

Comparison of planned and measured rectal dose in vivo during high dose rate Cobalt-60 brachytherapy of cervical cancer

Abstract

Cobalt-60 (Co-60) is a relatively new source for the application of high-dose rate (HDR) brachytherapy. Radiation dose to the rectum is often a limiting factor in achieving the full prescribed dose to the target during brachytherapy of cervical cancer. The aim of this study was to measure radiation doses to the rectum in-vivo during HDR Co-60 brachytherapy. A total of eleven HDR brachytherapy treatments of cervical cancer were recruited in this study. A series of diodes incorporated in a rectal probe was inserted into the patient's rectum during each brachytherapy procedure. Real-time measured rectal doses were compared to calculated doses by the treatment planning system (TPS). The differences between calculated and measured dose ranged from 8.5% to 41.2%. This corresponds to absolute dose differences ranging from 0.3 Gy to 1.5 Gy. A linear relationship was observed between calculated and measured doses with linear regression R² value of 0.88, indicating close association between the measured and calculated doses. In general, absorbed doses for the rectum as calculated by TPS were observed to be higher than the doses measured using the diode probe. In-vivo dosimetry is an important quality assurance method for HDR brachytherapy of cervical cancer. It provides information that can contribute to the reduction of errors and discrepancies in dose delivery. Our study has shown that in-vivo dosimetry is feasible and can be performed to estimate the dose to the rectum during HDR brachytherapy using Co-60.

Keyword: Brachytherapy; Cervical cancer; Cobalt-60; High dose rate; In-vivo dosimetry