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ORIGINAL RESEARCH

Psychiatric and psychosocial morbidity 1 year after epilepsy surgery

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Objectives: There is a high rate of psychiatric comorbidity in patients with epilepsy. However, the impact of surgical treatment of refractory epilepsy on psychopathology remains under investigation. We aimed to examine the impact of epilepsy surgery on psychopathology and quality of life at 1-year post-surgery in a population of patients with epilepsy refractory to medication.

Methods: This study initially assessed 48 patients with refractory epilepsy using the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), the Hospital Anxiety and Depression Scale (HADS) and the Quality of Life in Epilepsy Inventory 89 (QOLIE-89) on admission to an Epilepsy Monitoring Unit (EMU) as part of their pre-surgical assessment. These patients were again assessed using the SCID-I, QOLIE-89 and HADS at 1-year follow-up post-surgery.

Results: There was a significant reduction in psychopathology, particularly psychosis, following surgery at 1-year follow-up ($p < 0.021$). There were no new cases of *de novo* psychosis and surgery was also associated with a significant improvement in the quality of life scores ($p < 0.001$).

Conclusions: This study demonstrates the impact of epilepsy surgery on psychopathology and quality of life in a patient population with refractory surgery. The presence of a psychiatric illness should not be a barrier to access surgical treatment.

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Key words: Epilepsy surgery, outcome, psychiatric, psychopathology, quality of life, refractory epilepsy.

Introduction

Epilepsy is a common neurological disorder with a lifetime prevalence of 0.5–1% (MacDonald *et al.* 2000). There is a higher rate of comorbid psychiatric disorders in patients with epilepsy, with mood disorders (particularly depression and anxiety) being the most common, followed by psychosis (Victoroff, 1994). The reported prevalence rates of comorbid psychiatric disorders vary widely with the highest reported rates in those with epilepsy refractory to medication with a prevalence of up to 70% (Devinsky, 2003; Engel *et al.* 2003; Gaitatzis *et al.* 2004). Resective surgery is the treatment of choice in those with refractory epilepsy resulting in seizure freedom in 50–80% of cases (Engel *et al.* 2003). Seizure freedom, and even partial seizure control, can improve quality of life, although the presence of a psychiatric comorbidity can have a negative impact on quality of life (Boylan *et al.* 2004; Ives-Deliperi & Butler, 2017).

The impact of epilepsy surgery on psychopathology is relevant considering the association between epilepsy and psychiatric comorbidities. However, the reports in literature are conflicting. Post-operative complications such as exacerbations of previously existing conditions and *de novo* psychopathology such as depression or psychosis have been reported, although others have reported an improvement or no change in psychiatric comorbidities after surgery (Taylor, 1972; Macrodimitris *et al.* 2011; Cleary *et al.* 2013; Ramos-Perdigués *et al.* 2018). In addition, although patients may not meet the full criteria for a psychiatric disorder post-operatively, they may still struggle with symptoms. Psychiatric complications presenting as exacerbation or recurrence of pre-surgical psychiatric comorbidities are most frequent in the first post-surgical year, as are psychosocial adjustment difficulties (Kerr *et al.* 2011). Psychiatric comorbidity may also have an impact on surgical success and post-surgical seizure control, although there are conflicting reports in literature. Psychiatric comorbidity has been

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associated with a worse surgical outcome after temporal lobectomy (Kanner *et al.* 2009; Koch-Stoecker *et al.* 2017). Others have found no significant associations between post-surgery seizure outcome and a current or lifetime history of any psychiatric disorder (Adams *et al.* 2012).

There are methodological limitations in the literature, which contribute to the variability of findings as most older reports have been cross-sectional studies in small samples or heterogenous groups of patients with limited follow-up. It is difficult to compare the studies due to the different methods used in identifying or measuring psychopathology. In addition, the standard psychiatric measures have not been validated in patients with epilepsy. Few prospective studies involve large samples or long-term follow-up which are essential in providing further insights into the psychiatric sequelae following epilepsy surgery.

