Case Report

Preoperative visual field deficits in temporal lobe epilepsy

Sanjeet S. Grewal a,⁎, William O. Tatumb b, Paul W. Brazis c, Jerry J. Shih b, Robert E. Wharen a

a Department of Neurosurgery, Mayo Clinic, 4500 San Pablo Road, Jacksonville, FL 32224, USA
b Department of Neurology, Mayo Clinic, 4500 San Pablo Road, Jacksonville, FL 32224, USA
c Department of Ophthalmology, Mayo Clinic, 4500 San Pablo Road, Jacksonville, FL 32224, USA

ARTICLE INFO

Article history:
Received 1 July 2016
Received in revised form 11 November 2016
Accepted 9 December 2016
Available online 21 January 2017

Keywords:
Laser thermoablation
Temporal lobe epilepsy
Visual field deficits

ABSTRACT

Surgical resection and laser thermoablation have been used to treat medically refractory epilepsy with good results. However, they are not without risk. One of the most commonly reported complications of temporal lobe surgery is contralateral superior homonymous quadrantanopia. We describe a patient with quadrantanopia discovered as part of our recently modified protocol to workup patients prior to epilepsy surgery. This field cut was subtle and not detected on routine neurological examination. While we understand that this is a single case, we advocate for more judicious preoperative visual field examinations to truly characterize the incidence of postoperative visual field lesions.

© 2017 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

1. Introduction

Surgical resection has been a well-documented treatment modality in patients with partial epilepsy localized to the temporal lobe. While resection has lead to good postoperative seizure outcomes, it is not without risk. Contralateral superior quadrant visual field deficits are one of the most commonly reported adverse outcomes after temporal lobe surgery, occurring in between 28% and 52% of patients [1,2]. Multiple techniques and adjuvant intraoperative technologies have been reviewed in an effort to minimize visual field deficits after temporal lobe surgery. In this case report, we describe a subtle preoperative visual field deficit that was not altered after temporal lobe surgery. We postulate that the true rate of postoperative visual field deficits is actually lower than the reported rates and that there are likely subtle deficits attributable to the patient’s underlying epilepsy.

2. Case report

Our patient was a 57-year-old woman with late-onset seizures. She had a 4-year history of seizures with no significant history of trauma or pediatric complications. The clinical semiology was very suggestive of dysequilibrium seizures (complex partial seizures) of temporal lobe origin. Based on some of the semiologic details (lip smacking, left upper extremity dystonic posturing, and head deviation to the left), our clinical suspicion was for right mesial temporal onset epilepsy. She had been trialed on 3 first-line antiseizure medications without full control. Her antiepileptic regimen included 100 mg of lamotrigine twice a day, 100 mg of topiramate twice a day, and 400 mg of eslicarbazepine daily. The patient was unable to tolerate dose escalation.

She had significant decline in her quality of life because she was legally not able to drive and work disabled because of her seizures. On physical examination performed by the epileptologist, there were no focal deficits and no visual field deficits. The patient denied any visual changes.

As part of our epilepsy protocol, patients undergo neuroophthalmologic evaluation in addition to neuropsychological testing. Upon neuroophthalmologic evaluation, there was concern for a subtle left superior homonymous quadrantanopia. This was confirmed with computational Goldman perimetry (Fig. 1a). The inpatient epilepsy monitoring unit workup revealed 8 focal seizures with either bitemporal onset or right temporal lobe onset, with rapid spread to the contralateral temporal lobe. Magnetic resonance imaging did not reveal any signs of mesial temporal lobe sclerosis, gray matter heterotopia, or focal cortical dysplasia. Positron emission tomography (PET) scan revealed interictal right mesial temporal lobe hypometabolism (Fig. 2). Based on these findings, the patient elected to undergo laser thermoablation of the right mesial temporal lobe.

As of her last follow-up appointment, the patient had remained seizure free, and neuroophthalmologic evaluation revealed no change in her baseline visual field deficit (Fig. 1b).

3. Discussion

Visual field deficits are one of the most commonly reported complications following temporal lobe surgery. This is likely due to the close
Fig. 1. Visual fields, A (presurgical)/B (postsurgical); images reveal a stable left homonymous quadrantanopsia.

Fig. 2. Axial and coronal positron emission tomography (PET) scans revealing mild right mesial temporal lobe hypometabolism.
proximity of the visual fibers to the epileptogenic zone in temporal lobe epilepsy. Nasal fibers from the superior temporal visual field pass through the optic nerve and decussate in the optic chiasm. These fibers synapse in layers 1, 4, and 6 of the lateral geniculate body and then travel anteriorly and inferiorly to loop around the temporal horn of the lateral ventricle to their eventual destination of synapsing in the primary visual cortex. The ventral aspect of the optic radiation passing anteriorly around the temporal horn is referred to as Meyer’s loop.

