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Psychiatric morbidity in refractory mesial temporal lobe epilepsy before and after epilepsy surgery

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Abstract

Background & Objective: Psychiatric disorders constitute a large part of illness burden in patients with refractory epilepsy. A careful presurgical psychiatric assessment is now an integral part of evaluation in most centers performing surgeries for refractory epilepsy. This study was undertaken to determine the prevalence of psychiatric disorders and outcome of the psychopathology in patients of refractory mesial temporal lobe epilepsy (mTLE) before and after epilepsy surgery. *Method:* Forty eight patients diagnosed as having refractory mTLE by the Neurologists were included in the study. The patients were assessed using the Brief Psychiatric Rating Scale (BPRS), Beck's Depression Inventory (BDI), Hamilton Depression Rating Scale (HDRS) and Hamilton Anxiety Rating Scale (HARS) before surgery as well as in the second and sixth month of postoperative period. *Results:* More than half of the patients (54%) had psychopathology. Depressive disorders were more common. Lateralisation of focus in MTS and psychopathology in the patient revealed equal right and left preponderance. No significant difference was found on BPRS, BDI and HDRS scales at 2 and 6 months follow up post epilepsy surgery in patients having psychopathology.
Conclusions: Patients had a favourable outcome after surgery as regards to their psychopathology as well as the seizures.

INTRODUCTION

Temporal lobe epilepsy (TLE) is the most frequent type of focal refractory epilepsy, accounting for two thirds of localisation-related epilepsy.[1,2] Surgical treatment of medically refractory epilepsy aims at reducing the number and intensity of seizures, minimising neurological morbidity and antiepileptic drug (AED) toxicity and improving the patient's quality of life.[3]A significant proportion of patients with mesial temporal lobe epilepsy (mTLE) is resistant to medications, surgical therapy is the best option for some of these individuals.[4]

Psychiatric disorders have been recognized in patients with both generalized and partial epilepsies. Interictal psychiatric symptoms are those that occur when patients are not experiencing any seizures and present as depressive, anxiety, psychotic or behavioural disorders.[5-7]There has been increased focus on psychiatric morbidity in patients with TLE and seizure control alone does not determine the success of the treatment.

The last two decades has seen research on en-bloc anterior temporal lobectomyresection[4] with the development of de novo postoperative psychiatric conditions like psychosis, anxiety, depression and obsessive-compulsive disorders or the role of temporal resective surgery in the exacerbation of preoperative psychiatric conditions.[8-15]This study was purposed to study the prevalence and type of psychiatric morbidity in patients of refractory mTLE before and after epilepsy surgery and relation between symptoms of psychopathology with localisation and lateralisation of epileptogenic focus with effectiveness of treatment with psychopharmacology and the outcome on 6 months follow up.

METHODS

This clinical survey was conducted in the Psychiatry Out Patient Department of a tertiary care hospital in patients diagnosed as having refractory mTLE, by the Neurologist as per the clinical seizure semiology and mesial temporal sclerosis (MTS) on the brain MRI after obtaining the permission of the Institutional Ethics Committee for the study, and consent from the patients or his/her relative.

Patients attending the Comprehensive Epilepsy Care Unit were enrolled in the study by the universal sampling method for a period of one

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year. The Comprehensive Epilepsy Care Unit evaluates about 8-10 patients every month, of which 4-6 patients are eligible for epilepsy surgery. Amongst these, patients fulfilling inclusion and exclusion criteria were enrolled in the study. Sixty one patients were screened and 48 patients who satisfied the criteria were enrolled in the study.

The inclusion criteria were: (1) Patients of either sex and irrespective of age suffering from MTS; (2) Patients having only refractory TLE diagnosed by the Neurologists after being treated with 2 or more AEDs for at least 2 years; (3) Patients having temporal lobe focus on video EEG with MRI showing MTS; (4) No prior history of administration of neuroleptics. The exclusion criteria were: (1) Patients with any other seizure semiology, e.g. frontal lobe seizures; (2) Patients previously diagnosed with any psychiatric illness; (3) History of administration of any psychotropic/ neuroleptics drugs in the past.

The Comprehensive Epilepsy Care Unit consisted of Neurologists, Neurosurgeons, Psychiatrist, Neuropsychologists and Radiologist. The neurodiagonostic evaluation included non-invasive EEG, MRI, neuropsychological testing with detailed psychiatric evaluation. The patients were diagnosed having refractory mTLE by the neurologist on the basis of seizure semiology and having been on 2 or more AEDs for at least 2 years.

