

# ABSTRACT

**Title:** Dosimetric Comparison of 3D Treatment Planning and Conventional Planning in Post-Operative Vaginal Mould Brachytherapy (VBT) for Patients with Gynaecological Malignancies

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## Objectives

The objectives of this study were to compare dose to target and organs at risk in conventional planning Vs CT based 3D plan in vaginal mould brachytherapy and to compare the effect of bladder distension on target dose distribution as well as dose to organs at risk.

## Materials and Methods

Patients with indication for vaginal mould brachytherapy were included in the study after a detailed gynecological assessment. All patients underwent planning CT with a full bladder and an empty bladder protocol. Target volumes and organs at risk were contoured in Eclipse® planning system and brachytherapy planning was done in Oncentra® brachytherapy planning system. For each CT, two plans were generated – one 2D based conventional unoptimized plan and another 3D based optimised plan. Dosimetric parameters like D90, D95, V100 and V150 were reported for clinical target volume (CTV) and D0.1cc, D1cc, D2cc and D5cc were reported for organs at risk (OARs). Dosimetric comparison was done between 2D and 3D based plans and also between full bladder and empty bladder protocols and the data was analysed.

## Results

92 observations were made from data collected from 43 patients. median age was 49 years (Range – 24 – 69). All patients had undergone hysterectomy and 54% (n = 23) of patients were diagnosed with carcinoma endometrium, followed by carcinoma cervix (30%) and carcinoma cervical stump (16%). Mean CTVsurface volume was 28.8cc (range 18.6cc– 39cc) and mean CTVdepth volume was 53cc (range 36.3cc – 68cc). Difference between CTV coverage in terms of optimised and non-optimised plans were not statistically significant for CTVsurface (p=0.286) and CTVdepth (p=0.11). Significant reduction in D0.1cc, D1cc, D2cc and D5cc dose parameters were observed in bladder, rectum, sigmoid and bowel with 3D optimised plan (p<0.001). Bladder distension did not have significant effect on CTVdepth and CTVsurface dose parameters. However, bladder distension showed a 35% reduction in dose for bowel (p<0.001) and 8% reduction in sigmoid dose which was not statistically significant (p=0.068).

## Conclusion

Our study established the dosimetric benefits with CT based 3D planning for vaginal brachytherapy over 2D based conventional planning. 3D CT based planning helps to decrease dose to critical organs without compromising target volume coverage by individualising the dosimetry according to each patient's anatomy. This study also illustrated the dosimetric benefit of bladder distension in lowering small bowel doses and aided us to develop an institutional protocol for image-based brachytherapy. As a result of this study, a smooth transition from 2D based conventional planning to a 3D imaged based planning could be achieved in our institution.