Purpose: In order to achieve a higher surface dose for electron beams of less than 15 MeV, tantalum wire mesh bolus has been investigated in the past. Despite an increase in surface dose as seen by a depth dose (DD) curve, these investigations did not quantify variation in surface dose over the radiation field. Thus quantifications of surface dose variations are given along with an investigation into the effect of randomized mesh placements over several treatment fractions.

Method and Materials: A tantalum wire mesh of 0.02 inch (0.51 mm) thickness and a mesh spacing of eight meshes per inch was used as bolus for a 6 MeV electron beam. DD curves were measured using a Scaditronix EFD3G electron diode in a water tank and profiles were measured with EBT2™ GafChromatic films in Solid Water™. The EBT2™ films were scanned using an Epson Expression 10000XL flat-bed scanner correcting for scanner non-uniformities.

Results: Despite a very flat surface dose as seen by one DD measurement, another DD measurement taken with the electron diode at a lateral offset of 2mm showed a 17% increase in surface dose. In general, high spatial frequency variations in the surface dose of nearly 70% were seen in the EBT2™ film due to the scattering and absorption of electrons in the tantalum mesh bolus. However, through the randomized placement of the tantalum mesh bolus on the surface over the course of ten fractions, the variations in surface dose were reduced to around 34%.

Conclusion: Tantalum wire mesh bolus has been shown to increase the surface dose of 6 MeV electrons, but with significant variations over the full radiation field. By randomly placing the mesh bolus on the surface, the large surface dose variations can be reduced to around 34%.