AbstractID: 7505 Title: Evaluation of Titanium Metal Imaging Artifacts on Pronton Dose Calculation

Purpose:

Metal implants can cause CT image artifacts that result in inaccurate CT number determination local to the metal implant. For proton therapy treatment planning, CT numbers are converted to stopping powers to calculate dose and range, which affects the treatment compensator design. We evaluated the effects of metal artifacts from titanium surgical implants on proton dose calculation accuracy and on range uncertainty.

Method and Material:

Surgical Titanium metal screws and discs are placed in a small water tube that was inserted into a plastic Head Phantom. The phantom was imaged on a GE 16 slice scanner using a standard Head protocol. Each image slice was then carefully reviewed and the Titanium metal and its artifacts in adjacent areas were contoured using Varian Eclipse TPS. Proton treatment plans were generated with and without overwriting the CT numbers within the metal artifacts contours on the planning image sets. Then, treatment plans were created and compared to each other for dose and range differences.

Result:

There appears to be less than 2% overall dose differences in the treatment target between the plans with and without artifact overwrite. There was an increase in proton range of 3 mm for the overwritten image set.

Conclusion:

For the commonly used Titanium screws and discs in brain surgery, the image artifacts appear to cause minimal (<2%) effect on dose delivered to the treatment target. The range uncertainty is of the order of 3mm, which is within the distal margin for passive scattering proton planning.