

**Purpose:**

To establish the overall accuracy and precision of an image-guided radiotherapy treatment strategy.

**Method and Materials:**

A perspex head & neck phantom developed in-house for the verification of IMRT techniques was used to test an image guided radiotherapy treatment. The treatment involved the imaging of the phantom in the treatment position, followed by the delivery of an IMRT plan designed to spare salivary function. The complex IMRT plan involved five step-and-shoot fields with a total 65 segments delivered at 6MV. The phantom was not moved between the imaging and delivery phases of the experiment. The dose was measured at six points distributed in the phantom simultaneously via the use of micro-mosfets. Development of the phantom used in the experiment will eventually allow up to 20 points of interest being independently measured. As the overall accuracy of the treatment was sought the dose from the whole treatment was considered. Doses from individual beams were not analyzed.

**Results:**

Planned dose to the 6 micro-mosfets ranged from 220cGy to 350cGy with a dose prescription of 440cGy per fraction to the treatment isocentre. The measured doses were on average within 0.5% ( $\pm 1.2\%$ ) when compared to planned doses. No differences greater than 2% were found in the investigation. Repeat experiments without moving the phantom demonstrated reliable delivery of the IMRT plan with a standard deviation of 0.5% from the average of the mean.

**Conclusion:**

A system has been developed to test the accuracy and precision of an image-guided radiotherapy treatment. It has been confirmed that the accuracy of a complex IMRT dose delivery using an image-guided approach using an Elekta Synergy linac is  $\pm 2\%$  in dose. The precision of the delivery system was demonstrated to be within 1% (2SD).

**Conflict of Interest (only if applicable):**

This research is partly funded by Elekta.