Initial Experience of Different Surgical Techniques in Temporal Lobe Epilepsy in Nepal

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An initial experience of different surgical techniques in intractable temporal lobe epilepsy (TLE) secondary to mesial temporal sclerosis (MTS) is presented. We resorted to surgery in 4 cases of TLE when all other means of non-surgical treatment failed. There were 3 males and 1 female with the history of seizure ranging from 9 to 13 years. All patients were on an adequate dose of multidrug regimes despite which they were having frequent seizure incapacitating daily life. All patients underwent interictal scalp electroencephalography (EEG), and magnetic resonance imaging (MRI) including fluid attenuated inversion recovery (FLAIR) technique. None had sphenoidal or other invasive EEG techniques. One patient had single photon emission computerized tomography (SPECT) and video telemetry. In all cases MTS was found on the right side, presumed to be the non-dominant side by handedness. None of our patients were subjected to Wada test for language determination. On the surgical technique, a standard temporal lobectomy was done in 1, tailored temporal lobectomy in 1 and selective amygdalohippocampectomy (SAH) in 2 cases. There was no mortality or morbidity in this series and all patients are leading an active life. All patients were asked to continue with preoperative medication and gradual tapering of the dose was planned. Postoperative follow up ranged from 2 and a half years for the initial case to 8 months for the latest case. Surgical results included complete remission in 3 cases (Engel class I) and 1 patient with SAH had 1 episode of seizure 3 months following surgery (Engel class II). It is hard to draw any conclusions, given the small number of patients and the relatively short duration of follow-up, but an attempt is made to assess the feasibility of applying different surgical techniques in our setting. Since the preoperative work-up, intraoperative monitoring and postoperative follow-up needs to be tailored in the context of available resources, we discuss the need to critically judge different surgical techniques best suitable to our setting.

Key words: epilepsy, intractability, surgery, technique

Surgery for seizure disorder is considered only when it becomes medically intractable. The definition of intractability differs among different institutions and should be individualized. The morbidity and mortality of persistent seizures include accidental injury, cognitive decline, sudden death, and psychosocial and vocational impairment. Although intracranial surgery involves risks, several studies in the past have shown it to be less than uncontrolled seizures.

Although started more than 100 years ago (late 19th century), surgery gained popularity for medically refractory epilepsy in the later half of 20th century. The Palm Desert Conference held in 1992 showed that surgery resulted in a seizure-free outcome in a majority of patients with hippocampal sclerosis.[6] A randomized, controlled trial of surgery for TLE showed a clear benefit upon medical management.[21] The result of individual institutions are getting even better now. Lesionectomy, anterior temporal lobectomy (ATL), (SAH),[22] corpus callosotomy, functional hemispherectomy, multiple subpial transaction (MST) are some of the techniques described for the surgical treatment of epilepsy. Recently stereotactic radiosurgery is being applied in treating TLE with mixed results. Here we discuss three different surgical techniques applied to deal with MTS in 4 cases of intractable seizure. Since the numbers of cases are too small to draw any conclusion, an attempt is made to discuss the feasibility of such surgery in the context of this country.

Patient No.	Age/Sex	Seizure history	Seizure type & Frequency	Medication	Surgery	Result
1	26 yr/M	13 yr	CPS 3-4/wk	CBZ 1200mg/D SV 1000mg/D	March 02 Rt. ATL	Engel I
2	23 yr/M	11 yr	CPS 1/wk to 3/day	CBZ 800mg/D phenytoin 300mg/D clonazepam 1mg/D	April 03 Rt. SAH	Engel I
3	16 yr/M	11 yr	CPS in clusters every 3 months	SV 1750mg/D phenobarbitone 120mg/D phenytoin 400mg/D frisium 20mg/D lamotrigine 25mg/D	January 04 Rt. SAH	Engel II
4	18 yr/F	9 yr	CPS 3-4/wk	SV 1000 mg/D CBZ 800 mg/D clobazam 1mg/D	January 04 Rt. TATL	Engel I

Table 1. Results of different surgical techniques for temporal lobe epilepsy. CPS: complex partial seizure, ATL: anterior temporal lobectomy, TATL: tailored anterior temporal lobectomy, SAH: selective amygdalohippocampectomy

