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Visual field defects after temporal lobe resection for epilepsy☆

Alvilda T. Steensberg[a,f], Ane Sophie Olsen[b], Minna Litman[c], Bo Jespersen[d], Miriam Kolko[a,b,e], Lars H. Pinborg[c,f,*]

[a] Department of Drug Design and Pharmacology, Copenhagen University Hospital, Denmark
[b] Department of Ophthalmology, Copenhagen University Hospital, Rigshospitalet, Denmark
[c] Neurobiology Research Unit, Copenhagen University Hospital, Rigshospitalet, Denmark
[d] Department of Neurosurgery, Copenhagen University Hospital, Rigshospitalet, Denmark
[e] Department of Ophthalmology, Zealand University Hospital, Roskilde, Denmark
[f] Epilepsy Clinic, Department of Neurology, Copenhagen University Hospital, Rigshospitalet, Denmark

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ABSTRACT

Purpose: To determine visual field defects (VFDs) using methods of varying complexity and compare results with subjective symptoms in a population of newly operated temporal lobe epilepsy patients.
Methods: Forty patients were included in the study. Two patients failed to perform VFD testing. Humphrey Field Analyzer (HFA) perimetry was used as the gold standard test to detect VFDs. All patients performed a web-based visual field test called Damato Multifixation Campimetry Online (DMCO). A bedside confrontation visual field examination ad modum Donders was extracted from the medical records in 27/38 patients. All participants had a consultation by an ophthalmologist. A questionnaire described the subjective complaints.
Reults: A VFD in the upper quadrant was demonstrated with HFA in 29 (76%) of the 38 patients after surgery. In 27 patients tested ad modum Donders, the sensitivity of detecting a VFD was 13%. Eight patients (21%) had a severe VFD similar to a quadrant anopia, thus, questioning their permission to drive a car. In this group of patients, a VFD was demonstrated in one of five (sensitivity = 20%) ad modum Donders and in seven of eight (sensitivity = 88%) with DMCO. Subjective symptoms were only reported by 28% of the patients with a VFD and in two of eight (sensitivity = 25%) with a severe VFD. Most patients (86%) considered VFD information mandatory.
Conclusion: VFD continue to be a frequent adverse event after epilepsy surgery in the medial temporal lobe and may affect the permission to drive a car in at least one in five patients. Subjective symptoms and bedside visual field testing ad modum Donders are not sensitive to detect even a severe VFD. Newly developed web-based visual field test methods appear sensitive to detect a severe VFD but perimetry remains the golden standard for determining if visual standards for driving is fulfilled. Patients consider VFD information as mandatory.

1. Introduction

Active epilepsy disrupts important aspects of life, and imposes physical, psychological and social burdens on individuals and families. Despite optimal medical treatment, a third of epilepsy patients continues to have seizures [1]. Resective surgery is an effective treatment for drug-resistant temporal lobe epilepsy [2]. However, surgery must always be weighted against possible adverse effects.

Anterior temporal lobe resection may cause damage to the optic tract in Meyer's loop (Fig. 1). A large individual anatomical variability of Meyer's loop makes it difficult to predict the exact location of the fibers and the corresponding visual field defect (VFD) [3,4]. Previous studies have demonstrated a VFD in 52% to 97% of patients after epilepsy surgery in the medial temporal lobe [2,5–10]. These studies were mostly published more than fifteen years ago. More recent studies suggest that postoperative VFDs are more frequent after a trans-sylvian than a temporobasal approach for selective amygdalohippocampectomy (SAH) [11]. Conflicting results on post-operative VFDs after SAH versus standard anterior

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* Corresponding author at: Neurobiology Research Unit, Copenhagen University Hospital, Rigshospitalet, Denmark.
E-mail address: lars.pinborg@nru.dk (L.H. Pinborg).

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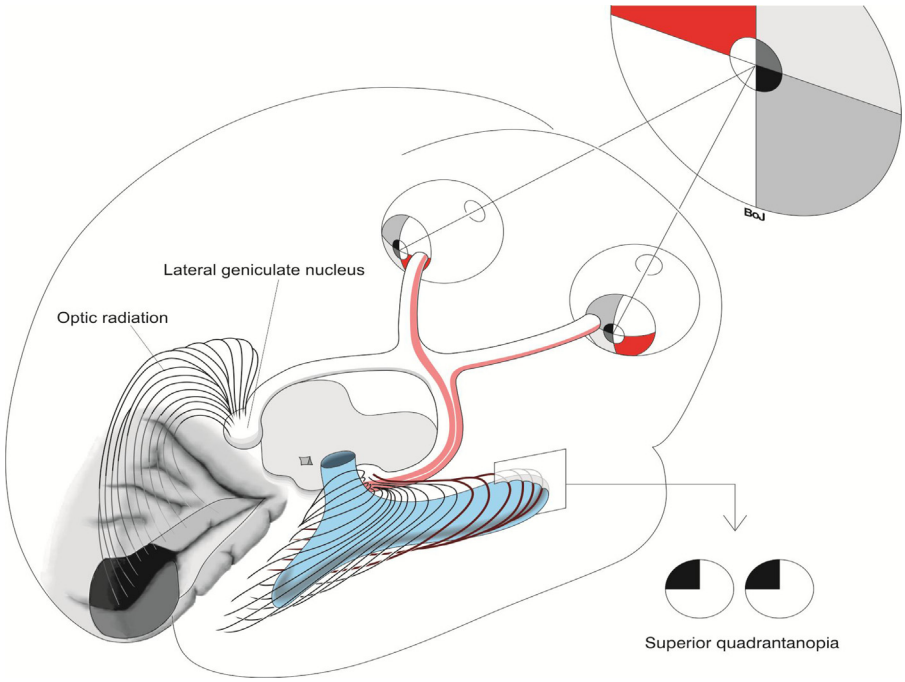