Considering the limitations in literature, we aimed to conduct a study with a prospective design using gold-standard tools with an adequate follow-up period to assess the impact of epilepsy surgery on psychiatric diagnosis, severity of psychiatric illness and quality of life at 1 year following surgery in a national referral centre for neurology, neurosurgery and neuropsychiatry.

Materials and methods

Patient selection

This study was conducted in the Beaumont Hospital, Dublin, Ireland which is an 820-bed academic teaching hospital and the Irish national referral centre for neurology, neurosurgery and neuropsychiatry. It has a dedicated neurology ward with an Epilepsy Monitoring Unit (EMU) with 24-hour video EEG monitoring for assessment of patients with complex and severe epilepsy. The monitoring occurs as part of pre-surgical workup which also includes brain imaging, neuropsychological evaluation, psychiatric evaluation if needed, intracranial video EEG monitoring if needed and a discussion at the Epilepsy Surgery Review Conference in the Beaumont Hospital. Patients who have debilitating seizures which impact significantly on the quality of life, which do not respond to antiepileptic medications and may have a clearly identified surgical focus are considered for surgery.

All inpatients aged 16 or over admitted to the EMU between July 2008 and July 2012 who had a diagnosis of medically refractory epilepsy were considered for inclusion in this study. All patients included in the study had an International League Against Epilepsy (ILAE) diagnosis of localisation-related epilepsy, which had proven resistant to treatment. Of the 152 patients admitted, 138 patients were initially deemed eligible to participate in this study. Patients were excluded if they had a diagnosis of psychogenic non-epileptic seizures (PNES) or if they had a moderate or severe intellectual disability, which prevented them from providing consent. Forty-eight patients proceeded to surgery during the time frame of this study. These patients were assessed pre-operatively and at 1 year post-operatively. Informed consent was obtained from all participants during this study and ethical approval was obtained from the Beaumont Hospital Research and Education Committee.

Assessments

A pro forma document was used to collect demographic and clinical data comprising age, gender, marital status, education, employment status, living circumstances, age of seizure onset, hand dominance, family history of epilepsy, family history of psychiatric illness, any self-reported past psychiatric history, a history of febrile convulsions, any history of birth injuries or developmental delay and anticonvulsant medication. The data were obtained both from patient self-report and a review of medical charts.

The Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) is a semi-structured interview for assessing for the presence of major DSM-IV psychiatric diagnoses (First, 1996). Patients were assessed for the presence of a current or past psychiatric disorder using the computerised SCID-I clinician-administered version.

The Hospital Anxiety and Depression Scale (HADS) was used to assess for the presence of anxiety and depressive disorders (Zigmond & Snaith, 1983). To prevent 'noise' from somatic disorders on all scores, all symptoms of anxiety and depression relating also to physical disorders such as dizziness, headaches, insomnia and fatigue were excluded. For both subscales, a score of 0–7 is normal, a score of 8–10 is suggestive of a disorder and a score of greater than 11 indicates the probable presence of a disorder.

Quality of life was assessed using the Quality of Life in Epilepsy 89 item (QOLIE-89) which is a health-related quality of life self-report instrument that is specific for adults 17 years and older with epilepsy (Devinsky *et al.* 1995). The QOLIE-89 is scored from 0 to 100 points with lower scores reflecting a worse quality of life and higher scores reflecting a better quality of life.

The pro forma, SCID-I, HADS and QOLIE-89 were conducted on all patients at baseline and repeated at the 1-year post-operative follow-up assessment.

Pre- and post-operative (at 1 year) seizure frequencies were recorded and seizure outcomes were assessed using the Engel Classification system, which is used to assess outcomes of surgery for refractory epilepsy and

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ranges from class I (free of disabling seizures) to class IV (no worthwhile improvement) (Engel *et al*. 1992).

