Surgical treatment for pharmacoresistant epilepsy has been available for over 100 years. Recently, safety and efficacy of surgical intervention have been greatly enhanced and there are increasing numbers of patients on whom epilepsy surgery is performed. Epilepsy surgery is no longer indicated in pharmacoresistant epilepsy, but can be planned as part of early management.

The goals of epilepsy surgery are either (1) remediable, as in mesial temporal sclerosis (MTS), functional hemispherectomy or lesionectomy in neocortical epilepsy; (2) adjunctive as in cases of extratemporal lesions especially if they are in eloquent areas or (3) palliative, as in corpus callosotomies which is becoming less frequent in recent epilepsy surgery in Saudi Arabia, with a 20 million population. It is estimated that 6,000 epileptic patients will benefit from epilepsy surgery. A surgical epilepsy program was established at Riyadh Armed Forces Hospital, Department of Neurosciences in June 1999. Successful surgery necessitates comprehensive presurgical evaluation. This includes (1) semiology, (2) electrophysiological studies, (3) neuropsychological studies and intracarotid amobarbital test (WADA) and (5) structural neuroimaging with high resolution MR, (6) functional neuroimaging which includes ictal and interictal single photon emission computerized tomography (SPECT) and interictal and ictal positron emission tomography using 2-[18F] fluoro-2-deoxyglucose (FDG), (FDG Pet).

Semiology. After clinical evaluation, all patients were kept on one or 2 medications before surgery. Video EEG is usually carried out in the Epilepsy Monitoring Unit (EMU) after stopping all anti-epileptic drugs (AEDs) for 7 days and 3 or more seizures are recorded. The objectives of evaluating the semiology are to lateralize the epileptic zone into right or left hemisphere and localize the epileptic zone to (1) temporal, either mesial temporal or neocortical temporal or (2) extratemporal into different anatomical location such as frontal, parietal or occipital lobes.

Neurophysiology studies. These include ictal surface EEG, which indicates the ictal onset zone and interictal EEG with sphenoidal montages with sleep recording. The interictal EEG points to the “irritative epileptic zone”. Invasive recording using the technique of electrocorticography (ECoG) permits more accurate delineation of the boundaries of the irritative zone. Depth electrode stereoelectroencephalography, epidural and subdural grids are used for chronic intracranial recording and are more accurate than surface EEG in delineating the ictal onset zone. However they are not without complications, and with advances in structural and functional imaging their use in becoming less and less.

Case Illustration. This case illustrates the importance of semiology and ictal EEG. A 23-year-old man, with repeated episodes at the age of 3-years-old, right-handed with normal delivery and milestones has repeated episodes. During recording, the episodes were at 2-3 per day. He was diagnosed to have either intractable motor epilepsy or involuntary movements (athetosis) described as abduction of the finger of the left side with rhythmic slow movement occasionally accompanied by myoclonic movement of hand and rarely the upper limbs without loss of consciousness. He was tried on medications including polytherapy and AEDs but without improvement. Semiology as seen by VEEG suggests left motor seizure - left upper clonic seizure without loss of consciousness, ictal surface EEG showed regional ictal discharges in the right fronto parietal region (Figure 1). Then, MR showed a localized region anterior to central sulcus and motor strip (Figure 2). He had regional resection under local anesthesia and his seizures were cured.

Neuropsychological evaluation. This usually determines hemisphere dominance, it will also lateralize and localize the cortical dysfunction and assess memory and cognition. It is generally complimented with intracarotid amobarbital test (WADA), which is carried out in our institute by a Neurologist and a Neuropsychologist with EEG monitoring. Amobarbital...
Figure 1 - EEG showing discharges in the right fronto parietal region.

Figure 2 - MR showing well circumscribed region anterior to the motor strip.

Figure 3 - Data discussed in the weekly meeting.

Figure 4 - A 34-year-old man with semiology consistent with left mesial temporal epilepsy. a) MR showing no lesion in the hippocampus or mesial structures. b) & c) coronal and axial sections of the ictal SPECT showing increase isotope uptake in the left temporal regions.
especially MTS, hemispherectomy and those with respectable lesion outside the eloquent areas. Establishment of the epilepsy surgical program is an essential part of any successful management of epilepsy, the key to success of this program is due to detailed pre-surgical evaluation, concordance of the different pre-surgical neurodiagnostic tests and the experience of the epilepsy surgeon. Successful surgery is rewarding, as it not only improves seizures but the quality of life as shown in a letter from the first patient who underwent epilepsy surgery, as shown at the bottom of this page.

Further Reading

Abstract

Is there a need for WADA test in epilepsy

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Abstract not available
Abstract

Indications for invasive recording and role of intraoperative monitoring and mapping in epilepsy

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Abstract not available
Abstract

Epilepsy surgery

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Abstract not available
Epilepsy is one of the most common neurological disorders. Temporal lobe epilepsy (TLE) presenting with partial complex seizures accounts for more than half of all cases and in up to half of those patients the disease is refractory to anti-epileptic medications. This is also the case in many extratemporal epilepsies. These intractable cases can benefit from resection of the epileptogenic area. In the past, neuropathologists contributed to the study of epilepsy by evaluating autopsy specimens. Now, with the increase in surgical treatment of intractable epilepsy, neuropathologists assume a more significant role in the management of affected patients. The types of specimens delivered to the laboratory vary considerably depending on the location of the epileptogenic area, the presence or absence of focal lesion and the surgical approach. This may be limited as in selective hippocampectomy or extensive as in functional hemispherectomy. Differences in patient selection criteria and the use of different terminology make it difficult to compare histopathological findings among different published studies. Hippocampal sclerosis, either alone or associated with a focal lesion, is the most frequent pathological abnormality seen in TLE. Neuronal migration disorders, neoplasms, vascular malformations, posttraumatic lesions and chronic encephalitis are other less common findings in both temporal and extratemporal epilepsies. Nonspecific changes or histologically normal specimens are encountered in a significant minority of cases.