Materials and Methods

Our institution is one of the few hospitals in Kathmandu offering Neurosurgical services. This study was a retrospective review of all of the cases of medically refractory epilepsy managed surgically at our institution from March 2002 to January 2004. All patients underwent MR imaging including FLAIR technique, surface EEG, and one patient (patient 3) had interictal SPECT and video telemetry. There was no invasive or intraoperative electrocorticography (ECoG) done in this series. None of the patients had intracarotid amytal (Wada)[18] or other functional tests to localize language or memory. Under general anesthesia with endotracheal intubation, craniotomy was performed. A Mayfield 3-pin head holder and operating microscope were used in all cases. In anterior temporal lobectomy (ATL) pial surface was preserved rather than opening the Sylvian fissure **(Figure 1).** The same principle was applied while dissecting the medial structure beyond the hippocampus and amygdala. Surgical end point was achieved when the cerebral peduncle, posterior communicating artery with its perforators and 3rd nerve were visible through the Pial-arachnoid membrane. On the surgical technique, a standard temporal lobectomy **(Figure 1)** in 1 and selective amygdalohippocampectomy (SAH) in 2 patients **(Figure 2 and 3)** were done. One patient underwent tailored temporal lobectomy **(Figure 4)**. Patients were transferred to intensive care unit (ICU) for overnight observation and discharged within few days on the regime of antiepileptic drugs (AED) they were taking before surgery and continued for 2 years.

The clinical notes, operative records as well as EEG and imaging studies of all patients were reviewed.

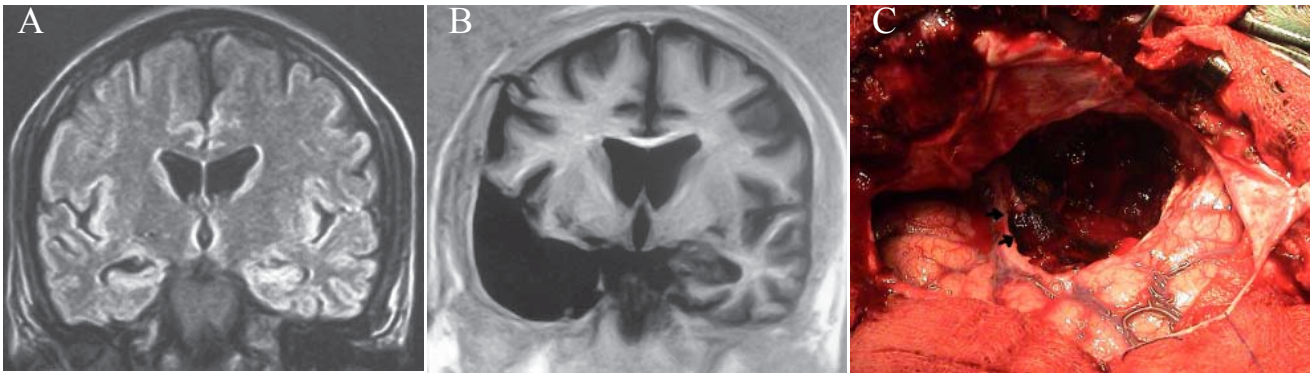

Figure 1 A: Preoperative MRI, FLAIR coronal section of patient 1 showing right hippocampal sclerosis, B: post operative image showing classical ATL where the hippocampus and the amygdala are also removed, C: Intraoperative photograph showing the extent of the surgical resection. Note that the dissection in the Sylvian fissure is subpial (arrow).