Statistical analysis

Data were analysed using SPSS v.18 for Windows (SPSS Inc., USA). Data are presented as means (standard deviation) and tests were two-sided with *p*-values of less than 0.05 judged as significant. The McNemar's test was used to compare the pre-operative and post-operative SCID-I diagnoses and paired *t*-tests were used to analyse the HADs and QOLIE scores. Two-sample *t*-tests, Pearson's correlation test and analysis of variance (ANOVA) were used to examine the relationships between the SCID-I diagnosis, HADs scores, QOLIE scores and surgical outcome at 1 year.

Results

Sociodemographic and clinical data

The sociodemographic data are outlined in Table 1. The age range was 17–65 years with the mean age of 35 years. The clinical characteristics of the patients are outlined in Table 2. The mean age of onset of seizures was 14 years and the most common localisation of seizures was temporal lobe.

Table 1. *Sociodemographic data*

Total	*n*	48
Age (years)	Mean	35
	Median	33
	Range	17–65
Sex	Male	20 (41.7%)
	Female	28 (58.3%)
Education	Primary	4 (8.4%)
	Secondary	21 (43.8%)
	Tertiary	23 (47.9%)
Employment	Full-time	17 (35.4%)
	Part-time	11 (22.9%)
	Disability	8 (16.7%)
	Student	5 (12.5%)
	Other	6 (12.5%)
Residence	Family	40 (83.3%)
	Alone	6 (12.5%)
	Supported	0
	Other	2 (4.2%)
Relationship	Married	13 (27%)
	Single	33 (68.8%)
	Widowed	1 (2.1%)
	Separated	1 (2.1%)

Table shows the sociodemographic data for our patient population.

Results of SCID-I assessments

Twenty-four of the 48 patients (50%) received a psychiatric diagnosis pre-operatively based on the SCID-I assessment. In contrast, at 1-year follow-up post-surgery, 14 patients (29.2%) were diagnosed with a psychiatric disorder on SCID-I assessment ($p < 0.021$) (Table 3, Supplementary Table S1).

Of the 24 patients who met the criteria for a SCID-I diagnosis pre-operatively, 8 continued to meet the criteria for the same SCID-I diagnosis and 12 patients (25%) no longer met the criteria for SCID-I diagnosis at 1-year post-surgery. Post-operatively, five of the patients with a mood disorder had a remission of their illness and three had ongoing depression. Eight patients with psychosis due to a general medical condition (GMC) and one patient with the brief psychotic disorder had their symptoms remit post-operatively. Two patients with an anxiety disorder had their symptoms remit post-operatively.

De novo *psychiatric illness*

Four patients (8.3%) developed a *de novo* psychiatric illness at 1-year post-surgery. There were no cases of *de novo* psychosis. One patient developed a new-onset major depressive disorder post-operatively. Two patients developed *de novo* anxiety disorders and both were diagnosed with generalised anxiety disorder at 1-year follow-up. Two patients with post-operative SCIDs had changes in their SCID-I diagnosis post-operatively. One patient had a pre-operative diagnosis of psychosis NOS which resolved, but they obtained a diagnosis of adjustment disorder at 1-year follow-up. One patient with a pre-operative diagnosis of a major depressive episode with agoraphobia continued to have this diagnosis at 1-year follow-up and they also developed panic attacks.

Results of HADS and QOLIE-89 assessments (Table 4)

HADS

Thirty-four patients (71%) completed a HADS questionnaire pre-operatively and at 1-year follow-up post-surgery. There were no statistically significant changes between the pre-operative and 1-year post-operative scores using the paired *t*-test ($p > 0.05$).

QOLIE-89

Thirty patients (62.5%) completed a pre-operative QOLIE-89 and 33 patients (68.8%) completed a QOLIE-89 at 1 year following surgery. In the surgical cohort, the pre-operative overall mean QOLIE-89 score was 69.9 (standard deviation 12.2). At 1-year follow-up, the overall mean QOLIE-89 score was 74.8 (standard deviation 14.1). This result was statistically significant ($p < 0.002$) using the paired *t*-test.