All the patients who were enrolled for the epilepsy surgery program underwent a 3 day video EEG recording with reduction of the AEDs. An ictal EEG was mandatory for all patients. All patients also did an epilepsy protocol 1.5Tesla or 3 Tesla MRI as advised by the neurologist. Depending on both the video EEG and MRI findings along with the seizure semiology the side of resection was finalised.

A proforma was prepared to study the various demographic variables and the psychiatric morbidities with the help of a clinical interview and diagnoses based on ICD 10 Diagnostic guidelines. Patient's clinical symptoms were assessed using the BPRS (Brief Psychiatric Rating Scale)and BDI (Beck's Depression Inventory)and the severity of depression and anxiety was rated on the HDRS (Hamilton Depression Rating Scale) and HARS (Hamilton Anxiety Rating Scale) respectively. All patients were examined before surgery as well as in the second and sixth months of postoperative period. Patients diagnosed as having psychiatric morbidity in the preoperative period were put on appropriate psychiatric medications(antidepressants, Selective serotonin reuptake inhibitor (SSRIs),benzodiazepines(BZD) or antipsychotics) depending on the diagnosis by the Psychiatrists. Prescribed medicines included escitalopram, clonazepam, lorazepam and risperidone. Epilepsy surgery was performed only after clinical improvement in patient's psychiatric symptoms seen in about 4-8 weeks after being on medications and regular follow up with the Psychiatrists.

All patients who underwent surgery had an anterior temporal lobectomy. All the patients who underwent epilepsy surgery were assessed in the postoperative period on the above mentioned scales at 2 and 6 months respectively.

Statistical analysis

Data was analysed using frequency distribution. Effectiveness of the treatment was analysed using paired t test. Chi square test was used to find the association between psychiatric morbidity and lateralisation.

Scales used in the study

Brief Psychiatric Rating Scale (BPRS)[16]: The BPRS assesses thought disturbance, emotional withdrawal, retardation, anxiety, depression, hostility and suspiciousness. It has 18 items which are rated on a seven-point, Likert scale from 0 to 6, with the total score ranging from 0 to 108.

Beck's Depression Inventory (BDI)[17]: The BDI includes 21 self-report items, each of which has four statements describing increasing levels of severity and the total score ranges from 0 to 84. Scores of 0 to 9 are considered minimal; 10 to 16, mild; 17 to 29, moderate; and 30 to 63, severe.

Hamilton Anxiety Rating Scale (HARS or HAM-A)[18]: The HARS has 14 items each of which is rated from 0 to 4 on an unanchored severity scale, with the total score ranging from 0 to 56. A score of 14 has been suggested as the threshold for clinically significant anxiety.

Hamilton Depression Rating Scale (HDRS or HAM-D)[19]: Items on the HDRS are scored from 0 to 2 or from 0 to 4, with total score ranging from 0 to 50. Scores of 7 or less may be considered normal; 8 to 13, mild; 14 to 18, moderate; 19 to 22, severe; and 23 and above, very severe.

RESULTS

Demographic variables

The demographic variable of the 48 study patients is listed in Table 1. As shown, the mean age of the patients was 27.7 ± 7.7 years (range 18 to 52 years). The age of the onset of epilepsy was in the range of 3-34 years. The mean duration of epilepsy was 11.1 years. The male to female ratio was 3:2.Close to two fifths (39.6%) was married. Majority of our patients were Hindus. Only one patient was illiterate, a third had completed secondary education, and close to a quarter (22.9%)were graduates. On employment, more than half (54.2%) were unemployed. Majority of the patients (81.3%) belonged to the lower middle class.

On the family history of psychiatric disorders, 89.3 % (40) gave history of nicotine dependence, 39 % (19) of alcohol dependence and 1 patient each gave history of accidental deaths by drowning and burns in first degree relatives.

Prevalence and type of psychiatric disorders

Psychiatric disorders were present in 54.2% (26) of the patients whereas 45% (22) had no psychopathology presurgically. Table 2a lists the psychopathology according to the ICD 10 diagnostic guidelines. As shown, 58% had depressive disorders, 15.4% had mixed obsessional thoughts and acts, 11.5% had mixed anxiety and depressive syndrome as well as personality and behavioural changes. On the other hand, there was no patient with psychosis nor substance use disorders.

