Radiation Oncology

RO001-EB-X

Radiology for the Radiation Oncologist: Pancreatic Cancer

All Day Room: RO Community, Learning Center

Participants
Cheng-Chia Wu, MD, PhD, New York, NY (*Presenter*) Nothing to Disclose
Neil T. Pfister, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Elizabeth M. Hecht, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Shang-Jui Wang, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Akhil Tiwari, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Stuart Bentley-Hibbert, MD, PhD, Valhalla, NY (*Abstract Co-Author*) Nothing to Disclose
David Horowitz, MD, New York, NY (*Abstract Co-Author*) Consultant, Champions Oncology

TEACHING POINTS

Review normal anatomy Discuss radiographic modalities to help assist radiation oncology treatment planning for patients with pancreatic cancer. Review treatment planning for patients with pancreatic cancer including intact pancreas, post-operative pancreas, and stereotactic body radiotherapy.

TABLE OF CONTENTS/OUTLINE

Pancreatic cancer staging General anatomy Imaging modality for work up and radiation planning Treatment Strategy Radiation in the post-operative setting Radiation in patients with intact pancreas Clinical imaging: CT Simulation and Image Guided Radiation Therapy with Cone beam CT

RO002-EB-X

Initial Experience in the Usefulness of Dual Energy Technique in the Abdomen

All Day Room: RO Community, Learning Center

Participants
Silvina E. De Luca, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Emilia Casalini, MD, Buenos Aires, Argentina (*Presenter*) Nothing to Disclose
Delfina Pascuzzi, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Tatiana Gillanders, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Paula Ramos, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Eduardo P. Eyheremendy, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Dual energy is an innovative imaging technique that has been described to have a considerable effect on the care of oncological patients. It operates applying two different energy settings that makes it possible to differentiate materials with different molecular compositions on the basis of their attenuation profiles. In this exhibit we review in which oncological patients this technique proved beneficial and in which it showed no added value.

TABLE OF CONTENTS/OUTLINE

1) Introduction: a. Physics of Dual Energy CT techniques b. Reconstruction techniques
including iodine maps, virtual unenhanced and monochrome virtual images.2) Case reviews of 65 patients in our institution from January 2014 to January 2016. a. Hepatocelular carcinoma b. Primary renal and pancreatic malignant tumors c. Hypervascular tumor metastasis.
3) Conclusions:- 10% modified the oncologic staging. Dua l Energy improved lesion conspicuity in all hepatocelular carcinomas. This new technique has proved beneficial in characterization of a handful of hypervascular tumor metastasis.

RO100-ED-X

Prognosis is the Key for Radiation Therapy in Management of Bone Metastases

All Day Room: RO Community, Learning Center

Participants
Hikaru Kubota, MD, Akashi-city, Japan (*Presenter*) Nothing to Disclose
Toshinori Soejima, MD, Akashi-city, Japan (*Abstract Co-Author*) Nothing to Disclose
Shuhei Sekii, Akashi-city, Japan (*Abstract Co-Author*) Nothing to Disclose
Yoko Matsumoto, Akashi-city, Japan (*Abstract Co-Author*) Nothing to Disclose
Yosuke Ota, MD, Akashi-city, Japan (*Abstract Co-Author*) Nothing to Disclose
Kayoko Tsujino, Akashi-city, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The goal of palliative radiation therapy for bone metastasis is pain relief, management of metastatic spinal cord compression (MSCC), prevention of MSCC or pathological fracture, and treatment of oligometastasis. Radiation oncologists rely on the predictive prognosis to determine the indication for radiation therapy or dose fractionation schedules.The aims of this exhibit on bone metastasis are as follows: 1. Understand the treatment algorithm for managing bone metastasis; 2. Learn the appropriate dose fractionation schedules; and, 3. Discuss factors relating to prognosis prediction for patients with bone metastases.

TABLE OF CONTENTS/OUTLINE

(1) Background: Overview of the etiology and clinical features of bone metastasis.(2) Imaging diagnosis: Review clinically important imaging findings including MSCC and impending fracture.(3) Treatment algorithm: Elucidate the algorithm used to determine the management of bone metastasis.(4) Radiation therapy: Describe the evidence used to determine the dose fractionation schedule and radiation treatment modalities.(5) Prognostic prediction: Discuss cases from our hospital (n = 629), including survival in the different groups of patients by age, sex, PS, KPS, and primary tumor. There were significant differences in survival with regards to patient sex, PS, KPS and primary tumor.

RO101-ED-X

Prostatic Carcinoma Treated with Brachytherapy: Multiparametric Magnetic Resonance (MR) Patterns of Recurrence

All Day Room: RO Community, Learning Center

Participants

Gianpiero Cardone, MD, Milano, Italy (*Presenter*) Nothing to Disclose
Maurizio Papa, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Antonella Messina, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Andrea Losa, MD, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose
Paola Mangili, PhD, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose
Fraco Gaboardi, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Giuseppe Balconi, Ornago, Italy (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To report the spectrum of multiparametric MR findings of prostate gland treated with temporary and permanent Brachytherapy. To review the most frequent recurrence patterns after Brachytherapy. To evaluate the most effective MR imaging examination techniques in the evaluation of patients treated with Brachytherapy.

TABLE OF CONTENTS/OUTLINE

1) Brachytherapy of the prostate: technical aspects2) MR imaging techniques 3) MR patterns of prostate gland after Brachytherapya) size b) morphology c) contrast enhancement (DCE)d) periprostatic changes after treatmente) radiation therapy seeds MRI evaluation4) MR most frequent recurrence patterns.MR evaluation showed parenchimal fibrosis and atrophy of the gland on T2w images. DCE MR showed reduction of the vascularization of the gland. Radiation therapy seeds were seen as small foci of focal signal intensity void. Recurrent prostate carcinoma tipically appears as focal nodular region of intermediate-to-low signal intensity on morphologic T2w MR images, with greater enhancement compared to the perilesional prostatic tissue on DCE and restricted diffusion on DWI. MR can be an effective imaging technique in the follow-up of prostate tumors treated with Brachytherapy, in particular in the evaluation of patients with clinical or biochemical suspect of recurrence.

RO102-ED-X

Prostatic Carcinoma Treated with Focal Brachytherapy: Multiparametric Magnetic Resonance (MR) Imaging Patterns

All Day Room: RO Community, Learning Center

Participants

Gianpiero Cardone, MD, Milano, Italy (*Presenter*) Nothing to Disclose
Antonella Messina, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Maurizio Papa, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Paola Mangili, PhD, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose
Fraco Gaboardi, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Giuseppe Balconi, Ornago, Italy (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To illustrate multiparametric MR imaging effectiveness in the early evaluation of post-implant dosimetry in patients treated with Focal Brachytherapy.To report the spectrum of multiparametic MR findings of prostate gland treated with Focal Brachytherapy. To show the evolution, as time passed, of the signal intensities of prostate treated with Focal Brachytherapy.

TABLE OF CONTENTS/OUTLINE

1) Focal Brachytherapy of the prostate: technical aspects2) Multiparametric MR imaging techniques 3) Anatomic and functional MR patterns of prostate gland after Focal Brachytherapy:a) size b) morphology c) contrast enhancement d) diffusione) spectroscopyf) radiation therapy seeds MRI evaluationg) periprostatic changes after treatment4) Post-implant dosimetryMorphologic MR evaluation showed reduction in size of the treated area of the gland and diffuse reduction of signal intensity on T2w images due to parenchimal fibrosis and atrophy. DCE and Spectroscopy showed atrophy of treated areas and normal patterns on spared portion of the gland. Radiation therapy seeds were seen as small foci of focal signal intensity void. MR can be an effective imaging technique in the follow-up of prostate tumors treated with FB, in the early evaluation of post-implant dosimetry and in patients with clinical or biochemical suspect of recurrence.

RO103-ED-X

Providing MR Imaging for Radiation Therapy Planning: Lessons for Radiologists

All Day Room: RO Community, Learning Center

Participants
Thomas P. Sullivan, MD, Maywood, IL (*Presenter*) Nothing to Disclose
Steven M. Shea, PhD, Oak Park, IL (*Abstract Co-Author*) Nothing to Disclose
Matthew M. Harkenrider, MD, Maywood, IL (*Abstract Co-Author*) Nothing to Disclose
Abbie M. Diak, PhD, Maywood, IL (*Abstract Co-Author*) Nothing to Disclose
Joseph H. Yacoub, MD, Maywood, IL (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Role of MRI in radiation treatment planning (RT)MRI for RT in gynecologic brachytherapy is idealImaging and workflow challenges using MRI for RTImage acquisitionFuture applications

TABLE OF CONTENTS/OUTLINE

MRI in RT is evolving/increasing, but not without challenges Current applications of MRI in RT Brain, head, neck Chest wall, breast Liver Pelvic organs Reasons for increasing use of MR in RT soft tissue resolution and increasing clinical use coregisration Challenges Acquisition Geometric distortion Artifacts Motion Workflow Diagnostic and therapeutic imaging procedures differ sequence parameters patient preparation Interdepartmental coordination Safety precautionsOur institutional experience with cervical & endometrial brachytherapy Why gyn European MR-only RT Electron density maps less necessary water-dense target assumed Less motion Current CT-MR workflow Phantom work characterizing applicator artifact MR safety Imaging protocol Reducing distortion/artifacts 3D acquisition Future applications MR-only cervical cancer RT Plastic applicators Improved targeted dose planning MR-only / combined MR for Linac RT 4D MRI for abdominal and lung RT

RO104-ED-X

Clear Cell Renal Carcinoma with TNM Staging: Radiologic-Pathologic Correlation

All Day Room: RO Community, Learning Center

FDA Discussions may include off-label uses.

Participants
Silvina E. De Luca, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Cecilia Carrera, Caba, Argentina (*Abstract Co-Author*) Nothing to Disclose
Lorena Alarcon, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
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Emilia Casalini, MD, Buenos Aires, Argentina (*Presenter*) Nothing to Disclose
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Gonzalo Vitagliano, CABA, Argentina (*Abstract Co-Author*) Nothing to Disclose
Leandro Blas, CABA, Argentina (*Abstract Co-Author*) Nothing to Disclose
Francisco Lopez, CABA, Argentina (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Clear cell renal carcinomaTNM stagingMDCTRadiologic-Pathologic Correlation

TABLE OF CONTENTS/OUTLINE

Renal cell carcinoma (RCC) is the most common malignant renal tumor in adults.Multidetector computed tomography (MDCT) remains the most effective modality for the detection and staging of RCC.The extent of the primary tumor at initial diagnosis, including location, size, relationship to the pelvicaliceal system and blood vessels is critical for accurate management of disease as the prognosis for patients diagnosed with renal cell carcinoma is directly related to stage at presentation.We reviewed 50 patients with diagnosis of RCC who underwent CT and were treated surgically in our institution, between January 2014 and March 2016. Images of the primary tumor were evaluated according to TNM system of the American Joint Committee on Cancer.There was an error rate in the T and N staging of 35%. In these cases 92% were due to misdiagnosis in T stage and the main reasons were errors of measurement (in borderline cases) and evaluation of local extension (perirrenal fat and Gerota invasion). Evaluation stage N was successful in 94% of the cases.MDCT represents the best method for characterizing and staging renal lesions. Its main limitations are related to the evaluation of size and locorregional extension in borderline cases.

RO105-ED-X

CHEST MRI: Problem Solving Tool in Broncho Pulmonary Cancer in Radiation Oncology

All Day Room: RO Community, Learning Center

Participants
Hajer Jarraya, Lille, France (*Presenter*) Nothing to Disclose
Laurent Basson, lille, France (*Abstract Co-Author*) Nothing to Disclose
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Alexandre Escande, lille, France (*Abstract Co-Author*) Nothing to Disclose
David Pasquier, MD, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Abel Cordoba, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Sophie Taieb, MD, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Luc Ceugnart, MD, Lille, France (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Chest MRI can provide useful information that can not be provided with other noninvasive or minimally invasive imaging techniques.Chest MRI is helpful in target delineation of bronchopulmonary cancer associated with parenchymal collapse before radiation delivery and is also useful in differenciating tumor recurrence from radiation injury after treatment

TABLE OF CONTENTS/OUTLINE

This educational exhibit will be designed as case study comparing for each case CECT, chest MRI and PET FDG and showing the value of chest MRI in patient management and follow up after stereotactic body radiotherapy of the chest.All reported cases were performed in a 3T MRI for 15 patients who were referred for radiation therapy for bronchopulmonary cancer associated with adjacent parenchymal collapse, making contour definition difficult, or for assessing treatment response after treatment when there was discordance. Chest MRI significantly helped delineation of Tumors associated with collapse, or local recurrence of previously treated tumors in all cases and was concordant with PET FDG uptake areas. It reduced the gross tumor volume of target lesions compared to CE CT scan delineation.After treatment In follow up, MRI helped differentiating focal radiation lung lesions from targeted tumor and made response assessment to therapy easier and more adequate compared to CECT.

RO106-ED-X

Pathology and Images of Radiation Induced Hepatitis

All Day Room: RO Community, Learning Center

Participants
Shigeyuki Takamatsu, MD, PhD, Kanazawa city, Japan (*Presenter*) Nothing to Disclose
Kazuto Kozaka, MD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
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Norihide Yoneda, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Kotaro Yoshida, MD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Dai Inoue, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Azusa Kitao, MD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Takahiro Ogi, MD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Tetsuya Minami, MD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Wataru Koda, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomoyasu Kumano, Ishikawa, Japan (*Abstract Co-Author*) Nothing to Disclose
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Toshifumi Gabata, MD, PhD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

TEACHING POINTThanks to recent advancement of radiation therapy such as stereotactic body radiotherapy (SBRT) and particle beam therapy, the indication of radiotherapy (RT) for liver tumors has been extended greatly. But, because of poor hepatic radiation tolerance, the estimation of irradiated liver by RT is important, especially in cirrhotic liver. The pathological changes of irradiated liver after RT are perivenular fibrosis and sinusoidal obstruction and damage to Kupffer cells and hepatocyte itself. Clinical images can visualized these pathological changes.The purpose of this exhibit is to: Illustrate the pathological change in the radiation induced liver disease (RILD). Illustrate the time course change of irradiated liver by RT. Illustrate the estimation of hepatic tumor after RT.

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TABLE OF CONTENTS/OUTLINE Pathology of RILD Temporal change of irradiated liver and surrounding liver and adjacent structure Imaging findings of RILD and surrounding liver Imaging of irradiated liver in Multimodality Estimation of therapeutic effect

SPIO11

Oncodiagnosis Panel: Liver Cancer

Sunday, Nov. 27 10:45AM - 12:15PM Room: E353C

GI IR OI RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Kathryn J. Fowler, MD, Chesterfield, MO (*Moderator*) Nothing to Disclose

Sub-Events

SPIO11A Pretreatment Imaging Evaluation of Liver Cancer

Participants
Ashkan A. Malayeri, MD, Bethesda, MD, (ashkan.malayeri@nih.gov) (*Presenter*) Nothing to Disclose

SPIO11B Surgical Intervention for Liver Cancer

Participants
Sam G. Pappas, MD, FACS, Maywood, IL (*Presenter*) Nothing to Disclose

SPIO11C Interventional Radiology Procedures for Liver Cancer

Participants
Sandeep Vaidya, MD, Seattle, WA (*Presenter*) Nothing to Disclose

SPIO11D Radiotherapy for Liver Cancer and Post-RT Evaluation of Response

Participants
Michael I. Lock, MD, FRCPC, London, ON (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Overview of technical details and options for radiation of liver cancer. 2) Review the evidence. 3) Review an approach to liver image interpretation post radiation.

ABSTRACT

Radiation for liver is becoming common. However, the literature reveals a large variation in practice and outcome. This review of the data will provide an organized summary of the evidence and an understanding of the various methods of radiating liver cancers. The primary objective is to review an approach to liver image interpretation post radiation. The presentation will cover expected imaging changes with time after radiation, provide predictive imaging tools to identify i) which patients will progress ii) when patients will progress and iii) which patients will survive.

URL

none

ROS-SUA

Radiation Oncology Sunday Poster Discussions

Sunday, Nov. 27 12:30PM - 1:00PM Room: RO Community, Learning Center

RO

AMA PRA Category 1 Credit ™: .50

Participants

John C. Grecula, MD, Columbus, OH (*Moderator*) Research Grant, Teva Pharmaceutical Industries Ltd Research Grant, Soligenix, Inc

Sub-Events

RO200-SD-SUA1 Implications of Magnitude of Shifts on PTV Margins using Daily Image Guidance for Pre-operative external Beam Radiotherapy of Extremity Soft Tissue Sarcomas

Station #1

Participants
Elizabeth B. Jeans, Chicago, IL (*Presenter*) Nothing to Disclose
Neilayan Sen, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Julius Turian, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Ross A. Abrams, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Dian Wang, MD, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The planning target volume (PTV) margin for the pre-operative treatment of extremity sarcomas in the absence of daily image guidance was previously reported as 1.5cm through a multi-institutional study (RTOG 0630). However, it remains unknown whether or not there is a difference between the shifts in upper vs. lower extremity sarcomas, as well as any impact on the shifts by different immobilization devices used in participating institutions. This analysis was conducted to determine the minimal safe PTV margin in this context.

METHOD AND MATERIALS

From 2008-2014, 18 patients received pre-operative external beam radiotherapy for upper extremity (n = 5) and thigh (n = 13) soft tissue sarcomas with daily image guidance at our institution. All patients were carefully immobilized using vaclok. Daily repositioning in the right-left (RL), superior-inferior (SI) and anterior-posterior (AP) directions were collected. Image guidance techniques included kV orthogonal images, MV orthogonal images, and MVCT. For each patient, mean and standard deviations were calculated for each of the three orthogonal directions. The Van Herk formulation (PTV margin = $2.5\Sigma + 0.7\sigma$) was used to estimate minimal safe PTV margin in the absence of image guidance. Σ was estimated at 2mm using institutional data.

RESULTS

For the entire cohort, the mean shifts in the RL, SI, and AP directions were 3.0mm, 5.2mm, and 6.2mm respectively. Sigma for the entire cohort was 4.8mm. For the upper extremity cohort, RL, SI, and AP shifts were 3.1mm, 5.0mm, and 6.4mm respectively. Sigma for the upper extremity cohort was 4.8mm. For the thigh cohort, RL, SI, and AP shifts were 2.9mm, 5.4mm, and 6.0mm respectively. Sigma for the thigh group was calculated at 4.7mm. Using the Van Herk formulation, PTV was found to be 8.38mm for the upper extremity group and 8.32mm for the thigh group (using Σ=2mm). As a cohort, PTV margin was calculated at 8.35mm.

CONCLUSION

In the pre-operative treatment of extremity soft tissue sarcomas, a minimum PTV margin of 8.35mm is suggested in the absence of daily image guidance, even in the setting of careful immobilization. There is no difference in shifts between upper vs. lower extremity.

CLINICAL RELEVANCE/APPLICATION

In the absence of daily image guidance, a large PTV margin for pre-operative treatment of extremity sarcomas is suggested even with careful immobilization.

RO201-SD-SUA2 Effects of Radiotherapy and Immediate Breast Reconstruction in Mastectomized Patient: A Retrospective Comparative Study

Station #2

Participants
Meritxell Arenas, Reus, Spain (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): There is a paucity of high-quality conclusive data regarding the correct sequencing of breast reconstruction and radiotherapy in mastectomized patients. Immediate breast reconstruction (IBR) is an increasingly technique among patients suffering from breast cancer (BC) which can enhance the aesthetic outcomes and, maybe, provide enormous psychosocial benefits. However, it's been long discussed the negative effects that radiotherapy may have on IBR. In this study, we aim to analyze the major complications with breast surgery and radiotherapy in a group of patients that underwent IBR or delayed reconstruction, in order to improve the timing of radiotherapy on the treatment of these patients.Materials/Methods: We analysed the complications from 133 patients treated with a mastectomy with or without IBR due to a BC from 2011 to 2015. Those patients were separated in two groups, regarding the use or not of radiotherapy. The list of complications that have been considered as an outcome are: dermatitis, folliculitis, esophagitis, neurotoxicity, edema, lymphedema, infection, mastitis, fibrosis, hematoma, seroma, ulcer, capsular contracture, transfusional anaemia, fatty necrosis, graft necrosis, prosthesis rejection, reoperation, recurrence or exitus.Results: From 133 mastectomized patients, 90 underwent IBR and it was delayed in 43. From these 133 mastectomized patients, 53 received postoperative radiotherapy. Bboth groups were homogeneous except for those which are related to

oncological treatment conditions and indications, for example the tumoral staging, or other therapeutical procedures. We have done a comparative analysis of the complications regarding the administration or not of radiotherapy in which we have not found any significant differences.Conclusion: We have found significant differences between the patients that underwent IBR and the patients that did not with an increased incidence of some complications in the IBR group as: infection, hematoma, mastitis, transfusional anaemia and reoperation. Nevertheless, within the patients that underwent IBR, we have not found significant differences in the incidence of our study outcomes regarding the administration of an adjuvant radiotherapy treatment. In conclusion, we are not able to affirm that radiotherapy has some influence on the incidence of complications that may come out within the follow-up of those mastectomized patients who underwent IBR.

RO202-SD-SUA3 Design and Implementation of a Radiation Oncology Quality of Life and Outcomes Database for Improving Documentation and Care for Head and Neck Cancer Patients

Station #3

Awards
Student Travel Stipend Award

Participants
Cato Chan, BS , Los Angeles, CA (*Presenter*) Nothing to Disclose
Sukhjeet S. Batth, MD, MS, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Nicholas Trakul, MD, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Electronic medical records (EMRs) are widely used to capture un-structured clinical patient information. Analyzing patient outcomes using EMRs is limited by its retrospective nature and the significant resources it requires. We have designed and implemented a web-based, electronic data capture (EDC) system for head and neck cancer patients receiving radiation therapy in order to analyze outcomes prospectively, enhance the quality of clinical information recorded, and to generate regular Quality Improvement and patient safety reports.Materials/Methods: Our institution uses two different implementations of the same EMR at two separate hospitals, one a private NCCN Comprehensive Cancer Center, and the other a safety net hospital. Prior to implementation of the EDC, documentation was performed by both dictation and transcription services as well as direct entry into the EMR. A separate radiation oncology-specific record and verify system maintains all radiation therapy information, including the radiation prescription and treatment plan. The EDC was designed to record patient demographics, history, cancer and treatment characteristics, and to be used for on-treatment visit (OTV) and follow-up visit documentation and reporting. Generated OTV and follow-up visit forms are exported to the EMR. Patient-reported quality of life outcomes were collected prior to treatment, end of treatment, and at each follow-up. Common Toxicity Criteria for Adverse Events version 4.0 is used for observer rated toxicity scoring at all encounters.Results: The EDC system was implemented in February 2016 after an orientation for providers and nurses. It has been used by four providers and three nurses in two clinics for 35 patient encounters. Compliant data was recorded for 2 of 3 new patients, 18 of 20 follow-up patients, and 15 of 15 OTV encounters (total compliance of 92%). Preliminary feedback suggests that the EDC has streamlined OTV and follow-up documentation for providers. Only 10 of 21 (48%) quality of life questionnaires were successfully completed. Low computer literacy rates seen in the safety net hospital setting pose a significant challenge to compliance for patient reported outcomes. Conclusion: Designing and implementing a radiation oncology quality of life and outcomes database is feasible for head and neck cancer patients. Providers and nurses demonstrated compliance with its use. This has the potential to significantly reduce the resources required to analyze patient outcomes, and for enhancing patient safety and Quality Improvement initiatives. We aim to further evaluate user experience, improve the EDC, make it available to share with other institutions, and adapt it to other disease sites.

RO203-SD-SUA4 Total Skin Electron Therapy for Mycosis Fungoides

Station #4

Participants
Charlotte I. Rivers, MD, Buffalo, NY (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Treatment options for mycosis fungoides (MF) include new targeted agents, topical therapies, oral chemotherapeutic agents, phototherapy, and total skin electron therapy (TSET). Historically, TSET has been used as an effective treatment to induce partial or complete response for patients refractory to other therapies. Standard full dose TSET is 30-36 Gray (Gy). TSET to a total dose as low as 9 Gy has been suggested to be effective in inducing response. There is interest in combining this low dose TSET with targeted therapies to maintain response. Relapse is expected in MF, but the use of a lower dose TSET allows for multiple courses of re-treatment . Here we analyze the extent and durability of response in patients from a single institution with cutaneous T cell lymphoma treated with TSET.Materials/Methods: Patients treated using TSET from 2009 to 2015 were identified from treatment database. Analysis included treatment dose and technique, treatment response, time to recurrence, response to retreatment(s), and toxicity.Results: 16 patients with cutaneous T cell lymphoma were treated at a single institution from 2009-2015 using total skin electron therapy. Dose for each treatment ranged from 9 Gy to 36 Gy (8 patients were prescribed low dose regimen of 9 or 10 Gy; 8 patients were prescribed standard regimen of 30-36 Gy). Of the 16 patients, 13 demonstrated a significant partial response (81%). All of the 8 patients treated with 9-10 Gy demonstrated treatment response. Two of the 30-36 Gy regimen patients discontinued treatment early due to side effects; one progressed during treatment on the soles of feet and in the mouth. In the low dose group, therapy overall was well tolerated, with no treatment-limiting side effects. 7 out of 8 patients completed the course without interruption; one patient discontinued treatment and was later re-treated to total dose of 9 Gy. Two patients received re-treatment with TSET, and three patients were treated focally to areas of recurrence with orthovoltage or external beam boosts. Conclusion: Total skin electron therapy is an effective treatment to induce response in patients with refractory T cell lymphoma. Low dose TSET (10 Gy or less) induced treatment response in all patients while allowing for future retreatment. As this treatment is well tolerated, it should be considered as an option earlier in the treatment course, along with systemic agents or other targeted therapies.

RO107-ED-SUA5 Radiology Collaboration-ECG Gated CT and Radiation Therapy; Saving Coronary Arteries One Heart Beat at a Time

Station #5

Participants

Nikkole Weber, Rochester, MN (*Presenter*) Nothing to Disclose
Shuai Leng, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Eric E. Williamson, MD, Rochester, MN (*Abstract Co-Author*) Research Grant, General Electric Company
Emily Sheedy, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Cynthia Walfoort, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Katie Halda, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Alexandria Tasson, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Rebecca Keller, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Share information about the damaging, long term effects of radiation therapy on coronary structures including, but not limited to the arteries and valves. Identify which patients will benefit from the use of this collaborative approach to radiation therapy Learn about the protocol used to generate detailed imaging of the location of these important structures of the heart and other vulnerable structures of the body and how they are used to design a radiation therapy treatment plan.

TABLE OF CONTENTS/OUTLINE

Background Widespread use of radiation therapy (lymphoma, breast CA, etc) Danger to cardiac structures (coronary arteries, aortic valve, etc) Cardiac CTA can identify these structures and help design a radiation therapy plan to avoid themWorkflow Identification of patients (RT) CT protocol (CT) Radiation therapy map (RT)Benefits Radiation plans Average radiation dose to radiosensitive structures – without & with "planning" Coronary arteries: left main, left anterior descending, circumflex, RCA Aortic valve Mitral valve Conclusion Radiation therapy planning using ECG-gated CT angiography has the potential to significantly reduce radiation dose to sensitive cardiac structures in patients referred for radiation therapy of the chest and mediastinum.

ROS-SUB

Radiation Oncology Sunday Poster Discussions

Sunday, Nov. 27 1:00PM - 1:30PM Room: RO Community, Learning Center

RO

AMA PRA Category 1 Credit ™: .50

FDA Discussions may include off-label uses.

Participants
John C. Grecula, MD, Columbus, OH (*Moderator*) Research Grant, Teva Pharmaceutical Industries Ltd Research Grant, Soligenix, Inc

Sub-Events

RO204-SD-SUB1 Nanoparticle Imaging and Treatment of Primary and Metastasized Tumor through Immunogenic Cell Death and Abscopal Effect, Respectively, by Targeted Dendritic-cell-mediated T-cell Priming and Immune Checkpoint Blockade via Radiotherapy

Station #1

Participants
Satoshi G. Harada, MD, Morioka, Japan (*Presenter*) Nothing to Disclose
Shigeru Ehara, MD, Morioka, Japan (*Abstract Co-Author*) Nothing to Disclose
Takahiro Satoh, DSc, Takasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Koichiro Sera, Takizawa, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

We aimed to image and treat primary tumors and metastasized tumors in vivo through immunogenic cell death (ICD) and abscopal effect, respectively, using microcapsules that release liposome-protamine-hyaluronic acid nanoparticles (LPH-NPs) in three radiation sessions under blockade of CTLA-4 and PD-1.

METHOD AND MATERIALS

Six hours before session one, 6 mg of anti-CTLA-4 antibody (Ab) was injected intraperitoneally into BALB/c mice with primary LM17 tumor in the left hind leg and lung metastases. For session one, LPH-NPs containing 5% iopamiron and 400 μg anti-PD-1 Ab were mixed with 1 mL 4.0% alginate, 3.0% hyaluronate, and 1 μg/mL P-selectin solution and added to 0.5 mM FeCl2 with 1 μg/mL α4β1 Ab. The microcapsules (ten billion) were injected intravenously (IV). After 9 h, primary tumors were exposed to 10 or 20 Gy 60Co γ-rays. In session two, dendritic cell (DC)-associated cross-priming of CD8+ T cells was intensified for treatment of lung metastases by the abscopal effect. To this end, LPH-NPs containing 250 nmol anti-CD47 siRNA, 40 ng HMGB1, and 10 μmol ATP were mixed with the above cocktail and added to 0.5 mM FeCl2 with 1 μg/mL anti-P-selectin Ab. Microcapsules (ten billion) were injected IV, which interacted with P-selectin. After 9 h, tumors were irradiated as before. For session three, 4 cGy 60Co whole-body γ-rays were administered at 24 h intervals for 5 days.

RESULTS

CTLA-4 was blocked before the first session. In session one, anti-α4β1 microcapsules accumulated around the primary tumor and metastases, which was detected by CT. Microcapsules released P-selectin-Ag and anti-PD-1 Ab with LPH-NPs after first irradiation. In session two, microcapsules accumulated around the primary tumor through P-selectin Ag-Ab reaction and released LPH-NPs containing anti-CD47 siRNA, HMGB1, and ATP, which intensified ICD in the primary tumor and CD8+ T-cell priming under CTLA-4 blockade. In session three, primed CD8+ T cells were activated by low dose whole body irradiation and targeted metastases whose PD-1 was blocked in session one. These treatments reduced the size of primary tumors and metastases by 92.4%.

CONCLUSION

Our targeted radioimunotherapy system has the potential to improve tumor diagnosis and treatment.

CLINICAL RELEVANCE/APPLICATION

Targeted dendritic-cell-mediated T-cell priming and immune checkpoint blockade through CTLA-4 and PD-1 enhanced the effects of radiotherapy on primary tumors and metastases.

RO205-SD-SUB2 A Comparison of Dosimetric Variance for External-beam Partial Breast Irradiation using Three-dimensional and Four-dimensional Computed Tomography

Station #2

Participants
Bing Guo, Jinan, China (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To investigate the potential dosimetric benefits from four-dimensional computed tomography (4DCT) compared with three-dimensional CT (3DCT) in radiotherapy treatment planning for external-beam partial breast irradiation (EB-PBI). Materials/Methods: 3DCT and 4DCT scan sets were acquired for 20 patients who underwent EB-PBI. The volume of the tumour bed (TB) was determined based on seroma or surgical clips on 3DCT images (defined as TB3D), and the end inhalation (EI) and end exhalation (EE) phases of 4DCT images (defined as TBEI and TBEE, respectively). The clinical target volume (CTV) consisted of the TB plus a 1.0 cm margin. The planning target volume (PTV) was the CTV plus 0.5 cm (defined as PTV3D, PTVEI, and PTVEE). For each patient a conventional 3D conformal plan (3D-CRT) was generated (defined as EB-PBI3D, EB-PBIEI, and EB-PBIEE). Results: The PTV3D, PTVEI, and PTVEE were similar ($p = 0.549$), but the PTV coverage of EB-PBI3D was significantly less than that of EB-PBIEI or EB-PBIEE ($p = 0.001$ and $p = 0.025$, respectively). There were no significant differences in the

homogeneity or conformity indexes between the three treatment plans (p = 0.125 and p = 0.536, respectively).The specified doses for the ipsilateral normal breast, the ipsilateral lungs and the heart were significantly lower using the 4DCT images (p Conclusion: Compared with 3DCT, we could benefit more from the use of 4DCT-based planning of 3D-CRT for EB-PBI in patients with breast cancer. Respiratory motion did not have a remarkable influence on dose distribution during free breathing, but could result in suboptimal dose coverage of the PTV when 3DCT is used for planning. Furthermore, 4DCT-based planning could significantly reduce the expose of non-target organs to irradiation. While we do not suggest that 4DCT should act as a replacement for 3DCT, we do suggest that the benefits of 4DCT planning would be most apparent in patients with an irregular breathing pattern.

RO206-SD-SUB3 Dosimetric Evaluation of Incidental Radiation of Internal Mammary Chain in Breast Cancer with Tangential Fields of 3D External Radiotherapy

Station #3

Participants
Esther Jorda, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): The internal mammary chain represents a less common yet important rout of lymphatic drainage of breast cancer, constituting a matter of debate in the current clinical practice. Poortmans P. 2015 suggests an improvement of disease-free survival, distant disease-free survival and a reduction of breast cancer mortality when they included the internal mammary and medial supraclavicular lymph-node irradiation. This study intends to determinate the incidental coverage and dose distribution of the internal mammary chain in breast cancer treatment, using tangential and opposite fields with 3D External Radiotherapy.Materials/Methods: We randomly reviewed 47 female patients treated at one institution between January and December of 2013 with an average age of 62 years. Thirty seven patients (78%) had invasive ductal carcinoma (IDC), and 10 patients (21.2%) other histology types; Her2: Negative (82%), hormonal receptors were positive in all of them, 30 affecting the left and 17 the right breast. The majority of tumours were Results: With an average volume of the internal mammary chain of 4.13 cm3, the median minimal dose and maximal dose delivered was 278cGy and 4008cGy respectively, this last one corresponding to 8% of Total dose prescribed for the mammary gland. The median V95 was 297.04cGy. Conclusion: The radiation of the internal mammary chain on patients of this study have showed minimal incidental doses, therefore we concluded that the contouring, volume delimitation and dose prescription has been appropriated by not affecting unwanted areas. In the other hand unintended radiation of internal mammary chain turns out as insufficient to treat subclinical disease.

RO207-SD-SUB4 Can Children Receive Radiation Therapy without Anesthesia? Virtual Reality, Game, and Body Motion Sensors

Station #4

Participants
Huan B. Giap, MD, PhD, Loma Linda, CA (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): This study proposes a noninvasive technique (in place of anesthesia) using virtual reality (VR) to keep young patients to remain still during the radiation treatmentMaterials/Methods: The VR system (Figure 1) consists of: (1) Head Mounted Display (HMD) that can display 3-D 1080p video and audio; (2) Multiple wireless IMU motion sensors; (3) multi-level 3-D games(4) the computer system that incorporates all these components and provide output to patients and technician. The game component will feature patient as an avatar flying an aero-skateboard to help mother dinosaur to collect all the lost eggs through multiple terrains (game levels) of forest, desert, mountain, etc. Positive feedback given as scores and bonus throughout the process to stimulate the patient during the 30-45 minute duration of the treatment. Once the game starts, as long as the patient remains still, the avatar will fly and collect eggs with different colors and adding scores. If motion of any body parts is detected above certain set threshold, the avatar is slowed down, and warning is given to patients indicating which part of needed to be still or resumes to reference position. Results: A prototype has been developed and currently being tested in healthy young children, and preclinical testing to insure there is no interfere with the electronics of the radiation equipments. The next step is to perform a pilot clinical study on actual young patients undergoing radiation treatments. Conclusion: The VR system can offer significant reduction of morbidity, cost, and inefficiency in the radiation treatment of pediatric population.

RC120

Fundamentals of Imaging for the Radiation Oncologist

Sunday, Nov. 27 2:00PM - 3:30PM Room: S404CD

RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Eric Leung, MD, FRCPC, Toronto, ON (*Moderator*) Nothing to Disclose

Sub-Events

RC120A Fundamentals in Radiation Oncology Imaging of Sarcoma

Participants
David B. Mansur, MD, Cleveland, OH (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

RC120B Fundamentals in Radiation Oncology Imaging of Breast Cancer

Participants
William Small JR, MD, Maywood, IL, (wmsmall@lumc.edu) (*Presenter*) Speakers Bureau, Carl Zeiss AG; Advisory Board, Varian Medical Systems, Inc

LEARNING OBJECTIVES

1) To enable attendees to understand the contribution of various imaging modalities in the initial evaluation of breast cancer.2) To review imaging modalites role in radiaiton treatment planning for breast cancer.3) To review the use of imaging modalities in the follow-up of breast cancer.

RC120C Fundamentals in Radiation Oncology Imaging of Prostate Cancer

Participants
Stanley L. Liauw, MD, Chicago, IL, (sliauw@radonc.uchicago.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) The primary objective of this session is to enable attendees to understand the contribution of various imaging modalities (including CT, MRI, bone scan, and novel imaging) in the management of prostate cancer by the practicing radiation oncologist.

ABSTRACT

RC120D Fundamentals in Radiation Oncology Imaging of Pancreatic Cancer

Participants
Joseph M. Herman, MD, MSc, Baltimore , MD (*Presenter*) Nothing to Disclose

RC122

Imaging for Proton Treatment Planning

Sunday, Nov. 27 2:00PM - 3:30PM Room: S403A

RO PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Jon J. Kruse, PhD, Rochester, MN (*Moderator*) Research Grant, Varian Medical Systems, Inc

ABSTRACT

Proton therapy has the potential to deliver very conformal dose distributions which may lead to higher cure rates or lower treatment toxicities than conventional or intensity modulated x-ray therapy. Like modern photon modalities, proton therapy relies heavily on advanced imaging techniques for treatment planning and dose calculation. This course will describe imaging requirements which are unique to proton therapy treatment planning. Much of the advantage of proton therapy is derived from the particle beam's finite range, and calculation of proton range within a patient requires a conversion between CT Hounsfield Units (HU) and proton stopping power. This calibration process is significantly different from the HU to electron density conversion which is performed for x-ray dose calculation. Uncertainties in the stopping power conversion are currently managed by expanding normal tissue margins around the clinical target volume and through appropriate beam selection. Improved CT techniques and alternative imaging modalities promise to deliver a more reliable image of stopping power within the patient, allowing for reduced treatment volumes. Tumor motion also presents a unique challenge in proton therapy, as a moving target exhibits not only variable position within a beam's eye view, but varying range as well. Modern proton therapy facilities which deliver treatments via a scanning beam are additionally susceptible to the interplay effect, in which the time dependent dose delivery is altered by motion of the target and surrounding anatomy. Four-dimensional imaging and dose calculation are then critically important in proton therapy to ensure that the treatment plan is robust against tumor motion.

Sub-Events

RC122A Uncertainties in Imaging for Dose Calculations

Participants
Andrew Wroe, PhD, Loma Linda, CA, (awroe@llu.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

Describe the Bragg peak and the impact this has on treatment delivery Understand proton therapy clinical workflow Discuss imaging modalities used for proton therapy treatment planning Describe the CT number to proton stopping power calibration Understand sources of range uncertainty in proton therapy Discuss alternate imaging modalities that may impact proton range uncertainty

RC122B Uncertainties in Motion for Treatment Planning

Participants
Heng Li, Houston, TX, (hengli@mdanderso.org) (*Presenter*) Research funded, Varian Medical Systems, Inc

LEARNING OBJECTIVES

1) Describe the impact of tumor motion on a proton dose distribution. 2) Compare the relative value of various four-dimensional imaging modalities in the evaluation of a proton plan for a mobile target. 3) Explain the process for incorporating four-dimensional imaging into dose calculation.

ABSTRACT

MSRO21

BOOST: Gastrointestinal-Oncology Anatomy (An Interactive Session)

Monday, Nov. 28 8:30AM - 10:00AM Room: S103AB

GI RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Mukesh G. Harisinghani, MD, Boston, MA (*Presenter*) Nothing to Disclose
Theodore S. Hong, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Achieve a basic understanding of the anatomy pertinent to the pancreatico-biliary region and imaging appearance of pancreaticobiliary tumors. 2)Understand strengths and limitations of imaging techniques, including MRI, PET-CT and CT, as they are used in delineating primary tumor and staging involved regional nodes. 3) Identify reasons for local recurrence and recognize the imaging appearances of these recurrences. 4) Improve radiation therapy delivery through understanding the contouring recommendations for the gross tumor volume (GTV) and clinical target volumes (CTV) for anorectal tumors, both in the locally advanced and postoperative setting.

ABSTRACT

In this course cross sectional imaging will be used to contour normal pancreatico-biliary anatomy as well as tumors involving this anatomical region. Also patterns of spread of pathological lymph nodes will be shown, and corss sectional imaging will be used to contour the regional nodal lesions. Cases will be
presented and the participants will be stimulated to do the contouring themselves, and will have feed-back on their results

MSRO24

BOOST: CNS-Oncologic Anatomy and Contouring Review: Emphasis on Molecular Markers and Role of MR/PET Imaging (An Interactive Session)

Monday, Nov. 28 8:30AM - 10:00AM Room: S103CD

NR BQ MI MR NM RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Rajan Jain, MD, Hartsdale, NY (*Presenter*) Consultant, Cancer Panels
Michael D. Chan, MD, Winston-Salem, NC (*Presenter*) Advisory Board, NovoCure Ltd
Christina I. Tsien, MD, Saint Louis, MO (*Presenter*) Speaker, Merck & Co, Inc

LEARNING OBJECTIVES

1) Describe how to differentiate gliomas from lymphoma, metastases as well as non-neoplastic etiologies such as demyelinating lesions: Role of functional imaging modalities. 2) Describe imaging characteristics of gliomas based on genomic differences: Imaging phenotype genotype correlation. 3) Advanced imaging techniques as a surveillance tool in post-therapy gliomas with emphasis on genomic markers.

ABSTRACT

Recent advances in glioma genomics have significantly changed our understanding of tumor biology and hence, affected how these patients are treated. Similarly, integrating imaging data with genomic markers has also helped create better prognostic and predictive biomarkers which offer promising future for personalized medicine. This session will highlight a multi-disciplinary approach with the focus on advanced imaging and genomics markers before and after therapy in gliomas.

RC220

Imaging Evaluation, Target Delineation and Response Evaluation for Skull Base and Spinal Stereotactic Radiosurgery/Radiotherapy

Monday, Nov. 28 8:30AM - 10:00AM Room: S404CD

NR BQ RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Simon S. Lo, MD, Seattle, WA, (simonslo@uw.edu) (*Moderator*) Research support, Elekta AB; Travel support, Accuray Incorporated; Speaker, Accuray Incorporated;

LEARNING OBJECTIVES

After the course, participants should be able to discuss:1. Imaging Evaluation, Target Delineation and Response Evaluation for Stereotactic Radiotherapy for Skull Base Tumors.2. Imaging Evaluation, Target Delineation and Response Evaluation for Stereotactic Body Radiotherapy for Spinal Metastases.

ABSTRACT

Sub-Events

RC220A Imaging Evaluation of Skull Base and Spinal Tumors

Participants
Pejman Jabehdar Maralani, MD, FRCPC, Toronto, ON (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To demonstrate the role of various imaging modalities for detection and follow up of spinal and skull base metastasis. 2) To demonstrate the role of imaging in pre-radiation planning with a focus on SBRT.

ABSTRACT

The aim of this presentation is to discuss the diagnostic performance of plain film, CT scan, bone scan, MRI and PET for detection and follow up of spinal and skull base bony metastasis. We will discuss the lasts trends and limitations regarding each modality. We also discuss dedicated role of imaging in planning for SBRT.

RC220B Target Delineation and Response Evaluation for Skull Base Stereotactic Radiosurgery/Radiotherapy

Participants
Lia M. Halasz, MD, Seattle, WA, (lhalasz@uw.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the challenges of target and normal structure delineation in the skull base. 2) Identify imaging modalities helpful to target and normal structure delineation. 3) Review data on pseudoprogression after radiation therapy to skull base tumors.

ABSTRACT

The aim of this session is to understand the challenges of target delineation and response evaluation in the treatment of skull base tumors. We will discuss helpful imaging modalities to aid in contouring and the issue of pseudoprogression in determining response.

RC220C Target Delineation for Spinal Stereotactic Radiosurgery/Radiotherapy

Participants
Kristin J. Redmond, MD, MPH, Baltimore, MD (*Presenter*) Research support, Elekta AB

RC220D Response Evaluation for Spinal Stereotactic Radiosurgery/Radiotherapy

Participants
Sten Myrehaug, MD, FRCPC, Toronto, ON (*Presenter*) Speakers Bureau, Pfizer Inc; Speakers Bureau, Novartis AG

LEARNING OBJECTIVES

1) Appreciate the challenges of spine response determination. 2) Issue of radiographic pseudoprogression. 3) Clinical trials and incorporation of response criteria.

ABSTRACT

The aim of this session is to understand the challenges of response determination with spine SBRT. In particular the issues of radiographic changes following high dose radiation. Clinical trials are in flux and determining how to handle response which will be discussed.

RC222

Imaging for Proton Treatment Guidance and Verification

Monday, Nov. 28 8:30AM - 10:00AM Room: S102C

RO PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Jon J. Kruse, PhD, Rochester, MN (*Moderator*) Research Grant, Varian Medical Systems, Inc

ABSTRACT

Proton therapy dose distributions are highly conformal and are often used to deliver therapeutic doses to tumors close to critical, radiosensitive normal anatomy. Precise daily reproduction and alignment of the patient anatomy is crucial, then, for successful outcome of proton radiotherapy. This course will describe modern approaches to pre- and intra-treatment imaging to align the patient for proton therapy as well as post-treatment modalities which can verify patient alignment and proton beam range. Pre-treatment image guidance for protons has evolved differently than many common approaches for standard external beam radiotherapy. One reason for this is the dissimilar impact of setup variations on the delivered proton dose distributions, while another is related to the expense of building a proton center and the need to maximize efficiency by moving as many complex processes out of the treatment room as possible. Additionally, the sensitivity of proton dose distributions to intra-fractional changes has led to the development of novel techniques to monitor patient anatomy throughout a treatment. Modest errors in patient positioning or in calculation of proton range could lead to tumor or healthy tissues receiving vastly different doses than were planned. This has led to the development of a number of approaches for post treatment verification of proton beam placement and range. Proton dose verification via positron emission tomography, prompt gamma imaging, and magnetic resonance imaging will be presented.

Sub-Events

RC222A Pre- and Intra-treatment Imaging Strategies for Patient Alignment

Participants
Jon J. Kruse, PhD, Rochester, MN (*Presenter*) Research Grant, Varian Medical Systems, Inc

LEARNING OBJECTIVES

1) Explain the impact of inter- and intra- fractional variations in patient anatomy on proton dose distributions. 2) Describe proton specific approaches to pre-treatment and intra-treatment imaging for patient alignment. 3) Compare various imaging modalities for post-treatment verification of a delivered proton dose distribution.

RC222B Advanced Imaging Techniques for Range Verification

Participants
Brian A. Winey, PhD, MS, Boston, MA (*Presenter*) Research Grant, Elekta AB; Travel support, Elekta AB; Travel support, Ion Beam Applications SA

LEARNING OBJECTIVES

1) Explain the impact of inter- and intra- fractional variations in patient anatomy on proton dose distributions. 2) Describe proton specific approaches to pre-treatment and intra-treatment imaging for patient alignment. 3) Compare various imaging modalities for post-treatment verification of a delivered proton dose distribution.

MSRO22

BOOST: Gastrointestinal-Science Session with Keynote

Monday, Nov. 28 10:30AM - 12:00PM Room: S103AB

GI RO OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Anna Shapiro, MD, Syracuse, NY (*Moderator*) Nothing to Disclose
Tarita O. Thomas, MD, PhD, Chicago, IL (*Moderator*) Nothing to Disclose

Sub-Events

MSRO22-01 Invited Speaker: Gastrointestinal Radiation Oncology

Monday, Nov. 28 10:30AM - 10:50AM Room: S103AB

Participants
Richard Tuli, MD, PhD, Los Angeles, CA (*Presenter*) Nothing to Disclose

MSRO22-03 Maximum Tumor Area and Reduction Rate May Predict Pathological Complete Response to NeoAdjuvant Chemoradiotherapy for Rectal Cancer

Monday, Nov. 28 10:50AM - 11:00AM Room: S103AB

Participants
Chongda Zhang, Beijing, China (*Presenter*) Nothing to Disclose
Hongmei Zhang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the diagnostic value of maximum area (MA) evolution in the tumor for predicting the pathological complete response (pCR) to neoadjuvant chemoradiotherapy(CRT) in patients with locally advanced rectal cancer (LARC).

METHOD AND MATERIALS

101 consecutive patients with LARC who received CRT followed by total mesorectal excision (TME) were recruited. . Maximum area before (MApre) and after CRT (MApost) was measured on high-spatial-resolution axial T2-weighted MR images showing the largest tumor area by manually tracing a region of interest. Concurrently, Maximum area reduction ratio(MARR) was calculated as follows: [(MApre−MApost) / MApre]×100%. The correlation between each parameter and pathologic response to CRT was assessed by Kruskal-Wallis Test or Analysis of Variance. In addition, receiver operating characteristic curve (ROC) was also used to determine the diagnostic performance of MApre, MApost and MARR for predicting pCR.

RESULTS

Statistically significant differences beween pathological complete responders and incomplete responders were obtained in the predictors of MApre, MApost and MARR with p value of 0.046, less than 0.000 and 0.002, respectively. Area under the ROC curve (AUC) value were 0.639 for MApre, 0.763 for MApost, 0.707 for MARR. An optimal cutoff value of 155.5 mm2 was obtained for MApost with a sensitivity of 64.6% and a specificity of 86.4% to predict PCR.

CONCLUSION

Quantitative evaluation of maximum tumor area was feasible to differentiate pCR from non-pCR groups to CRT in rectal cancer. MApre, MApost and MARR seem to be potential tools for distinguishing pathological complete responders to aid appropriate individually tailored therapies.

CLINICAL RELEVANCE/APPLICATION

Functional MR can demenstrate maximum areas of tumors in rectal cancer and is recommended as part of a MR study to evaluate rensponses to neoadjuvant chemoradiotherapy.

MSRO22-04 Prediction of Pathological Complete Response to New Adjuvant Chemoradiotherapy by T2 Signal Intensity Evolution for Locally Advanced Rectal Cancer

Monday, Nov. 28 11:00AM - 11:10AM Room: S103AB

Participants
Chongda Zhang, Beijing, China (*Presenter*) Nothing to Disclose
Hongmei Zhang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the diagnostic value of T2 signal intensity (SI) evolution in the tumor for predicting the pathological complete response (pCR) to neoadjuvant chemoradiotherapy(CRT) in patients with locally advanced rectal cancer (LARC).

METHOD AND MATERIALS

101 consecutive patients with LARC who received CRT followed by total mesorectal excision (TME) were recruited. SI(SIt) and average SI of musculus obturator internus(SIm) were measured before and after CRT on high-spatial-resolution axial T2-weighted MRI images. To reduce the influence of image-specific factors, the SI was normalised by SIm(SI=SIt/SIm), resulting relative values before (SIpre) and after (SIpost) CRT. Concurrently, SI reduction ratio(SIRR) was calculated as follows: [(SIpre −SIpost) / SIpre

]×100%. The correlation between each parameter and pathologic response to CRT was assessed by Kruskal-Wallis Test or Analysis of Variance. In addition, receiver operating characteristic curve (ROC) was also used to determine the diagnostic performance of SIpre, SIpost and SIRR for predicting pCR.

RESULTS

Statistically significant differences beween pathological complete responders and incomplete responders were obtained in the predictors of SIpost and SIRR with p value of 0.003 and 0.001, respectively. While the difference was not considered significant with a p value of 0.783 for SIpre. Area under the ROC curve (AUC) value was 0.705 for SIpost and 0.743 for SIRR. The optimal cutoff values of 1.56 (sensitivity=70.9%, specificity=63.6%) and 0.365(sensitivity=77.3%,specificity=68.4%) were obtained for SIpost and SIRR respectively.

CONCLUSION

Quantitative evaluation of T2 signal intensity was feasible to differentiate between pCR and non-pCR groups to CRT in rectal cancer. SIpost and SIRR seem to be potential tools for distinguishing pathological complete responsers to aid appropriate individually tailored therapies.

CLINICAL RELEVANCE/APPLICATION

Functional MR can demenstrate signal intensity of tumors in rectal cancer and is recommended as part of a MR study to evaluate rensponses to neoadjuvant chemoradiotherapy.

