modulated radiotherapy technique that is used to minimize the dose applied to lung and heart by evaluating the use of the number of beams, beam direction, and virtual organ delineation in order to optimize radiotherapy treatment plans.
Materials and Methods: The subject in this paper were five patients with lung cancer who represent relatively small errors caused by organ motions by penetrating tumors into mediastinum. The number of beams and beam direction used in a treatment plan were 5, 7, 9, and 14 portals ranged from 200 to 160 in an equispaced field and 7 and 9 portals (non-equispaced and arbitrary fields), respectively. The dose constraint (V20 and V25) was configured based on references. Also, the optimized treatment plan can be obtained using a certain proper use in virtual organs. Dose-volume histogram (DVH), isodose line, and dose statistics were used to evaluate the radiotherapy treatment plan. In particular, the utility of the virtual organ delineation was evaluated by analyzing the results before and after applying it.
Results: The nine portals equispaced field-IMRT and 7 portals non-equispaced field-IMRT method demonstrated desirable results within 20% in the PTV (planning target volume), dose homogeneity, mean lung dose, V20, and V25 and showed the same results in these methods due to the application of the virtual organ delineation. Also, it is able to complement possible errors in a treatment process by applying a lung cancer intensity modulated radiotherapy protocol to clinics.
Conclusions: This study designed such a lung cancer intensity modulated radiotherapy protocol and obtained the optimal radiotherapy treatment plan based on the virtual organ delineation and irradiation plan.

938 POSTER

Development of a new normoxic polymer gel dosimeter (TENOMAG)

S. Lee[1], S. Cho[2], H. Huh[2], S. Lee[2], H. Shin[2], S. Kwon[2], H. Yun[3], D. Yang[1], Y. Park[1], C. Kim[1]. *[1]College of Medicine Korea University, Radiation Oncology, Seoul, South Korea; [2]Kyonggi University, Medical Physics, Seoul, South Korea; [3]Donguk University, Radiation Oncology, Ilsan, South Korea*

Background: In recent years, the verification of the three-dimensional (3-D) dose distribution in tumor volume has been significantly considered in a radiation therapy treatment plan. Because the conventional dosimeter including an ion chamber doesn't represent 3-D dose distribution, this study attempts to develop a gel dosimeter that performs 3-D dose analysis using MR images for the chemical change caused by the radiation in tissue equivalent gel in order to overcome this problem.
Materials and Methods: This study produced polymer gel that can be produced in a normoxic condition using anti-oxidants instead of using a polymer gel dosimeter that can only be applied in a hypoxic condition using nitrogen gas. Also, this study investigated the characteristics of normoxic polymer gel according to the composition of gel compound samples to produce practical polymer gel and composited polymer gel with five different compositions. A glass bottle filled with gel that was fabricated to measure dose was produced to investigate the relationship between the amount of radiation and the transverse relaxation time in MR images whereas the MR image of the glass bottle was obtained after applying irradiation. MR images, R2 mapping image, dose-R2 response curves in accordance with composition ratios, and dose distribution were analyzed as evaluation elements.
Results: This study showed the polymer gel that was composited using the combination of a 6% gelatin and 9% MAA applied in this study demonstrated excellent characteristics in the radiation dose. Also, it was evident that it showed very high radiation sensitivity due to the strong oxygen removal reaction of the applied anti-oxidant. The gradients of the sets were 0.60, 0.775, 0.683, and 0.954, respectively, and the intercepts of the curve were 0.322, 0.473, 0.611, and 1.032, respectively. In the case of the set 3, it showed better results in the linearity, such as 0.9491, than other groups.
Conclusion: This study composited polymer gel (Tetrakis hydroxymethyl phosphonium chloride-Normoxic-Methacrylic acid-Gelatin, TENOMAG) in a normoxic condition using anti-oxidants and obtained a composition ratio that can be practically applied to clinics.

