

# Dosimetric Consequences of Breath-Hold Respiration in Conformal Radiotherapy of Esophageal Cancer

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## Abstract

The objective of this paper is to study the dosimetric impact of respiratory gated radiotherapy in locally advanced esophageal carcinoma and to define the optimal respiratory phase for this treatment.

The study included 8 consecutive patients with squamous-cell carcinoma (SCC) or histologically proved adenocarcinoma, for both at least T3-T4 NX or TX N1 M0 stage. Informed consent was obtained before beginning the study. Three spiral scans were performed in breath-hold respiration: one acquisition in end expiration (EBH), one in end inspiration (IBH) and one in deep inspiration breath-hold (DIBH); and one acquisition was performed in Free Breathing (FB). A 3 mm-margin was defined as Internal Target Volume (ITV) on FB CT-scan. No ITV was applied on EBH, IBH and DIBH CT-scan. Target volumes were analyzed and we performed dosimetric comparisons on DVH data of each CT-scan for PTV and Organs at Risk (OAR) (Conformity Index,  $V_{\text{dose}}$ ,  $D_{\text{mean}}$ , Equivalent Uniform Dose).

DIBH and IBH correlated with a 32% ( $p = 0.77$ ) and 20% ( $p = 0.52$ ) decrease in lung  $V_{20}$  respectively as compared to FB (13.5% and 15.6% respectively versus 19.9%). DIBH and IBH correlated with a 25% ( $p = 0.25$ ) and 17% ( $p = 0.39$ ) decrease in cardiac  $V_{40}$  respectively, as compared with FB (16.9% and 18.9% respectively versus 22.7%). For spinal cord irradiation, the minimum dose was obtained in IBH (36.5 Gy).

Conformal radiotherapy with respiratory gating for esophageal cancer decreases the irradiated dose to OAR. We suggest that DIBH technique should be used when irradiation is performed using the spirometric system. In the Tidal Volume, the inspiration phase is the most favourable and should be chosen for irradiation with a free breathing gating system.

KEYWORDS: esophageal cancer, radiotherapy, gating, respiration, dose-volume histogram.

## Technical Note

# Dose Distribution of Modified Heyman Packing

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## Abstract

**Introduction.** One of the treatment modalities of brachytherapy of endometrial carcinomas is the modified Heyman packing technique. The aim of the study is to assess the dose distributions of regular arrangements of modified Heyman packings.

**Materials and Methods.** We reconstructed the catheters with biplane X-ray images and optimised the dose distribution with defining 'dose points' the uterine wall thickness apart from the outermost left and right catheters. We fitted the reconstructed catheters with the diagnostic sagittal MR scan obtained prior to the first insertion. We checked the dose distribution defining 'patients points' on sagittal contour of the uterus.

**Results and Conclusions.** The treatment plans optimised 'on dose points and geometry' resulted in a satisfactory dose distribution, however systematic overdosed and under-dosed regions have been experienced.

KEYWORDS: modified Heyman packing, endometrial carcinoma.