Electronic Poster: RTT track: Patient preparation, patient immobilisation and support aids

EP-1615

Setup rotational error reduction initiatives for large intact breast irradiation: The SGMC experience

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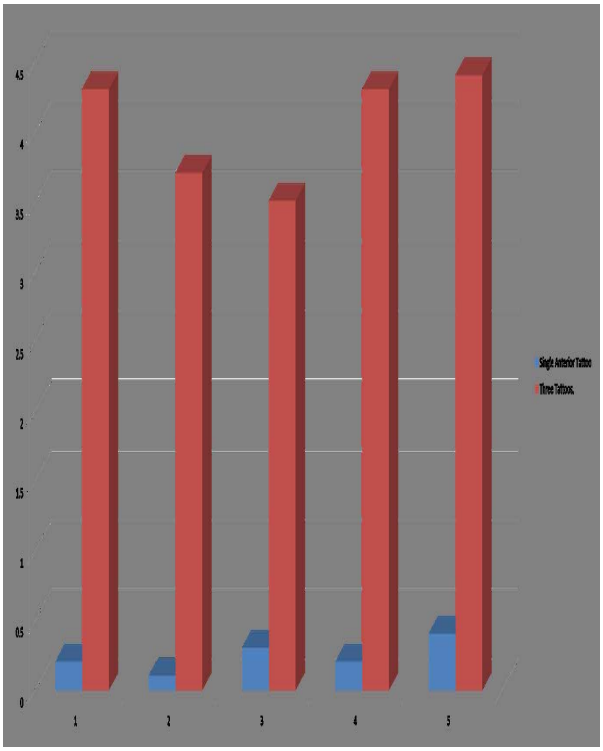
Purpose/Objective: The technique of placing all three (3) reference tattoos on a single position or slice during CT simulation becomes a challenge when presented with patients with very large and pendulous breasts. This study reviews the CT simulation setup and treatment technique initiatives employed at SGMC over the years in reducing systematic rotational setup errors.

Materials and Methods: Ten (10) intact breast cancer patients with very huge breasts who had undergone 3D Conformal Radiotherapy (3DCRT) between August 2011 and July 2014 were selected for this study. Five (5) of them (Group A) had a reference anterior tattoo placed on the sternum during CT simulation. The other five (Group B) had an anterior tattoo placed on the sternum and two lateral tattoos placed more inferiorly on the sides (for setup rotation correction).Using the IView GT system, anterior-posterior portal images for the first five fractions of both groups were analysed for rotational setup deviations by matching them unto reference digitally reconstructed radiographs (DRRs).

Results: With an acceptable rotational shift tolerance of 3 degrees at SGMC, 50 portal images were analysed and comparism made between the initiatives taken so far. For Group A (huge breast with only one tattoo on the sternum), an average rotational deviation of 4.43° was calculated with a minimum and maximum deviations of 3.5° and 5.0° respectively. For Group B (huge breast with three tattoos- one on the sternum and the other two placed more inferiorly on the sides), an average rotational deviation of 0.04° was calculated with a minimum and maximum deviations of 0° and 0.2° respectively. The new initiative (Group B) had no rotational errors during setup as compared to the earlier initiative (Group A) but requires extra work and careful placement of the treatment plan reference position (TPRP), during planning



Conclusions: While translational errors can be corrected with a simple couch shift, rotational errors cannot be easily accounted for and therefore exist throughout the course of treatment. Such rotational errors represent a systematic difference between patient simulation and treatment, and the dosimetric consequences need to be carefully evaluated. The rotational errors reduced to 0% with the new initiative adopted at SGMC in treating huge sized intact breast cancer patients.

EP-1616

A review of bladder filling protocols for patients receiving radical pelvic radiotherapy

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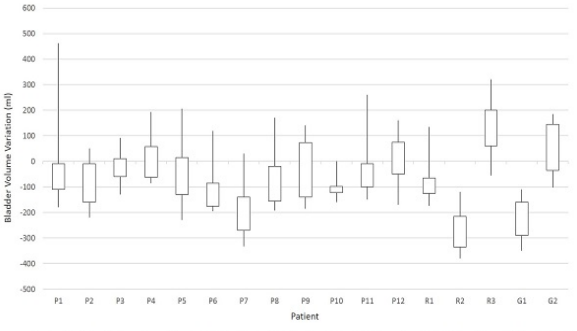
Purpose/Objective: Radiotherapy techniques have evolved to improve target volume conformity and enable higher radiation doses to be delivered whilst sparing normal tissues. Bladder-filling affects target position for patients with prostate, rectal and gynaecological cancers and inconsistent filling may impact both outcomes and toxicity.