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Table 2. *Clinical characteristics*

Total	*n*	48
Age of onset		Mean 14.45 (S.D.11.4)
Seizure localisation	Temporal lobe	42 (87.5%)
	Frontal lobe	5 (10.4%)
	Other	1 (2.1%)
History of mental illness (self-reported)	None	36 (75%)
	Psychotic disorder	4 (8.3%)
	Depressive disorder	4 (8.3%)
	Anxiety disorder	1 (2.1%)
	Other	3 (6.3%)
Hemisphere	Right	26 (54.2%)
	Left	19 (39.6%)
	Bilateral	3 (6.24%)
	Unknown	0
Seizure classification	CP	2 (4.2%)
	CP and SG	13 (27.1%)
	SP	1 (2%)
	SP and SG	2 (4.2%)
	SP and CO	8 (16.7%)
	SP and CP and SG	5 (10.4%)
	CP and GTC	17 (35.4%)
Family history of mental illness	None	31 (64.6%)
	Mood disorder	9 (18.8%)
	Psychotic disorder	1 (2.1%)
	Substance abuse	4 (8.3%)
	Suicide	1 (2.1%)
	Unknown	2 (4.1%)
Childhood complications	No complications	39 (81.25%)
	Birth complications	2 (4.2%)
	Developmental delay	3 (6.25%)
	Illness/trauma	4 (8.3%)
Febrile convulsions	Yes	10 (20.8%)
	No	36 (75%)
	Unknown	2 (4.2%)
Handedness	Right	41 (85.4%)
	Left	7 (14.6%)

CP, Complex partial; SG, secondary generalisation; SP, simple partial; GTC, Generalised tonic-clonic.
Table outlines the clinical data for the patient population.

Table 3. *Results of SCID-I DSM IV assessments*

	Pre-surgery	1-year post-surgery	*p*-value
Total	48	48	
No diagnosis	24 (50%)	34 (70.1%)	<0.021
Psychotic disorder	18 (37.5%)	9 (18.8%)	0.004
Mood disorder	8(16.7%)	5 (10.4%)	0.5
Anxiety disorder	4 (8.3%)	4 (8.3%)	<0.625
Other	1 (2.1%)	0	

Table compares the results of the SCID-I assessments before and after surgery.
Supplementary Table S2 outlines the detailed psychiatric diagnoses based on the SCID-I assessments.

Table 4. *Results of HADS and QOLIE-89 assessments*

HADS	Pre-surgery	1-year post-surgery
n	34	34
Overall mean	8.1 (S.D. 6.7, 95% CI 5.76–10.41)	8.7 (S.D. 7.3, 95% CI 6.18–11.28)
Anxiety mean	5.3 (S.D. 4.1, 95% CI 3.79–6.78)	5.6 (S.D. 4.5, 95% CI 4.07– 7.22)
Depression mean	3.6 (S.D. 3.2, 95% CI 2.40–4.76)	3.1(S.D. 3.4, 95% CI 1.86–4.25)
QOLIE-89		
n	30	33
Overall mean	69.88 (S.D. 2.23)	74.38 (S.D. 21.62)

Table compares the results of the HADS and QOLIE-89 assessments before and after surgery.

Seizure outcomes

One year following surgery, 10 patients had no change in the frequency of seizures (majority in the lowest frequency group), 35 patients had a lower number of seizures and 3 patients had an increase in seizure activity (Table 5). In relation to Engel surgery criteria outcome at 1-year follow-up, 23 patients (41.7%) had a class I outcome (the best possible), 11 patients (22.9%) had a class II outcome, 8 patients (16.7%) had a class III and 6 patients (12.5%) had a class IV outcome. Of the six patients who had a class IV outcome, three had no post-operative SCID-I diagnosis, and one each had generalised anxiety disorder, psychosis due to a GMC and a major depressive disorder.

