

# The Use of Computed Tomography for Evaluation of the Dose Calculation Effect in the Presence of Metallic Dental Prostheses on Head and Neck Radiotherapy

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## Abstract

This study is to investigate the dose calculation effect in the presence of metallic dental prostheses on head and neck radiotherapy. Kilovoltage computed tomography (kVCT) and megavoltage computed tomography (MVCT) were used in treatment plan to compare the dosimetric difference with different settings. The presence of dental implant was simulated with the RANDO<sup>®</sup> Phantom and dental prostheses which were made of Titanium alloy. kVCT and MVCT images were obtained with different number of metallic dental prostheses to generate treatment plans, which were designed in linear accelerator 6MV photon energy, field size 12cmx12cm, four groups of beam directions, and dose calculation points representing the target region and organs at risk (OAR). The results indicated that the increase of number of metallic dental prostheses resulted in more dose difference. The most significant difference (5.9%) was from full-mouth metallic dental prostheses. The dose calculation inaccuracy was more from the metal material itself than from metal artifact. The most significant point dose difference was in the target region close to dental prostheses. With metallic dental prostheses, dose calculation inaccuracy was shown in treatment plan by use of kVCT. In addition, MVCT had more precise density estimation for metal prostheses. MVCT-based plan with more accurate dose calculation can correct dose difference in kVCT plan.

**Keywords:** *Metallic dental prostheses, Kilovoltage computed tomography, Megavoltage computed tomography, Treatment planning, Dose calculation.*