The effectiveness of surgery in the management of epilepsy
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Authors' objectives
To assess the effectiveness of surgery for epilepsy.

Searching
The authors searched MEDLINE, EMBASE, HealthSTAR and the NHS Centre for Reviews and Dissemination's databases (DARE and NHS EED); the search dates and strategy were not stated. The authors also scanned relevant HTA resources such as websites and booklets, and contacted researchers and practitioners for expert judgement.

Study selection
Study designs of evaluations included in the review
Initial topic searches identified a lack of randomised controlled trials (RCTs) on surgery compared with medical management of intractable epilepsy. The authors therefore included case series and controlled but not randomised case series and one RCT which compared two different forms of surgery for epilepsy. Follow-up ranged from 1 to 21 years in length.

Specific interventions included in the review
Surgery for intractable epilepsy including limbic resections (anterior temporal lobectomy; partial versus total hippocampectomy), neocortical resections (lesionectomies, temporal or extra-temporal resections), hemispheric removals (hemispherectomies and multilobar resections) and corpus callosum sections.

Participants included in the review
Children and adults with intractable epilepsy. Patient ages are stated in 3 studies (3-51 years; 12 and younger and 13 to 20 years; and less than 18 and over 18 years of age).

Outcomes assessed in the review
The primary outcomes assessed were seizures and seizure frequency; use of anti-epileptic drugs; quality of life; and mortality. Secondary outcomes assessed were health assessment or psychosocial functioning, change in IQ and change in employment status.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
The authors do not state that they assessed quality.

Data extraction
The authors do not state who, or how many of the reviewers, performed the data extraction. Data were extracted for the categories of: trial identification, design, intervention, patient numbers, inclusion criteria, exclusion criteria, primary outcomes, secondary outcomes, follow-up period, seizure frequency, secondary end points and adverse events.

Methods of synthesis
How were the studies combined?
The studies were combined in a narrative review which discussed the participants characteristics and the outcomes achieved in each study.
How were differences between studies investigated?
The authors do not state how differences between the studies were investigated.

Results of the review
Seven studies were included in the review. One RCT with 70 participants (34 partial hippocampectomy versus 36 total hippocampectomy); 1 controlled (not randomised) case series (n = 248; 202 surgery, 46 non-surgery); 2 multicentre retrospective case series (n = 6,161; 3,992 limbic resections, 1,250 neocortical resections, 356 hemispheric removals and 563 corpus callosum sections); 1 prospective single-centre case series with 89 participants; and 2 retrospective single-centre case series with 236 participants.

For limbic resection, primarily anterior temporal lobe resection but also including amygdalohippocampectomy, the percentage of patients becoming seizure free (not including auras) after surgery is reported to be 68%, ranging between 50% and 70%. A further 5% to 10% are also reported to have a greater than 90% reduction in frequency of seizure. Between 5% and 15% of patients were reported to experience worse seizures after surgery in one of the larger studies.

For neocortical resection, including extra temporal resection and lesionectomies, the percentage of patients becoming seizure-free after surgery is reported to be 45%, ranging between 30% and 55%.

Evidence on the use of anti-epileptic drugs after surgery is inconclusive. One study reported a statistically significant reduction in the average number of drugs used per patient, however, this was not replicated in two other studies.

The percentages of patients becoming seizure-free following hemispherectomies (Hs), multilobar resections (MR) and corpus collosum sections (CCSs) (reported in one multicentre retrospective case series) were 67.4%, 45.2% and 7.6% respectively.

Quality of life for surgery patients in one study scored significantly better for health perception, social function, pain and role limitation caused by physical and emotional problems. No significant improvement was found in emotional well-being, cognitive function, role limitation caused by memory problems, physical function, energy or overall quality of life. A second study found that (at two years following surgery) patients who were either seizure-free or had a greater than 90% reduction in seizure frequency had a statistically significant improvement in overall quality of life as measured by the Epilepsy Surgery Inventory (ESI-55). The difference in overall change from baseline ESI-55 score between the medically and surgically treated groups was not significant, though significant changes did occur for health perceptions, social function and role limitations due to memory and physical limitations. When asked at follow-up, 11% of patients treated surgically regretted having surgery. A third study reported a statistically significant improvement in unemployment and underemployment following surgery. A fourth study reported a range of social benefits including improvements in self-confidence and learning abilities in children and social life and economic benefits for parents together with higher levels of single living in adults.