Relationship between assessments and surgical outcome

Although there was no confirmed association between the HADS and SCID-I diagnosis using a two-sample *t*-test, it approached significance with a *p*-value of 0.057. There was no association between QOLIE-89 scores and the presence of a SCID-I diagnosis ($p = 0.21$). There was a strong correlation between HADS and QOLIE-89 scores using the Pearson's correlation test and patients with higher HADS scores had lower QOLIE-89 scores (two-tailed Pearson's correlation coefficient−0.645, $p < 0.0001$).

Patients with a depressive diagnosis at 1 year following surgery ($n = 4$) were found to have a lower QOLIE-89 score than patients without depression or patients with

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Table 5. *Change in seizure frequency*

Number of seizures per month	Pre-surgery	1-year post-surgery
1 or less	10 (20.8%)	34 (70.8%)
2–4	13 (27.1%)	9 (18.8%)
5–15	12 (25%)	3 (6.3%)
16–30	7 (14.6%)	2 (4.1%)
30+	6 (12.5%)	0

Table compares the monthly seizure frequency before and after surgery.

the presence of other psychiatric diagnoses post-operatively ($p = 0.01$). ANOVA showed no significant relationship between the HADS and QOLIE-89 and the Engel outcome. The mean HADS score was higher in the group with poorer surgical outcomes than with a good surgical outcome, but this was not statistically significant ($p = 0.136$). The QOLIE-89 score was not found to be dependent on the Engel score when the SCID-I diagnosis was controlled for using the ANOVA testing although this result was not statistically significant ($p = 0.87$).

Discussion

Our study is a prospective cohort study, which examines the impact of neurosurgery for the treatment of epilepsy refractory to medication on psychopathology and quality of life. Overall, our main findings were that there was a significant improvement in quality of life and a significant reduction in the rates of psychiatric disorder, particularly psychosis, with no new cases of *de novo* psychosis at 1 year following surgery.

Rates of psychopathology

Only 25% of the patients in our study reported a history of psychiatric illness on initial assessment although 50% were diagnosed with a psychiatric disorder using the SCID-I. This is in keeping with previous findings that psychiatric illness may be underreported and undertreated in patients with epilepsy (Hermann *et al*. 2000).

Our finding of reduced rates of psychiatric disorder at 1-year post-surgery contributes to literature, which contradicts older studies linking surgery to serious psychiatric sequelae including increased rates of suicide, psychosis and depressive disorders (Taylor, 1972; Trimble, 1991). More recent studies have found conflicting results. Some have reported a worsening of psychiatric disorders, particularly depression and anxiety (Bladin, 1992; Anhoury *et al.* 2000; Cleary *et al.* 2012; Cleary *et al.* 2013; Desai *et al.* 2014), whereas other studies have found reductions in psychiatric disorders or symptoms (Devinsky *et al.* 2005; Pintor *et al.* 2007; Macrodimitris *et al.* 2011). A recent study using the SCID-I reported no significant changes in the rates of post-operative diagnoses at 12 months. However, the authors did note an improvement in symptomology in the surgical group (Ramos-Perdigués *et al.* 2018). Other studies using the SCID-I have shown more positive results. Pintor *et al.* (2007) reported a significant improvement in rates of anxiety and depressive disorders using the SCID-I. Different assessment methods, diagnostic criteria, time to follow-up and other methodological limitations including study design impact on these findings. Overall, most recent studies using structured clinical instruments and longer follow-up have generally reported a more positive outcome. See Supplementary Table S2 for a summary of these studies since June 2012 and Cleary *et al.* (2013) for studies prior to June 2012.

