3mm Brass Bolus or 3mm Superflab Daily versus 5mm Superflab QOD

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Objective

The goal of this study was to evaluate the relative skin dose achievable using 3mm brass bolus, 3mm superflab bolus and 5mm superflab

Background

- Post-mastectomy patients are at higher risk for tumor recurrence on the skin
- Traditionally, bolus is used to increase the skin dose in chestwall radiation therapy patients
- Different thickness of bolus can be used to achieve the desired result
- Typical material used for bolus include tissue equivalent superflab, brass mesh, paraffin wax and 3D printed bolus, among others

Methods & Materials

- Gafchromic film was placed between two 5cm slabs of solid water
- 400 MU was delivered via an open 20cm x 20cm field using a Varian iX linear accelerator
- Exposures were made with no bolus, 3mm tissue equivalent brass bolus, 3mm superflab and 5mm superflab covering the film
- Each film was scanned immediately after exposure and analyzed using a TomoTherapy Vidar scanner
- The data was exported to Microsoft Excel for further analysis

Figure 1. Solid water setup with film embedded between 5 cm slabs

Results

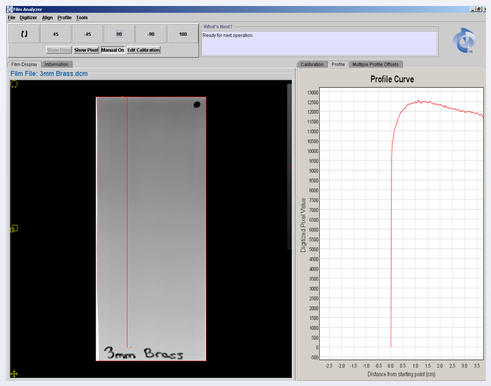

Figure 2. 3mm tissue equivalent brass bolus film scanned and analyzed by TomoTherapy Vidar scanner software

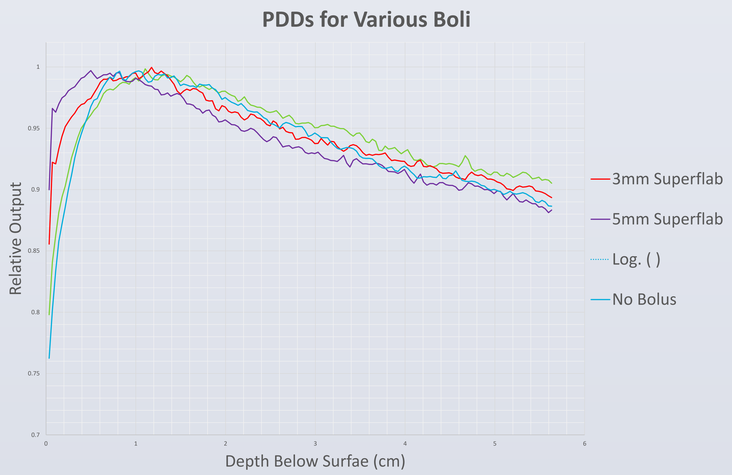

Figure 3. PDD data for each film taken with a 20cm x 20cm open field

	3mm Brass	3mm Superflab	5mm Superflab	No Bolus	5mm QOD
0.000	0.767	0.780	0.827	0.741	0.784
0.035	0.829	0.931	0.973	0.784	0.878
0.071	0.852	0.914	0.960	0.819	0.889
0.107	0.873	0.928	0.966	0.848	0.907
0.142	0.890	0.938	0.973	0.867	0.920
0.178	0.898	0.949	0.977	0.877	0.927
0.214	0.908	0.954	0.977	0.895	0.936
0.249	0.921	0.957	0.984	0.905	0.945
0.285	0.931	0.962	0.981	0.919	0.950
0.320	0.937	0.963	0.987	0.933	0.960
0.356	0.948	0.971	0.988	0.940	0.964
0.392	0.951	0.968	0.994	0.950	0.972
0.427	0.956	0.972	0.990	0.955	0.973
0.463	0.959	0.974	0.999	0.963	0.981
0.499	0.963	0.974	0.995	0.972	0.984
0.534	0.966	0.983	0.992	0.974	0.983

Figure 4. Depth dose information for each bolus scheme for the first 0.534 cm below the surface

Discussion

- Surface dose is difficult to measure accurately.
- The brass bolus is a mesh with holes in it, so the PDD is dependent upon what part of the bolus the measurement was under, which was not discernible in this project
- The output for 5mm superflab QOD was calculated using the average for no bolus and 5mm bolus PDDs
- The results of this study showed that superficial dose increases in the following order: 3mm brass bolus followed by 5mm superflab QOD with 3mm superflab giving the highest superficial dose within the first 5mm of tissue
- These results were analyzed using the two tailed paired sample test and all three bolus schemes were found to be statistically different from each other with p-value of 0.05

Conclusion

- The data supports the hypothesis that different bolus schemes produce different levels of superficial dose
- Whether or not these differences are clinically relevant need to be determined by the physician and physics staff at each institution
- At our facilities, we use the brass bolus for patients with implants/expands as it conforms better to the patient curvature and minimizes any air gaps

Further Studies

This study only investigated data for 6MV beams. The effect of different thicknesses and material bolus on other energies still needs to be explored. It should be noted that at our facilities, we only use brass bolus for 6MV and 10MV beams.

We have started tracking clinical data at our center to see if the frequency and rate at which patients develop a skin reaction that necessitates a break from radiation correlates with the type of bolus used for treatment