MSRO22-05 Negative FNA of Suspicious Inguinal Nodes is Associated with a Low Risk of Recurrence in Patients with Anal Carcinoma

Monday, Nov. 28 11:10AM - 11:20AM Room: S103AB

Participants
Stephanie Markovina, MD, PhD, Saint Louis, MO (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Non-metastatic anal cancer is treated with definitive chemoradiation (CRT). Standard of care includes intensity modulated radiation therapy (IMRT) with dose levels defined by clinical stage and lymph node involvement, as defined by clinical exam and 18F-fluorodeoxyglucose Positron Emission Tomography (FDG-PET), but non-specific uptake in the inguinal lymph regions can complicate staging. Fine needle aspiration (FNA) is often used to evaluate equivocal FDG-PET findings, but the accuracy of the test is not well-known, as surgical dissection is a common part of management. We report our experience with groin FNA as a component of initial work-up for anal carcinoma.Materials/Methods: Patients with non-metastatic anal carcinoma and staging FDG-PET were included and charts were reviewed. Patients were treated with Nigro regimen chemotherapy (5-fluorouracil and mitomycin C) and concurrent radiation using 3 dimensional-conformal radiotherapy (3D-CRT) or IMRT, with low-dose RT to elective regions and boost to the primary tumor and involved lymph node regions. FNA was performed under ultrasound or CT-guidance.Results: 153 patients were identified with anal cancer and staging FDG-PET treated from 2003-2013. Inguinal lymph nodes were interpreted as positive or equivocal for metastatic involvement on staging FDG-PET in 58 patients (38%). Of these, 17 underwent groin FNA (30%). 8 aspirates were positive for carcinoma (47%), 9 were negative and 1 was non-diagnostic. Median dose to inguinal regions was 30Gy (range 30-45Gy) for patients with negative FNA and 54Gy (range 50.4-56Gy) for patients with positive FNA. After a median follow-up of 30.1 months, 42 patients (27%) had died, and 28 (18%) had experienced recurrence. Of patients with negative inguinal FNA, all but one patient was alive and none had experienced recurrence of disease, compared to 5 deaths and 7 recurrences among patients with positive inguinal FNA, including 2 inguinal failures.Conclusion: In a contemporary cohort of patients with anal cancer and staging FDG-PET, FNA was commonly employed for equivocal FDG-PET findings. FNA confirmed suspicion of lymph node involvement half the time. Although accuracy of FNA cannot be determined without subsequent groin dissection, recurrence is low after negative FNA of suspicious or equivocal FDG-avid adenopathy.

MSRO22-06 Brachytherapy as a Sole Treatment Modality for Early Esophageal Cancer (EEC)

Monday, Nov. 28 11:20AM - 11:30AM Room: S103AB

Participants
Nhu Tram Nguyen, MD, Hamilton, ON (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): EEC is a rare disease entity with only a handful of patients diagnosed every year at most large centers treating esophageal cancer. Standard treatments for EEC include endoscopic mucosal resection, surgery (S) or chemoradiation (CRT). Patients are often not candidate for S or CRT because of their comorbidities or for EMR because of extent of tumor. Brachytherapy in these instances can give high doses of RT locally to the tumor. We present our experience using Radical Brachytherapy (RBT) alone in EEC.Materials/Methods: Data of patients with EEC who were treated with RBT alone was extracted from a prospective database of patients with esophageal cancer treated between 2008- 15. Demographic, tumor, treatment and outcomes data were analyzed. Under direct endoscopic visualization, the cranial and caudal extent of the tumor was recorded using fluoroscopic imaging. A 4mm intra-esophageal catheter with a marker wire was passed across a guide wire placed under endoscopic vision across the tumor into the stomach. Following catheter visualization and positioning fluoroscopically, a treatment length included the tumor with a 4cm margin craniocaudally. Dose was prescribed at 1cm from the centre of the source axis and was delivered with 192- Ir Varisource HDR afterloader. Patients received 24 Gy/4 fractions over 2 weeks. Patients were followed with CT scan and upper GI endoscopy; biopsies were taken if there were suspicious findings. Actuarial overall (OS), cancer-specific survival (CSS), disease-free survival (DFS) were calculated using Kaplan-Meier analyses.Results: Twelve patients with EEC were treated with RBT alone and were included in the analysis. Among these patients, 11 patients were deemed not candidate for S and/or CRT due to their comorbidities and one patient refused S/CRT. Median follow-up was 11 mos (range 3-70 mos). Median age was 81 years (range 56- 91yrs) and median Charlson-comorbidity index was 6. They had T1-3N0M0 adenocarcinomas (n=7), squamous cell carcinomas (n=4) or poorly differentiated carcinoma (n=1). Tumor location included Upper thoracic (n=2), lower thoracic (n=5) and GEJ (n=5). Median treatment length was 13 cm (range 8-17cm). Two patients had local recurrence and died from their cancer; 3 patients died from non-cancer-related causes. No significant acute toxicities (eg. perforations, severe esophagitis, bleeding) were recorded. Both the 3- and 5-year OS were 50%: 3- and 5-year CSS 76%: both 3- and 5-year DFS=76%. Long-term complications included esophageal strictures (n=3; median time to stricture 4.8 mos (3.5-16 mos) that needed dilations and chronic esophageal ulcer that healed after 14 months (n=1). No patient developed a fistula.Conclusion: In this series of patients unsuited for S, CRT or

EMR due to comorbidities/ tumor extension/ patient refusal to S or CRT, RBT alone was a safe and effective treatment modality for EEC. This is one of the largest North American series of EEC treated with RBT alone.

MSRO22-07 Multiparametric MRI as A Predictive Response Biomarker in Esophageal Cancer

Monday, Nov. 28 11:30AM - 11:40AM Room: S103AB

Participants
Connie Yip, MBChB, FRCR, London, United Kingdom (*Presenter*) Nothing to Disclose
Musib J. Siddique, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Geoff Charles-Edwards, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Adrian J. Green, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Adrian J. Green, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
John Spence, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
John Spence, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Lyndall Blakeway, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Joanna Bell, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
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James Gossage, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Andrew Davies, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Jesper Lagergren, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Gary Cook, MD, FRCR, London, United Kingdom (*Abstract Co-Author*) Research support, General Electric Company; Research support, Alliance Medical Limited; Research support, Siemens AG; Research Consultant, Blue Earth Diagnostics Ltd; Speakers Bureau, Bayer AG
Gary Cook, MD, FRCR, London, United Kingdom (*Abstract Co-Author*) Research support, General Electric Company; Research support, Alliance Medical Limited; Research support, Siemens AG; Research Consultant, Blue Earth Diagnostics Ltd; Speakers Bureau, Bayer AG
Vicky J. Goh, MBBCh, London, United Kingdom (*Abstract Co-Author*) Research Grant, Siemens AG Speaker, Siemens AG

ABSTRACT

Purpose/Objective(s): We hypothesized that imaging intratumoral angiogenesis/hypoxia may be predictive response biomarkers in esophageal cancer. We evaluated the predictive value of multiparametric MRI in neoadjuvant chemotherapy response assessment in esophageal cancer.Materials/Methods: Patients treated with neoadjuvant chemotherapy for resectable esophageal adenocarcinoma were recruited for this IRB-approved exploratory prospective study. Patients underwent baseline (TIME0), post-cycle 1 (TIME1) and post-neoadjuvant chemotherapy (TIME2) 1.5T MRI which included high-resolution T2-weighted (T2w parameters: signal intensity histogram), diffusion-weighted (DW parameters: apparent diffusion coefficient (ADC) histogram) and dynamic contrast-enhanced MRI (DCE-MRI parameters: transfer constant (Ktrans), rate constant (kep) extravascular-extracellular volume (ve), and plasma volume (vp) derived using an extended Toft's model). A whole primary tumor volume was defined as a volume-of-interest using an in-house software. Relative change in all MR parameters between TIME1/2 and TIME0 were calculated. Primary end-point was pathological tumor regression grade defined as per the Mandard's criteria with TRG1-3 classified as responders and TRG4-5 as non-responders. Mann-Whitney U test was used to assess for associations between absolute and relative change in MR parameters and pathological tumor response. Mean±SD are presented; pResults: There were 5 responders (36%) and 9 (64%) non-responders. 1/5 (7%) patients had complete response. Baseline TIME0 ADC skewness was associated with pathological response (responders vs. non-responders: -0.2±0.1 vs. -0.5±0.3, p=0.042). The following post-treatment TIME2 parameters were also significant predictive response markers: DCE Ktrans (0.7±0.1 vs. 1.6±0.9, p=0.006), T2w entropy (4.0±0.1 vs. 3.7±0.1, p=0.003), T2w fractal lacunarity (0.006±0.002 vs. 0.004±0.001, p=0.011) and T2w mean fractal dimension (2.9±0.1 vs. 2.8±0.1, p=0.045). However, relative MR changes between TIME1/2 and TIME0 were not predictive of pathological response. A complete responder had the lowest TIME2 Ktrans value (0.54 min-1) indicating that post-treatment Ktrans may be a sensitive imaging response biomarker after neoadjuvant chemotherapy, related to reduced vascular perfusion/permeability.Conclusion: Baseline MRI ADC and post-treatment DCE/T2w parameters, but not relative change over baseline, showed potential as imaging response biomarker in esophageal cancer treated with neoadjuvant chemotherapy. These results coupled with its superior soft tissue definition make MRI an attractive imaging (re)staging modality, and bodes well for future integrated PET/MRI studies in this setting.

MSRO22-08 Outcomes of Trimodality Therapy in Elderly Patients with Locally Advanced Esophageal Cancer

Monday, Nov. 28 11:40AM - 11:50AM Room: S103AB

Participants
Nina Sanford, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): The standard of care for locally advanced esophageal cancer includes neoadjuvant chemoradiotherapy (CRT) followed by surgery, however there is concern that aggressive trimodality therapy may be too toxic for elderly patients. We retrospectively evaluated the effect of older age on treatment and outcome.Materials/Methods: The median follow-up among surviving patients was 4.4 years (range 0.4 – 16.1). The proportion of patients who underwent esophagectomy was 82.9%, 82.6% and 63.6% for ages 80 years (P = 0.29). There were no statistically significant differences in the number of acute toxicities of CRT among the three age groups (P = 0.29). Patients in the three age groups also had similar rates of post-operative pulmonary complications, however the incidence of cardiac complications rose with increasing age groups from 22.3% to 38.6% to 71.4%. Three patients died within 30 days of surgery, all of whom were P for trend = 0.41). The median OS trended towards shorter for older patients (3.3 years for 80 (P = 0.06)) however there was no difference in progression free survival among the 3 respective age groups with medians of 1.8, 1.7 and 1.5 years (P = 0.49).Results: The median follow-up among surviving patients was 4.4 years (range 0.4 – 16.1). The proportion of patients who underwent esophagectomy was 82.9%, 82.6% and 63.6% for ages 80 years (P = 0.29). There were no statistically significant differences in the number of acute toxicities of CRT among the three age groups (P = 0.29). Patients in the three age groups also had similar rates of post-operative pulmonary complications, however the incidence of cardiac complications rose with increasing age groups from 22.3% to 38.6% to 71.4%. Three patients died within 30 days of surgery, all of whom were P for trend = 0.41). The median OS trended towards shorter for older patients (3.3 years for 80 (P = 0.06)) however there was no difference in progression free survival among the 3 respective age groups with medians of 1.8, 1.7 and 1.5 years (P = 0.49).Conclusion: Elderly patients undergoing trimodality therapy for esophageal cancer appear to derive similar cancer-specific benefits as compared to younger patients, but may be at higher risk for post-operative cardiac complications.

MSRO22-09 Proton Therapy Posterior Beam Approach with Pencil Beam Scanning for Esophageal Cancer: Clinical Outcome, Dosimetry, and Feasibility

Monday, Nov. 28 11:50AM - 12:00PM Room: S103AB

Participants
Jing Zeng, MD, Seattle, WA (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): With increasing availability of proton therapy as well as evolving proton technology, more patients with esophageal cancer have access to proton therapy as a treatment option. We present the feasibility and preliminary clinical results of a novel pencil beam scanning (PBS) posterior beam technique of proton treatment for esophageal cancer in the setting of tri-modality therapy, which could potentially further lower dose to normal organs. Materials/Methods: From February 2014 to June 2015, 13 patients with locally advanced esophageal cancer (T3-4N0-2M0) were treated with trimodality therapy (neoadjuvant chemoradiation, followed by esophagectomy). Eight patients were treated with uniform scanning (US) and five patients were treated with PBS. Comparison planning with PBS was performed using 3 plans: 1) AP/PA beam arrangement; 2) PA plus left posterior oblique (LPO) beams, and 3) single PA beam (treated twice for motion mitigation). Patient outcomes, including pathologic response and toxicity were evaluated. Results: All 13 patients completed chemoradiation to 50.4 Gy (RBE) and all but one patient underwent surgery. Of the 12 evaluable patients, 100% had a R0 resection and pathologic complete response was seen in 25% (3/12). There was no difference in outcome between patients treated with PBS and US. There was one grade 5 post-operative mortality (20(10% vs 17%, PConclusion: Proton therapy with a single PA beam PBS technique for preoperative treatment of esophageal cancer appears safe and feasible. Given the superior dosimetric sparing of normal tissues compared to other proton techniques, this technique should be further explored and validated.

MSRO25

BOOST: CNS-Science Session with Keynote

Monday, Nov. 28 10:30AM - 12:00PM Room: S103CD

NR RO OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Hui-Kuo G. Shu, MD, PhD, Atlanta, GA (*Moderator*) Speakers Bureau, Varian Medical Systems, Inc; Speakers Bureau, Siemens Medical Solutions USA, Inc; Stockholder, General Electric Company; Stockholder, Medtronics, Inc; Stockholder, Mylan NV; Stockholder, Apple Inc
John C. Grecula, MD, Columbus, OH (*Moderator*) Research Grant, Teva Pharmaceutical Industries Ltd Research Grant, Soligenix, Inc

Sub-Events

MSRO25-01 Invited Speaker: CNS

Monday, Nov. 28 10:30AM - 10:50AM Room: S103CD

Participants
Samuel T. Chao, MD, Cleveland, OH (*Presenter*) Nothing to Disclose

MSRO25-03 Delayed-Contrast MRI for Differentiating Tumor/Non-Tumor Tissues in Brain Tumor Patients: Potential Application for Delineating SRS Dose Effects

Monday, Nov. 28 10:50AM - 11:00AM Room: S103CD

Participants
Yael Mardor, Ramat Gan, Israel (*Abstract Co-Author*) Reseach Consultant, BrainLAB AG; Research Grant, BrainLAB AG; License agreement, BrainLAB AG; Support, F. Hoffmann-La Roche Ltd;
Galia Tsarfaty, MD, MPH, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose
David Last, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Dianne Daniels, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Leor Zach, Rockville, MD (*Abstract Co-Author*) Nothing to Disclose
Roberto Spiegelmann, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Yuval Grober, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Dvora Nass, Tel Hashomer, Israel (*Abstract Co-Author*) Nothing to Disclose
Sharona Salomon, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Andrew Kanner, Tel Aviv, Israel (*Abstract Co-Author*) Nothing to Disclose
Debora Blumenthal, Tel Aviv, Israel (*Abstract Co-Author*) Nothing to Disclose
Felix Bokstein, Tel Aviv, Israel (*Abstract Co-Author*) Nothing to Disclose
Yigal Shoshan, Jerusalem, Israel (*Abstract Co-Author*) Nothing to Disclose
Marc Wygoda, Jerusalem, Israel (*Abstract Co-Author*) Nothing to Disclose
Dror Limon, Petah Tikva, Israel (*Abstract Co-Author*) Nothing to Disclose
Tzahala Tzuk, Haifa, Israel (*Abstract Co-Author*) Nothing to Disclose
Zvi R. Cohen, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Ouzi Nissim, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose
Chen C. Hoffmann, MD, Ramat-Gan, Israel (*Abstract Co-Author*) Nothing to Disclose
David Guez, Ramat Gan, Israel (*Presenter*) Nothing to Disclose

PURPOSE

We have recently presented high resolution treatment response assessment maps (TRAMs) enabling efficient separation between tumor (contrast clearance >1 hr post injection, blue) and treatment-effects (TEs, contrast accumulation, red), validated histologically in 54 resected patients. Here we demonstrate potential advantages in delineating stereotactic radiosurgery (SRS) dose-effects.

METHOD AND MATERIALS

In a preliminary study on 7 brain metastases, T1-Gd and the TRAMs were co-registered to the SRS dose-plan and pixel-by-pixel analysis was performed comparing baseline T1-Gd/TRAMs and dose-plan to T1-Gd/TRAMs acquired 141±12 days (day140) post SRS.

RESULTS

Tumor-growth rates were significantly correlated with initial tumor volumes when calculated from blue regions in the TRAMs ($r2=0.77;p<0.03$) but not when calculated from enhancing regions in T1-Gd ($r2=0.4;p<0.19$), consistent with the TRAMs superiority over T1-Gd in depicting true tumor tissues.T1-Gd showed that the % of enhancing pixels at baseline that turned non-enhancing at day140 increased moderately from 40.4% to 54.2% between 13-21.7Gy with a sharp rise to 98% above 22.8Gy. Similar analysis with the TRAMs showed linear increase in tumor-kill from 83% at 18Gy to 100% at 21.7Gy.T1-Gd also showed that the % of non-enhancing pixels at baseline (normal-appearing brain) that turned enhancing at day140 increased linearly to 20.2Gy, where it raised sharply to 48% followed by a sharp drop at 21.2Gy. The TRAMs showed that the increase to 20.2Gy may be explained by new blue/tumor growth with a sharp drop at 20.2Gy, while the sharp rise at 20.2Gy may be explained by development of TEs (red).Per-lesion analysis showed significant correlations between dose and blue growth-rates ($r2=0.81;p<0.014$). % of blue volumes exposed to >20Gy was found higher in solid (88%) vs cystic (54%) lesions.

CONCLUSION

These preliminary results demonstrate the TRAMs potential advantages in delineating SRS dose effects. Efficacy was higher at lower doses when studied by the TRAMs vs T1-Gd and thresholds were delineated better. The TRAMs suggest induction of TEs and prevention of new tumor growth in normal-appearing brain at >20Gy.

CLINICAL RELEVANCE/APPLICATION

The ability of the TRAMs to provide high resolution differentiation between tumor/treatment-effects may enable improved determination of thresholds for tumor kill and side effects, thus may be applied for individual dose painting radiotherapy

MSRO25-04 Temporally Dependent Intracranial Control of Melanoma Brain Metastasis by Stereotactic Radiotherapy in Patients Treated with CTLA-4 Blockade

Monday, Nov. 28 11:00AM - 11:10AM Room: S103CD

Awards
Student Travel Stipend Award

Participants
Wen Jiang, MD, PhD, Houston, TX (*Presenter*) Nothing to Disclose
Yi An, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Jing Li, MD, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Numerous studies suggest that radiation can boost antitumor immune response via stimulating the release of tumor-specific antigens. However, the optimal timing between radiotherapy and immune checkpoint blockade to achieve synergistic benefits is unclear. Our current study investigated whether the timing of stereotactic radiosurgery (SRS) for patients who developed new brain metastases from advanced melanoma after receiving the CTLA-4 inhibitor ipilimumab affects intracranial tumor control and survival.

METHOD AND MATERIALS

This is a multi-institutional retrospective analysis of patients diagnosed with metastatic melanoma who had received ipilimumab and SRS to the brain for new metastases after immunotherapy from 2007 to 2014. A total of ninety-nine patients with metastatic melanoma to the brain were eligible and included in the analysis. All patients had received at least 2 doses of ipilimumab before SRS, and all must have had complete blood-test information available before SRS.

RESULTS

From the training cohort, patients who received SRS within 5.5 months (n=51) of their last dose of ipilimumab had significantly improved intracranial control compared with patients who received SRS after 5.5 months (n=20) (median interval 8.09 vs. 3.63 months, hazard ratio [HR] 0.474, 95% confidence interval [CI] 0.253-0.887, P=0.019). Overall survival (OS) was not significantly different between the two arms. The improved intracranial control rate was confirmed using an independent cohort of patients (n=28) treated at a second comprehensive cancer center. We also found that circulating absolute lymphocyte count before SRS predicted treatment response: those with baseline count >1000/μL had reduced risk of intracranial recurrence compared with those with ≤1000/μL (HR 0.378, 95% CI 0.212-0.675, P=0.001).

CONCLUSION

In this multi-institutional study, we found that patients who received SRS for new brain metastases within 5.5 months after ipilimumab therapy had better intracranial disease control than did patients who received SRS later; moreover, circulating lymphocyte count predicted intracranial disease control.

CLINICAL RELEVANCE/APPLICATION

Timing of radiation in relation to CTLA4 blockade is critical for promoting immune-mediated intracranial control of melanoma brain metastasis and is recommended to be delivered within close proximity to immunotherapy administration.

MSRO25-05 Radiation Dose-Dependent Hippocampal Atrophy Detected with Longitudinal Volumetric MRI

Monday, Nov. 28 11:10AM - 11:20AM Room: S103CD

Awards
Student Travel Stipend Award

Participants
Tyler Seibert, MD, PhD, La Jolla, CA (*Presenter*) Research Grant, Varian Medical Systems, Inc; Consultant, Medscape, LLC
Roshan Karunamuni, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Hauke Bartsch, PhD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Samar Kaifi, MD, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Anithapriya Krishnan, PhD, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Jeffrey Burkeen, MD, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Tanya Nguyen, PhD, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Carrie R. McDonald, PhD, La Jolla, CA (*Abstract Co-Author*) Consultant, CorTechs Labs, Inc
Nikdokht Farid, MD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Nathan White, PhD, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Vitali Moiseenko, PHD, Surrey, BC (*Abstract Co-Author*) Speaker, Varian Medical Systems, Inc; Travel support, Varian Medical Systems, Inc
James B. Brewer, MD, PhD, La Jolla, CA (*Abstract Co-Author*) Scientific Advisory Board, Human Longevity Inc; Board Member, CorTechs Labs, Inc; Stock options, Human Longevity Inc ; Stock options, CorTechs Labs, Inc ; Research Grant, Navidea Biopharmaceuticals, Inc; Scientific Advisory Board, Alkermes plc; Scientific Advisory Board, Bristol-Myers Squibb Company; Scientific Advisory Board, Otsuka Holdings Co, Ltd; Scientific Advisory Board, Novartis AG; Scientific Advisory Board, F. Hoffmann-La Roche Ltd; Scientific Advisory Board, Eli Lilly and Company
Jona Hattangadi-Gluth, La Jolla, CA (*Abstract Co-Author*) Research Grant, Varian Medical Systems, Inc

PURPOSE

Following brain radiation therapy (RT) patients often experience memory dysfunction, thought to be mediated in part by damage to the hippocampus. Hippocampal atrophy measured by MRI is a known correlate of cognitive decline in other disease processes. We sought to determine whether patients undergoing brain RT would show radiation dose-dependent hippocampal atrophy on volumetric MRI.

METHOD AND MATERIALS

Hippocampal volume was measured with MRI in 52 patients who underwent fractionated, partial brain RT for primary brain tumors. Study patients had high-resolution, 3D volumetric MRI (inversion recovery spoiled gradient-echo sequence: TE, 2.8ms; TR, 6.5 ms; TI, 450 ms; flip angle, 8 degrees; FOV, 24cm; 0.93 x 0.93 x 1.2mm; sagittal) prior to and one year post-RT. Images were processed using software with FDA clearance and CE marking for automated measurement of hippocampal volume. Processing included correction for distortion and segmentation of the hippocampus bilaterally. Automated results were inspected visually for accuracy and for censoring of tumor and surgical changes. Radiation dose data were co-registered with processed MRI data. Mean dose to each hippocampus was tested for correlation with change in hippocampal volume in the year following RT. Average hippocampal volume change was also calculated for hippocampi receiving >40 Gy mean dose and for hippocampi receiving <10 Gy mean dose. Statistical significance was evaluated with Student's t-test at $\alpha = 0.05$.

RESULTS

Median prescribed RT dose was 60 Gy (range 50.4 to 60 Gy). Most patients (96%) received temozolamide. Greater hippocampal volume loss was seen at higher mean hippocampal doses ($r = -0.24$, $p = 0.016$). Hippocampi receiving mean dose >40 Gy had a mean volume loss of 5.8% ($p = 0.009$), whereas hippocampi receiving <10 Gy had a mean volume loss of 1.2% ($p = 0.103$).

CONCLUSION

Higher mean radiation dose to the hippocampus was associated with greater hippocampal atrophy one year later.

CLINICAL RELEVANCE/APPLICATION

RT dose avoidance of the hippocampus is being tested in clinical trials. Measurement of hippocampal atrophy holds value as an imaging biomarker and may be associated with cognitive outcomes.

MSRO25-06 Variation in Outcomes of 1p19q Co-deleted Gliomas by Grade

Monday, Nov. 28 11:20AM - 11:30AM Room: S103CD

Participants
Debra Yeboa, MD, Houston, TX (*Presenter*) Travel support, Eli Lilly and Company
James B. Yu, MD, New Haven, CT (*Abstract Co-Author*) Research Grant, 21st Century Oncology, Inc
Joseph N. Contessa, MD, PhD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Recent retrospective molecular analyses of patients with lower grade gliomas suggest 1p19q co-deleted subtype have similar survival outcomes irrespective of pathological grade. This finding prompted a re-evaluation of glioma prognostic groups. Whether these similar outcome are present in large observational cohorts in the US are unknown. We therefore examined survival outcomes for patients with 1p19q co-deleted treated with definitive therapy. Materials/Methods: Using the National Cancer Data Base, 703 patients diagnosed between 1998 and 2012 with grade II or III gliomas with 1p19q co-deletion were identified. Median age at diagnosis, sex, Charlson-Deyo comorbidity score (CDCS), and tumor histology (anaplastic oligodendroglioma, anaplastic astrocytoma, mixed) were assessed. Grade was defined by WHO grade. Summary statistics were performed on the percentage of grade II and III glioma patients receiving surgery alone, surgery + adjuvant RT, surgery +adjuvant chemo, and surgery + concurrent chemoRT. To assess overall survival (OS), Kaplan Meiers and log-rank tests were performed.Results: Using the National Cancer Data Base, 703 patients diagnosed between 1998 and 2012 with grade II or III gliomas with 1p19q co-deletion were identified. Median age at diagnosis, sex, Charlson-Deyo comorbidity score (CDCS), and tumor histology (anaplastic oligodendroglioma, anaplastic astrocytoma, mixed) were assessed. Grade was defined by WHO grade. Summary statistics were performed on the percentage of grade II and III glioma patients receiving surgery alone, surgery + adjuvant RT, surgery +adjuvant chemo, and surgery + concurrent chemoRT. To assess overall survival (OS), Kaplan Meiers and log-rank tests were performed.Conclusion: Contrary to other studies, our data with a large observational cohort demonstrates a significant difference in overall survival between grade II and grade III gliomas that are 1p19q co-deleted. Differences in survival outcomes were partially mitigated by adjuvant therapy, suggesting that treatment variables must be considered prior to assigning this molecular subtype into a single prognostic group.

MSRO25-07 Diffusion Tensor Imaging Characterization of Long-Term Neurotoxicity in Adult Survivors of Pediatric Brain Tumors

Monday, Nov. 28 11:30AM - 11:40AM Room: S103CD

Participants
Silun Wang, MD, PhD, Atlanta, GA (*Presenter*) Nothing to Disclose
Jianming Ni, Wuxi, China (*Abstract Co-Author*) Nothing to Disclose
Liya Wang, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Tricia Z. King, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Hui Mao, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Radiotherapy is known to causes central nerve system injury. However, the long term effect of structural injury in white matter (WM) and functional impairment in survivors of pediatric brain tumors has not been elucidated. Functional imaging and diffusion tensor imaging may provide sensitive detection of WM injury after radiotherapy and better understanding of the functional outcome of the survivors.

METHOD AND MATERIALS

14 adult survivors of pediatric brain tumors (with median radiation dose of 5400 cGy) and 27 demographically matched healthy controls (mean age: 22.7 ± 4.5 vs. 22.9 ± 4.3, $p>0.05$) were enrolled in the study. Anatomical MRI and DTI were performed on all participants using a 3T MRI scanner. Tract-based Spatial Statistics (TBSS) was used to determine structural changes in WM tracts. Correlation matrix of DTI indices, i.e., (FA, axial diffusivities (AxD) and radial diffusivities (RD,) in whole brain WM tracts (n=50) were generated to identify the disruptions of connectivity. The correlations of DTI measurements with neurophysiological evaluations were derived from statistical analyses.

RESULTS

Significantly lower FA and AxD and higher RD values were observed in survivors comparing to the controls. However, AxD showed higher sensitivity than FA in detecting WM integrity changes, particularly in identifying changes in projection and brain stem fibers. When WM tracts were examined with inter-tracts correlation matrices, the survivor group showed weaker correlation coefficient compared to the control group in the regions of brainstem, projection and association fibers. Significantly lower IQ scores was found in survivor group compared to controls (101± 5 vs., 109 ± 8, $p<0.01$). Changes of FA, AxD and RD were found to correlate with IQ scores, with RD changes in projection fibers and association fibers exhibiting stronger correlations with all IQ scores (all $p<0.05$).

CONCLUSION

AxD shows higher sensitivity to detect radiotherapy induced WM injury and may indicate diffused axonal degeneration. RD changes strongly correlated with neurophysiological results. Overall, weaker inter-tracts correlations in survivors may indicate heterogeneous injury of white matter function groups or disruptions in connectivity.

CLINICAL RELEVANCE/APPLICATION

We have identified promising imaging biomarkers, using DTI to characterize and localize radiotherapy induced white matter injury in adult survivors with pediatric brain tumors.

MSRO25-08 Dosimetric Predictors of Freedom from Treatment Failure After Stereotactic Radiosurgery for Trigeminal Neuralgia

Monday, Nov. 28 11:40AM - 11:50AM Room: S103CD

Participants
Edward M. Marchan, MD, Augusta, GA (*Presenter*) Nothing to Disclose
John R. Vender, MD, Augusta, GA (*Abstract Co-Author*) Nothing to Disclose
Rebecca R. Cantrell, MS, Augusta, GA (*Abstract Co-Author*) Nothing to Disclose
Ramon E. Figueroa, MD, Martinez, GA (*Abstract Co-Author*) Nothing to Disclose
Waleed F. Mourad, MD, NewYork, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Stereotactic radiosurgery (SRS) is a treatment modality for classical trigeminal neuralgia (cTN). Success of SRS in facilitating long term pain control is dependent on maximizing prescribed dose (PD) to the trigeminal nerve. We analyzed several internationally standardized SRS treatment parameters and assessed as a primary endpoint whether either of them would predict freedom from treatment failure (TF). We hypothesized that higher energy and homogeneity indexes independently decrease the risk of treatment failure.

METHOD AND MATERIALS

Between 2007-2015, 178 cTN patients underwent Gamma Knife SRS, with a 4 millimeter collimator. Pain before and after SRS was scored as level I-V per the Barrow Neurological Institute (BNI) pain intensity scoring criteria. Pain relief was graded as an improvement to BNI levels I, II, or III from pre-SRS BNI levels IV or V. TF was graded as a return to BNI levels IV or V or need for additional SRS or operative intervention. Time to TF (TTF) was measured. The energy index, conformity index, homogeneity index (HI) [(D2% minus D98%)/D50%], and gradient index were calculated. A statistical model using Cox regression evaluating our primary endpoint was designed comparing a) TF and non-TF patients to determine TF risk.

RESULTS

Median PD was 80 Gy [range (r): 70-80]. The median follow-up was 15 months (r: 1.5-82). The median time to initial response was 1 month (r: 0.05-5) and the median TTF was 20 months (r: 0-82). Ninety percent reported initial pain relief, and actuarial rates of freedom from TF at 12, 24, 36 and 48 months were 55, 40, 33, and 28%, respectively. Statistical modeling showed that HI was the only treatment parameter that independently predicted time to TF ($p=0.0273$). Each unit increase in HI had a 88.3% decrease in TF risk (HR: 0.117 95% CI: 0.017-0.788).

CONCLUSION

This is the first cTN series showing that optimization of the HI enhances freedom from TF. Incorporation of the HI may be used to guide dosimetric treatment planning in SRS for cTN.

CLINICAL RELEVANCE/APPLICATION

Optimization of the homogeneity index (HI) enhances freedom from treatment failure and should be incorporated in SRS treatment planning for cTN.

MSRO25-09 Targeting Glucose Metabolism in Brain Tumor Initiating Cells: An Novel Therapeutic Approach for Radiosensitization

Monday, Nov. 28 11:50AM - 12:00PM Room: S103CD

Participants
Kailin Yang, PhD, Cleveland, OH (*Presenter*) Nothing to Disclose
Xiuxing Wang, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Jeremy Rich, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Glioblastoma (GBM) is a deadly form of brain tumor for which conventional treatments including radiation therapy offer only palliation. Increasing evidence suggests that metabolic reprogramming, namely the Warburg effect, is not simply a passenger in tumorigenesis but may be an initiating event as recurrent somatic mutations of metabolic enzymes have been reported. Previously, brain tumor initiating cells (BTICs), a subset of tumor cells that exhibit radiation resistance, were found to hijack the process of high-affinity glucose uptake normally active in neurons to maintain energy demands in dynamic tumor microenvironments. Here, we aim to understand the molecular mechanism of aberrant glucose metabolism in BTICs and develop targeted approach to achieve

radiosensitization.

METHOD AND MATERIALS

BTICs were derived from patient GBM specimens. Metabolomics profiling was performed in matched pairs of BTICs and differentiated glioma cells (DGCs) labeled with U-13C-glucose. Genetic validation of identified metabolic pathways was performed using TCGA GBM dataset. Functional validation of target gene was performed in vitro for BTIC viability and self-renewal, and in vivo for tumorigenecity. Radiation treatment was delivered using Cs-137 irradiator.

RESULTS

Glucose influx, mediated by high-affinity glucose transporter GLUT3, regulates BTIC maintenance and tumorigenecity. Using unbiased metabolomics analysis, we traced carbon flow following glucose influx into BTICs, and discovered downstream glucose metabolism pathways including de novo purine synthesis were functionally upregulated, mediating glucose-sustained anabolic metabolism. Inhibiting purine synthesis through RNA interference and FDA-approved pharmacologic inhibitors such as mycophenolate mofetil or ribavirin attenuated BTIC viability after radiation, supporting metabolic reprogramming as a potential therapeutic point of fragility. Elevated expression of purine synthesis enzymes predicts poor prognosis in GBM patients.

CONCLUSION

A stem-like radioresistant state in GBM is associated with metabolic reprogramming to fuel tumor hierarchy, revealing potential BTIC cancer dependencies amenable to targeted therapy for radiation sensitization.

CLINICAL RELEVANCE/APPLICATION

This study provided scientific rationale to target aberrant glucose metabolism (such as using FDA-approved anti-purine synthesis medications) as potential adjuvant therapy to enhance efficacy of radiation treatment.

SSC15

Radiation Oncology (Gynecologic)

Monday, Nov. 28 10:30AM - 12:00PM Room: S104A

GU OB OI RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants
Jerry J. Jaboin, MD, PhD, St. Louis, MO (*Moderator*) Nothing to Disclose
Tracy M. Sherertz, MD, San Francisco, CA (*Moderator*) Nothing to Disclose

Sub-Events

SSC15-01 Evaluation of Therapeutic Response to Concurrent Chemoradiotherapy in Patients With Advanced Cervical Squamous Carcinoma Using Dynamic Contrast-Enhanced MR Imaging

Monday, Nov. 28 10:30AM - 10:40AM Room: S104A

Participants
Yue Dong, Shen Yang, China (*Presenter*) Nothing to Disclose
Zao H. Zhang, Shen Yang, China (*Abstract Co-Author*) Nothing to Disclose
Shuai He, Shen Yang, China (*Abstract Co-Author*) Nothing to Disclose
Yahong Luo, Shenyang, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the changes of dynamic contrast-enhanced MR imaging (DCE-MRI) parameters in the patients with advanced cervical squamous carcinoma before and after concurrent chemo-radiotherapy (CCRT), and to correlate the parameters with final tumour response to therapy.

METHOD AND MATERIALS

Forty-five patients with advanced cervical squamous cancer underwent DW-MRI before CCRT (preTx), 4 weeks (postT1) after initiating treatment and at 1 month (postT2) after the end of treatment. DCE-MRI was obtained using a 3D fast field echo sequence in the axial plane (TR/TE 3.6/1.8 ms, flip angle 15°, acquisition time 5 min). Images were obtained immediately after a bolus injection of gadolinium DTPA (Magnevis,GE) at a rate of 3 ml/s. Pharmacokinetic analysis was performed according to extended tofts model, and the following quantitative parameters were calculated:volume transfer constant (Ktrans), rate constant (kep) and fraction of extravascular extracellular volume (Ve). DCE-MRI parameters were calculated in the tumour and normal myometrium. Final response to treatment as determined by changes in tumour size and volume was correlated with pre-treatment DCE-MRI parameters at each point.

RESULTS

Before therapy, the mean values of Ktrans , kep and Ve in the tumors were significantly lower than those in the myometrium ($P<0.05$). DCE-MRI parameters in the tumors showed significantly increased changes in response to CCRT ($P<0.05$) and in particular Ktrans and Ve demonstrated early significant increase (postT1) ($P<0.01$), but those in normal myometrium did not show a significant difference ($P>0.05$). Ktrans of the tumors at (preTx) was statistically associated with tumour size or volume change at postT1 and postT2. Changes of of Ktrans and kep in tumor at postT1 had a significant correlation with tumor size and volume change at postT2.

CONCLUSION

DCE-MRI parameters may help evaluate early changes of cervical squamous cancer to CCRT.

CLINICAL RELEVANCE/APPLICATION

DCE-MRI parameters, as early biomarkers, have the potential to evaluate therapeutic responses to CCRT in advanced cervical squamous cancers.

SSC15-02 Prediction of Patient Outcome in Locally Advanced Cervical Carcinoma Following Chemo-radiation - Comparative Effectiveness of Qualitative Response Assessment Interpretation Criteria using MRI and 18F-FDG PET-CT

Monday, Nov. 28 10:40AM - 10:50AM Room: S104A

Participants
Andrew F. Scarsbrook, FRCR, Leeds, United Kingdom (*Presenter*) Nothing to Disclose
Sriram Vaidyanathan, MD,FRCR, Leeds, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Fahmid Chowdhury, MBBS, FRCR, Leeds, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Sarah E. Swift, Leeds, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Rachel Cooper, Leeds, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Chirag Patel, FRCR, Oxford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Evaluation of a qualitative response assessment scoring system at MRI and 18F-FDG PET-CT following chemo-radiation for locally advanced cervical carcinoma and correlation with patient outcome.

METHOD AND MATERIALS

77 patients with locally advanced cervical carcinoma treated with radical chemo-radiotherapy (CRT) in a single center (2011-2014) underwent MRI and 18F-FDG PET-CT 3 months post therapy. Tumor response at MRI was assessed using a 3-point scale based on residual T2-weighted signal intensity. Metabolic response at PET-CT was assessed using a 5-point scale ranging from background activity to progressive metabolic disease. Clinical and radiologic follow-up was performed in all patients (minimum 18 months). Progression-free (PFS) and overall survival (OS) was calculated using the Kaplan-Meier method (Mantel-Cox log-rank) and groups responses were correlated using Chi2 test.

RESULTS

Of 77 patients with median (range) age of 45 (24-75) years, 39 (51%) had complete response (CR) on MRI (Score M1), 10 relapsed (26%). Of 29 with complete metabolic response (CMR, Score P1/2) on PET, 2 (7%) recurred. Of 21 patients with CR on MRI and PET-CT, 2 relapsed (10%). Of 32 patients (42%) with partial response (PR) at MRI (Score M2), 15 relapsed (47%). All 8 patients with M2 and negative PET-CT remained disease free at follow-up. Of 38 patients (49%) with indeterminate uptake on PET (Score P3/4), 19 relapsed (50%). Recurrence was lower in patients with M1 (6/15, 40%) compared to M2 (11/21, 52%). 5/6 patients (83%) with significant signal intensity at MRI (Score M3) relapsed. PET-CT demonstrated progressive disease (PD, Score P5) in 9 patients (12%). Kaplan-Meier analysis demonstrated a highly statistically significant difference in PFS and OS between patients with CMR, indeterminate uptake, PMR and PD (Log-rank, $P < 0.0001$). Chi2 test demonstrated a highly statistically significant association between increasing qualitative score and risk of recurrence or death ($P<0.001$).

CONCLUSION

MRI and PET-CT provide complementary information post CRT in locally advanced cervical cancer. Qualitative scoring systems in this clinical scenario predict outcome and may help guide further patient management.

CLINICAL RELEVANCE/APPLICATION

In the era of precision medicine, objective MRI and PET-CT response assessment criteria may help guide an individualized approach to subsequent patient management in locally advanced cervical cancer.

SSC15-03 Concurrent Chemoradiotherapy Using Daily Low-Dose Cisplatin for Extrapelvic Lymph Node Recurrences after Curative Treatment for Cervical Cancer: Clinical Outcomes and in Vitro Study

Monday, Nov. 28 10:50AM - 11:00AM Room: S104A

Participants
Aki Kanazawa, Chiba, Japan (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To investigate the clinical outcomes of radiotherapy for extrapelvic lymph node recurrences after curative treatment for cervical cancer and discuss the results of our in vitro study on the effectiveness of concurrent chemoradiotherapy.Materials/Methods: A total of 20 patients, aged 29-75, who underwent radiotherapy for lymph node recurrence from 2002 and 2015 were included. The location of recurrence was para-aortic lymph node in 7, supraclavicular in 8, mediastinal in 1, supraclavicular + mediastinal in 2, and supraclavicular + para-aortic in 2 patients. The histology was squamous cell carcinoma, adenocarcinoma, adenosquamous cell carcinoma in 12, 7, 1 patient. The median total radiation dose (EQD2) was 50 Gy. Thirteen patients received concurrent chemoradiotherapy with daily low-dose cisplatin (median 8 mg/m2 per day). In addition, in vitro study was conducted; HeLa-S3 cells after exposing radiation with different doses of cisplatin were cultured and 3H-thymidine uptake was measured.Results: Local responses immediately following radiotherapy were CR in 13 patients and PR in 3 (80%). Treatment was well tolerated, with no GI/mucosal toxicity, 35% grade 3-4 leukopenia, and 25% grade 3-4 thrombocytopenia. With median follow-up period of 17 months, the 2-year local control rate was 45% and the 3-year overall survival rate was 43%. Four patients are still alive without disease over 5 years. Recurrence was observed at the field margin in 3, in-field in 9, both in and out of field in 3 patients. Neither use of chemotherapy nor dose over 50 Gy affected overall survival. A shorter interval between initial treatment and first recurrence had marginal impact on patient's poor prognosis; patients with NED vs. others: 18 months vs. 6 months. In vitro study demonstrated that exposure to blood cisplatin levels of =2.5 mg/mL had a synergistic effect in the radiation and low-dose cisplatin.Conclusion: Radiotherapy for extrapelvic lymph node recurrences after curative treatment for cervical cancer could lead to long-term survival for some patients. In vitro study using HeLa-S3 cells supported the use of concurrent administration of low-dose cisplatin with radiation therapy.

SSC15-04 Metabolic Response on Post-treatment 18F-FDG PET/CT to Predict Local Control and Survival Outcomes in Vulvar Cancer

Monday, Nov. 28 11:00AM - 11:10AM Room: S104A

Awards
Trainee Research Prize - Medical Student

Participants
Comron J. Hassanzadeh, Kansas City, MO (*Presenter*) Nothing to Disclose
Yuan J. Rao, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the response to therapy for vulvar carcinoma using post-therapy imaging with F-18 fluorodeoxyglucose (FDG) positron emission tomography/computed tomography (PET/CT) and compare the metabolic response to local regional control and survival outcomes.

METHOD AND MATERIALS

This was a retrospective study of 23 women with vulvar cancer. Radiation intent was definitive in 12 patients (52%), adjuvant radiation after surgery in 8 patients (35%), and neoadjuvant radiation prior to surgery in 3 patients (13%). All patients received intensity modulated radiation treatment to a mean dose of 55.6 Gy (range 49.6 to 70 Gy). Prior to any treatment, all patients received a staging FDG-PET/CT. Post-treatment whole body FDG-PET/CT was performed at 0.2 to 7 months (median 2.5 months) after completion of radiation therapy.

RESULTS

The post-treatment FDG-PET showed no evidence of disease (complete metabolic response) in 13 patients. Residual disease or progressive disease on FDG-PET was seen in 10 patients. A Cox proportional hazards model of clinical outcome indicated that post-treatment PET response was the most significant predictor of biopsy-proven local-regional control (HR=8.89, 95% CI 1.8-43.9, p=0.01) and overall survival (HR 9.16, 95% CI 1.05-79.6, p=0.045) compared to other prognostic parameters. The 2-year local-regional control rate was 90% for patients with no evidence of disease vs. 22.5% for patients with residual or progressive disease on post-treatment PET. The 2 year overall survival was 100% for patients with no evidence of disease vs. 42.8% for patients with residual or progressive disease.

CONCLUSION

In this single-institution study of women with vulvar cancer, the post-treatment FDG response on whole-body FDG-PET/CT was predictive of local regional control and survival.

CLINICAL RELEVANCE/APPLICATION

Post-treatment 18F-FDG PET/CT may help physicians identify a subset of patients diagnosed with vulvar cancer at a higher risk of recurrence who may benefit from salvage therapy, such as surgery or radiation.

SSC15-05 Prospective Dosimetric and Comparative Study Evaluating Two Dimensional versus Three Dimensional Planning in Patients with Cervical Cancer Undergoing High Dose Rate Brachytherapy

Monday, Nov. 28 11:10AM - 11:20AM Room: S104A

Participants
Irfan Bashir, New Delhi, India (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To do a prospective dosimetric and comparative study of two dimensional radiography (2D) and computed tomography (CT) based three dimensional planning (3D) in patients with carcinoma cervix undergoing high dose rate brachytherapy, in terms of dose distribution to target and doses to organs at risk (OAR).Materials/Methods: A total of 16 patients underwent 48 sessions of brachytherapy after receiving external beam radiotherapy (EBRT) to a dose of 50.4 Gy in 28 fractions. Brachytherapy was planned after completion of EBRT and dose of 7 Gy was prescribed to point A in each session, to a total of 3 sessions for each patient. All patients underwent CT simulation and two plans were generated for each patient. For 2D planning, doses to point A and ICRU bladder and rectal points were recorded. For 3D planning, doses received by 90%, 95% and 100% of the target volume as well as doses to 0.1cc, 1cc, 2cc and 5cc of bladder and rectum were recorded. Comparative analysis of 2D and 3D planning was done in terms of target coverage and doses to OARs.Results: For a prescription of 7Gy to point A, mean dose received by 90%, 95% and 100% of the target volume was 5.9 Gy, 5.7 Gy and 5.3 Gy respectively. Mean dose to ICRU bladder point was 2.92 Gy while as doses to 0.1cc, 1cc, 2cc and 5cc of bladder were 7.2 Gy, 6.3 Gy, 5.7 Gy and 5.2 Gy respectively. Mean dose to ICRU rectal point was 3.68 Gy while as doses to 0.1cc, 1cc, 2cc and 5cc of rectum were 6.8 Gy, 5.7 Gy, 5.1 Gy and 4.5 Gy respectively. Statistical analysis revealed that doses received by 0.1cc, 1cc and 2cc of bladder volume were 2.9, 2.7 and 2.3 times greater than the ICRU bladder point (pConclusion: 2D brachytherapy overestimates the target coverage and underestimates the doses to OARs. Wherever feasible, 3D brachytherapy should be encouraged as it allows precise identification and dose optimization of target volume and OARs.

SSC15-06 Pelvic Bone Marrow Sparing in Volumetric Modulated Arc Therapy Reduced the Hematologic Toxicity for Cervical Cancer

Monday, Nov. 28 11:20AM - 11:30AM Room: S104A

Participants
Yao Sun, Oak Brook, IL (*Presenter*) Nothing to Disclose
Zhiyong Yuan, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose
zhen tao, tianjin, China (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To determine if bone marrow sparing (BMS) in volumetric modulated arc therapy (VMAT) reduce the hematologic toxicity compared with VMAT without BMS.Materials/Methods: Two groups of 10+ patients with cervical cancer at our institution were enrolled respectively. All the patients received postoperative VMAT to 50.4Gy to the pelvic lymphatics and vagina. All plans were generated using our in-house-developed automatic inverse planning (AIP) algorithm. One group was treated with BMS-VMAT, while the other group was treated with VMAT without BMS. Planning objectives for PTV were minimum dose =95%, maximum dose= 107%,. The pelvic bone marrow (PBM) was limited to V5 t-test. The X2test was used to compare rates of hematologic toxicity.Results: All the patients were clinical stage IA2-IIA. The median age was 54 years old. After radical hysterectomy, eleven patients were diagnosed to have lymphovascular space involvement (LVSI); 5 patients had primary tumor size larger than 4cm; 9 patients had more than a third of stromal invasion. No patients had positive lymph node, parametria or positive surgical margins. The two groups resulted in equivalent homogeneity (1.07±1.2% vs 1.10±3.1%; P=0.210) and conformity index (0.842± 2.7% vs 0.827±1.2%; P=0.444). The PBM dose metrics showed a significant decrease in V5 (83.1%±3.2% vs 89.0%±0.8%; P=0.037) and V10 (74.8%±1.6% vs 82.3%± 2.1%; P=0.008) in the BMS-VMAT group compared to the VMAT group. However, V30 and V40 of PBM dose metrics were not significantly different between the two groups. The nadir for WCC (P=0.008) and ANC (P=0.004) were significantly reduced in the VMAT group compared to the BMS-VMAT group. In the BMS-VMAT group, 16.7% had grade 2 or higher hematologic toxicity (HT) compared with 56.7% in the VMAT group (P=0.036).Conclusion: BMS-VMAT reduced irradiation of PBM compared to VMAT without BMS, especially in the low dose radiation (V5 and V10). This analysis supports the hypothesis that low dose radiation of PBM is associated with acute HT during postoperative radiotherapy for cervical cancer. Techniques to limit pelvic bone marrow irradiation can reduce HT in cervical cancer patients.

SSC15-07 Incidence and Prognostic Value of NFkB-p65 Nuclear Versus Cytoplasmic Expression in Locally Advanced Cervical Cancer Patients Treated Definitively with Concurrent Chemoradiation

Monday, Nov. 28 11:30AM - 11:40AM Room: S104A

Participants
Darlene G. Attiah, MS, Chicago, IL (*Presenter*) Nothing to Disclose
Tamer Refaat Abdelrhman, MD, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

Irene Helenowksi, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Jonathan B. Strauss, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
William Small JR, MD, Maywood, IL (*Abstract Co-Author*) Speakers Bureau, Carl Zeiss AG; Advisory Board, Varian Medical Systems, Inc
Eric D. Donnelly, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

This study aims to report the incidence of NFkB-p65 nuclear versus cytoplasmic over-expression in locally advanced cervical cancer patients treated definitively with concurrent chemoradiation therapy (CRT) and their respective prognostic values on treatment outcomes.

METHOD AND MATERIALS

This IRB approved retrospective study included locally advanced cervical cancer patients, stages IB1 through IVA treated definitively with CRT. Evaluation of both nuclear and cytoplasmic immunoreactivity for NFkB-p65 was performed applying the same immunohistochemistry staining protocol reported by Garg et al. and scored quantitatively by 3 pathologists blinded to the treatment outcomes. Overall survival (OS), progression free survival (PFS), local regional control (LC), and distant metastases free survival (DMFS) rates were obtained via the Kaplan-Meier method and differences between groups were evaluated by the Log-Rank test.

RESULTS

The study evaluated 28 eligible patients with a median age of 51 ± 10 years. None of the patients expressed pretreatment NFkB-p65 nuclear immunoreactivity, whereas 15 (53.6%) and 13(46.4%) had cytoplasmic expression with a recurrence H-index ≥180 and <180, respectively. For patients with pretreatment cytoplasmic NFKB H-index ≥180, and <180, the 5-year OS were 49.45% and 64.10% (P-Value = 0.34), PFS were 39.29% and 57.69% (P-value = 0.21), LC were 78.57% and 69.23% (P-value = 0.86), and DMFS were 49.11% and 76.92% (P-value = 0.18), respectively.

CONCLUSION

This study demonstrated that NFkB-p65 have a significantly higher incidence of cytoplasmic versus nuclear expression. Cytoplasmic NFkB-p65 over-expression (H-index ≥180) was associated with a non-statistically significant trend towards poor clinical outcomes in locally advanced cervical cancer patients treated definitively with CRT.

CLINICAL RELEVANCE/APPLICATION

NFkB-p65 have a significantly higher incidence of cytoplasmic versus nuclear expression, and did not demonstrate significant association with treatment outcomes in locally advanced cervical cancer patients treated definitively with CRT.

