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MRI Assessment of the Anatomy of Optic Radiations after Temporal Lobe Epilepsy Surgery

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Key Words
Optic radiations · Visual field · Epilepsy surgery

Abstract

Objective: The aim of this study was to determine the course of the temporal optic radiations. ***Material and Methods:*** Eighteen patients were included in this prospective study. All of them underwent a temporal lobectomy for epilepsy, including the mesial temporal structures and a variable extent of lateral neocortex (from 2 to 7 cm behind the temporal tip). An MRI was performed 2 months postoperatively, allowing assessment of the extent of lateral resection. Postoperative visual fields were determined by automatic static perimetry (ASP). ***Results:*** (1) No patient complained of a disabling visual field deficit. (2) ASP, a highly sensitive technique, however, detected postoperative visual field deficits in 83% of patients, confined to the superior homonymous field contralateral to the resection. (3) A strong correlation was found between the presence of a visual field deficit and the extent of laterotemporal resection. (4) The smallest anteroposterior resection resulting in a field defect was limited to 20 mm from the temporal tip. ***Conclusion:*** (1) This study confirms a strong correlation between postopera-

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tive visual field deficits and the extent of lateral neocortical temporal resection. (2) The anterior limit of Meyer's loop is likely to be located more rostrally than previously believed. (3) Despite this, lateral resection remains useful in some cases for seizure control.

Introduction

Many temporal lobe epilepsies do not originate from the temporomesial structures alone. Indeed, as often determined by depth electrode recordings, laterotemporal neocortical gyri may be involved in temporal lobe epilepsy, temporal lobectomies tailored to the results of the presurgical investigations are performed. These additional neocortical resections, however, may interfere with the temporal course of the optic radiations [1–3].

The aims of this prospective study were: (1) to detect, by means of a highly sensitive technique (automatic static perimetry), postoperative visual field deficits after temporal lobectomy, and (2) to correlate these deficits with the extent of laterotemporal resection, as determined by postoperative MRI.

Patients and Methods

Eighteen patients (6 males, 12 females, mean age: 36) with temporal lobe epilepsy were the subject of this study. All of them were selected for surgery on the basis of video EEG, MRI, and PET scan, and 12 of them underwent depth electrode recording according to the Talairach method of stereoelectroencephalography. Every patient underwent a tailored temporal lobectomy including the mesial structures in all cases and a variable extent of the lateral neocortex (from 2 to 7 cm beyond the temporal tip). For each patient, a postoperative MRI was obtained 2 months after surgery. The T_1 sequences were analyzed, and the extent of lateral neocortical temporal resection was measured on the sagittal slices. Postoperative visual fields were determined by automatic static perimetry [Metrovision (R)], a sensitive technique for assessing visual field deficits, a mean of 18.4 weeks following surgery. All patients were questioned about their subjective visual impairment and its impact on daily life.

Results

The patients were assigned to three different groups on the basis of the anteroposterior length of the laterotemporal cortex resection (especially T_2 and T_3). Group 1 (3 patients) had a resection of less than one third of the temporal neocor-

Table 1. Correlation between visual field deficit and the extent of laterotemporal resection

	No deficit	Mild quadrantanopia	Moderate quadrantanopia	Total quadrantanopia
Group 1, %	75	25	0	0
Group 2, %	17	33	33	17
Group 3, %	0	20	33	47

Mild quadrantanopia: defects of less than 50% of the 30 central degrees of the upper quadrant. Moderate quadrantanopia: defects of more than 50% of the 30 central degrees of the upper quadrant.

tex (mean: 16.7 mm), group 2 (4 patients) had a resection of one third to less than two thirds of the temporal neocortex (mean: 31.3 mm), and group 3 (11 patients) had a resection of more than two thirds of the temporal neocortex (mean: 51 mm). The overall frequency of a postoperative visual field deficit was 83% (15 patients), all confined to the superior homonymous field contralateral to the resection. A clear correlation was found between visual field deficit and the extent of laterotemporal resection (table 1). The smallest anteroposterior resection resulting in a field defect (mild quadrantanopia) was limited to 20 mm from the temporal tip. There was no reduction in visual acuity. No patient complained of a visual field deficit interfering with daily life.

Conclusion

This study demonstrates a strong correlation between the extent of temporal neocortical resection and the risk of visual field deficit. Our finding of a visual field deficit in 83.3% is high when compared to previous series [4, 5], but this may be explained by the high frequency of small deficits, more easily detected by static perimetry than by standard Goldmann perimetry. Our observations indicate that the anterior limit of Meyer's loop may lie 20 mm from the temporal tip. The optic radiations could be preserved by limiting the lateral resection to 20 mm from the temporal tip or by performing a lateral neocortectomy sparing the white matter of the temporal lobe.

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