Fig. 1. Fig. 1 shows the visual pathways. A lesion in the temporal lobe may result in damage to Meyer's loop and cause a characteristic loss of vision in the opposite superior quadrant.

temporal lobectomy (ATL) have been published [12,13]. Interestingly, the combination of preoperative tractography of the optic radiation, intraoperative MRI and neuronavigation appear to reduce the severity of VFD without affecting seizure outcome [14].

Diagnosing VFD is important obviously for safety reasons but also because a reduction in the visual field after epilepsy surgery makes patients more vulnerable to the possible future effect of a progressive visual field losses in relation to eye diseases like glaucoma. In Denmark, testing of VFDs using perimetry is no longer part of the standard epilepsy surgery program and after surgery patients are only tested using the bedside confrontation visual field examination (ad modum Donders).

The aim of the study was to use perimetry as a golden standard to determine the existence of VFDs in the population of epilepsy patients newly operated in the medial temporal lobe and compare findings with bedside confrontational visual field examinations ad modum Donders, a web-based visual field test (Damato Multifixation Campimetry Online (DMCO)), and subjective symptoms reported by the patients before VFD testing.

2. Methods

2.1. Study design and participants

In Denmark epilepsy surgery is centralized to the Copenhagen University Hospital (Rigshospitalet) [15]. From our database we identified 56 consecutive patients aged between 15 and 60 years that underwent anteromedial temporal lobe resection for drug resistant epilepsy between 2011 and 2014. Sixteen patients declined to participate: 1) five patients due to the distance to the study site in Copenhagen, 2) five patients due to concerns about school, work or children, 3) one patient due to the inability to see the personal benefits, 4) one patient due to a wish to leave the epilepsy behind, 5) one patient due to illness with myasthenia gravis, 6) one patient due to illness after a falling accident, 7) two patients due to missing return of phone calls or letters. Forty patients were included in the study. Two patients were subsequently excluded from the study because they failed to perform the Humphrey Visual Field Analyzer (HFA) test. Finally, data from 38 patients (23 females; mean age: 39 years; age range: 17–60 years) were included in the study. Patients were operated 26 years (mean) after first seizure (range 4–52 years). In patient number 10 a SAH (temporobasal approach) was performed. In all other patients, ATLs were performed ad modum Spencer [16]. The results of the pathological examinations of hippocampus were hippocampal sclerosis in 25/38 patients, stroke in 1/38 patients (patient number 39), gangliogliomas and a dysembryoplastic neuroepithelial tumor were found in 3/38 patients (patient numbers 4, 17 and 20), focal cortical dysplasia in 1/38 patients (patient number 31) and normal or gliolis in 8/38 patients (patient numbers 3, 14, 18, 19, 23, 36, 38, 40). In the neocortex focal cortical dysplasia was dignosed in 2/38 patients (patient numbers 27 and 35) and normal or with gliosis in the remaining 36 patients. Patients were tested at least 9 months after epilepsy surgery (range 280–1323 days, median 655 days, average 712 days).

The collection of HFA data (reference standard), DMCO (index test), and questionaires including subjective symptoms of a VFD were planned before the tests were performed. Data from the pre-surgical evaluation program and two years post-surgical follow-up were available from our database and electronic patients files at Rigshospitalet and the Epilepsy Hospital in Dianalund. This included bedside data on VFD testing ad modum Donders.

The Danish Health and Medicines Authority and the Danish Data Protection Agency approved collection and handling of data. The ethical committee of the Copenhagen Capital Region categorized the project as a quality and safety study (H-15004868).

2.2. Test methods

The HFA (program 30-2, SITA fast strategy) perimeter was used as the gold standard test to detect VFDs. We defined the degree of anopsia according to the average number of “black spots” in the most affected quadrant on a HFA printout. Accordingly, no VFD: 0 black spots, small VFD: 1–6 black spots, moderate VFD: 7–12 black spots and severe VFD: 13–19 black spots. In Fig. 2, one example for each group is shown.