Complications of Epilepsy Surgery: A Single Surgeon's Experience from South India

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OBJECTIVE: **Epilepsy surgery is largely underused in developing counties as a result of many misconceptions. The current study evaluates complications of epilepsy surgery performed by a single surgeon from South India.**

METHODS: **A retrospective analysis was performed of 697 consecutive patients who underwent epilepsy surgery. Complications were classified as minor and major medical, neurologic, and psychiatric complications. The study population was divided into groups of surgery for temporal lobe epilepsy (TLE), extratemporal lobe epilepsy (ETLE), and other procedures. Incidence of complications was compared in children aged ≤12 years and those aged >12 years. Engel class I and IIA was classified as favorable outcomes.**

RESULTS: **The average age of the cohort was 21.9 ± 11.15 years, with 300 (42.8%) females. The mortality was 0.14%. Medical complications were observed in 2%: minor in 10 patients (1.43%) and major in 4 patients (0.57%). In patients with TLE (n = 467), minor and major neurologic complications were observed in 18 patients (3.9%) and 4 patients (0.9%), respectively, and 14 patients (2.9%) had psychiatric complications. In 175 patients with ETLE, the lesion was in noneloquent area in 108; no patients had major and 20 patients (18.5%) had minor neurologic complications. In the remaining 67 patients with ETLE with eloquent area surgery, 29 patients (43.2%) had neurologic deficits as expected, and 12 (17.9%) had major neurologic deficit. Age did not influence complications. Engel favorable outcome was reported in 400 patients with TLE (85.7%) and 116 patients with ETLE (65.2%).**

CONCLUSIONS: **In the current study, risk of mortality was 0.1% and rate of overall major complications was 1.4%. Epilepsy surgery should be increasingly used in developing countries.**

INTRODUCTION

Over the past 3 decades, surgery as an option for drug-resistant epilepsy has become increasingly accepted.[1] Advances in surgical techniques have greatly improved the efficacy and safety of these procedures, as evident in reported patient outcomes of seizure control/freedom[2] and improved quality of life.[3] Complimenting advances in neuroimaging with the introduction of positron emission tomography, magnetic resonance imaging (MRI), functional MRI, single-photon emission computed tomography, and magnetoencephalography have made significant contributions to presurgical evaluation of suitable patients, thus making these surgeries lesion directed[4] and with a lower rate of complications.[5]

However, epilepsy surgery still remains largely underused, with <5% of all eligible patients opting for surgery.[6] The reasons cited for this underuse include associated negative attitudes of patients toward brain surgery,[7] potential candidates being enrolled into trials for new antiepilepsy medication,[8] and uncertainty among physicians about safety and efficacy of epilepsy surgery.[9] The underestimated benefits and overestimated risk of epilepsy surgery by neurologists often result in delayed referral, with the reported average time from onset to referral being up to 20 years.[10]

Moreover, patients with intractable epilepsy consider surgery as the last option, probably because of high overestimation of complication rates, as reported by Zuccato et al.[11] The same study reported that up to 75% of the respondents believed that death and

Key words
- Complications
- Epilepsy surgery
- Medically refractory epilepsy
- Outcome

Abbreviations and Acronyms
APOS: Acute postoperative seizures
ETLE: Extratemporal lobe epilepsy
HH: Hypothalamic hamartoma
MRI: Magnetic resonance imaging
TLE: Temporal lobe epilepsy
VNS: Vagus nerve stimulation

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major complications were very likely after surgery; whereas the true rates were 0% and <5%, respectively. Furthermore, the Italian OPTEFF (Opinioni e Prassinel Trattamentodelle Epilessie Focal I Farmacoa Resistenti) study[12] acknowledged that 96% of patients with epilepsy preferred more concrete risk-benefit information before considering surgery.

Surgical procedures for epilepsy are sufficiently cost effective to make it feasible to establish epilepsy surgery programs in developing countries, where many eligible patients exist.[13] Counseling of eligible patients about the underlying importance of epilepsy surgery without exaggerating risk perceptions is a challenge in developing countries, where 80% of the world's patients with epilepsy reside[14] and where many misconceptions still exist about epilepsy, especially epilepsy surgery, despite consistent efforts in establishing epilepsy surgery programs.[15] The current study aims to evaluate complications of epilepsy surgery in 697 patients with medically intractable epilepsy operated on by a single surgeon from South India.

