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A prospective randomized study comparing two frameless immobilization systems for cranial stereotactic radiotherapy

Dylan Callens ^{1 2}, Chahrazad Benazzouz ², Lise Stessens ², Wout Piot ², An Nulens ²,
Maarten Lambrecht ^{1 2 3}, Patrick Berkovic ^{1 2}, Jean-François Daisne ^{1 2 3}

Affiliations

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Abstract

Introduction: The Dual Shell Encompass Fibreplast™ System (DS-Encompass) by CQ Medical™ is validated for frameless immobilization in stereotactic brain radiotherapy. An alternative mask model has been proposed with the rear shell replaced by a Moldcare® cushion (M-Encompass). To validate the use of this model in our cranial stereotactic workflow method including HyperArc™, we performed a prospective randomized study comparing inter- and intrafractional motion and patients' comfort between both masks.

Materials & methods: A prospective randomized study between DS-Encompass and M-Encompass was conducted involving 60 participants. Stratification between DS-Encompass and M-Encompass was carried out based on the fractionation scheme. Treatment plans were created with HyperArc™. During treatment, surface guidance was used for patient positioning and monitoring. A pre-treatment cone-beam CT (CBCT) was acquired to correct interfractional motion and a post-treatment CBCT was acquired to quantify the intrafractional motion. Patients' reported comfort was analyzed with a Likert-scale at the end of the treatment. Unpaired t-tests were conducted to determine the level of significance.

Results: No significant difference in interfractional translations is present. A significant difference is revealed in roll-axis rotation, where DS-Encompass allows for smaller deviations. Since interfractional motion can be corrected through daily CBCT-scans and 6D-couch corrections, they are clinically irrelevant. Intrafractional motion does not differ significantly and remains below 0.5 mm and 0.5° for both systems. There is no statistical difference in patient-reported comfort.

Conclusion: We conclude that Encompass with Moldcare offers a safe alternative to Dual Shell Encompass for non-coplanar stereotactic brain radiotherapy. There is no significant difference in intrafractional motion nor difference in comfort levels.

Keywords: Frameless; Immobilization; SRS/FSRT.

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Figures



Fig. 1 From inclusion to mask creation...

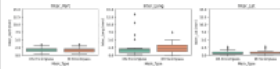


Fig. 2 Boxplot distribution of interfractional

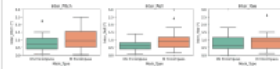


Fig. 3 Boxplot distribution of interfractional rotations...

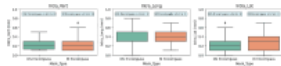


Fig. 4 Boxplot distribution of intrafractional vertical...

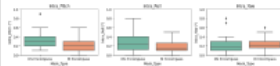


Fig. 5 Boxplot distribution of intrafractional pitch,...

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