A Study using Tractography of the Optic Radiation to Investigate Visual Field Deficits after Selective Transsylvian Amygdalohippocampectomy (sTAH) for Temporal Lobe Epilepsy

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Introduction

One third of epilepsy patients are refractory to medical treatment and may be considered for surgery. A common complication of the traditional anterior temporal lobectomy (ATL) is a superior homonymous quadrantanopia. This occurs because of disruption to Meyer's loop, the anterior part of the optic radiation.

The optic radiaton seen following Klinger's fibre dissection technique (1)

Meyer's loop indicated by the blue arrows

Visual field deficits may prevent driving in patients who are seizure free post-surgery. The Selective Transsylvian Amygdalohippocampectomy (sTAH) approach may improve visual outcomes.

Aims

This study set out to demonstate surgical disruption of Meyer's loop in patients following sTAH. The study also explored the significance of both the anterior extent of Meyer's loop and the length of surgical resection for visual field outcomes.

Results

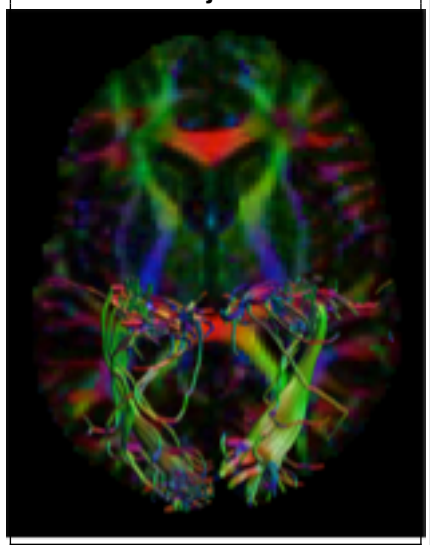
DTI tractography demonstrated disruption to the antero-lateral edge of Meyer's loop in two subjects who developed a quadrantanopia. The mean distance from the anterior edge of Meyer's loop to the temporal pole (ML-TP) was 40.3 mm (range 36-43 mm).

Methods

- Three subjects underwent standardised post-operative visual field assessement.
- Structural and diffusion tensor imaging (DTI) scans were performed and the optic radiations were visualised using tractography.
- Measurements were taken of the distances from the anterior edge of Meyer's loop to landmarks in the temporal lobe on the non-resected side; and the lengths of surgical resection.

These measurements fall within the range reported by previous tractography studies. The mean length of resection was 52% of the temporal pole-occipital pole distance (range 47.4%- 60.3%). A shorter ML-TP distance and longer resection were associated with worse visual outcomes.

Subject 1



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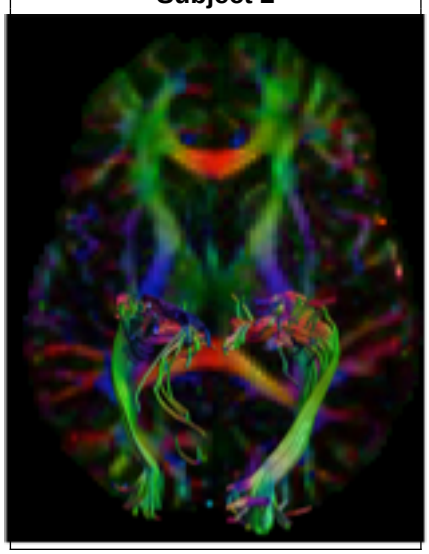

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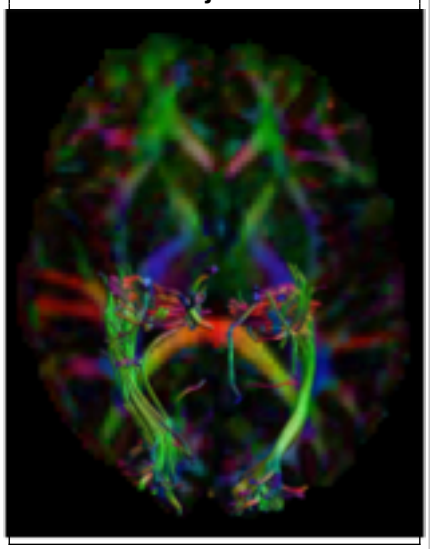

Conclusions

The sTAH approach may spare many of the fibres that are lost in traditional surgery and result in a lower incidence and severity of post-operative VFDs. Further investigation is needed to determine the significance for visual field outcomes of both the anterior extent of Meyer's loop and the resection length.

Learning Objectives

By the conclusion of this session, participants should be able to:

1) Appreciate the potential of selective transsylvian amygdalohippocampectomy to provide better visual field outcomes for patients.

2) Discuss the clinical significance of white matter imaging and its potential to be integrated into the standard imaging of patients undergoing neurosurgical procedures - notably to identify patients at greater risk of visual problems and to better guide surgical procedures.

3) Identify areas of future research to improve preservation of vision in patients undergoing temporal lobe surgery.

Reference

(1) Sherbondy A, Dougherty RF, Napel S, Wandell BA. Identifying the human optic radiation using diffusion tensor imaging and fibre tractography. Journal of Vision. 2008; 8(10): 12.1-12.11.