The Factors on Dose Optimization Process for Vaginal Applicators

Purpose: In clinic, we use cylindrical applicator for vaginal brachytherapy. In this study, we evaluate the effects of applicator diameter, dwell position interval and optimized dose points' interval on dose homogeneity with fixed active length of 5 cm for vaginal applicator.

Material and Methods: Following the ABS treatment report guideline, we set the surface dose points at applicator surface and off-surface dose points at 5 mm from applicator surface to estimate the doses. The normalized optimized dose points are set at 5 mm off the applicator surface. During treatment planning, we vary the applicator diameter, the dwell position interval and the optimized dose points' interval to obtain the surface doses and the off-surface doses for later analysis and comparison.

Results: The vaginal applicator with smaller diameter (1.5cm) has a higher average surface dose and an enhanced inhomogeneous dose distribution than a larger one (3.5cm) does (Table1). When the optimized dose points' interval increasing from 2.5 to 10 mm, the dose at surface apex increased by 28% and the standard deviation of surface dose increased by 100% with the larger diameter applicator (Fig1 & Table1). Increasing the dwell position interval resulted in a worse dose inhomogeneity when a larger one is used (Table2). And, it caused a rise of dose at apex too (Fig2).

Conclusions and discussions: In vaginal applicator application, larger diameter applicator with smaller optimized points and dwell position intervals will result in a better homogeneous dose distribution.

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