

AB003. Benefits of proton radiotherapy in thymic epithelial tumors using the model-based approach

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Background: Radiotherapy (RT) for thymic epithelial tumors (TET) is indicated postoperatively for advanced/aggressive disease or incomplete resection, or as primary treatment in inoperable patients. In selected patients, proton therapy spares better normal tissues compared to standard photon treatment, and therefore has a high potential to reduce toxicity. The aim of this study is to compare photon and proton plans regarding doses and normal tissue complication probability (NTCP), as a validated surrogate for toxicity.

Methods: Patients with TET referred for radiotherapy from 08.2019–03.2022 were included. Intensity-modulated proton therapy (IMPT) and volumetric-arc photon therapy (VMAT) plans were compared for mean doses to the lungs (MLD), heart (MHD) and esophagus (MED) (using Wilcoxon signed ranks test), and normal tissue complication probability (NTCP) with endpoints radiation pneumonitis (grade ≥ 2), cardiac toxicity (major coronary events), acute dysphagia (grade ≥ 2) and since 03.2022 secondary breast cancer. VMAT plans consisted typically of 2–3 partial 6 MV arcs in the anterior region, and the dose was prescribed to the PTV. IMPT plans were typically administered with 3 or 4 anterior and anterior-oblique beams, using robust

optimization.

Results: Twenty-four TET-patients had a VMAT-IMPT comparison (17 thymoma/4 thymic carcinoma) with Masaoka-Koga stages IIA–IVB. Mean age was 61 years. Average MLD, MHD and MED decreased significantly with IMPT (from 9.4 to 5.4 Gy, from 9.0 to 6.6 Gy and from 7.4 to 2.0 Gy, respectively). Average NTCP-values for radiation pneumonitis, cardiac toxicity and dysphagia all decreased with IMPT compared to VMAT from 11.6% to 7.1%, from 16.3% to 14.6% and from 15.5% to 3.4%, respectively. Average NTCP-difference favoring proton therapy was 4.5% (range, 0.6% to 15.9%) for radiation pneumonitis, 1.7% (–0.1% to 4.9%) for cardiac toxicity and 12.1% (–0.3% to 43.4%) for dysphagia. Seventeen patients (71%) had a significantly lower NTCP with IMPT for at least one of the endpoints and qualified for reimbursement; 13 of these were treated with protons at our centre.

Conclusions: IMPT significantly reduced mean doses to lungs, heart and esophagus in all patients compared with VMAT, resulting in a significant reduction of NTCP for at least one endpoint in 71% of patients.

Keywords: Thymoma, thymic carcinoma (TC), radiotherapy, proton

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://med.amegroups.com/article/view/10.21037/med-22-ab003/coif>). STHP and MH are members of the Dutch guidelines about thymic tumors. FM reports that she is an unpaid committee member of Dutch Rare Cancer Platform and Dutch guidelines about Thymic Tumors. The other authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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