Table 2b lists the severity of depression according to the BDI.As shown, borderline clinical depression and moderate depression were seen in

Table1: Demographic variables of the study patients

Variable	No. of patients (n=48)
Age	Mean: 27.8 years SD: 7.7 years
Duration of epilepsy	Mean: 11.1 years SD:6.8 years
Sex	
Males	29 (60.4%)
Females	19 (39.6%)
Marital status	
Married	19 (39.6%)
Unmarried	28 (58.3%)
Separated	1 (2.1%)
Religion	
Hindu	41 (85.4%)
Muslim	6 (12.5%)
Christian	1 (2.1%)
Education	
Primary	20 (41.7)
Secondary	16 (33.3%)
Graduate	11 (22.9%)
Illiterate	1 (2.1%)
Employment status	
Working	22(45.8%)
Not working	26(54.2%)
Socio-economic status	
Upper Middle class	3 (6.3%)
Lower Middle class	39 (81.3%)
Lower class	6 (12.5%)

Table 2a: Type of psychiatric disorder as per ICD 10 Diagnostic Guidelines

ICD 10 Disorder	Total no. of patients (n=26)
Mild depressive episode with/without somatic syndrome	5 (19.2%)
Moderate depressive episode with /without somatic syndrome	10 (38.5%)
Mixed obsessional thoughts and acts	4 (15.4%)
Mixed anxiety and depressive syndrome	3 (11.5%)
Personality and behavioural changes due to brain disease, damage and dysfunction	3 (11.5%)
Emotionally unstable personality disorder impulsive type	1 (3.8%)

15 of 48 (31.2%) patients. No de novo onset of psychopathology was seen post surgically in the patients who did not have any psychopathology whereas those with psychopathology were maintained.

Lateralisation of focus

Table 3a lists the lateralization of epileptic focus according to the ictal video EEG and MRI. As shown, there was discrepancy on the lateralization of focus according to MRI or video EEG. Based on MRI, 50% of our patients showed left sided MTS. On the other hand ictal Video EEG showed bilateral discharges in nearly 60% of the patients

Relationship between psychopathology and laterality of MTS

Table 3b shows the relationship between psychopathology and laterality of MTS according to MRI. Out of the total 26 patients who were diagnosed as having psychiatric morbidity, 11 (42%) patients each were found to have a left sided or a right sided MTS and 4 (15%) patients had a bilateral MTS.

As shown, there was no clear lateralization in the patients with mixed obsessional thoughts and acts disorder, mixed anxiety depressive disorders, mild/moderate depressive disorders, and personality change disorder.

Outcome of psychopathology on follow up

All our patients were followed up for a period of 6 months after anterior temporal lobectomy surgery and were assessed clinically and with the help of the scales at 2 and 6 months respectively on follow up. Of the 26 patients with psychopathology, none had any worsening of symptoms or de novo symptoms in the post operative follow up period but they reported an improvement in their existing mood symptoms, sleep, appetite and behavioural symptoms. Table 4 lists the outcome of the 26 patients with psychopathology according to the scales. Table 4a compares the scores from baseline to 2 months of follow up, and Table 4b from 2 months to 6 months of follow up. No significant

Table 2b: Severity of depression as per Beck's Depression Inventory (BDI)

Severity as per BDI	Score at baseline	Total no. of patients (n=48)
Normal	1-10	20 (41.7%)
Mild Mood Disturbance	11-16	13 (27.1%)
Borderline Clinical Depression	17-20	11 (22.9%)
Moderate Depression	21-30	4 (8.3%)
Severe Depression	31-40	0

Table 3a: Lateralisation of focus as per ictal video EEG and epilepsy protocol MRI

Study	Right	Left	Bilateral	Total no. of patients (n=48)
MRI	18(37.5%)	24(50%)	6(12.5%)	48
Ictal EEG	8(16.7%)	11(22.9%)	29(60.4%)	48

difference was found on BPRS, BDI, HARS and HDRS scales at the end of 2 month follow up, but a highly significant difference on HARS ($p< 0.001$) and HDRS ($p<0.03$) was seen at the end of 6 months follow up.

