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abstract

Artificial Intelligence in Radiation Oncology: Necessity or Luxury in a Low- and Middle-Income Country - Experience from a Tertiary Cancer Center in Bangladesh

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abstract

Assessment of Average Glandular Dose Determinants and Breast-Thickness–Specific DRLs in Digital Breast Tomosynthesis

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Introduction: Artificial Intelligence (AI) is increasingly adopted in radiation oncology to enhance contouring efficiency and consistency. In Bangladesh, only 39 radiotherapy machines serve ~167,526 new cancer cases annually, causing major delays, up to 8 months in government hospitals, 1–2 months in private centers. At Ahsania Mission Cancer & General Hospital (AMCGH), 9 radiation oncologists treat over 2,400 patients yearly using 2 LINACs, 1 cobalt unit, and 2 contouring stations. To address high workload and limited manpower, AMCGH introduced the MVision AI-assisted auto-contouring system, the first in Bangladesh, to evaluate feasibility, accuracy, and workflow impact.

Methodology: The MVision Contour Plus system was implemented and evaluated from August 2025 until today. Fifty-one cases were contoured using AI with manual edits. Ten random cases (5 head-and-neck, 5 pelvis) were selected for accuracy analysis. AI-generated organs-at-risk (OAR) contours were compared with final clinical contours using Dice Similarity Coefficient (DSC), surface DSC (s-DSC), 95th percentile Hausdorff Distance (HD95), and volume differences. Inter-observer variability was assessed in 5 cases by two oncologists. Total contouring time was recorded.

Results: For head-and-neck OARs (brainstem, eyes, lenses, optic chiasm), mean DSC ranged from 0.58 (optic chiasm) to 0.91 (eyes), with HD95 of 1.5–4 mm. For pelvic OARs (bladder, bowel bag, rectum, femoral heads, spinal cord), mean DSC was 0.80 ± 0.12, highest for bladder/femoral heads (0.88–0.89) and lowest for spinal cord (0.55; HD95 = 50.4 mm). Contouring time decreased from 20–30 min (manual) to 5–10 min (AI-assisted), a 75% reduction ($p < 0.001$). Inter-observer DSC (~0.80) matched AI vs. clinical DSC. Clinicians reported high satisfaction with AI guideline adherence.

Coclusion: AI-assisted contouring was feasible, accurate for most OARs, and reduced contouring time by 75% in a high-volume, resource-limited center.

While excellent for large/regular OARs, performance was limited for small/mobile structures, requiring manual correction. AI integration is a necessity, not a luxury, to improve efficiency, consistency, and timely access to radiotherapy.

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