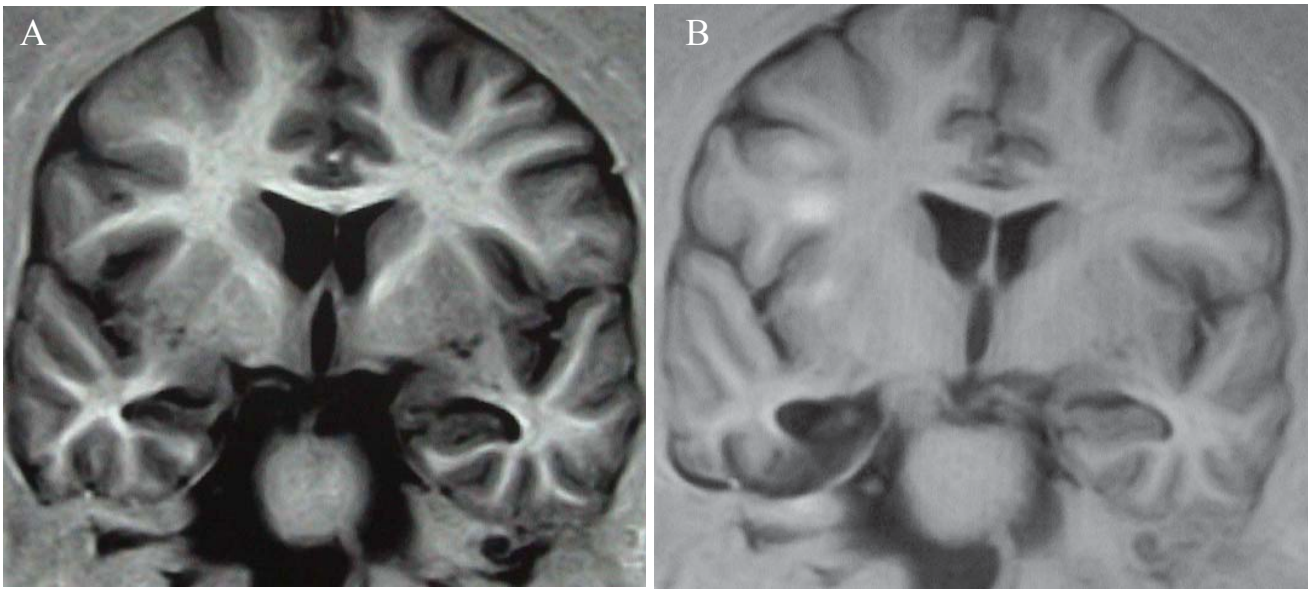

Figure 2. A: Preoperative MRI, T1WI of patient 2 showing right hippocampal sclerosis, B: postoperative image showing the extent of surgical resection in SAH.

Results

From March 2002 to January 2004, we operated on 4 cases of intractable TLE mainly presenting in the form of complex partial seizure (CPS). All patients were on multidrug therapy for 9 to 13 years prior to presentation with poor seizure control **(Table 1)**. The mean age was 21 years and all of the patients were below the age of 30. They had their first seizure during childhood or early puberty. Their lives were considerably affected by the seizures and consequently unproductive. There were 3 males and 1 female, all of whom were right handed and all had demonstrable MTS on the right side. None of the cases in this series had any vascular or neoplastic lesion in the temporal lobe. Although associations of TLE and febrile convulsion have been shown, there was no history of febrile convulsion in the present series.

There was no immediate or delayed postoperative morbidity or mortality in this series. None of the patients suffered from hemiparesis, visual field defect, cranial nerve deficits or meningitis following surgery. Since none of our cases was operated on the dominant hemisphere there was no language dysfunction or verbal memory deficit noted postoperatively.

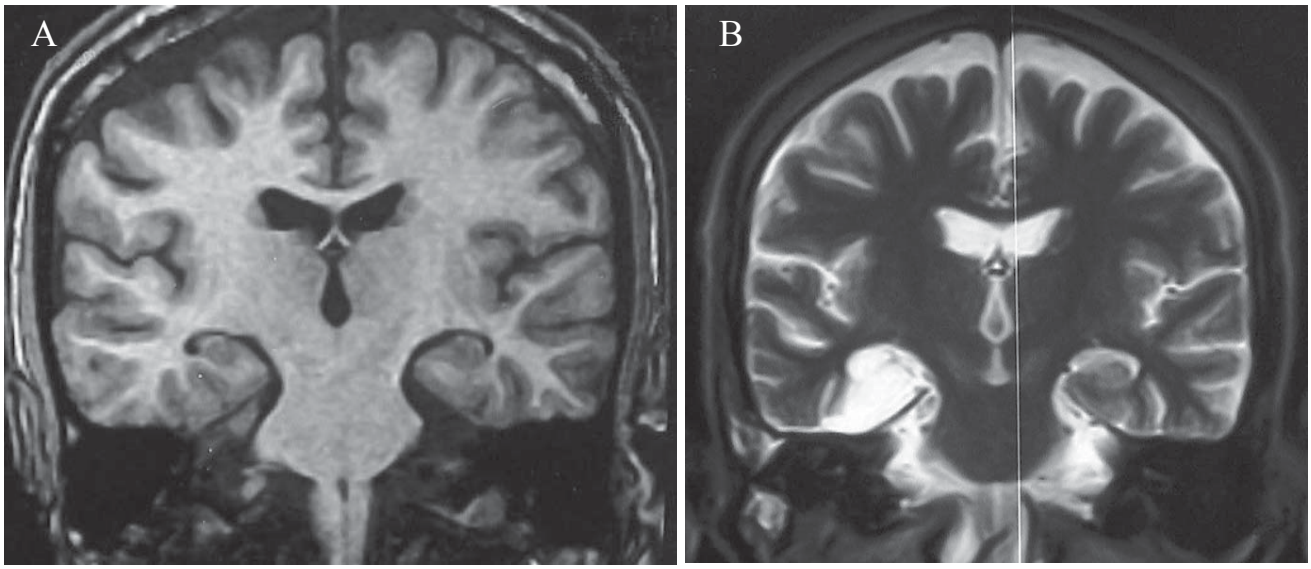

Figure 3. A: Preoperative MRI, T1WI of patient 3 showing right hippocampal sclerosis, B: postoperative MRI, T2WI showing the extent of surgical resection in SAH.