It was originally thought that one could avoid Meyer’s loop by limiting the posterior extent of a temporal lobectomy to 6 cm from the temporal pole [3]. This was subsequently revised to 4 to 5 cm [4]. However, recent studies suggest a high degree of variability in the location of the temporal radiations, with variations both between subjects, as well as between the left and right temporal lobes, with Meyer’s loop typically being more anterior in the left temporal lobe [5–7]. Due to this variability, surgeons have increasingly employed intraoperative adjuncts, such as neuronavigation with tractography, in an attempt to minimize postoperative visual field deficits. In addition, cortical-sparing approaches have been employed, such as selective amygdalohippocampectomies through a subtemporal approach or trans-sulcal approaches, and most recently, laser thermoablation.

Despite the use of cortical-sparing approaches and intraoperative adjunctive tools, visual field deficits remain a potentially significant morbidity, with field cuts detected postoperatively in 20% to 35% of patients [8,9]. Fortunately, many of these deficits are clinically insignificant and do not preclude patients from driving [5].

This case illustrates a patient with a clinically “silent” contralateral superior homonymous quadrantanopsia following laser thermoablation of the mesial temporal lobe. In most retrospective studies and series, this would have been attributed to a lesion of Meyer’s loop from surgery. However, due to our recent protocol accommodation of preoperative visual field examination, our patient’s visual field deficit was recognized preoperatively and was noted to have remained stable after the procedure. While antiepileptics such as vigabatrin, topiramate, and carbamazepine are known to cause visual disturbances and visual field changes, it is unlikely that an isolated superior homonymous quadrantanopsia was the result of antiepileptics [10]. We posit that the patient’s visual field deficit was the result of aberrant neuronal activity in the mesial temporal lobe, as depicted in the PET scan. While the onset of seizures is generally cortical in location, seizures can propagate through white matter tracts (Meyer’s loop), and prolonged seizure propagation along these tracts could potentially lead to the subtle visual field defect we detected in our patient.

While we acknowledge the limitations of a single case report, the authors believe that subtle preoperative visual field deficits are likely an underreported entity and contribute to the high incidence of postoperative visual field deficits. We advocate the judicious use of preoperative visual field testing for patients undergoing temporal lobe surgery for epilepsy.

References

[1] Egan RA, Shults WT, So N, Burchiel K, Kellogg JX, Salinsky M. Visual field deficits in conventional anterior temporal lobectomy versus amygdalohippocampectomy. Neurology 2000;55:1818–22.
[2] Tecoma ES, Laxer KD, Barbaro NM, Plant GT. Frequency and characteristics of visual field deficits after surgery for mesial temporal sclerosis. Neurology 1993;43:1235–8.
[3] Penfield W. Temporal lobe epilepsy. Br J Surg 1954;41:337–43.
[4] Falconer MA, Wilson JL. Visual field changes following anterior temporal lobectomy: their significance in relation to Meyer’s loop of the optic radiation. Brain 1958;81:1–.
[5] Jeelani NU, Jindahra P, Tamber MS, Poon TL, Kabasele P, James-Galton M, et al. ‘Hemispherical asymmetry in the Meyer’s Loop’: a prospective study of visual-field deficits in 105 cases undergoing anterior temporal lobes resection for epilepsy. J Neurol Neurosurg Psychiatry 2010;81:985–91.
[6] Nilsson D, Starck G, Ljungberg M, Ribbelin S, Jonsson I, Malmgren K, et al. Intersubject variability in the anterior extent of the optic radiation assessed by tractography. Epilepsy Res 2007;77:11–6.
[7] Yogarajah M, Focke NK, Bonelli S, Cercignani M, Acheson J, Parker GJ, et al. Defining Meyer’s loop-temporal lobe resections, visual field deficits and diffusion tensor tractography. Brain 2009;132:1656–68.
[8] Waseem H, Osborn KE, Schoenberg MR, Kelley V, Bozorg A, Cabello D, et al. Laser ablation therapy: an alternative treatment for medically resistant mesial temporal lobe epilepsy after age 50. Epilepsy Behav 2015;51:152–7.
[9] Yeni SN, Tanrıcıer N, Uyanık O, Ulu MO, Ozkara C, Kayaşac G, et al. Visual field defects in selective amygdalohippocampectomy for hippocampal sclerosis: the fate of Meyer’s loop during the transylvian approach to the temporal horn. Neurosurgery 2008;63:507–13 [discussion 513–5].
[10] Hilton EJ, Hosking SL, Betts T. The effect of antiepileptic drugs on visual performance. Seizure 2004;13:113–28.