SSC15-08 Outcomes of a Single Institution Study of Radiation Sandwiched between 6 Cycles of Chemotherapy for Surgically Staged High-Risk Endometrioid Adenocarcinoma

Monday, Nov. 28 11:40AM - 11:50AM Room: S104A

Awards
Student Travel Stipend Award

Participants
Sujith Baliga, MD, New York , NY (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): The optimal treatment modality for patients with high-risk endometrial cancers, including the sequencing of radiation and chemotherapy, is not yet well established. Here we report our experience of radiation "sandwiched" between 6 cycles of chemotherapy for patients with surgically staged high-risk endometrioid adenocarcinoma (EA). Materials/Methods: From April 2010 – June 2014, 27 patients with Stage IA-IVB histologically confirmed high-risk EA were treated with a combination of adjuvant sandwich chemoradiation. Inclusion criteria include patients with histologically documented EA defined by the following: IA Grade 3 with LVSI, IB G2 or IB G3, any surgical Stage II or Stage III disease, and any surgical Stage IV disease with no residual macroscopic tumor. Chemotherapy consisted of a combination of Carboplatin (AUC 6 pre-RT and AUC 5 post-RT) and Paclitaxel (175 mg/m2). Chemotherapy was administered every 21 days for 3 cycles, followed by a planned chemotherapy break during which external beam radiotherapy (EBRT) and 3 high dose rate (HDR) brachytherapy vaginal cylinder treatments were sequentially delivered. Chemotherapy was resumed after the completion of EBRT and typically overlapped with the HDR brachytherapy. Post-RT chemotherapy was administered for 3 cycles. EBRT consisted of 45 Gy to the pelvis utilizing IMRT, and extended field RT (EFRT), to include the para-aortic (PA) nodes, was used if 2 or more pelvic lymph nodes were involved or if there was PA disease. RTOG toxicity criteria were used to calculate the cumulative gastrointestinal (GI), genitourinary (GU), and hematologic toxicity. Results: Mean age of our cohort at diagnosis was 58 years. The median follow up was 25 months. 7 patients had Stage I disease (25%), 5 patients had Stage II disease (17.9%), 4 patients had Stage IIIA disease (14.3%), 6 patients had Stage IIIC1 disease (25%), 4 patients had Stage IIIC2 disease (14.3%) and 1 patient had Stage IVB disease (3.6%). There were no local or distant failures in our cohort. The rate of acute Grade 2 GI and GU toxicity was 10.7% and 0%, respectively. Acute grade 3 GI toxicity occurred in 1 patient (3.6%). The rate of late grade 3 GU or GI toxicity was 3.6% and 3.6%, respectively. The rate of acute grade 3 thrombocytopenia, anemia, and neutropenia were 7.1%, 3.6%, and 35.7%, respectively. 7.1% of patients required chemotherapy dose reduction and 17.9% of patients required cycle delay. Conclusion: In patients with high risk EA, adjuvant sandwich chemoradiation results in excellent loco-regional and distant control with acceptable toxicity.

SSC15-09 Management of Inoperable Carcinoma Endometrium with Radiotherapy alone- A Single Institution Study

Monday, Nov. 28 11:50AM - 12:00PM Room: S104A

Participants
Umesh Velu, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Surgically inoperable early stage Carcinoma Endometrium patients treated with Radiotherapy alone.Materials/Methods: 48 Patients with Early Stage Carcinoma Endometrium(Stage 1 low risk) from JK cancer institute, Kanpur

were selected. These patients who were surgically inoperable were taken up for this study. These patients received Radiation therapy in the form of EBRT of 50.4 Gy in 28 daily fractions and followed by 4 sessions of Intracavitatory Brachytherapy of 6 gy in 4 fractions. These patients were further followed up every month in the first year and every 3 monthly for the next 2 yearsResults: 48 patients registered.All the patients were deemed inoperable in view of medical comorbidity. 24 had cardiovascular diseases. 16 patients were above 70 years of age. 8 patients had other associated medical comorbidities due to which anaesthesia could not be administered. All patients completed the entire course of external beam radiotherapy and Brachytherapy. After 3 years of follow up , it was found that only 3 patients out of the 48 had residual disease after Radiotherapy. 4 patients developed Lung Metatstasis during the follow up. 41 patients have shown complete response to radiotherapy both clinically and radiologicallyConclusion: Radiotherapy alone can be a single modality of choice in patients who are early stage Carcinoma Endometrium who are inoperable due to any medical reasons.However A larger study with large number of patients is required to confirm our study

ROS-MOA

Radiation Oncology Monday Poster Discussions

Monday, Nov. 28 12:15PM - 12:45PM Room: RO Community, Learning Center

RO

AMA PRA Category 1 Credit ™: .50

FDA Discussions may include off-label uses.

Participants
Tarita O. Thomas, MD, PhD, Chicago, IL (*Moderator*) Nothing to Disclose

Sub-Events

RO208-SD-MOA1 Accelerated Partial Breast Irradiation (APBI) with Intensity Modulated Radiation Therapy and Image Guided Radiation Therapy (IMRT+IGRT)

Station #1

Participants
Patricia Elena Murina, MD, Cordoba, Argentina (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To evaluate the feasibility and safety of Accelerated Partial Breast Irradiation with IntensityModulated Radiation Therapy and Image Guided Radiation Therapy (IMRT+IGRT)Materials/Methods: Between 12/2011 and 12/2015, 46 pts, 68 years(54-82) were admitted with a diagnosis of infiltrating ductal carcinoma pT1, pN0 M0, RH+, GN2, and no lymph node involvement. All of them had lumpectomy with 5 titanium clips placed in the tumor bed, free margins and sentinel node biopsy.Virtual simulation with CT was performed and teflon guides were placed at the lumpectomy scar and the breasts contours. CT images were obtained every 2,5mm and transferred to the Iplan-BrainLabv.4.5 planner via DICOM.GTV (tumor bed with clips);CTV(GTV 35 mm expansion);PTV(CTV 5 mm expansion)and PTV Eval (less than 5mm subtraction between PTV and skin or ribs) were drawn OAR's : remaining homolateral breast,contralateral breast, both lungs, thyroid gland,costal wall,spinal cord and the heart and received 6MV photons delivered by NOVALIS TX Varian-Brianlab linear accelerator and IMRT with 8 non-coplanar beam incidences and IGRT with ExacTrac.The total dose prescribed to the PTV_Eval was 38.5 Gy(D95%)given in 10 fractions of 3,85 b.i.d.,6 hours apart over 5 consecutive days.The mean volume of GTV, CTV and PTV_Eval, homogeneity in dose distribution, and the dose received by OAR´s based at RTOG constraints.Results: 46 pts(19right-sided-27left sided breasts)had 16.5 months follow-up(4-37,9)infiltrating ductal carcinoma,1.01 medium tumor size[0.51.7],RE+,RP+ ,HER2-, negative LVI, and GN1-2. The GTV11,7cc[2-36],CTV 32, 7 cc [7-96],PTV-eval 68,3 cc[13-170].D98% PTV_eval =37.9Gy[35.2-39.3]; D95%=38.3Gy[36.9-39.5] and D2%=41.5 Gy[39.3-43].The percentage of irradiated breast receiving the prescribed dose was16,4%[10-31].The average breast volume was 578cc[170-1200] and the ratio between the irradiated total breast volume and the PTV_eval was 12,8%[9 -21].OAR´s V11.5Gy--6.1 % homolateral lung(0,3-14);V2Gy contralateral lung1.4 Gy(0,4-7), max.dose to contralateral breast 0,9 Gy(0.22-2),max.dose to thyroid gland was1,9 Gy, the heart from left breast received 15,6 Gy(0-38); and max.dose to spinal cord was 4,6 Gy.At last follow-up, very good cosmetic results were reported and mild G1 fibrosis limited to the tumor site in only two patients.Conclusion: Despite the short follow-up period, we may suggest that APBI with IMRT+IGRT is feasible and safe. A longer follow-up is required to confirm results in disease control and cosmesis.

RO209-SD-MOA2 Image Based Response Evaluation Of Intracranial Lesions after Cyberknife Robotic Radiosurgery - A Radiological Review

Station #2

Awards
Student Travel Stipend Award

Participants
Shazia Kadri Sr, MBBS, Karachi, Pakistan (*Presenter*) Nothing to Disclose
Naveed V. Ahmed, MBBS, FRCR, karachi, Pakistan (*Abstract Co-Author*) Nothing to Disclose
kelash kumar Sr, MBBS, Karachi, Pakistan (*Abstract Co-Author*) Nothing to Disclose
Aneeta Ghulam Mohammad Sr, MBBS, Karachi, Pakistan (*Abstract Co-Author*) Nothing to Disclose
Shumaila Arooj Sr, MBBS, Karachi, Pakistan (*Abstract Co-Author*) Nothing to Disclose
Kamran Saeed Sr, MBBS,DMRD, Karachi, Pakistan (*Abstract Co-Author*) Nothing to Disclose
tariq mahmood VI, MBBS,DMRD, Karachi, Pakistan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To study the radiological response of Cyber Knife Robotic Radiosurgery for treating intracranial tumors by tailored MRI sequences in providing maximum details

METHOD AND MATERIALS

653 patients were selected from December 2012 to June 2015 who were referred to the department of cyberknife from different hospitals within and outside Pakistan for the radiosurgery. Tumors with less than 6 cm size, post operative residual/recurrent tumor and surgically unresectable tumor were included. Patient was followed every three months with 3D T1 contrast MRI and added sequences according to need.

RESULTS

Out of 653 patients,Overall 35% of benign tumors showed reduction in size and 63% remain stable and 2% were resolved radiologically with clinical improvement in 80 % cases where as 47% of malignant tumors were reduced , 31% remain stable and 22% showed progression radiologically but 70% of patients showed clinical improvement.Considering Meningiomas,out of 135 cases 33% were reduced, 65%remained stable and 2% resolved with clinical improvement in 82%of cases. In 109 AVM,82%were

reduced,13%remained stable and 5% were resolved with clinical improvement in 84%of cases. Out of 91 cases of gliomas 64% of low grade gliomas and 58% of high grade gliomas were reduced with clinical improvement of 86% and 73%respectively. From 76 cases of Acoustic neuroma 20% reduced and 80%remained stable with clinical improvement in 86%.In 53 cases of metastatic lesions predominantly from breast 83% were reduced with clinical improvement in 85%. Out of 71 cases of pituitary adenomas 52% were reduced and 76% clinically improved. From 17 cases of craniopharyngioma 53% were reduced and 88% were clinically improved.

CONCLUSION

Our results clearly shows that cyberknife is highly effective in controlling benign tumors and a good palliative modality for recurrent malignant and metastatic brain tumors.T1 3D contrast is the sequence of choice for most of the intra cranial lesions after treatment follow up, while in cases of pituitary adenoma, acoustic neuroma, schwannoma we utilized BTFE for cranial nerve definition. Longer follow up with conventional MRI is mandatory.

CLINICAL RELEVANCE/APPLICATION

Cyberknife Robotic Radiosurgery showed promising results in patients with residual /recurrent or surgically unresectable intracranial neoplastic mass lesions.

RO210-SD-MOA3 Treatment Outcome for Ependymal Tumors in the United States

Station #3

Participants
Kailin Yang, PhD, Cleveland, OH (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Ependymal tumors are rare CNS neuroectodermal neoplasm with a significant impact on patient mortality and quality of life. This study is to compare the effect of surgery and adjuvant radiation therapy (RT) on survival outcomes for various histological subtypes of ependymal tumors in the United States.Materials/Methods: All patients aged >=18 with ependymal tumors (myxopapillary ependymoma 9394/1, subependymoma 9383/1, ependymoma 9391/3, and anaplastic ependymoma 9392/3) were identified from the Surveillance, Epidemiology, and End Results registry (2000-2009). Patients with unknown status of RT or surgery were excluded. Surgical treatment was categorized into gross total resection (GTR) and no GTR (including no surgery and subtotal resection). Demographic and clinicopathological predictors were analyzed using chi-square test and t-test. Log-rank test and multivariate Cox proportional hazard modeling were used to examine treatment effect on overall survival (OS).Results:The primary analysis totaled 2091 patients, with 424 cases of myxopapillary ependymoma (20.3%), 211 subependymoma (10.1%), 1325 ependymoma (63.4%), and 131 anaplastic ependymoma (6.2%). On univariate analysis, GTR was associated with improved OS for ependymoma (89% vs. 81%, pConclusion: Ependymoma was the most common histological subtype among all ependymal tumors in the United States. Age at diagnosis was found to significantly contribute to patient long term survival for all 4 subtypes. Surgery in the format of GTR provided survival benefit particularly in ependymoma. Adjuvant RT was found to adversely impact on OS of ependymoma, which might reflect a selection bias of preferential offering of RT to patients with worse prognosis. More definitive study incorporating factors including disease severity and chemotherapy would be needed to validate our findings.

RO211-SD-MOA4 Quantitative Evaluation of Fat-to-Water Ratio (FWR) Change in the Liver using Three-Point Dixon Magnetic Resonance Imaging (MRI) after Stereotactic Body Radiation Therapy (SBRT) for Hepatocellular Carcinoma (HCC)

Station #4

Participants
Faraz Amzajerdian, Charlottsville, VA (*Abstract Co-Author*) Nothing to Disclose
Yuenan Wang, Charlottesville, VA (*Presenter*) Nothing to Disclose

PURPOSE

To quantitatively and noninvasively evaluate fat-to-water ratio (FWR) in the liver using the three-point Dixon MRI method in order to compare the FWR variation after stereotactic body radiation therapy (SBRT) for patients with hepatocellular carcinoma (HCC).

METHOD AND MATERIALS

Five patients with hepatocellular carcinoma (HCC) treated with SBRT were retrospectively selected for this IRB-exempt quantitative MRI study. The patients underwent SBRT, also known as stereotactic ablative radiotherapy, with prescribed dose of 20-50 Gy in 3-5 fractions on TrueBeam or Trilogy linear accelerators (Varian Medical Systems). At least two weeks before and two weeks after SBRT, the T1 axial interleaved in-phase and out-of-phase MRI pulse sequence was acquired on 1.5 T Siemens MAGNETOM Avanto scanner within breathhold using the following parameters: resolution= 256x144, flip angle = 65 dgr, TR=206 ms, in/out of phase TE=2.45 / 3.03 ms. Using the three-point Dixon method, where the in-phase signal intensity SI_in = Water + Fat and the out of phase SI_out = Water - Fat, we obtained the fat-only image and water-only image to calculate pixel-by-pixel FWR in the pre-SBRT and post-SBRT liver using MATLAB (Fig 1). ROI of the liver was contoured and mean FWRs for the pre and post SBRT MRI were compared.

RESULTS

Among the five patients, all of them had decreased FWR in the liver after SBRT, which was -12%, -19%, -43%, -61% and -44%, respectively. Their average FWR values in the liver for the pre vs. post SBRT were 0.017 vs. 0.015, 0.021 vs. 0.017, 0.075 vs. 0.043, 0.038 vs. 0.015, and 0.026 vs. 0.014, respectively. Further study is needed to determine whether this decrease of FWR is due to patient weight loss or liver necrosis / fibrosis after SBRT. Also more patient data is needed for future investigate.

CONCLUSION

Monotonically decreased fat-to-water ratio (FWR) in five patients was observed after SBRT. More retrospective MRI data will be included for liver functional study in the future; with more detailed segmentation, we will evaluate FWR change for tumor and normal liver damage after SBRT. This method has clinical potential of quantitatively and noninvasively evaluating liver tissue change after radiation therapy.

CLINICAL RELEVANCE/APPLICATION

Using three-point Dixon MRI, fat-to-water ratio (FWR) has been observed decreased monotonically in five patients after stereotactic liver radiation therapy.

RO212-SD-MOA5 Phase Ib/II Clinical Trial of Novel Oxygen Therapeutic in Chemoradiation of Glioblastoma

Station #5

Participants
Jason Lickliter, MBBS, PhD, Melbourne, Australia (*Presenter*) Nothing to Disclose
Jeremy Ruben, MBBCh, MD, Melbourne, Australia (*Abstract Co-Author*) Nothing to Disclose
David Wilson, Tucson, AZ (*Abstract Co-Author*) Shareholder, NuVox Pharma LLC;
Heling Zhou, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Ralph P. Mason, PhD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Evan C. Unger, MD, Tucson, AZ (*Abstract Co-Author*) Shareholder, NuvOx Pharma LLC; Shareholder, Microvascular Therapeutics

PURPOSE

Tumor hypoxia limits the response of glioblastoma multiforme (GBM) to radiotherapy (RT). The purpose of this study is to evaluate the use of a novel oxygen therapeutic (OT), dodecafluoropentane emulsion (DDFPe) in chemoradiation treatment of GBM.

METHOD AND MATERIALS

Adult GBM patients with residual tumor post surgery enrolled in an open label Phase Ib/II clinical trial received doses of 0.05 mL/kg, 0.1 mL/kg or 0.17 mL/kg 2% w/vol DDFPe administered via IV infusion prior to each of 30 fractions of RT over a 6-week period. PK samples were obtained in five patients at the recommended dose. Patients were followed with serial MR scans and evaluated as per RANO criteria and also underwent TOLD MRI scans pre and post DDFPe on days 1 and 5 or 10 of dosing. Tumor DNA profiling (with methylation) analysis was performed on all patients.

RESULTS

Six patients have completed dosing; 3 more patients are presently being treated. There were no acute adverse events associated with administration of DDFPe. At the dose of 0.17 mL/kg a DLT was observed due to Grade III radiation necrosis confirmed by surgery 3 months post RT and 0.1 mL/kg was determined to be the therapeutic dose. One other patient treated at the 0.1mL/kg dose had Grade III radiation necrosis confirmed by surgery at 9 months post RT. The first patient was predicted non responder to temozolomide (negative methylation of MGMT) survived 21-months post diagnosis. At this time all other patients are alive. Survival data will be presented. TOLD MRI showed significant decreases in T1 of tumor tissue with little appreciable change in contralateral brain.

CONCLUSION

Acute administration of DDFPe is well tolerated in association with chemoradiation but may increase risk of radiation necrosis. TOLD MRI confirms tumor re-oxygenation. Preliminary survival data suggests therapeutic benefit.

CLINICAL RELEVANCE/APPLICATION

DDFPe is the first OT with sufficient safety factor to enable administration during each fraction of RT. A randomized, prospective placebo controlled trial is planned.

RO213-SD-MOA6 Oncologic Outcome of Patients with Stage yp0-I Rectal Cancer after Neo-Adjuvant Chemo-Radiotherapy

Station #6

Participants
Ning Li, Beijing, China (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To investigate the oncologic outcomes of patients with stage yp0-I rectal cancer and prognostic factors for long-term survival.Materials/Methods: Between January 2008 to December 2013, 87 patients with locally advanced rectal cancer were enrolled into the present study. Total mesorectal excision (TME) surgery was performed 4-8 weeks after concurrent chemo-radiotherapy (CRT). Total dose of 45-50.4Gy radiation was given to the whole pelvic, concurrently given capecitabine or capecitabine combined with oxaliplatin chemotherapy. Results: Median follow-up time was 34.1(range, 10.22-112.13) months. The median interval between neoadjuvant CRT and TME surgery was 51 days. 44.8% of the patients received adjuvant chemotherapy. 3-year local recurrence-free survival (LRFS), distant metastasis-free survival (DMFS), disease-free survival (DFS), and overall survival (OS) were 98%, 96.1%, 93.3% and 93.2%, respectively. Uni-variate analysis showed that CEA level was associated with DMFS and DFS (p=0.043, 0.041), and stage IIA was associated with DMFS, DFS and OS (p=0.019, 0.018, 0.032). Multi-variate analysis showed that Stage IIA was an independent prognostic factor (p=0.05) for DFS in the patients with yp0-I after neoadjuvant CRT.Conclusion: Excellent long-term DFS and OS were achieved in the patients with yp0-I stage after neoadjuvant CRT, with low rates of local recurrence and distant metastasis. Earlier pretreatment stage could be considered as a poor prognostic factor for DFS.Table 1.Charactoristics of patients nGender Male64(73.6%) Female23(26.4%) Age53(23-75) Distant to anal verge 10-12cm3(3.4%) 5-10cm34(39.1%) 50(57.5%) Operation APR47(54.0%) LAR30(34.5%) HARTMANN6(6.9%) TRG TRG139(44.8%) TRG221(24.1%) TRG316(18.4%) TRG42(2.3%) TRG51(1.1%) Unknown8(9.2%) Interval between CRT and TME51(26-134)daysAdjuvant Chemotherapy Yes39(44.8%) No48(55.2%) Completed Chemotherapy Cycles 0-560(69.0%) 6-1019(21.8%) Unknown8(9.2%) Chemotherapy Regimen FOLFOX8(9.2%) XELOX18(20.7%) Capecitabine5(5.7%) Unknown8(9.2%)

RO214-SD-MOA7 Retrospective Analysis of Outcomes, Late Effects and Prognostic Factors of Definitive Chemo-Radiotherapy for Cervical Cancer

Station #7

Participants
Guanghui Cheng, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To determine the oncologic outcomes, late toxicity and prognostic factors of patients treated with definitive chemo-radiotherapy for cervical cancer. Materials/Methods: 107 eligible cervical squamous cancer patients with stage Ib-IVa who underwent definitive chemo-radiotherapy were retrospectively identified between January 2010 and November 2012 in a prospectively maintained database. The clinical features, postoperative morbidity and mortality, and prognostic factors for postoperative morbidity were analyzed. The treatment related toxicities were evaluated according to Radiotherapy Oncoiogy Group (RTOG) criteria. Results: The median follow-up time was 34 months and the following rate was 92.2 %. According to the FIGO staging system, 4, 20, 47, 33 and 3 patients had stage Ib, IIa, IIb, III and IVa disease. 55 patients (51.3%) received concurrent chemotherapy (cisplatin 15%, mean cycles: 4.8, carboplatin/ paclitaxel 85%, mean cycles: 1.9). All patients received the external beam radiotherapy (EBRT) (Three dimensional conformal radiotherapy (3D-CRT): 39 persons, Intensity-modulated radiation therapy (IMRT): 68 persons) and three-dimensional high-dose-rate adaptive brachytherapy (3D-HDR-ABT) (Intracavitary brachytherapy: 8 persons, Intracavitary+interstitial brachytherapy: 99 persons). The most common EBRT dose/fractionation schedule was 45 Gy in 25 fractions (70.6%) and the most common 3D-HDR-ABT dose was 28 Gy in 4 fractions weekly (84.8 %). In all patients, the 1 and 3 years OS were 90.9% and 81.1%, with pelvic control rates of 96.0% and 87.8%. 11 patients (9.7%) had distant metastasis, and the most common sites were the lung, inguinal region and liver. The distant metastasis was the main cause of death. The rate of late RTOG grade 3/4 toxicity was 21.0% (intestinal: 13 events, 12.4% of patients; urinary: 9 events, 8.6% of patients). Moreover, we found that the 1 year OS was significantly higher in patients whose HR CTV D90 were more than 8500 cGy (in EQD2 models). Cox multivariate analyses demonstrated that the D2ccof rectum above 7000 cGy was the only factor associated with late gastrointestinal toxicity.Conclusion: Outcomes of patients treated with chemo-radiotherapy for cervical cancer are in keeping with those reported in other series. The HR CTV D90 more than 8500 cGy could improve 1 year OS. The D2cc of rectum above 7000 cGy was the only predictor of late gastrointestinal toxicity.

ROS-MOB

Radiation Oncology Monday Poster Discussions

Monday, Nov. 28 12:45PM - 1:15PM Room: RO Community, Learning Center

RO

AMA PRA Category 1 Credit ™: .50

Participants
Tarita O. Thomas, MD, PhD, Chicago, IL (*Moderator*) Nothing to Disclose

Sub-Events

RO216-SD-MOB2 Patterns of Failure in Glioblastoma Multiforme Following Standard (60 Gy) or Short-course (40 Gy) Radiation and Concurrent Temozolomide

Station #2

Participants
Miyu Mizuhata, MD, Kanazawa city, Japan (*Presenter*) Nothing to Disclose
Shigeyuki Takamatsu, MD, PhD, Kanazawa city, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomoyasu Kumano, Ishikawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Shinji Fujita, MD, kanazawa city, Japan (*Abstract Co-Author*) Nothing to Disclose
Yoko Taima, MD, Kanazawa city, Japan (*Abstract Co-Author*) Nothing to Disclose
Mikoto Nakagawa, MD, Kanazawa city, Japan (*Abstract Co-Author*) Nothing to Disclose
Toshifumi Gabata, MD, PhD, Kanazawa, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To analyze the patterns of failure in patients with glioblastoma multiforme (GBM) that were treated with standard (St; 60 Gy/30 fractions) or short-course (Sc; 40 Gy/15 fractions) radiation therapy and concurrent temozolomide.

METHOD AND MATERIALS

Thirty-one consecutive patients with newly diagnosed glioblastoma that were treated at our hospital between 2007 and 2015, were included. All patients underwent complete surgical resection followed by St (n=15) or Sc (n=16) with concurrent temozolomide. We analyzed the failure pattern in 31 patients who underwent a radical course of radiotherapy and chemotherapy with gadolinium-enhanced post-operative magnetic resonance imaging. The chi-square test was used to analyze the associations between the tumor recurrence pattern and the type of treatment.

RESULTS

We found that after St recurrences occurred at the resection margin alone in 11 of 15 (73%) patients, only at distant sites in 1 of 15 (7%) patients, and at both the resection margin and distant sites in 3 of 15 (20%) cases. After Sc, recurrences occurred at the resection margin alone in 12 of 16 (75%) patients, only at distant sites in 1 of 16 (6%) patients, and at both the resection margin and distant sites in 3 of 16 (19%) cases.

CONCLUSION

There was no differences in the tumor recurrence pattern between the two protocols.

CLINICAL RELEVANCE/APPLICATION

Patterns of failure in glioblastoma multiforme following standard (60 Gy) or short-course (40 Gy) radiation is not different with concurrent temozolomide.

RO217-SD-MOB3 Clinical Outcomes of Elderly Patients (>= 70 years) with Resectable Esophageal Squamous Cell Carcinoma Who Underwent Esophagectomy or Chemoradiation: A Retrospective Analysis from a Single Cancer Institute

Station #3

Participants
Hui Zhu, MD, PhD, Jinan, China (*Presenter*) Nothing to Disclose
Wang Jing, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Li Kong, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Jinming Yu, Jinan, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The efficacy of chemoradiation (CRT) in comparison with esophagectomy in elderly patients with resectable esophageal squamous cell carcinoma (ESCC) is unclear. We conducted a retrospective analysis to investigate outcomes of elderly patients with resectable ESCC who underwent surgery (S) or CRT.

METHOD AND MATERIALS

We performed a retrospective review of the records of elderly patients (≥ 70 years) with resectable ESCC who underwent esophagectomy or CRT between January 2009 and March 2013. According to the main treatment strategy, patients were allocated into either S group or CRT group. The primary endpoint was OS and the secondary endpoint was PFS. OS and PFS were calculated by Kaplan-Meier method, and log-rank test was used to evaluate the difference in survival curves. Univariate and multivariate survival analyses were performed by the Kaplan-Meier method and Cox proportional hazards model, respectively. Two-sided p values < 0.05 were considered statistically significant.

RESULTS

A total of 188 patients were enrolled. Eighty-eight patients underwent esophagectomy and 100 patients underwent CRT. The median age of the patients was 73 years (range, 70 - 81 years) in the S group and 76 years (range, 70 - 88 years) in the CRT group. The median survival time (MST) for the whole cohort was 25.6 months, and 1-, 3- and 5-year survival rates were 69.2%, 36.1% and 21.9%, respectively. The MST in the S group and CRT group was 36 months and 15 months, respectively. The 1-, 3-, and 5-year survival rates in the S group were 82.4%, 49.0% and 33.3%, compared to 58.0%, 24.1% and 7.8% in the CRT group ($p < 0.0001$). Multivariate analysis revealed that LN status [hazard ratio (HR) = 0.598, $p = 0.011$] and treatment strategies (HR = 0.538, $p = 0.001$) were independent and significant prognostic factors for OS in elderly patients.

CONCLUSION

Surgery was still the main treatment strategy for elderly patients with resectable ESCC. Advanced age and comorbidities should not be the cause for elderly patients to avoid aggressive regimens. Delivered therapeutic approaches should be individualized based on carefully evaluating the balance of benefits, risks and life expectancy.

CLINICAL RELEVANCE/APPLICATION

Esophagectomy is superior to chemoradiation in elderly patients with resectable esophageal squamous cell carcinoma and is recommended in those settings after evaluation with caution.

RO218-SD-MOB4 Analysis of Risk Factors and Treatment Outcome in Adult Patients with Brainstem Glioma

Station #4

Awards
Student Travel Stipend Award

Participants
Kailin Yang, PhD, Cleveland, OH (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Brainstem glioma (BSG) is much more rare and heterogeneous in adults compared to pediatric population. The maturation of MRI-guided biopsy has enabled more definitive diagnosis of BSG. Clinical outcome of this type of brain tumor remains poor despite aggressive treatment. We aim to analyze the effect of radiation therapy (RT) and surgery on survival outcome of BSG in an adult population.Materials/Methods: Adult patients of age 19 or older with the diagnosis of BSG were identified from the NCI Surveillance, Epidemiology, and End Results (SEER) database (1973-2012). Information for the status of radiation therapy was obtained. Surgical treatment was categorized into no surgery, subtotal resection (STR), and gross total resection (GTR). Demographic and clinicopathological predictors were analyzed using chi-square test, t-test, and logistic regression modeling. Kaplan-Meier analysis and multivariate Cox proportional hazard modeling were used to assess the impact of treatment on overall survival (OS).Results:1667 adult patients with BSG were identified. 54.6% were males, and 83.1% were Caucasian. The median age was 45.5 years. 67.5% of patients received RT. Surgery was only performed in a small subset of patients with 7.4% receiving STR and 6.4% receiving GTR. 12.1%, 13.3%, 10.3%, and 18.1% were diagnosed with WHO grade I, II, III, and IV glioma respectively, with the rest of unknown grade status. OS at 10 years was 26.8%, with a median follow-up time of 9.7 years. Advanced age and high WHO grade were associated with poor OS, with 8.9% for age 75+ and 10.3% for grade IV at 10 years respectively. There was no significant OS benefit with RT for grade III (18.9% with RT vs. 18.4% without RT, p=0.94), but improved OS with RT for grade IV (12.1% with RT vs. 3.39% without RT, p=0.03). However, worse OS was observed with RT for grade I (50.0% with RT vs. 77.3% without RT, pConclusion: The overall outcome of high-grade adult BSG remains poor though RT provides benefit on OS for grade IV tumors, keeping in mind possible bias in offering RT to patients with worse prognosis. GTR is associated with improved survival in a subset of patients. More definitive diagnosis and grading of adult BSG would guide improved management strategy. Given the unfavorable survival of high-grade BSG, more specific therapeutic regimen targeting the underlying genetic aberration is needed to improve patient outcome.

RO219-SD-MOB5 Carbon-Ion Radiotherapy for Colorectal Adenocarcinoma Paraaortic Lymph Node Metastasis

Station #5

Participants
Daniel K. Ebner, Chiba, Japan (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): In 5% of post-surgical colorectal adenocarcinoma cases, paraaortic lymph node involvement is noted. However, due to the degree of disease invasiveness, repeat surgery is typically not indicated. Carbon-ion radiotherapy (CIRT) has demonstrated a high therapeutic effect in cases of adenocarcinoma and sarcoma. As such, CIRT is expected to show good efficacy in cases of recurrent colorectal adenocarcinoma, including metastasis. This study aims to examine the safety and efficacy of CIRT on paraaortic lymph node metastasis following colorectal adenocarcinoma resection.Materials/Methods: Patients with recurrent lesions confined to the paraaortic lymph nodes following colorectal adenocarcinoma resection were identified. Dose was expressed in units of relative biological effectiveness (RBE)-weighted absorption. A carbon-ion beam was used to deliver 48.0 – 55.2 Gy (RBE) in 12 fractions over three weeks to the target site. Actuarial local control and overall survival were calculated using the Kaplan–Meier method.Results: 41 subjects were identified from between April 2004 to December 2014. 14 patients were female and 27 patients were male. Median age was 63 years old (range 39 to 85). Median follow-up duration for all patients and surviving patients was 23.2 months (range, 2.1-63.9 months) and 17.8 months (range, 2.1-63.9 months), respectively. The initial site was the rectum in 21 cases. 48 Gy (RBE) was delivered to 4 patients, 50.4 Gy (RBE) to 4 patients, 52.8 Gy (RBE) to 32 cases, and 55.2 Gy (RBE) to 1 case. All patients completed their treatment course, and no grade-3 or higher skin or digestive tract acute or long-term adverse events were noted. Local control and overall survival were 73% and 62% at three years, respectively. During the followup period, 15 local recurrences (6 in-field, 9 margin) and 24 distant metastases were noted. 11 cases of local recurrence and 8 distant metastases were able to be retreated with CIRT in an effort to prevent further metastasis. Conclusion: The carbon-ion beam enabled treatment of colorectal adenocarcinoma paraaortic lymph node metastasis without grade 3 or higher adverse events, and with good overall survival and local control. Nonetheless, a significant portion of patients went on to develop recurrent disease, particularly distant metastasis. Further work is needed to improve distant control and survival outcomes in this complex disease.

RO220-SD-MOB6 Cervical Cancer Treatment Outcomes in a Public Safety Net Hospital and Association with Race

Station #6

Participants
Suisui Song, MD, Elgin, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Race and socioeconomic status (SES) are both independently associated with cervical cancer survival, with Hispanics and African Americans patients and patients in lower SES showing worse survival. This study aims to explore association between race and treatment outcomes among patients with cervical cancer treated in a public safety net hospital setting, where non-white patients comprises the majority.Materials/Methods: We retrospectively reviewed 49 patients with locally advanced cervical cancer treated consecutively from April 2013 to December 2014 in a public safety net hospital. All patients received concurrent chemoradiation followed by high dose rate brachytherapy boost as a curative treatment. Median follow up was 10 months. The primary study outcome measures were locoregional failure (LF), distant failure (DF), and failure-free survival (RFS), which were calculated using Kaplan-meier method. Results: Median age was 51. 71% were squamous cell histology. Median tumor size was 6cm. Stage distribution were 16 patients with stage IB (33%); 19 patients with stage II (39%); 11 patients with stage III (22%), and 3 patients with stage IV (6%). 49% of patients had node positive disease. Racial distribution for the entire cohort were 3 black (6%), 30 Hispanics (61%), 15 Asians (31%), and 1 white (2%). There was no significant differences in stage distribution, node positivity, tumor histology, or tumor size among the different races. LF, DM, and any failure rates for the entire cohort were 18%, 20%, and 30%, respectively. There was more LF in Asians vs. Hispanics patients (33% v 10%, p=0.04). 1y LF free survival, DF free survival, and RFS for the entire cohort were 83%, 80%, and 70%, respectively. Asians vs Hispanics patients had a significantly worse 1y LF free survival and RFS: 72% v 91% (pConclusion: Our study shows that in our public safety net hospital, the Asian patients with locally advanced cervical cancer had a significantly higher LF and worse 1y LF free survival than Hispanic patients, despite a similar stage distribution and tumor characteristics. Longer follow up will be needed to see if this result would hold.

RO221-SD-MOB7 Vaginal Sparing with Volumetric Modulated Arc Therapy (VMAT) for Rectal Cancer

Station #7

Participants
Scott Boulet, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Compare dosimetric differences between VMAT plans with and without an objective to spare the vagina, to determine whether the volume of the vagina that receives 20 (V20Gy), 30, 40, 45, or 50Gy could be reduced. Secondary objectives included whether the maximum dose (Dmax) delivered, and the mean dose (Dmean) delivered are significantly different between the two treatment plans.Materials/Methods: Ten patients with rectal cancer previously treated with 3D conformal radiotherapy were selected for this study. All patients received 50.4 Gy in 28 fractions of radical neoadjuvant RT for T3, N1-2, low rectal cancers. Two VMAT plans were created for each patient; one with an objective to spare the vagina and one without. Target coverage and sparing of other organs at risk were not compromised between the two VMAT plans. Differences in vaginal dose was determined using Wilcoxon signed-rank tests. The selected threshold for significance was P-value = 0.05/7 using a Bonferroni correction for multiple comparisons.Results: Significant differences were observed for the median Dmax and Dmean doses delivered, and the median V50Gy volumes; 52.6 vs 49.6Gy (p=0.0051), 49.9 vs 47.8Gy (p=0.0051), and 47.6 vs 0% (p=) respectively. V45Gy volumes also appeared different between the two treatment plans and would be considered significant at the P-value =0.05 threshold, but because the threshold P-value was adjusted using the Bonferroni correction, it was no longer significant. The dosimetric differences between V20Gy, V30Gy, and V40Gy were not significant.Conclusion: VMAT planning using an objective to spare the vagina can significantly reduce the volume of vagina receiving 50Gy, as well as the Dmax and Dmean, without compromising target coverage or adjacent organs at risk dose constraints.

MSRO23

BOOST: Gastrointestinal-Case-based Review (An Interactive Session)

Monday, Nov. 28 3:00PM - 4:15PM Room: S103AB

GI RO

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50

Participants
Mukesh G. Harisinghani, MD, Boston, MA (*Presenter*) Nothing to Disclose
Theodore S. Hong, MD, Boston, MA (*Presenter*) Nothing to Disclose
Lawrence Blaszkowsky, MD, Boston, MA (*Presenter*) Spouse, Stockholder, Pfizer Inc
Cristina Ferrone, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Achieve a basic understanding of the anatomy pertinent to the pancreatico-biliary region and imaging appearance of pancreaticobiliary tumors. 2)Understand strengths and limitations of imaging techniques, including MRI, PET-CT and CT, as they are used in delineating primary tumor and staging involved regional nodes. 3) Identify reasons for local recurrence and recognize the imaging appearances of these recurrences. 4) Improve radiation therapy delivery through understanding the contouring recommendations for the gross tumor volume (GTV) and clinical target volumes (CTV) for anorectal tumors, both in the locally advanced and postoperative setting.

ABSTRACT

In this course cross sectional imaging will be used to contour normal pancreatico-biliary anatomy as well as tumors involving this anatomical region. Also patterns of spread of pathological lymph nodes will be shown, and corss sectional imaging will be used to contour the regional nodal lesions. Cases will be
presented and the participants will be stimulated to do the contouring themselves, and will have feed-back on their results

MSRO26

BOOST: CNS - Current Controversies in CNS Tumors: Case-Based Approach with Role of MR/PET Imaging (An Interactive Session)

Monday, Nov. 28 3:00PM - 4:15PM Room: S103CD

NR MR NM RO

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50

Participants

Andrew S. Chi, MD,PhD, New York, NY (*Presenter*) Nothing to Disclose
Daniel P. Cahill, Boston, MA (*Presenter*) Consulting, Merck & Co, Inc
Whitney B. Pope, MD, PhD, Los Angeles, CA (*Presenter*) Research Consultant, F. Hoffmann-La Roche Ltd; Research Consultant, Amgen Inc; Research Consultant, Tocagen Inc; ;
Christina I. Tsien, MD, Saint Louis, MO (*Presenter*) Speaker, Merck & Co, Inc

LEARNING OBJECTIVES

1) Identify areas of controversy in the management of CNS tumors. 2) Apply cranial MR/PET information to answer challenging clinical management questions.

ABSTRACT

SSE24

Radiation Oncology (Gastrointestinal)

Monday, Nov. 28 3:00PM - 4:00PM Room: S104A

GI RO OI

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

Participants
Tarita O. Thomas, MD, PhD, Chicago, IL (*Moderator*) Nothing to Disclose
Richard Tuli, MD, PhD, Los Angeles, CA (*Moderator*) Nothing to Disclose

Sub-Events

SSE24-01 Feasibility of Vascular Matching for Pancreatic Stereotactic Body Radiotherapy

Monday, Nov. 28 3:00PM - 3:10PM Room: S104A

Awards
Student Travel Stipend Award

Participants
Subha Perni, New York, NY (*Presenter*) Nothing to Disclose
Christine Chin, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Ping Yan, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Theodore Yanagihara, MD, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
David Horowitz, MD, New York, NY (*Abstract Co-Author*) Consultant, Champions Oncology

PURPOSE

Implanted fiducial markers (IFM) and biliary stents are established as targets for image-guidance during stereotactic body RT (SBRT) in treatment of pancreatic adenocarcinoma (PDAC). IFM are well tolerated, but may delay treatment. IFM/stent migration may also cause insufficient target coverage and normal tissue toxicity. This study evaluated vascular matching (VM), IFM and stent matching for image-guidance in delivery of SBRT for PDAC.

METHOD AND MATERIALS

Between April 2011- November 2015, 39 patients received SBRT for PDAC at our institution. Cone beam CT (CBCT) was performed for setup verification. 221 CBCT images were analyzed for setup shifts based on either IFM, stent or celiac and SMA vasculature contoured using Mosaiq, version 2.60 (IMPAC Medical Systems, Inc. Sunnyvale, CA). Kaplan-Meier calculations, analysis of variance, likelihood ratio, and Wilcoxon tests were used to evaluate local control and survival and compare groups.

RESULTS

15 patients were treated with IFM, 9 with stents, and 15 with VM. Waiting times from consult to treatment in the IFM, stent, and VM groups were 24 days (range 2-91 days), 14 days (range 9-56 days), and 19 days (range 5-39 days), respectively. The average magnitude for superior/inferior shifts was 0.45 ± 0.42 mm (IFM), 0.48 ± 0.46 mm (stent), and 0.37 ± 0.33 mm (VM) ($p = 0.24$), lateral shifts 0.42 ± 0.99 mm, 0.29 ± 0.35 mm, and 0.26 ± 0.22 ($p = 0.26$), and anterior/posterior shifts were 0.33 ± 0.40 mm, 0.34 ± 0.28 mm, and 0.37 ± 0.28 mm ($p = 0.70$). Vector magnitudes were 0.85 ± 1.04 mm, 0.74 ± 0.53 mm, and 0.67 ± 0.36 mm, respectively ($p = 0.24$). There were no complications from IFM or stent placement or significant differences in GI toxicities ($p = 0.25$), but there was one Grade 3 toxicity in the stent group. There were no significant differences in tumor resectability ($p = 0.70$), margin status ($p = 0.43$), local control ($p = 0.31$), or overall survival ($p = 0.88$).

CONCLUSION

There was no difference in positional shifts, toxicity, or outcomes for patients planned with implanted fiducial markers, stents, or vascular matching. VM may be preferable over more invasive methods of target localization.

CLINICAL RELEVANCE/APPLICATION

Vascular matching is a feasible, less invasive image-guidance technique that allows for reproducible and convenient SBRT delivery to PDAC and shorter treatment delays.

SSE24-02 Duodenum Planning Organ at Risk Volume: Estimation from Respiratory Phase Guided Radiotherapy Planning CT Scan

Monday, Nov. 28 3:10PM - 3:20PM Room: S104A

Participants
Trinanjan Basu, Gurgaon, India (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): In the era of stereotactic body radiotherapy (SBRT) radiation induced changes in duodenum (D) are a concern. The difficulties in delineation led to the publication of RTOG upper abdominal normal structure contouring guidelines. We have published contouring guidelines for D (Kataria T, Gupta D, Basu T et.al.Br J Radiol 2016; 89: 20150661). The current study assesses the impact of respiration (expiration, inspiration and free breathing) on D with quantification of planning organ at risk volume (PRV) from respiratory phase guided radiotherapy planning CT scan.(RPRTP).Materials/Methods: Ten cases of liver tumors (primary hepatocellular-eight(8) liver metastasis-two (2) were selected. RPRTP with 1 mm slice thickness were obtained in end expiration (E), end inspiration (I) and free breathing (FB) accounting for three image sets and imported in contouring workstation (Focal Sim) with E as primary. D as a whole structure and also different parts (1st –D1,2nd- D2,3rd and 4th together as D3) in E, I and FB phases of respiration were contoured creating twelve contour sets per patient. Motion variation for each structure was

calculated by the difference in all three (XYZ) co-ordinates. Mean variations in position of D, D1, D2 and D3 with respect to E, I and FB phases were noted. The difference between E/I, E/FB and I/FB for D, D1, D2 and D3 were analyzed. Final data had 36 sets of values for mean and standard deviation per patient.Results: Mean variations (cm) of D motion between E and I in XYZ co-ordinates were: 0.38(±0.53), 0.61(± 0.56), 0.53(± 0.72); between E and FB: 0.47(± 0.53), 0.49 (± 0.52), 0.49(± 0.74); between I and FB 0.35(± 0.49), 0.62(± 0.39), 0.61(± 0.81).The next step was the motion calculation for different parts of D in XYZ co-ordinates. For D1: between E and I 0.31(± 0.25), 0.65(± 0.71), 0.44(± 0.38), between E and FB: 0.31(± 0.17), 1.0(± 1.35), 0.66(± 0.84); between I and FB 0.22(± 0.15), 1.05(± 1.39), 0.66(± 0.88). For D2: between E and I; 1.18(± 1.26), 2.4(± 2.65), 0.55(± 0.76); between E and FB 1.01(± 1.07), 2.28(± 2.29), 0.45(± 0.6), between I and FB: 0.29(±0.22), 0.46(± 0.44), 0.18(± 0.16). Similarly for D3 between E and I; 0.77 (± 1.01), 1.5(± 2.13), 0.52(±0.65), between E and FB: 0.48(± 0.41), 1.48(±2.76), 0.2(± 0.16) and between I and FB: 0.9 (± 1.11), 2.4(±2.99), 0.62(± 0.83).Conclusion: D moves maximally in cranio-caudal (CC) direction and minimally in lateral direction in different phases of respiration. Relatively fixed D1 moves maximally in anterio-posterior (AP) direction (range: 0.1-2.3 cm), while mobile parts D2 and D3 in CC directions (range: 0.5-4 cm). We propose a PRV for duodenum 3mm radial and 5 mm CC with respiratory phase guidance to cover the range of motion. Differential margin for D1-D3 with validated delineation guideline should be evaluated in a larger cohort.

SSE24-03 Repeat Stereotactic Body Radiation Therapy for Liver Tumors

Monday, Nov. 28 3:20PM - 3:30PM Room: S104A

Awards
Student Travel Stipend Award

Participants
James O. Galle, MD, Indianapolis, IN (*Presenter*) Nothing to Disclose
David Long, MD, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose
Mark Tann, MD, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose
Susannah Ellsworth, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose
John A. Cox, MD, Carmel, IN (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Stereotactic body radiation therapy (SBRT) for liver tumors has high rates of local control (LC) and acceptable toxicity. Some patients develop recurrent hepatic disease and additional SBRT can be considered; however, outcomes after repeat SBRT are not well described.

METHOD AND MATERIALS

383 patients treated with liver SBRT at a single institution from 2006-2016 were reviewed; 16 patients underwent multiple SBRT courses. 7 patients were re-treated for hepatocellular carcinoma (HCC), 1 for cholangiocarcinoma, and 8 for metastases (LM). 2 patients with HCC were excluded; 1 for incomplete radiation plans and 1 who had routine liver transplant after 1 fraction of repeat SBRT without toxicity. 2 patients received a 3rd course of SBRT.

RESULTS

Median dose for patients with primary liver tumors (PLT) was 48 Gray (Gy) / 3 fractions for the 1st SBRT and 40 Gy / 5 fractions for 2nd SBRT, compared to 54 Gy / 3 fractions and 50 Gy / 5 fractions for LM for the 1st and 2nd SBRT, respectively. Median follow up was 18.2 months in living patients. Crude LC for the 1st and 2nd treatment was 78.6% and 85.7%, respectively. For the whole cohort, mean progression free survival (PFS) and overall survival (OS) from the 2nd SBRT were 11.9 and 28.1 months, respectively. PFS was significantly shorter in patients with LM compared to PLTs with median values of 4.3 vs 18.4 months, respectively (p=0.01), but there was no difference in OS between the two groups (median 20.7 vs. 26.6 months, p=0.18). Change in liver volume between the 1st and 2nd SBRT courses was predictive of PFS and OS (p=0.05 and p=0.02, respectively). Median OS in patients with liver volume loss between SBRT courses was 13.1 vs 42.5 months in patients without volume loss (p=0.01, HR 5.17 [0.83-32.37]). 2nd SBRT was well tolerated, but severe liver decompensation was seen in both patients receiving a 3rd SBRT course.

CONCLUSION

A 2nd course of liver SBRT is safe and associated with high LC; however, PFS differs between patients with PLT and LM. Patients with liver volume loss appear to have worse outcomes. Significant toxicity occurred in both patients undergoing a 3rd SBRT. Weaknesses of this study include its retrospective nature and low patient numbers.

CLINICAL RELEVANCE/APPLICATION

Although a 2nd course of liver SBRT appears safe, caution should be used when considering re-treating patients with liver volume loss; more than 2 SBRT courses were not well tolerated.

SSE24-04 The Dosimetric Impact of Inter-fractional Organ-at-Risk Movement during Liver Stereotactic Body Radiation Therapy

Monday, Nov. 28 3:30PM - 3:40PM Room: S104A

Participants
Ryan Schmid, BS, Milwaukee, WI (*Presenter*) Nothing to Disclose
An Tai, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose
Khalid Ramahi, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose
Taylor Giordano, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose
Slade Klawikowski, PhD, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose
X. A. Li, PhD, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose
Jared R. Robbins, MD, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The use of stereotactic body radiation therapy (SBRT) for treating liver malignancies is increasing. The impact of inter-fractional variation of organs-at-risk (OAR) during SBRT is not well studied. We examine the dose variations due to inter-fractional organ movement in patients treated with liver SBRT.

METHOD AND MATERIALS

Ten subjects treated with liver SBRT were analyzed. Most patients were treated with five fraction regiments with gated treatment delivery. Daily image-guidance with diagnostic quality CT-on-rails imaging was performed prior to each fraction. OARs were delineated on daily CTs including the liver, heart, right kidney, esophagus, stomach, duodenum and large bowel. Contouring and planning was performed using Monaco planning software (Stockholm, Sweden). Dose distribution on each daily CT was generated by templating the original plan to the daily CT using the daily shifts to replicate the daily treatment isocenter. Daily doses to all 7 OARs were recorded including the maximum dose to the 5cc, 3cc, 1cc, 0.3cc and 0.1cc and other clinically relevant metrics.

RESULTS

Although the doses to the OARs varied daily, only one organ in one patient on one day exceeded a clinically relevant threshold for a rate of error <1/300. For all OARs the dose to the liver was most consistent between fractions. For the liver dose parameters, the composite average percent change ranged from -5.92% to 1.2% with standard deviations of 0.11 to 0.74. Doses to the other OARs varied more between fractions depending on the proximity of the OAR to the target volume and organ motion. There were some large variations between the planned and delivered doses with up to two-fold differences for some OARs, but these did not exceed clinically meaningful levels.

CONCLUSION

With our current standard using CT-on-rails and respiratory gating, inter-fractional variations in liver doses were fairly consistent, while more variation was observed for other OARs. While inter-fractional variations of daily dose could be large, it was rarely clinically relevant. Dose accumulation measurement may help further evaluate the clinical significance of these changes, but currently no extra planning parameters seem necessary in most patients and scenarios.

CLINICAL RELEVANCE/APPLICATION

There can be significant inter-fractional variation in radiation doses to OARs during liver SBRT, but in this study the variation did not lead to clinically significant risks to patients.

SSE24-05 Quantitative Evaluation of Fat-to-Water Ratio (FWR) Change in the Liver using Three-Point Dixon Magnetic Resonance Imaging (MRI) after Stereotactic Body Radiation Therapy (SBRT) for Hepatocellular Carcinoma (HCC)

Monday, Nov. 28 3:40PM - 3:50PM Room: S104A

Participants
Faraz Amzajerdian, Charlottsville, VA (*Abstract Co-Author*) Nothing to Disclose
Yuenan Wang, Charlottesville, VA (*Presenter*) Nothing to Disclose

PURPOSE

To quantitatively and noninvasively evaluate fat-to-water ratio (FWR) in the liver using the three-point Dixon MRI method in order to compare the FWR variation after stereotactic body radiation therapy (SBRT) for patients with hepatocellular carcinoma (HCC).

METHOD AND MATERIALS

Five patients with hepatocellular carcinoma (HCC) treated with SBRT were retrospectively selected for this IRB-exempt quantitative MRI study. The patients underwent SBRT, also known as stereotactic ablative radiotherapy, with prescribed dose of 20-50 Gy in 3-5 fractions on TrueBeam or Trilogy linear accelerators (Varian Medical Systems). At least two weeks before and two weeks after SBRT, the T1 axial interleaved in-phase and out-of-phase MRI pulse sequence was acquired on 1.5 T Siemens MAGNETOM Avanto scanner within breathhold using the following parameters: resolution= 256x144, flip angle = 65 dgr, TR=206 ms, in/out of phase TE=2.45 / 3.03 ms. Using the three-point Dixon method, where the in-phase signal intensity SI_in = Water + Fat and the out of phase SI_out = Water - Fat, we obtained the fat-only image and water-only image to calculate pixel-by-pixel FWR in the pre-SBRT and post-SBRT liver using MATLAB (Fig 1). ROI of the liver was contoured and mean FWRs for the pre and post SBRT MRI were compared.