Adverse effects such as death or neurological deficit were reported in the smaller case series but not the large trial. A very approximate estimate is of about 1% mortality and 4-10% neurological deficits.

In the temporal epilepsy group, 57% of adult patients have been reported to experience dysphoric disorders and 42% to experience new psychiatric disorders, appearing within two months of surgery and treatable with psychotropic medications. The incidence of disabling long-term psychiatric morbidity not previously present was low (approximately 3%). The appearance of dysphoric symptoms had a direct negative impact on post-operative quality of life of patients.

Cost information
The average marginal cost of surgery for epilepsy, including both limbic and neocortical resections, is £13,800 per patient going forward to surgery, ranging between £13,100 and £19,100. The marginal cost per seizure-free year gained is estimated at £2,400, ranging between £2,200 and £4,200 for patients undergoing limbic and neocortical resection.

In a typical health authority, between 10 and 30 patients per year would be suitable for assessment for surgery and between 3 and 14 patients would be identified as suitable for surgery per year, with a base case estimate of 7. The total cost per year for assessment and surgery to a typical health authority is estimated at between £60,000 and £220,000.
Authors’ conclusions
The authors state that the guidelines all acknowledge that there have been no RCTs carried out in respect of surgery for epilepsy. However, all report that case studies have shown that a substantial proportion, up to two thirds, of selected patients become seizure-free after surgery and for other patients the seizure frequency is reduced. Although not directly measured, this implies quality of life improvement.

Despite the shortage of RCT literature, there is a strong professional consensus that epilepsy surgery is a desirable option for treatment of certain forms of intractable epilepsy. Therefore, it is inevitable that some form of epilepsy surgery will continue to be needed. The number of patients who may require assessment means that epilepsy surgery would be too common to be designed as a national service under the National Specialist Commissioning Advisory Group (NSCAG) proposals.

There are strong arguments for ensuring that all young people with medically refractory seizures are evaluated by a neurologist/paediatrician or other specialist with an interest in epilepsy, so that all suitable patients are identified and may be offered surgery. Surgery has a high chance of controlling epilepsy for these people, allowing them to complete their education, integrate socially, achieve employment and avoid a lifetime of anti-epileptic drugs and hospital attendance. This requires a high quality epilepsy service at district level and may require additional investment in neurological services in many districts. The consideration of the wider service provision for people with epilepsy is outside the scope of this review, but it should be stressed that surgery needs to be viewed as one component of a pattern of services for epilepsy.

CRD commentary
The literature search is good but the authors have not stated inclusion and exclusion criteria. It is possible that publication bias exists, and that additional relevant studies may have been missed, by excluding non-English publications. Extracted data is reported in several tables and discussed in a narrative review which was appropriate because of the lack of trial data. The authors have not reported on how the articles were selected and they do not report who performed the data extraction. The quality of the included studies was not assessed.

The authors did not test for homogeneity but the differences between studies and their drawbacks are acknowledged in the discussion. The authors acknowledge that there was a lack of trial data, a likely referral bias in case series from the major centres, differences in practice between trial centres, and the process of evaluation of patients for surgery for epilepsy is evolving rapidly. The authors believe that these critiques probably influence the conclusions and guidelines drawn from the review. The review should be viewed with caution because of the methodological omissions in the process and the criticisms of the data raised by the authors.

Implications of the review for practice and research
Practice: The review guidelines state that assessment should include input from a neurologist, a neurosurgeon and a neuro-psychologist. Post-operative counselling, especially with respect to risks and benefits, is important and, as part of the assessment process, it is essential to confirm that the diagnosis actually is epilepsy and to establish clearly the seizure type and potential structural basis for the seizures.

Research: The review states that a NIH consensus statement recognised that there was, in 1990, a lack of evidence linking seizure control to quality of life and identified this as an area for research.

Bibliographic details
Indexing Status
Subject indexing assigned by CRD

MeSH
Cerebral Cortex /surgery; Epilepsy /diagnosis /prevention & control /surgery; Epilepsy, Temporal Lobe /surgery; Outcome Assessment (Health Care); Prognosis; Temporal Lobe /surgery; Treatment Outcome

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.