Journal of Clinical Neuroscience 39 (2017) 203–208

Contents lists available at ScienceDirect

Journal of Clinical Neuroscience

journal homepage: www.elsevier.com/locate/jocn

Opinion paper

Comprehensive preoperative work-up and surgical treatment of low grade tumor/benign lesion related temporal lobe epilepsy

Rui Feng [a], Jie Hu [a,b,*], Jinsong Wu [a,*], Liqin Lang [a], Chengxin Ma [a], Shize Jiang [a], Bing Sun [a], Xin Gu [b], Li Pan [a]

[a] Department of Neurosurgery, Huashan Hospital, Fudan University, Shanghai 200040, China
[b] Department of Neurosurgery, Jing'an Branch of Huashan Hospital, Fudan University, Shanghai 200040, China

ARTICLE INFO

Article history:
Received 19 October 2016
Accepted 22 January 2017

Keywords:
Low grade tumor/benign lesion related temporal lobe epilepsy
Preoperative work-up
Surgical treatment
Dense array electroencephalography source imaging

ABSTRACT

Objective: Generally low-grade tumor/benign lesion related temporal lobe epilepsy (LGT/BL-TLE) is considered easier to treat and has better prognosis when compared to non-lesional TLE. However, multiple disputes exist in surgical management of this epilepsy entity. This study aims to discuss comprehensive preoperative work-up, surgical strategies and outcome of it.
Methods: A retrospective review of sixty LGT/BL-TLE cases which underwent comprehensive preoperative work-up and then resective surgeries was conducted. Surgical strategies were categorized into limited and expanded resections. Surgical efficacy was evaluated using Engel grading after telephone or clinic follow-up and compared statistically.
Results: Preoperative work-up includes magnetic resonance imaging (MRI), conventional electroencephalography, semiology evaluation, positron emission tomography (PET) and 256-channel dense-array electroencephalography source imaging (256-ch dESI). In aspect of concordance with epileptic lesions demonstrated on MRI, 256-ch dESI was more accurate than PET (72.7% vs. 39.4%) ($p < 0.05$). Limited resections were performed in 28 cases while expanded resections in 32 cases. Altogether the surgical efficacy was: Engel grade I 86.7%, I + II 95.0%. Comparison of surgical outcome showed neither the outcome between limited and expanded resection nor the outcome between mesial and neocortical TLE (mTLE & nTLE) undergoing limited resections was significantly different ($p > 0.05$).
Conclusions: For LGT/BL-TLE, most surgical strategies can be made preoperatively after comprehensive work-up rather than intraoperatively. Limited and expanded strategies yield similar surgical outcome in either nTLE or mTLE as long as comprehensive work-up supports the strategy and the epileptic lesion is totally removed. 256-ch dESI which can visualize both structural and electrophysiological lesions may be contributable to surgical planning of this entity.

1. Introduction

Approximately 70–80% of intractable temporal lobe epilepsy (TLE) cases are found lesional on structural magnetic resonance imaging (MRI). The most common entities are hippocampal sclerosis (HS) which has been broadly studied [1,2]. In addition to HS, low grade tumors/benign lesions are common reasons for intractable temporal lobe epilepsy (LGT/BL-TLE). In addition to some special types of WHO grade II tumors, such as pleomorphic xanthoastrocytoma (PXA), which frequently causes epilepsy, the most common low grade epileptic tumors are certain kinds of WHO grade I tumors such as pilocytic astrocytoma (PA), dysembryoplastic neuroepithelial tumor (DNET), ganglioglioma (GG), etc. The most common benign non-neoplastic lesions are supposed to be vascular malformations (VM), focal cortical dysplasia (FCD), etc. Generally speaking, LGT/BL-TLE is mostly easier to treat when compared to non-lesional TLE [3–6]. After comprehensive preoperative epilepsy work-up, resective surgeries can be cure for this epilepsy entity. However, there're still controversies in choice of surgical strategies and importance of preoperative work-up which are worthy of discussion. This study aims to discuss the comprehensive preoperative work-up, surgical strategies and outcome of this entity.

* Corresponding authors at: Department of Neurosurgery, Huashan Hospital, Shanghai Medical College, Fudan University, 12 Wulumuqi Zhong Road, Shanghai 200040, China.
E-mail addresses: jiehu68@yahoo.com (J. Hu), wjsongc@126.com (J. Wu).

http://dx.doi.org/10.1016/j.jocn.2017.01.013
0967-5868/

2. Material and methods

2.1. Patient selection

We retrospectively reviewed LGT/BL-TLE cases that underwent comprehensive preoperative work-up and then resective surgeries from July, 2008 to May, 2015 in functional neurosurgery subdivision of Neurosurgical Department, Huashan Hospital.

2.2. Inclusion criteria

1. All cases were diagnosed with unifocal low grade tumor or benign lesion (LGT/BL) in unilateral temporal lobe by structural MRI and confirmed by histopathology after surgeries.
2. Preoperative work-up including semiology and conventional electroencephalography (cEEG) indicated the diagnosis of TLE.
3. All patients have been taking at least one antiepileptic drug before surgeries, for at least half a year.

