poor rate of career progression, lack of benefits and financial support from institutions and the government. Although RTT does not perform certain activities in the clinic, the clinical domains described by ESTRO CC were classified by most RTTs as skills and competences acquired during the academic degree, but may not apply on their clinical daily practice.

PD-0580

Clinical evaluation of pitch and roll capabilities for patient setup in head and neck radiotherapy

L. Woods[1], C. Baker[1]
[1]*Clatterbridge Cancer Centre, Radiotherapy, Wirral, United Kingdom*

Purpose/Objective: To compare and quantify residual set-up errors for head and neck IMRT between 4DoF (translation and yaw) and 6DoF (translation plus pitch, roll and yaw) clinical accelerator couches and evaluate the impact on treatment time and imaging frequency.

Materials and Methods: 30 retrospective patient records formed 2 groups of data for comparison. Group A (n=15) was treated on a traditional 4DoF Varian IGRT couch and group B (n=15) was treated on a Varian PerfectPitch™ 6DoF couch. 293 CBCTs were analysed retrospectively. Each CBCT was registered at the superior, central and inferior level of the treatment volume. The differences in indicated displacements at each level relative to the online registered treatment position were recorded to indicate residual set-up error. Maximum shifts over the extent of the treatment volume in the vertical, longitudinal and lateral directions were averaged over the course of treatment along with their standard deviations. In addition, the maximum vector shift over the 3 registration levels was recorded for each fraction and averaged over the course of treatment. The time taken for image acquisition and analysis was recorded as were the number of repeat CBCTs performed. Significance testing for differences between groups was assessed via the t-test.

Results: Improved setup accuracy for the 6DoF group was reflected through significantly smaller standard deviations of the maximum residual error in the vertical and longitudinal directions, as shown in the table below. Significantly reduced maximum vector shifts were also observed, from an average of 0.30 cm to 0.19 cm for the 4DoF and 6DoF groups respectively. Overall setup times for the 6DoF group were on average 2.4 minutes less than for the 4DoF group, as a result of a reduced number of repeat patient setups. 24 repeat CBCTs were required for the 4DoF group, due to an inability to correct for observed displacements, compared to 4 for the 6DoF group.

Group	Maximum Translational Error						Maximum Vector Error	
	Vert	SD	Long	SD	Lat	SD	Average	SD
4DoF	0.07	0.23	-0.01	0.07	0.01	0.17	0.30	0.13
6DoF	0.03	0.16	-0.01	0.05	-0.00	0.10	0.19	0.07
p value	0.484	0.03	0.96	0.13	0.733	0.003	<0.001	<0.001

Maximum translational setup errors [cm] (vertical, longitudinal and lateral) and maximum vector errors for 4DoF and 6DoF groups. Each quantity represents the maximum over 3 target levels (superior, central and inferior), averaged over each treatment fraction and over all patients in each group. The standard deviation of each quantity over each group is indicated. The corresponding (t-test) p-value indicates significance in the difference between each group of patients.

Conclusions: A significant reduction in the magnitude and variation of residual setup error and imaging time was observed when using a 6DoF robotic couch for head and neck IGRT. A maximum residual vector shift over the treatment volume of 0.19 cm for the 6DoF group is a significant improvement over the 0.3 cm achieved with the standard 4DoF couch. Changes in neck flexion are common for this treatment site and whilst pitch rotation cannot always provide adequate correction, the number of repeat CBCTs required was found to be significantly reduced when this capability was available. From a resource perspective, significant time savings were observed when using a 6DoF couch. Using 15 minutes treatment slots as an example, the average saving of 2.4 minutes per patient found in this study could potentially allow 5 extra patients to be treated in an average 9 hour treatment day using a 6DoF couch.

PD-0581

In vivo dosimetry as verification of delivered dose leading to an adaptive radiotherapy

G. Pastore[1], C. Menichelli[1], A. Fanelli[1], S. Tubin[1], C. Arrichiello[1], S. Grespi[1], A. Ferullo[1], F. Casamassima[1]
[1]*Ecomedica, Radiotherapy Department, 50053, Italy*

Purpose/Objective: The control of VMAT plans is a key issue in the QA process. The steps in VMAT verification can be an independent calculation of monitor units, measurement of fluences or, using phantoms, measurement of point dose and dose distributions. This steps rely on phantoms to simulate the patient, with the consequent loss of realism in the verification. The possibility to evaluate the transit dose through the patient to calculate the 3D dose distribution in each fraction of treatment can detect some errors.

Dosimetry Check (DC) (Math Resolutions, Columbia) is a commercial software for portal dosimetry which allows pre-treatment verification and transit dose using transmitted fluence information gathered by the EPID. It overlaps isodose curves on the CT image, calculates the dose at reference points, reconstructs dose and gamma (Γ) volume histograms allowing possibility to verify the dose distribution to PTV and OAR and, if necessary, replanning it.

In this study is tested the possibility to use the DC for an adaptive radiotherapy.

Materials and Methods: 22 patients with prostate cancer, 6 with head and neck and 18 with thoracic cancer were selected for this study. Dose calculation was performed using Monaco TPS (Elekta, Crawly). A VMAT plan was generated using a 6MV photon beam and Montecarlo optimization algorithm. Treatments were delivered through a MLC (4mm) Elekta SynergyS. Integrated images were acquired by EPID in continuous mode (60 frames/rotation) for the arc during the delivery and imported with planning CT data, associated structures and 3D dose matrix into DC. It uses the imported fluence fields to calculate the absolute dose and dose distribution through Pencil Beam (PB) algorithm. Analysis was based on the comparison between planned and delivered dose at isocenter (ΔD), and the calculation of Gamma Index (Γ).

When a ΔD difference of 5% was found, or if there was a value of Γ index less than 95% for more than three days a re-planning was considered.

Results: Prostate cases: the ΔD is 4.9%(±4.1%). The mean Γ (3%;3mm) value is (95.3 ±2.3)%. In 5 cases, the Γ value is less than 95%, however Γ index for OARs and PTV is greater than 95%. We deduced that the cold and hot spots were in the body.

H&N cases: ΔD is 6.3%(±4.1%). Γ is 92.2%(±1.8%). In 3 cases the Γ is less than 90%: patients had lost weight, so it was necessary to re-planning it.

Thoracic cancer: deviation ΔD is 6.5%(±4.8%). Γ passing rate test is 93.23%(±6.3%). Low values of Γ are due to the difference of the calculation algorithm between TPS and DC.

Conclusions: DC seems to be a valid method for monitoring the delivering of a treatment planning and avoiding setup