In our regional centre, the departmental bladder filling protocol advises patients to drink 4-5 200ml cups of water within 5 minutes of emptying their bladder. After 30 minutes, bladder volume is assessed using US and the planning procedure commences 45 minutes from start of drinking. For patients with prostate cancer, the desired bladder volume is 200-400ml. For patients with rectal or gynaecological cancers, the aim is to be 'comfortably full'.

The aim was to review existing bladder-filling protocols to establish if they provide effective consistent filling throughout treatment and to see if this impacts toxicity.

Materials and Methods: All patients receiving radical radiotherapy for prostate, rectal and gynaecological cancers over a 6 month period were included. Bladder scan measurements were conducted at radiotherapy planning and US was performed 3 times weekly throughout treatment. The RTOG toxicity score was reviewed retrospectively.

Results: 12 patients with prostate cancer, 3 with rectal cancer and 2 with cervical cancer were identified. Bladder filling protocols were adhered to in that the number of preparatory cups of water drunk was consistent. US assessment showed significant variation in bladder volumes from the original volume at planning. For prostate patients this ranged from +462mls to -333mls, for rectal patients +320mls to -380mls, and for cervical patients +185mls to -350mls. The mean variation of median values for each group was 76.25mls, 166.7mls and 160mls respectively, giving a collective mean across all patients of 102mls. The variation in bladder filling did not affect patients' toxicity.



Box-and-whisker plot showing variation in bladder volume for patients with prostate cancer (denoted by P), rectal cancer (denoted by R) and gynaecological cancers (denoted by G). The ends of the whiskers indicate the minimum and maximum values. The ends of the rectangles correspond to the upper and lower quartiles of the data values.

Conclusions: It is important to reliably achieve bladder filling throughout treatment that is consistent with the bladder volume on which the radiotherapy plan is based otherwise it may impact both treatment outcomes and toxicity. Despite having standardised preparation protocols, consistent filling is challenging.

Variation may be due to patient compliance, time lag between US to planning CT, or time on treatment couch, during which there is continued bladder filling, introducing significant changes in bladder volume.

Standardising bladder-filling protocols, patient education, and minimizing time between bladder US and treatment time all play important roles in improving consistent bladder filling.

EP-1617

Assessment of set-up errors in frameless fractionated SRT of cranial lesions with CBCT and immobilization cast

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Purpose/Objective: Setup errors are inherent part of any radiation treatment. It is introduced by virtue of manual as well as machine related attribute which to a certain extent can be controlled by daily meticulous procedural checks. They are defined as the difference between the actual and intended position with respect to radiation delivery. The Aim of our study is to assess setup error and its frequency in cases of frameless stereotactic radiotherapy given in case of brain tumors without frame with the help of orfit ray cast with open mouth and All in One base plate.

Materials and Methods: A total of 11 patients undergoing treatments in between 3 to 6 fraction on linear accelerator with HD MLC at our hospital by frameless stereotactic radiotherapy for lesions metastatic to brain. Each patient was planned without rigid frame, though immobilization was achieved by orfit cast. Daily verification of setup was done with the help of CBCT. Analysis of daily setup error and shift thus applied was calculated for each patient at the end of his/her treatment.

Results: In our present study, it was found that the displacement in antero-posterior, supero-inferior and medio-lateral direction was 0.137$\pm$0.089cm, 0.154$\pm$ 0.056 cm and 0.199 $\pm$ 0.153 cm respectively. It was seen that the set up errors ranged between 0.04 - 0.26cm for antero-posterior, 0.1 - 0.3cm for supero-inferior and 0.04 - 0.58 cm for medio-lateral direction.

Conclusions: Our present study has come to the conclusion that frameless stereotactic radiotherapy cranial field mean set-up error was <0.2 cm in all X Y Z coordinates. Caution is warranted against adopting generic margin as different margin generating recipes lead to a different probability of target volume coverage.

EP-1618

Study of the capacity to keep the treatment position during radiotherapy in palliative patients

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Purpose/Objective: To assess if the patient position for palliative patients with well controlled pain is guaranteed in each treatment session during the whole treatment.

Materials and Methods: 16 palliative patients with well controlled pain were selected. The simulation was performed without any particular immobilization system. The patients are usually in supine position with a pillow under the head and another under the legs, to help keep a stable and comfortable position during the treatment.

The method used in this study was:

1. To perform a set of two setup images (MV/MV or KV/MV) at the beginning of the session and to repeat them at the end of the session for 5 treatment sessions.
2. To compare the setup images taken at the beginning and at the end of each session, with the reference images (DRRs) obtained from the Eclipse Planning System, by means of the 'Off-line review' software (both softwares from Varian Medical Systems).

The differences obtained in the aforementioned comparison, were introduced in a spreadsheet and they were carefully analyzed in order to determine if the patient position was kept within tolerances during each of the analyzed sessions.

The tolerance for palliative treatments in the image protocol implemented in our hospital is ± 0.7cm in each of the three axes.