3D RAPID MANUFACTURING BOLUS VS COMMERCIAL BOLUS – SKIN DOSE COMPARISON

RESULTS & DISCUSSION

The surface adjustability was assessed by both visual inspection and evaluation of CT axial and sagittal planes. The Superflab bolus confirms the difficulties often found in placing it on an irregular surface, causing air gaps, as we can observe in Fig. 1. The 3D bolus customized shape has a perfect fit to the phantom surface.

The Fig. 2 represents axial and sagittal planes, with the two boluses types. The results of the visual inspection were corroborated by the CT images acquired with the two boluses in place. Again, the difference in fit between the two boluses is evident along the surface of the phantom. The 3D bolus shows to be more efficient than the commercial one for surface fit adjustment.

For in vitro measurements, 3D CRT treatment plans were performed in the RANDO phantom for a right breast, using two parallel opposed tangential fields with 6 MV photon beams. The prescription dose for a whole breast volume was 50 Gy in 25 fractions. The same planning parameters were used for all 3D-CRT plans. Dose distributions were calculated using the analytical anisotropic algorithm (AAA) with a calculation grid size of 2 mm.

The sensitivity points of the detectors were accurately placed in 5 points on the phantom surface (Fig. 4), for in vitro measurements.

The average differences, calculated according the eq.1, between calculated and measured doses in the 3D bolus and Superflab bolus, ranged from 2-10% as observed in the first table. However, the highest dose difference (approximately 10%) was observed for the Superflab bolus.

CONCLUSIONS

Customized bolus was successfully manufactured using 3D-RM techniques. The 3D rapid manufactured bolus can reduce the uncertainty in the daily positioning and help to overcome the dose discrepancy due to unwanted air gaps affecting breast cancer radiation therapy. With the commercial bolus a higher dose difference relatively to TPS was observed. The skin dose increase is observed in the same proportion for both boluses.