PO-0944

An assessment of patient intrafraction motion for lung SABR using VMAT

K. Moore[1]
[1]*Beatson West of Scotland Cancer Centre, Radiotherapy, Glasgow, United Kingdom*

Purpose/Objective: At the Beatson Cancer Centre, we have developed a novel treatment delivery technique for our SABR lung patients. This involves an 'arms down' patient set-up, utilising thermoplastic thorax immobilisation, 4DCT-based planning, and on-line CBCT verification prior to each fraction and VMAT delivered IMRT to assess the effectiveness of patient set-up using our immobilisation, and quantify associated patient intrafraction motion, on-treatment verification using CBCT pre and post treatment delivery was carried out. Here, we report the results of our first 28 SABR patients.
Materials and Methods: Patients are placed in a supine position with their arms by their sides, on a BDS board (Sinmed, Iowa, USA). Head and neck support is individualised to ensure comfort, support and to minimise gaps at the base of the neck. Thoracic immobilisation is provided by a thermoplastic (Klarity, Ohio, USA) mould with 4 point fixation, which supports the patient from the inferior edge of the lower lip to the mid thorax or lower where possible. Each patient receiving SABR with VMAT (55 Gy/5#) undergoes a CBCT prior to treatment and then further CBCT on completion of each fraction. A region of interest was used to perform an automatic bony match between the pre and post treatment CBCTs. The patient intrafraction motion is represented by the difference between pre and post treatment bony matches. differences were measured for each CBCT.
Results: Analysis was based on the first 28 patients, which produced 138 CBCT image sets. For each direction, the frequency distribution of set-up shifts and a confidence interval was calculated.

Direction	Range	% of tCBCTs within range	95% confidence interval (lower bound)	95% confidence interval (upper bound)
Anterior-posterior	± 1 mm	86.2	0.80	0.91
	± 2 mm	99.3	0.97	1.00
Longitudinal	± 1 mm	82.6	0.76	0.88
	± 2 mm	94.9	0.91	0.98
Lateral	± 1 mm	83.3	0.77	0.89
	± 2 mm	91.3	0.87	0.95

Conclusions: These results demonstrate that this novel immobilisation and VMAT delivery technique is successful in minimising intrafration motion for lung SABR patients.

PO-0945

Target volume margins calculations in daily image-guided radiotherapy of locally advanced prostate cancer

E.H. Thøgersen[1], A. Vestergaard[2], J.B. Pedersen[2], L. Bentzen[3], L.P. Muren[4]
[1]*Aarhus University Hospital (Herning), Department of Medical Physics, Aarhus, Denmark*
[2]*Aarhus University Hospital, Department of Medical Physics, Aarhus, Denmark*
[3]*Aarhus University Hospital, Department of Oncology, Aarhus, Denmark*
[4]*Aarhus University Hospital, Department of Clinical Medicine, Aarhus, Denmark*

Purpose/Objective: Patients with locally advanced prostate cancer treated with radiotherapy (RT) to the prostate, seminal vesicles and pelvic lymph nodes are routinely treated with a simultaneous integrated boost (SIB) approach, based on fiducial marker based daily image-guidance. However it is known that the soft and bony structures may have different motion patterns. The aim of this study was therefore to assess the margins required at various anatomical levels of the lymph node target, following daily 2D kV imaging based set-up on prostate fiducials.
Materials and Methods: This study was based on locally advanced prostate cancer patients that underwent both daily 2D kV imaging for fiducial marker based set-up as well as weekly cone-beam CT scanning. In the planning CT scan for each patient, a senior radiation oncologist contoured the pelvic lymph node target at three different anatomical levels according to RTOG guidelines. Using the Eclipse registration module (version 10.0), a rigid 6D bone match between the planning CT and each of the CBCTs was performed. Subsequently, a rigid 3D match on the prostate fiducials between the CBCT and the planning CT was performed to mimic the treatment geometry/position. The centre of gravity for the planned and the registered lymph node structures were found and margins (for rigid motion) of the three lymph node levels was calculated using the widely accepted van Herk margin recipe (**$2.5\Sigma + 0.7\ \sigma$**). A total of 15 patients was included in the study, but here we report the results of the analysis of the first five patients who had a total number of 32 CBCTs acquired during treatment.
Results: The calculated margins for lateral (LR), anterior/posterior (AP) and superior/inferior (SI) are shown in the table for each level of the lymph nodes, ranging from 9 to16 mm LR, from 3 to 11 mm AP and from 5-6 mm in the SI direction. The margins are clearly lower in the caudal part of the target (in particular for the LR and SI directions), possibly related to the distance to the prostate.

Margins (mm)	LR	AP	SI
Cranial part	16,3	3,4	4,7
Middle part	15,5	11,6	6,2
Caudal part	8,5	4,1	4,8

Conclusions: In this study we have investigated the margins required to cover the pelvic lymph nodes when these are treated simultaneously with the prostate, using prostate fiducials. It was found that the margins differ according to the anatomical level, being smallest in the caudal part of the target, closest to the prostate (and the fiducials). Analysis of further patients is required for a more accurate determination of the margins for this population.

