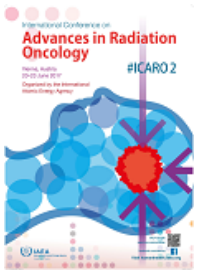

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Commissioning and validation of total skin electron therapy (TSET)

Thursday 22 June 2017 10:35 (5 minutes)

AIM: To report the results of commissioning, validation and in-vivo dosimetry of Total Skin Electron Therapy (TSET).
Methods and Materials: TSET was commissioned in linear accelerator (Varian True beam) using 6MeV electron in high dose rate total skin electron ode (HDTSe) mode at a treatment distance of 5 m with filed size 40x40cm2 at gantry angle 270°, collimator angle 0°, using the Stanford technique based on the AAPM TG report 23. TSET patient positioning device was made of wood with a Plexiglas beam spoiler of 2mm thickness. Dose prescription was 30.6 Gy/17fractions.

The measurements were carried out using parallel ion chamber (Roos chamber, PTW) with UNIDOS electrometer (PTW inc), gafchromic film, and TLD (LiF). Phantoms used for commissioning and validations were solid water phantom slabs of various thickness, 30X30 cm 2(Standard imaging Inc) and a 30cm diameter cylindrical cheese phantom (Standard imaging Inc).

Commissioning: PDDs and profiles (along X and Y axes) were measured for single dual field.PDDs and profiles for the single dual-field beam created from two scattered electron beams directed at oblique angles (±11°) were measured using Roos chamber and gafchromic film .A gafchromic film was kept at cross-sectional plan sandwiched between two halves of a cylindrical phantoms located at the treatment plane midpoint was irradiated to determine the depth dose due to six dual-field beam geometry. The characteristics of the electron beams were evaluated by calculating most probable energy Ep,o a lower mean energy Eo and R50.
The beam uniformity was checked by irradiating films pasted on the surface of the cylindrical phantom on a plane perpendicular to the beam axis at the treatment SSD.
Dose output was measured for single dual beam and it was followed by the measurement of overlapping factor from dose measured by TLD.

Validation: Validation of absolute dose was carried out using TLDs powder in sachets size 1cm x1cm which were kept on the cylindrical phantom to measure the dose and compared with the calculated dose.

In vivo dosimetry:

In-vivo dosimetry was carried out using TLDs (LiF).Sachets of TLDs were kept at different parts (viz. forehead, SSN, umbilicus, left intra mammary ,right axilla,right calf and left toes etc) of patient skin (during the patient treatment)

Result:
From the Y-profile, uniformity the degree of scattering angulations between two oblique fields were calculated and found to be (±11⍰). The symmetry and flatness of single beam in X and Y axis were 1.02% and 3.83% on the treatment plane 4.5 % and 8.77% respectively. The measured symmetry and flatness were out of tolerance (4% for X-axes and 8% for Y-axes) as per AAPM report no 23, however was improved in single dual beam technique. It was improved further to 0.7% and 1.36% along X-axes and 1.54 % and 4.64% along Y axes.
The most probable energy Ep,o and a lower mean energy Eo were calculated as 4.38MeV and 3.31MeV . R50 and Rp were found to be 1.43 cm and 2 cm.
Dmax measured for single dual beam was 5mm while the Dmax measured for six dual beams was 2 mm.
The overlapping factor calculated was found to be 3.1.
The films exposed at the treatment plane using six dual fields were found to be uniform within 0.5%.
The absolute dose validated by the TLDs kept on the phantoms; it was upto 6 % from the calculated.

For patient in-vivo dosimetry, doses measured at SSN, umbilicus, left intra mammary and left toes were in the range of 5.5-9% variation from the prescribed dose but as expected doses to organs like forehead, right axilla, right calf etc shows high dose variation in the range of 20-28% from the prescribed dose. (Table 1)
Conclusion:
TSET has been clinically commissioned and validated.

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