

Purpose: Oral tongue carcinoma is a highly curable cancer treated by radiation therapy and especially by interstitial brachytherapy. However, multiple hairpins, needles or hollow catheters are needed to be inserted into the tumor bed for both low-dose-rate (LDR) and high-dose-rate (HDR) interstitial radiotherapy. The whole insertion procedure is quite invasive and painful to the patient each time it is administered. Therefore, the main aim of this study is to investigate the potential use of Cyberknife in the treatment of oral tongue cancer, which would dramatically reduce unpleasant experiences associated with HDR/LDR treatments.

Methods: Using CT images of the patient treated with the HDR interstitial implant, a structure (GTV) was created out of the applicator. A special device will be used to immobilize the tongue during treatment. In CyberKnife treatment planning, the Xsight Spine tracking method was used for patient localization. A 2 mm margin in all directions was added to account for potential localization uncertainties. Subsequent planning is based on prescribing 2000 cGy in 5 fractions to the PTV.

Results: The isodose line of 66% (20 Gy in 5 fractions) covers the outer boundary of the PTV in the CyberKnife plan. The conformity index is 1.26 with 98.76% of the target volume covered by the prescription line. The maximum dose inside PTV is 30.3 Gy while the HDR treatment delivers more than 40 Gy to more than 20% of the PTV. Only 3.4 cc of the right mandible receives more than 10 Gy. The maximum dose to left mandible is only 4.4 Gy. The total treatment time is about 18 min/fraction.

Conclusions: It is shown that Cyberknife treatment can be a viable alternative to interstitial HDR treatments, which may greatly improve the patient care with tongue cancer.