

3-D reconstruction of the orbita from 3T MRI as an alternative to CT

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Fractures of orbital structures are common in maxillofacial traumas and are the most challenging to treat. An optimal anatomical surgical reconstruction of the orbita relies heavily on 3D image data of the patient for diagnosis, pre-operative planning, surgery and post-operative assessment. Computer tomography (CT) is currently the imaging modality of choice for orbital trauma as it provides excellent depictions of the bony tissue structures. However, repeated CT scanning can exceed the radiation dose threshold for lens damage. As an alternative, magnetic resonance imaging (MRI) is not only free of ionizing radiation, but also provides superior detail of soft tissue structures compared to CT. Over the last few years, the feasibility of MRI as non-radiation based imaging modality for pre and post-operative diagnostic imaging of orbital trauma has been demonstrated using 1.5T MRI.

Despite the advantages of MRI, it has not yet been used for the skeletal 3D reconstruction of the orbita. Therefore, this project aims to determine the extent to which the accuracy of MRI based virtual 3D models of the orbita can approach that of CT based models. The intact orbita of patients with unilateral orbital fractures will be imaged with a state of the art 3T MRI scanner in addition to the clinically required CT scan. The accuracy of the MRI based models will be analyzed and quantified through geometric and volumetric comparison with the corresponding CT based models.

The study is expected to provide recommendations for the use of MRI as a safer alternative to CT for the imaging of orbital trauma cases.