Bolus as a shaper in the superficial lesions treatment with an electron beam

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Purpose: The aim of this work is to evaluate an emerging material called eXaSkin in a 6MeV electron beam to treat superficial lesions. This high density bolus could be placed on the skin to shield normal tissue areas. A treatment without low fusion point alloys is designed to shape the beam and to protect organs at risk (OAR), instead eXaSkin is used for the beam shaping.

Materials and Method: In the first place, a planning CT of an Euromechanics EMP 5001-424 phantom is performed. On the surface of this phantom a toroidal eXaSkin bolus is placed. Bolus dimensions are 3cm thickness and 3.3cm inner diameter.

In the second place, a treatment with a 6MeV electron beam is designed, being the prescription dose 5Gy at the point located in the toroid centre and on the phantom surface. The source-surface distance (SSD) is 100cm and the chosen accessory is the 6x6cm^2 applicator.

The treatment planning system (TPS) used is Eclipse version 13.7 with the algorithm Electron Monte Carlo (Version 13.7.20). A Varian TrueBeam linac is used to deliver the treatment. To verify the correct treatment delivery, Gafchromics filmsEBT3 are used. Films are analysed with IBA OmniPRO IMRT software.

Results: The obtained dose distribution can be seen in figure 1.

In the verification with films, the 93.28% of the points pass the gamma analysis 3%-3mm with 10% of maximum dose threshold and absolute dose differences.

The dose was reduced to 10% from the prescription dose with 2.1cm of bolus.

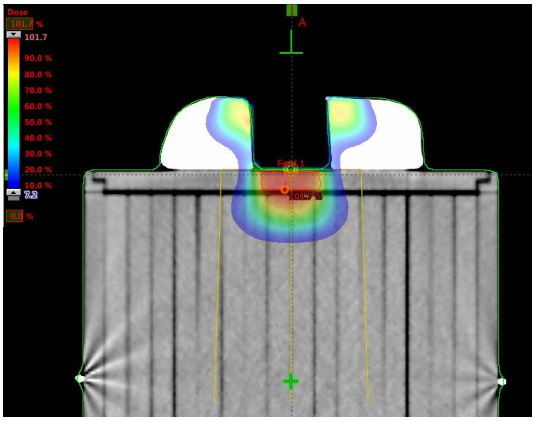

Figure 1: dose distribution of the treatment.

Conclusions: Due to the high density of the bolus, with a few centimeters of the material a high shaping is achieved. The radiation beam is totally attenuated in the areas where protection is required. This procedure can be an alternative to the use of low fusion point alloys for shaping of electron beams when treating superficial lesions.

Keywords: electron, shielding, bolus, radiotherapy.