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Clinical characteristics, surgical and neuropsychological outcomes in drug resistant tumoral temporal lobe epilepsy

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HIGHLIGHTS

- Surgery for refractory tumoral temporal lobe epilepsy offers complete seizure freedom in majority, provided complete epileptogenic zone is excised.
- Intraoperative electrocorticography is a useful adjunct to ensure complete removal of epileptogenic zone.
- There is a significant improvement in the quality of life scores with no negative impact of surgery on memory and intelligence.
- Even the patients who are not seizure free can attain worthwhile improvement.

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ABSTRACT

Introduction: Glioneuronal tumors are found in nearly one third patients who undergo surgery for pharmacoresistant epilepsy with temporal lobe being the most common location. Few studies, however have concentrated on the neurological and neuropsychological outcomes after surgery, hitherto none from India.
Methods: We studied 34 patients with temporal lobe tumors and drug resistant epilepsy. These patients underwent anterior temporal lobectomy or lesionectomy based on the involvement of the hippocampus and mesial temporal structures. The clinical history, EEG, neuropsychology profile and MRI were compared. Seizure outcome was categorized using Engel's classification.
Results: At a mean follow up of 62 months, 85.29% of the patients were seizure free (Engel's Class I). All 8 patients with intraoperative electrocorticography (ECoG) guided resection were seizure free.
Discussion: Presence of a residual lesion was significantly associated with persistence of seizures post surgery ($p = 0.002$). Group analysis revealed no significant shifts in IQ and memory scores postoperatively. There was a significant improvement in the quality of life scores (total and across all subdomains) in all patients ($p < 0.001$). Postoperative EEG abnormalities predicted unfavorable seizure outcome.
Conclusion: Surgery for temporal lobe tumors and refractory epilepsy offers complete seizure freedom in majority. Complete surgical excision of the epileptogenic zone is of paramount importance in achieving seizure freedom. Intraoperative electrocorticography (EcoG) is a useful adjunct to ensure complete removal of epileptogenic zone, thus achieving optimal seizure freedom. There is a significant improvement in the quality of life scores ($p < 0.001$) with no negative impact of surgery on memory and intelligence. Even the patients who are not seizure free can achieve worthwhile improvement post surgery.

1. Introduction

Drug resistant epilepsy is defined as “failure of adequate trials of two tolerated, appropriately chosen and used antiepileptic drug schedules (whether as monotherapies or in combination) to achieve sustained seizure freedom” [1]. Glioneuronal tumors are found

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in nearly one third patients who undergo surgery for pharmacoresistant epilepsy [2].Focal pharmacoresistant epilepsy is the presenting symptom in 75% cases, with temporal lobe being the most common location (60%) [3]. Although several studies have addressed the surgical outcomes in patients with tumoral epilepsy [4–6], very few studies have addressed the surgical and neuropsychological outcomes in temporal lobe epilepsy (TLE) [7,8], hitherto none from India.

2. Methods

We analyzed the data of 34 patients with temporal lobe tumors and drug resistant epilepsy. The Institutional Ethics Committee gave us a waiver of consent as it was a retrospective study. These patients had undergone surgery at the Comprehensive Epilepsy care Centre at K.E.M. Hospital, Mumbai from 2001 to 2013 and had completed at least 1 year of follow up postoperatively. The presurgical evaluation included detailed clinical history and examination, MRI, Video EEG and neuropsychological assessment.

2.1. Imaging

MRI was performed with a 1.5T or 3T MRI machine using a temporal lobe epilepsy protocol with T2 and FLAIR coronal slices perpendicular to the hippocampus with contrast. All patients underwent a repeat MRI postoperatively to document the completeness of tumor resection.

2.2. EEG

Standard 10–20 system of electrode placement was used with additional anterior temporal electrodes (T1 and T2). All the patients underwent continuous noninvasive video-EEG monitoring for 72 h. Patients were admitted for Long term Video- EEG monitoring three days prior to their EEG appointment. The antiepileptic drugs were tapered by 40%–50% over 3 days (add-on drugs initially followed by the primary drug in the Video- EEG unit, if the patient does not get a seizure). In cases where the patient did not get a seizure even after drug tapering, a repeat 72 h Video- EEG examination was done. In such cases, patients were admitted a week prior to their Video-EEG appointment and the antiepileptic drugs were tapered. Interictal and ictal EEGs were analyzed by a team of epileptologists. An average of 2 seizures were recorded in all the patients. Lateralization and localization of the seizure focus was done on the basis of ictal and interictal EEG.