RESULTS

Among the five patients, all of them had decreased FWR in the liver after SBRT, which was -12%, -19%, -43%, -61% and -44%, respectively. Their average FWR values in the liver for the pre vs. post SBRT were 0.017 vs. 0.015, 0.021 vs. 0.017, 0.075 vs. 0.043, 0.038 vs. 0.015, and 0.026 vs. 0.014, respectively. Further study is needed to determine whether this decrease of FWR is due to patient weight loss or liver necrosis / fibrosis after SBRT. Also more patient data is needed for future investigate.

CONCLUSION

Monotonically decreased fat-to-water ratio (FWR) in five patients was observed after SBRT. More retrospective MRI data will be included for liver functional study in the future; with more detailed segmentation, we will evaluate FWR change for tumor and normal liver damage after SBRT. This method has clinical potential of quantitatively and noninvasively evaluating liver tissue change after radiation therapy.

CLINICAL RELEVANCE/APPLICATION

Using three-point Dixon MRI, fat-to-water ratio (FWR) has been observed decreased monotonically in five patients after stereotactic liver radiation therapy.

SSE24-06 Radiotherapy Technique Can Be Important on Survival in Patients with Gastric Cancer Treated with Postoperative ChemoRadiotherapy

Monday, Nov. 28 3:50PM - 4:00PM Room: S104A

Participants
Beyza Sirin Ozdemir, antalya, Turkey (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To investigate the clinical and pathological features and evaluate the survival rate of patients with gastric

carcinoma receiving postoperative chemoradiotherapy.Materials/Methods: Two hundred and four patients who have had postoperative chemoradiotherapy for the diagnosis of gastric cancer in our clinic between 1999 and 2014 have been evaluated retrospectively. Clinical prognostic factors affecting survival were studied.Results: One hundred and twenty nine (63%) of the patients were male, 75 (37%) were female and median age was 57 years (range 28-81). According to the stage distribution; 4 (%2) patients were on stage I, 61 (30%) patients were on stage II and 139 (68%) patients were on stage III. Applied surgery type: subtotal gastrectomy on 128 (62,7%) patients and total gastrectomy on 76 (37,3%) patients. Histopathologically, 73% of the patients were adenocarcinoma, 24% were signet-ring cell and 3% were other histopathological diagnosed. Tumor differentiation was evaluated in 197 patients and 11,2% of them were well-differentiated, 33% were moderately differentiated and 55,8% were poorly differentiated. Surgical margin status was positive or close in 33 (16,7%) out of 204 patients. Lymphatic dissection type was D1 on 159 (78%) patients, D2 on 28 (14%) patients; however, it was unknown in 17 (8%) patients. The median number of the dissected lymph node was 16 (range 0-90), which was 10 or less in 63 (31%) patients, more than 10 in 141 (69%) patients. 166 (81,4%) of the patients had lymph node metastasis. 92% of the patients received 5-fluorouracil (5-FU) -based chemotherapy during radiotherapy (RT). Doses of RT ranged from 40 to 54 Gy with a median dose of 46 Gy in 1.8-2 Gy fractions. RT technique was two-dimensional conventional on 98 (48%) patients and three-dimensional conformal RT on 106 (52%) patients. During chemoradiotherapy, it was monitored that 14,3% of the patients had hematologic, 5% of the patients had gastrointestinal grade 3 and more toxicity. The median follow-up was 29 months (range 3-147). The overall survival rates for 2, 5 and 10 years were 52%, 37% and 32% respectively. Stage, lymphatic dissection type (D1 or D2), presence of lymph node metastasis, dissected lymph node number (10 or less) and RT technique (two-dimensional conventional or three-dimensional conformal) have been found as significant prognostic factors in terms of overall survival. The 2, 5 and 10- year progression-free survival rates were 59%, 51% and 46%, respectively. Stage and presence of nodal metastasis are significant prognostic factors of progression-free survival. Conclusion: Postoperative chemoradiotherapy should be considered for all patients with high risk of recurrence after gastrectomy. Beside well-known prognostic factors such as stage, lymph node metastasis, lymphatic dissection type; RT technique was an important prognostic factor in our study. These results suggest that there is a long-term survival benefit for patients treated with three-dimensional conformal radiotherapy.

MSRO29

BOOST: Gastrointestinal-eContouring

Monday, Nov. 28 4:45PM - 6:00PM Room: S104B

GI RO

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50

Participants

Theodore S. Hong, MD, Boston, MA (*Presenter*) Nothing to Disclose

MSRO31

BOOST: Breast-Oncology Anatomy (An Interactive Session)

Tuesday, Nov. 29 8:30AM - 10:00AM Room: S103AB

BR RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Jean L. Wright, MD, New York, NY (*Presenter*) Nothing to Disclose
Susan C. Harvey, MD, Lutherville, MD, (sharvey7@jhmi.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand breast and regional lymph node anatomy. 2) Be familiar with how the basic anatomic structures appear on a variety of imaging modalities. 3) Be familiar with breast and regional lymph node contouring techniques used in radiation treatment planning for breast cancer. 4) Apply contouring knowledge to inform radiation treatment planning for breast cancer.

ABSTRACT

MSRO34

BOOST: Lung-Oncology Anatomy (An Interactive Session)

Tuesday, Nov. 29 8:30AM - 10:00AM Room: S103CD

CH RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Meng X. Welliver, MD, Columbus, OH, (meng.welliver@osumc.edu) (*Moderator*) Nothing to Disclose
Michelle S. Ginsberg, MD, New York, NY (*Presenter*) Nothing to Disclose
Gregory Videtic, MD, FRCPC, Cleveland, OH, (videtig@ccf.org) (*Presenter*) Nothing to Disclose
Feng-Ming Kong, MD, PhD, Augusta, IN (*Presenter*) Research Grant, Varian Medical Systems, Inc; Speaker, Varian Medical System, Inc; Travel support, Varian Medical System, Inc

LEARNING OBJECTIVES

1) Review the Radiologist's approach to thoracic anatomy that impacts treatment decision making in the treatment of lung cancer regarding tumors and proximity to great vessels/heart; involvement of airway/esophagus/chest wall; involvement of diaphragm/pericardium/phrenic nerve; involvement of vertebral column; and mediastinal and hilar nodes. 2) Understand the terminology used by Radiation Oncologists when defining targets for treatment and normal structures for avoidance including a) review the contouring of gross tumor volume (GTV), clinical target volume (CTV), and planning target volume (PTV) for stereotactic body radiotherapy for medically inoperable early stage non-small cell lung cancer; b) review the contouring of gross tumor volume (GTV), clinical target volume (CTV), and planning target volume (PTV) for conventional external beam radiotherapy for non-metastatic non-small cell lung cancer and small cell lung cancer. c)review the contouring of, and standardized definitions for, critical organs at risk (OARs) in the thorax: e.g. esophagus, brachial plexus, heart, airways, lungs, as they relate to definitive radiotherapy

ABSTRACT

Lung Cancer is a challenging disease to treat. It typically presents in advanced stage and even in the curative setting, the normal structures in the thorax make it challenging to treat with radiotherapy because of their inherent sensitivity. In this course, the Radiologist's perspective will inform a review the normal anatomy of the chest and how its structures relate to, and can predict, the acute and late manifestations of radiotherapy on these organs and tissues. Then, the parameters by which Radiation Oncologists design their treatment targets in order to maximize treatment of cancer and minimize injury to organs-st-risk will be reviewed.

RC320

Challenges in Hodgkin's Lymphoma Management Across the Age Spectrum

Tuesday, Nov. 29 8:30AM - 10:00AM Room: S102C

RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Stephanie A. Terezakis, MD, Baltimore, MD (*Moderator*) Nothing to Disclose
Satish P. Shanbhag, MBBS, MPH, Baltimore, MD (*Presenter*) Nothing to Disclose
Bradford Hoppe, MD, Jacksonville , FL (*Presenter*) Nothing to Disclose
Chelsea C. Pinnix, MD, PhD, Houston, TX (*Presenter*) Nothing to Disclose
Stacy L. Cooper, MD, Baltimore, MD, (scoope30@jhmi.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Compare pediatric and adult adaptive therapy trials in Hodgkin Lymphoma. 2) Examine the pattern of relapse amongst pediatric and adult patients with Hodgkin Lymphoma. 3) Critique radiation doses used in pediatric and adult patients with Hodgkin Lymphoma.

RC322

Imaging for Personalized Medicine: Thorax

Tuesday, Nov. 29 8:30AM - 10:00AM Room: S502AB

CH RO PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Martha M. Matuszak, PhD, Ann Arbor, MI (*Moderator*) Research Grant, Varian Medical Systems, Inc

Sub-Events

RC322A Managing Anatomical Change and Respiration during Radiotherapy

Participants
Geoffrey Hugo, PhD, Richmond, VA (*Presenter*) Research Grant, Koninklijke Philips NV; Research Grant, Varian Medical Systems, Inc

LEARNING OBJECTIVES

1) Understand how respiration impacts radiotherapy imaging and delivery and how to implement strategies to mitigate these issues. 2) Understand types and magnitude of geometric changes in thoracic anatomy during radiotherapy, and determine approaches to correct for discrepancies between the planned and delivered dose to the patient.

ABSTRACT

Radiotherapy is in widespread use for both early and advanced stage lung cancer, as a sole modality and also in combination with other modalities such as chemotherapy. Due to the potential for both acute and late toxicities in organs adjacent to treated regions, modern techniques seek to limit the extent of the high dose volume. The purpose of this session is to develop an understanding for how geometric and anatomic changes during radiotherapy can be managed. The focus will be on solutions readily available in the clinic today, particularly with respect to imaging modalities and planning solutions.

RC322B Functional Targeting and Adaptation

Participants
Martha M. Matuszak, PhD, Ann Arbor, MI (*Presenter*) Research Grant, Varian Medical Systems, Inc

LEARNING OBJECTIVES

1) Understand the opportunities for targeting and avoidance based on functional imaging in lung. 2) Discuss the technical details of functional targeting for tumor and functional avoidance in normal tissue for lung cancer in the pre-treatment and adaptive settings.

ABSTRACT

Radiation therapy continues to play an important role in the treatment of lung cancer although many opportunities remain to improve local control and survival as well as reduce toxicity, especially in advanced stage lung cancer. The use of functional imaging and biomarkers to predict tumor burden and response as well as measure and predict normal tissue toxicity has begun to increase in the community. This session aims to summarize the different modalities and types of information available to perform functional targeting or avoidance of tumor and normal tissue in lung cancer, including imaging (such as PET and SPECT) and other data (such as blood-based biomarkers). The session will also highlight the technical details associated with the use of functional data for treatment planning, treatment response, and adaptation.

MSRO32

BOOST: Breast-Science Session with Keynote

Tuesday, Nov. 29 10:30AM - 12:00PM Room: S103AB

BR RO OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants
Anna Shapiro, MD, Syracuse, NY (*Moderator*) Nothing to Disclose
Tracy M. Sherertz, MD, San Francisco, CA (*Moderator*) Nothing to Disclose

Sub-Events

MSRO32-01 Invited Speaker:

Tuesday, Nov. 29 10:30AM - 10:50AM Room: S103AB

Participants
L. Christine Fang, MD, Salt Lake City, UT (*Presenter*) Nothing to Disclose

MSRO32-03 An Abbreviated Interval Between Radiotherapy and Follow-up Mammography in Breast Conservation Surgery May Lead to Unnecessary Downstream Work-up

Tuesday, Nov. 29 10:50AM - 11:00AM Room: S103AB

Participants
Stephen Abel, BS, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Shaakir Hasan, MD, Pittsburgh, PA (*Presenter*) Nothing to Disclose
LaShondria Camp, MD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Meredith Witten, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Leslie Teng, DO, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Luis Aguilera, DO, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Frances Philp, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Thomas B. Julian, MD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Stephen M. Karlovits, MD, Allison Park, PA (*Abstract Co-Author*) Nothing to Disclose
Michael Cowher, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Surveillance mammography for breast conservation therapy (BCT) is frequently conducted within 6 months upon completion of adjuvant radiotherapy (XRT). We retrospectively analyzed the effect of post-XRT mammographic timing and radiation technique in relation to additional downstream workup for 569 BCT patients treated with adjuvant XRT following their initial surveillance mammogram (MMG).

METHOD AND MATERIALS

From January 2011 to December 2014, 1959 consecutive breast cancer patients were reviewed, 569 of whom had breast conservation surgery and adjuvant XRT with a follow-up MMG. Patients between the ages 31 and 91 (median 63) with stages 0(Tis) to IIIA of ductal, lobular, mixed, and metaplastic histologies were included. Patients were stratified by the time interval until their first post-XRT MMG, and by XRT technique – whole breast (472), accelerated partial breast (96), conventional fractionation (373), hypofractionation (94), surgical cavity boosts (407) or no boost (66). The primary endpoint was further imaging after the initial MMG. P values were generated from Chi square testing via MedCalc. IRB approval was received for this retrospective study.

RESULTS

Additional workup for those receiving a MMG within 3 months of completing XRT was 51% (73/143), compared to 40% (84/210) with MMG between 3 to 6 months, and 34.5% (75/217) with MMG after 6 months (P = 0.04). Two of ten biopsies were positive for recurrence among those with surveillance MMG within 6 months, compared to 1 of 2 patients with MMG after 6 months. Accelerated partial breast irradiation, hypofractionation, and surgical cavity boosts did not correlate with further downstream imaging.

CONCLUSION

BCT patients who underwent screening MMG prior to 6 months after completion of XRT were more likely to undergo downstream workup, including additional biopsies. Comparatively aggressive radiation techniques were not associated with the need for supplementary workup. Further study is needed to assess appropriate selection of high risk patients and possible negative implications of earlier post-radiotherapy screening MMG such as healthcare costs and quality of life.

CLINICAL RELEVANCE/APPLICATION

Premature surveillance mammography relative to adjuvant radiation in breast conservation therapy is common and likely results in excessive downstream workup, costs, and patient discomfort.

MSRO32-04 Analysis of Radiation Lung Fibrosis after Hypo-fractionated Breast Radiotherapy: 3 Dimensional Volume Measurement

Tuesday, Nov. 29 11:00AM - 11:10AM Room: S103AB

Participants

Jiho Nam, MD, Yangsan, Korea, Republic Of (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Hypo-fractionated breast radiotherapy is widely accepted as an alternative treatment option for early stage breast cancer. However, long term clinical outcome of late toxicity is relatively scarce compared to conventional radiotherapy regime. To evaluate whether hypo-fractionated breast radiotherapy can cause more late lung toxicity, instead of using subjective grading system, we have directly measured volume of fibrotic lung tissues in the region of tangential radiation fields.Materials/Methods: Fifty-three early stage breast cancer patients who were treated with hypo-fractionated radiotherapy and the same number of early stage breast cancer patients with conventional radiotherapy were retrospectively analyzed. All patients had multiple follow up chest CT images for more than three years. With deformable registration with radiation treatment planning data, lung fibrosis tissues within radiotherapy fields were segmented and 3 dimensional volumes of lung fibrosis were directly measured. Radiation therapy techniques and protocols were the exactly same, but only dose scheme was different.Results: The volume of lung fibrosis appeared to be slightly larger in the group of hypo-fractionated breast radiotherapy. Mean volume of lung fibrosis in patients with hypo-fractionated radiotherapy arm was 14.1 cc, and the volume in patients with conventional radiotherapy arm was 12.3 cc. We compared histogram of volume distribution of each patient group. Conventional radiotherapy group appeared to show slightly smaller volume of lung fibrosis compared to hypo-fractionated radiotherapy group, however, which was not statistically significant (pConclusion: Even though the lung fibrosis in this study was subclinical, hypofractionated radiotherapy may cause slightly more lung fibrosis, caution is needed when patient irradiation lung volume is significantly exceeded as usual.

MSRO32-05 The Impact of Pretreatment 18F-FDG (PET/CT) Maximum Standardized Uptake Value and Neutrophil/Lymphocyte Ratio (NLR) in Predicting Prognosis in Surgically Treated Oligometastatic Breast Cancer Patients

Tuesday, Nov. 29 11:10AM - 11:20AM Room: S103AB

Participants
Hala A. El-Lathy, MD, MSc, Dammam, Saudi Arabia (*Presenter*) Nothing to Disclose
Ahlam Dohal, Dammam, Saudi Arabia (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate baseline PET/CT SUVmax value and Neutrophil/lymphocyte ratio (NLR), as prognostic indicators of progression free survival (PFS) and overall survival (OS) in surgically treated oligmetastatic breast cancer (OMBC) patients.

METHOD AND MATERIALS

The pretreatment 18FDG-PET-CT SUVmax and NLR in surgically treated OMBC patients were compared with clinicopathological parameters. The prognostic value of pretreatment SUVmax and NLR for PFS and OS were assessed using Log rank and Cox regression.

RESULTS

Overall, 87 OMBC were included, mastectomy and axillary clearance was performed in 72 patients (83%) who responded to preoperative systemic. The receiver operator curve (ROC) demonstrated that SUVmax of 4.4 and 6.5 to be the cut off value for predicting PFS in patients with oligometastasis to bones and visceral organs respectively. Additionally, baseline NLR cut off value of 2.7 predicted PFS in all studied patients. In surgically treated 46 OMBC patients (64%) to bones SUVmax of >4.4 had a significantly shorter OS [Hazard ratio (HR 2.9)] <4.4 (P<0.01), whereas patients with SUVmax of ≤4.4 had significantly longer PFS compared with those with SUVmax >4.4 (P=0.02). Similarly, 26 OMBC patients (36%) to visceral organs with SUVmax ≤6.5 had significant improvement in OS compared to those with SUVmax >6.5 (HR 2.3)]. Moreover, patients with NLR ≥2.7 showed significantly lower PFS (HR, 2., P<0.001) and overall survival rate (HR,1.9, P=0.02) than patients with NLR<2.7. Cox regression multivariate for OS revealed that higher baseline SUV max and NLR along with visceral metastasis were independently correlated with poor prognosis, with HR 3.04, 8.83 and 9.21 respectively

CONCLUSION

The pretreatment PET-CT SUVmax and NLR showed a significant association with different clinicopathological prognostic factors in OMBC patients. Additionally, the may be considered as potential independent prognostic indicators of clinical outcomes in surgically treated OMBC patients.

CLINICAL RELEVANCE/APPLICATION

FDG PET CT APPLICATION IN BREAST CANCER

MSRO32-06 Multi-Images Guided Study of Gross Tumor Volume for the Breast Cancer Patients Treated by External-Beam Partial Breast Irradiation after Breast-Conserving Surgery

Tuesday, Nov. 29 11:20AM - 11:30AM Room: S103AB

Participants
Aiping Zhang, Jinan, China (*Presenter*) Nothing to Disclose
Jianbin Li, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Wei Wang, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Yongsheng Wang, Jinan, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of the study was to compare preoperative MRI, postoperative pathology, excised specimen size, and tumor bed delineation as methods for determining the gross tumor volume (GTV) for radiotherapy after breast-conserving surgery (BCS).

METHOD AND MATERIALS

Fifty patients with breast cancer who underwent preoperative MRI and radiotherapy after BCS were enrolled. The GTVs determined by MRI, pathology, and the excised specimen were defined as GTVMRI, GTVPAT, and GTVES, respectively. GTVMRI+1 was defined

as a 1.0-cm margin around the GTVMRI. The radiation oncologist delineated GTV of the tumor bed (GTVTB) using planning computed tomography according to surgical clips placed in the lumpectomy cavity. Potential factors such as the interval from surgery to radiotherapy, number of clips, locations of primary tumors that may affect the coincidence degree between GTVES and GTVTB were analyzed.

RESULTS

The median GTVMRI, GTVMRI+1, GTVPAT, GTVES, and GTVTB were 0.97 cm3 (range, 0.01–6.88), 12.58 cm3 (range, 3.90–34.13), 0.97 cm3 (range, 0.01–6.36), 15.46 cm3 (range, 1.15–70.69), and 19.24 cm3 (range, 4.72–54.33), respectively. There were no significant differences between GTVMRI and GTVPAT, GTVMRI+1 and GTVES, GTVES and GTVTB ($p = 0.188$, 0.070, 0.264, respectively). Neither GTVES nor GTVTB correlated with GTVMRI ($p = 0.071$, 0.378, respectively). Furthermore, neither GTVES nor GTVTB correlated with GTVMRI+1 ($p = 0.068$, 0.375, respectively). And the factors we analyzed had no impact on the coincidence degree between GTVES and GTVTB ($p > 0.05$).

CONCLUSION

Although preoperative MRI was available for every BCS patient, neither the volume of tumor bed nor the volume of excised specimen correlated significantly with the volume of tumor defined by the preoperative MRI if the boundary of the resected tumor was not pre-or intraoperatively marked by image guidance. When ≥5 surgical clips were used to demarcate the LC during BCS, the volume of tumor bed was consistent with the volume of excised specimen. Therefore, a reasonably resected boundary of lumpectomy is a reliable indicator of the volume of tumor bed. These data suggest that surgeons should strictly refer to preoperative images when performing surgical resections.

CLINICAL RELEVANCE/APPLICATION

Our data demonstrates that GTVES, GTVPAT, and GTVTB do not correlate with the GTV in preoperative MRI scans, suggesting that surgeons and radiation oncologists do not utilize these images routinely.

MSRO32-07 Evaluating Candidacy for Endocrine Therapy, Accelerated Partial Breast Irradiation, and Hypofractionated Radiation Therapy following Breast Conserving Surgery: A Surveillance Epidemiology and End Results (SEER) Analysis

Tuesday, Nov. 29 11:30AM - 11:40AM Room: S103AB

Participants
Bindu Manyam, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Standard breast conserving therapy consists of lumpectomy followed by whole breast irradiation. Alternative strategies in appropriately selected patients (pts) include endocrine therapy (ET) alone, accelerated partial breast irradiation (ABPI), and hypofractionated radiation therapy (HFRT), which can limit treatment duration, and potentially reduce morbidity and cost. However, limited data are available on the percentage of pts eligible for these alternative treatments; therefore, a Surveillance Epidemiology and End Results (SEER) analysis was performed to assess candidacy for these alternative options in women with early stage breast cancer according to current consensus guidelines and trial eligibility criteria. Materials/Methods: Women treated for breast cancer between the years of 2010-2012 were identified in the SEER database. Pts with metastatic disease, T3/T4 disease, and node positive disease were excluded. Pts were defined as eligible for ET alone according to the CALGB 9343 inclusion criteria (Age =70 years; T1; Estrogen receptor positive [ER+]) and PRIME II inclusion criteria (Age =65 years; T1/T2; ER+ and/or Progesterone receptor positive [PR+]). Pts were defined as eligible for HFRT according to ASTRO consensus guidelines (Age =50 years; T1/T2). Pts eligible for APBI were evaluated based on ASTRO consensus guidelines (Age =60 years; T1; ER+), American Brachytherapy Society (ABS) and the GEC-ESTRO consensus guidelines (Age =50 years; T1/T2), and the GEC-ESTRO APBI trial criteria (Age =40 years; Tis-T2). Additional pathologic features, dosimetric data, and chemotherapy receipt were not available.Results: 110,858 women with early stage breast cancer who met aforementioned inclusion criteria were identified. Of these pts, 23,286 (21.0 %) were eligible for ET alone according to CALGB 9343 criteria and 43,278 (39.0%) according to PRIME II criteria. Based on ASTRO consensus guidelines, there were 91,492 (82.5%) pts eligible for HFRT. There were 44,528 (40.2%) pts who were eligible for APBI according to ASTRO consensus guidelines, 88,945 (80.2%) pts eligible according to ABS consensus guidelines, and 88,945 (80.2%) pts eligible according to the GEC-ESTRO consensus guidelines. There were 107,235 (96.7%) pts who were eligible for APBI according to the GEC-ESTRO APBI trial criteria. Conclusion: This SEER analysis demonstrates there is a substantial proportion of women with early stage breast cancer who may be eligible for ET alone, HFRT, and/or APBI following breast conserving surgery according to consensus guidelines and prospective trial criteria. Moving forward, with incorporation of additional pathologic, dosimetric, and chemotherapy data, quality assurance pathways may use such data to help ensure pts are receiving appropriate risk stratified treatment recommendations.

MSRO32-08 Left Whole Breast Radiotherapy In the Prone versus Supine Free Breathing and Deep-Inspiration Breath Hold (DIBH) Positioning: Optimizing Heart and Lung Sparing

Tuesday, Nov. 29 11:40AM - 11:50AM Room: S103AB

Participants
Ashley Sekhon, MD, Columbus, OH (*Presenter*)

ABSTRACT

Purpose/Objective(s): The Early Breast Cancer Trialists Collaborative Group identified cardiac mortality and secondary lung malignancy as the predominant long-term risks associated with modern breast cancer radiotherapy, particularly in smokers. As such, treatment techniques that provide optimal sparing of both the heart and lungs have become increasingly important in this population. One recent investigation, the UK HeartSpare Study (Stage IB), has found preference for supine positioning with DIBH for cardiac sparing. We performed a retrospective dosimetric analysis to assess the degree of cardiopulmonary avoidance achieved when each method is applied. Materials/Methods: Women diagnosed with early-stage invasive carcinoma or DCIS of the left breast who received radiation to the breast only using either supine positioning with FB or DIBH technique, or prone positioning were studied. The last consecutive 20 left-sided supine cases, 10 FB and 10 with DIBH, and the last consecutive 20 left-sided prone cases treated prior to August 2015 were studied. The following cardiac constraints were used for treatment planning in all cases: mean heart dose Results: Prescribed whole breast doses ranged from 42.56-50 Gy; 75% of patients received a lumpectomy cavity boost of 10-14 Gy. There was no statistically significant difference in mean heart and LAD doses (Gy) between the prone (1.1;

5.5), FB (1.4; 12.0), and DIBH (1.2; 7.6) groups, respectively. There was also no statistically significant difference in the lung parameters between the FB and DIBH groups. However, both mean lung dose (Gy) and V(20) (%) were significantly lower in patients treated in the prone (0.4; 0.2) versus supine FB (2.6; 4) and DIBH (3.7; 5.1) positions. Six of the 20 prone patients, 5/10 DIBH, and 2/10 FB patients were chronic smokers. Mean BMI and breast PTV volumes were similar amongst all 3 groups. Conclusion: Equivalent cardiac sparing can be achieved with left whole breast radiotherapy in either the prone or supine position with DIBH or FB, with mean heart doses less than 2 Gy. However lung dose is significantly lower in the prone position, suggesting that this treatment method may be most advantageous for chronic smokers.

MSRO32-09 Evaluation of Distant Brain Failure Among Patients Undergoing Sterotactic Radiosurgery (SRS) for Breast Brain Metastases

Tuesday, Nov. 29 11:50AM - 12:00PM Room: S103AB

Participants
Rahim F. Ismail, Orlando, FL (*Presenter*) Nothing to Disclose
Andrew Keller, Kissimmee, FL (*Abstract Co-Author*) Nothing to Disclose
Gurjaspreet K. Bhattal, BS, Orlando, FL (*Abstract Co-Author*) Nothing to Disclose
Shilpa Kailas, Orlando, FL (*Abstract Co-Author*) Nothing to Disclose
Talayesa Buntinx-Krieg, BA, Orlando, FL (*Abstract Co-Author*) Nothing to Disclose
Tiffanie Do, BS, Orlando, FL (*Abstract Co-Author*) Nothing to Disclose
Jacqueline Babb, Coconut creek, FL (*Abstract Co-Author*) Nothing to Disclose
Joshua Dajac, Jacksonville, FL (*Abstract Co-Author*) Nothing to Disclose
Esther Kim, BA, Orlando, FL (*Abstract Co-Author*) Nothing to Disclose
Zoran Pavlovic, BA, Orlando, FL (*Abstract Co-Author*) Nothing to Disclose
Aryan Sarparast, BSC, Windermere, FL (*Abstract Co-Author*) Nothing to Disclose
Naren R. Ramakrishna, MD, PhD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Stereotactic Radiosurgery (SRS) has largely supplanted WBRT in the management of patients with limited brain metastatic disease. The omission of WBRT results in an increase in distant brain failure, however the parameters which modify distant brain failure are poorly understood. We set out to determine the amount of time before an initial distant failure (Distant Brain Metastasis Free Survival or DBMFS), the distant brain failure rate (Distant Brain Failure Rate or DBFR) and the overall distant brain failure at the last follow up (Overall Distant Brain Failure or ODBF). We assessed the impact of age, gender, number of initial mets, initial volume, KPS, ECD status, WBRT before, WBRT after, WBRT both, markers/histological subtype, on distant brain failure.

METHOD AND MATERIALS

Our IRB approved study was based on a patient population of 47 breast cancer patients treated with SRS between November 2008 and January 2014 at the UF Health Cancer Center, Orlando.

RESULTS

Mean survival time overall was 51.089 months (SD +11.709) and median survival time was 19.400 months (SD +12.037) Impact of various parameters on are as follows:KPS Score ≥ 70: ODBF (p=.014)ECD: DBMFS (Log rank p=.026) and ODBF (p=.008)WBRT Before: DBFR (p=.008)PR status: ODBF (p=.034)

CONCLUSION

In our analysis, having had WBRT before SRS was found to have a significant impact on distant brain failure rate. Additionally, ECD was found to have a significant impact on distant brain failure survival. Lastly, the parameters which had a significant impact on overall distant brain failure in our analysis were KPS score, ECD status and PR status. Other factors than those stated above did not have an impact on distant brain failure rate, mean distant brain failure or overall distant brain failure. Further evaluation is warranted on this issue. Additionally, study of a larger population would allow analysis of more parameters such as the impact of ductal vs lobular or WBRT treatment combined with SRS.

CLINICAL RELEVANCE/APPLICATION

Various clinical, procedural and histological indicators exist that may predict a patient’s response to SRS treatment.

MSRO35

BOOST: Lung-Science Session with Keynote

Tuesday, Nov. 29 10:30AM - 12:00PM Room: S103CD

CH RO OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
John C. Grecula, MD, Columbus, OH (*Moderator*) Research Grant, Teva Pharmaceutical Industries Ltd Research Grant, Soligenix, Inc
Matthew M. Harkenrider, MD, Maywood, IL (*Moderator*) Nothing to Disclose

Sub-Events

MSRO35-01 Invited Speaker:

Tuesday, Nov. 29 10:30AM - 10:50AM Room: S103CD

Participants
Meng X. Welliver, MD, Columbus, OH (*Presenter*) Nothing to Disclose

MSRO35-03 Predictors for Radiation Pneumonitis During Radiotherapy for NSCLC

Tuesday, Nov. 29 10:50AM - 11:00AM Room: S103CD

Participants
Zhibin Huang, DPhil, Greenville, NC (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Radiation pneumonitis (RP) is a dose-limiting toxicity for patients undergoing chemoradiotherapy for non-small cell lung cancer (NSCLC). The occurrence of RP is associated with the irradiated volume of the total lungs receiving a certain dose. The purpose of this study is to investigate whether some parameters from the dose-volume histogram would add predictive power in foreseeing RP.Materials/Methods: 113 patients undergoing radiation therapy were included for this study. The gross tumor volume was delineated using CT grayscale or PET/CT images. Dose-volume histograms (DVH) were analyzed and the relative volumes of total lungs receiving dose = 5 Gy (V5) and = 20 Gy (V20), were evaluated and correlated with RP. The presence of RP was noted during regular follow up and recorded. ROC analysis was performed using SPSS. If both parameters (V5 and V20) were correlated RP, the synergistic effect between V5 and V20 was analyzed. Results: V5, V20, and mean lung dose (MLD) were all correlated to the development of RP. The mean lung dose was 18 Gy, and the mean of V5 and V20 was 59% and 27%, respectively. V5 and V20 had the strongest correlation (p = 0.037 and 0.028). ROC analysis showed that the area under curve (AUC) was 0.632 for V5 and 0.639 for V20, respectively. When both parameters were combined, a new term (V5*V20) showed that the predictive power was improved with AUC=0.643 and p=0.024, suggesting a synergistic effect between these two parameters. Conclusion: Studies have shown that the DVH parameters V20 and V30 were significantly correlated with RP, and recent studies also showed the correlation between V5 and RP. Our finding of a synergistic effect between V5 and V20 adds a significant predictor for RP, although the synergistic effect needs to be confirmed on a larger number of patients.

MSRO35-04 Dynamic Contrast-Enhanced Perfusion MRI vs Dynamic Contrast-Enhanced Area-Detector CT vs FDG-PET/CT: Capability for Therapeutic Outcome Prediction in NSCLC Patients with Chemoradiotherapy

Tuesday, Nov. 29 11:00AM - 11:10AM Room: S103CD

Participants
Yoshiharu Ohno, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Bayer AG; Research Grant, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd; Research Grant, Fuji Pharma Co, Ltd; Research Grant, FUJIFILM RI Pharma Co, Ltd; Research Grant, Guerbet SA;
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Noriyuki Negi, RT, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Yuichiro Somiya, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
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Kazuro Sugimura, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, Eisai Co, Ltd Research Grant, DAIICHI SANKYO Group

PURPOSE

To directly compare the capability for therapeutic outcome prediction between dynamic first-pass CE-perfusion area-detector CT (ADCT) and MRI assessed by same mathematical method and FDG-PET/CT in non-small cell lung cancer (NSCLC) patients treated with chemoradiotherapy.

METHOD AND MATERIALS

43 consecutive Stage IIIB NSCLC patients (25 male, 18 female; mean age 67 year old) underwent PET/CT, dynamic CE-perfusion ADCT and MRI, chemoradiotherapy, and follow-up examination. In each patient, therapeutic outcomes were assessed as

therapeutic effect based on RECIST guideline, disease free interval and overall survival. Then, all patients were divided into two groups as follows: 1) CR+PR (n=23) and 2) SD+PD (n=20) groups. In each patient, total tumor perfusion (TP) and tumor perfusions from pulmonary (TPP) and systemic (TPS) circulations calculated by dual-input maximum slope method from dynamic ADCT and MRI data and SUVmax on PET/CT were assessed at each targeted lesion, and averaged to determine final values. To compare the capability for distinguishing two groups, ROC analyses were performed. Then, disease free and overall survivals between responders and non-responders assessed by each index were compared by Kaplan-Meier method followed by log-rank test.

RESULTS

Area under the curves (Azs) of TP (MRI: Az=0.90, ADCT: Az=0.87) and TPS (MRI: Az=0.84, ADCT: Az=0.84) were significantly larger than that of TPP (MRI: Az=0.72, p<0.05; ADCT: Az=0.72, p<0.05). Disease free survivals of responder were significantly longer than that of non-responder by TP (MRI: p=0.01, ADCT: p=0.03) and TPS (MRI: p=0.01, ADCT: p=0.001). Overall survivals of responder were also significantly longer than that of non-responder by TP (MRI: p=0.007, ADCT: p=0.004), TPS (MRI: p=0.001; ADCT: p=0.0001) and SUVmax (p=0.04).

CONCLUSION

Dynamic first-pass CE-perfusion ADCT and MRI has equal to or better potential to predict therapeutic outcome than PET/CT in NSCLC patients treated with chemoradiotherapy. Perfusion parameters from dynamic first-pass CE-perfusion ADCT and MRI may be applicable as new biomarkers in this setting.

CLINICAL RELEVANCE/APPLICATION

Dynamic first-pass CE-perfusion ADCT and MRI has equal to or better potential to predict therapeutic outcome than PET/CT in NSCLC patients treated with chemoradiotherapy. Perfusion parameters may be applicable as new biomarkers in this setting.

MSRO35-05 99mTc-MAA SPECT/CT Guided Volumetric Modulated Arc Therapy (VMAT) for Thoracic Tumors to Reduce Radiation Dose to Functioning Lung

Tuesday, Nov. 29 11:10AM - 11:20AM Room: S103CD

Participants
Michael W. Schmuecking, MD, Hamburg, Germany (*Presenter*) Nothing to Disclose
Natalie D. Klass, MD, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Walter Gross-Fengels, MD, PhD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Roland Bigler, MS, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose
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Isabel Lauer, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Antje Scheffler, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Thomas Krause, MD, PhD, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Arne Blechschmidt, MS, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Fabian Fehlauer, MD,PhD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Bernd Klaeser, MD, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Dose volume histogram (DVH) based dosimetric parameters of the lung such as mean lung dose (MLD), V20 and V30 are usually used to estimate the risk of radiation treatment associated symptoms. However, these metrics are imperfect predictors, primarily because they assume homogenous function throughout the lung which is not seen in patients with chronic bronchitis and emphysema. Hence, detailed information about the distribution of lung function may be especially important for these patients presenting lung tumors. This study aims to use the local perfusion of the lungs to minimize the dose to the well perfused areas in the radiation treatment planning procedure.

METHOD AND MATERIALS

So far, in 49 patients the SPECT/CT was acquired in radiation treatment position after injection of 185 MBq of 99mTc-MAA. Segmentation of the whole lung was done in order to create avoidance structures for the planning procedure: Area with > 85% of maximum lung perfusion (structure with the highest level of avoidance), > 75%, > 15-75% and 0-15% (structure without avoidance). VMAT radiation treatment plans with and without incorporation of these avoidance structures were calculated and differences in MLD, V5, V10, V20 and V30 evaluated.

RESULTS

In 11/49 (22%) patients the SPECT/CT shows (unexpected) perfusion deficits in areas being inconspicuous in CT, in 2% detection of an unknown pulmonary embolism. In 18/49 (37%) significant reductions of dose to the well perfused areas: MLD: up to -16%. V30: up to -9%, V20: up to -12%, V10: up to -8%, V5: up to -5%. In contrast, in these patients the MLD increased up to 14% in the less perfused areas. Information of regional lung perfusion did not change VMAT plans significantly in 31/49 (63%) patients. Target volume coverage and normal tissue dose constraints for the organs at risk (OAR) were not affected in all patients.

CONCLUSION

SPECT-guided VMAT shows potential for reducing the dose delivered to highly functional lung regions. These promising results must be further confirmed in a prospective study which should include SPECT/CT lung perfusion scans after radiation treatment to assess radiation treatment induced changes in perfusion during follow-up.

CLINICAL RELEVANCE/APPLICATION

A dose reduction to functioning lung by 99mTc-MAA SPECT/CT guided VMAT for thoracic tumors may reduce the incidence of high-grade pneumonitis and improve patient quality of life after radiotherapy.

MSRO35-07 Biological Effective Dose (BED) Influence on Clinical Outcomes of Stage I Non-Small Cell Lung Cancer (NSCLC) Treated with Fiducial-based Robotic Stereotactic Body Radiation Therapy (SBRT) with Respiratory Motion Tracking

Tuesday, Nov. 29 11:30AM - 11:40AM Room: S103CD

Awards
Student Travel Stipend Award

Participants
Jonathan W. Lischalk, MD, Washington, DC (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): SBRT for early stage NSCLC is an established treatment option for medically inoperable patients. Previous research has supported a biological effective dose (BED) threshold to achieve superior control rates. Fiducial-based robotic SBRT allows for intrafractional respiratory motion management, which avoids the requirement to create an internal target volume (ITV). We report the long-term outcomes of patients treated using this novel unique technique, in particular whether this respiratory motion management strategy is also subject to a reported BED threshold. Materials/Methods: In this single institutional retrospective series we reviewed clinical outcomes of stage I inoperable NSCLC. Inclusion criteria was as follows: (1) AJCC 7thedition stage I tumors, (2) pathologic confirmation of malignancy, (3) pre-treatment PET/CT for mediastinal staging, and (4) medical inoperability determined by multidisciplinary evaluation. All patients were treated using a robotic fiducial-based SBRT system with respiratory motion tracking in 3 or 5 fraction of 10 to 20 Gy to a minimum BED of 100 Gy using a NSCLC tumor a/ß of 10. Locoregional failure was defined as recurrence within the locally treated field, involved lobe, or ispilateral nodal region (N1-2). Local control, locoregional control, and overall survival were calculated using the Kaplan-Meier method and comparisons between BED above and below 105 Gy were calculated using the generalized Wilcoxon test.Results: Sixty-one patients with a median age of 75 years were included. The majority of patients determined to be surgically inoperable due to pulmonary dysfunction. The majority of patients (75%) were diagnosed with AJCC prognostic stage IA NSCLC. Patients were treated using robotic SBRT to a median total dose of 50 Gy with a median BED of 112.5 Gy (range, 100 to 180 Gy). Thirty-one patients were treated with a BED greater than 105 Gy and the remaining 30 with a BED below 105 Gy. Five year local control, locoregional control, and overall survival for those patients treated above and below a BED of 105 Gy were 90.5% vs. 82.6% (p = 0.26), 78.6% vs. 64.8% (p = 0.03), and 38.7% vs. 42.9% (p = 0.97). Conclusion: Statistically significant improvements in locoregional control were observed in patients treated with a BED greater than 105 Gy, although this did not translate into an improvement in overall survival. Treatment of stage I NSCLC with fiducial-based robotic SBRT using advanced respiratory motion management does not preclude the necessity of delivering an adequate BED to the tumor target.

MSRO35-08 Effect of Tumor Contouring on the Prediction Performance of Using Radiomic Approach to Predict Gene Mutational Status in Non-Small Lung Cancer Patients With Gefitinib Treatment

Tuesday, Nov. 29 11:40AM - 11:50AM Room: S103CD

Participants
Lin Lu, New York, NY (*Abstract Co-Author*) Nothing to Disclose
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Yajun Li, fort lee, NJ (*Abstract Co-Author*) Nothing to Disclose
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Binsheng Zhao, DSc, New York, NY (*Presenter*) License agreement, Varian Medical Systems, Inc; License agreement, Keosys SAS ; License agreement, Hinacom Software and Technology, Ltd; License agreement, ImBio, LLC ; Research funded, ImBio, LLC; License agreement, AG Mednet, Inc
Lawrence H. Schwartz, MD, New York, NY (*Abstract Co-Author*) Committee member, Celgene Corporation Committee member, Novartis AG Committee member, ICON plc Committee member, BioClinica, Inc

PURPOSE

Radiomic delta-features describe the change of tumor imaging phenotype between baseline and follow-up scan images. Prior to computation of radiomic delta-features, tumor regions-of-interest (ROI) on baseline and follow-up images need to be delineated by radiologist. This study was to explore the effect of different tumor ROIs drawn by different radiologists on the performance of using radiomic delta-features to predict the epidermal growth factor receptor (EGFR) gene mutational status in non–small cell lung cancers (NSCLC) patient with gefitinib treatment.

METHOD AND MATERIALS

This was a retrospective analysis on a clinical trial data of 46 early stage NSCLC patients with a total of 46 tumors (one tumor per patient) whose EGFR mutation status were known (EGFR+:EGFR-=20:26). All of the patients had non-contrast enhanced, 1.25mm and lung reconstruction images at both CT scan time points. Three radiologists, with reading experiences of 23, 15 and 8 years respectively, used an identical in-house algorithm to independently delineate baseline and three-week follow-up tumor ROIs, upon which 89 radiomic features to describe the change of tumor size, intensity histogram, shape, edge and texture were extracted. Delta-features were the differences between baseline and follow-up features. The area
under the curve (AUC) of the receiver operator characteristic (ROC) was calculated to assess the power of radiomic delta-features on predicting the EGFR mutational status of patients.

RESULTS

Tumor ROIs delineated by different radiologists resulted in different performance on the prediction of the EGFR mutational status. The highest AUCs (number of significant features: AUC >0.8) of the three radiologists' were 0.91 (3), 0.85 (5), and 0.79 (0), respectively. A same feature can have different prediction power if calculated from different tumor ROIs. For example, the AUCs of feature Run_PLU (Run-Length Primitive Length Uniformity) were 0.88, 0.75 and 0.73 for three different ROIs.

CONCLUSION

Radiomic delta-features are able to be used as potential imaging biomarkers to predict the gene mutational status of patient. However, tumor delineation induced differences in predicting EGFR mutations warrants further investigation.

CLINICAL RELEVANCE/APPLICATION

With the rapid growth of the field of radiogenomics, our findings are valuable because they increase awareness of variations in the performance of predicting EGFR mutations using radiomic features.

MSRO35-09 Multiparametric Imaging of the Tumor Response in Non-small Cell Lung Cancer to Stereotactic

Ablative Radiation Therapy

Tuesday, Nov. 29 11:50AM - 12:00PM Room: S103CD

Participants
Dae-Myoung Yang, MSc, London, ON (*Presenter*) Nothing to Disclose
David Palma, MD, FRCPC, London, ON (*Abstract Co-Author*) Nothing to Disclose
Ting-Yim Lee, MSc, PhD, London, ON (*Abstract Co-Author*) License agreement, General Electric Company

PURPOSE

To determine whether metabolism as measured with dynamic fluorine-18 fluorodeoxyglucose (FDG) positron emission tomography (PET) and perfusion as measured with dynamic contrast-material enhanced (DCE) computed tomography (CT) scanning can help predicting and assessing the integration and true pathological rate of stereotactic ablative radiation therapy (SABR) in non-small cell lung cancer (NSCLC).

METHOD AND MATERIALS

After Research Ethics Board approval was obtained, 13 patients who have histologically confirmed early stage T1 or T2a NSCLC that has a tumour diameter ≤ 5 cm and no nodal metastases (T1T2N0) underwent dynamic FDG-PET and DCE-CT pre- and post-SABR since September 2014. The post scans were acquired 8 weeks after SABR. Dynamic FDG-PET measures maximum standardized uptake values (SUVmax) in the tumour. DCE-CT imaging allows quantitative mapping of blood flow (BF) and blood volume (BV) in the tumours. Since free-breathing was allowed during DCE-CT scanning, breathing motion was minimized by non-rigid image registration before the BF and BV functional maps were generated. Lobectomy surgery was performed 10 weeks after SABR, to allow sufficient time for reactive response to SABR to subside.

RESULTS

Analysis of dynamic FDG-PET and DCE-CT scans of the first 10 patients showed difference from pre- to post-SABR. Following SABR, there were a reduction in BF (41.3%, P = 0.001), BV (27.8%, P = 0.062) and SUVmax (46.0%, P = 0.005). The included 3D scatter plot shows the distinct characteristic response of NSCLC to SABR.

CONCLUSION

Dynamic FDG-PET and DCE-CT can assess and measure the response of NSCLC to SABR. In future analysis, sensitivity and specificity of this imaging technique and quantitative measurements of glucose kinetics can be calculated.

CLINICAL RELEVANCE/APPLICATION

Novel combination of neoadjuvant SABR plus surgery is being evaluated as a cure for T1T2N0 NSCLC. Dynamic FDG-PET and DCE-CT are a useful adjunct to standard follow-up in assessing true response rate.

SSG15

Radiation Oncology (Genitourinary)

Tuesday, Nov. 29 10:30AM - 12:00PM Room: S104A

GU RO OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants
Martin Colman, MD, Houston, TX (*Moderator*) Nothing to Disclose
Abhishek A. Solanki, MD, Maywood, IL (*Moderator*) Nothing to Disclose

Sub-Events

SSG15-01 Margin-Positive (M+) Radical Prostatectomy (RP): Differential Risk of PSA Relapse by Extent of Margin Involvement

Tuesday, Nov. 29 10:30AM - 10:40AM Room: S104A

Participants
James K. Russo II, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Michael Laszewski, MD, Bismarck, ND (*Abstract Co-Author*) Nothing to Disclose
Mark Rodacker, MD, Grand Forks, ND (*Abstract Co-Author*) Nothing to Disclose
Sarah Mott, MS, Iowa City, IA (*Abstract Co-Author*) Nothing to Disclose
John M. Watkins, MD, Bismarck, ND (*Presenter*) Nothing to Disclose

PURPOSE

M+ is an established risk factor for PSA failure following RP; however, often this is identified in the context of other high-risk feature(s). The objective of the current study was to expand upon our previous single-institution findings in the multi-institutional setting, with longer follow-up, in order to optimally delineate the margin extent (ME) for stratification by Gleason score (GS).

METHOD AND MATERIALS

Retrospective analysis of patient- and tumor-specific factor association with PSA relapse-free survival (bRFS). Eligible patients underwent RP at the study institutions for biopsy-proven prostate adenocarcinoma, without adjuvant radiotherapy (RT) or hormone therapy (HT). Patients with evidence of metastatic disease or PSA >30 at diagnosis, or pathologic involvement of seminal vesicles or lymph nodes at RP were excluded. RP specimen slides were reviewed by pathology, and M+ details (foci, ME) were recorded.

RESULTS

Between 2002 and 2010, 644 patients underwent RP at the study institutions, of whom 429 were eligible for the present analysis. The median age at diagnosis was 61 years (range 43-76), and pre-RP PSA was 5.6 (0.9-26). Of 154 patients with confirmed M+, 146 had slides available for review. At a median follow-up of 80 months (range 16-155), 100 patients had experienced PSA relapse at a median of 22 months post-RP (1-124), of whom 64 had involved surgical margins. On multivariate analysis, pre-RP PSA, pathologic GS, and margin status were significantly associated with bRFS. Subset evaluation by GS and ME identified a group at lower risk of failure: GS

CONCLUSION

Within the present study, GS/=7 with any extent M+ have poor early bRFS.

CLINICAL RELEVANCE/APPLICATION

Reporting of ME in RP pathology reports should be considered, as this may influence consideration of adjuvant therapy versus surveillance.

SSG15-02 Stereotactic Body Radiotherapy (SBRT) for Primary Renal Cell Carcinoma (RCC): Intrafraction Target Movement and Patient Outcomes

Tuesday, Nov. 29 10:40AM - 10:50AM Room: S104A

Participants
Orit Kaidar-Person, MD, Chapel Hill, NC (*Presenter*) Nothing to Disclose
Alex Price, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Eric C. Schreiber, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Timothy M. Zagar, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Ronald Chen, MD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Renal cell carcinoma (RCC) is traditionally considered to be radioresistant. The current standard treatment for clinically localized disease is partial or radical nephrectomy; in patients unfit for surgery, cryotherapy or HIFU are recommended. Little has been published on the use of SBRT for primary RCC. Materials/Methods: This is an IRB-approved retrospective study. All patients were treated using a robotic-arm stereotactic system with fiducial tracking; target motion during treatment was extracted from motion models from actual treatment sessions. Patient records were reviewed for toxicity and cancer control outcomes.Results: Between the years 2010 and 2016, 6 patients who were non-surgical candidates were treated with SBRT for primary RCC with curative intent; all were treated to 39 Gy in 3 fractions given daily. Median age was 68.5 years (range: 61-77). All patients had two kidneys, with one kidney involved with primary localized RCC with a mean size of 5 cm (range: 4.2-6.5) and a mean PTV 124 cc (range: 72-210). Mean intrafraction tumor motion available for 4 patients was: superior/inferior 4.2 mm, left/right

5.7 mm, anterior/posterior 3.0 mm.Median follow-up was 23 months (range 14-49). All patients were followed with imaging every 6 months after treatment. Acute toxicity (Conclusion: SBRT to 39 Gy in 3 fractions is well-tolerated and provided durable local control in patients with primary RCC who were not surgical candidates. Initial imaging after treatment can show slight tumor enlargement. Tumor motion is an important technical issue for this treatment.

SSG15-03 Intraprostatic Polymer Based Fiducial Marker (FM) Placement allows for Accurate Co-registration of mpMRI and Planning CT Images

Tuesday, Nov. 29 10:50AM - 11:00AM Room: S104A

Participants
Neilayan Sen, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Dian Wang, MD, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
James C. Chu, PhD, Chicago, IL (*Abstract Co-Author*) Research Grant, Varian Medical Systems, Inc
Julius Turian, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Multiparametric magnetic resonance imaging (mpMRI) allows for reliable detection of adverse pathologic features (ie. high-grade tumor, extracapsular extension, and seminal vesicle involvement) which are indications for dose-escalated radiotherapy (RT). Accurate co-registration of the mpMRI and planning CT images using FMs is essential to enhance tumor target delineation and to deliver focal high-dose RT to intraprostatic lesions defined by mpMRI while sparing normal adjacent structures. However, it is unknown whether intraprostatic polymer based FMs may affect radiologic interpretation of the mpMRI. Additionally, it is unknown whether FMs can be reliably utilized for co-registration of the MRI with the planning CT images. To answer these questions, we have examined a cohort of patients with mpMRI and planning CT performed after FM placement. Materials/Methods: This analysis was limited to patients with histologically proven prostate cancer. All eligible patients had three polymer-based FMs (1 mm diameter and 3 mm in length, PolyMarkTM Fiducial Markers, CIVCO Medical Solutions, Coralville IA), implanted into the prostate using transrectal ultrasound guidance (one FM placed to apex, one into base and a third one into contralateral lobe). Patients subsequently underwent mpMRI within 12-40 days (median 19) and CT simulation.Results: 18 patients met inclusion criteria. 8 had palpable disease by digital rectal examination (range T2a – T3a). Median PSA was 11.5 (range 5-144). Median Gleason sum was 8 (range 7-10), median % core involvement was 59 (range 8-100%), and 11 patients were high risk by NCCN criteria. 11 patients had at least one lesion identified on mpMRI (range 1-4) with median PI-RADS 4 (range 1-5). Of the patients with mpMRI positive lesions, 4 had pre-fiducial mpMRI available for comparison. According to expert radiology review, none of these patients had evidence of new lesions after FM placement. FM were clearly identified in both mpMRI and planning CT, allowing for accurate co-registration. Conclusion: It is feasible to accurately co-register mpMRI and CT planning images using polymer based FMs implanted into the prostate. Furthermore, the placement of three intraprostatic FMs has not generated any false positives or otherwise altered mpMRI interpretation.