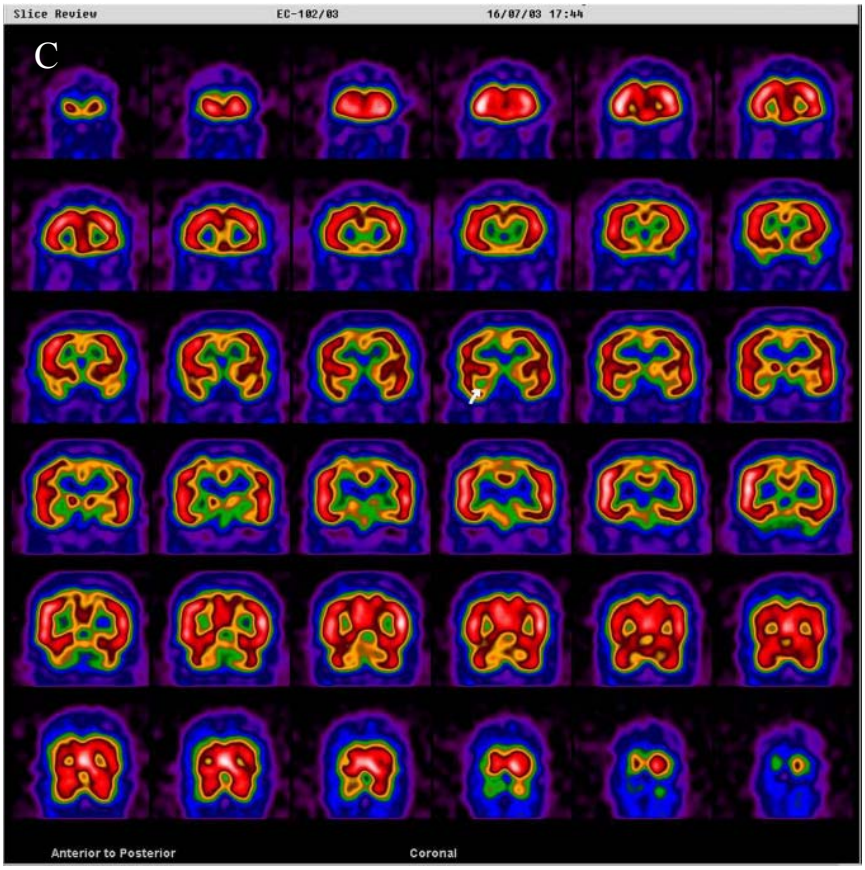

Figure 3.Continued. C: Preoperative interictal SPECT showing hypoperfusion area in the right hippocampal region (arrow).

For seizure outcome, the Engel classification system, devised in 1987 was used.[6] The follow up ranged from 2 and a half years for the initial case to 8 months for the latest case. The result was Engel class I in 3 cases (no seizure or aura) and 1 (patient 3) had single episode of seizure 3 months following surgery, but is seizure free for the last 5 months (Engel class II). All of our patients are leading active professional lives and patient 1, who is seizure free for more than 2 years, is driving a private vehicle. Although there is a report stating the possibility of early reduction of AED following successful surgery, we plan to continue AED for 2 years.[7]

Discussion

Although we do not have national data on the prevalence of seizure, a study conducted by our institute showed 73% incidence of focal seizure caused by neurocysticercosis (NCC).[14] Though there is a report of NCC in the mesial temporal structure,[20] such occurrence was not seen in this series. Because of the inadequate antenatal, perinatal and overall medical care, we believe that the prevalence of TLE in this country should be equal to if not more than in the Western population.

Out of different modalities of epilepsy surgery the greatest emphasis is on ATL because this is the most commonly performed surgery.[15] It also has the clearest indications and best results. Before undergoing surgical intervention the following criteria were met by each case: All had seizure not satisfactorily controlled with adequate dose of multidrug therapy; all had demonstrable MTS and interictal EEG confirmed that seizure was beginning on the side of the lesion. Since ATL is a functional surgery we wanted to minimize failure; thus help from senior authors *(KA, TH)* for lesion localization and surgical technique was obtained. Although advisable we could not do video telemetry or intraoperative EEG in all patients due to the unavailability of the resources. Wada test or other language, verbal memory localization tests were also not done. There was no language dysfunction postoperatively in any of the cases. Limiting temporal lobectomy to 6 cm from the tip avoided damage to the visual pathway and the pia of the frontal lobe was not disturbed to prevent damage to the Broca's area. Some have recommended leaving the superior temporal gyrus; others find no benefit from this technique.[13]

Due to unavailability we could not obtain SPECT in every case. To determine the eloquent area, centers dedicated for epilepsy care are doing magnetic encephalography,[1] electrical stimulation mapping for cortical language localization,[11,12] and functional MRI, none of which were possible here. Our series included two ATL and two SAH of which one had post operative seizure on one occasion. This could be attributed to the limited intraoperative investigation to see the extent of the epileptogenic area which might have been in the lateral temporal structure. Although this series is small, the results have been excellent.

