

Determining the Tissue Equivalence of a Brass Mesh Bolus in a Reconstructed Chest Wall Irradiation



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Conclusions

Brass mesh bolus is most equivalent to a 3 mm bolus, and does not affect the dose beyond the buildup region. This bolus cannot be directly calculated in Eclipse, hence a 3mm bolus calculation is a good reflection of the dose response to the brass mesh bolus

Introduction

Post mastectomy reconstructed chest wall irradiation with bolus is difficult to perform due to the difficulty of conforming the square superflab bolus to the round reconstructed breast contour.

Brass mesh bolus conforms well to the breast and hence may be a suitable alternative for bolus (Fig 1).



Figure 1a: DRR of Superflab bolus 5mm



Figure 1b: DRR of Brass Mesh bolus

Since this bolus cannot be simulated we performed measurements to determine its tissue equivalence.

We also measured the brass mesh skin dose and behavior beyond the build-up region.

Aim

To determine the tissue equivalence of a brass mesh bolus (RPD, Inc) in the setting of a reconstructed chest wall irradiation.

Materials and Methods

We measured breast skin dose delivered by a tangential field plan on an anthropomorphic phantom using Mosfet (Best medical, Canada) and nanoDot (Landauer) dosimeters in five different locations on the breast. We also measured skin dose using no bolus, 5mm and 10mm superflab bolus and Brass Mesh bolus (Fig2).



Figure 2: Conforming brass mesh bolus to breast contour

In the Eclipse treatment planning system (Varian, Palo Alto, California) we calculated skin dose for different bolus thicknesses, ranging from 0 to 10 mm, in order to evaluate which calculation best matches the brass mesh measurements, as the brass mesh cannot be simulated due to artefacts. Finally, we measured depth dose behavior with the brass mesh bolus to verify that the bolus does not affect the dose to the breast itself beyond the build-up region.

Results

nanoDot and Mosfet measurements were consistent with each other. As expected, skin dose measurements with no bolus had the least agreement with Eclipse calculation, while measurements for 5 and 10 mm agreed well with the calculation despite the difficulty in conforming superflab bolus to the breast contour.

For the brass mesh the best agreement was for 3 mm bolus Eclipse calculation. For Mosfets, the average measurement was 90.8% of the expected dose, and for nanoDot 88.33% compared to 83.34%, 83.64% ,93.94% and 99.11% (2,3,5 and 10 mm bolus calculation respectively). (Fig3)

