AbstractID: 5294 Title: EPID transmission dosimetry for QA use in adaptive radiotherapy

**Purpose:** Radiotherapy patients treated for H&N cancer often lose weight and have shrinkage of their tumors causing drastic anatomical changes. This can result in changes in dose distribution with respect to PTV coverage and OARs. Monitoring these changes is difficult and presents QA problems for IMRT treatments. In this work we develop a method to monitor H&N thickness changes and correlate with changes in dose distribution.

**Method and Materials:** Wax was applied to the neck region of an anthropomorphic phantom in 3-1cm layers. Contours depicting tumor and critical structures were delineated. An IMRT plan was generated to delivery 70Gy to the PTV. The resultant sequence was virtually delivered to the phantom with layers of wax removed. PTV coverage, hot spot, and PRV doses were recorded. A characteristic response curve was generated using the amorphous silicon EPID on a Varian 21EX linear accelerator and slabs of solid water. The phantom was then consecutively imaged removing 1cm layers of wax. All images were acquired for the same number of MU.

**Results:** Decreasing the thickness of the neck region bilaterally by 3cm resulted in an increase in 95% PTV coverage from 70Gy to 72.8Gy. The maximum dose in the PTV increased from 80.6Gy to 86Gy. The PTV volume receiving 110% of the prescribed dose increased from 13.4% to 66.6%. The dose to 0.01cc of the spinal cord and brainstem PRVs increased from 45.8Gy to 47.9Gy and 49.7Gy to 51.2Gy, respectively. Using the EPID we were able to predict changes in the lateral dimension of the phantom to within 4mm.

**Conclusion:** Our results indicate that anatomical changes during treatment may lead to unacceptable dose distributions. By using lateral EPID images we can monitor the thickness changes (path length) in the H&N region. These changes may be used to determine when re-planning is necessary.