Some of the most commonly reported psychiatric outcomes with surgery are mood changes and depression within the first 6 months to a year following surgery (Macrodimitris *et al.* 2011). Pintor *et al.* (2007) previously reported a decrease in depression from 17.2% to 4.3% at 12-month post-operative follow-up using the SCID-I. Although the reduction of the rate of depressive disorder in our patient population did not reach statistical significance, our findings are consistent with studies which demonstrated that patients with a history of depression prior to surgery were more likely to present with depression post-surgery (Devinsky *et al.* 2005; Pintor *et al.* 2007; Macrodimitris *et al.* 2011).

Majority of the previous studies report either an improvement or no change in the rates of anxiety post-surgery in keeping with our findings (Hamid *et al.* 2014; Iranzo-Tatay *et al.* 2017; Ramos-Perdigués *et al.* 2018). However, worse rates have been reported with the indication that anxiety may be more prevalent within the first few days following surgery and resolve within the first 3 months (Desai *et al.* 2014).

There was a very statistically significant reduction in the rate of psychotic disorder post-operatively. This was due to the cessation of auras which comprise mainly hallucinatory phenomenon. The majority of our patients with the psychotic disorder had a diagnosis of psychosis due to GMC. If the patients with psychosis due to GMC were excluded, the results still showed a reduction in the rate of psychotic disorder from 2.4% pre-operatively to 1.2% post-operatively. A few recent studies have examined the impact of surgery on psychosis and reported positive outcomes in keeping with our results (D'Alessio *et al.* 2014; Iranzo-Tatay *et al.* 2017). Buranee *et al.* (2016) reported a significant reduction in epilepsy-related psychoses at 24 months post-surgery. Overall, our findings are in keeping with literature showing a reduction in the rates

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of psychotic disorders post-surgery and in marked contrast to older studies, which found a higher rate of *de novo* psychotic disorders in the post-operative population (Roberts *et al.* 1990; Trimble, 1992). Nevertheless, the mechanism whereby psychiatric illness improves post-operatively is not fully understood. Removal of dysfunctional brain tissue, reduced fear of seizures, the perception of improved locus of control and reduced anticonvulsant medication may all possibly be factors (Cleary *et al.* 2013).

De novo *psychiatric illness*

We identified four new cases of *de novo* psychiatric disorder at 1-year post-surgery and no new cases of psychosis. *De novo* psychiatric disorders have previously been reported as occurring post-operatively at rates of 1.1–18.1% with a predominance of milder psychiatric disorders (Macrodimitris *et al.* 2011). Devinsky *et al.* (2005) found *de novo* rates of 6.1% and 6.9% rates for depression and anxiety, respectively, which are very similar to our *de novo* findings. Another study looking at a post-operative sample using SCID-I found a higher *de novo* post-operative rate of psychiatric illness of 17.3% (Pintor *et al.* 2007). The variability in the rates of *de novo* disorders may be explained by the variability in assessment methods in various studies. In addition, the lack of pre-surgical psychiatric assessments in older studies may increase the reported rates of *de novo* complications. Nevertheless, our findings are in keeping with the literature which suggests that *de novo* psychiatric disorders post-operatively tend to be of lesser severity.

Impact on quality of life, seizure frequency and psychiatric symptoms

There was a significant improvement in quality of life at 1-year post-surgery. However, patients who continued to have or were diagnosed with a mood disorder post-operatively had significantly lower quality of life scores when compared to the other patients with none or other psychiatric diagnoses. Our findings show that impaired quality of life is more likely in depressed patients post-operatively than patients with any other psychiatric comorbidity. Psychiatric status has been shown to be a strong predictor of quality of life in previous studies with several studies showing that the presence of psychiatric comorbidity has a detrimental effect on the quality of life and our findings are consistent with these results (Johnson *et al.* 2004; Pulsipher *et al.* 2006; Ives-Deliperi and Butler, 2017). Other studies have also found that psychiatric illness, especially depression influences quality of life more than seizure frequency (Boylan *et al.* 2004; Johnson *et al.* 2004; Pulsipher *et al.* 2006).