2.3. Neuropsychology

Patients underwent neuropsychological assessment preoperatively and after 1 year of surgery. For cognitive evaluation, standardized tests of general intelligence, verbal and visual memory were administered and test scores were interpreted using Indian normative data [9,10] with the impairment range defined as scores below the 15th percentile. The Indian adaptations of the Wechsler Intelligence Scales were administered [11,12] and the Verbal IQ (VIQ), Performance IQ (PIQ) and Full Scale IQ (FSIQ) scores were selected for general intelligence.

Verbal memory was assessed on the Indian adaptation of the Auditory Verbal Learning Test [9]. For visual memory, the Motor Free Design Test [10] was used for children below 16 years of age, and the Visual Retention Test from the Wechsler Memory Scale III [13] was used for adults. The immediate recall and delayed recall scores for both tests were selected for analysis.

For the Quality of Life (QoL) evaluation, the Quality of Life in Epilepsy Inventory (QOLIE-31) was administered for the adults and the QOLIE-48 for the peadiatric group [14,15].Both these scales are well established, extensively used, epilepsy specific, reliable and valid measures of quality of life.

The QOLIE -31 consists of 31 items divided into seven sub scales: seizure worry, emotional wellbeing, energy/fatigue, cognition, medication, social function and overall quality of life. For QOLIE-31 scoring, we used the scoring manual (Copyright, 1993 RAND).

The QOLIE- 48 consists of 48 items in eight sub scales: epilepsy impact, memory/concentration, attitude towards epilepsy, physical functioning, stigma, social support, school behavior, health perceptions.

For this study, the Quality of Life Scales were translated into Hindi using the standardized 'forward-backward method'. The reliability of the translated version was established by repeating the assessment on two occasions, in a sub sample of another group of epilepsy patients. The test re-test reliability was then calculated.

2.4. Surgery

The surgery was tailored and guided by the involvement of the hippocampus and mesial temporal structures and the extent of the tumor. We performed anterior temporal lobectomy (ATL) with amygdalahippocampectomy if the tumor involved the hippocampus and the mesial temporal structures, and only lesionectomy was performed if they were uninvolved. Additionally, intraoperative electrocorticography (ECoG) was performed for surgeries done after 2009. In cases of lesions close to eloquent cortex, we did not persue doing the electrocorticography recording in the eloquent cortex in order to avoid any neurocognitive deficits.

2.5. Histopathology

For pathological diagnosis, the WHO definition of primary brain neoplasms [16] was used. Associated mesial temporal sclerosis was defined as the loss of ≥30% neurons in the CA1 sector of the hippocampal formation with or without neuronal loss and gliosis involving other mesial temporal lobe structures [17]. For Focal cortical dysplasia (FCD), the Pamini classification was used [18].

2.6. Follow up and outcome assessment

The follow-up of patients was performed by clinic visits and telephonic interviews. The patients visited our epilepsy clinic at 3 monthly intervals for the first year. After the end of first postoperative year, patients who stayed far away were followed up for seizure freedom by telephonic interviews every 3 monthly. All patients were advised to follow-up to our epilepsy clinic at least once every year. AED tapering was advised only when the patients followed up in our epilepsy clinic. Seizure outcome was categorized using Engel's classification [19], consisting of the following classes:

Class I: free of disabling seizures
Class II: rare disabling seizures
Class III: worthwhile improvement
Class IV: no worthwhile improvement

Outcome of surgery was defined as 'Seizure free' or 'Not seizure free'. Patients who were not seizure free were further classified as having 'worthwhile improvement' (>80% reduction in seizure frequency as compared to preoperative state) or 'no worthwhile improvement' (<80% reduction in seizure frequency as compared to preoperative state).

Discontinuation of AED's was considered after 1.5–2 years of seizure freedom. Patients were given the option of tapered AED withdrawal based on complete excision of the lesion on