Microsurgical clipping and endovascular coiling of intracranial aneurysms: a critical review of the literature

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CRD summary
This review concluded that studies of endovascular coiling versus microsurgical clipping for the treatment of intracranial aneurysms (ruptured and unruptured) showed no clear consensus with regard clinical effectiveness. Despite the poorly described review methods and the limitations of both the review and the study data, the authors’ cautious conclusion is likely to be valid.

Authors' objectives
To assess the evidence for microsurgical clipping and endovascular coiling for the treatment of intracranial aneurysms.

Searching
PubMed and the Cochrane Library were searched, up to September 2007, for studies published in English. Search terms were reported. In addition, reference lists of retrieved editorials and review articles were checked for further studies.

Study selection
Studies that compared coil embolisation with microsurgical clipping in patients with intracranial aneurysms (ruptured and unruptured) were eligible for inclusion in the review. Eligible studies designs were randomised controlled trials (RCTs), controlled trials, clinical trials, observational studies, cohort studies, cases series, and case reports. Studies assessing coil embolisation alone or microsurgical clipping alone were excluded. Studies were not excluded on the basis of year of assessment, despite technical differences in endovascular coiling since 1991.

Primary outcome measures were rate of occlusion, aneurysmal re-rupture, functional status (measured using the Glasgow Outcome Scale or Rankin Score), and mortality. Secondary outcomes included procedural failure and morbidity (short-term and long-term).

The included studies used different approaches for craniotomy including suboccipital, pterional modified orbitozygomatic, retrosigmoid, subtemporal and combined transmastoid-retrolabyrinthine with lateral suboccipital. The Guglielmi detachable coil system was the most frequently used endovascular coiling system. Approximately 10% of the studies reported the use of or requirement for intraoperative angiography for microsurgical clipping. Most of the studies (60%) did not report the failure rate for therapy but, where data were reported, the majority of failures were associated with coiling versus surgical failures. Crossover to the other technique was reported in some cases, most commonly crossover from coiling to microsurgical clipping.

Where reported, included participants had aneurysms mainly in the anterior circulation (84.4%) and the remainder were in the posterior circulation (definitions of anterior and posterior were reported in the review). The minimum age of included participants ranged from nine to 51.5 years; the maximum age ranged from 47 to 89 years. Where reported, the mean age of patients undergoing microsurgical clipping was 50.8 years; for those undergoing coil embolisation the mean age was 53 years. Where sufficient data were reported regarding patient gender, 27.7% of participants were male.

The authors did not state how papers were selected for review.

Assessment of study quality
The authors did not state that they assessed validity. However, some limitations and biases were reported for individual studies, but not in a systematic manner.

Data extraction
The main findings and data, including measures of statistical significance were extracted (where reported).

The authors did not state how data were extracted for the review.
Methods of synthesis
Studies were grouped by outcome and summarised using a narrative synthesis

Results of the review
Forty-seven studies were included in the review: two were RCTs; 23 were prospective observational studies; 20 were retrospective observational studies; and two studies combined retrospective and prospective data.

Eighteen studies reported no significant differences in outcomes between coiled and clipped groups. Of these, 18 studies favoured coiling, 10 studies favoured clipping, and one study failed to reach a conclusion.

Of the two RCTs included, one early single centre study (57 patients with microsurgical clipping and 52 patients with endovascular coiling) reported the two techniques as statistically equivalent at one year post-intervention. The other larger, more recent RCT (1,070 patients with microsurgical clipping and 1,073 patients with endovascular coiling), found that endovascular coiling was significantly better than microsurgical clipping for survival-free disability at one year post-intervention. However, this RCT suffered from poor recruitment and statistical flaws, in addition to any issues of neurological surgical expertise. Longer term follow-up from this RCT suggested that endovascular coiling was associated with higher recurrence and re-haemorrhage rates.

Authors’ conclusions
Studies of endovascular coiling versus microsurgical clipping for intracranial aneurysms (ruptured and unruptured) showed no clear consensus with regard to clinical effectiveness.

CRD commentary
This review assessed a clearly defined review question using a broad range of study designs. Two databases were searched but only studies published in English were eligible for inclusion in the review, so there may be a risk of both publication and language bias. The risk of reviewer error and bias was unclear as the reviewers did not clearly report their methods.

No formal assessment of study quality was reported, so the reliability of the data was unclear. However, some individual study limitations and biases were reported and, given the lack of RCTs and the inclusion of a large number of retrospective studies, the data were likely to be at risk of a significant degree of bias. The studies also differed in terms of intervention, population, design and outcomes, which limited the analysis to a narrative summary.

However, despite the poorly described review methods and the limitations of both the review and the study data, the authors’ cautious conclusion about the lack of consensus is likely to be valid.

Implications of the review for practice and research
Practice: The authors stated that individualised treatment algorithms should be used to treat patients with intracranial aneurysms until further evidence becomes available.

Research: The authors stated that further studies are required to assess cost-effectiveness, long-term plus short-term outcomes, and complications associated with endovascular coiling and microsurgical clipping for intracranial aneurysms. Studies in high risk groups, including the elderly and poor-grade patients, and studies assessing symptomatic vasospasm, new embolisation materials and the benefits of intraoperative angiography, are also required.

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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.