Outcome of surgery

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The successful outcome for epilepsy neurosurgery depends upon:

- type of operation
- site of the lesion
- nature of the lesion
- results of pre-operative assessment (especially the degree of congruence)
- experience of the centre/surgeon carrying out the surgery.

The risks depend upon these factors, but the risks of any additional investigations also need to be incorporated (e.g. the risks of intracarotid amytal, depth electrodes etc).

Risks of pre-operative investigation

Even apparently non-invasive investigation can carry some risk. Video-EEG telemetry can carry some risk if drug reduction is undertaken in order to record an adequate number of seizures. Drug reduction can produce more severe seizures that can occasionally result in post-ictal psychosis, peri-ictal injury and, rarely, death. Thus consent is necessary for drug reduction in video-EEG telemetry units with the potential risks and benefits carefully explained to the patient.

Invasive investigations carry more obvious risks:

- A standard intracarotid sodium amytal test results in permanent neurological change in less than 0.5%, but transient neurological deficits can occur in more (up to 3%).
- Subdural electrodes frequently result in mild-to-moderate complications. The risk of infection is approximately 3–5%; over a quarter of patients develop an aseptic meningitis – usually restricting recordings to 10 days or less.
- Intracranial electrodes are mainly complicated by infection and haematoma. The risk is dependent on the number of depth electrodes and their placement. The risk is approximately 1–2% for most studies.

Outcome of operation by type of surgery

Temporal lobe surgery (anterior temporal lobectomy, selective amygdalo-hippocampectomy) results in approximately 70% of patients becoming seizure free (this figure may be even higher in those with hippocampal sclerosis and concordant investigations), and 20% are improved. Approximately 50% of patients remain seizure free for 10 years. The overall mortality of temporal lobectomy is less than 0.5%, and the risk of permanent hemiparesis less than 1%. A transient hemiparesis can occur in up to 5%. Memory problems and visual field defects are other common complications. Visual field defects that prevent driving can occur in over 5% of those undergoing mesial temporal resection. Psychosis and depression are not

uncommon sequelae following temporal lobe resection, and most patients should be warned of the possibility of these following surgery.

Extratemporal surgery is performed less frequently and the results are less impressive, with 40% becoming seizure free and 30% improved. The morbidity is related to the site of resection.

Hemispherectomy is particularly effective in controlling seizures, with approximately 80% becoming seizure free, but this operation is reserved for patients with a profound hemiplegia.

Corpus callosotomy results in 70% of patients having a worthwhile improvement, but less than 5% become seizure free.

Multiple subpial transection also results in a significant improvement of seizures in approximately 70%, but if eloquent cortex is involved there is at least a 20% chance of permanent neurological deficit.

Outcome of operation by pathology

The outcome of resective surgery is worse when no lesion can be identified by MRI (MRI-negative cases). When a lesion can be identified, the chance of operative success depends upon the pathology of the lesion, the site of the lesion, whether there are other associated abnormalities and whether the lesion can be completely excised. Also, the concordance of other pre-operative investigations is important. Thus complete excision of well circumscribed benign tumours such as dysembryoplastic neuroepithelial tumours is associated with a 80–90% chance of excellent surgical outcome, while excision of focal cortical dysplasia is associated with 40–50% chance of success. Outcomes for cavernomas, low-grade gliomas and arteriovenous malformations tend to be somewhere in between. In some cases there may be more than one pathology (e.g. temporal lobe tumour and hippocampal sclerosis). In many of these instances, surgical success is greater if both lesions are removed.

Vagal nerve stimulation and other simulation

Vagal nerve stimulation is an approved device in the UK and is for the most part a palliative procedure. This approach involves surgically implanting a small stimulator under the skin in the neck, which intermittently stimulates the left vagal nerve. Recent data on the vagal nerve stimulator in patients with intractable partial seizures show a significant decrease in seizure frequency with few side effects. At best vagal nerve stimulation offers approximately a 50% chance of a 50% or greater reduction in seizure frequency. The efficacy is comparable to short-term results in new antiepileptic drug (AED) trials. Few patients become seizure free, but there is some evidence of improved efficacy with time. The main side effects are hoarse voice and pain. Peri-operative infections also occur, albeit uncommonly.

Trigeminal nerve stimulation is now licenced in Europe and this involves stimulation with external electrodes and stimulator over the first division of the trigeminal nerve at night – it is non-invasive but experience is limited.

There is good evidence that deep brain stimulation, in particular of the anterior thalamic nucleus, can be effective in refractory epilepsy in which resective surgery is not possible. Experience in the UK is at present limited.

Further reading

SHORVON S, PERUCCA E, ENGEL J et al (2009) *Treatment of Epilepsy* (3rd Edition). Wiley-Blackwell, Oxford.