Table 5 lists the outcome of the 22 patients with no psychopathology according to the scales. Table 5a compares the scores from baseline to 2 months of follow up, and Table 5b from 2 months to 6 months of follow up. No significant difference was found on BPRS, BDI, HARS and HDRS scales at the end of 2 month follow up but a highly significant difference on HARS ($p< 0.009$) was seen at the end of 6 months follow up.

Outcome of seizures on follow up

All the patients had seizure freedom till the 6 months of follow up.

DISCUSSION

Demographic variables

Most of our patients had onset of seizures in their adolescence, which is keeping in with the general epidemiological findings of seizure disorders.[20] Longerduration of active epilepsy leads to a higher number of seizures before seizure control and increases the risk of recurrence.[21] Most of our patients were young adult males. In

Table3b: Relationship between psychopathology and laterality of mesial temporal sclerosis (MTS)

ICD 10 disorder	Lesion on MRI			Total no. of patients (n=26)
	Right	Left	Bilateral	
Mixed obsessional thoughts and acts	0	2 (7.7%)	2 (7.7%)	4 (15.4%)
Moderate depressive disorder with /without somatic syndrome	2 (7.7%)	7 (26.9%)	1 (3.8%)	10 (38.5%)
Mild depressive disorder with/without somatic syndrome	3 (11.5%)	1 (3.8%)	1 (3.8%)	5 (19.2%)
Mixed anxiety and depressive syndrome	3 (11.5%)			3 (11.5%)
Personality and behavioural changes due to brain disease, damage and dysfunction	2 (7.7%)	1(3.8%)		3 (11.5%)
Emotionally unstable personality disorder impulsive type	1 (3.8%)			1 (3.8%)
Total	**11 (42.3%)**	**11 (42.3%)**	**4 (15.4%)**	**26**

Table 4: Improvement or worsening of symptoms of psychopathology on follow up after epilepsy surgery in patients with psychopathology (n=26)

(a) Follow up from baseline to 2 months

Scales	Mean ±SD Baseline	Mean ± SD 2 months	t	p value	95% CI
BPRS	48.077±8.173	46.346± 6.456	1.072	0.2938	-1.593 to 5.055
BDI	17.308±4.946	16.577±5.383	0.988	0.332	-0.7915 to 2.253
HARS	15.577±4.168	14.731±3.874	0.8613	0.3973	-1.177 to 2.869
HDRS	16.577±6.670	15.654±4.019	0.648	0.5227	-2.009 to 3.855

(b) Follow up from 2 months to 6 months

Scales	Mean ±SD 2 months	Mean ± SD 6 months	t	p	95% CI
BPRS	46.346±6.456	34.23±9.597	1.819	0.089	-0.4529 to 7.299
BDI	16.577±5.383	14.269±6.576	1.930	0.0651	-0.1551 to 4.770
HARS	14.731±3.874	11.192±5.123	3.521	0.0017**	1.469 to 5.608
HDRS	15.654±4.019	13.231±5.799	2.243	0.0340*	0.1986 to 4.648

BPRS, Brief Psychiatric Rating Scale; BDI, Beck's Depression Inventory; HDRS, Hamilton Depression Rating Scale; HARS, Hamilton Anxiety Rating Scale

India female health is given less importance as compared to the males and so medical treatment is not sought immediately which could result in the gender difference. Close to half of our patients had primary or no education, not working, and nearly 60% was not married or separated. Negative attitudes towards epilepsy affect schooling, employment, marriage and other social activities.[22-26] More than 90% of our patients belonged to the lower middle and lower classes, not employed or doing unskilled or semi skilled work and sought treatment in a general hospital where medication and consultation is free.

Most of our patients denied depression and psychosis in their family though a high incidence of substance dependence was seen. The latter probably adds to the burden in the family.

Prevalence and type of psychiatric co-morbidities

Psychiatric co-morbidities were seen in more than half (54.2%) of our MTS epilepsy surgery patients. Psychiatric problems of various types are seen in epilepsy.[25-33]Prevalence of psychiatric co-morbidities fluctuates from 20 to 40% in patients with epilepsy. A higher prevalence of psychiatric co-morbidities is observed in epileptic patients studied at tertiary centres (40-60%)[29], while population-based studies show an intermediate prevalence of about 20%.[31]

It has been said that the prevalence of psychiatric disorders is higher in patients with generalized epilepsies, extra-temporal focal epilepsies, non-surgically treatable TLE, and patients eligible for surgery.[27] The prevalence of

