

Pediatric Image-Guided Craniospinal Irradiation: Practice Patterns and Opportunities for Improvement at a Tertiary Care Center in Pakistan

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DOI: 10.69690/ODMJ-018-0915-5952



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Introduction: Advance radiation techniques like IMRT (Intensity Modulated Radiation Therapy) and VMAT (Volumetric Modulated Arc Therapy) warrants IGRT for accurate delivery of highly conformal treatment. Setup errors may result in undertreatment of target volumes and increase dose to critical organs. The aim of this study is to identify gaps and propose optimization strategies in pediatric Image Guided Craniospinal Irradiation at a tertiary care center in Pakistan.

Methodology: A retrospective analysis of 04 pediatric patients and 175 portal images evaluated IGRT practices including patient demographics, RT details, IGRT frequency, and imaging exposure. Descriptive statistics were used to assess current practices and identify areas for improvement.

Results: The median age of patients was 5.9 years (SD= 3.98). Treatment sites included were

Craniospinal axis (n=4 Medulloblastoma). RT techniques were IMRT (n=1) and VMAT (n=3) with 75% patients undergoing weekly CBCT with daily portal imaging and 25% solely portal imaging based IGRT. Orthogonal MV-MV imaging was predominant (83% n=140), MV-KV images (16.7%). Set up errors requiring revisions were analyzed in 16% of cases (n= 28) with majority reasons being inappropriate alignment. Inter fraction shift analysis revealed minimal changes with mean vertical, longitudinal and lateral shift being 1.43mm, 2.16mm and 1.76mm respectively. Collimation to reduce scan range was applied in n=24 fractions (13.7%). Key areas of improvement included reducing MV imaging (associated with increase radiation exposure per fraction), and refining imaging field size.

Conclusion: Optimizing the conformality while simultaneously ignoring IGRT dose may result in organ at risk being exposed to a greater proportion

of radiation from IGRT than from therapeutic beams. Efforts in incorporating non ionizing IGRT measures via SGRT (surface guided radiation therapy) and development of pediatric Craniospinal institutional protocols can be a way forward.

Conflict of Interest: None

Funding: None

Disclosure statement: None

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