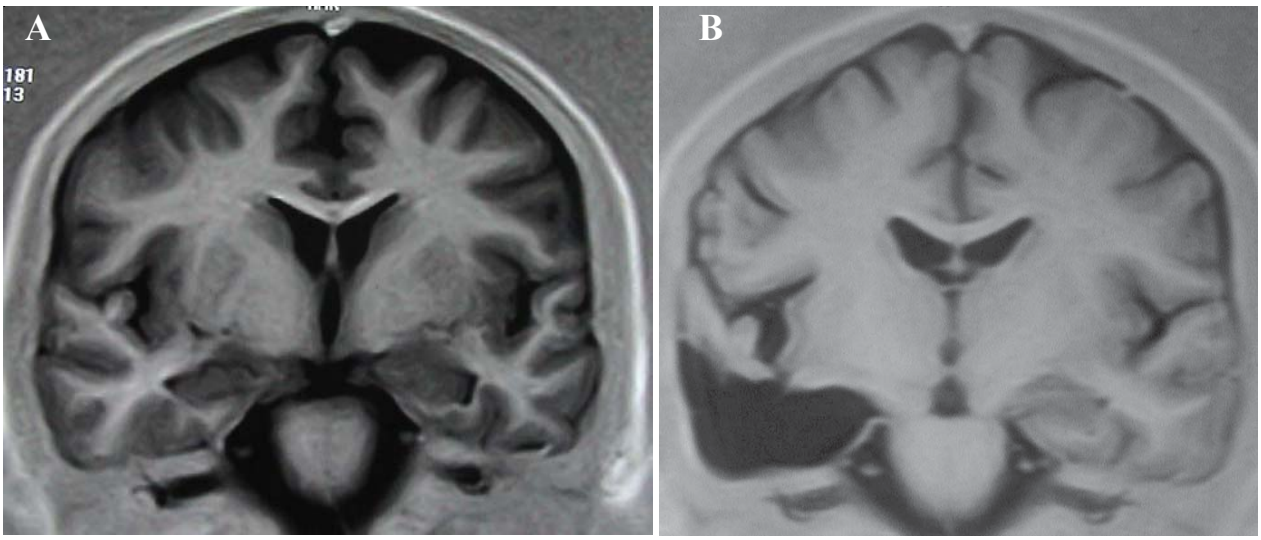

Figure 4. A: Preoperative MRI, T1WI of patient 4 showing right hippocampal sclerosis, B: postoperative image showing extent of surgical resection in tailored ATL which includes removal of hippocampus and amygdala.

Clusmann, et al, in a report, found different surgical approaches in TLE resulting in equally good outcomes.[2, 9] Seizure outcome is mainly dependent on the diagnosis and extent of resection whereas the neuropsychological results are better after resecting epileptogenic zone only. Another report by the same author on 89 children operated found a 94% success rate with ATL and only 74% with SAH.[3] The results after SAHs were disappointing; probably because of difficulties in precise localization of the epileptogenic focus. The result of ATL on long-term seizure control is worst with cases where there is a lack of obvious abnormality or the presence of diffuse pathology. In addition, preoperative secondarily generalized seizures are risk factors for recurrence after surgery.[10] There is a new interest on the treatment of TLE with stereotactic radiosurgery but the majority of the authors have observed the need of a high dose for any beneficial result.[4, 5, 19] There are reports of cases who required surgery following radiosurgery.[8, 16] Thus to date resection surgery for TLE is a preferred technique and the technique could be easily adapted in the majority of neurosurgical facilities. Since we lack preoperative localization of language, memory and other functions, operating on the dominant side could be done under awake anesthesia in the future.

Conclusions

To the best of our knowledge, these are the first reported cases of ATL and SAH in MTS from Nepal. The results have demonstrated that this surgery can give excellent outcomes in our setting also. Due to the limited availability of investigation techniques, a precise localization of the epileptic zone may not always be possible. Thus in the majority of cases we recommend classical anterior temporal lobectomy until a well established electrophysiological monitoring set-up is established.

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