Outcomes of nonsurgical retreatment and endodontic surgery: a systematic review

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CRD summary
The authors found that endodontic surgery appeared initially more effective than non-surgical retreatment for root-filled teeth, but that non-surgical treatment was more effective long term. The review had many limitations, including lack of direct evidence, poor reporting, low-quality studies, differences between studies and questionable statistical methods. The authors' conclusions may not be reliable.

Authors' objectives
To compare the effectiveness of nonsurgical retreatment versus endodontic surgery for persistent periapical pathosis and/or clinical symptoms in root-filled teeth.

Searching
MEDLINE via PubMed, The Cochrane Library, three major endodontic textbooks (named in the review) and the previous two years' issues of seven endodontic journals (named in the review) were searched. Reference lists of relevant articles were checked. The search was restricted to peer-reviewed studies published in English from 1970 to July 2008.

Study selection
Studies of nonsurgical or surgical endodontic retreatment of persistent periapical pathosis and/or clinical symptoms in root-filled teeth among people with periodontally sound teeth were eligible for inclusion. Studies were required to report data for at least 25 teeth and to report clinical and/or radiographic outcomes with at least two years' mean follow-up. Studies were excluded if they reported outcomes for individual roots rather than whole teeth or reported only histological data.

Most studies in the review included participants with apical periodontitis; some also included participants with solely radiological indications for treatment. Most studies included a combination of tooth types. A wide range of clinical techniques, instruments and materials were used to deliver surgical or nonsurgical interventions. Only half of the studies reported specialist involvement; in others the intervention was delivered by general practitioners and/or students (where reported). Outcomes were measured using radiography, clinical examination and/or questionnaires. Review outcomes were treatment success (complete or incomplete healing) and treatment failure (uncertain or unsatisfactory healing) defined using published criteria (detailed in the review). Outcomes were reported overall and at two to four years, four to six years and more than six years. Duration of follow-up varied widely within individual studies (for example, six months to 12 years). Most studies were set in teaching hospitals or dental schools. Nonsurgical treatment studies were published between 1998 and 2008 and surgical ones from 1970 to 2008.

Articles retrieved by the search were screened and irrelevant ones were discarded. The reviewers selected studies from those remaining, with differences settled by consensus.

Assessment of study quality
Studies were allocated up to 17 points for quality items, including: design; sample size; reporting of methods; reporting of participant characteristics, intervention and operator characteristics; description of losses to follow-up; outcomes measures; and statistical techniques. Methods of randomisation, allocation concealment, blinding and management of attrition were also assessed. The authors did not state how many reviewers performed the assessment.

Data extraction
Data were classified by healing status (complete, incomplete, uncertain or unsatisfactory) and assigned a lower category where there was uncertainty. A percentage success rate and Wilson score interval were calculated for each study. The reviewers extracted data and differences were settled by consensus.

Methods of synthesis
Studies were grouped by intervention and data were combined to calculate pooled and weighted mean success rates and 95% confidence intervals (CIs). A DerSimonian and Laird random-effects model was apparently used for the pooled analyses. No details were given of the methods used to weight studies in the weighted analysis. Outcomes were reported across the whole duration of follow-up and subgrouped by follow-up intervals (two to four years, four to six years and over six years).

**Results of the review**

Thirty four studies were included in the review (n=8,253 teeth in tables; reported as n=8,198 in text), range 27 to 1,016). Four were randomised controlled trials (RCTs), but only one of these (n=95) compared the interventions of interest directly. Most studies were case series. Mean quality scores were 7.1 points for surgical and 5.5 for non-surgical studies (overall range 2 to 12 points). In half of the non-surgical and 80% of the surgical studies the same person delivered the intervention and evaluated the outcome.

When data were combined across follow-up periods, there was no statistically significant difference between the weighted mean success rates for endodontic surgery (mean 75%, 95% CI 73.9 to 76.2; 26 studies, n=6,647) and non-surgical retreatment (mean 78%, 95% CI 75.6 to 80.4; eight studies, n=1,606).

Subgroup analysis by duration of follow-up showed a significantly (p<0.05) higher weighted mean success rate in the surgical group (77.8%, 95% CI 76.3 to 79.2; 16 studies) than in the nonsurgical group (70.9%, 95% CI 66.7 to 75; three studies) at two to four years. However, there was a significantly (p<0.05) higher weighted success rate in the nonsurgical group (83%, 95% CI 80.1 to 85.9; five studies) than in the nonsurgical group (71.8%, 95% CI 69.8 to 73.9; seven studies) at four to six years.

Other findings were reported in the review.

**Authors' conclusions**

Endodontic surgery appeared initially more effective than nonsurgical retreatment for root-filled teeth, but non-surgical treatment was more effective in the long term.

**CRD commentary**

The objectives and inclusion criteria of the review were clear and relevant sources were searched for studies. The restriction to published studies in English meant that the review was prone to language and publication biases. Publication bias was not formally assessed. It appeared that steps were taken to minimise the risk of reviewer bias and error by having more than one reviewer independently extract study data, but it was unclear whether such precautions applied to all stages of study selection or to quality assessment. Few details were provided about the characteristics of individual studies (such as design, population and follow-up rate), which made it hard to assess validity and applicability. As the authors noted, most studies used outdated filling materials, which created doubt about clinical relevance. Most studies were case series, with strong potential for selection bias. The summary findings of the sole relevant RCT were not reported. The statistical pooling of the studies did not appear appropriate, as interventions and outcome measures differed widely, as did reported success rates (for example, 27% to 92% for surgical studies). These factors suggested that the studies were not sufficiently similar to combine. Comparison of success rates for the two interventions and for different time-frames also appeared inappropriate, since only one study directly compared the interventions in the same population and all other comparisons were indirect. The review was limited in many respects, including a lack of direct evidence, poor reporting, low-quality studies, clinical and methodological differences between studies and questionable statistical methods. The authors’ conclusions may not be reliable.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that long-term high-quality RCTs were needed to compare endodontic surgery versus non-surgical endodontic retreatment or a combination of procedures and noted that studies should use current techniques and materials.
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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.