METHODS

The current study reports a retrospective analysis of 697consecutive patients with medically intractable epilepsy who underwent surgery for epilepsy by a single surgeon (M.P.), at Krishna Institute of Medical Sciences, a tertiary referral care center in Secunderabad, South India, and had at least 1 year of follow-up. Patients who underwent surgery for temporal lobe epilepsy (TLE), extratemporal lobe epilepsy (ETLE), and hemispherical epilepsy were included. Our working definition of refractory epilepsy was disabling seizures occurring at a frequency of at least 2 per month for a period of more than 2 years despite treatment with at least 2 antiepileptic drugs either in combination or successive monotherapies in optimum/tolerated doses. The surgical procedures included standard temporal lobectomy, lesionectomy, multilobar resections, functional hemispherotomy, corpus callosotomy, surgery for hypothalamic hamartoma (HH), and vagus nerve stimulation (VNS). Subdural grid placement was performed in 8 patients and depth electrode placement in 6 patients; none of them had medical or neurologic complications and they were not included for analysis because there were few of them.

The clinical evaluation included variables such as age at surgery, gender, cause, age of onset of epilepsy, type and frequency of seizures, history of neonatal seizures, febrile convulsions, status epilepticus, and clinical findings of neurologic examination.

All the patients underwent standard presurgical evaluation: MRI brain, video electroencephalographic study, and detailed neuropsychological evaluation. Visual fields, ictal single-photon emission computed tomography, fluorodeoxyglucose-positron emission tomography, and functional MRI were performed as and when required.

Surgery

For TLE, the surgical procedure was a standard temporal lobe resection or lesionectomy guided by electrocorticography. For ETLE resections, the surgery was guided by navigation and electrocorticography. Intraoperative cortical stimulation and awake language mapping were performed when the lesion was close to the eloquent cortex.

Postsurgical Evaluation and Outcome

The postoperative hospital course, complications, and functional outcome data were collected and analyzed. Acute postoperative seizures (APOS) were defined as seizures occurring within 7 days after surgery. The outcome at the last follow-up at 1 year or more was assessed using the Engel outcome classification, in which Engel class I was considered seizure free.[16] We considered Engel class I and IIA as favorable outcome.

Complications: Definitions

Complications were defined and classified as described by Hader et al.[17] in a systematic review of complications of epilepsy surgery. Minor medical complications referred to cerebrospinal fluid leak, intracranial/extracranial infection (superficial or deep), aseptic meningitis, deep vein thrombosis/pulmonary embolus, pneumonia, intracranial hematomas, metabolic disturbances. Major medical complications included hydrocephalus and deep infections, such as intracerebral and epidural abscesses, requiring intervention for drainage or bone flap removal with cranioplasty.

Minor neurologic or psychiatric complications were considered temporary and included those that resolved completely within 3 months of the surgical procedure. Major neurologic complications persisted beyond that time frame. Minor or major neurologic deficits involving cranial nerves, dysphasia, significant memory disturbances, and motor weakness (all or part of a limb) were considered as complications. New-onset psychiatric diagnosis or worsening of preexisting psychiatric illness was considered as a psychiatric complication. In addition, APOS, status epilepticus, and death as a direct result of the procedure were also recorded. Visual field defects were considered as complications if they were new onset and patients were symptomatic. New-onset neurologic complications after surgery for lesions in an eloquent area or hemispherotomy, if anticipated, were segregated as expected complications.

Statistical Analysis

After confirming the homogeneity of data, although all categorical variables were expressed as frequency/percentages, continuous variables were reported as mean and standard deviation. The study population was divided into groups based on surgical procedures into TLE ($n = 467$), ETLE ($n = 175$), and other procedures that included hemispherotomy, surgery for HH, callosotomy, and VNS ($n = 55$) groups. One hundred and seventy-five patients with ETLE were further divided into surgery for lesions in an eloquent area ($n = 69$) and noneloquent area ($n = 106$). To compare the incidence of complications among age groups, the study population in each of these groups was divided into those $\leq$ 12 years and younger and those older than 12 years. All statistical analysis was performed using SPSS version 17.0 for Windows (SPSS Inc., Chicago, Illinois, USA).

RESULTS

In the current study of 697 patients with medically refractory epilepsy who underwent surgery, 467 underwent surgery for TLE. The average age of the entire cohort was 21.9 $\pm$ 11.15 years (patients with TLE, 25.32 $\pm$ 11.34 years; patients with ETLE, 17.09