

# THE ACCURACY OF RECONSTRUCTED HIGH DOSE RATE BRACHYTHERAPY SOURCE CONFIGURATION AND DOSE DISTRIBUTION USING C-ARM X-RAY UNIT AND CT SIMULATOR

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In brachytherapy, exact information of the source position is necessary for an accurate calculation of the dose to tumor and critical organs. To obtain exact information in source position, various radiography methods can be used such as Computed Tomography (CT), X-ray Simulator, C-arm X-ray unit, and Magnetic Resonance Imaging. The aim of this study is to compare the accuracy of brachytherapy source reconstruction using computed tomography and C-arm X-ray unit, to find out the delivered dose accuracy and the most suitable method for clinical usage.

Reconstruction accuracy test phantom and dose accuracy test phantom were made to compare the position accuracy and the dose accuracy. With the CT scanner 1mm, 3 mm and 5 mm slice thicknesses were studied. With C-arm X-ray unit with and without reconstruction jig were studied. All reconstructed distances were compared with reference distance. To find out dose accuracy, delivered dose was measured with ionization chamber and compared with planned dose.

The average reconstruction errors for the C-arm X-ray unit with and without reconstruction jig were respectively 0.19 mm and 2.71 mm . In the case of CT scanner, the average errors for 1, 3 and 5 mm slice thicknesses were 0.04, 0.21 and 0.29 respectively. This study shows that the reconstructed images for the C-arm X-ray unit and CT scanner are within the acceptable limits except for the reconstruction method for the C-arm X-ray unit without reconstruction jig.

The dose received by the patient is high in CT based reconstruction method compared to the C-arm based reconstruction method during the imaging process. Patient handling time is also high in CT based reconstruction method due to transfer of patient from brachytherapy room to CT room. Also CT imaging cost is comparatively high. Therefore it can be concluded that the C-arm based reconstruction method with reconstructing jig is the most suitable method for clinical uses.

The deviation of the doses are 3%, 6.67%, 9.67%, 10.33% and 12.33 % for the planes 1, 2, 3, 4 and 5 respectively. Plane 3, 4, 5 are more than 2 cm away from the source point and such points are not used for the clinical practices. Delivered dose to the clinical points less than 2 cm distance from source point are well within the acceptable limits.