2.3. Exclusion criteria

1. Cases with multiple LGTs/BLs and cases that underwent staged surgeries were excluded.
2. Cases with unclearly diagnosed epileptic lesions, high-grade tumors confirmed by histopathology and cases with tumoral recurrence were excluded.

Our comprehensive preoperative work-up of epileptogenic zone (EZ) includes detailed semiology evaluation, cEEG acquisition and analysis, structural MRI and interictal fluorodeoxyglucose positron emission tomography (FDG-PET). For twenty-two recent cases, we included 256-channel dense array electroencephalography source imaging (256-ch dESI) as a new work-up tool.

3. FDG-PET

All interictal PET studies were carried out in PET center of our hospital. PET hypometabolism was identified by two experienced physicians blind to the patients' diagnoses. The physicians noted the presence of decreased FDG uptake by visual inspection.

3.1. Semiology evaluation and cEEG analysis

Detailed semiology were analyzed based on high-resolution videos recorded simultaneously with EEG. cEEG examinations always include both waking and sleeping EEG, and they were performed using a 32-channel EEG system (Biologic, US). Electrode placement followed the international 10–20 system, and the data were sampled at 512 Hz with a 0.1–100-Hz band-pass filter. The off-line cEEG analysis was accomplished by two experienced EEG experts.

3.2. Structural MRI

MRI data acquired in our center was all carried out with a 1.5-T MRI (Signa HDx 1.5 T, GE). MRI scanning was performed according to an epilepsy protocol (image size, 512 × 512; thickness, 4 mm) including coronal T2WI, T2 FLAIR, axial T1WI, T2WI, T2 FLAIR, and sagittal T2 FLAIR. Enhanced T1WI sequences were performed for tumor-suspected cases.

3.3. 256-ch dESI

Twenty-two recent cases of this patient series accepted 256-ch dESI study. In routine work of 256-ch dESI in our center, a standardized workflow of 256-channel dense array EEG (256-ch dEEG, Electrical Geodesics, Inc., US) data processing was applied (Fig. 1)

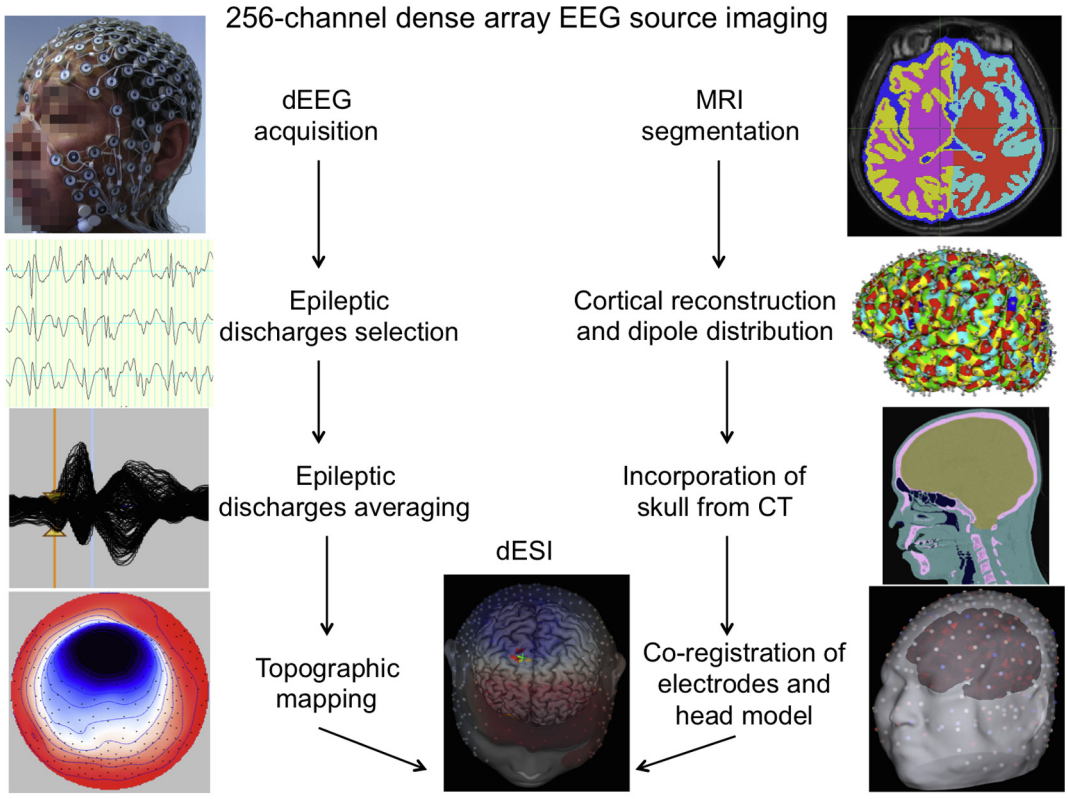

Fig. 1. Standardized workflow of 256-channel dense array electroencephalography source imaging applied in Department of Neurosurgery, Huashan Hospital. (Cited from our team's publication in Clinical Neurophysiology, 2016 [7]).