ONCODAILY MEDICAL JOURNAL

abstract

# Evaluation of Planning Target Margins in Head and Neck Cancer Radiotherapy: A Metacentric Experience from Bangladesh

**Jobairul Islam , Abu Kausar, Mohammad Ullah Shemanto, Abbas Ali, Savino Cilla , Mostafa Aziz Sumon, AFM Kamal Uddin, Alessio Giuseppe Morganti**

DOI: 10.69690/ODMJ-018-3101-6827

AMSTRO
Asia and Middle East Society of Therapeutic Radiation and Oncology
Affiliated with ASTF

*abstract*

# Evaluation of Planning Target Margins in Head and Neck Cancer Radiotherapy: A Metacentric Experience from Bangladesh

**Author:** Jobairul Islam[1], Abu Kausar[2], Mohammad Ullah Shemanto[3], Abbas Ali[4], Savino Cilla[5], Mostafa Aziz Sumon[1], AFM Kamal Uddin[1], Alessio Giuseppe Morganti[6]

**Affiliation:** [1]Labaid Cancer Hospital & Super Speciality Centre, Dhaka, Bangladesh
[2]Delta Hospital Limited, Dhaka, Bangladesh
[3]Evercare Hospital Chattogram, Chattogram, Bangladesh
[4]United Hospital Limited, Dhaka, Bangladesh
[5]Responsible Research Hospital, Campobasso, Italy
[6]Bologna university, Italy

**DOI:** 10.69690/ODMJ-018-3101-6827

**Introduction:** Head and neck cancers (HNC) pose unique challenges due to anatomical complexity and setup uncertainties during radiotherapy. In resource-limited settings like Bangladesh, standardized planning target volume (PTV) margins may inadequately address institutional variations in imaging and setup protocols. This multicentric study evaluates PTV margins across four Bangladeshi institutions, quantifying systematic (Σ) and random (σ) errors to optimize precision.

**Methodology:** Forty (40) HNC patients underwent intensity-modulated radiotherapy (IMRT) or volumetric modulated arc therapy (VMAT) at four centers (May–September 2024). Translational setup deviations (left-right [LR], anterior-posterior [AP], superior-inferior [SI]) were measured using electronic portal imaging devices (EPID) or cone-beam computed tomography (CBCT). Σ (standard deviation of mean displacements) and σ (root mean square of daily variations) errors were calculated. PTV margins were derived using van Herk's (2.5Σ + 0.7σ) and Stroom's (2.0Σ + 0.7σ) formulas. Planning organ-at-risk volume (PRV) margins followed McKenzie's method (1.3Σ + 0.5σ). Results were compared to 16 global studies (737 patients).

**Results:** Significant institutional disparities were observed. PTV margins ranged from 4.7 mm (CBCT-equipped center) to 8.0 mm (mean: 6.8 ± 1.2 mm), aligning with literature (weighted mean: 6.8 mm; range: 3.6–9.9 mm). PORV margins varied from 2.6–4.4 mm.

Institutions using CBCT demonstrated smaller margins ($p<0.05$, Kruskal-Wallis/Dunn's test), with lower Σ errors (1.2 ± 0.3 mm vs. 1.4 ± 0.5 mm in EPID-only centers). Daily CBCT reduced PTV margins by 3.3 mm, correlating with advanced imaging's role in error mitigation.

**Conclusion:** Institution-specific PTV margins, tailored to local imaging capabilities, are critical in resource-constrained settings to balance tumor coverage and organ sparing. Daily CBCT enables margin reduction, directly supporting toxicity reduction strategies. These findings advocate for adaptive protocols and context-specific guidelines to enhance global radiotherapy equity, emphasizing technology integration in low-resource environments.

**Conflict of interests:** The authors declare no conflict of interests.

**Funding:** This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.