DOSE WALL HISTOGRAMS FOR THE RECTUM

A mathematical model for the rectum wall is developed, incorporating its stretching due to variable rectum filling and neighboring structures. The model is based on the assumption that the amount of cross-sected rectum wall tissue perpendicular to the central axis of the rectum is constant throughout the entire rectum. The model is used to create a set of inner contours out of the outer contours of the rectum. Both sets of contours are used to derive a dose-wall histogram (DWH). The model is verified using 20 sets of CT data (5 patients x 4 scans). The DWHs are compared with DVHs of the rectum wall, which require contouring of the outer and inner surfaces of the rectum wall and with DVHs of the total rectum. Results:(A) The local wall thickness of the rectum outlined on CT data is in conformity with the described rectum model. (B) The amount of rectum wall tissue per unit length rectum varied considerably between patients (27%, 1SD). (C) The DWHs correspond well to the DVHs of the rectum wall. (D) Large discrepancies are observed between the DVHs of the total rectum and the DVHs of the rectum wall. The model yields accurate descriptions of the dose distribution of the rectum wall, without delineating the inner surface of the rectum. This reduces both the work load and variations due to inaccurate delineation of the rectum wall. The DWH is an effective tool to estimate the complication probability of the rectum.