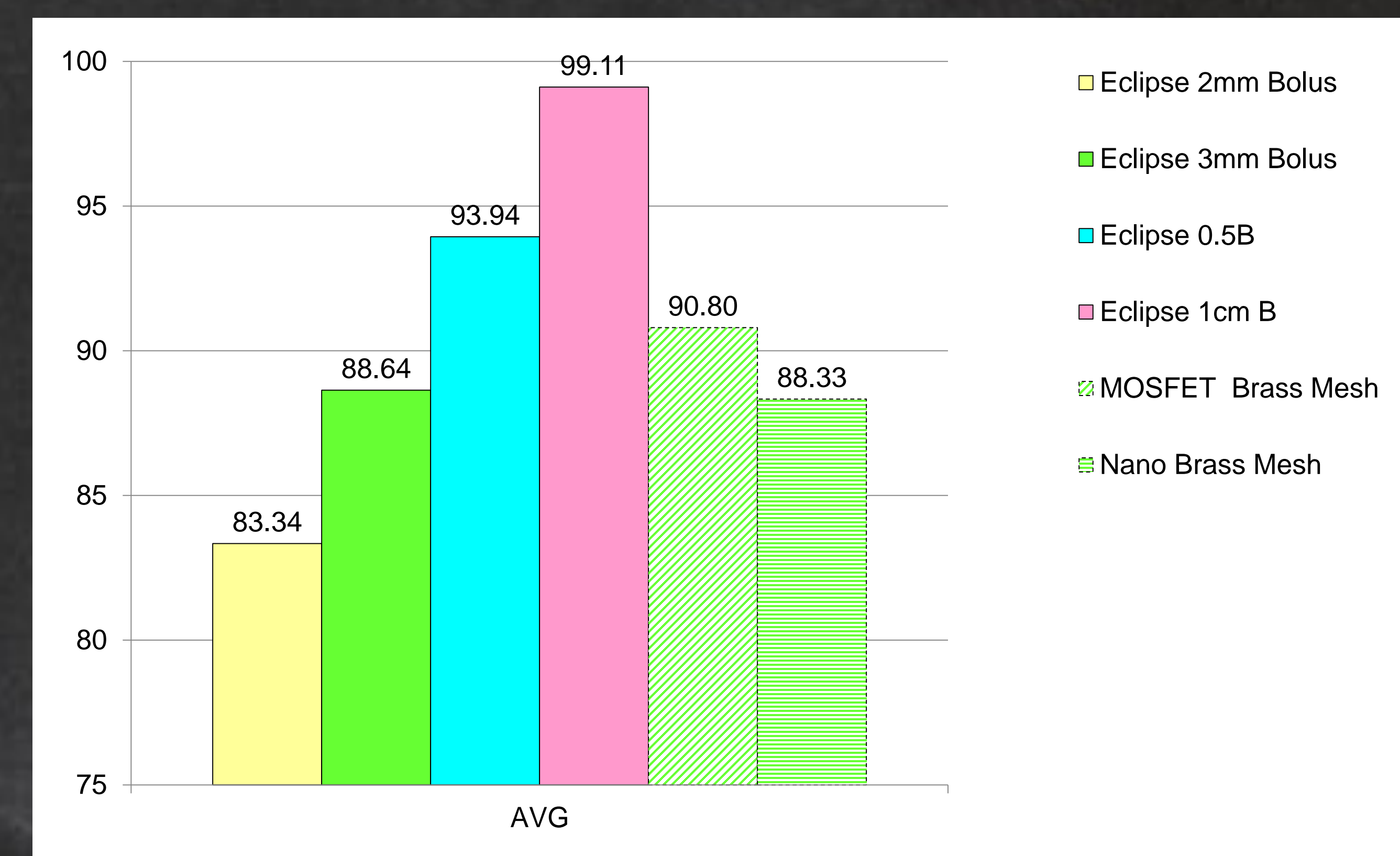


Figure 3: Brass mesh measurements vs. Eclipse calculations

The brass mesh bolus increased skin dose by approximately 25% but there was no dose increase beyond the build-up region (Fig 4.)

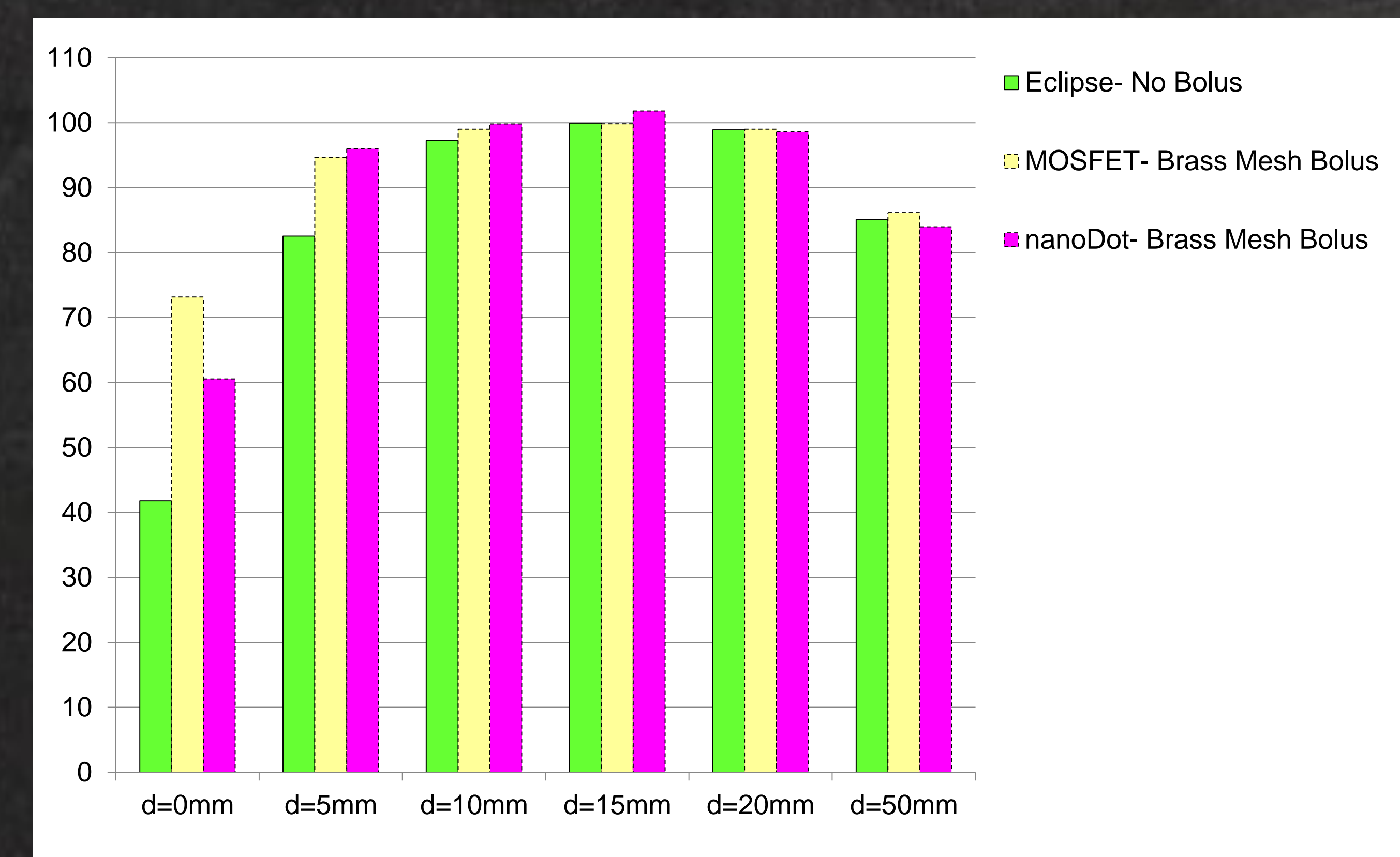


Figure 4: Brass mesh Does not affect the dose beyond the build-up region