PO-0946

Methods for assessing atlas-based contouring in head and neck cancer

M.J. Gooding[1], L. Durrant[2], K.Y. Chu[2], C.L. Eccles[2], F. Kaster[1], T. Kadir[1]
[1]*Mirada Medical Ltd, Science and Medical Technology, Oxford, United Kingdom*
[2]*Gray Institute for Radiation Oncology and Biology, Department of Oncology, Oxford, United Kingdom*

Purpose/Objective: Many measures have been used in the literature to assess the accuracy of atlas-based contouring. The objective of this study was to investigate whether there is a strong clinical basis for them, and which is the most appropriate for this purpose.
Materials and Methods: 33 structures were contoured to atlas standard according to RTOG guidelines for 10 Head and Neck subjects. A leave-one-out approach was used to auto-contour each case using an atlas-based contouring system (RTx, Mirada Medical, Oxford,UK). Thus, 90 cases with manual ground truth results were available for assessment. Three clinical experts independently rated the performance of the auto-contouring result quantitatively based on a visual assessment, determining the approximate percentage of the contours requiring negligible editing. Rating was performed individually for left and right parotids (LP, RP), brain stem(BS), spinal cord (SC) and mandible (MD), for the case as a whole (WC). The Dice coefficient, mean, median and Hausdorff distances in both 2D and 3D were calculated between the automatic and the ground truth contours for each structure. Dice coefficients were also calculated for the case as a whole. Pearson correlation coefficients were calculated between the experts' average score and each measure.
Results: The Pearson correlation coefficients and average measures are shown in the table for each structure and for the case as a whole. The average percentage utility according to the experts was 79%, 76%,77%, 86%, 82% and 91% for WC, LP,RP, BS, SC and MD respectively.

Correlation against experts							
Structure	DICE	Mean 2D error	Mean 3D error	Median 2D error	Median 3D error	2D Hausdorff distance	3D Hausdorff distance
Whole case	0.49	-	-	-	-	-	-
Left Parotid	**0.86**	-0.52	-0.53	-0.67	-0.58	-0.08	-0.15
Right Parotid	**0.84**	-0.59	-0.59	-0.75	-0.56	-0.20	-0.42
Brainstem	0.47	-0.43	-0.55	-0.34	**-0.62**	-0.40	-0.39
Spinal Cord	0.41	**-0.51**	-0.37	-0.37	-0.25	-0.38	-0.14
Mandible	**0.95**	-0.91	**-0.95**	-0.95	**-0.95**	-0.34	-0.83
Average Scores							
Structure	DICE	Mean 2D error (mm)	Mean 3D error (mm)	Median 2D error (mm)	Median 3D error (mm)	2D Hausdorff distance (mm)	3D Hausdorff distance (mm)
Whole case	0.68	-	-	-	-	-	-
Left Parotid	0.68	3.4	3.4	2.1	1.7	18.2	12.8
Right Parotid	0.77	3.7	3.7	2.2	2.0	20.1	13.4
Brainstem	0.74	1.9	1.9	1.5	1.5	7.0	9.3
Spinal Cord	0.89	1.2	1.2	1.1	0.7	4.8	6.1
Mandible	0.68	1.8	1.8	0.5	0.2	22.0	5.2

Conclusions: The highest correlating measure with respect to clinical assessment was found to vary according to the structure under consideration. Clinical assessment of the accuracy may be influenced by the complexity of the structure to draw and its relative importance in planning. In contrast the quantitative measures may reflect the variation of the structure within the population and the errors that could occur when using atlas-based contouring – i.e. the cord may have a 2D displacement, whereas the parotids may vary in shape more. The Hausdorff measure was found to be poorly correlated with experts' assessment reflecting the Hausdorff measure's sensitivity to outliers. Therefore, multiple quantitative measures should be reported when assessing the accuracy of atlas-based contouring.

POSTER: RTT TRACK: PATIENT CARE AND PATIENT INFORMATION

PO-0947

Breast cancer patientsí knowledge of RT at the beginning of their RT period

M. Siekkinen[1], S. Pyrhönen[2], H. Leino-Kilpi[1]
[1]*University of Turku, Department of Nursing Science, Turku, Finland*
[2]*Turku University Hospital, Department of Oncology and Radiotherapy, Turku, Finland*

