

Purpose:

Treatment planning for HDR brachytherapy can be difficult in cases in which it is necessary to create custom applicators that incorporate shielding for the protection of normal structures. This can be overcome by the use of MVCT, which reduces artifacts in the image set.

Method and Materials:

A custom oral applicator was created by a dentist for the treatment of a superficial recurrence of an oral tongue cancer. The applicator contained two interstitial catheters placed one cm. apart, along with approximately 2.1 mm of lead sheeting to shield the maxilla, mandible, and supporting structures. At time of simulation, the applicator was placed in the patient's mouth, with dummy strands inside the catheters, and an MVCT was performed on the Tomotherapy® system. Another MVCT was performed of just the applicator with dummy strands. The MVCT images were transferred to the Velocity® system for image registration. The catheters were visualized on the scan of the applicator, and then the contours were transferred to the full MVCT set. The MVCT and contour DICOM sets were transferred to BrachyVision for HDR planning. Dwell times were manually optimized to cover the target volume, with a prescription of 32 Gy in 8 BID fractions.

Results:

Due to the lead shielding, 3DCT treatment planning would have been difficult without the use of MVCT. TLDs placed inside the applicator's tooth cavities for a test run showed that the lead shield reduced the dose by 65-75%, depending on the location of the TLD.

Conclusion:

The use of MVCT along with image registration software allows visualization of HDR applicators in the presence of shielding or other high-Z materials. This work can be extended to the use of MVCT for planning treatments with standard applicators, such as T&O, which may not be kVCT compatible.