SSG15-04 Preliminary Evaluation of Seed Migration in Coated vs Non-coated Seeds for LDR Prostate Brachytherapy using the Mick Applicator Implant Technique

Tuesday, Nov. 29 11:00AM - 11:10AM Room: S104A

Participants
Bryan J. Traughber, MD, Cleveland Heights, OH (*Presenter*) Spouse, Employee, Koninklijke Philips NV
Tarun K. Podder, Greenville, NC (*Abstract Co-Author*) Nothing to Disclose
Yan Xing, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Valdir Colussi, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Elisha Fredman, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Lee E. Ponsky, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Rodney J. Ellis, MD, Pepper Pike, OH (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Low dose rate (LDR) brachytherapy is a highly effective modality for the treatment of prostate cancer. However, incorrect placement of seeds can lead to suboptimal outcomes and treatment related sequelae such as urethral and rectal toxicities. Even secondary lung cancers due to seed migration have been reported in the literature. The purpose of this study is to evaluate the incidence of seed migration and resultant dosimetric impact using coated vs. uncoated seeds with a Mick applicator implant technique.

METHOD AND MATERIALS

Twenty patients with prostate cancer treated at a high-volume single institution status post LDR brachytherapy were retrospectively analyzed and compared for seed slippage when using coated vs. uncoated seeds with a Mick applicator implant technique. All patients were planned with pre-treatment multi-parametric MRI and evaluated with intraoperative ultrasound, real-time intraoperative dosimetry, and a Day 0 CT-based dosimetric analysis. All dosimetric calculations were based on TG-43 formulation. The incidence of seed slippage was compared between patients treated with coated vs. uncoated seeds.

RESULTS

Eight patients were treated with coated seeds and twelve patients with uncoated seeds, representing 699 and 1099 total seeds placed respectively. The total migration rate was 3.2% vs. 10.2% for coated vs. uncoated seeds. Intra-prostatic migration was 1.2% for coated seeds, and 5.1% for uncoated seeds. Importantly, the seed non-visualization rate from intraoperative monitoring with ultrasound and Day 0 CT was 2.0% and 5.1% respectively, likely representing extra-prostatic seed migration. Dosimetric consequences were also evaluated but data not shown due to space limitations.

CONCLUSION

The use of coated seeds with a Mick applicator implant technique reduces seed migration by nearly ⅔ rds, including extra-prostatic slippage not identified on real-time intraoperative ultrasound or post-implant CT. Further sector based analyses including regional dosimetric impact relative to gross disease identified on multi-parametric MRI and adjacent organs-at-risk are warranted.

CLINICAL RELEVANCE/APPLICATION

Prostate seed migration following LDR brachytherapy can compromise local tumor control in addition to unintended consequences

such as extra-prostatic seed migration to the lungs and abdomen-pelvis.

SSG15-05 Prostate Stereotactic Body Radiotherapy using a Standard Linear Accelerator: Acute Toxicity and Biochemical Outcomes

Tuesday, Nov. 29 11:10AM - 11:20AM Room: S104A

Participants
Agustina Mendez, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Biological dose escalation through stereotactic body radiotherapy (SBRT) holds promise of improved patient convenience, system capacity and tumor control with decreased cost and side effects. The objectives are to report the toxicities and biochemical outcomes.Materials/Methods: A total of 60 patients were low risk localized prostate cáncer received SBRT 35 Gy in 5 fractions, once weekly on standard linear accelerators. Patients have been treated with IMRT and IGRT techniques of Kv daily. Radiation Therapy Oncology Group acute morbidity scores were used to assess acute toxicities, and International Prostate Symptom Score 6 (I-PSS 6). Biochemical control (BC) was defined by the Phoenix definition.Results: As of February 2014, 60 patients have completed treatment with a median follow-up of 13 months (range 2–24 months). Median age was 70 years and median PSA was 5.9 ng/ml. The following toxicities were observed: acute grade 3: 0% gastrointestinal (GI), 0% genitourinary (GU); grade 2: 6% GI, 0% GU; grade 1: 25% GI, 80% GU; grade 0: 69% GI, 20% GU. The BC was 98,33%Conclusion: This novel technique employing standard linear accelerators to deliver an extreme hypofractionated schedule of radiotherapy is feasible, well tolerated and shows excellent biochemical control.

SSG15-06 Salvage Radiation Therapy after Radical Prostatectomy: Contribution of a Dose Escalation to Macroscopic Local Relapses

Tuesday, Nov. 29 11:20AM - 11:30AM Room: S104A

Participants
Imad Eddine Selmaji, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Salvage radiation therapy (RT) after radical prostatectomy for prostate cancer using 66 Gy is a standard treatment but may not be sufficient to treat a macroscopic disease. The presence of a visible lesion on MRI could justify a focal dose escalation. This study evaluates the tolerance and efficacy of a new technique of irradiation, including a focal boost to the nodule.Materials/Methods: Between 2011 and 2015, 14 patients, with a biochemical failure (PSA > 0.2ng/mL) and a macroscopic relapse visible on MRI, underwent targeted MRI-guided biopsies for histological confirmation. Three gold markers were implanted into the prostatic bed near the relapse for a more accurate CT/MRI fusion and dose delivery. A dose of 60 Gy was administered to the prostatic bed using IMRT and daily set-up on pelvic bone structures (kV/kV repositioning). An additional dose escalation up to 72Gy was delivered to the macroscopic nodule based on the nodule set-up using the 3 gold markers. Acute and late genitourinary (GU) and gastrointestinal (GI) toxicities were evaluated using CTCAE v4. PSA level and toxicities were assessed at 1 month and then every 6 months for 3 years.Results: The mean follow-up was 26.2 months (range, 18 – 36). The mean PSA value at the time of biochemical relapse was 0.84 ng/mL (range, 0.3 – 1.65). This mean value decreased at 0.18 ng/mL and 0.06 ng/mL after 6 and 12 months of follow-up. The local control rate was 100% and the biochemical control rate was 85.7% at the time of follow-up. Two patients (14.3%) had a biochemical failure at 12 and 24 months after this salvage RT (one bone metastasis and one lymph node recurrence). One patient presented with grade 2 urinary toxicity during the prostatic bed irradiation which lowered to grade 1 when the dose was focalized to the nodule. No acute or late grade = 2 toxicities were seen thereafter. All late GI and GU toxicities were grade 1. Conclusion: A dose escalation to the macroscopic nodule visible on MRI is feasible using an IMRT-IGRT approach with gold makers. This technique allows a perfect initial local control with a good tolerance.

SSG15-07 Systematic Review and Meta-analysis of 68Ga-Prostate Specific Membrane Antigen (PSMA)-PET/CT for Restaging of Patients with Biochemical Recurrence of Prostate Cancer

Tuesday, Nov. 29 11:30AM - 11:40AM Room: S104A

Participants
Finn E. von Eyben, MD,PhD, Odense, Denmark (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): It is known that subgroups of patients with biochemical recurrence of prostate cancer treated with conventional salvage radiotherapy (SRT) for the prostate bed have a high risk of a second biochemical recurrence. We aimed to evaluate whether the prostate specific membrane antigen (PSMA) PET/CT might be relevant for restaging. Materials/Methods: We search in Pubmed until February 2016 for articles that reported restaging with radiolabeled PSMA PET/CT. We undertook a meta-analysis. Results: 4 studies with 660 patients had a median of the mean/median PSA levels at restaging of 2.2 ng/mL (range 0.2 - 161 ng/mL). The studies gave the PSMA tracer with a median radiation activity of 168 MBq (range 155 – 300 MBq) and used an uptake time of 45 -60 minutes. 535 patients (81%) had a positive site detected with PSMA PET/CT. Of patients with positive sites, 29% had a site in the prostate bed, 38% had a site in regional lymph nodes, 32% had sites in distant organs, and 1% had more than 1 sites of recurrence. In one study, patients with PSA of 0.2 - 0.5 ng/mL had a detection rate about 50%. Nearly half the patients who underwent restaging with PSMA PET/CT had a change of the planned treatment. Conclusion: PSMA PET/CT may be relevant for restaging of patients with biochemical recurrence and high risk even with PSA levels of 0.2 - 0.5 ng/mL. Patients with biochemical recurrence who have metastatic sites at restaging with PET/CT may be candidates for targeted treatment guided by the findings.

SSG15-08 Comparison of Intraoperative MRI/US Fusion in Relation to Standard CT/US Based Planning for LDR Prostate Brachytherapy

Tuesday, Nov. 29 11:40AM - 11:50AM Room: S104A

Awards
Student Travel Stipend Award

Participants
Stephen Abel, BS, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Paul Renz, DO, Pittsburgh, PA (*Presenter*) Nothing to Disclose
Mark G. Trombetta, MD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Olivier Gayou, PhD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Jie Tang, MSc, Steubenville, OH (*Abstract Co-Author*) Nothing to Disclose
E. Day Werts, PhD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Intraoperative planning with transrectal ultrasound (US) is used for accurate seed placement and optimal dosimetry in prostate brachytherapy. However, prostate MRI has shown superiority in delineation of prostate anatomy. Accordingly, MRI/US fusion may be useful for accurate intraoperative planning. We analyzed planning with MRI/US fusion to compare differences in dosimetry to that derived from postoperative CT.

METHOD AND MATERIALS

Twenty patients underwent preoperative prostate MRI which was fused intraoperatively with US during prostate brachytherapy using a MiM Symphony treatment planning system (MiM Software; Cleveland, Ohio, USA). Following implantation, dose comparisons were made between data derived from MRI/US and that from post-operative CT scans. Plan parameters analyzed included the D90 (dose to 90% of the prostate), rectal D30, and the rectal V30 (volume of the rectum receiving 30 percent of dose), and the prostate V100.

RESULTS

The median number of seeds implanted per patient was 76 with mean activity of 0.381mCi per seed. The MRI measured prostate volume was on average 4.47cc smaller than the CT measured prostate volume. In 9 patients, the apex of the prostate was better identified under MRI and an average of 4 fewer seeds were required to be placed in the apex/urinary sphincter region. Both MRI and US individually showed reduced intraoperative prostate D90 in comparison to postoperative CT-based prostate D90 with a larger mean difference for MRI in comparison with US (9.71 vs. 4.31Gy, p=0.007). This was also true for the prostate V100 (5.18 vs. 2.73cc, p=0.009). Post-operative CT underestimated rectal D30 and V30 in comparison to both MRI and US with MRI showing a larger mean difference than US for D30 (40.64 vs. 35.92Gy, p=0.04) and V30 (50.20 vs. 44.38cc, p=0.009).

CONCLUSION

The MRI/US fusion demonstrated lower prostate volume compared with standard CT/US based planning likely due to the better resolution of the prostate apex. Furthermore, rectal dose was underestimated with CT vs. MRI based planning. Additional study is required to assess long term clinical implications of disease control and effects on the rectum and urinary sphincter.

CLINICAL RELEVANCE/APPLICATION

MRI/US intraoperative fusion may improve prostate dosimetry and sparing of the rectum, potentially impacting disease control and late toxicity.

SSG15-09 Impact Factors on Acute Hematologic Toxicity in Prostate Cancer Patients Treated with Radiation Therapy

Tuesday, Nov. 29 11:50AM - 12:00PM Room: S104A

Participants
Xiaoying Li, Beijing, China (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To determine factors predictive for hematologic toxicity (HT) in patients with prostate cancer treated with radiotherapy.Materials/Methods: The medical records of 47 men receiving radiation therapy for prostate cancer were reviewed. Hematologic toxicity was defined by use of Common Terminology Criteria for Adverse Events(version 4.0). Pelvic bone marrow (PBM) was contoured for each patient and divided into three subsites: lumbosacral spine(LSS), ilium(IBM), and lower pelvis(LP). The volume of each region receiving 5,10,15,20,25, 30,35 and >40 Gy (V10, V15, V20, V25,V30, V35and V40, respectively) was calculated. Endpoints included any grade hematologic event (HE), Logistic regression was used to test associations between HT and dosimetric/clinical parameters.Results: 24 (51.1%)patients experienced leukopenia, 20(42.6%) were Grade I,4 (8.5%)were Grade II. Pelvic radiation was associated with an increased worse leukopenia. No association was found with age, ADT therapy, radiation dose and other clinical factors. Multivariate logistic regression analysis shows PBM V5(OR, 1.046;95% CI, 1.006–1.088; p =0.024),IBM V10(OR, 1.032; 95% CI, 1.006–1.059; p =0.023)ALS V25(OR, 6.967; 95% CI, 1.336–36.338; p =0.015)was associated with an increased worse leukopenia. ROC curve shows,LS V25 is the best predictor of leukopenia(AUC 0.718 p=0.01),Patients with LS V25>71.38%,leukopenia significantly increased(65.7% Vs 8.3%,P=0.001).21 patients experienced(44.7%)anemia during treatment. Univariate analysis shows age(P=0.03) and ADT therapy (P=0.021) was associated with incidence of anemia, Multivariate logistic regression analysis shows ADT therapy is the only factor associated with anemia(OR, 6.967; 95% CI, 1.336–36.338; p =0.021).ADT therapy increases by a factor (odds ratio) of 6.967. No association was found with ADT time, bone radiation dose and other clinical factors.No patient experienced thrombocytopenia.Conclusion: Leukopenia and anemia are the most common hematologic toxicity (HT) events happened during radiation therapy of prostate cancer patients. Pelvic radition was associated with an increased worse leukopeni, LS V25 is the best predictor of leukopenia. When Patients' LS V25 is greater than 71.38%,leukopenia significantly increased.ADT therapy is the only factor associated with anemia during radiation therapy.
Area under the ROC curvevariables areaStd.error asymptotic sig asymptotic 95% confidence interval lower boundupper boundLS250.718 0.076 0.01 0.569 0.868IBM100.674 0.08 0.041 0.517 0.831PBM50.665 0.08 0.053 0.508 0.821

ROS-TUA

Radiation Oncology Tuesday Poster Discussions

Tuesday, Nov. 29 12:15PM - 12:45PM Room: RO Community, Learning Center

RO

AMA PRA Category 1 Credit ™: .50

Participants
L. Christine Fang, MD, Salt Lake City, UT (*Moderator*) Nothing to Disclose

Sub-Events

RO222-SD-TUA1 Clinicopathologic Characteristics and Prognosis Analysis in the Elderly Patients with Primary Esophageal Small Cell Carcinoma in Limited Stage

Station #1

Participants
Jun Wang, MD, Shijiazhuang, China (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To retrospectively analyze the clinicopathologic characteristics and prognostic factors in the elderly patients with primary esophageal small cell carcinoma (PESC) in limited stageMaterials/Methods: A total of 34 elderly patients with esophageal small cell carcinomas in limited stage were enrolled into the study. Of them, 19 cases received no treatment after operation, and 15 cases received postoperative adjuvant therapy (9 patients received postoperative chemotherapy, 6 cases received postoperative chemoradiotherapy). The clinicopathologic characteristics and lymph node metastasis were observed, Kaplan-Meier method was applied to calculate the survival rate, local control rate and distant metastasis. The influencing factors for lymph node metastasis and survival were analyzed using the COX regression modelResults: Lymph node metastasis was occurred in 17 cases, lymph node metastasis rate was 50.0%. A total of 41 out of 314 lymph nodes had metastasis, and lymph node metastasis ratio was 13.1%. For upper thoracic esophageal small cell carcinomas, lymph node metastasis ratio were 28.6%,0,0 and 0 in the superior mediastinum, middle mediastinum, inferior mediastinum and abdominal cavity, respectively. For middle thoracic esophageal small cell carcinomas, lymph node metastasis ratios were 16.7%, 10.9%, 9.4%, and 16.4% respectively. For lower thoracic esophageal small cell carcinomas, lymph node metastasis ratio were 0, 0, 17.4% and 24.1%. The lymph node metastasis ratio in T3-4 stage patients was significantly higher than that of T1-2 stage (20.6% vs 4.5%,P=0.005). Lymph node metastasis ratio in tumor =5cm group patients was significantly higher than that of P=0.018). The 1-, 3- , 5-year overall survival (OS) rates in no treatment after operation group were 42.1%, 15.8%, 5.3% respectively; for postoperative adjuvant therapy patients, the 1-, 3-, 5-year OS rates were 93.3%, 46.7%, 31.1% respectively (P=0.043); The 1-, 3- and 5-year distant metastasis rates who received no treatment after operation were much higher than that of postoperative adjuvant therapy group (54.3%, 71.4% and 85.7% vs 13.3%, 30.0% and 30.0%, respectively,P=0.010). Multivariate analysis showed that postoperative chemotherapy was the independent factor for survival in elderly patients with limited stage of primary esophageal small cell carcinomas (P=0.017). Conclusion: The metastases of lymph nodes and regional distributions of small cell carcinoma of esophagus are similar to squamous cell carcinoma of esophagus, but distant metastasis is much higher. Postoperative chemotherapy or radiochemotherapy could prolong the survival rate in old patients with small cell carcinoma of the esophagus. As a result, systemic chemotherapy still remains the cornerstone of treatment for elderly patients with esophageal small cell carcinoma in good status after the surgery.

RO223-SD-TUA2 Intensity Modulated Proton Therapy for Retreatment of Colorectal and Anal Cancer

Station #2

Participants
Uma Goyal, MD, Tucson, AZ (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Intensity Modulated Proton Therapy (IMPT) has potential advantages in sparing previously irradiated normal tissue. This retrospective review represents the first known clinical experience using IMPT for colorectal and anal cancer retreatment.Materials/Methods: Five previously irradiated recurrent colorectal or anal cancer patients underwent IMPT. CT- and MRI-based simulation and treatment planning were done. Patients were setup supine with a rectal balloon to displace normal rectal tissue. Daily setup was accomplished with orthogonal kV x-rays. Treatment included 3750-7860cGy daily fractions to the clinical target volume. Previously irradiated normal structures were contoured, and dose constraints and beam selection were made for maximum treatment plan robustness. Treatment was delivered with single enface or two oblique beams using pencil beam scanning (images below). Clinical outcomes during and after treatment were abstracted from the EMR.Results: Four patients were treated definitively and 1 patient palliatively. Maximum and mean doses were: rectum 6378cGy/6120cGy, femoral heads 2921cGy/29.4cGy, bladder 7921cGy/1877cGy and bowel 4550cGy/418cGy. One patient had a complete response, 2 patients had stable rectal pain, 1 patient had improved rectal bleeding, and no other acute toxicities were noted. Mean follow-up is 6.2 months, and all patients are alive with no local failures.Conclusion: IMPT is technically feasible and potentially an effective approach for colorectal and anal cancer retreatment with no more than grade 2 pain. More patients and further follow-up will be needed to refine this technique and for assessment of late toxicities and local control.

RO226-SD-TUA5 A Pilot Study of a Novel Radiation Therapy Support Garment for Patients Undergoing Radiation following Lumpectomy for Breast Cancer

Station #5

Participants
Alfred Tinger, MD, Yonkers, NY (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): It is well established that women with large breast size undergoing lumpectomy and radiation therapy (RT)

are at increased risk for side effects due to the larger field size required. Pulmonary, cardiac and hepatic effects from RT can be reduced by limiting radiation exposure to these tissues. Short term morbidities caused by skin folds can lead to interruptions of the RT course, possibly compromising local outcomes. The purpose of this IRB-approved pilot study is to assess whether a novel garment ("Bra") for support of the breast during RT will reduce the exposure of non-target tissues, reduce RT side effects and improve quality of life (QOL). We report on the technical details of the Bra and preliminary results of the first 6 patients enrolled.Materials/Methods: The patented Bra was developed and is manufactured by a U.S.-based company. Materials neither absorb radiation nor are they altered by it. It has adjustments in the shoulder, rear and lateral regions. Irritability, sensitivity, cytotoxicity tests, and Radiologic Test Reports have been completed and FDA 510K Clearance has been received.All patients in the study had a self-reported bra size of 36B or larger and were provided the Bra at no charge. All underwent lumpectomy for DCIS or invasive breast cancer and were scheduled for postoperative RT. Treatment plans were devised with and without the Bra and the various parameters were compared using paired t-tests. Physician and patient assessments of comfort, tolerance, QOL, and toxicity were performed throughout the treatment course and at first follow-up.Results: Patients received a mean RT dose of 48.0 Gy (range 45-50.4 Gy). The Bra was well tolerated by all 6 patients, and there were no garment-related adverse events. Based on dosimetric comparisons, the Bra reduced the global maximum field dose by a mean of 122.3 cGy, the global maximum breast dose by 45.7 cGy, and other parameters in a similar fashion (Table), although none of the comparisons reached statistical significance likely due to the small number of patients. Table Comparison of Dosimetric Parameters With vs Without the Bra Without BraWith Bra% Change Global maximum field (cGy)5874.985752.68-2.08 Global maximum breast (cGY)5743.675698.00-.80 V110%18.6310.30-44.77 Lung V5%22.4019.77-11.74 Lung V10%16.6714.64-12.18 Lung V20%13.0711.32-13.39 Heart V5%5.675.00-11.77 Heart V10%4.003.33-16.75 Heart V20%3.132.58-17.57 Lung mean dose (cGy)709.83631.67-11.01 Heart mean dose (cGy)233.67202.83-13.20 Liver mean dose (cGy)251.30240.67-4.23 Conclusion: The Bra resulted in a decrease in RT dose to non-target organs in this pilot study and was well-tolerated by the patients. With more patients and follow up, we will additionally be able to assess morbidity, QOL and cosmesis.

RO227-SD-TUA6 Comparison of Two Immobilization Systems for Prostate Radiotherapy-A Single Institutional Review

Station #6

Participants
Hassan Beydoun, Detroit, MI (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Definitive external beam radiotherapy (EBRT) is a mainstay in the treatment of localized prostate cancer. Reproducible patient immobilization is critical to the accurative delivery of EBRT, both to minimize set-up variability to avoid under-dosage of clinical target volume (CTV) and avoid over-dosage of organs at risk (OARs). We retrospectively compare two immobilization systems used at our institution.Materials/Methods: Patients with cT1-cT3 prostate adenocarcinoma were reviewed in this study. All patients had an intact prostate and were treated definitively with EBRT. Patients at site A were immobilized with a cradle; while patients at site B were immobilized with knee-and-foot lock (Civco Medical Solutions). All patients had daily cone beam computed tomography (CBCT). Measurements were made on 86 patients from site A, 41 patients from site B. Measurements were recorded as shifts in the anterior-posterior (AP), cranial-caudal (CC), and medial-lateral (ML) dimensions. Total vector error defined as TVE = (X2 + Y2 + Z2)1/2was calculated for each site.Results: An average of 42 measurements (range 24 - 46) was obtained on each of the 127 patients. At site A, the mean shifts were 5.13mm, 5.60mm, and 5.03mm in the ML, CC, and AP dimensions respectively. At site B, the mean shifts were 5.30mm, 6.70mm, and 5.25mm in the ML, CC, and AP dimensions respectively. The differences in the CC dimension are statistically significant (pConclusion: The cradle immobilization system was more reproducible than the knee-and-foot lock system, particularly in the CC dimension.

Lunch and Learn: Supported by Bayer (Invite only)

Tuesday, Nov. 29 12:30PM - 1:30PM Room: S403A

Participants

PROGRAM INFORMATION

This session will focus on best practices of managing both radiation and contrast dose.
This course does not offer CME credit.

ROS-TUB

Radiation Oncology Tuesday Poster Discussions

Tuesday, Nov. 29 12:45PM - 1:15PM Room: RO Community, Learning Center

RO

AMA PRA Category 1 Credit ™: .50

Participants
L. Christine Fang, MD, Salt Lake City, UT (*Moderator*) Nothing to Disclose

Sub-Events

RO228-SD-TUB1 External Beam Radiation Therapy in Combination with 131Cs Brachytherapy for the Management of Intermediate to High-Risk Prostate Cancer

Station #1

Participants
Chirag Modi, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To report our outcomes for patients with intermediate to high-risk prostate cancer treated with 131Cs brachytherapy in combination with external beam radiation therapy.Materials/Methods: We identified 57 consecutive patients with prostate cancer who were treated with combination 131Cs brachytherapy in combination with external beam radiation therapy between 2006-2015. Disease and patient characteristics, treatment information, and clinical outcomes were tabulated for each patient. The Phoenix definition (absolute nadir plus 2 ng/ml) was used to define biochemical freedom from disease (BFD). Results: Of the 57 patients included in this study, 37 had intermediate risk and 18 had high risk disease. 21 patients received brachytherapy before EBRT and 36 patients received brachytherapy after EBRT. 28 patients received androgen deprivation therapy. The external beam dose was 45 Gy to the pelvis and the brachytherapy dose was aimed to deliver 75-85 Gy prostatic dose using 1.6 -1.8 U per seed activity Cs131 seeds. Median follow up for all patients was 4.19 years. 3 and 4 year actuarial BFD were 97.3% and 81%, respectively, for patients with intermediate-risk disease and 94.4% and 72.2%, respectively, for patients with high-risk disease. 92.2% of patients had PSA Conclusion: Patients treated with 131Cs brachytherapy in combination with external beam radiation therapy have shown promising results and further follow-up will be evaluated.

RO229-SD-TUB2 Outcomes Following Proton Therapy for the Treatment of High-risk Prostate Cancer: Efficacy and Toxicity Results from a Prospective Single Institution Cohort

Station #2

Participants
Seungtaek Choi, MD, Houston, TX (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Proton therapy is currently used for the treatment of prostate cancer but reports of outcomes for various risk groups have been limited. We aim to report the outcomes of high-risk prostate cancer patients treated with definitive proton therapy at a single institution.Materials/Methods: This prospective single center cohort aimed at evaluating the acute and late normal tissue sequelae in adult patients treated with proton therapy for various tumor sites. For the purpose of this analysis, only patients with high-risk prostate cancer were considered. High risk was defined according to NCCN guidelines: stage =T3a, Gleason score =8, or prostate specific antigen (PSA) =20 ng/ml. All patients had a negative metastatic work-up. Follow-up was scheduled every 6-12 months for up to 5 years. Biochemical relapse was defined as PSA above nadir + 2 ng/mL. Overall survival (OS), biochemical progression free survival (bPFS), and distant metastasis free survival (DMFS) were analyzed for this cohort. Results are presented as numbers and percentages and survival rates are computed using Kaplan Meier, using the end of radiation therapy as the start date. Results: From 2009 to 2015, 159 high-risk prostate cancer patients were treated with proton beam radiation therapy (stage =T3a: n=31, 19.5%, Gleason score =8: n=135, 84.9%; =20 ng/ml: n=27, 17.0%). 121 pts (76.1%) had an age adjusted Charlson Comorbidity Index of 0 or 1. Patients received a median dose of 78 Cobalt Gray Equivalent (CGE) in 39 fractions over 8 weeks using passively scattered beams in 13 pts (8.2%) and spot scanning in 146 pts (91.8%). The target volume included prostate and seminal vesicles (SV) in 66.7% of the patients and prostate and proximal SV in 32.7%. The pelvic lymph nodes were not treated. Androgen deprivation therapy (ADT) using leuprolide was given to 152 pts (95.6%) for a median duration of 14.4 months (range: 2-44). Some patients are still receiving ADT as of last follow-up, which underestimates the reported duration. The median follow-up was 2.8 years. Three-year OS, bPFS and DMFS rates were 97%, 93% and 97%, respectively. Cumulative acute grade =3 genitourinary (GU) and gastrointestinal (GI) toxicity rates were 2% and 0%, respectively. Three-year cumulative rates of late grade =3 GU and GI toxicity rates were 3% and 1%, respectively.Conclusion: This prospective single institution cohort of high-risk prostate cancer patients treated with proton therapy combined with ADT demonstrates the efficacy and safety of this treatment approach. These results need to be confirmed with longer follow-up and compared with competing treatment options.

RO230-SD-TUB3 Assessment of Acute Toxicity in Prostate Cancer Patients using Hydrogel Spacer During Proton Therapy

Station #3

Participants
Jesse Conterato, Warrenville, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Patients undergoing proton beam radiotherapy (PBRT) with hydrogel spacer (HS) should experience low rates of acute toxicity. HS will likely have an impact on the reduction of late gastrointestinal (GI) toxicity by reducing the risk of proctitis. This single institution review evaluates acute toxicity outcomes in prostate cancer (CaP) patients treated with PBRT with

HS placement.Materials/Methods: From April 2015 to February 2016, 63 men with CaP had placement of HS and were treated with PBRT. All patients completed PBRT, receiving 79.2 Cobalt Gray Equivalent in 44 fractions. Toxicity was prospectively assessed weekly during PBRT and scored according to CTCAE v4.0 in 12 categories, including Fatigue (F), Urinary Tract Pain (UT), Urinary Frequency (UF), Urinary Retention (UR), Urinary Incontinence (UI), Urinary Urgency (UU), Hematuria (H), Fecal Incontinence (FI), Rectal Hemorrhage (RH), Erectile Dysfunction (ED), Proctitis (PR), and Diarrhea (D). Of the 63 patients receiving HS, PBRT was delivered for low risk (N=15), intermediate risk (N=33) and high risk (N=15) disease. PBRT targets were prostate (P) only (N=14), P plus seminal vesicles (SV) (N=36) and P plus SV with elective inclusion of pelvic lymph nodes (N=13). In this group, median age was 65 (49 – 80), median IPSS score was 5 (0 – 33), and median prostate size was 63.9 cc (35.0 – 253.0 cc). Results: Change From Baseline F UT UF UR UI UU H FI RH ED PR D Number of Patients No Change 36 25 16 14 46 26 58 60 56 50 62 56 1 Grade Increase 25 29 28 27 12 27 5 2 7 12 1 6 2 Grade Increase 2 7 19 22 5 10 0 1 0 1 0 1 3 Grade Increase 0 2 0 0 0 0 0 0 0 0 0 0 2% of patients experienced an increase of 2 grades in FI from baseline. 11% of patients experienced an increase of 1 grade in RH from baseline. 2% of patients experienced an increase of 1 grade in PR from baseline. 2% of patients experienced an increase of 2 grades in D from baseline.2% of patients experienced an increase of 2 grades in F from baseline. 14% of patients experienced an increase of 2-3 grades in UT from baseline. 30% of patients experienced an increase of 2 grades in UF from baseline. 35% of patients experienced an increase of 2 grades in UR from baseline. 8% of patients experienced an increase of 2 grades in UI from baseline. 16% of patients experienced an increase of 2 grades in UU from baseline. 8% of patients experienced an increase of 1 grade in H from baseline. 2% of patients experienced an increase of 2 grades in ED from baseline.Conclusion: HS placement for CaP patients has acceptably low rates of acute GI and urinary toxicity. Longer follow up is needed to assess effects of HS placement on late toxicity.

RO231-SD-TUB4 To Compare the Effect of Different Forms of Therapy on the Quality of Life with Prostate Cancer Patients by the Expanded Prostate Cancer Index Composite Scales

Station #4

Participants
Dong Zhou, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): At present, the main treatments for prostate cancer are radical intensity modulated radiation therapy (IMRT) and radical prostatectomy (RP). Assessment of the outcome of prostate cancer treatment entails measuring not only the duration of survival but also the quality of life. There are many studies about survival data of IMRT and RP in prostate cancer patients, however, the research about the quality of life in the comparison between IMRP and RP is little. We sought to characterize the quality of life after contemporary treatments for prostate cancer.Materials/Methods: Retrospective analysis prostate cancer patients from 2011 to 2013, including radical IMRT (prostate 76-78Gy, 2Gy/d), post-prostatectomy IMRT (prostate bed 66-72Gy, 2Gy/d) and PR. Patient-reported outcome measures, including the Expanded Prostate Cancer Index Composite (EPIC-26) were collected by phone-survey facility before treatment and at 3,6,12 and 24 months after the start of treatment. According to different forms of treatments, prostate cancer patients were divided into radical IMRT group, RP group and RP+IMRT group.Results: 195 radical IMRT patients, 60 RP and 49 post-prostatectomy IMRT patients' information is available for analysis. The quality of life was evaluated primarily as the change over time in domains of urinary incontinence, urinary irritation or obstruction, the bowel or rectal, sexual function and vitality or hormonal function. The radical IMRT group shows an obviously better score than RP group and RP+IMRT group (all P=0.00) at 3,6,12 and 24 months after treatment in domain of urinary incontinence. On the other hand, radical IMRT group and RP+IMRT group reveal a worse score than RP group (all P0.05,respectively 0.001,0.01,0.017,0.013) at 3,6,12 and 24 months after treatment in domain of the bowel or rectal. However, there was no difference in domain of sexual function. The urinary irritation or obstruction and vitality or hormonal function scores show difference because of the different patients' demographics.Conclusion: For prostate cancer patients, RP may increase side effects in domain of urinary incontinence and radical IMRT may increase bowel and rectal symptoms. So clinicians should inform the patients adequately of the side effects on the IMRT or RP, and make an efficient therapeutic plan for the patients based on the patients' demographics and their choices.

RO232-SD-TUB5 Intraoperative Radiotherapy for Treatment Breast Cancer according to ASTRO Criteria and ESTRO: Result of a Hospital

Station #5

Participants
Guilherme Gondim, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To evaluate the outcome of patients treated with adjuvant IORT according to the consensus statement of the American Society for Therapeutic Radiation Oncology (ASTRO) and European Society for Radiotherapy and Oncology (ESTRO). Materials/Methods: This study is a retrospective analysis of patients who underwent intraoperative radiotherapy (IORT) and conservative surgery for the treatment of early breast cancer. A database was formed based on the medical records of patients treated with IORT using electron beams. Oncological and toxicity results were evaluated as well all the patients' and tumors' characteristics included in ASTRO and ESTRO consensus statements.Results: 146 patients were treated with IORT from 2005 to 2014. 55 patients treated fulfill all ASTRO's consensus recommendations and 97 fulfill all ESTRO's. Local recurrence was observed in only one patient treated according to ASTRO's recommendations and in 3 patients treated according to ESTRO's consensus. 5 recurrences occurred in patients whose characteristics did not meet ASTRO's or ESTRO's criteria. Local control of the entire study cohort corresponded to 5.4%. Local control of patients whose characteristics met ASTRO's and ESTRO's recommendations corresponded to 1.8% and 3%, respectively. Actuarial data on overall survival, distant metastasis, side effects and locoregional control will be presented in ASTRO's meeting.Conclusion: Conservative surgery and adjuvant IORT showed good rates of local control in patients with early breast cancer. Patients treated according to ASTRO's and ESTRO's consensus statements showed local control better than that of the other patients whose characteristics did not meet such consensus statements.

RO233-SD-TUB6 Combination of High Ki67 and No Post-surgery Radiotherapy Predicts Risk of Low Disease-Free Survival among Breast Cancer Patients

Station #6

Participants
Zhensheng Li, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To evaluate overall survival (OS) and disease-free survival (DFS) after breast conserving surgery (BCS) or mastectomy (MAS) and impact of post-surgery radiotherapy (PSRT) by Ki67 expression level of breast cancer (BC).Materials/Methods: In 2008, 716 women with stage I to III breast carcinoma underwent BCS or MAS with/out ALND; 30.3% (217) received PSRT. All were followed up to July 1, 2014 for time-events of recurrence, metastasis, death, or loss of contact. Four subgroups of patients classified by PSRT status (yes vs. no) and Ki67 level (low vs. high [>14%]) was created for 2-dimensional Cox models on OS and DFS with/out covariates which included age, pre-menopause (y/n), MAS (y/n), ALND (y/n), pathology, grade, T stage (T1 to T4, Tx), lymphovascular invasion (IVI, y/n), chemotherapy (y/n) and BC subtypes - luminal A (ER/PR+, HER2-), luminal B (ER/PR+, HER2-), HER2, and triple negative (TN; ER-, PR-, HER2-). Prior to that, traditional Cox models of RT status, Ki67 level, and their interaction term were conducted with/out covariates as well. Hazard ratio (HR) and its 95%CI were calculated along with p value. Results: With a median follow-up time of 71.4 months, overall mortality was 10.5% and treatment failure (death/relapse/metastasis) was 14.9%. Compared with low Ki67 without PSRT, high Ki67 without PSRT had marginally significantly greater adjusted risk of low DFS (HR 1.835, 95% CI 0.964-3.493; p= 0.06), with similar HRs among patients - low Ki67 with PSRT (HR 0.860, p=0.70) and high Ki67 with PSRT (HR 1.030; p=0.93). Without covariates, these estimated HRs (p value) were 1.770 (p=0.05) for high Ki67 without PSRT, 2.435(p=0.01) for low Ki67 with PSRT, and 3.360 (pConclusion: Chemotherapy and clinicopathological factors account for reduction of estimated survival risk associated with high Ki67. High Ki67 without PSRT predicts risk of low DFS among post-surgery BC patients.

MSRO33

BOOST: Breast-Case-based Review (An Interactive Session)

Tuesday, Nov. 29 3:00PM - 4:15PM Room: S103AB

BR RO

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50

Participants

Oren Cahlon, New York, NY (*Presenter*) Nothing to Disclose
Melissa L. Pilewskie, MD, New York, NY (*Presenter*) Nothing to Disclose
Shari Goldfarb, MD, New York, NY (*Presenter*) Nothing to Disclose
Karen Y. Oh, MD, Portland, OR (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Improve basic knowledge and skills relevant to radiation therapy use in breast cancer patients. 2) Apply information learned from provided breast cancer case scenarios to clinical practice. 3) Assess technological innovations and advances which can enhance clinical practice and problem-solving in the breast cancer population. 4) Apply principles of critical thinking to ideas from breast oncology experts and peers in the radiologic sciences.

MSRO36

BOOST: Lung-Case-based Review (An Interactive Session)

Tuesday, Nov. 29 3:00PM - 4:15PM Room: S103CD

CH RO

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50

Participants

Simon S. Lo, MD, Seattle, WA, (simonslo@uw.edu) (*Moderator*) Research support, Elekta AB; Travel support, Accuray Incorporated; Speaker, Accuray Incorporated;
Jing Zeng, MD, Seattle, WA, (jzeng13@uw.edu) (*Presenter*) Nothing to Disclose
Jyoti D. Patel, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Ben J. Slotman, MD, PhD, Amsterdam, Netherlands, (bj.slotman@vumc.nl) (*Presenter*) Research Grant, Varian Medical Systems, Inc; Speakers Bureau, Varian Medical Systems, Inc;
Philip A. Linden, Cleveland, OH, (Philip.linden@uhhospitals.org) (*Presenter*) Nothing to Disclose
Gregory Kicska, MD, PhD, Seattle, WA, (kicskag@uw.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the role of radiation therapy in management of lung cancer, and areas of controversy.

ABSTRACT

SSJ24

Radiation Oncology (Breast)

Tuesday, Nov. 29 3:00PM - 4:00PM Room: S104A

BR RO

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

Participants
L. Christine Fang, MD, Salt Lake City, UT (*Moderator*) Nothing to Disclose
Tracy M. Sherertz, MD, San Francisco, CA (*Moderator*) Nothing to Disclose

Sub-Events

SSJ24-01 Cosmesis after Early Stage Breast Cancer Treatment with Breast Conserving Surgery and Radiotherapy: Experience of Patients Treated In A Chilean Radiotherapy Center

Tuesday, Nov. 29 3:00PM - 3:10PM Room: S104A

Participants
Lorena Vargas, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): The aim of this study is to analyze the overall cosmetic outcome according to patient self assessment and evaluate differences according to the fractionation received.Materials/Methods: A questionnaire was drawn up on the basis of subjective rating scales of cosmesis and it was applied at the start of treatment, at discharge and/or at follow-up visits to patients with early stage breast cancer who received radiotherapy (RT) with tangentials fields between June/2014 and July/2015. Self-perception of cosmesis, pain, changes in the treated breast, and fractionation used (hypofractionation (HF) or conventional fractionation (CF)) were evaluated. Surgical bed boost and use of field in field technique (FIF) were also recorded. A descriptive analysis was performed to calculate proportions, frequencies and medians. Chi square and Kruskal Wallis tests were use when appropiate. Results: 352 questionnaires were obtained: 71 at enrollment, 80 at discharge and 201 at follow up visits (281 were considered as evaluation of RT effect). Median age was 58 yo.Forty five percent (126/279) of patients reported "excellent" cosmesis, 53% (147/279) "acceptable", and 2% (6/279) "poor" cosmesis. Cosmesis was considered "acceptable/excellent" by 98% (273/279) of patients.According to fractionation received, no statistically significant difference was found in overall cosmesis (p = 0.6), pain (p=0.9), boost use or FIF.The alteration that occurred more frequently was "difference between the two breasts" (77%), followed by "alteration in shape of the breast" (56%) and then for "induration" (53%). Change in breast normal color was reported in 48%.Fifteen percent of patients younger than 58 yo reported change of normal breast color affecting cosmesis compared to 9% of patients older than 58 yo (p = 0.04). Patients under 58 yo had a greater frequency of breast induration (61% versus 49%, p=0.03).Nine percent of patients with stage I-II reported complications affecting breast cosmesis compared with 2% with cancer in situ (DCIS) (p = 0.04). Fourteen percent in stage I-II referred color change affecting cosmesis compared with 6% of those with DCIS (p = 0.03).Pain was reported by 68% of patients, and in most of them it was occasional (62%), whereas only 6.4% reported permanent pain.When considering only the questionnaires before the start of RT and at the end of it, in both times the most frequent response was acceptable cosmesis (53.5% and 63.8% respectively), while 3% and 4% reported poor cosmesis at the beginning and at discharge respectively.Ninety-four percent of patients stated that they would accept treatment again.Conclusion: No difference was found between HF and CF in our patients in terms of cosmetic results. Great satisfaction regarding cosmetic outcome of cancer treatment is reported, given by 98% of excellent/acceptable cosmesis, and 94% of patients who would receive treatment again.

SSJ24-02 Cost Minimizing Analysis of Intraoperative Radiotherapy (IORT) in Conservatively Treated Early Breast Cancer

Tuesday, Nov. 29 3:10PM - 3:20PM Room: S104A

Participants
Pedro Lara, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Accelerated Partial Breast Irradiation (APBI) by IORT is becoming an attracting alternative to external beam radiotherapy (EBRT) in early breast cancer treated by conservative surgery (BCS). One of the mayor issues for implementing a new treatment is the cost related to health results.Materials/Methods: The Breast IORT programme started in our center in January 2013. Since then, 195 patients received BCS for early breast cancer until December 2014. The cost analysis was performed after the completion of the treatment of every patient. The full cost of the surgical procedure included: Operating Room (OR), physicians and other personnel, pharmacy, pathology, nuclear medicine, recovery and days in bed at hospital. Cost of the IORT administration were also calculated and included in the analysis: first consultation, preplanning CT scan, disposables, time of radiation oncologist, physicist, technician, annual equipment cost per number of patients treated. EBRT treatment included the whole (consultation, simulation, planning and treatment delivery) process for 25 fractions. Results: Two patients were treated of bilateral cancer with IORT and were excluded from the analysis. Of the 193 remaining cases, 108 were referred to IORT although only 81 received the treatment. 27 cases do not fit for IORT due to the big size of the cavity after removal of the tumor (24 cases) or device technical problems at OR(3 patients). The mean cost of surgery for the whole 193 cases was 4,610.31±1,591.67€ (median 4,346.91€). Surgery was slightly more expensive for those cases that received IORT treatment (4,777.75±1,650.78€; median: 4,430.86€) compared with those not referred to IORT (4,376.54±1,443.90€; median: 4,206.11€) (5,2% incremental cost; pThe total cost of the BCT for the whole series of patients was 9,091.09±2,016.28€ per case. Cost comparison of BCS+IORT (6,800.79±1,658.17€; median:6,463.98€) vs BCS+EBRT (10,090.97±1,443.70€; median 9,920.54€) showed a strong advantage in total cost for IORT treatment (incremental cost 53,47%;pHealth results showed a 100% actuarial local control at 3 years for IORT (follow-up closed at Feb 2016) and no CTACAE 4.0 toxicity score over 2 were observed. Results non-inferior to those observed in the EBRT arm for BCT. Conclusion: IORT slightly increases the cost of the surgical procedure of BCS (5,2%) but saves up to a 53,47% of the total cost of a Breast Conserving Treatment, when compared with standard EBRT in 25 fractions, showing equivalent health results in terms of clinical outcome and toxicity. Indirect cost and patient convenience are further advantages to be taking into account.

SSJ24-03 VMAT as Treatment Technique in Complex Radiotherapy Breast including IMC, L3 and L4 Nodes

Tuesday, Nov. 29 3:20PM - 3:30PM Room: S104A

Participants
Antonia Lavorato, Oxford, United Kingdom (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): The aim of the present study is to demonstrate the validity of the volumetric modulated arc therapy technique (VMAT) for the whole breast, internal mammary nodal chain (IMC) and medial supraclavicular fossa (SCF) in deep inspiration and compare its dosimetric results to the standard tangential field-in-field (FinF) combined with an anterior beam technique.Materials/Methods: A complex case was chosen for this study. A 31 years old lady presented with a self-detected lesion in the medial aspect of the left breast. She was diagnosed with an invasive ductal carcinoma of the left breast grade 3, ER 3/8, PR negative (0/8), HER-2 negative. BRCA 1 and 2 negative as well as panel gene testing negative. CT showed no evidence of metastatic disease or enlarged internal mammary nodes. The patient had undergone a total of six cycles of chemotherapy and left breast wide local excision with complete pathological response. Adjuvant breast radiotherapy and boost to the tumour bed was recommended (Px 40Gy/15#, 16Gy in 8#).Risks versus benefits of irradiating the IMC and SCF were evaluated by the oncologist who concluded that in this clinical case the benefits would outweigh the risks providing an optimised plan could be achieved minimising, as much as possible, the dose to the ipsilateral lung and to the heart. The oncologist delineated the relevant CTVs following the ESTRO consensus guideline. The patient central lung dose for tangential beams was 4.5cm.A total of three plans were generated for this patient: two VMAT partial arcs with different gantry angles and a standard tangential FinF with a combined anterior beam.The plans were created with Pinnacle, treatment planning system.Results: Treatment TechniqueLeft Lung V20Left Lung V10Left Lung V5Heart V25Heart V10Heart Mean GySpinal Canal Max GyTangential FinF + Ant Beam 34.9%43.6%54.3%00.6%2.238.4VMAT Gantry 150-300 degrees23%42.2%64.3%08.1%5.229.9VMAT Gantry 178-300 degrees25%43.3%57%04.6%4.426.9In Both VMAT plans better V20 and V10 to the Left (Ipsilateral) Lung was achieved; also better coverage and dose homogeneity were achieved with VMAT when compared with FinF techniques. There was no significant difference to the mean contralateral breast between the two VMAT techniques. The dose coverage (V38Gy) to the breast and L3 and L4 nodes was quite comparable across the techniques but IMC coverage using tangential beams was inferior.Conclusion: The results support the hypothesis that VMAT technique is feasible and in this specific case perhaps the only solution. The results showed that the dose to the ipsilateral lung can be reduced and the dose homogeneity can be improved without increasing the dose to the contralateral breast or lung.

SSJ24-04 Effect of Adjuvant Radiotherapy on Survival in Male Breast Cancer: A Population-Based Analysis

Tuesday, Nov. 29 3:30PM - 3:40PM Room: S104A

Awards
Trainee Research Prize - Resident

Participants
Matthew J. Abrams, MD, Boston, MA (*Presenter*) Nothing to Disclose
Paul Koffer, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jaroslaw Hepel, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

There are no randomized trials providing evidence for or against adjuvant radiation for male breast cancer because of its rarity. This study examines the impact of post-lumpectomy (PLRT) and post-mastectomy radiation (PMRT) in male breast cancer patients in the National Cancer Institute's Surveillance Epidemiology and End Results (SEER) database.

METHOD AND MATERIALS

The SEER database 8.3.1 was queried for men ages 20+ diagnosed with localized or regional non-metastatic grade I-III invasive ductal/lobular carcinoma from 1998-2011. Included patients were treated with a lumpectomy or modified radical mastectomy (MRM) with or without post-surgical external beam radiation. Univariate and multivariate analyses evaluated predictors for PMRT use after MRM. Overall survival (OS) curves were calculated by the Kaplan-Meier method and compared by the log-rank test. Cox-regression was used for multivariate survival analyses.

RESULTS

A total of 1,980 patients were followed for a maximum of 10 yrs (median follow up = 56 months). 349 patients underwent lumpectomy while 1,631 underwent MRM. Of those who underwent lumpectomy, PLRT improved 10 yr OS (68% vs. 57% p=0.001). Of those who underwent MRM, PMRT had no impact on neither the entire group 10 yr OS (54% PMRT vs. 53% no PMRT) p=0.585 nor on the subset of node negative patients 10 yr OS (60% PMRT vs. 62% no PMRT) p=0.736. However, there was a benefit in 10 yr OS for 1-3 nodes positive (55% PMRT vs. 46% no PMRT, p=0.033) and for 4+ nodes positive (49% vs. 21%, p=0.001). Using cox-regression analysis, increasing number of nodes positive, larger size and older age were all associated (p<0.001) with a survival detriment while the use of PMRT (p<0.001) was associated with improved survival (HR=0.62 [0.49-0.77]). Using binary logistic regression, predictors for the use of PMRT were unknown/borderline ER status, grade III disease, increasing nodes positive, and larger primary tumor size.

CONCLUSION

The use of post-lumpectomy radiation is associated with a survival benefit. After a modified radical mastectomy, PMRT improves survival in those with positive nodes. There may be a subset of node negative patients who derive a survival benefit and more study of this group is needed.

CLINICAL RELEVANCE/APPLICATION

After a diagnosis of male breast cancer, post-lumpectomy radiation should be considered for all patients and post-mastectomy radiation should be considered for node positive patients.

