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O-MSC-05 - A comparative study of imaging registration of a Human skull phantom

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Resumen

Objectives: Image registration is an essential part of any neurosurgical planning and navigation system because it facilitates combining images with important complementary structural and functional data to improve the information basis on which a surgeon makes critical decisions. The purpose of this study is to assess the accuracy of image registration between the CT, MR and optically acquired point cloud of a human skull phantom, based on iterative-closest point algorithms.

Material and methods: Fourteen targets were strategically positioned inside the phantom with a specific target point and orientation. The CT and MR of the phantom were then acquired, as was its digitalized point cloud using an infrared optically tracked probe with the Polaris Spectra System. The resulting point clouds were then segmented, and the Iterative-closest point algorithm was applied to obtain the parameters of rigid transformations between the three point clouds. The geometric center and orientation of each target were used as reference.

Results: The obtained registration error was 1.05 ± 0.37 mm between the MR and optical registration, 1.00 ± 0.35 mm between the CT and optical registration and 0.45 ± 0.25 mm between the CT and MR registration. The registration error for the orientation was found to be equal to 7.49 ± 5.51 degrees for CT/MR dataset, 12.31 ± 7.00 degrees for CT/optical dataset and 7.84 ± 5.87 degrees for MR/optical dataset.

Conclusions: A validation pipeline was successfully implemented providing an assessment tool to existing and new brain imaging registration tools.