Table 5: Improvement or worsening of symptoms of psychopathology on follow up after epilepsy surgery in patients without psychopathology (n=22)

(a) Follow up from baseline to 2 months

Scales	Mean ±SD Baseline	Mean ± SD 2 months	t	p value	95% CI
BPRS	34.22±5.589	32.09± 4.679	1.329	0.1982	-0.7450 to 3.381
BDI	9.591±2.443	8.591±1.894	2.013	0.057	-0.03300 to 2.033
HARS	8.00±3.132	7.09±3.02	0.1756	0.8623	-0.9857 to 1.167
HDRS	8.45±2.45	8.36±2.88	0.174	0.8634	-0.9943 to 1.176

(b) Follow up from 2 months to 6 months

Scales	Mean ±SD 2 months	Mean ± SD 6 months	t	p value	95% CI
BPRS	32.09±4.67	31.36±3.36	1.305	0.2058	-0.9163 to 4.007
BDI	8.59±1.89	8.36±1.64	0.5272	0.6036	-0.6692 to 1.124
HARS	7.90±3.02	5.95±1.93	2.865	0.0093**	0.5361 to 3.373
HDRS	8.36±2.88	8.13±2.23	0.4171	0.6837	-0.9169 to 1.371

BPRS, Brief Psychiatric Rating Scale; BDI, Beck's Depression Inventory; HDRS, Hamilton Depression Rating Scale; HARS, Hamilton Anxiety Rating Scale

psychiatric disorders in TLE patients is in general, two-fold that in the general population.[28]

The prevalence of these co-morbidities also varies according to the type of patient studied, the type of psychiatric disorder studied, the duration of the study, and the type of diagnostic procedure used (structured interview or self-applicable questionnaire).The prevalence of psychoses in patients with epilepsy is about 2 to 7% in the general population but measured at approximately 20–60% of those seen in psychiatric departments.[29]

Psychiatric disorders usually have a multifactorial etiology and the patients in our study were referred to the comprehensive epilepsy care unit for assessment for epilepsy surgery. The details about previous psychiatric disorder, diagnosis or treatment were often not available. Hence in this study, we excluded patients having a prior history of psychiatric illness as we wanted to study the prevalence of psychiatric morbidity in refractory MTS before and after surgery.

Depression has been found to be the most common psychiatric co-morbidity based on ICD 10 diagnostic guidelines, seen in 58% of our 26 patients with psychopathology. This is followed by mixed obsessional thoughts and acts (15.4%), mixed anxiety and depressive syndrome (11.5%) and personality and behavioural changes (11.5%). This was also corroborated with the BDI. Our findings are in keeping with other previous studies where depression was also found to be more

prevalent as compared to other disorders. In a study by Adams *et al.*[33] the psychiatric disorder found was depression in 32.6%, psychosis in 7.2% and other psychiatric disorders in 36.1%. The other psychiatric disorders included anxiety in 6.9%, substance misuse or dependence in 3.1%, somatoform disorders in 4.7%, personality disorders in 13.8%, more than one psychiatric diagnosis in 4.7% and other disorders in 2.8%. Rates for depression, psychosis and other psychiatric diagnoses did not differ significantly between males and females.[33] Gaitatsiz *et al*. found anxiety in 11% of their sample with a higher prevalence than ours of OCD.[30]Kula *et al*. reported interictal dysphoric disorder in 54.8% of cases with a "clear-cut" relationship with epileptic seizures.[31]Gaitatsiz et al. found anxiety in 11% of their sample.[30]Some have reported a phenomenological similarity between OCD and the forced thinking that occurs in 2% of patients with TLE.[32]There is little information on the prevalence of anxiety symptoms in community-based populations of patients with epilepsy. In one large study based on diagnoses in primary care records, the rate of anxiety disorders was 11% in 5,834 people who had epilepsy, compared with 5.6% in 831,163 without epilepsy. Obsessive–compulsive disorder was rare, present in only 0.4% of cases.[32]Existing data on personality disorders in patients with epilepsy reveal prevalence between 4 and 38%.[25]

The differences in patient groups, and lack of control groups (healthy or subjects with other chronic medical conditions) can be the reason which makes it difficult to compare these different findings. Furthermore, the epilepsy group is often not representative of the total epilepsy population. For example, only in-patients or outpatients, or sometimes a very specific subgroup of epilepsy patients (e.g., surgery patients) are studied. Also important is the use of a variety of diagnostic instruments as only a few studies use standardized diagnostic instruments based on specific criteria.