939 POSTER

Administered dose to the rectum and colon in prostate cancer patients treated with curative radiotherapy presenting a secondary intestinal cancer

D.C. Weber[1], H. Wang[1], M. Rouzaud[1], R. Miralbell[1], E. Rapiti[2]. *[1]University Hospital of Geneva, Radio-Oncologie, Geneva, Switzerland; [2]Geneva Cancer Registry, University of Geneva, Geneva, Switzerland*

Background: Radiotherapy (RT) is a known strong risk factor for cancer development. Controversy still exists, however, on the possible carcinogenic hazard on colon and rectum derived from the irradiation of a prostate cancer. This study aims to evaluate the administered dose to the rectum-colon and technique characteristics of patients presenting an intestinal tumor after curative RT for prostate cancer.
Materials and Methods: Using data from the population-based cancer registry, 11/264 (4.2%) prostate cancer patients treated with curative RT presented a rectal or colon cancer. These tumors were diagnosed at a median time of 96.5 months (range, 75–145) after RT. Three secondary cancers were located at the recto-sigmoid and transverse colon, respectively. Other location were sigmoid colon (n = 2), caecum (n = 2) ascendant colon (n = 1). Median delivered dose to the pelvis was 50 Gy (range, 45−54). Median delivered dose to the prostate was 66 Gy (range, 50−70). All patients were treated with high-energy photons (10 MV, 9 patients; 18 MV, 2 patients). Eleven CT datasets were selected to match the patient's clinical characteristics (weight, patient thickness) so as to reconstruct the dose deposition of the curative RT.
Results: All but 2 patients were treated with a 4 field box technique for the pelvic fields. One patient interrupted the RT before the boost delivery. The prostate boost was delivered by a 2, 6 and 4 field technique in 7, 2 and 1 patients, respectively. The dose to the intestinal tractus will be detailed at the ECCO meeting.
Conclusions: Secondary cancers after curative RT for prostate cancer occur out of the treatment fields in a substantial number of cases.

940 POSTER

Body immobilization systems: gadgets or tools?

P. Fava, S. Devic, T. Vuong. *McGill University Health Centre, Radiation Oncology, Montreal, Canada*

Background: There are cases that highlight the importance of eliminating researcher bias, this is one of them. Fortunately the rigours of proper testing reassert the self-correcting nature of science.
With the introduction of new technology such as intensity modulated radiotherapy (IMRT), image-guided radiotherapy (IGRT), TomoTherapy® etc. small misalignments can result in treatment failure. This prompted the question as to whether immobilization systems are indispensable tools. The purpose of this study is to evaluate the BodyFix® System.
Materials & Methods: This device consists of a body size bag (shell) filled with Styrofoam pellets, which moulds to the patient's form as air is removed via a vacuum pump. The patient lies in this shell and is immobilized for treatment. Biweekly anterior and lateral set-up check films (CF) were taken for the duration of treatment for eleven patients undergoing pelvic irradiation with six of them randomly selected to be mobilized with this system. To evaluate the quality of the immobilization, two therapists measured, compared and recorded the distance between the field edge and two bony landmarks for each (CF) and corresponding digitally reconstructed radiograph (DRR). If the measurement on the (CF) differed from those of the (DRR), the patient was realigned, (CF) verified and treatment given. Set up times were recorded biweekly to evaluate the practicality of the product.
Results: Our data showed that the immobilized patients were misaligned on average by 0.8 ± 0.3 mm while the non-immobilized patients were misaligned on average by 4 ± 8 mm. Thus, our data shows that this device does provide adequate immobilization. The patient set-up time was virtually unaffected as it increased only by about one minute when the device was used. We found that the major disadvantage of this immobilization system is that a significant amount of space is required to store the shells.
Conclusion: Our results suggest that what we thought would be a useless gadget, actually proved to be a helpful tool. Regrettably, due to space restrictions, only a limited number of patients can realistically be treated with this immobilization system. We therefore propose comparative multicenter trials so more systems can be simultaneously tested and results shared. This will help us to soon find an adequate immobilization system that could benefit all patients.

941 POSTER

Individual superficial applicators – geometric optimization of treatment plans

E. Mazur[1], M. Szlag[1], K. Slosarek[1], B. Bialas[2]. *[1]Centrum Onkologii – Instytut im. M.C. Sklodowskiej, Treatment Planning, Gliwice, Poland; [2]Centrum Onkologii – Instytut im. M.C. Sklodowskiej, Brachytherapy, Gliwice, Poland*

Aim: to analyze dosimetric parameters of dose distributions calculated for surface applicators in order to optimize the geometry of the individual applicators for small irradiated areas (about 9 cm^2), to meet requirements of conformal brachytherapy. Treatment plans for individual surface applicators, where temporal and geometrical optimization was employed, are presented in this paper to introduce it's usefulness in treating different localization of skin cancers.