Black bone MRI in the diagnosis and planning of craniofacial, orthognathic and mandibular oncological surgery

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The risks of ionizing radiation associated with serial CT scans in the investigation and monitoring of patients have been well documented. Currently within craniofacial, orthognathic, and oral oncological surgical sub-specialties ionizing radiation is employed via a combination of plain radiographs and CT scanning in the diagnostic, planning and follow-up phases of surgery. The benefits of a non-ionizing method of imaging, particularly in young patients are potentially profound. We are investigating the potential of MRI as an alternative imaging modality. MRI is radiation free, but standard sequences provide poor imaging of bone compared to CT. The "black bone" imaging sequence developed at our unit shows good potential for bone imaging. The aim of the research project is to further develop the sequence to permit identification of cranial sutures, and the depth of invasion of tumor in mandibular cancer cases. The cephalometric accuracy of the technique will be determined, permitting use within orthognathic surgery. Work on three dimensional reconstruction of images will be undertaken, and subsequently be used to create anatomically accurate working models, to aid with the planning of surgery.