Lateralisation of focus

The accurate location of epileptic foci with EEG[34] and MRI[35] in treatment-refractory epileptic patients is an important issue as it determines the site of surgery. In all patients at least 3 ictus's were recorded and the decision of the side to be resected was taken by the multidisciplinary team after a correlation of clinical semiology of the seizures, presence or absence of speech arrest, the neuropsychological findings , MRI and both ictal and interictal video EEG findings. The patients having bilateral ictal discharges on video EEG had so, either due to a rapid spread of the epileptogenic activity from the side of lesion or had an independent ictal discharge from the other side. In a few patients ictal SPECT was also done. As all our patients achieved seizure freedom in 6 months, the lateralization was likely to be appropriate in most cases. In our study we had only included those patients having MTS on MRI hence patients with dysplasia were excluded**.**

Relationship between psychopathology and laterality of MTS

In our study we did not find any association between any type of psychopathology and the side of lesion as per MRI as there was nearly an equal preponderance of psychopathology in patients having either right or left MTS. Some previous studies have found right sided lesions[36,37] to be more predisposing for the development of psychopathology while others have implicated the left sided lesion.[38-40]Some researchers also found no effect of lateralisation with psychopathology.[41-43]Both methodological and theoretical factors appear to account for these discrepant findings. For psychiatric assessment, a variety of diagnostic instruments are used, ranging from predominantly subjective self-reporting questionnaires to objective and reliable diagnostic tests. Some authors use cut off scores to classify the subjects, whereas others use mean scores. Psychiatric findings from these studies are thus difficult to compare.[44]

There was no worsening of existing psychopathology or evidence of new symptoms in our patients probably partly because there was a proper screening of the patients for psychopathology. Patients with psychopathology are operated only after improvement in patients' psychopathology which could be after 6-8 weeks on treatment with medication and assessment by the psychiatrist on a regular follow up. There are previous reports wheretemporal resections may exacerbate preexisting psychosis.[8,10,13]

Blumer *et al*.[8] found worsening of the pre-existing psychiatric conditions in 24% of their patients and 42.1% of their preoperatively intact patients developed depression after temporal lobectomy. Malmgren *et al*.[13] found that the incidence of anxiety disorders and affective disorders increased from 1.4% preoperatively to 17% postoperatively. Shaw *etal.*[14] found that

incidence of de novo psychosis to be 3.4% among patients undergoing anterior temporal lobectomy with amygdalo-hippocampectomy. They also found that psychotic symptoms developed within the first 12 postoperative months. Wrench *et al*.[15] reported 10% incidence of de novo postoperative depression.

The presence of psychopathology could worsen the postsurgical outcomes especially in psychosis where patients have no insight and may refuse to take medications and have behavioral problems. Patients with anxiety and depression would have a poor self-esteem, guilt feelings and suicidal ideations. These patients can therefore be a risk to self and others and this would impair the treatment outcomes in terms of seizure control and better quality of life post surgery.

In all our patients, the HARS scores in the 6 month follow up decreased significantly post surgery. There was also a significant reduction in the BDI scores in the patients having psychopathology indicating that there was further improvement in the existing psychopathology. Thus overall, patients had a favourable outcome after surgery as regards to their psychopathology as well as the seizures. Probably, having seizure freedom post surgery boosted the morale of the patients who were previously stigmatised and this improved their overall outlook to life. Patients however did express subjective anxiety about their future as they were now seizure free and so had to deal with their own and family expectations. This burden of normalcy could worsen the psychopathology as the patients would now be expected to take responsibility and also lose out on being cared for. Findings of worsening in anxiety were also studied by Malmgren *et al*.[13] in their group of patients.Hence a longer follow up would help in understanding these issues.

The limitations of our study were that only patients with the refractory mTLE from a tertiary centre were studied and follow up was for only 6 months after surgery. Patients with prior psychiatric illness were excluded in our study. Comparing patients with and without previous psychiatric illness will throw more light on the impact of psychopathology on the outcomes of epilepsy surgery in terms of seizure control and quality of life. Studies with longer follow up are needed to know thelong term outcomes for both seizures and psychopathology.

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DISCLOSURE

Conflict of interest: None

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