SSJ24-05 Assessment of Cosmetic Outcome Following Intra-operative Radiation Therapy during Breast Conserving Surgery as Treatment for Early Breast Cancer

Tuesday, Nov. 29 3:40PM - 3:50PM Room: S104A

Participants
Norman S. Williams, London, United Kingdom (*Presenter*) Travel support, Carl Zeiss AG

ABSTRACT

Purpose/Objective(s): Intra-operative radiation therapy during breast-conserving surgery is increasingly being used as a treatment for early breast cancer. A variety of techniques are used, and many have been shown to be safe and effective. Another important aspect is the long-term cosmetic (aesthetic) results of treatment, as most women will survive for decades. In order to determine the variety and extent of methods currently being used to assess cosmetic outcome, a review of the literature was performed. In particular, the results obtained from objective assessment methods were sought.Materials/Methods: PubMed was searched using the terms (ioert[All Fields] OR IORT[All Fields] OR intraoperative[All Fields]) AND ("breast"[MeSH Terms] OR "breast"[All Fields]) AND (cosmesis[All Fields] OR cosmestic[All Fields] OR ("esthetics"[MeSH Terms] OR "esthetics"[All Fields] OR "aesthetic"[All Fields]) OR ("esthetics"[MeSH Terms] OR "esthetics"[All Fields] OR "esthetic"[All Fields])). Abstracts of all articles were read to eliminate those not relevant to this study. Review articles were read in their entirety to determine if any articles were missed from the initial PubMed search. From the final set of articles, the methods used for intra-operative radiation therapy cosmetic assessment, and results obtained from the assessment, were tabulated. The proportion of patients determined to have Excellent or Good outcome (EG), and the 95% confidence intervals, were calculated.Results: A total of 184 items were identified by the search, of which 145 were determined from the abstract to be not relevant. 39 publications were read in detail, and included 10 reviews and editorials, 2 studies where either no assessment was made or no radiation therapy given. Of the remaining studies, only 4 reported the use of an objective method of assessment of cosmetic outcome, the others using either subjective or poorly specified methods. One study used a LINAC-based method of delivering the intra-operative radiation therapy, the other three used Intrabeam (the TARGIT technique). Results are shown in the Table.Conclusion: A minority of reports assessing cosmetic outcomes following intra-operative radiation therapy use objective methods. Such methods should be required as they provide unbiased estimates of outcome.PublicationMethodnProportion EG (95%CI)Cracco et al (2015)LINAC-IORT8184 (8) % EBRT10588 (6) %Keshtgar et al (2013)Intrabeam-IORT17186 (5) % EBRT15175 (7) %Grobmyer et al (2013)Intrabeam-IORT1788 (15) %Kraus-Tiefenbacher et al (2006)Intrabeam-IORT (as boost) plus EBRT7393 (6) %

SSJ24-06 Evaluation of Axillary Dose Coverage following Whole Breast Radiotherapy: Variation with the Different Radiotherapy Field

Tuesday, Nov. 29 3:50PM - 4:00PM Room: S104A

Participants
Rong Cai, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To evaluate dose distribution and coverage of the axilla levels I–III ,superior axillary vein lymph nodes(Sup-AV) and inferior axillary vein lymph nodes(infer-AV) area, according to AMAROS field(A),high tangent field(HT), standard tangent field (ST).Materials/Methods: We retrospectively delineated the axillary levels I-III, Sup-AV and Infer-AVon planning CT-images of 10 patients who treated with breast conservation and whole breast radiotherapy along 2015 in our institution. Every patients were treated using the AMAROS(A) ,high tangent field(HT), standard tangent field (ST). Mean dose levels and V90(volume receiving at least 90% of the prescribed dose) of every axillary lymph nodes ,Su-AV andIn-AV were evaluated.Results: The median dose delivered to level I using A, HT and ST were 42.96Gy ,37.3Gy , 27.9Gy.The median dose delivered to level II using A ,HT and ST were 46.4Gy, 26.6Gy,18.5Gy. The median dose delivered to level III using A ,HT and ST were 50.9Gy, 19.1Gy, 10.3Gy.The median dose delivered to Sup-AVusing A ,HT and ST were 47.3Gy, 19.4Gy, 6.16Gy .The median dose delivered to Inf-AV using A ,HT and ST were 43.8Gy, 41.4Gy, 33.4Gy. The dose of lung V20% using A, HT and ST were 38.8Gy, 16.74Gy and 16.14Gy.Conclusion: AMAROS provide high coverage of axilla I-III but high lung dose coverage. For level I , A and HT had similar dose distribution higher than ST; For level II ,AMAROS and HT provide high dose coverage than ST.

RC420

Imaging Evaluation of Post-Radiation Therapy Normal Tissue Effects

Tuesday, Nov. 29 4:30PM - 6:00PM Room: S104A

GU HN NR OI RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Christina I. Tsien, MD, Saint Louis, MO (*Moderator*) Speaker, Merck & Co, Inc

Sub-Events

RC420A Post-radiation Therapy CNS Imaging

Participants
Michael D. Chan, MD, Winston-Salem, NC (*Presenter*) Advisory Board, NovoCure Ltd
Tammie S. Benzinger, MD, PhD, Saint Louis, MO, (benzingert@wustl.edu) (*Presenter*) Research Grant, Eli Lilly and Company Investigator, Eli Lilly and Company Investigator, F. Hoffmann-La Roche Ltd

RC420B Post-radiation Therapy Head and Neck Imaging

Participants
Allen M. Chen, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Rajan Jain, MD, Hartsdale, NY (*Presenter*) Consultant, Cancer Panels

LEARNING OBJECTIVES

1) Discuss the role of surveillance imaging in identification of radiation induced changes in normal tissue, so that these changes are not misinterpreted as evidence of persistent or recurrent tumor. 2) Describe imaging characteristics of radiation injury to various tissues including visceral mucosal space, salivary glands, bones and vascular structures in the neck as well as surrounding organs such as brain, skull base and lungs. 3) Discuss the advantage of early identification of these using case-based approach.

ABSTRACT

Radiation therapy for head and neck cancers can cause adverse effects and toxicity to the normal tissues in the irradiated regions. This does not only lead to a variety of comorbidities, but also present a challenging and complex appearance on surveillance imaging studies. Timely identification of some of these adverse effects can improve patient survival and quality of life.

RC420C Post-radiation Therapy Gynecologic Imaging

Participants
Akila N. Viswanathan, MD, Baltimore, MD (*Presenter*) Nothing to Disclose
Kathryn J. Fowler, MD, Chesterfield, MO (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review and demonstrate the imaging findings of gynecologic malignancies following radiation therapy. 2) Review the imaging modalities used to assess response.

ABSTRACT

RC422

Imaging for Personalized Medicine: Abdomen

Tuesday, Nov. 29 4:30PM - 6:00PM Room: S102C

GI RO PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Kristy K. Brock, PhD, Ann Arbor, MI (*Moderator*) License agreement, RaySearch Laboratories AB; Development agreement, Varian Medical Systems, Inc;

ABSTRACT

The use of imaging and other biomarkers to increase the efficacy of treatment and decrease the risk of toxicity increased in the abdomen. Functional imaging and serum-based biomarkers can enable a more detailed understanding of the tumor, its characteristics, and early indications of its response to therapy. In addition, they can also be utilized to assess an individual patients risk for toxicity, enabling a personalize approach to radiotherapy. These advanced imaging techniques can be combined with anatomical information to generate high precision treatment plans which can be adapted over the course of treatment to account for identified uncertainties, changes, and deviations which may compromise the delivery of the intended treatment or identify the ability to re-optimize treatment to improve the therapeutic ration. In this session, technical and clinical concepts will be described to design and deliver personalized radiotherapy in the abdomen. Technical concepts will include incorporation of multi-modality imaging for treatment planning, image guidance at treatment, and functional and anatomical adaption. Clinical concepts will include functional targeting, clinical goals, and toxicity risks.

Sub-Events

RC422A IGRT and Anatomical Adaptation

Participants
Kristy K. Brock, PhD, Ann Arbor, MI (*Presenter*) License agreement, RaySearch Laboratories AB; Development agreement, Varian Medical Systems, Inc;

LEARNING OBJECTIVES

1) Describe the processes necessary for the safe and accurate integration of multi-modality imaging for treatment planning. 2) Understand the role of image guidance for abdominal radiotherapy. 3) Illustrate methods to perform functional and anatomical adaptation in the abdomen.

ABSTRACT

The use of imaging and other biomarkers to increase the efficacy of treatment and decrease the risk of toxicity increased in the abdomen. Functional imaging and serum-based biomarkers can enable a more detailed understanding of the tumor, its characteristics, and early indications of its response to therapy. In addition, they can also be utilized to assess an individual patients risk for toxicity, enabling a personalize approach to radiotherapy. These advanced imaging techniques can be combined with anatomical information to generate high precision treatment plans which can be adapted over the course of treatment to account for identified uncertainties, changes, and deviations which may compromise the delivery of the intended treatment or identify the ability to re-optimize treatment to improve the therapeutic ration. In this session, technical and clinical concepts will be described to design and deliver personalized radiotherapy in the abdomen. Technical concepts will include incorporation of multi-modality imaging for treatment planning, image guidance at treatment, and functional and anatomical adaption. Clinical concepts will include functional targeting, clinical goals, and toxicity risks.

RC422B Functional Targeting, Clinical Goals, and Toxicity Risks

Participants
Joseph M. Herman, MD, MSc, Baltimore , MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review methods to obtain, process and analyze tissue and serum based biomarkers for abdominal tumors. 2) Describe current dose/fractionation regimens as well as normal tissue constraints utilized in treating abdominal tumors. 3) Explain potential advantages of assessing treatment response with MRI and quantitative PET/SPECT (PERCIST) imaging over CT based response (RECIST) in abdominal tumors.

ABSTRACT

In order to deliver personalized radiation therapy in abdominal tumors, it is important to understand the methods used to obtain, analyze, and interpret serum and tissue based biomarkers. Most research to date has focused on identifying specific biomarkers used to personalize systemic or targeted therapies. Radiation-specific biomarkers are emerging and may eventually be used to determine whether radiation is indicated or identify specific radiation sensitizers for use in abdominal tumors. Radiation therapy planning has historically used computed tomography (CT)-based imaging. Molecular imaging using hybrid positron emission tomography (PET)/CT scanning or single-photon emission computed tomography (SPECT) imaging and functional magnetic resonance imaging (MRI) has provided new insights into the precise identification of gross tumor volume (GTV) and clinical tumor volume (CTV) and has provided response information during and after therapy. The effective use of PET/SPECT and MRI in clinical practice, however, requires an appreciation of the unique challenges inherent to these modalities. Fundamental physical issues of limited spatial resolution relative to the biological process, partial volume effects, image misregistration, motion management, and edge delineation must be carefully considered and can differ by agent or the method applied. Integration of PET/SPECT and MRI imaging into multicenter clinical trials and clinical practice can be particularly challenging due to differences in imaging protocols, machines, and anatomy. Imaging protocols that clearly outline scan and fusion parameters are crucial. Further,

interpretation of tumor response should be standardized, and scans should be obtained at consistent time intervals. In addition, it is important to consider novel tracers of tumor biology (e.g. hypoxia, proliferation, apoptosis) beyond the commonly used radiotracers. In this session, we will discuss these applications and challenges as well as provide guidance on how to integrate PET/SPECT/MRI into radiation treatment planning and assessing treatment response. Finally, we will evaluate common dose and fractionation regimens as well as established dose constraints used in treating abdominal tumors with conventional and stereotactic body radiation therapy.

MSRO39

BOOST: Breast-eContouring

Tuesday, Nov. 29 4:45PM - 6:00PM Room: S104B

BR RO

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50

Participants

Jean L. Wright, MD, New York, NY (*Presenter*) Nothing to Disclose
Atif J. Khan, MD, New Brunswick, NJ (*Presenter*) Consultant, Elekta AB; Consultant, Vertex Pharmaceuticals Incorporated; Speaker, Elekta AB; Speaker, Vertex Pharmaceuticals Incorporated; Research funded, Elekta AB; Research funded, Cianna Medical, Inc

LEARNING OBJECTIVES

1) Know where to locate the available resources for optimal contouring of breast cancer radiation targets. 2) Understand the contouring guidelines in contemporary breast radiation protocols and know standard contouring nomenclature currently used in these studies. 3) Understand how contouring represents a critical component for optimal planning in breast cancer. 4) Carry out contouring on representative CT images for two scenarios: intact breast, and chest wall and regional nodes.

MSRO41

BOOST: Head and Neck - Oncology Anatomy: Lymph Nodes and Brachial Plexus (An Interactive Session)

Wednesday, Nov. 30 8:30AM - 10:00AM Room: S103CD

HN NR RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Sub-Events

MSRO41A Imaging of the Lymph Nodes of the Head and Neck: Applied Anatomy

Participants
Suresh K. Mukherji, MD, Northville, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the normal anatomy of the lymph nodes of the head and neck. 2) Define the size criteria used to identify metastatic lymph nodes. 3) Review the classification of the cervical lymhp nodes.

ABSTRACT

This lecture will review the normal anatomy of the lymph nodes of the head and neck. The talk will also define the size criteria used to identify metastatic lymph nodes and review the classification of the cervical lymhp nodes.

MSRO41B Current Concepts and Controversies in Radiation Planning of the Head and Neck Lymph Nodes

Participants
Sung Kim, MD, New Brunswick, NJ, (sk1375@cinj.rutgers.edu) (*Presenter*) Nothing to Disclose

MSRO41C Question and Answer

Participants

MSRO41D Imaging of the Brachial Plexus: Applied Anatomy

Participants
Suresh K. Mukherji, MD, Northville, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the normal anatomy of the brachial plexus. 2) Describe common tumors that involve the brachial plexus. 3) Review the post-radiation therapy appearance of the brachial plexus.

ABSTRACT

This lecture will review the normal anatomy of the brachial plexus. The lectures will also describe common tumors that involve the brachial plexus and review the post-radiation therapy appearance of the brachial plexus.

MSRO41E Current Concepts and Controversies in Contouring and Treatment of the Brachial Plexus and Surrounding Structures

Participants
Sung Kim, MD, New Brunswick, NJ (*Presenter*) Nothing to Disclose

MSRO41F Question and Answer

Participants

RC520

Molecular and Functional Imaging/Surrogate Markers in Radiation Oncology

Wednesday, Nov. 30 8:30AM - 10:00AM Room: S403B

BQ OI RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Nina A. Mayr, MD, Seattle, WA (*Moderator*) Nothing to Disclose

Sub-Events

RC520A Imaging Surrogate Markers in Liver Cancer

Participants
Mary U. Feng, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

RC520B Imaging Surrogate Markers in Lymphoma

Participants
John P. Plastaras, MD, PhD, Philadelphia, PA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand how PET/CT scans after chemotherapy are used to make decisions about lymphoma treatment. 2) Describe how pre-chemotherapy PET/CT scans are used to define target volumes in involved site radiotherapy paradigm. 3) Propose prescription doses for lymphoma treatments based on PET/CT as an imaging biomarker.

ABSTRACT

RC520C Imaging Surrogate Markers in Esophageal Cancer

Participants
Steven H. Lin, MD, PhD, Houston, TX, (shlin@mdanderson.org) (*Presenter*) Research Grant, STCube Pharmaceuticals, Inc; Research Grant, F. Hoffmann-La Roche Ltd; Research Grant, Elekta AB; Research Grant, Peregrine Pharmaceuticals, Inc; Research Grant, Hitachi, Ltd; Speaker, AstraZeneca PLC; Speaker, ProCure Treatment Centers, Inc; Speaker, McKesson Corporation

LEARNING OBJECTIVES

1) Assess the critical role of imaging in the diagnosis and treatment of esophageal cancer. 2) Critically appraise the utility of FDG-PET imaging as a predictive and prognostic marker in esophageal cancer. 3) Describe the novel imaging approaches for improved imaging biomarkers for preoperative therapy.

RC520D Imaging Surrogate Markers in Head and Neck Cancer

Participants
Min Yao, MD, PhD, Cleveland, OH (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1. Review the application of FDG PET in head and neck cancer2. Review how to use FDG PET in treatment planning3. Review new tracers PET in head and neck cancer

RC522

Imaging for Personalized Medicine: Head and Neck

Wednesday, Nov. 30 8:30AM - 10:00AM Room: S102D

HN NR RO PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Robert Jeraj, Madison, WI (*Moderator*) Founder, AIQ Services

LEARNING OBJECTIVES

ABSTRACT

Sub-Events

RC522A IGRT and Anatomical Adaptation

Participants
Marija Popovic, PhD, Montreal, QC, (marija.popovic@mcgill.ca) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the evolution of adaptive radiotherapy and relevant technological advances as they pertain to head and neck radiotherapy. 2) Understand the clinical rationale for plan adaptation in head and neck patient population. 3) Describe possible routes to clinical implementation. 4) Discuss risks associated with adaptive planning workflows and appropriate quality assurance.

ABSTRACT

This session will focus on the practical implementation of adaptive radiotherapy for head and neck cancer. Although the concept of adaptive radiation therapy (ART) has been around for more than two decades, routine plan adaptation has not become standard practice in the management of head and neck cancer despite huge technological advances in imaging, image registration software, and dose calculation speed. The remaining challenges in implementing ART for head and neck cancer in 2016 as well as an update of the demonstrated clinical need will be discussed. Features of successful adaptive radiotherapy implementations will be highlighted as well as a summary of useful clinical tools and required quality assurance.

RC522B Functional Targeting and Adaptation

Participants
Robert Jeraj, Madison, WI (*Presenter*) Founder, AIQ Services

LEARNING OBJECTIVES

1) To learn about appropriate anatomical and imaging modalities for selection and delineation of target volumes in HN. 2) To learn about biologically conformal approaches (dose painting) in HN. 3) To learn about quantitative imaging requirements for RT in HN.

ABSTRACT

Anatomical and molecular imaging is used to tailor radiation treatment by enabling proper selection and delineation of target volumes and organs, which in turn lead to dose prescriptions that take into account the underlying tumor biology. Dose modulation to different parts of target volume may also be used to match variable tumor radiosensitivity (so-called biologically conformal radiotherapy or dose-painting). For accurate implementation of targeted and adaptive IMRT, tools and procedures, such as accurate image acquisition and reconstruction, automatic segmentation of target volumes and organs at risk, non-rigid image and dose registration, and dose summation methods, need to be developed and properly validated.

MSRO42

BOOST: Head and Neck-Science Session with Keynote

Wednesday, Nov. 30 10:30AM - 12:00PM Room: S103CD

RO HN OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Sung Kim, MD, New Brunswick, NJ (*Moderator*) Nothing to Disclose
Timothy J. Kruser, MD, Madison, WI (*Moderator*) Nothing to Disclose

Sub-Events

MSRO42-01 Invited Speaker:

Participants
Minh T. Truong, MD, Boston, MA (*Presenter*) Nothing to Disclose

MSRO42-03 Intravoxel Incoherent Motion Diffusion Weighted Imaging (IVIM-DWI) in Evaluating the Hypoxia and Radiosensitivity of Nasopharyngeal Carcinoma Xenografts

Wednesday, Nov. 30 10:50AM - 11:00AM Room: S103CD

Participants
Youping Xiao, Fuzhou, China (*Presenter*) Nothing to Disclose
Yunbin Chen, MD, Fuzhou, China (*Abstract Co-Author*) Nothing to Disclose
Ying N. Chen, PhD, Fuzhou, China (*Abstract Co-Author*) Nothing to Disclose
Dechun Zheng, MS, Fuzhou, China (*Abstract Co-Author*) Nothing to Disclose
Xiang Zheng, MS, Fuzhou, China (*Abstract Co-Author*) Nothing to Disclose
Jianji Pan, Fuzhou, China (*Abstract Co-Author*) Nothing to Disclose
Li Peng, BS, Fuzhou, China (*Abstract Co-Author*) Nothing to Disclose
Xiangyi Liu, BS, Fuzhou, China (*Abstract Co-Author*) Nothing to Disclose
Zhuangzhen He, Fuzhou, China (*Abstract Co-Author*) Nothing to Disclose
Jing Zhong, Fuzhou, China (*Abstract Co-Author*) Nothing to Disclose
Wang Ren, Fuzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To preliminary investigate intravoxel incoherent motion diffusion weighted imaging(IVIM-DWI) in assessing the hypoxia and radio-sensitivity of nasopharyngeal carcinoma(NPC) xenografts.

METHOD AND MATERIALS

Two different radiosensitive NPC cell lines(CNE-1 and CNE-2) were transplanted on sixty nude mice(30 of each group) to raise xenografts, which received the fractional radiations(30Gy, each fraction of 10Gy) at the alternative days. Each group was then subcategorized into the following five groups: non-radiation group(G0), radiation group of 10Gy(G1), 20Gy(G2), 30Gy(G3), and 3 days after 30Gy radiation(G4). On a 3.0T MR system, IVIM-DWI with 14 b-factors(0~1000 s/mm2) were performed on G0 xenografts directly and G1~G4 xenografts after irradiations. IVIM-parameters of xenografts were calculated with IDL6.3 software. The cell density, necrosis proportion and HIF-1α of xenografts were analyzed histopathologically. The general changes of IVIM-parameters and pathological features after irradiations were tested with One-way ANOVA, their difference were compared by Student t test and/or Mann-Whitney U test. The correlations between different variables were analyzed with Spearman test.

RESULTS

After fractional radiations, the general changes of D, f and D* values in CNE-2 xenografts were statistically significant than those of CNE-1 xenografts($P<0.01$). D increased while D* and f decreased more significantly in CNE-2 xenografts($P<0.01$). D and necrosis proportion of G3 and G4 in CNE-2 xenografts were higher than those of CNE-1 xenografts($P<0.05$), while D* and f of G4 as well as cell density of G2, G3 and G4 in CNE-2 xenografts were lower than those in CNE-1 xenografts($P<0.005$). However, the general change of HIF-1α expression in CNE-1 xenografts was more significant than that of CNE-2 xenografts($P<0.005$). On the other hand, D correlated negatively with cell density($rs=-0.861$, $P < 0.001$) and HIF-1α expression($rs=-0.814$, $P<0.001$), while it behaved a positive correlation with necrosis proportion($rs=0.952$, $P<0.001$). Furthermore, f correlated positively with cell density($rs=0.627$, $P<0.001$) but negatively with necrosis proportion($rs=-0.649$, $P<0.001$).

CONCLUSION

High-radiosensitive CNE-2 xenografts behaved more significant changes in IVIM-parameters than low-radiosensitive CNE-1 xenografts after fractional radiations, which correlated significantly with microstructure features and hypoxia of xenografts. Thus, IVIM-DWI can be potentially valuable in predicting the radio-sensitivity of NPC xenografts.

CLINICAL RELEVANCE/APPLICATION

Animal studies of IVIM-DWI can help demonstrate the mechanism on hypoxia and radiosensitivity of NPC.

MSRO42-04 A Phase I Trial of Ketogenic Diet with Concurrent Chemoradiation (ChemoRT) in Head and Neck Squamous Cell Carcinoma (HNSCC)

Wednesday, Nov. 30 11:00AM - 11:10AM Room: S103CD

Participants
Carryn Anderson, MD, Iowa City, IA (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Ketogenic diet (KD) combined with chemoRT reduced tumor growth and improved survival in pre-clinical models. We hypothesized stage III-IVb HNSCC patients would be able to remain compliant with KD because of PEG tube requirement during chemoRT. Research supported by NIH U54TR001356 and KetoCal® 4:1 provided by Nutricia Pharmaceuticals.Materials/Methods: This phase I clinical trial enrolled stage III-IVb definitive and post-op HNSCC patients receiving concurrent platinum-based chemoRT. PEG placement was required, but subjects were encouraged to continue KD by mouth. KD recipes and KetoCal® shakes were provided for daily consumption for 5 weeks starting 2 days prior to chemoRT. Fingerstick ketones (FK) were checked Mon-Fri, and serum beta-hydroxybutyrate (BHB), glucose, and uric acid were checked weekly. Lipid panel was checked at week 3. Serum oxidative stress parameters were assessed prior to, during, and after completing KD. Adverse events were graded utilizing CTCAE version 4.0.Results: Median follow-up for all enrolled subjects (n=12) from completion of RT was 4.9 mo (range: 0-16.6). 4/12 subjects successfully completed 5 weeks of KD as prescribed. Successful subjects used scheduled anti-emetics, consumed shakes via PEG tube as opposed to orally and had strong social support. Median days on KD for those who discontinued was 5.5 (range: 2-8). Of the first 4 subjects treated, 2 completed, 1 withdrew due to fatigue (gr. 3), and 1 had a dose limiting toxicity (DLT) (hyperuricemia, grade 4; 12.7 nd/dL; nl ref 2.4-7.0). The protocol was amended to address diet-related hyperuricemia and allow for increased protein intake. Subsequently, 8 eligible subjects enrolled with 2 completing therapy and 2 experiencing DLTs (acute pancreatitis grade 3; hyperuricemia with complicating nausea and vomiting, grade 3). The remaining 4 subjects withdrew due to diet intolerance prior to beginning chemoRT (n=1), and nausea with vomiting (nausea grade 2, vomiting grade 1, n=3). Serious adverse events included hospitalizations for parotiditis (n=1), acute pancreatitis (n=1), neutropenic fever (n=1), and nausea with vomiting (n=1). Both the acute pancreatitis and nausea with vomiting SAEs were considered related to study diet and were deemed DLTs. In those who completed KD, the median days FK were elevated and weeks the BHB levels were above baseline were 24.5 days (range: 19-25) and 5 weeks (range: 4-6), respectively. Median uric acid levels were 4.9 nd/dL (range: 3.4-5.4). Lipids remained normal. Serum oxidative stress markers, as assessed by protein carbonyls, increased linearly with increasing days on KD.Conclusion: While challenging despite PEG availability, KD compliance is possible when combined with concurrent chemoRT for HNSCC. Enrollment continues.

MSRO42-05 Unilateral versus Bilateral Intensity Modulated Radiation for Surgically-treated Squamous Cell Carcinoma of the Palatine Tonsil Staged with FDG-PET/CT

Wednesday, Nov. 30 11:10AM - 11:20AM Room: S103CD

Awards
Student Travel Stipend Award

Participants
Re-I Chin, BA, Saint Louis, MO (*Presenter*) Nothing to Disclose
Yuan J. Rao, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Michael Y. Hwang, Newark, NJ (*Abstract Co-Author*) Nothing to Disclose
Christopher R. Spencer, MD, MS, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Todd DeWees, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Pranav Patel, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Parul Sinha, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Hiram A. Gay, MD, Greenville, NC (*Abstract Co-Author*) Nothing to Disclose
Brian Nussenbaum, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Douglas Adkins, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
James S. Lewis Jr, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Wade L. Thorstad, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Michael Pierro, BS, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

We report long-term outcomes of unilateral (UL) vs. bilateral (BL) radiation therapy (RT) for tonsil cancer in the era of FDG-PET/CT (PET). We hypothesize that staging with PET aids in patient selection for ULRT, especially in patients with multiple ipsilateral lymph nodes (stage N2b), for which there is controversy on whether ULRT is appropriate.

METHOD AND MATERIALS

The population included 159 patients treated with IMRT for tonsil cancer from 1997-2013. The primary tumor was treated to a median dose of RT was 66 Gy. PET was used in 113 (71%) patients. Fifty-two patients received ULRT for lateralized (>1cm from midline) tonsil cancer. Twenty-nine patients with N2b disease received ULRT and 56 received BLRT. All patients received surgery to the tonsil primary and 154 (97%) received neck dissection. We evaluated acute toxicity and patient-reported quality of life (PROQOL). We also reviewed cases of contralateral failures (CLF) in N2b patients receiving ULRT on PubMed, and correlated these outcomes to utilization of PET staging.

RESULTS

Median follow-up was 6.1 years. The 5 and 10-year rates of local-regional control (LRC) among patients treated with unilateral RT vs bilateral RT were 98% and 98% vs 96% and 96% respectively (p=0.41). There were no CLF. P16+ was associated with improved LRC on univariate and multivariate analysis (HR 0.11, p=0.02). Unilateral RT reduced use of reactive gastrostomy tube, xerostomia, pharyngitis, and weight loss. Global and xerostomia PROQOL were superior for unilateral radiation. Publications without use of staging PET had significantly higher rates of CLF in unilaterally treated stage N2b patients compared to studies that used staging PET (9.9% vs 1.4% CLF rate).

CONCLUSION

Unilateral neck radiation reduces acute toxicity and improves quality of life compared to bilateral radiation, and results in high LRC. For properly selected patients with well lateralized tumors (>1cm from midline), there was no difference in LRC between unilateral and bilateral radiation. In this study with high utilization of PET, we observed no CLF. FDG-PET staging may be useful when considering unilateral radiation in patients with stage N2b disease.

CLINICAL RELEVANCE/APPLICATION

This study highlights the importance of staging FDG-PET in contributing to proper patient selection when considering unilateral radiation in patients with stage N2b tonsil cancer.

MSRO42-06 Patterns of Loco-Regional Failure Following Post-Operative IMRT to Oral Cavity Cancer: Quantitative Dose-Volume Analysis Using a Standardized Pattern-of-Failure Typology

Wednesday, Nov. 30 11:20AM - 11:30AM Room: S103CD

Participants
Andrew Wong, BS, Houston, TX (*Presenter*) Nothing to Disclose
Abdallah S. Mohamed, MD, MSc, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Clifton D. Fuller, MD, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
David I. Rosenthal, Houston, TX (*Abstract Co-Author*) Advisory Board, Bristol-Myers Squibb Company Advisory Board, Merck KGaA Research support, Merck KGaA
Brandon Gunn, MD, Galveston, TX (*Abstract Co-Author*) Nothing to Disclose
Adam S. Garden, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Loco-regional failure is traditionally coded as a binary variable. For oral cavity cancer patients receiving post-operative intensity modulated radiotherapy (PO-IMRT), we seek to localize and identify volumetric/dosimetric patterns of failure with quantitative dose maps, using a standardized typology.

METHOD AND MATERIALS

Oral cavity cancer patients receiving PO-IMRT at our institution between 2001-2011 were identified. Diagnostic CT documenting recurrence (rCT) was co-registered with the original planning CT (pCT) with previously validated deformable image registration method. Manually segmented recurrent gross disease (rGTV) on the rCT was deformed to co-registered pCTs. Dose to 95% failure volume (fD95%) was compared to 95% dose to target volume the failure centroid originated from (pD95). Failures were classified into five types: A (fD95 higher than pD95, centroid within CTV1), B (fD95 higher, centroid in CTV2 or CTV3), C (fD95 lower, in CTV1), D (fD95 lower, in CTV2 or CTV3), E (centroid outside all target volumes), and F (centroid from matching low-neck supraclavicular field).

RESULTS

289 patients were reviewed. Local and loco-regional control at 5-years was 83% and 76%, respectively. Of 62 patients with documented local/regional failure, 51 had available rCT and pCT for analysis. 1-, 2- and 4-year overall survival was 74%, 30%, and 4%, respectively. Mean time to recurrence diagnosis post-radiation treatment was 6.4 months. Primary tumor sites were: 22 oral tongue, 10 alveolar ridge, 6 buccal mucosa, 6 retromolar trigone, 4 hard palate, and 3 floor of mouth. 83 rGTVs were identified (primary = 45, nodal = 38). Only 35 of 83 (42%) of failures were classified as Type A. Non-Type A failures were distributed as follows: 21 (25%) type B, 6 (7%) type C, 5 (6%) type D, 13 (16%) type E, and 3 (4%) type F.

CONCLUSION

Over half of failures following PO-IMRT in oral cavity cancer were not those that had originated from high-dose target volumes and that had received adequate dosimetric coverage. A standardized typology incorporating volumetric and dosimetric metrics adds value to failure characterization over simplistic binary "loco-regional failure" categories.

CLINICAL RELEVANCE/APPLICATION

A standardized typology for failure classification incorporating volumetric and dosimetric metrics can be utilized to infer mechanisms of failure and to identify interventions to reduce failure rates.

MSRO42-07 PET/CT in CT Simulation: Significance of a Standardized Positioning Protocol for Head and Neck Radiotherapy Planning

Wednesday, Nov. 30 11:30AM - 11:40AM Room: S103CD

Participants
George Tolekidis, Chicago, IL (*Presenter*) Nothing to Disclose
Miranda Thoma, BS,RT, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Mehee Choi, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Aidnag Z. Diaz, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Diagnostic imaging scans are a valuable tool for head and neck (H&N) cancer radiotherapy treatment planning (RTP). Information from diagnostic scans can be incorporated into the RTP process by performing a dedicated diagnostic scan in the treatment position or by co-registering an existing scan with the simulation scan. The purpose of this study was to use the clival incline to quantify differences in H&N positioning between patients undergoing diagnostic PET/CTs positioned with vs. without the RTP immobilization mask.

METHOD AND MATERIALS

Twenty patients receiving radiotherapy for H&N cancer from 2011-2015 at our institution were selected for this retrospective review. Ten patients underwent diagnostic PET/CT using the mask created during simulation (Group A) while ten patients underwent PET/CT without the mask (Group B). Clival incline was measured three times for each simulation and PET/CT group and used to obtain a mean clival incline value.

RESULTS

Mean clival incline measured on the CT from the PET/CT images in Group B was 61.44° (standard deviation (SD), 8.30°; standard error mean (SEM), 2.62°), while clival incline for Group A was 72.25° (SD, 7.78°; SEM, 2.46°). Comparing the simulation CT to the PET/CT, mean clival incline difference was 12.61° in Group B (SD, 5.62°; SEM, 1.78°), and 1.48° (SD, 1.03°; SEM, 0.32°) in Group A. These differences between the groups were statistically significant, p=.008 and p=.001, respectively, using T-test analysis for the equality of means.

CONCLUSION

Based on these results we reach two conclusions. 1) When no mask is used for PET/CT, there is a different approach to positioning: PET/CT technologists favor a neutral to flexion position, while we favor a neutral to extended position. 2) Using the simulation mask for PET/CT greatly reduces the difference in head position when compared to its respective simulation scan. This allows for more robust registration. When possible, patients should have PET/CT performed using the immobilization mask created for simulation. However, as this is not always feasible, a standardized neck positioning protocol for both H&N simulation and PET/CT scans should be explored.

CLINICAL RELEVANCE/APPLICATION

We hypothesize that simulating patients with their RTP mask will 1) increase patient comfort 2) allow for a superior registration and 3) not significantly affect plan quality.

MSRO42-08 Moderately Accelerated Radiotherapy for Early Stage Glottic Cancer: Report on 10 Year Experience

Wednesday, Nov. 30 11:40AM - 11:50AM Room: S103CD

Participants
Christopher Chipko, Richmond , VA (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Multiple fractionation schemes have been employed in the treatment of early stage glottic carcinomas. Acute and late toxicity widely varies among different regimens with similar outcomes in terms of local control (LC) and overall survival (OS). We sought to describe outcomes and toxicity of a unique moderately accelerated regimen of 65.1Gy in 31 daily fractions (fx). Materials/Methods: Records of patients treated with definitive radiation therapy for early stage glottic cancer (T1 a-b, NO) between 2006 and 2014 at Virginia Commonwealth University (VCU) were reviewed. A total of 38 patients were identified, with 34 having at least 2 year follow-up. Data regarding acute and late toxicity based on the Common Terminology Criteria for Adverse Events (CTCAE) was recorded as well as LC and OS.Results: Median follow-up was 49.5 months (24 – 93) with an OS of 100%. 33 out of 34 patients had no evidence of disease recurrence. Treatment was well tolerated with no grade 3 or higher acute toxicities. The most common grade 2 or under acute toxicities were dysphagia (29.4%, n=10), hoarseness (47%, n=16), and radiation dermatitis (29.4%, n=10). Mean pain score on a 0-10 scale during treatment was 4.55 (range 0-10). With regards to late toxicity, mean chronic pain score at subsequent follow up was 0.91 (range 0-8). Grade 0-1 late hoarseness was seen in 27 patients (79.4%) and grade 2 hoarseness in 7 patients (20.6%). One patient had grade 2 laryngeal edema and one patient had grade 2 chronic dysphagia (2.9%). There were no = grade 2 toxicities seen with respect to xerostomia, subcutaneous or deep tissue fibrosis, or head and neck lymphedema. There were no reported cases of spinal cord toxicity.Conclusion: Moderately accelerated radiation therapy to 65.1Gy in 31 fx as definitive treatment of early stage glottic carcinomas is an effective, well tolerated treatment regimen.

MSRO42-09 Inter-Scan Positional Variability of Head and Neck Soft Tissue on a Dedicated 1.5T MR Simulator with Open-Face Immobilization

Wednesday, Nov. 30 11:50AM - 12:00PM Room: S103CD

Participants
Oi Lei Wong, PhD, Happy Valley, Hong Kong (*Presenter*) Nothing to Disclose
Gladys G. Lo, MD, Happy Valley, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
Jing Yuan, PhD, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

With the advancement in radiotherapy treatment delivery techniques, quality of soft-tissue delineation for RT planning becomes increasingly important. Owing to the superior soft tissue contrast in MR images, MR-sim is superior to CT-sim. In this study, the inter-scan positional repeatability on MR-sim is quantitatively evaluated based on the concordance index (CI) and centroid position.

METHOD AND MATERIALS

Four healthy volunteers were scanned (4 scans for each on different days) using a T2w CUBE sequence with identical coverage, voxel-size(0.8x0.8x1.0mm^3) and receiver-bandwidth(62.5kHz) on a 1.5T MR-sim with open-face thermoplastic cast for immobilization. Image distortion was minimized using the system provided geometric correction function. VOIs of the parotid gland(PGs), intervertebral discs(C23,C67), brainstem(BS), pituitary gland(PIT) and eyeballs(EBs) were carefully drawn. For each volunteer, volume and centroid position of each VOI were calculated. CI and centroid shift of the delineated VOIs, all referencing to the first scan, were subsequently calculated.

RESULTS

The calculated CI (mean±SD) of C23, C67, PIT, EBL, EBR, PGL, PGR and BS were 0.13±0.04, 0.10±0.07, 0.25±0.13, 0.66±0.04, 0.68±0.03, 0.62±0.07, 0.66±0.06 and 0.72±0.08, respectively. For PGs, our CI was similar to the published CI for an interobserver study using CT-sim. The observed low CI in C23, C67 and PIT corresponded to the small intersection between the delineated VOI of different scan sessions. The mean 3D shift of C23, C67, PIT, EBL, EBR, PGL, PGR and BS were 3.73±1.41, 9.11±10.45, 3.20±1.17, 3.69±0.71, 3.46±0.65, 3.55±1.11, 3.50±2.61, 4.30±4.18mm. Small CI and large 3D shift indicated a large positional variability in C67 since C67 was located at the posterior end of the cast. For BS, the large CI and large 3D shift were noted. Large CI corresponded to a large VOI intersection, which was affected by multiple factors such as positional variability, shape and size of the delineated VOI.

CONCLUSION

Except for C67, acceptable 3D shift was obtained for all VOIs (3.2-4.3mm) using MR-sim.

CLINICAL RELEVANCE/APPLICATION

Measurement of the inter-scan positional variability of MR-sim is important as it is related to the normal tissue sparing and hence the treatment outcome.

SSK11

Molecular Imaging (Oncology)

Wednesday, Nov. 30 10:30AM - 12:00PM Room: S504CD

MI RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants
Umar Mahmood, MD, PhD, Charlestown, MA (*Moderator*) Research Grant, Sabik Medical Inc; Advisory Board, Blue Earth Diagnostics Ltd;
Yasuhisa Fujibayashi, PhD, Fukui, Japan (*Moderator*) Nothing to Disclose

Sub-Events

SSK11-01 A Dual-Labeled Anti-CD 146 Monoclonal Antibody for PET/NIRF Detection of Liver Malignancies

Awards
Student Travel Stipend Award

Participants
Emily B. Ehlerding, Madison, WI (*Presenter*) Nothing to Disclose
Reinier Hernandez, MSc, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Haiyan Sun, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Yunan Yang, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Christopher England, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Todd Barnhart, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Weibo Cai, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Due to hepatic clearance of the majority of contrast agents, molecular imaging of liver malignancies is challenging. However, overexpression of CD146 has been associated with aggressiveness and metastatic potential in liver cancer. Herein we develop a CD146-targeted probe for high contrast positron emission tomography (PET) and nearinfared fluorescence (NIRF) imaging of liver cancer.

METHOD AND MATERIALS

In vitro expression levels of CD146 were characterized in the liver cancer cell lines HepG2 (+) and Huh7 (-) via several in situ methods. YY146, an anti-CD146 monoclonal antibody, was conjugated to the NIRF dye ZW800-1 and to deferoxamine (Df) for radiolabeling with 89Zr. Sequential PET and NIRF imaging were performed after intravenous injection of 3.7 – 7.4 MBq of 89Zr-Df-YY146-ZW800 in athymic nude mice bearing HepG2 or Huh7 subcutaneous (s.c.) xenografts. Orthotopic tumors were generated by injection of luciferase-transfected HepG2 cells into the liver, allowing progression monitoring by bioluminescent imaging. Multimodality imaging was carried out in mice with confirmed orthotopic liver tumors as described for s.c. tumors. At 168 h p.i., tissues were collected for ex vivo NIRF imaging, biodistribution, and histological studies.

RESULTS

PET and NIRF imaging unveiled a prominent and persistent uptake of 89Zr-Df-YY146-ZW800 in HepG2 tumors that peaked at 31.7±7.2 %ID/g 72 h p.i. Owing to such marked accumulation, the detection of orthotopic HepG2 tumors was successful despite the relatively high liver background. CD146-negative Huh7 and CD146-blocked HepG2 tumors exhibited significantly lower 89Zr-Df-YY146-ZW800 accretion (6.1±0.5 and 8.1±1.0 %ID/g at 72 h p.i., respectively), demonstrating the CD146-specificity of the tracer in vivo. Ex vivo studies verified the accuracy of the imaging data and correlated 89Zr-Df-YY146-ZW800 uptake with in situ CD146 expression.

CONCLUSION

Overall, 89Zr-Df-YY146-ZW800 showed excellent properties as a PET/NIRF imaging agent, including high specificity for CD146-expressing liver cancer. Molecular imaging using dual-labeled YY146 had great potential for noninvasive detection and image-guided resection of liver malignancies.

CLINICAL RELEVANCE/APPLICATION

Liver malignancies are often difficult to distinguish from background tissue. Thus, we present a dual nearinfared- and radio-labeled antibody targeting CD146 for detection of these malignancies.

SSK11-02 Role of 11C-Acetate and 18F FDG Dual Tracer PET-CT Scan for Detection of Hepatocellular Carcinoma

Wednesday, Nov. 30 10:40AM - 10:50AM Room: S504CD

Participants
Wan Hang K. Chiu, MBBCh, FRCR, Hong Kong, Hong Kong (*Presenter*) Nothing to Disclose
Pek Lan Khong, MBBS, FRCR, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
Tony Kwok Loon Loke, MBBS,FRCR, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
Joseph K. Lee, MD, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Up to 45% of Hepatocellular Carcinoma (HCC) show atypical contrast enhancement (CE) pattern on CT/MR, thereby requiring

histologic confirmation. The aim of this study is to evaluate the additional value of Dual Tracer (DT) PET with 11C Acetate (Ac) and 18F FDG for detection and characterization of HCC.

METHOD AND MATERIALS

Consecutive patients who had histological confirmation of HCC and underwent CT/MR and DT in our centres from 2014-16 were identified. CE and PET uptake patterns were reviewed. Typical CE pattern on CT/MR was arterial hyperenhancement followed by portovenous/delayed phase washout. All other CE patterns were considered atypical. On PET, a lesion was deemed positive by visual inspection of lesion above background liver uptake on Ac and/or FDG. Results were compared with tumor size and grade on histology. Tumour size were separated into <3 cm, 3-5 cm and >5 cm groups as each has different treatment option. Grading was based on Edmondson and Steiner system. Pearson's Chi-Square tests were applied to compare the sensitivities and ANOVA-test for subgroup analysis.

RESULTS

Thirty-two HCC lesions from 24 patients were identified (mean size ± SD 34 ± 27 mm). The sensitivity of CT/MR by CE pattern was 53%, FDG alone 56%, Ac alone 94%, DT 97% and combined CT/MR with DT 100% ($p<0.0001$).Two lesions were non-Ac avid. Enhancement pattern were not affected by tumour size whereas FDG sensitivities increase with tumour size from 39% to 67% and 75% for lesions <3 cm, 3-5 cm and >5cm respectively.Histological grade available in 30 lesions were well differentiated HCC (n=7), moderately-differentiated HCC (n=22) and poorly differentiated HCC (n=1). Atypical enhancement pattern was more common in well-differentiated compared to moderately-differentiated lesions (71% vs 45%). No trend was observed for tracer avidities in different grades of HCC.

CONCLUSION

DT combined with CT/MR increases the sensitivity of HCC detection compared to CT/MR alone, providing 100% sensitivity and hence, being most helpful in equivocal liver lesions with atypical contrast enhancement.

CLINICAL RELEVANCE/APPLICATION

The use of DT obviates tissue sampling for diagnosing HCC in patients with liver lesions with atypical CT/MR contrast enhancement.

SSK11-03 64Cu-Labeled Ipilimumab for Determination of CTLA-4 Levels in Lung Cancer

Wednesday, Nov. 30 10:50AM - 11:00AM Room: S504CD

Participants
Emily B. Ehlerding, Madison, WI (*Presenter*) Nothing to Disclose
Christopher England, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Stephen Graves, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Glenn Liu, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Robert J. Nickles, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Weibo Cai, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

CTLA-4 is expressed on the surface of activated T cells and some cancer cells, and is the target of the clinically-approved monoclonal antibody Ipilimumab. Ipilimumab is only successful in a small subset of patients, making neoadjuvant patient selection crucial. In this study, we employ radiolabeled 64Cu-DOTA-Ipilimumab to monitor CTLA-4 expression levels in subcutaneous (s.c.) lung cancer xenografts using positron emission tomography (PET).

METHOD AND MATERIALS

Ipilimumab was conjugated with the chelator 1,4,7,10-tetraazacyclododecane-1,4,7,10-tetraacetic acid (DOTA) for radiolabeling with 64Cu ($t1/2 = 12.7$ h). Western blot, ELISA, flow cytometry, and live cell imaging were employed to determine the CTLA-4 expression levels of three lung cancer cell lines: A549, H460, and H358. Longitudinal PET studies following intravenous injection of 64Cu-DOTA-Ipilimumab into mice bearing s.c. xenografts of the aforementioned lung cancer cells allowed for tracer uptake to be quantified up to 48 h p.i. Ex vivo biodistribution and histological studies were employed to verify PET results.

RESULTS

By in situ analysis, A549 was found to have the highest CTLA-4 expression level, and H358 the lowest. PET quantification verified these results, with A549 tumor uptake peaking at 13.1 ± 3.9 %ID/g, H460 at 10.5 ± 1.9 %ID/g, and H358 at 8.3 ± 1.3 %ID/g, 48 h p.i. A549-blocked mice also displayed decreased tracer uptake values at 8.1 ± 1.0 %ID/g. Ex vivo analysis following the terminal imaging timepoint also corroborated these findings.

CONCLUSION

Radiolabeled 64Cu-DOTA-Ipilimumab is able to differentiate tumors based on their CTLA-4 expression levels noninvasively using PET. Thus, this antibody holds promise to be employed in small doses prior to immunotherapy treatment to predict the success of such anti-CTLA-4 therapy and aid in patient selection.

CLINICAL RELEVANCE/APPLICATION

Anti-CTLA-4 immunotherapies are effective in a small subset of patients. Thus, we use 64Cu-DOTA-Ipilimumab to determine tumors which have high expression levels and may respond well to such therapy.

SSK11-04 Molecular Optical Imaging in Radiofrequency Heating-Enhanced Direct Intratumoral HSV-TK Gene Therapy of Cholangiocarcinoma

Wednesday, Nov. 30 11:00AM - 11:10AM Room: S504CD

Participants
Yin Jin, MD, Seattle, WA (*Presenter*) Nothing to Disclose
Feng Zhang, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Jun Gao, MD, PhD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

Xiaoming Yang, MD, PhD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To validate the feasibility of using molecular optical imaging to monitor radiofrequency heating (RFH)-enhanced herpes simplex virus thymidine kinase (HSV-TK)/ganciclovir (GCV) therapy of cholangiocarcinomas.

METHOD AND MATERIALS

This study included in-vitro confirmation experiments with luciferase/mCherry-labelled human cholangiocarcinoma cells (Mz-Cha-1) and in-vivo validation experiments using mouse models with luciferase/mCherry-cholangiocarcimonas. Both in-vitro and in-vivo experiments were divided into four groups with treatments of: (i) combination therapy (green fluorescent protein (GFP)/HSV-TK/plasmid gene transfection plus RFH at 42°C,and followed by ganciclovir administration; (ii) gene therapy alone; (iii) RFH alone; and (iv) saline. GFP optical imaging was first performed to detect successful expression of GFP/HSV-TK genes, while bioluminescent optical imaging used to follow up tumor responses to various treatments among different groups, which were correlated with subsequent histologic confirmation.

RESULTS

Of in-vitro experiments, MTS assay demonstrated the lowest cell proliferation in combination therapy compared with three control groups (24.1±7.2% vs 41.6±4.9% vs 72.3±7.9% vs 100%, $p<0.05$). Of in-vivo experiments, GFP optical imaging detected greater green fluorescent signal from GFP/HSV-TK/plasmid-transfected tumors than non-gene transfected tumors (200.73±37.85 VS 52.80±17.36, $p<0.05$), which indicated successful expression of GFP/HSV-TK genes. Bioluminescent optical imaging demonstrated decreases of both bioluminescence signals and tumor sizes in combination therapy, compared to other control groups (0.68±0.11 vs 1.47±0.19 vs 2.01±0.33 vs 2.33±0.41, $p<0.05$), which were confirmed by histologic correlation (Figure).

CONCLUSION

We have established the "proof-of-principle" of using molecular optical imaging to monitor RFH-enhanced GFP/HSV-TK/plasmid gene expression and HSV-TK/GCV gene therapy of cholangiocarcinoma.This concept may pave a new avenue for management of pancreatobiliary malignancies by simultaneous integration of molecular optical imaging, radiofrequency technology, interventional oncology,and direct intratumoral gene therapy.

CLINICAL RELEVANCE/APPLICATION

This concept may pave a new avenue for management of cholangiocarcinoma by simultaneous integration of molecular optical imaging,radiofrequency technology,interventional oncology,and gene therapy.

SSK11-05 89Zr-Labeled Pembrolizumab for Neoadjuvant Imaging and Human Dosimetry Estimation

Wednesday, Nov. 30 11:10AM - 11:20AM Room: S504CD

Participants
Emily B. Ehlerding, Madison, WI (*Presenter*) Nothing to Disclose
Christopher England, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Reinier Hernandez, MSc, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Stephen Graves, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Todd Barnhart, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Weibo Cai, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Pembrolizumab is a clinically-available humanized monoclonal antibody that targets programmed cell death protein (PD-1) on the surface of activated T and B cells. In order to potentially identify patients who would benefit from such therapy, herein we evaluate the pharmacokinetics, biodistribution, and dosimetry of 89Zr-labeled pembrolizumab in vivo using positron emission tomography (PET).

METHOD AND MATERIALS

Pembrolizumab was conjugated with the chelator desferrioxamine (Df) for radiolabeling with 89Zr ($t_{1/2}$ = 3.3 days). Whole-body tracking of the radiolabeled antibody was compared in two murine models, including NSG and PBL mice (NSG mice reconstituted with human peripheral blood mononuclear cells). Mice were injected with 5-10 MBq of radiolabeled antibody. Timepoints from 0.5 h to 168 h p.i. were utilized in the PET study to fully capture the pharmacokinetics of Pembrolizumab. Biodistribution data obtained from PET scans were extrapolated to predict radiation dose estimates in humans.

RESULTS

In all groups, 89Zr-Df-Pembrolizumab stayed in circulation throughout the study and accumulated greatest in liver and spleen. Notable biodistribution differences between PBL and NSG mice included significant uptake in salivary glands in PBL mice, indicating the specificity of Pembrolizumab for human T-cells, which localize here following an autoimmune response. Peak uptake values for the liver of 14.40 ± 1.55 %ID/g for PBL and 12.93 ± 1.96 %ID/g for NSG mice, and for the spleen of 7.33 ± 1.53 %ID/g for PBL and 5.48 ± 0.71 %ID/g for NSG were found 0.5 h p.i. with values steadily declining thereafter. Even with relatively high uptake in these clearance organs, the estimated doses remained well within safe limits, with a total body effective dose of 0.515 ± 0.005 mGy/MBq calculated.

CONCLUSION

The low total body and major organ doses found in this study indicate the potential use of 89Zr-Df-Pembrolizumab for the clinical selection of patients that may benefit from anti-PD-1 therapy. The techniques in this study may be further applied to other antibodies for better understanding of the pharmacokinetics, biodistribution, and dosimetry for future clinical applications.

CLINICAL RELEVANCE/APPLICATION

Herein we evaluate a radiolabeled, clinically-approved antibody, 89Zr-Df-Pembrolizumab, targeting PD-1, that could potentially screen for patients who would respond to such anti-PD-1 immunotherapy.

SSK11-06 Prolactin Receptor-Mediated Internalization of Imaging Agents Detects Epithelial Ovarian Cancer with

Enhanced Sensitivity and Specificity

Wednesday, Nov. 30 11:20AM - 11:30AM Room: S504CD

Participants
Karthik M. Sundaram, MD, PhD, Nashville, TN (*Presenter*) Nothing to Disclose
Yilin Zhang, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Brian B. Roman, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Joseph A. Piccirilli, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Ernst Lengyel, MD,PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To develop a highly sensitive, specific, and clinically amenable molecular imaging agent for ovarian cancer diagnosis that enables (i) detection of tumors when they are still small, confined to the pelvis, and curable and (ii) differentiation between benign and malignant ovarian tumors.

METHOD AND MATERIALS

We used tissue microarray analysis to identify the prolactin receptor (PRLR) as a high specificity biomarker for malignant OvCa. We conjugated gadolinium-chelates and near-infrared fluorescence imaging probes to human placental lactogen (hPL), a specific and high affinity PRLR ligand, and evaluated internalization by PRLR (+) and PRLR (-) ovarian cancer cells. We further evaluated that capacity of hPL-conjugates and reduced binding hPL analog conjugates to imaging mouse xenografts of human ovarian cancer by magnetic resonance imaging and near-infrared fluorescence imaging.

RESULTS

Our results indicate that > 98% of OvCas over-express PRLR regardless of stage, grade, and type. Furthermore, we show both hPL-gadolinium conjugates and hPL-near-infrared probes conjugates internalize specifically and efficiently into PRLR (+) cancer cells in OvCa mouse models. This enables detection of xenograft PRLR (+) tumors in mice with substantially greater specificity and sensitivity than currently used clinical contrast agents.

