

The phantom is locally fabricated with the aim of cost effectiveness and its application as a Quality assurance tool for brachytherapy treatment plans.

As the brachytherapy procedures are very important and needs much more accuracy in treatment delivery so the quality assurance tool for treatment planning system and treatment delivery unit is needed for verification and validation. The brachytherapy dosimetry in phantom is useful and applicable in routine practice. The phantom fabricated in this study is cost effective and easy to setup in brachytherapy along with the slot provided for Gafchromic film dosimeter which is easy to obtain the planner dose instead of point dose.

In this study the OARs doses were higher for large volume tumor in middle-lower region than small volume tumor in lower region in bronchus whereas the organs at risk tolerance dose limit not exceeded. The OARs doses were higher in left lung carcinoma than right lung carcinoma patients. The effect of Target Volume on the OARs doses was significant for $TV > 22\text{cc}$ and only significant for Contralateral lung max dose while not significant for rest OARs in $TV < 22\text{cc}$ in left and right-side lung lesion. Hence, the EBBT is very effective treatment modality in carcinoma lung with best selection of the patient considering the tumor location and site to achieve an optimized plan with good quality of life²⁷.

The Intraluminal brachytherapy is beneficial to the patients of carcinoma lung where the lesion is in primary and secondary bronchus. There are critical structures present around the target volume and received the radiation dose during the treatment²⁸. The doses received by the target volume and organ at risk are checked in the TPS and which is to cross verify at the machine when actual treatment executed. The doses

calculated in the treatment planning system are without the inhomogeneity correction as the TPS is based on the TG 43/TG43U1 calculation formalism²⁷. To find out the variation in TPS planned and actual dose delivered at the treatment machine, there should be a tool with the institute to quantify the variation to be considered while planning an Intraluminal brachytherapy treatment plan on a patient. Once it is clear to us that how much variation is in the planned and delivered radiation doses, this can be considered on the patient planning. Also the dose distribution uniformity around the brachytherapy source plays vital role whereas the target volume is inhomogeneous tissue especially in lung carcinoma where air present. Although brachytherapy having an advantage over external beam radiotherapy with rapid dose fall off by following inverse square law.

This study showed that the Conformity Index was better in 3rd EBBT plans than 1st EBBT plans. It also showed that there is a signification volume reduction in the target volume irradiated with EBBT. This implies that the EBBT is better technique in the lung carcinoma patient if the disease is in the endobronchial region where applicator catheter can be placed easily.