ABSTRACT

Cervical cancer is one of the most common and deadly cancers among women, particularly in developing countries, including Indonesia. HDR brachytherapy plays a crucial role in cervical cancer treatment by delivering localized high radiation doses while minimizing exposure to surrounding healthy tissues. This study aimed to evaluate the dose distribution to organs at risk (OARs) in 2D HDR brachytherapy treatment planning for cervical cancer using the Fletcher applicator, comparing two fractionation schemes: 3 × 7 Gy and 2 × 8,5 Gy, and assessing their biological effects based on ICRU 38 recommendations. The research methodology included Fletcher applicator simulation, 2D imaging using C-arm fluoroscopy, and dose planning with a Treatment Planning System (TPS) based on the manchester method. Dose evaluation was performed on Point A (target), Point B, and OARs such as the bladder and rectum. The results indicated that both fractionation schemes complied with ICRU 38 dose limits, with the 3 × 7 Gy regimen yielding higher biologically effective doses (BED) for the tumor (35,7 Gy) and OARs (69,3 Gy) compared to 2 × 8,5 Gy (31,45 Gy for the tumor and 65,16 Gy for OARs). EQD2 calculations confirmed that the cumulative doses from external beam radiotherapy (EBRT) and brachytherapy remained within safe limits for the bladder (80 Gy) and rectum (75 Gy). In conclusion, the 3 × 7 Gy scheme provided greater therapeutic effects on the tumor but also increased the risk of toxicity to OARs compared to 2 × 8,5 Gy. The choice of fractionation should balance treatment efficacy and patient safety. This study offers valuable guidance for medical physicists in optimizing 2D HDR brachytherapy planning for cervical cancer.

Keywords : *HDR brachytherapy, cervical cancer, Fletcher applicator, organs at risk (OARs), BED, EQD2*