CONCLUSION

Using prolactin receptor-mediated internalization, hPL-conjugates demonstrate the specificity to distinguish PRLR (+) from PRLR (-) tumors in mouse models of ovarian cancer. Given that > 98% of OvCas over-express PRLR, we believe our ability to image PRLR will enhance specificity and sensitivity of ovarian cancer diagnosis.

CLINICAL RELEVANCE/APPLICATION

Given the difficulties of currently used methods for ovarian cancer diagnosis, we believe molecular PRLR imaging using hPL-conjugates will engender a new paradigm for targeted molecular imaging of OvCa. Coupled with magnetic resonance imaging, molecular PRLR imaging holds the potential to achieve a more precise and earlier diagnosis of OvCa, thereby reducing the number of unnecessary surgeries and increasing patient survival.

SSK11-08 Differential Uptake of CD146-Specific Antibody in Solid Lung Malignancies

Wednesday, Nov. 30 11:40AM - 11:50AM Room: S504CD

Participants
Christopher England, PhD, Madison, WI (*Presenter*) Nothing to Disclose
Haiyan Sun, Da Lian, China (*Abstract Co-Author*) Nothing to Disclose
Reinier Hernandez, MSc, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Yunan Yang, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Todd Barnhart, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Weibo Cai, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Recent studies have revealed that a cell surface protein called CD146 is a marker of epithelial-to-mesenchymal transition (EMT) in cancer cells whose overexpression has also been found to correlate with cancer progression, invasion, and metastasis. Additionally, CD146 has low background levels in normal tissue as well as differential expression in metastases and advanced primary tumors, showing its significant potential in cancer therapies. This study evaluates the utilization of YY146, an anti-CD146 monoclonal antibody, for molecular imaging of solid lung malignancies.

METHOD AND MATERIALS

The anti-CD146 antibody (YY146) was conjugated to 1,4,7-triazacyclononane-triacetic acid (NOTA) and radiolabeled with 64Cu. CD146 expression was evaluated in six human lung cancer cell lines (A549, NCI-H358, NCI-H522, HCC4006, H23, and NCI-H460) by flow cytometry and quantitative Western blot studies. The biodistribution and tumor uptake of 64Cu-NOTA-YY146 was assessed by sequential PET imaging in athymic nude mice bearing subcutaneous lung cancer xenografts. The correlation between CD146 expression and tumor uptake of 64Cu-NOTA-YY146 was evaluated by graphical software while ex vivo biodistribution and immunohistochemistry studies were performed to validate the accuracy of PET data and spatial expression of CD146.

RESULTS

Flow cytometry and Western blot studies showed similar findings with H460 and H23 cells highly expressing CD146. Small differences in CD146 expression levels were found between A549, H4006, H522, and H358 cells. Tumor uptake of 64Cu-NOTA-YY146 was highest in CD146-expressing H460 and H23 tumors, peaking at 20.1 ± 2.86 and 11.6 ± 2.34 %ID/g at 48 h post-injection (n=4). Tumor uptake was lowest in the H522 model (4.1 ± 0.98 %ID/g at 48 h post-injection; n=4), while H4006, A549 and H358 exhibited similar uptake of 64Cu-NOTA-YY146. A positive correlation was found between tumor uptake of 64Cu-NOTA-YY146 (%ID/g) and relative CD146 expression ($r^2=0.98$, $p<0.01$). Ex vivo biodistribution corroborated the accuracy of PET data.

CONCLUSION

The strong correlation between tumor uptake of 64Cu-NOTA-YY146 and CD146 expression demonstrates the potential use of this

radiotracer for imaging tumors that elicit varying levels of CD146.

CLINICAL RELEVANCE/APPLICATION

This imaging tracer may promote enhanced monitoring of therapeutic response and improved patient stratification.

SSK11-09 Smartphone based Diagnostics (D3) Enable Molecular Characterization of Lymphoma in Resource-limited Countries

Wednesday, Nov. 30 11:50AM - 12:00PM Room: S504CD

Awards
Student Travel Stipend Award

Participants
Aoife Kilcoyne, MBBCh, Boston, MA (*Presenter*) Nothing to Disclose
Divya Pathania, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Hyungsoon Im, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Hakho Lee, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Cesar Castro, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Ralph Weissleder, MD, PhD, Boston, MA (*Abstract Co-Author*) Investor, T2 Biosystems, Inc

PURPOSE

A major hurdle in cancer therapy is it's timely diagnosis and treatment. This is of particular concern in resource-limited settings. For example, aggressive forms of non-Hodgkins lymphoma are major health concerns in sub-Saharan Africa. A substantial number of cases evade comprehensive evaluation and are not appropriately classified due to the lack of proper tissue specimens, diagnostic reagents and specialists. Although a good proportion of cases are curable even in low and middle income countries, windows of therapuetic opportunity are often missed due to delay in diagnosis. This necessitates the need for a low-cost, rapid and accurate detection technology to expedite the diagnosis of aggressive lymphomas (and other prevalent cancers) in the resource-limited environment.

METHOD AND MATERIALS

We have developed a digital diffraction diagnostic (D3) platform that allows modern smartphones to be used for molecular cancer diagnostics of scant clinical samples (fine needle aspirates). Fine Needle Aspirate (FNA) samples are immunolabeled with microbeads in a microfluidic module and then holographically detected by the smartphone camera.

RESULTS

Diffraction patterns generated by the antibody-microbeads were detected with the smartphone camera using bright-field settings. Digital signal processing was used to reconstruct images to count bead-bound cells. We optimized the assay so that thousands of cells could be analyzed without washing steps in near real-time. The D3 profiling results on lymphoma cell lines demonstrated excellent agreement with those by flow cytometry (gold standard). We further analyzed scant clinical samples (FNAs) from 8 patients. The D3 assay generated readouts within an hour and demonstrated agreement (100%) with standard pathology.

CONCLUSION

The D3 approach of molecular analysis could have far reaching applications. The major advantages are the simplicity of the method, the accuracy and it's ability to be used in resource-limited settings.

CLINICAL RELEVANCE/APPLICATION

Leveraging smartphones as a mobile diagnostic terminal could empower resource-poor communities with complex laboratory tests. This work addresses the practical diagnostic needs of low and middle income countries and reflects the type of technologies that may gain sustainable traction in such settings.

SSK18

Radiation Oncology (Lung)

Wednesday, Nov. 30 10:30AM - 12:00PM Room: S104A

CH RO OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Meng X. Welliver, MD, Columbus, OH (*Moderator*) Nothing to Disclose
Matthew M. Harkenrider, MD, Maywood, IL (*Moderator*) Nothing to Disclose

Sub-Events

SSK18-01 A Comparison of Chemoradiotherapy Regimens used for Elderly Patients with Stage III Non-Small Cell Lung Cancer in the US

Awards
Student Travel Stipend Award

Participants
Jeremy P. Harris, MD , Stanford, CA (*Presenter*) Nothing to Disclose
Manali Patel, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Billy W. Loo JR, MD, PhD, Stanford, CA (*Abstract Co-Author*) Research support, Varian Medical Systems, Inc; Research support, RaySearch Laboratories AB; Board Member, TibaRay, Inc
Heather Wakelee, MD, Stanford, CA (*Abstract Co-Author*) Research Grant, F. Hoffmann-La Roche Ltd; Research Grant, Eli Lilly and Company; Research Grant, Exelixis, Inc; Research Grant, Novartis AG; Research Grant, Pfizer Inc; Research Grant, Celgene Corporation; Research Grant, AstraZeneca PLC; Research Grant, Regeneron Pharmaceuticals, Inc; Research Grant, Clovis Oncology, Inc; Research Grant, Gilead Sciences, Inc; Research Grant, Xcovery; Research Grant, Bristol-Myers Squibb Company; Research Consultant, Peregrine Pharmaceuticals, Inc; Research Consultant, ACEA Biosciences, Inc; Research Consultant, Pfizer Inc; Research Consultant, Helsinn Healthcare SA;
Maximilian Diehn, MD, PhD, San Carlos, CA (*Abstract Co-Author*) Consultant, F. Hoffmann-La Roche Ltd; Consultant, Quanticel Pharmaceuticals Inc; Research Grant, Varian Medical Systems, Inc

PURPOSE

The standard of care for patients with unresectable stage III non-small cell lung cancer (NSCLC) is definitive radiation with concurrent chemotherapy. For these patients, consolidation chemotherapy is frequently given, although several randomized trials have failed to show a benefit. We explored the association of consolidation chemotherapy with outcomes using a population-based comparative effectiveness approach.

METHOD AND MATERIALS

Surveillance, Epidemiology, and End Results (SEER)-Medicare was used to identify patients aged ≥65, diagnosed 2002-2009, and treated with definitive radiation. We identified the various platinum-based doublet chemotherapy agents used. Chemoradiotherapy regimens were given as either sequential, concurrent only, concurrent with induction, or concurrent with consolidation. Outcomes were overall survival (OS) and cancer specific survival (CSS). Survival was estimated using the Kaplan-Meier method, with comparisons being made using log-rank tests, Cox proportional hazards models, and Royston-Parmar flexible parametric models.

RESULTS

2,006 patients were identified. Median OS was 18 months, with 1- and 2-year survival estimates of 68% (66-70%) and 39% (37-41%). The majority of patients (97%) received carboplatin-paclitaxel/docetaxel/gemcitabine/etoposide or cisplatin-etoposide. The use of consolidation chemotherapy was associated with improved OS and CSS compared to concurrent chemotherapy alone, with a multivariate adjusted OS HR of 0.82 ($p = 0.0098$) and CSS HR of 0.82 ($p = 0.03$). Propensity score adjusted analyses demonstrated similar results. In subset analyses, the benefit of consolidation chemotherapy was found only for patients treated with carboplatin-based doublets and not with cisplatin-etoposide.

CONCLUSION

For elderly patients in the US with NSCLC being treated with definitive concurrent chemoradiation, we found that patients receiving cisplatin during radiation do not appear to benefit from additional chemotherapy. However, for patients receiving carboplatin, consolidation chemotherapy appears to result in improved survival.

CLINICAL RELEVANCE/APPLICATION

For elderly patients with stage III non-small cell lung cancer treated with concurrent chemotherapy and radiation, additional consolidation chemotherapy should be given when carboplatin is used.

SSK18-02 What are Recurrence Patterns in Patients with Malignant Pleural Mesothelioma Treated with IMRT after Lung-sparing Pleurectomy/Decortication?

Wednesday, Nov. 30 10:40AM - 10:50AM Room: S104A

Participants
Micheal H. Raj, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Darragh Halpenny, MBBCh, MRCPI, New York, NY (*Presenter*) Nothing to Disclose
Andreas Rimner, MD, New York, NY (*Abstract Co-Author*) Research Consultant, General Electric Company Research Consultant, Varian Medical Systems, Inc Research Grant, Varian Medical Systems, Inc
Michelle S. Ginsberg, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study is to asses patterns of recurrence in patients with malignant pleural mesothelioma (MPM) treated with hemithoracic pleural intensity-modulated radiation therapy (IMRT) after lung-sparing pleurectomy/decortication.

METHOD AND MATERIALS

The institutional review board approved this study. Consecutive patients with MPM treated with lung-sparing pleurectomy/decortication and IMRT between February 21, 2005 and December 1, 2015 were included. Only patients who had chest CTs pre and post IMRT were included and imaging was retrospectively reviewed by two radiologists in consensus. Features assessed included: presence or development of single or multiple pleural or parenchymal nodules or consolidation, focal or diffuse pleural thickening, pleural effusion, chest wall mass or peritoneal disease.

RESULTS

Fifty patients with MPM treated with lung-sparing pleurectomy/decortication and IMRT were included. The MPM subtypes on histology included: 41 epithelioid (82%), 2 sarcomatoid (4%), and 7 biphasic (14%). 25 patients (50%) had residual disease after surgery on the baseline CT prior to IMRT. 39 patients (78%) had recurrent disease on CT: 21 local, 13 distant and 5 local and distant.Of the 26 patients with local recurrence, the most common CT appearance of pleural recurrence were new/ increased focal mass or pleural thickening, nodular pleural thickening or multiple new pleural nodules. In the 25 patients without local recurrence, the most common appearance included stable or decreased pleural thickening or new/increased diffuse smooth pleural thickening. In the 18 patients with distal recurrence, the most common sites were in the lung parenchyma or peritoneum.

CONCLUSION

In patients with MPM treated with lung-sparing pleurectomy/decortication and IMRT local recurrence presented as new/increased focal pleural mass/thickening, diffuse nodular pleural thickening, or multiple pleural nodules. The most common sites for distant recurrence were lung parenchyma and peritoneum.

CLINICAL RELEVANCE/APPLICATION

Familiarity with the patterns of recurrence on CT in patients with MPM treated with IMRT is important in the follow up of these patients.

SSK18-03 Prognostic Potential of CBCT for Tracking Tumor Regression in Stage II-III Non-Small Cell Lung Cancer

Wednesday, Nov. 30 10:50AM - 11:00AM Room: S104A

Awards
Student Travel Stipend Award

Participants
Kylie Kang, BS, Cleveland, OH (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): During external beam radiation therapy (EBRT) of lung cancer, cone beam computed tomography (CBCT) is routinely performed for image guidance. This study was conducted in order to determine the prognostic potential of CBCT for evaluating treatment outcome in terms of GTV reduction and to determine the difference of tumor reduction based on different histology. Materials/Methods: Forty-one NSCLC patients treated with definitive radiotherapy at one institution who received daily CBCT were randomly selected. Patients received mean EBRT of 60.7 Gy (range: 50-71.4 Gy) at 1.8 or 2 Gy per fraction. Initial mean gross tumor volume (GTV) was 197.3 cc (range: 3.4-1815.0 cc). Six sets of CBCT at an interval of one week were chosen, starting from the first fraction of treatment. The CBCTs were transferred to MIM Software (v.6.0) and single physician manually contoured the GTV on each slice. The change in GTV was recorded. Patient's clinical information was obtained from the institution electronic medical record. All statistical analysis was conducted on MedCalc (v.16.2). Univariate survival analysis was done using the Kaplan-Meier method with log-rank test. Median overall GTV reduction was used as a cutoff value (DGTVDGTV=45%). A univariate regression analysis was done to explore the correlation between histology and GTV reduction. A pResults: A consistent regression of GTVs was observed in 29 patients, while 12 patients experienced an increase of GTV at some point during their EBRT. Maximum reductions occurred during week 1 and 2 week of radiation, with mean % reductions of 13.5% and 12.6%, respectively. There was an overall GTV % reduction between weeks 1 to 6 in all 41 patients (median: 45%). The recurrence free survival (RFS) in our stratified group with DGTVDGTV=45% was 24.3 months (SE: 4.6) (p= 0.61). Overall survival (OS) for the group of patients with DGTVDGTV=45% (p= 0.21). There was a 6.6% greater overall GTV reduction in adenocarcinoma versus SCC on univariate regression analysis (p= 0.31). There was no statistical significance between histology and RFS (p=0.84) or OS (p=0.06).Conclusion: Large regression of GTV over the course of EBRT for stage II-III NSCLC patients was observed, however, no correlation was found with clinical outcome (RFS, OS). There was slightly higher GTV reduction in adenocarcinoma as compared to SCC, but no statistical significance. A future study with larger sample size involving multivariable analysis is warranted.VariablesMean/Median/CountSD/Range/%Median Age (y)6244-80Gender (#) Female/Male27/1465.9%/34.1Week 1 GTV (cc) Mean197.33.4-1815 Median68.93.4-1815Follow-Up (months) Median12.41.9-61.3

SSK18-04 Stereotactic Radiotherapy for early Stage Non-small Cell Lung Cancer in a Community Based Cancer Practice

Wednesday, Nov. 30 11:00AM - 11:10AM Room: S104A

Participants
Jonathan Ciochon, Chicago, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Initially starting at academic institutions, Stereotactic Radiotherapy (SRT) for non-small cell lung cancer (NSCLC) has been in clinical use for a number of years and now has become available at most community based cancer centers. We report SRT data of early stage NSCLC patients treated at our rural community based cancer center.Materials/Methods: Feb 2014 through Jan 2016, medical records of all patients treated with SRT at CHI-Health St Francis Cancer Treatment Center were identified. Only patients with NSCLC treated with SRT were included in the analyses. All patients were medically inoperable or

declined surgery. CT and/or PET-CT imaging were utilized for staging. ECOG performance score and Charlson Comorbidity index were calculated for each patient prior to treatment. SRT was given either in 3 fractions of 20 Gy or 4 fractions of 12.5 Gy each, depending on tumor size and/or patient tolerance. The mean total dose was 55 Gy (range 50-60 Gy). No patients received adjuvant or neoadjuvant chemotherapy. Overall (OS) and Progression-Free (PFS) survival, toxicity, and radiographic responses were determined using conventional criteria.Results: A total of 41 patients (13F/28M) with a median age of 75 (range 60-82) were identified who had received SRT during the study period. Twenty-seven of them were NSCLC patients with clinical stage I-II (T1-2, N0, M0) disease. Histology was adenocarcinoma in 14 (52%), squamous cell in 12 (44%), and poorly differentiated carcinoma in 1 (4%) patient. Median ECOG score was 1 (range 0-2), median Charlson Comorbidity index was 6. Total of 9 (33 %) patients received 4 fractions and 18 (66%) patients received 3 fractions. The median follow-up was 12 months (range1-24 months). Ninety-two percent (25/27) of patients were alive and progression free at the time of analysis. Overall median survival and progression free survival have not been reached yet. Overall radiographic response on follow-up imaging was 86% (23/27). Eighteen percent (4/23) of responders had a Complete Response(CR) and 82% (19/23) had a Partial Response (PR). Toxicity included dyspnea, fatigue, and dermatitis, with 10% grade 1, 15% grade 2. There were no grade 3 or 4 complications.Conclusion: SRT for early stage NSCLC delivered in a community based practice is safe and effective making it a reasonable alternative for surgically unfit patients. Our local control and toxicity outcomes are similar to those reported in tertiary centers. Larger prospective studies of SRT in the community setting are needed. With the availability of newer and much less toxic biologic systemic treatments for NSCLC, studies exploring the utility and indications of neoadjuvant and/or adjuvant approaches with SRT may make this treatment modality even more appealing.

SSK18-05 Prognostic Value of Pretreatment PET Parameters in Stereotactic Ablative Radiotherapy (SABR) for Metastatic Non-Small Cell Lung Cancer

Wednesday, Nov. 30 11:10AM - 11:20AM Room: S104A

Awards
Trainee Research Prize - Resident

Participants
Alexander L. Chin, MD, MBA, Stanford, CA (*Presenter*) Nothing to Disclose
Kiran A. Kumar, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Henry Guo, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Peter G. Maxim, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Maximilian Diehn, MD, PhD, San Carlos, CA (*Abstract Co-Author*) Consultant, F. Hoffmann-La Roche Ltd; Consultant, Quanticel Pharmaceuticals Inc; Research Grant, Varian Medical Systems, Inc
Billy W. Loo JR, MD, PhD, Stanford, CA (*Abstract Co-Author*) Research support, Varian Medical Systems, Inc; Research support, RaySearch Laboratories AB; Board Member, TibaRay, Inc
Michael Gensheimer, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Increasing interest exists in the use of stereotactic ablative radiotherapy (SABR) for treatment of patients with oligometastatic non-small cell lung cancer (NSCLC). Factors influencing outcomes after SABR for metastatic NSCLC are still unclear. We hypothesized that metabolic burden of disease on FDG PET at time of SABR can serve as a biomarker of survival outcome.Materials/Methods: Patients with metastatic NSCLC who received SABR, defined as total BED10 of =50 Gy delivered in =8 fractions, to one or more lesions were identified. All patients underwent FDG PET within 30 days prior to start of radiotherapy (RT). Patients with untreated brain metastases or who received either RT to the brain or non-SABR RT to any site within 2 weeks of SABR treatment were excluded from the analysis. Metabolic tumor volume (MTV) and total lesion glycolysis (TLG) were measured on pretreatment PET separately for treated and untreated lesions using a gradient-based method. Cox regression was used to assess the influence of imaging and clinical factors on overall survival (OS).Results: 59 treatment courses in 44 patients qualified for analysis, with median number of lesions treated of 1 (range 1 to 6) and median BED10 of 87.5 Gy (range 50.4 to 180 Gy). 66% (n=39) of treatment courses involved oligometastatic disease, defined as =5 total metastatic lesions. The most commonly treated sites were primary tumor (n=18), bone (n=17), and lung metastasis (n=14). With a median follow-up of 13.6 months, there were 4 local failures (7%). Median progression-free survival (PFS) and OS were 6.6 and 28.6 months, respectively. On univariate Cox regression, factors predictive of OS were MTV of untreated lesions (hazard ratio [HR] 1.024 for a 1 mL increase in MTV; p=0.003), TLG of untreated lesions (HR 1.003 for a 1 unit increase in TLG; p=0.008), MTV of all lesions (HR 1.012; p=0.02), and TLG of all lesions (HR 1.002; p=0.03). Three of the four factors (total MTV, untreated lesion MTV, and untreated lesion TLG) remained significant on multivariate regression controlling for age and performance status. MTV and TLG of treated lesions did not predict OS or PFS. Furthermore, the presence/absence of active untreated lesions was not a significant predictor of OS (p=0.755).Conclusion: In a cohort of metastatic NSCLC patients with primarily oligometastatic disease treated with SABR, metabolic tumor burden on FDG PET was predictive of overall survival after treatment. Pretreatment PET parameters may serve as a useful biomarker to select patients most suitable for aggressive local treatment with SABR.

SSK18-06 Long-term Outcomes of Stereotactic Body Radiotherapy for Stage I Non-small Cell Lung Cancer using Different Doses Depending on Tumor Size: Re-evaluation by Superposition-Comparable Dose Calculation Algorithms

Wednesday, Nov. 30 11:20AM - 11:30AM Room: S104A

Participants
Fumiya Baba, MD, Nagoya, Japan (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): In stereotactic body radiotherapy (SBRT) for stage I non-small cell lung cancer (NSCLC), it was found that the outcomes of stage IB patients were worse than those of stage IA patients when treated with the same dose. We have performed SBRT since 2004 using different prescribed doses depending on tumor size. The clinical outcomes treated with our protocol are herein reported. In addition, radiation doses were re-evaluated by the algorithm comparable to the superposition method.Materials/Methods: Between February 2004 and November 2008, 124 patients with stage I NSCLC underwent SBRT; 87 had stage IA and 37 had stage IB disease. Total doses of 44, 48, and 52 Gy were administered to the isocenter for tumors with a longest diameter of 3 cm, respectively. All doses were delivered in 4 fractions twice a week. Pencil beam convolution with Batho power law correction (PBC-BPL) was used as the dose calculation algorithm. These plans were recalculated by anisotropic analytical algorithm (AAA) with the same monitor units.Results: The median follow-up period for living patients was 69 months (range: 24 to 124). For all 124 patients, overall survival (OS) was 55%, cause-specific survival (CSS) was 75%, progression-free survival (PFS)

was 61%, and local control (LC) was 80%, at 5 years. The 5-year OS was 58% for 85 stage IA patients treated with 48 Gy and 49% for 37 stage IB patients treated with 52 Gy (p = 0.16). At 5 years, CSS was 76% versus 73% (p = 0.45), PFS was 60% versus 56% (p = 0.31), and LC was 83% versus 73% (p = 0.21). At 5 years, the cumulative incidence of grade 2 or 3 radiation pneumonitis (RP) was 15% for all patients; it was 9% in stage IA patients and 29% in stage IB patients (p=0.0086). Median doses to the isocenter recalculated using AAA were 47.58 Gy (range: 42.70-48.59) in 48 Gy prescription, and 51.54 Gy (range: 49.28-52.34) in 52 Gy prescription. Median PTV D95 doses of PBC-BPL plans were 45.79 Gy (range: 38.64-47.28) in 48 Gy prescription, and 49.35 Gy (range: 41.76-50.39) in 52 Gy prescription. Median recalculated PTV D95 doses of AAA plans were 42.00 Gy (range: 34.03-44.99), and 46.16 Gy (range: 40.64-48.71) in the two prescriptions, respectively. There were significant differences between PBC-BPL plans and AAA plans both in the isocenter dose and the PTV D95.Conclusion: In our protocol, there were no significant differences in OS, CSS, PFS and LC between stage IA and IB tumors despite the difference in tumor size. On the other hand, there was a significant difference in RP incidence. In the revised protocol, dose was prescribed at the PTV D95 using superposition-comparable dose calculation algorithms, taking these results into account.

SSK18-07 Image-Guided Hypofractionated Proton Therapy in the Management of Centrally Located Early Stage NSCLC

Wednesday, Nov. 30 11:30AM - 11:40AM Room: S104A

Participants
Bradford Hoppe, MD, Jacksonville , FL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Stereotactic body radiotherapy (SBRT) has proven to be an excellent way to manage patients with small and peripheral early-stage non-small cell lung cancer (NSCLC). Unfortunately, concern exists regarding the management of early-stage centrally located NSCLC with SBRT because of reports of toxicity. We investigated outcomes from delivering hypofractionated proton therapy (PT) among patients with centrally located stage I NSCLC.Materials/Methods: From 2009 through 2015, 16 patients were treated for medically inoperable centrally located de novo (n=12) or relapsed (n=4) stage I NSCLC (IA, n=5; IB, n=11) with image-guided hypofractionated PT on an IRB-approved outcomes tracking protocol (median age, 69 years). Centrally located tumors were those within 2 cm of the proximal bronchial tree or heart. Patients underwent 4D CT simulation following fiducial marker placement and an iGTV was contoured per the 10 phases of the scan (median, 15.5 cc; range 6-56 cc). Initially, a 5-mm margin was added to make an ITV but was eliminated in 2014, followed by a 5-mm margin for the PTV (median, 78.5cc; range 32-211cc). Daily image-guidance was done using fiducial markers and double exposure of orthogonal kv imaging at the peaks of inspiration and expiration. Patients were all treated with 60 Gy(RBE) (6 Gy[RBE]/fraction x 10 fractions) utilizing pre-defined dose constraints. Patients were evaluated by a physician and assessed for CTCAEv4 toxicities weekly during treatment, at 1 month after treatment, then every 3 months for 2 years, and then every 6 months until 5 years with a CT or PET/CT. Overall survival, progression-free survival, local control, regional control, and control of distant metastases were evaluated using the Kaplan-Meier method. Results: Median follow-up for the cohort was 44 months (range, 4-67). The 3-year progression-free survival and overall survival rates were 41% and 84%. The median progression-free and overall survival were 28 and 60 months. The 3-year local (ipsilateral lobe), regional, and distant control rates were 89%, 77%, and 74%. Four patients died with disease and 1 from complications of pneumonia 52 months after treatment. Seven patients developed a recurrence, including 5 distant, 3 regional, and 1 in the ipsilateral lobe at the edge of the treatment field. Five received salvage radiation for the recurrences using either SBRT (n=2) or standard fractionated proton therapy +/- chemo (n=3). Three have had no evidence of disease for >1.5 years.Within 6 months of treatment 6 patients (38%) experienced respiratory symptoms (cough, fatigue, shortness of breath) that resolved with antibiotics and/or a short course of steroids. One grade 3 toxicity occurred in a patient who developed a bronchial stricture (PTV, 211cc) requiring hospitalization and stent. Conclusion: Image-guided hypofractionated PT for centrally located stage I NSCLC provides promising local control and long-term survival with acceptable toxicity. Regional nodes and distant relapses remain a problem.

SSK18-08 The First Report to Evaluate Clinical Outcome of Dynamic Tumor-Tracking Stereoactic Body Radiotherapy for Early Stage Lung Cancer and Oligometastatic Lung Tumors Using a Gimbal-Mounted Linear Accelerator

Wednesday, Nov. 30 11:40AM - 11:50AM Room: S104A

Participants
Takamasa Mitsuyoshi, Kyoto, Japan (*Presenter*) Nothing to Disclose
Yukinori Matsuo, MD, Kyoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Mitsuhiro Nakamura, Kyoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Kenji Takayama, MD, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Masaki Kokubo, MD, Kobe, Japan (*Abstract Co-Author*) Research Consultant, Mitsubishi Corporation
Takashi Mizowaki, MD, Kyoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Masahiro Hiraoka, MD, PhD, Kyoto, Japan (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Recently, stereotactic body radiotherapy (SBRT) has developed as a new treatment modality for early stage lung cancer or oligometastatic lung tumor. When a lung tumor is treated with SBRT, the whole trajectory of a moving tumor is included in the irradiation field. It means healthy tissues are irradiated and leads to increase risks of toxicities. So, we hypothesized that dynamic tumor-tracking (DTT) SBRT using a gimbal-mounted linear accelerator could reduce irradiated volumes of healthy tissues and risks of toxicities without reducing tumor local control (LC) rate. This is the first reported study to evaluate clinical outcomes of DTT-SBRT using a gimbal-mounted linear accelerator.Materials/Methods: Eligibility criteria were as follows: (1) a single lung tumor with a diameter of 50 mm or less, (2) no metastasis, (3) respiratory tumor movement of 10 mm or more, (4) age of 20 years or above, (5) performance status (PS) of 0–2. Prior to the treatment, gold markers were placed under bronchoscopic guidance around the tumors as an internal surrogate for the tumor position. The tumors and markers were monitored with the kV imagers during irradiation in real-time. Out of 47 patients whom markers had been injected in, 29 patients (62%) were treated by DTT-SBRT successfully between September 2011 and April 2015 in Kyoto University Hospital or Institute of Biomedical Research and Innovation and had been enrolled in this study. The dose fraction schedule was 48 Gy/4 fr for clinical stage 1A lung cancer, and 56Gy Gy/4 fr for clinical stage 1B lung cancer and oligometastatic lung tumors. The prescribed dose was defined at the isocenter. The patients characteristics were as follows: median age, 78 years (range, 58–88); male/female: 22/7; PS 0/1/2: 9/16/4; primary lung cancer/oligometastatic lung tumor: 24/5; clinical stage T1a/T1b/T2a: 12/8/4 (UICC-7). Toxicity grading was scored using the Common Terminology Criteria for Adverse Events v.4.0. The survival rates were calculated using the Kaplan-Meier methods.Results: The median follow-up time was 23.4 months (range, 0.2–49.2). The 2-year overall survival (OS), progression free survival (PFS) and

LC rate was 72%, 58% and 87%, respectively. Local recurrence developed in 4 patients and distant metastasis developed in 5 patients. At the time of analysis, 21 patients were alive and 8 patients had died. Out of living patients, 4 patients had recurrence. Out of dead patients, 4 patients died from progressive disease. Univariate analysis (log-rank test) could not help to identify the factor for worse OS or PFS. Grade 2 or worse toxicities were occurred in 2 patients (6.9%). One had Grade 2 radiation pneumonitis and the other had Grade 3 radiation pneumonitis.Conclusion: DTT-SBRT using a gimbal-mounted linear for patients with early stage lung cancer and oligometastatic lung tumors resulted in good LC with acceptable toxicities.

SSK18-09 Stereotactic Ablative Body Radiation (SABR) for Stage I Lung Cancer: A Retrospective Single Institution Report

Wednesday, Nov. 30 11:50AM - 12:00PM Room: S104A

Participants
Sarit Appel, ramat gan, Israel (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Stereotactic Ablative Radiation Therapy (SABR) is the new standard of care in medically inoperable stage I lung cancer and has been advocated for use as an alternative to surgery in patients with operable stage I lung cancer. Prior to beginning a pilot study for use of SBRT in operable stage I Iung cancer, we reviewed and report local control, survival and toxicities of SABR in Stage I lung cancer in tertiary single institution since its introduction in 2009.Materials/Methods: A retrospective database analysis of stage I lung cancer treated with SBRT from 2009-2015. Database included: gender, age, histology, stage, radiation dose and fractionation and treatment dates. Survival status was confirmed from the national registry. Local failure was defined as increased FDG uptake on PET-CT scan within a 2 cm radius of the treated region. Survival and local control were dated from first day of radiation and censored at last visit or at event. Toxicity was graded according to common toxicity criteria adverse events (CTCAE) v. 4.03. Statistical methods used were Kaplan-Meier and Cox regression for survival analysis.Results: A total of 114 patients were treated for 122 stage I lung cancer lesions over the study period. Median follow up time was 27 months (range 8.2-69.5 months), median age was 76 (range 40-96). Stage IA was in 82% of the lesions, adenocarcinoma was in 45%, no biopsy was in 19.7%. The prescribed dose to encompass the PTV was 50 Gy/5fx in 68%, 54 Gy/3fx in 14.5% and 60Gy/8fx in 11.5%. The calculated BED was at least 100 Gy in 94.3% of treated lesions.Median survival was 46 months, estimated 3 years overall survival was 59% (95% CI 47-69%). For stage IA and IB, median survival was 51.3 and 41.4 months respectively (NS). Three years local control was 88% (95% CI 78-94%). On Cox regression, the survival and local control were not significantly affected by histology or fractionation. Toxicity was mild and included chest wall pain in 8.4% patients, rib fracture in 0.9%, grade 1-2 pneumonitis in 12%, grade 3 pneumonitis in 12% and grade 5 in 0.9%. Sixteen central lesions were treated with 8-10 fractions without occurrence of airway necrosis or hemoptysis.Conclusion: SABR has been successfully implemented at our institution for the treatment of stage I lung cancer in inoperable patients with excellent local control, low toxicity and acceptable overall survival. A prospective study evaluating SBRT as an alternative to surgery in operable patients with stage I lung cancer will be proposed.

ROS-WEA

Radiation Oncology Wednesday Poster Discussions

Wednesday, Nov. 30 12:15PM - 12:45PM Room: RO Community, Learning Center

RO

AMA PRA Category 1 Credit ™: .50

FDA Discussions may include off-label uses.

Participants
Edward Y. Kim, MD, Seattle, WA (*Moderator*) Research support, Eisai Co, Ltd; Research support, Novartis AG; Research support, Johnson & Johnson; Research support, Bayer AG; Research support, Threshold Pharmaceuticals, Inc ; Research support, Eli Lilly and Company; Research support, MabVax Therapeutics Inc;

Sub-Events

RO234-SD-WEA1 Pre-treatment Multiparametric MRI as a Predictive Marker for Biochemical Recurrence Following External Beam Radiation Therapy for Prostate Cancer

Station #1

Awards
Student Travel Stipend Award

Participants
Luca F. Valle, BA, Spokane, WA (*Presenter*) Nothing to Disclose
Matthew Greer, BS, Cleveland Heights, OH (*Abstract Co-Author*) Nothing to Disclose
Andra Krauze, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Aradhana Kaushal, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Joanna Shih, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Peter L. Choyke, MD, Rockville, MD (*Abstract Co-Author*) Researcher, Koninklijke Philips NV; Researcher, General Electric Company; Researcher, Siemens AG; Researcher, iCAD, Inc; Researcher, Aspyrian Therapeutics, Inc; Researcher, ImaginAb, Inc; Researcher, Aura Biosciences, Inc
Baris Turkbey, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Deborah Citrin, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The capacity of pretreatment multiparametric MRI (mpMRI) to predict biochemical recurrence (BR) after external beam radiation therapy (EBRT) +/- androgen deprivation therapy (ADT) is largely unexplored. We evaluated if pretreatment mpMRI of the prostate with dynamic contrast enhanced (DCE) imaging and diffusion weighted imaging (DWI) with apparent diffusion coefficient (ADC) maps could predict the risk of BR after EBRT +/- ADT.

METHOD AND MATERIALS

All patients from our institution with diagnostic mpMRI prior to EBRT were included in this retrospective analysis. BR was defined by Phoenix criteria. mpMRI consisted of endorectal coil T2W imaging, DCE, and DWI with ADC maps. Prostate lesions were identified in each MRI sequence by a prostate-dedicated radiologist. The hazard ratio (HR) of BR associated with mpMRI features was estimated with Cox proportional cause-specific hazard models. mpMRI features were correlated with known clinical predictors of BR using the Kruskal-Wallis rank test. To account for multiple comparisons, $p<0.01$ defined significance.

RESULTS

141 patients (11 low, 43 intermediate, and 87 high risk by D'Amico grouping) were included. At a median follow up of 60 months, BR occurred in fourteen (10%) patients. High pre-treatment PSA and detectable post-EBRT PSA nadir were predictors of BR (HR 1.2, $p<0.0001$ and HR 4.92, $p=0.003$, respectively). T2 imaging characteristics including the number of lesions (mean 1.4, range 0-4, $p=0.099$), size of the dominant prostate lesion ($p=0.436$), and location of the tumor ($p=0.394$-0.694) did not predict for BR. DWI and DCE positivity did not predict BR ($p=0.868$ and $p=0.368$, respectively). Tumor size did correlate with known predictors of BR, such as increasing Gleason score ($p<0.001$), T stage ($p=0.009$), and D'Amico risk grouping ($p<0.001$).

CONCLUSION

In this retrospective series, mpMRI findings did not predict for BR after EBRT +/- ADT. Although this is the largest series evaluating these parameters as predictive markers in this setting, it is possible that larger patient numbers or a higher proportion of BR may provide an opportunity to elucidate mpMRI characteristics capable of predicting BR.

CLINICAL RELEVANCE/APPLICATION

While mpMRI is effective in the detection of prostate cancer and in the prediction of BR following radical prostatectomy, it may have shortcomings when predicting the risk of BR after EBRT +/- ADT.

RO235-SD-WEA2 Image-based Response Assessment of HCC Treated by Stereotactic Body Radiotherapy with Respiratory Tracking

Station #2

Participants
Hajer Jarraya, Lille, France (*Presenter*) Nothing to Disclose
Xavier Pauwels, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Xavier Mirabel, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Jerome Durand Labrunie, lille, France (*Abstract Co-Author*) Nothing to Disclose

Wilfrid Kouakam, Lille, France (*Abstract Co-Author*) Nothing to Disclose
David Buob, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Luc Ceugnart, MD, Lille, France (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To describe post therapeutic imaging features of HCC treated by SBRT as an aid in assessing response to treatment.
To assess tumor response using RECIST , mRECIST and EASL.

METHOD AND MATERIALS

Imaging Data and medical records of 50 patients with 60 HCC treated with stereotactic body radiotherapy (SBRT) were reviewed. Tumor size and contrast enhancement of lesions were evaluated up to 6 months after radiation. Contrast Enhanced Ultrasound performed in 5 patients were reviewed.

RESULTS

Median age was 70 years (range, 44–86 years). Cirrhosis was mainly due to alcohol consumption and majority of patients had CTP A cirrhosis. Half of the patients had already received treatment for HCC, the majority with chemoembolization (23.7%). Median tumor diameter was 32 mm (11,96). Local control rate according to RECIST, mRECIST and EASL were respectively 98.6%, 98.6%,98% (Kappa : -0.45)
Contrast Enhanced US performed in 5 cases was unconclusive. Reasons will be be detailed.At MRI, local control was associated with, disappearance, shrinkage of the target and decrease or disappearance of internal enhancement. Progression was associated with size increase and persistence of internal enhancement.Evaluation with m RECIST and EASL are more adequat than RECIST criteria assessed to Localprogression free survival LPFS rates.Histological results were obtained in one case showing a radiohistological correlation between radiological features and liver induced focal inflammatory reaction.

CONCLUSION

SBRT is an emerging technique for treatment of unresectable liver malignancies, especially HCC. The interpretation of post therapeutic imaging features may be challenging for radiologists. Being familiar with these features may improve patient management and avoid additional treatments.

CLINICAL RELEVANCE/APPLICATION

Stereotactic Body Radiotherapy is an emerging technique in the treatment of liver malugnancies espicially HCC and may be safely used as a bridge treatment before transplantation. Radiologists should be familiar with post therapeutic features the interpretation of which may be challenging, to improve patient management and avoid errors of interpretations that may lead to additional harmful treatments. Response assessment is more adequat with m RECIST or EASL compared to RECIST criteria.

RO236-SD-WEA3 Current Practice of Brachytherapy and External Beam Radiotherapy for Cervical Cancer in Ontario Canada

Station #3

Participants
Negin Shahid, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To recognize the practice of brachytherapy (BT) and external beam radiotherapy (EBRT) for management of cervical cancer across Ontario, Canada with a population of 13.6 million.Materials/Methods: An electronic survey (SurveyMonkey) was sent to all 14 provincial cancer centers in 2013. The survey included 72 questions in 4 different categories: general/demographic, pre-treatment assessment, EBRT and BT questions.Results: The response rate was 100%. Ten out of 14 centers treated cervical cancer patients and had a dedicated brachytherapy suite. All 10 centers that treated cervix cancer had a peer review process for quality assurance (QA). Nine centers had written treatment planning and delivery protocol and 5 centers used a specific plan evaluation protocol for organs at risk for EBRT. The standard EBRT technique was 4-field box in 8 centers and 1 center used IMRT if treating the para-aortic nodes simultaneously; 1 center did not respond. The dose/fractionation scheme to the whole pelvis was 45-50Gy in 1.8-2 Gy per fraction in all but one center. Nine centers used image verification at some point during EBRT. All ten centers used HDR brachytherapy and 1 center also used PDR brachytherapy to treat cervix cancer patients. Brachytherapy was performed under general anesthesia, regional anesthesia and conscious sedation in 4, 1 and 5 centers, respectively. Only one center offered interstitial brachytherapy. The majority of centers used ultrasound image guidance for intrauterine applicator insertion. For treatment planning 2 centers used CT and MRI, 4 centers used CT only and 4 centers used orthogonal x-rays. GEC-ESTRO guidelines were used in 3 centers for target volume delineation and in 5 centers for organs at risk (OAR) dose constraints. Nine centers prescribed and reported dose to Point A. Volumetric dose prescription was performed in 1 center and 4 centers reported dose to a target volume. Eight centers reported dose to OARs. The number of brachytherapy applicator insertions varied significantly between the centers ranging from 1 to 6. The dose prescription was also variable ranging from 5.5Gy to 8Gy per fraction.Conclusion: The main findings from the survey were the variation in the BT dose fractionation and treatment planning used in the regional cancer centers while there was a general uniformity in peer reviewed QA, written institutional treatment protocol and EBRT technique/dose fractionation scheme across the province. This study shed light on the need for further investigations to identify potential reasons for practice variations and to implement a harmonized evidence-based brachytherapy practice for cervical cancer in order to improve patients' outcome across Ontario, Canada.

RO237-SD-WEA4 Prognosis of Patients who received Palliative Intent Radiotherapy for Bone Metastases in Recent Years

Station #4

Participants
Yasushi Hamamoto, MD, Toon-City, Japan (*Presenter*) Nothing to Disclose
Noriko Nishijima, Toon-City, Japan (*Abstract Co-Author*) Nothing to Disclose
Kei Nagasaki, Toon-City, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiromitsu Kanzaki, Toon-City, Japan (*Abstract Co-Author*) Nothing to Disclose
Toshiharu Manabe, Imabari-City, Japan (*Abstract Co-Author*) Nothing to Disclose

Teruhito Mochizuki, MD, Toon, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

With the development of systemic cancer therapy, unignorable proportion of patients who receive palliative intent radiotherapy (PIRT) for bone metastases have become to live longer. To consider individualization of PIRT for recent year patients, reinvestigation of survival time after PIRT is necessary. In this study, we examined prognostic factors after PIRT.

METHOD AND MATERIALS

Between December 2009 and June 2015, 100 patients received the initial PIRT for bone metastases in our institution. Of these, 83 patients (range 50-86 years, median 69 years; male : female = 56:27; performance status (PS) 0-1 : PS 2-4 = 45:38; breast cancer : other cancer = 10:73) were followed up until death (80%) or for more than six months (20%). Clinical records concerning the initial PIRT of these 83 patients were examined. Follow-up time was 0.4 - 36.6 months (median 4.7 months).

RESULTS

The overall survival rates at 2-years from the initial PIRT were 19% for all 83 patients, 17% for lung cancer, 28% for breast cancer, 18% for digestive tract cancer, 0% for liver/biliary tract/pancreas cancer. On univariate analysis, statistically significant factors for survival were gender (p=0.0491) and PS (PS0-1 vs. PS2-4) (p=0.0007). Age (<75 vs. 75<) and primary sites (breast vs. other cancer) were not statistically significant factors (p=0.8032 and p=0.0544, respectively), On multivariate analysis, both gender and PS were statistically significant favorable factors for survival. The overall survival rates at 2-years from the Initial PIRT were 33% for female (12% for male) and 26% for PS0-1 patients (11% for PS2-4 patients).

CONCLUSION

Recently, individualized PIRT seemed to be necessary for bone metastases. Based on our series, female and good PS patients seemed to need PIRT with comparatively high total doses and small fraction size.

CLINICAL RELEVANCE/APPLICATION

Female and good performance status seemed to be favorable prognostic factors for patients who received radiotherapy to bone metastases in recent years.

RO238-SD-WEA5 A Phase I Trial of Ketogenic Diet with Concurrent Chemoradiation (ChemoRT) in Head and Neck Squamous Cell Carcinoma (HNSCC)

Station #5

Participants
Carryn Anderson, MD, Iowa City, IA (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Ketogenic diet (KD) combined with chemoRT reduced tumor growth and improved survival in pre-clinical models. We hypothesized stage III-IVb HNSCC patients would be able to remain compliant with KD because of PEG tube requirement during chemoRT. Research supported by NIH U54TR001356 and KetoCal® 4:1 provided by Nutricia Pharmaceuticals.Materials/Methods: This phase I clinical trial enrolled stage III-IVb definitive and post-op HNSCC patients receiving concurrent platinum-based chemoRT. PEG placement was required, but subjects were encouraged to continue KD by mouth. KD recipes and KetoCal® shakes were provided for daily consumption for 5 weeks starting 2 days prior to chemoRT. Fingerstick ketones (FK) were checked Mon-Fri, and serum beta-hydroxybutyrate (BHB), glucose, and uric acid were checked weekly. Lipid panel was checked at week 3. Serum oxidative stress parameters were assessed prior to, during, and after completing KD. Adverse events were graded utilizing CTCAE version 4.0.Results: Median follow-up for all enrolled subjects (n=12) from completion of RT was 4.9 mo (range: 0-16.6). 4/12 subjects successfully completed 5 weeks of KD as prescribed. Successful subjects used scheduled anti-emetics, consumed shakes via PEG tube as opposed to orally and had strong social support. Median days on KD for those who discontinued was 5.5 (range: 2-8). Of the first 4 subjects treated, 2 completed, 1 withdrew due to fatigue (gr. 3), and 1 had a dose limiting toxicity (DLT) (hyperuricemia, grade 4; 12.7 nd/dL; nl ref 2.4-7.0). The protocol was amended to address diet-related hyperuricemia and allow for increased protein intake. Subsequently, 8 eligible subjects enrolled with 2 completing therapy and 2 experiencing DLTs (acute pancreatitis grade 3; hyperuricemia with complicating nausea and vomiting, grade 3). The remaining 4 subjects withdrew due to diet intolerance prior to beginning chemoRT (n=1), and nausea with vomiting (nausea grade 2, vomiting grade 1, n=3). Serious adverse events included hospitalizations for parotiditis (n=1), acute pancreatitis (n=1), neutropenic fever (n=1), and nausea with vomiting (n=1). Both the acute pancreatitis and nausea with vomiting SAEs were considered related to study diet and were deemed DLTs. In those who completed KD, the median days FK were elevated and weeks the BHB levels were above baseline were 24.5 days (range: 19-25) and 5 weeks (range: 4-6), respectively. Median uric acid levels were 4.9 nd/dL (range: 3.4-5.4). Lipids remained normal. Serum oxidative stress markers, as assessed by protein carbonyls, increased linearly with increasing days on KD.Conclusion: While challenging despite PEG availability, KD compliance is possible when combined with concurrent chemoRT for HNSCC. Enrollment continues.

RO239-SD-WEA6 Stereotactic Ablative Radiotherapy (SABR) for Stages I-II Non-Small Cell Lung Cancer (NSCLC):Setting up with Multi-Dampening, First Analysis Has Shown Promising Results

Station #6

Participants
Elena Montero, Seville, Spain (*Presenter*) Nothing to Disclose
Maria Rubio, MD, Seville, Spain (*Abstract Co-Author*) Nothing to Disclose
Santiago Velazquez, DIPLPHYS, Seville, Spain (*Abstract Co-Author*) Nothing to Disclose
Maria Jose Ortiz, PhD,MD, Seville, Spain (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): The standard of care for treatment of early-stage non-small cell lung cancer patients is definitive surgery. However, there are patients who refuse surgery or are not surgical candidates. In these patients SABR is an alternative to surgery. Our hypothesis is that multidampening SABR, developed in our hospital, is an efficient method for these patients, well-tolerated and have high rates of local tumor control.Materials/Methods: Between April 2014 and January 2016, a total of 11 patients with 11

primary lung tumors with stage I and II NSCLC [T1, n=3;T2, n=8] were enrolled on prospective study of SABR for lung cancer. All patients had histological confirmation by biopsy or cytological evaluation, the histologies were: 7 adenocarcinoma, 2 squamous cell carcinoma and 1 NSCLC. All patients had ECOG 0-1. The median age was 74 years (67-86). The implementation of SARB in routine requires a careful considering of organ motion, we used stringent customized breathing control that was obtained with our multidampening system. In all cases the technique was guided by CBCT image after CT simulation and calculation. The SABR dose was either 54 Gy in 3 fractions or 50 Gy in 5 fractions, according a risk adapted fractionation scheme of biologically effective dose DBE > 100 Gy, and treatment lasted between one-and-a-half to two weeks. Failure was defined radiographically, chest radiography the first month after treatment, thereafter every 3 months for 2 years and then annually; CT of chest and upper abdomen every 3 months the first year and then every 6 months. PET/CT is obtained at the 6 month in all cases. Results: The median follow-up period was 11 months (range, 3-22).The results in terms of local control after treatment were: 5 patients in partial radiographically response, 2 patientes with stable disease and 2 in complete response. 8 patients had a pre- and post-treatment PET/TC imaging. All patients had a decrease in post-treatment SUV (decrease percentage,31-90%). 2 exitus at the time of the study, one from secondary head and neck cancer and one form comorbidities. Median disease-free survival was 11 months. The toxicity reported in all patients was less than G2 in CTCAE.4 scale by site.Conclusion: SABR used as a radical treatment for non-operable patients is safe and promising. The SABR with multidampening method is well-tolerated, seems to be an efficient alternative and to have a low risk of complications. Although recommendations exist for CT- and PET/CT-based follow-up after SABR, better metrics are required for early detections of recurrence and distinguishing recurrence from fibrosis.

ROS-WEB

Radiation Oncology Wednesday Poster Discussions

Wednesday, Nov. 30 12:45PM - 1:15PM Room: RO Community, Learning Center

RO

AMA PRA Category 1 Credit ™: .50

Participants
Edward Y. Kim, MD, Seattle, WA (*Moderator*) Research support, Eisai Co, Ltd; Research support, Novartis AG; Research support, Johnson & Johnson; Research support, Bayer AG; Research support, Threshold Pharmaceuticals, Inc ; Research support, Eli Lilly and Company; Research support, MabVax Therapeutics Inc;

Sub-Events

RO240-SD-WEB1 Trends in the Utilization of Adjuvant Vaginal Brachytherapy in the Treatment of Women with Stage I and II Endometrial Cancer: Results of an Updated Period Analysis of SEER Data

Station #1

Awards
Student Travel Stipend Award

Participants
Ankit Modh, MD, Detroit, MI (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Adjuvant vaginal brachytherapy (VB) is a well-established and effective radiation treatment (RT) modality in women with early stage endometrial carcinoma (EC). We sought to evaluate and update the trends in utilization of VB versus other RT modalities (pelvic external beam RT (EBRT) or the combination of VB and pelvic EBRT using the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) database.Materials/Methods: The SEER database was queried for adult females with histologically confirmed FIGO (1988) stage I-II endometrial cancer diagnosed from 1995-2012 who underwent hysterectomy and adjuvant radiation therapy. Patients with multiple primary malignancies, those who received radiation treatment prior to surgery or those who did not have any adjuvant RT were excluded. Chi-squared tests were used to assess differences by radiation modality (VB, EBRT, and VB+EBRT) and various demographic and clinical variables.Results: We identified 15,201 patients who met our inclusion criteria. There was an overall increase in the use of VB observed from 17.1% in 1995-2000 compared to 57.1% in 2007-2012 (p p p p p p pConclusion: There continues to be a trend for the increased use of VB in the adjuvant setting for patients with FIGO stage I-II EC. This trend was observed across patient or treatment factors analyzed.

