

Evaluation of radiotherapy doses in pediatric patients with Hodgkin Lymphoma: Monte Carlo Simulations

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Background: Hodgkin lymphoma (HL) is one of the most common cancers in children, and radiotherapy (RT) is a crucial part of treatment [1,2]. However, the risk of late effects, such as cardiotoxicity and secondary malignant neoplasms, is a concern due to radiation exposure to critical organs [2-8]. Advanced dose calculation methods, such as Monte Carlo Methods (MCMs), can improve dosimetry accuracy and help minimize these risks [9,10]. **Objective:** This study aims to assess organ doses in pediatric patients undergoing RT for HL. **Methods:** The research was structured into three main components: a systematic literature review, dose calculations using the Eclipse treatment planning system and simulations using the PRIMO software. Information was collected from the Pubmed database on the effect of doses on the organs of pediatric patients undergoing RT for HL. The search terms and the Boolean operator were used in the following search query: ((Hodgkin) AND (Late effects)) AND (Pediatric). A total of 17 articles were considered. **Results and Discussion:** PRIMO simulations showed greater accuracy with lower uncertainties than Eclipse. PRIMO calculated a heart dose of 1645 mGy, while Eclipse estimated 2142 mGy. For the breasts, PRIMO calculated 243 mGy versus 189 mGy in Eclipse. Though small, these differences may have clinical relevance, as studies indicate that doses above 20-30 Gy raise the risk of late effects like breast cancer and cardiotoxicity [11]. PRIMO's precision makes it more reliable for assessing pediatric radiation exposure, where accurate dosimetry is key to minimizing long-term risks [9]. **Conclusion:** The comparative analysis showed that PRIMO, using MCMs offers more detailed and accurate dose calculations than Eclipse TPS. Incorporating MCMs into clinical protocols can improve the assessment of radiation risks and better protect critical organs, promoting safer and more effective treatment for pediatric HL patients.

Keywords: radiotherapy, pediatrics, Hodgkin Lymphoma

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