Purpose/Objective: The aim of patient education is to provide patients the necessary knowledge and skills about health problems and treatment. With knowledge patients can be empowered to make informed choices and take care of them selves. Patient education is an essential part of a RT period, because of treatments psychosocial and physical side effects. For this patient education to be at its most effective, it should be based on an evaluation that is able to describe patients' knowledge. The purpose of this study is to report the results of descriptive study that evaluated the breast cancer patients' knowledge of RT at the beginning of their RT period.
Materials and Methods: 133 breast cancer patients in one university hospital of Finland were surveyed with 'Knowledge Test of RT for Breast Cancer patients' (KTRT-BC) tool, which is a 28 item 'yes/no' questionnaire. The content of the tool was the bio-physiological knowledge consisted of 'RT process' (7 item) and 'Possible side-effects' (7 items) themes and the functional knowledge consisted of 'Side-effects and self-care' (7 items) and 'Lifestyle and RT' (7 items) themes. The data was collected at the beginning of RT period before first RT session. It was possible to have 7 points from each theme.
Results: Patients received test average 21.65 point knowledge of the 28 possible points. The range of the right answers was from 11 to 27. The mean from all themes was 5.15. Patients knew best of 'RT process' (5.94), 'Possible side-effects' (5.61) and 'Lifestyle and RT' (4.93) themes and the least of 'Side-effects and self-care' (3.84) theme of RT knowledge. No of the patients did not respond to all propositions correctly.Patients' age (p = 0.0113), employment status (p = 0.0085), educational qualification (p = 0.0103) and computer using skill (p = 0.0139) had significant associations with knowledge level.
Conclusions: Patients knew best how the RT was carried out but they had mediocre knowledge related to the self-care of side effects. There is need to provide patients more education of RT, particularly of the functional empowering knowledge. The empowering effect of patient education according to knowledge level diagnosis should also be studied.

PO-0948

Health care professionals' evaluation of quality of life issues in patients with brain metastases

N. Lauzon[1], G. Bedard[1], L. Zhang[1], A. Sahgal[1], L. Zeng[1], K. Koo[1], E. Chow[1]
[1]*Sunnybrook Health Sciences Centre, Radiation Therapy, Toronto, Canada*

THIS ABSTRACT HAS BEEN WITHDRAWN BY THE AUTHORS

POSTER: RTT TRACK: EDUCATION AND TRAINING

PO-0949

Advanced practice in New Zealand for radiation therapists

K. Coleman[1], M. Jasperse[1], J. Yielder[2]
[1]*University of Otago Wellington, Department of Radiation Therapy, Wellington, New Zealand*
[2]*University of Auckland, Faculty of Medical & Health Sciences, Auckland, New Zealand*

Purpose/Objective: This presentation will highlight the main findings from a New Zealand survey of Radiation Therapists (RTs) on Advanced Practice and discuss a potential way forward for the profession. The proposed career pathway allows flexibility with respect to the diversity of clinical areas of expertise and perceived need in departments nationally, and also in supporting academic structures within the New Zealand university framework. In 2008 the New Zealand Institute of Medical Radiation Technology (NZIMRT) determined that Advanced Practice roles for medical imaging and radiation therapy professionals would be investigated. Previous research conducted in New Zealand has indicated that the majority of MRTs, Radiation Therapists, Radiologists and Radiation Oncologists, support role extension and the establishment of advanced practitioner roles. Recent surveys aimed to clarify which profiles and criteria should be prioritised and developed for the profession. Contextual influences affecting the implementation of such roles were also investigated.
Materials and Methods: Electronic surveys were distributed to all radiation therapists in New Zealand, to gain feedback on potential advanced practice profiles and criteria. The perceived advantages and barriers of implementing advanced practice were also explored. Potential profiles were offered for comment, with respondents being asked what further activities could be included within these profiles and which could be removed. They were also asked whether there were any potential profiles missing.
Results: Results indicated that there is significant support within New Zealand radiation therapy departments for formalised Advanced Practice roles. A diverse range of perceived advantages for the profession were identified, however many in the profession expressed concerns around accountability, acknowledgment and support.
Conclusions: There was similar support for all profiles and criteria in radiation therapy. How Advanced Practitioner roles can be used will be dependent on the culture and needs of each clinical RT department. It was identifed that 'advanced skills' may beome 'standard skills', therefore it is important that an Advanced Practitioner role focuses on leadership that continually develops innovations and best practice within the role. Generic academic structures are needed to give flexibility to support RTs seeking these roles.

PO-0950

Quality assesment of transfering competences from one staff group to another.

M.D. Lund[1], M. Berg[1], L.M. Nielsen[2]
[1]*Vejle Hospital, Medical Physics. Dep. of Oncology, Vejle, Denmark*
[2]*Vejle Hospital, Radiotherapy. Dep. of Oncology, Vejle, Denmark*

Purpose/Objective: With increasing use of online pretreatment IGRT comes increased demand for reviewing resources. It is therefore desirable to shift the competence of reviewing these images to the treatment staff. The purpose of this study is to compare the quality of image matching for rectal and anal cancer patients done by two different groups of staff.
Materials and Methods: In our department physicists have the reviewing competence for IGRT. A few years ago this competence was transfered to radiation therapist nurses (RTNs) for prostate seed matching. This study describes the transfering of reviewing competence for rectal and anal treatments to RTNs. RTNs attended training sessions and had to take an exam before being allowed to review pretreatment cone beam computed tomography (CBCT) unassisted. The training sessions consisted of a lecture by an