RO241-SD-WEB2 Acute Toxicities using Intensity Modulates Radiation Therapy for Adjuvant and Definitive Salvage Treatment of Endometrial Cancer: A Single Institution

Station #2

Participants
Phoebe Chidley, MBBS, Heidelberg, Australia (*Presenter*) Nothing to Disclose
Carminia Lapuz, MBBS,FRANZCR, Melbourne, Australia (*Abstract Co-Author*) Nothing to Disclose
Adeline Lim, FRANZCR, Heidelberg, Australia (*Abstract Co-Author*) Speaker, Teva Pharmaceutical Industries Ltd

ABSTRACT

Purpose/Objective(s): Intensity modulated radiation therapy (IMRT) can be used to reduce dose to organs at risk (OARs) whilst maintaining target coverage, theoretically reducing treatment-related morbidity and allowing dose escalation. IMRT is dosimetrically advantageous compared with conventional external beam radiotherapy (EBRT) in the treatment of endometrial cancers as there can be large volumes of OARs within conventional pelvic fields, increasing potential toxicities and limiting dose escalation in recurrent disease. The aim of this study is to evaluate the acute toxicities of adjuvant and definitive salvage EBRT for primary or recurrent endometrial cancer confined to the pelvis using IMRT.Materials/Methods: Patients treated with pelvic EBRT for adjuvant or definitive salvage therapy of endometrial cancer between April 2013 to January 2016 were identified from our center's database. All patients were treated using 7 to 9 field IMRT to a dose of 45 - 50.4 Gy to the pelvis in the adjuvant setting and 54 - 59.4 Gy using a simultaneous integrated boost to recurrent disease, with or without chemotherapy. Target and OARs contouring was based on published guidelines. Daily cone beam imaging was used for image guidance. Acute toxicity data was collected according to Common Terminology Criteria for Adverse Events v4.0 weekly. Descriptive statistics was used for analysis.Results: 20 patients were included in this study. Median age was 66.5 years (range: 51-90 years). Stage 1, 2, 3 and recurrent disease was seen in 4, 4, 6 and 6 patients respectively. Concurrent chemotherapy with cisplatin was given in 5 patients. Grade 1 acute genitourinary toxicities was seen in 65% and grade 2 in 15% of patients, predominantly reported as urinary frequency. Grade 1 acute bowel toxicities were seen in 65% of patients and grade 2 in 20%, mainly in the form of diarrhea and bowel frequency. 14 patients experienced grade 1-2 nausea. Grade 1-2 fatigue was seen in 11 patients. There were no cases of acute toxicities greater than grade 2.Conclusion: Pelvic EBRT with doses up to 59.4 Gy for endometrial cancers using IMRT is well tolerated and is associated with low grade acute genitourinary and gastrointestinal toxicities only. This is consistent with published studies, however, longer follow-up is required to assess late toxicities and tumor control. The results of larger prospective studies are awaited to assess whether IMRT results in reduction in acute and long term toxicities and better tumor outcomes compared with conventional EBRT.

RO242-SD-WEB3 PET Response Assessment in Patients with Hodgkin Lymphoma Receiving Brentuximab: A Single Institution Experience

Station #3

Participants
Genevieve Maquilan, MD, Dallas, TX (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Brentuximab is increasingly being used for treating CD30-positive Hodgkin lymphoma (HL). Anecdotal reports of high false-positive rates on post-brentuximab imaging with positron emission tomography (PET), including a 75% rate in a phase II study of early stage non-bulky HL (NCT01534078), have caused concern about interpretation of results and guidance of further therapy, including consolidative radiotherapy. This study provides a formal description of the findings on PET on interim scans or after completion of treatment with brentuximab at a single institution.Materials/Methods: Patients with HL who received treatment with brentuximab as part of initial therapy or salvage treatment from 2011 - 2015 were included. Persistence or newly avid sites of Deauville =4 on post-treatment PETs were judged as positive findings.Results: 13 patients were evaluated. Seven patients received brentuximab as part of initial therapy, 4 patients received it as salvage therapy, and 4 received it as consolidative therapy after transplant, with 2 of those latter patients having received brentuximab previously. Six patients had not yet completed the intended course of brentuximab-based treatment and were only evaluated for their interim scans. Four out of the 13 patients (30.8%) had an increase in fluorodeoxyglucose (FDG) avidity of sites of known disease, and 3 out of the 13 patients (23.1%) had appearance of new FDG-avid sites of disease on PET, obtained as either an interim study or after the completion of treatment. Three patients (23.1%) completed therapy and had either an increase in avidity in sites of known disease or development of new sites on the post-treatment PET (Deauville =4). Of these, 2 patients proceeded to a subsequent chemotherapy regimen for progression, with only one patient having biopsy confirmation of active disease. The third patient, treated with brentuximab as part of initial definitive therapy for stage IIAEX disease, underwent mediastinoscopy dissection of newly FDG-avid sites, which was negative. Repeat PET showed resolution of these new sites of uptake one month after dissection with only residual uptake in an initially involved bulky site, and thus he proceeded to standard consolidative radiotherapy.Conclusion: Positive PET findings after the completion of treatment with brentuximab were biopsied in the absence of clear clinical progression, with demonstration of one apparent false positive case that changed therapy. Our single institution findings raise caution in regards to presuming a high false-positive rate on post-treatment PET, and, if feasible, biopsy should be considered.

RO243-SD-WEB4 Middle Cerebral Artery Stenosis in Nasopharyngeal Carcinoma Patients after Radiotherapy: The Incidence of Stenosis and the Risk Factors Language: ZH-CN; Mso-Bidi-Language: AR-SA risk factors

Station #4

Participants
Xueguan Lu, Suzhou, China (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): The purpose of present study was to investigate the incidence of middle cerebral artery (MCA) stenosis by contrast-enhanced magnetic resonance angiography (CE-MRA), and to evaluate the risk factors for significant (>50%) MCA stenosis in patients with nasopharyngeal carcinoma (NPC) after radiotherapy.Materials/Methods: One hundred and sixteen patients with NPC after radiotherapy were recruited into the irradiation group to investigate the incidence and degree of MCA stenosis by CE-MRA. The results were compared with those of the control group, which comprised 57 newly diagnosed NPC patients who did not receive radiotherapy. Furthermore, the risk factors for significant MCA stenosis were evaluated.Results: The incidence of significant MCA stenosis in the irradiation group was 8.6% (10/116) and 5.2% (12/232) in terms of patient number and vessel involvement, respectively. However, no significant MCA stenosis was found in the control group. Unvariate analysis showed that hypercholesterolemia, T3-4 stage and longer time interval from radiotherapy were the risk factors related to significant MCA stenosis. Multivariate analysis demonstrated that time interval from radiotherapy was the independent predictor for the development of significant MCA stenosis.Conclusion: The results showed that radiation can cause MCA stenosis in NPC patients after radiotherapy, especially for those with T3-4 probably. The longer time interval from radiotherapy was the risk factor of significant MCA stenosis development.

RO244-SD-WEB5 Patient-Reported Experience using Complementary and Alternative Medicine (CAM) while Receiving Radiation Therapy (RT)

Station #5

Participants
Alejandro Carvajal, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): CAM encompasses a wide range of non-mainstream approaches not typically offered as a part of standard oncologic treatment. The objective of this study is to describe associate factors and patient experiences with CAM while undergoing RT as part of their oncologic treatment. This includes type of CAM used, its effect, and source from which patient learned about CAM.Materials/Methods: The study was conducted over a one month period at Roger Williams Radiotherapy Center. An IRB approved 14 item questionnaire was offered to patients at the institution who were either currently undergoing RT or had undergone RT within the past year. Results: 88 surveys were distributed and completed. Utilization of CAM was seen in a total of 29 (33%) patients, 11/88 (12%) of patients used CAM prior to being diagnosed with cancer, whereas 18/88 (20%) reported starting CAM after starting RT treatment. The most commonly used method of CAM was dietary supplements in 17/29 (59%), followed physical relaxation methods in 11/29 (38%), and mental and spiritual methods in 7/25 (28%). The most common source of information about CAM was from family and friends, as reported by 15/29 (52%) and 11/29 (38%) reported hearing about CAM through their radiation oncologist. 3/29 (10%) heard of CAM through newspapers and magazine, and another 3/29(10%) reported through the internet. 24/29 (83%) of patients reported improvement in quality of life after using CAM. Quality of life improvements included reduction of adverse symptoms related to cancer or RT itself. However, only 15/88 (17%) of the patients talked to their oncologists about CAM. Surprisingly, 12/15 (80%) of oncologists provided patients with additional information on CAM, whereas 3/15 (20%) disagreed, and 2/15 (13%) recommended that the patient stop CAM all together. 49/88 (56%) of patients wished their oncologist had discussed CAM with them.Conclusion: CAM use doubled after starting RT treatment for cancer. Patients reported increase in their quality of life, specifically including reduction of symptoms of cancer or RT treatment with integration of CAM to their RT. Interestingly, 80% of radiation oncologists provided more information about CAM to their patients when the patient asked about them. Discussion of CAM between patients and radiation oncologists is important for an effective integration of CAM with RT, which has potential to improve quality of life in these patients.

RO245-SD-WEB6 Prognostic Potential of CBCT for Tracking Tumor Regression in Stage II-III Non-Small Cell Lung Cancer

Station #6

Participants
Kylie Kang, BS, Cleveland, OH (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): During external beam radiation therapy (EBRT) of lung cancer, cone beam computed tomography (CBCT) is routinely performed for image guidance. This study was conducted in order to determine the prognostic potential of CBCT for evaluating treatment outcome in terms of GTV reduction and to determine the difference of tumor reduction based on different histology. Materials/Methods: Forty-one NSCLC patients treated with definitive radiotherapy at one institution who received daily CBCT were randomly selected. Patients received mean EBRT of 60.7 Gy (range: 50-71.4 Gy) at 1.8 or 2 Gy per fraction. Initial mean gross tumor volume (GTV) was 197.3 cc (range: 3.4-1815.0 cc). Six sets of CBCT at an interval of one week were chosen, starting from the first fraction of treatment. The CBCTs were transferred to MIM Software (v.6.0) and single physician manually contoured the GTV on each slice. The change in GTV was recorded. Patient's clinical information was obtained from the institution electronic medical record. All statistical analysis was conducted on MedCalc (v.16.2). Univariate survival analysis was done using the Kaplan-Meier method with log-rank test. Median overall GTV reduction was used as a cutoff value (DGTVDGTV=45%). A univariate regression analysis was done to explore the correlation between histology and GTV reduction. A pResults: A consistent regression of GTVs was observed in 29 patients, while 12 patients experienced an increase of GTV at some point during their EBRT. Maximum reductions occurred during week 1 and 2 week of radiation, with mean % reductions of 13.5% and 12.6%, respectively. There was an overall GTV % reduction between weeks 1 to 6 in all 41 patients (median: 45%). The recurrence free survival (RFS) in our stratified group with DGTVDGTV=45% was 24.3 months (SE: 4.6) (p= 0.61). Overall survival (OS) for the group of patients with DGTVDGTV=45% (p= 0.21). There was a 6.6% greater overall GTV reduction in adenocarcinoma versus SCC on univariate regression analysis (p= 0.31). There was no statistical significance between histology and RFS (p=0.84) or OS (p=0.06).Conclusion: Large regression of GTV over the course of EBRT for stage II-III NSCLC patients was observed, however, no correlation was found with clinical outcome (RFS, OS). There was slightly higher GTV reduction in adenocarcinoma as compared to SCC, but no statistical significance. A future study with larger sample size involving multivariable analysis is warranted.VariablesMean/Median/CountSD/Range/%Median Age (y)6244-80Gender (#) Female/Male27/1465.9%/34.1Week 1 GTV (cc) Mean197.33.4-1815 Median68.93.4-1815Follow-Up (months) Median12.41.9-61.3

PS40

Wednesday Plenary Session

Wednesday, Nov. 30 1:30PM - 2:45PM Room: E450A

GU RO ED

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credit: 1.00

Participants
Richard L. Baron, MD, Chicago, IL (*Presenter*) Nothing to Disclose

Sub-Events

PS40A **Announcement of Education Exhibit Awards**

Participants

PS40B **Announcement of Quality Storyboard Awards**

Participants

PS40C **Annual Oration in Radiation Oncology: Prostate Cancer: Improving the Flow of Research**

Participants
Colleen A. Lawton, MD, Milwaukee, WI (*Presenter*) Nothing to Disclose
Edward Y. Kim, MD, Seattle, WA (*Presenter*) Research support, Eisai Co, Ltd; Research support, Novartis AG; Research support, Johnson & Johnson; Research support, Bayer AG; Research support, Threshold Pharmaceuticals, Inc ; Research support, Eli Lilly and Company; Research support, MabVax Therapeutics Inc;

Abstract

Prostate cancer for men like breast cancer for women is the second leading cause of cancer death in the United States. This fact alone should cause nation-wide concern and result in a push for improved screening and treatment for men plagued with this disease. Yet over the past three decades we have seen screening with PSA come and go and treatment for localized disease improve, but at a relative snail's pace. Treatment for locally advanced disease has seen progress, but hereto the tempo is sluggish and adoption of the advances not universal. Recently there has been a large influx of treatment options for metastatic patients which of course is progress, but in the end these patients will likely die of their disease. The goal of this presentation will be to review what we have learned from prostate cancer research over the past three decades. This will include a review of the research on imaging for accurate staging in addition to research on screening and treatment options. We will look at where we have succeeded and where much work still needs to be done. Finally we will explore opportunities to identify what needs to be done to help increase the flow of research so as to brighten the future for prostate cancer patients.

MSRO43

BOOST: Head and Neck-Case-based Review (An Interactive Session)

Wednesday, Nov. 30 3:00PM - 4:15PM Room: S103CD

HN NR RO

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50

Participants
Suresh K. Mukherji, MD, Northville, MI (*Presenter*) Nothing to Disclose
Sung Kim, MD, New Brunswick, NJ (*Presenter*) Nothing to Disclose
Francis P. Worden, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Theodoros Teknos, MD, Columbus, OH (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review common tumors of the head and neck. 2) Review imaging findings in head and neck malignancies that specifically change staging. 3) Review the value of imaging in directly affecting management and treatment.

ABSTRACT

This session will be tumor board that includes a head and neck radiologist, head and neck surgeon, medical oncologist and radiation oncologist. We will discuss a variety of head and neck cancer cases and illustrate the value-added benefits and highlight of imaging affects staging, treatment and management.

SSM21

Radiation Oncology (Outcomes and Quality of Life)

Wednesday, Nov. 30 3:00PM - 4:00PM Room: S105AB

RO OI

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

Participants
Edward Y. Kim, MD, Seattle, WA (*Moderator*) Research support, Eisai Co, Ltd; Research support, Novartis AG; Research support, Johnson & Johnson; Research support, Bayer AG; Research support, Threshold Pharmaceuticals, Inc ; Research support, Eli Lilly and Company; Research support, MabVax Therapeutics Inc;
Ralph P. Ermoian, MD, Seattle, WA (*Moderator*) Nothing to Disclose

Sub-Events

SSM21-01 Identifying Patients who Require Gastrostomy Tube Placement during Definitive Chemo-Radiation for Locally Advance Oropharyngeal Cancer

Wednesday, Nov. 30 3:00PM - 3:10PM Room: S105AB

Participants
Einsley-Marie Janowski, MD, PhD, Washington, DC (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Malnutrition is a significant treatment-related morbidity for patients with oropharyngeal cancer undergoing definitive chemo-radiation. Therefore, some clinicians recommend prophylactic gastrostomy tube (G-tube) placement prior to radiation. At our institution, we take a more conservative approach, placing G-tubes on an as needed basis. Here, we evaluate patient- and treatment-related factors associated with G-tube placement during chemo-radiation for locally advanced oropharyngeal cancers to aid in early identification of patients that may benefit from prophylactic G-tube placement.
Materials/Methods: From May 2006 to January 2013, patients were treated with definitive chemo-radiation at our institution for locally advanced oropharyngeal cancer. The medical records from these patients were reviewed for demographics, performance status (PS), placement of G-tubes, disease characteristics, treatment regimen, outcomes, and acute and late toxicities. Univariate and multivariate analysis (MVA) using Cox regression analysis was used to identify factors associated with G-tube placement during therapy as well as dysphagia chronically. Predictors of overall survival (OS) and progression free survival (PFS) were also identified. Results: Eighty two patients with a median age at diagnosis of 58.1 (range, 41-87) were treated. Seventy four (90%) of the patients were male, and 71 (87%) were Caucasian, with an ECOG PS = 1 in 94% and a Charlson Comorbidity Index (CCI) of =2 in 79% of patients. Ultimately, 19% of patients underwent G-tube placement during treatment. The only patient related factor associated with G-tube placement was lower baseline PS (p=0.043). Chronic dysphagia correlated with prior G-tube placement, but did not achieve significance (p = 0.058). However, higher pre-treatment CCI (p=0.002) and non-cisplatin based chemotherapy (p=0.002) were both associated with patient reported chronic dysphagia. With a median follow up of 36 months, the overall survival and progression free survival were 74.6 ± 3 % and 73.9 ± 3 %, respectively. On univariate analysis, G-tube placement was associated with a worse mean OS of 58 months versus 79 months (p=0.004). G-tube placement was not significant on MVA for OS, but was significant for reduced PFS.Conclusion: While G-tube placement was not significantly correlated with chronic dysphagia, it was associated with a reduction in progression free survival, and this may be attributable to toxicity-related treatment interruptions. While the majority of patients can avoid G-tubes, early G-tube placement in patients with poor performance statuses should be considered for this patient population.

SSM21-02 Obesity in Patients Undergoing External Beam Radiation Therapy for Prostate Cancer is Associated with Genitourinary Toxicity

Wednesday, Nov. 30 3:10PM - 3:20PM Room: S105AB

Participants
David Byun, New York, NY (*Presenter*) Nothing to Disclose
Laura Happersett, MS, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Xin Pei, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Sean M. McBride, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Marisa A. Kollmeier, MD, Rockville Centre, NY (*Abstract Co-Author*) Nothing to Disclose
Michael J. Zelefsky, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): There is a paucity of information exploring obesity's influence on radiotherapy-related toxicity for localized prostate cancer. The purpose of this study is to evaluate whether obese patients undergoing external beam radiation therapy (EBRT) for treatment of prostate cancer will have an increase in treatment-related toxicity.Materials/Methods: Between 1995 and 2009, 3,713 patients were treated with EBRT for prostate cancer using our institution's proprietary treatment planning system. With 3,178 files archived, only 535 electronic files were readily accessible for analysis. Due to concomitant use of brachytherapy, 285 patients were excluded, while the remaining 250 patients met inclusion criteria for analysis. Of the cohort, neoadjuvant hormonal therapy was prescribed in 143 patients. Abdominal adiposity was measured by contouring the waist circumference between the 4th and 5thlevel of the lumbar spine, which is an established surrogate measure for obesity. For Cox regression analysis, bladder neck was contoured for dosimetric calculation along with collection of relevant comorbidities (i.e. diabetes, smoking status) and treatment outcomes. Treatment-related toxicity was graded based on the Common Terminology Criteria for Adverse Events.Results: Mean age was 70.4 years (range 49 – 89) with median follow-up time of 81.0 months and total prescription dose of 86.4 Gy. The mean waist circumference was 102.2 cm with a range of 69.7 - 159.9 cm. Kaplan-Meier analysis showed significant increases in risk for long-term genitourinary (GU) toxicity in waist circumferences over 120 centimeters (P = 0.04), while no association was found for gastrointestinal (GI) toxicity (P = 0.50). Multivariate analysis of waist circumference as a continuous variable demonstrated that with incremental increase in circumference, there was an increased risk of long-term GU toxicity of grade 2 or higher [hazard ratio (HR) 1.02, P = 0.05] as well as an increased GU toxicity associated with neoadjuvant hormonal therapy (HT) (HR 1.03, P = 0.009).

In addition, diabetes was associated with a significant increase in urinary toxicity (HR 2.21, P = 0.02), while bladder neck dosimetry analysis did not yield a significant correlation. Analysis of late GI toxicity events did not show a significant association between obesity and GI toxicity, or between obesity and other relevant comorbidity variables. Further, biochemical recurrence and distant metastasis were not associated with abdominal obesity.Conclusion: Obese patients with prostate cancer have an increased risk of long-term genitourinary toxicity following curative radiation therapy to the prostate. Further evaluation of the relationship between obesity and genitourinary toxicity should be conducted.

SSM21-03 Outcomes and Complications of Radiation Therapy in Patients with Familial Adenomatous Polyposis

Wednesday, Nov. 30 3:20PM - 3:30PM Room: S105AB

Awards
Student Travel Stipend Award

Participants
Meng Gan, Oak Brook, IL (*Presenter*) Nothing to Disclose
Shane Lloyd, MD, Salt Lake City, UT (*Abstract Co-Author*) Consultant, Sirtex Medical Ltd
Dustin Boothe, MD, Salt Lake City, UT (*Abstract Co-Author*) Nothing to Disclose
Jonathan Frandsen, Salt Lake City, UT (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Familial adenomatous polyposis (FAP) is an autosomal dominant condition due to mutations in the APC gene highly associated with colorectal and other cancers. There are no large published series on the effectiveness and complications of radiation therapy (RT) in patients with FAP. Materials/Methods: We queried the Hereditary Gastrointestinal Cancer Registry which tracks patients with familial cancer syndromes enrolled on trials at a referral center for genetics and cancer research. Fourteen patients were identified with FAP who received radiation therapy. Outcomes assessed included treatment toxicity, local recurrence, and secondary malignancies. Common Terminology Criteria for Adverse Events (CTCAE) version 4 was used to grade adverse events. Results: Median age at treatment was 44. Mean length of follow up was 8.4 years after RT. Treated sites included rectal cancer (n=3, median RT dose 45 Gy), intra-abdominal desmoid (n=3, median RT dose 49 Gy), prostate cancer (n=2), breast cancer (n=1), melanoma (n=1), medulloblastoma (n=1), gastric cancer (n=1), and glioma (n=1). Eight patients received concurrent systemic therapy. 2 of 4 patients with desmoid tumors and 1 of 3 patients with rectal cancer recurred locally within 5 years. Overall 35.7% of patients experienced recurrence after RT. Secondary infield tumors occurred in 2 patients: a meduloblastoma was diagnosed in a patient treated for glioma, and a desmoid tumor was diagnosed in a patient treated for rectal cancer. While all 9 patients treated with abdominal or pelvic RT had previously undergone prophylactic colectomies, rates of GI toxicity were acceptable with one patient experiencing grade 2 diarrhea. Overall, 21% experienced CTCAE grade 1, 29% grade 2, and 7% grade 3 toxicity. The most common toxicity was dermatitis, seen in 50% of patients. Conclusion: In this cohort, RT was well tolerated with adverse effects consistent with non-FAP patients. Rates of secondary in-field tumors were increased likely due to prior predilection from FAP itself, although an increased role of radiation cannot be ruled out.

SSM21-04 Short-Course Radiation for Palliation of Squamous Cell Carcinoma of an Unknown Primary of the Head and Neck

Wednesday, Nov. 30 3:30PM - 3:40PM Room: S105AB

Participants
Shayna Rich, MD, Gainesville, FL (*Presenter*) Nothing to Disclose
William M. Mendenhall, MD, Gainesville, FL (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): To examine the treatment patterns used for palliative radiotherapy for squamous cell carcinoma from an unknown primary of the head and neck; and to compare the acute toxicity and tumor response for these patients for the most common dose-fractionation regimens.Materials/Methods: We reviewed the radiation therapy records and follow-up visit notes of 45 patients with biopsy-proven squamous cell carcinoma from an unknown primary with cervical lymphadenopathy treated with palliative-intent radiation therapy at our institution from 1966 to 2015.Results: Most patients presented with N3 disease (32 pts; 71%), with symptoms of pain (19 pts; 42%) or difficulty swallowing (12 pts; 27%). Patients were most commonly treated with 20 Gy in 2fractions with a 1-week interfraction interval (13 pts; 29%) or 30 Gy in 10 fractions (13 pts; 29%). Toxicity was mild regardless of dose-fractionation, with only 6 patients experiencing dysphagia and 1 having a pulmonary embolus. Most patients had a partial nodal response during the radiation course (25 pts; 56%), and partial symptom response by the first follow-up (17 pts; 52%). Results were similar for 20-Gy and 30-Gy courses. Median survival was approximately 5 months and did not differ by radiation course.Conclusion: Patients treated with dose-fractionation regimens of 20 Gy in 2 weekly treatments or 30 Gy in 10 fractions had minimal toxicity. Most patients had an excellent response in nodal size during radiation, and nearly all had symptomatic response within the first month of follow-up. Patients with advanced disease of the head and neck may have a surprising durability of response with even a short course of palliative radiation therapy.

SSM21-05 Spinal Instability Neoplastic Scores, Spinal Surgery Referral Patterns, and Outcomes in Unselected Patients Receiving Palliative Radiotherapy to the Spine

Wednesday, Nov. 30 3:40PM - 3:50PM Room: S105AB

Participants
Maryam Dosani, MD, Vancouver, BC (*Presenter*) Nothing to Disclose
Sarah Lucas, MD, Kelowna, BC (*Abstract Co-Author*) Nothing to Disclose
Jordan Wong, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Lorna M. Weir, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Sheri Lomas, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Christina Cumayas, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Charles Fisher, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Scott Tyldesley, MD, FRCPC, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): The Spinal Instability Neoplastic Score (SINS) was developed to identify patients requiring assessment by a

spine surgeon. Patients are stratified into 3 groups: score 0-6 (stable spine, no referral), 7-12 (potentially unstable, consider referral), and 13-18 (unstable, required). Purposes of study: (1) characterize the scores seen in a consecutive cohort of patients treated with spinal radiotherapy (RT) (2) assess referral patterns to spinal surgery (3) identify whether high SINS was prognostic of worse outcome following palliative RT. Materials/Methods: We retrospectively reviewed consecutive patients receiving palliative spine RT between 2012 and 2013. The SINS was calculated based on the CT simulation scan and clinical assessment. Charts were reviewed. Data analyzed using Kaplan-Meier and Cox models. A threshold of 7 stratified patients into low vs high SINS groups.Results: 196 patients with (median(range)): Age 66 (34-95), ECOG 2 (0-4), Charlson Comorbidity Score 0 (0-4). Follow-up was 6.1 (0.1-42.3) months in all patients and 28.5 (0.2-42.3) months in living patients. By time of analysis, 83.7% had died.Median (range) SINS was 7 (1-18). SINS was 0-6, 7-12, and 13-18 in 34%, 59% and 7% of patients. SINS indicated potentially unstable or unstable spine in 84%, 63%, 53%, and 62% of breast, lung, prostate, and other cancer patients. 19 patients were referred to spine surgery (13 before and 6 after RT), with a surgery performed in 0 of 2 patients with SINS 0-6, 3 of 14 with SINS 7-12, and 1 of 3 with SINS 13-18. Stable spine on assessment, intact neurological status, and poor life expectancy were the most common reasons not to pursue surgery amongst surgically referred patients. SINS>7, Age, ECOG>2, cancer type, solitary vertebral metastasis, control of primary, systemic therapy, and estimated prognosis were not predictive of surgery referral on univariate analysis.Outcomes (median(95%CI)) did not differ between low vs high SINS groups. Overall survival was 7.1 months (4.4-9.8, low) vs 6.4 months (2.1-10.5, high), p=0.262. Time to ECOG =3 was 17.1 months (5.2-28.9, low) vs 22.0 months (20.8-23.1, high), p=0.167. Freedom from subsequent intervention (RT or surgery) to the same vertebrae at 1 year was 81.7 +/- 5.5% (low) vs 79.0% +/- 5.4% (high), p=0.211. Ambulation at 1 year was 84.2 +/- 4.7% (low) vs 90.2 +/- 4.0% (high), p=0.085. Conclusion: Most patients with unstable or potentially unstable spines according to SINS were not referred to a spine surgeon. Higher SINS did not predict for worse survival, functional outcomes, or increased need for subsequent intervention. It is uncertain whether SINS would be predictive of outcomes in a cohort with better performance status. At the time of this study, many physicians were not using SINS to guide referral decisions. Whether and how SINS score should be used to select patients for surgery requires further study.

SSM21-06 Improved Pain Control Following Conformal Palliative Radiotherapy for Painful Bone Metastases

Wednesday, Nov. 30 3:50PM - 4:00PM Room: S105AB

Participants
Kara Romano, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): High quality care for patients with advanced cancer and bone metastases requires treatment that is effective while avoiding excess health care costs. Palliative radiotherapy (RT) for bone metastases has traditionally been delivered with conventional, non-conformal radiation therapy (NCRT), such as with AP:PA portals. NCRT is simpler and potentially less expensive than the more complex delivery of conformal radiation therapy (CRT), but may lead to more normal tissue irradiated and more acute toxicity. We evaluated short-term outcomes of patients treated with CRT versus NCRT. We hypothesize that CRT decreases acute toxicity compared to NCRT. Materials/Methods: We retrospectively evaluated a cohort of patients who received palliative RT (CRT on a TomoTherapy unit or NCRT on a TrueBeam/Trilogy unit) at our institution for axial skeletal bone metastases from 2012 to 2014. Patient and treatment characteristics were obtained including: technical details, concurrent chemotherapy, acute toxicity and subjective pain during treatment and in the acute post-treatment period (defined as = 60 days after completion). Acute toxicity was scored according to CTCAE v4.0 criteria. Statistical analyses were conducted using t-tests, Chi-square tests, and multivariate logistic regression (MVA).Results: A total of 179 patients and 267 treatment plans were identified (145 CRT, 122 NCRT). No significant differences were observed between CRT and NCRT groups for: total dose, number of fractions, number of vertebral bodies treated, treatment site, and concurrent chemotherapy. In MVA models, technique (CRT vs NCRT) was not associated with toxicity rates (any, = Grade 2, or = Grade 3 events). Only a higher number of vertebral bodies in the treatment field was significantly associated with a higher rate of acute toxicity post-treatment ($p = 0.015$), and only a higher total dose was significantly associated with a higher rate of acute toxicity during treatment ($p = 0.0141$). CRT was associated with higher rates of improvement of pain during treatment (31% vs. 14%; p) and a non-significant trend toward fewer patients reporting significant worsening of pain after treatment (2.7% vs. 7.4%; $p = 0.08$).Conclusion: Our results suggest that CRT is associated with improved pain control, with no difference in acute toxicity, when compared to NCRT for painful bone metastases. These findings suggest a potential role for CRT in bone metastasis management, which must be balanced against cost considerations. Conclusions are limited by retrospective, nonrandomized study design, with multiple potential confounders including differences in concurrent therapy, patient selection for RT technique, and subjective reporting of pain. Larger studies are needed to further evaluate the role of CRT for bone metastases and to explore differences in patient reported outcomes between RT techniques.

MSRT46

ASRT@RSNA 2016: MRI Guidance for Prostate Cancer: A Radiation Therapist Perspective

Wednesday, Nov. 30 3:40PM - 4:40PM Room: N230B

GU MR RO

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants
Jessy Abed, Toronto, ON, (jessy.abed@hotmail.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explain the importance and relevance of an MRI-guided approach to prostate cancer treatment (EBRT, HDR brachytherapy). 2) Explain the rationale for GTV-tumour targeted approach versus whole gland prostate treatment. 3) Discuss the interventional program at Princess Margaret Cancer Centre, including demonstration of the innovative MRI-guided HDR brachytherapy suite.

ABSTRACT

With the evolution of advancements in image-guided technologies, radiation therapy treatment accuracies and efficiencies in delivery continue to improve as well as a reduction in associated toxicities. But despite these improvements, local recurrence of prostate cancer remains prevalent. Localized prostate cancer is not limited to the prostate gland. As such, regions of tumor-density within the prostate can serve as the gross tumour volume (GTV). Adopting a tumour-targeted radiation therapy (RT) approach to treat prostate cancer is one that may improve the therapeutic ratio by decreasing normal tissue toxicities while improving local control. This can be accomplished by adopting magnetic resonance imaging (MRI) as the image-guided modality for external beam radiation therapy (EBRT) and high dose rate (HDR) brachytherapy for prostate cancer. MRI provides excellent soft tissue contrast without exposing the patient to ionizing radiation. It also allows for more specialized delineation of anatomic structures and disease, thereby allowing more accurate visualization of the target volume. Interventional radiotherapy using MRI-guidance can increase target precision while allowing for dose escalation and normal tissue avoidance. Our institution employs MRI for interventional prostate HDR and EBRT treatment. Adopting a tumor-targeted method for prostate cancer is an innovative approach to prostate cancer RT treatment.

MSRO49

BOOST: Head and Neck-eContouring

Wednesday, Nov. 30 4:45PM - 6:00PM Room: S104B

HN NR RO

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50

Participants

Suresh K. Mukherji, MD, Northville, MI (*Presenter*) Nothing to Disclose
Sung Kim, MD, New Brunswick, NJ (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the pertinent anatomy of the upper aerodigestive tract. 2) Discuss the spread patterns of various head and neck tumors. 3) Illustrate the important of multimodality imaging for tumor contouring.

ABSTRACT

This e-contouring session will be given by a head and neck radiologist and radiation oncologist. This session will review the pertinent anatomy of the upper aerodigestive tract, discuss the spread patterns of various head and neck tumor and Illustrate the importance of multimodality imaging for tumor contouring.

SPSC50

Controversy Session: Is It Time to Put Whole Brain Radiotherapy to Pasture? What's New in the Treatment of Limited Brain Metastases

Thursday, Dec. 1 7:15AM - 8:15AM Room: E450B

NR RO

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants

Simon S. Lo, MD, Seattle, WA, (simonslo@uw.edu) (*Moderator*) Research support, Elekta AB; Travel support, Accuray Incorporated; Speaker, Accuray Incorporated;
Jing Li, MD, PhD, Houston, TX (*Presenter*) Nothing to Disclose
Arjun Sahgal, Toronto, ON (*Presenter*) Speaker, Medtronic, Inc; Speaker, Elekta AB; Medical Advisory Board, Varian Medical Systems, Inc; Speaker, Accuray Incorporated; Research Grant, Elekta AB
Andrew B. Lassman, MD, New York, NY (*Presenter*) Consultant, BioClinica, Inc; Consultant, VBI Vaccines Inc; Consultant, Sapience Therapeutics, Inc; Consultant, Cortice Biosciences; Consultant, Mateon Therapeutics, Inc; Consultant, F. Hoffmann-La Roche Ltd; Consultant, AbbVie Inc; Speaker, prIME Oncology ;
Simon S. Lo, MD, Seattle, WA, (simonslo@uw.edu) (*Presenter*) Research support, Elekta AB; Travel support, Accuray Incorporated; Speaker, Accuray Incorporated;

LEARNING OBJECTIVES

1) Review the role of stereotactic radiosurgery in the treatment of limited brain metastases. 2) Describe the benefits and risks of whole brain radiotherapy to treatment of patients with CNS metastatic disease. 3) Determine the optimal multidisciplinary approach for treatment of patients with single and multiple brain metastases.

ABSTRACT

The aim of this session is to review the evidence for radiosurgery for brain metastases and why whole brain radiation is less and less a treatment of choice. There are serious harms associated with whole brain radiation which will be discussed. Novel strategies with targeted therapy and SRS are also the future in particular with melanoma. Ultimately whole brain radiation will be phased out as a therapy of last resort.

RC622

MRI: Imaging for Radiation Treatment Guidance and Verification

Thursday, Dec. 1 8:30AM - 10:00AM Room: S102D

MR RO PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 0

Participants
Rojano Kashani, Saint Louis, MO (*Moderator*) Investigator, Koninklijke Philips NV; Investigator, ViewRay, Inc

LEARNING OBJECTIVES

1) Understand the main concepts of MRI-guided radiation therapy. 2) Understand the advantages and limitations of MRI-guided radiotherapy systems currently in use or under development. 3) Understand the use of in-room MRI guidance for management of intr- and inter-fraction variations in anatomy.

ABSTRACT

Sub-Events

RC622A In-Room MRI for Treatment Guidance

Participants
Rojano Kashani, Saint Louis, MO (*Presenter*) Investigator, Koninklijke Philips NV; Investigator, ViewRay, Inc

LEARNING OBJECTIVES

1) Understand the main concepts of MRI-guided radiation therapy. 2) Understand the advantages and limitations of MRI-guided radiotherapy systems currently in use or under development. 3) Understand the use of in-room MRI guidance for management of intr- and inter-fraction variations in anatomy.

RC622B Integrating MRI, The Clinician Perspective

Participants
Mary U. Feng, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the clinical benefits associated with the integration of MRI into Radiotherapy. 2) Describe the uncertainties and challenges that exist in MR for radiotherapy.

ROS-THA

Radiation Oncology Thursday Poster Discussions

Thursday, Dec. 1 12:15PM - 12:45PM Room: RO Community, Learning Center

RO

AMA PRA Category 1 Credit ™: .50

Participants
Edward Y. Kim, MD, Seattle, WA (*Moderator*) Research support, Eisai Co, Ltd; Research support, Novartis AG; Research support, Johnson & Johnson; Research support, Bayer AG; Research support, Threshold Pharmaceuticals, Inc ; Research support, Eli Lilly and Company; Research support, MabVax Therapeutics Inc;

Sub-Events

RO246-SD-THA1 Outcomes of Rituximab-based Chemotherapy alone for Primary Mediastinal B-Cell Lymphoma

Station #1

Participants
Steven Oh, MD, Cleveland, OH (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Recent studies of primary mediastinal B-cell lymphoma (PMBCL) have suggested favorable outcomes with immunochemotherapy alone without consolidative mediastinal radiotherapy. This study evaluates our institutional experience of PMBCL patients after treatment with R-CHOP (rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisone) without radiotherapy. Materials/Methods: We queried our institutional, IRB approved cancer registry of patients treated from 2001-2010 and identified 16 patients with PMBCL treated with R-CHOP alone that were eligible for analysis. All patients were treated with definitive intent. All patients were treated with six or eight cycles of R-CHOP. Results: The median follow up was 66.5 months. The median age was 42 years. Eleven patients were male and 5 patients were female. Seven patients had bulky disease (44%), 13 patients had an elevated LDH (>220 U/L), and 2 patients had extranodal disease. Three patients, nine patients, one patient, and three patients were stage I, II, III, and IV, respectively. Overall, 4 patients (25%) developed a relapse. The 3-year and 5-year relapse free survival were 69% and 56%, respectively. The 3-year and 5-year overall survival were 81% and 69%, respectively. Conclusion: The use of R-CHOP chemotherapy alone without radiotherapy for PMBCL leads to relatively decreased relapse free survival and overall survival rates when compared to historical controls treated with combined chemoradiotherapy. Patients with PMBCL may require treatment intensification with the addition of radiotherapy or dose-adjusted R-EPOCH (rituximab, etoposide, doxorubicin, cyclophosphamide, vincristine, and prednisone) chemotherapy.

RO247-SD-THA2 The Impact of Volume of Bone Marrow Irradiated in Head and Neck Cancer on Hematologic Toxicity

Station #2

Participants
Jay C. Shiao, BS, Houston, TX (*Presenter*) Nothing to Disclose
Abdallah S. Mohamed, MD, MSc, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Aasheesh Kanwar, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Andrew Wong, BS, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
David I. Rosenthal, Houston, TX (*Abstract Co-Author*) Advisory Board, Bristol-Myers Squibb Company Advisory Board, Merck KGaA Research support, Merck KGaA
Brandon Gunn, MD, Galveston, TX (*Abstract Co-Author*) Nothing to Disclose
Adam S. Garden, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Merrill Kies, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Clifton D. Fuller, MD, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

We aim to determine the effect of the volume of bone marrow irradiated in the head and neck on the hematologic toxicity after single modality radiation treatment.

METHOD AND MATERIALS

Head and neck cancer patients receiving definitive IMRT alone in one institution was reviewed from 2000 to 2012. Serial hematocrit (Hct), hemoglobin (Hgb), total lymphocyte count (TLC), total neutrophil count (TNC), total monocyte count (TMC), platelets (Plt), and total white blood cell (WBC)) were recorded for pre (latest CBC w/ DIFF before treatment), during (4-6 weeks after start of treatment), and after treatment (0-2, 2-6, 6-12, >12 month after IMRT). CTCAEv.4 criteria was used to determine Hct, Hgb, TLC, TNC, TMC toxicity endpoints. Grade 2-3 toxicity was considered moderate and Grade 4 was considered severe. Radiation treatment plans were restored and isodose lines were regenerated followed by the segmentation of bony structures receiving 1 Gy, 2 Gy, 6 Gy, 10 Gy dose thresholds. Recursive partitioning analysis (RPA) was used to identify bony dose-volume thresholds associated with moderate and severe hematologic toxicity during and after IMRT.

RESULTS

Of the 430 patients reviewed, 63 patients head and neck cancer patients were evaluated during and after IMRT; median age was 58 years old (14 – 78), 47 (74.6%) were male, 52 (82.5%) were Caucasian, 39 (61%) were treated for oropharyngeal cancer. Median radiation dose was 66 Gy (14.4-72) in 30 fractions (4-40). 48 patients (76.2%) had stage III-IV cancer. 48 (76.2%) patients suffered moderate to severe lymphopenia. 3 (4.8%) suffered moderate anemia and 3 (4.8%) suffered leukopenia. No patients suffered a decrease in TNC nor Plt. RPA identified whole bone V6 (volume receiving 6 Gy) ≥ 541.5 cc to be significantly associated with moderate to severe lymphopenia during IMRT (RPA logworth $p<0.002$; cumulative ROC AUC 0.7379; chi-square $p<0.01$). Baseline TLC was normal, dropped 67.5% during treatment, and did not return to baseline after 12 months.

CONCLUSION

Our findings strongly suggest that treatment related lymphopenia is a common enduring side effect of radiation treatment in head and neck cancer patients. Higher bony V6 was associated with the development of moderate and severe lymphopoenia during the course of treatment.

CLINICAL RELEVANCE/APPLICATION

Dose-volume association of irradiated bone marrow and moderate to severe lymphopenia suggest immune preservation is important in IMRT to the head and neck.

RO248-SD-THA3 The Sydney Swallow Questionnaire (SSQ) as a Predictor of Clinical Outcomes in Patients Undergoing Radiation Therapy for Head and Neck Cancer

Station #3

Awards
Student Travel Stipend Award

Participants
Luke C. Peng, MD, MSc, Baltimore, MD (*Presenter*) Nothing to Disclose
Zhi Cheng, MD, MPH, Baltimore, MD (*Abstract Co-Author*) Research Grant, Toshiba Corporation
Xuan Hui, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Scott Robertson, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Joseph A. Moore, PhD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Michael Bowers, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Brandi Page, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Ana P. Kiess, MD, PhD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Jolyne O'Hare, Kogarah, Australia (*Abstract Co-Author*) Nothing to Disclose
Peter Graham, Kogarah, Australia (*Abstract Co-Author*) Nothing to Disclose
Julia Maclean, Kogarah, Australia (*Abstract Co-Author*) Nothing to Disclose
Michal szcesniak, Kogarah, Australia (*Abstract Co-Author*) Nothing to Disclose
Ian Cook, Kogarah, Australia (*Abstract Co-Author*) Nothing to Disclose
Todd R. McNutt, PhD, Baltimore, MD (*Abstract Co-Author*) Research collaboration, Koninklijke Philips NV Research collaboration, Toshiba Corporation Research collaboration, Elekta AB
Harry Quon, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): The Sydney Swallow Questionnaire (SSQ) is a validated quantitative tool for the evaluation of swallowing function in the head and neck cancer (HNC) patient. We hypothesized that the SSQ may predict for clinical outcomes such as weight loss and changes in Functional Oral Intake Scale (FOIS) during a course of radiotherapy to guide management decisions.Materials/Methods: Measures of patient clinical status including SSQ score, weight, feeding tube status, and FOIS were captured at all clinical visits from February 2015 to December 2015 for patients who underwent radiotherapy for head and neck cancer at our institution. Statistical correlations between the SSQ score, its change, and weight loss or FOIS level were evaluated by the Pearson product-moment correlation coefficient. Results: Ninety-three patients who underwent treatment had SSQ scores captured throughout radiation treatment. Median weight change rate during radiation treatment was -0.44 kg per week [interquartile range (IQR), -0.85 to -0.03] and median absolute weight change over treatment course was -2.87 kg [IQR, -6.29 to +0.55]. A negative correlation was found between magnitude of SSQ score increase for each patient and average FOIS (r = -0.479; p). There was also a weak but statistically significant correlation between SSQ score change and max percentage weight loss (r = 0.208; p = 0.0496). For 10 patients who eventually used a PEG tube for nutrition, a strong correlation was found between maximum percentage weight loss and magnitude of SSQ score increase (r = 0.796; p = 0.006).Conclusion: Magnitude of increase in SSQ score was negatively correlated with FOIS confirming that a worsening swallow function leads to compensatory change in functional intake such as switching to softer diet or using a feeding tube. Such adaptations seem to be a partial but incomplete compensation for swallow dysfunction given the weak but significant correlation between SSQ score change and percentage weight loss. SSQ score may be one important predictive factor for identifying patients at increased risk for substantial weight loss, but it likely lacks sufficient explanatory power to predict for such patients independently.

ROS-THB

Radiation Oncology Thursday Poster Discussions

Thursday, Dec. 1 12:45PM - 1:15PM Room: RO Community, Learning Center

RO

AMA PRA Category 1 Credit ™: .50

Participants

Edward Y. Kim, MD, Seattle, WA (*Moderator*) Research support, Eisai Co, Ltd; Research support, Novartis AG; Research support, Johnson & Johnson; Research support, Bayer AG; Research support, Threshold Pharmaceuticals, Inc ; Research support, Eli Lilly and Company; Research support, MabVax Therapeutics Inc;

Sub-Events

RO249-SD-THB1 Clinical Characteristics, Prognosis and Outcome of Elderly Nasopharyngeal Carcinoma Patients in the United States: A Population-Based Study

Station #1

Participants
Ying Huang, Oak Brook, IL (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Because of age and co-morbid conditions, most elderly nasopharyngeal carcinoma (NPC) patients were excluded from randomized clinical trials. Survival of elderly NPC patients in the United States was not explored before. This study was to evaluate clinical characteristics, prognosis and outcome of elderly (=65 years old) NPC patients in the United States.Materials/Methods: We searched the Surveillance, Epidemiology, and End results (SEER) database for patients with NPC who were diagnosed from 2004 to 2012. We analyzed the clinical characteristics, prognosis and outcomes of elderly (=65 years old) patients. The overall survival (OS) and cancer-specific survival (CSS) rates were calculated by Kaplan-Meier method, and compared by log-rank test. Prognostic factors were analyzed by Cox regression model.Results: Our search criteria retrieved 3911 NPC patients. Among them, 904 (23.1%) patients were elderly patients (=65 years old). The 1-, 3-, and 5-year CSS rates were 80%, 67.7%, and 60.1% respectively. The 1-, 3-, and 5-year OS rates were 65%, 45.2% and 34.1% respectively. Their clinical characteristics and outcomes were compared with those of younger patients (P=0.459, P=0.462).Conclusion: Elderly NPC patients (=65 years old) have worse survival than younger patients. Important prognostic factors include clinical stage and receiving radiotherapy. Radiotherapy is an effective curative treatment for elderly NPC patients. Radiotherapy needs to be considered in the treatment of elderly patients (=65 year old) with nasopharyngeal carcinoma.

RO250-SD-THB2 Benign Parapharyngeal Space Tumors after Radiotherapy: A Single Center Experience

Station #2

Participants
Muge Akmansu, Ankara, Turkey (*Presenter*) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Parapharyngeal space tumor is uncommon. Since, this tumor is localized adjacent to the carotid artery or the base of skull, surgery is limited. As a safe treatment approach, radiotheapy is used for this type of tumor. However, knowledge related to prognosis and results is limited.Materials/Methods: Analysing our database from 2001 to 2016, 20 patients (12 female, 6 male) with benign parapharyngeal space tumors were evaluated. The median age is 48 (ranging from 11 to 75). Among these 20 patients, 16 had glomus tumor (glomus jugulare or glomus tympaticum), 3 had schwannoma and 1 had triton tumor. Radiotherapy (RT) was applied with 3D conformal radiotherapy, IMRT or IGRT techniques. A total dose between 5000-6000 cGy with 200 cGy conventional fractions was administered.Results: The median follow-up is 57 months. Of the twenty patients with parapharyngeal space involvement, upper neck region was involved in 12 patients, skull base was involved in 8 patients. In 45% (9 patients) of cases, tumor regression was reported (1 patient had total response). Two patients died due to tumor 1 month and 12 months after RT. Remaining patients had stable disease during follow-up, 3 patients suffered from local pain and 2 patients had dysphagia as long term side effect of RT. Total radiotherapy doses and response rates were not correlated.Conclusion: External RT is a safe and applicable therapy for benign parapharyngeal space tumors. RT dose prescription should be assessed according to tumor involvement of main arteries.

SPSH53

Hot Topic Session: Radiation and Immune Therapies: Challenges in Evaluation of Treatment Response

Thursday, Dec. 1 3:00PM - 4:00PM Room: E353B

BQ RO

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants

Sub-Events

SPSH53A Radiation and Immune Therapy

Participants
Marka R. Crittenden, MD, PhD, Portland, OR, (marka.crittenden@providence.org) (*Presenter*) Advisory Board, Regeneron Pharmaceuticals, Inc; Advisory Board, AstraZeneca PLC; Advisory Board, Pfizer Inc; Researcher, Jounce Therapeutics, Inc; Researcher, Rigel Pharmaceuticals, Inc; Researcher, Bristol-Myers Squibb Company

LEARNING OBJECTIVES

1) Describe the mechansims of synergy between radiation and the immune system. 2) Develop an understanding of how to combine radiation and immune therapy to enhance both local and sytemic responses.

ABSTRACT

That radiation therapy has the capacity to prime immune responses has gained traction in recent years. Various mechanisms of synergy between radiation and adaptive immune responses have been identified in preclinical studies. There are now multiple clinical studies attempting to integrate immunotherapy with RT to extend the effects beyond the primary tumor. However, in addition to these positive stimuli on immunity, RT also initiates suppressive mechanisms in the tumor, which relate to intrinsic processes associated with repair of damaged tissues. A greater understanding of the positive role which radiation plays on adaptive immunity and the negative feedback on inflammation that shuts down these immune responses is needed by radiation oncologists. This input from preclinical models is particularly relevant as we begin to integrate immunologic agents into clinical practice. This educational session will provide an introduction to radiation and immunotherapy broken down into radiation's impact on adaptive immunity and the negative feedback that radiation can cause in the tumor environment and on innate immune cells that may limit the efficacy of radiation combined with immunotherapy. In the process we will identify promising targets for clinical translation and extend the audiences understanding through checkpoint inhibitors and beyond.

URL

SPSH53B Radiation and Immune Therapy in CNS Tumors

Participants
Lia M. Halasz, MD, Seattle, WA, (lhalasz@uw.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the existing data on immunotherapy for treatment of primary and secondary brain tumors. 2) Learn about new areas of study and clinical trials. 3) Recognize challenges for response evaluation.

ABSTRACT

Response of primary and secondary brain tumors to immunotherapy has brought into question the dogma of the central nervous system as an immuno-priveleged site. In this educational session, we will review the clinical data for immunotherapy in the treatment of primary and secondary brain tumors, as well as existing clinical trials. We will also discuss the challenges in determining response and possible toxicities from combined immunotherapy and brain irradiation.

URL

SPSH53C Radiographic Imaging and Cancer Immune Therapy

Participants
Annick D. Van den Abbeele, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

ABSTRACT

URL

RC722

MRI: Imaging for Radiation Treatment Planning

Thursday, Dec. 1 4:30PM - 6:00PM Room: E351

MR RO PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Eric Paulson, Milwaukee, WI (*Moderator*) Nothing to Disclose

ABSTRACT

Sub-Events

RC722A MRI for Anatomical Definition

Participants
Eric Paulson, Milwaukee, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the advantages of MRI simulation for anatomical delineation in both external beam radiation therapy and brachytherapy. 2) Understand the differences between images obtained during MRI simulation versus diagnostic MRI. 3) Understand the current solutions to address technical challenges of using MRI for anatomical delineation in Radiation Oncology.

ABSTRACT

MRI is rapidly emerging as a primary imaging modality in Radiation Oncology, fueled by innovations in MRI-guided treatment delivery, MRI simulation systems, and the role of MRI in individualizing and adapting radiation therapy. This course will discuss the advantages and technical challenges of using MRI for anatomical definition in radiation treatment planning. Current solutions to tailor MRI to the unique demands of Radiation Oncology will be explored. Clinical examples illustrating the use of MRI for anatomical delineation in both external beam radiation therapy and brachytherapy will be presented.

RC722B MRI for Functional Definition

Participants
Uulke A. van der Heide, PhD, Amsterdam, Netherlands (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Get an overview of the most relevant functional MRI modalities are available. 2) Understand how they can be used to improve target definition. 3) Understand their limitations and specific concerns for use in radiation oncology.

ABSTRACT

In addition to anatomical imaging, MRI affords a range of functional techniques. Diffusion-weighted MRI images the restriction of water mobility in tissue, thus probing microanatomy. This is used to identify tumors and monitor response to treatment. Dynamic contrast-enhanced MRI shows the tracer kinetics of contrast agents and reflects the characteristics of the microvasculature, such as flow and permeability. These and other techniques can be used to improve target definition, and to characterize tumor tissue for radiotherapy dose painting.