In relation to surgical outcome, we found that surgery was associated with improved quality of life and psychopathology at 1-year follow-up although this improvement was not associated with the degree of success in the surgery. However, it must be noted that the majority of patients in this study had a successful surgical outcome with Engel scores of less than 4 and therefore, there were too few unsuccessful outcomes for it to be used as a measure. These findings are in keeping with the literature that there is a lack of clarity in relation to the link between the success of surgery and psychopathology (Anhoury *et al.* 2000; Pintor *et al.* 2007). We hypothesise that undergoing surgery may also have a placebo impact on improving the self-report of psychiatric symptoms and also resulting in the higher quality of life scores.

Risk factors for post-operative psychiatric illness

We were not able to identify any risk factors for post-operative psychiatric illness in our study. Several previous studies have attempted to identify predictive risk factors for psychiatric outcomes following epilepsy surgery. Some studies have found post-operative seizure control to be related to an improvement in measures of depression and anxiety (Devinsky *et al.* 2005; Hamid *et al.* 2011) although others have not been able to replicate these findings (Iranzo-Tatay *et al.* 2017). A recent study by Iranzo-Tatay *et al.* (2017) found that a history of mental illness was a risk factor for the presence of psychopathology after surgery. A systematic review by Macrodimitris *et al.* (2011) found that the two main predictors of psychiatric outcomes were seizure freedom and pre-surgical psychiatric history.

Strengths and limitations

This study has a number of strengths and limitations. One of the strengths of this study is the use of a well-validated structured assessment tool such as the SCID-I in addition to self-administered questionnaires. Another strength is the high proportion of potential candidates who initially agreed to participate in the study. However, the findings of our study are limited by the relatively small sample that proceeded to surgery within the timeframe of the study and by the lack of a control group. In addition, the SCID-I does not specifically identify some disorders that are specific to epilepsy (such as interictal dysphoric disorder), which may have led to under-diagnosis of depressive symptoms. Another limitation of our study is that although the majority (88%) of our patient population had temporal lobe epilepsy, there was a large degree of heterogeneity in organic diagnosis within this group making it difficult to extrapolate the findings to any specific epilepsy diagnosis. The period of 1-year follow-up post-

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operatively is another potential limitation, which may bias the prevalence rates of psychopathology in patients who underwent surgery in view of the relatively low prevalence and long latency of some psychiatric disorders.

Future research implications

This study demonstrates the need for more prospective, ideally larger multicentre studies using structured clinical instruments, to better delineate the prevalence and severity of psychiatric conditions occurring in the context of epilepsy surgery. Future studies over a longer time frame would establish the natural course of improvements in quality of life. Larger cohort studies may clarify the relationship between positive mental health outcomes and the success of surgery if such a relationship exists.

Conclusion

In keeping with a more recent body of literature, our data provides no support for the view that the surgical treatment of refractory epilepsy is associated with increased psychopathology. Indeed, our data suggests the opposite, that there is a reduction in the rate of psychopathology and an improvement in the quality of life after surgery to treat refractory epilepsy. Furthermore, we have observed that the presence of psychiatric comorbidities such as depression has a significant impact on the quality of life. Therefore, it is very important to identify and treat psychiatric illness in this population to improve the quality of life. Close supervision and regular review for psychiatric complications and psychosocial adjustment difficulties are necessary and best provided through a formal follow-up programme.

Supplementary material

To view supplementary material for this article, please visit https://doi.org/10.1017/ipm.2020.114

Contributors

MClancy, DC, KCM, HB, ND and MCannon conceived the study concept and design. MClancy and HB enroled patients and collected the data. MClancy and MClarke performed statistical analysis. SP, DC and NQ drafted the manuscript. All authors approved the final manuscript for submission.

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Conflict of interest

The authors have no conflicts of interest to disclose.

Ethical standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committee on human experimentation with the Helsinki Declaration of 1975, as revised in 2008. This study protocol was approved by the Beaumont Hospital Research and Ethics Committee.

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