Outcome of surgical endodontic treatment performed by a modern technique: a meta-analysis of literature

Tsesis I, Faivishevsky V, Kfir A, Rosen E

CRD summary
This review found that surgical endodontic treatment performed using a modern technique for magnification had a successful healing outcome in 96.1% patients more than one year after treatment. Due to limitations in the review process and uncertain quality of the included studies, the extent to which the authors’ conclusions are reliable is unclear.

Authors' objectives
To evaluate healing after surgical endodontic treatment performed using a modern technique for magnification.

Searching
MEDLINE and EMBASE databases and EviDents and Ovid search engines were searched from 1966 to September 2008 for studies published in English; search terms were reported. Bibliographies of relevant reviews were handsearched.

Study selection
Randomised controlled trials (RCTs) or prospective case series of all surgical endodontic treatments performed by a modern technique using magnification, root-end resection with minimal or no bevel, retrograde cavity preparation with ultrasonic tips, and retrograde root canal filling, with the lesion located at the periapical area were eligible for inclusion if they had at least one year of follow-up. The outcome had to be healing evaluated using the techniques of Rud et al (radiographic evaluation criteria) and/or Molven at al (clinical evaluation) (see Other Publications of Related Interest). Studies of re-surgery (previous endodontic surgery) or of teeth presented with apico-marginal defects or periodontal disease (periodontal pockets or and/or mobility) were excluded. The root end filling material used in most studies was EBA (modified zinc oxide-eugenol cement); a few studies used MTA (mineral trioxide aggregate) or IRM (intermediate restorative material). The three magnification methods used were the dental operative microscope, endoscope or loupes. Mean age of patients, where reported, ranged from 36 to 43 years in women and 37 to 49 years in men. Mean percentage of males ranged from 35% to 43%. Mean anterior tooth location ranged from 34% to 79%.

Three independent reviewers performed the study selection. Disagreements were resolved by discussion.

Assessment of study quality
The authors used level of evidence criteria of Mead et al (see Other Publications of Related Interest) for endodontic surgery outcomes (RCTs considered to be high level and prospective case series considered to be relatively high level of evidence).

Data extraction
The numbers of patients (where given) and units of teeth treated were extracted for each study. Units (expressed as a percentage) of teeth with complete healing, incomplete healing, uncertain healing and failure to heal were extracted. Success was considered as either complete or incomplete healing. A case was considered a failure (regardless of radiographic evaluation) when a clinical sign or symptom was present such as pain and/or swelling, tenderness to percussion or palpitation, or sinus tract.

The authors did not state how many reviewers performed data extraction.

Methods of synthesis
The percentage of successful healing was pooled with 95% confidence intervals (CI) using generalised linear models, assuming a binomial (proportion) distribution. Each study was weighted by an estimate of 1/variance of the proportion of successes. Where relevant information was available, the effect of different variables was considered: mean age;
percentage of males; percentage of treated anterior teeth; root-end filling materials used; and magnification techniques used.

Results of the review
Eleven relevant studies were identified (880 teeth). Numbers of patients were not reported for four studies; for the other studies n=503 patients (range 21 to 122). There were six RCTs (486 teeth, range 10 to 148) and five prospective case series (394 teeth, range 28 to 120). The authors considered the overall level of evidence to be high.

Pooled analysis of success for healing for a modern technique using magnification was 91.6% (95% CI 85.9% to 95.1%). Pooled percentage for failure was 4.7% (95% CI 2.24% to 9.50%). The remainder showed uncertain healing (3.7%). None of the confounding variables had a significant effect.

Authors' conclusions
Surgical endodontic treatment performed using the modern technique was a predictable treatment. Successful outcome after follow-up for more than one year postoperatively was achieved in 91.6% patients. Age, gender, tooth type, root-end filling material and magnification system used had no significant effect on success.

CRD commentary
The review addressed a well-defined question in terms of participants, interventions, study design and relevant outcomes. However, it was unclear whether there was an intention to compare the intervention with an alternative treatment (presumably standard treatment). Relevant databases were searched, but only studies published in English were included and there was no specific search for unpublished studies, so some studies may have been missed. Publication bias was not assessed. The authors' assumption that the evidence from all RCTs and prospective case series was of relatively high quality was not warranted and very little relevant information was provided to enable the reader to assess the quality of included studies. Efforts were made to reduce error and bias in study selection; it was not reported whether this occurred with data extraction. Relevant study details were reported, but no details of length of follow-up or loss to follow-up were given. There was no reported data relevant to the comparisons made in the RCTs. Percentages of successful healing were pooled for the intervention groups, but no data was provided in order to make comparisons with control groups. Results were pooled for all studies and additional separate pooled analyses for the RCTs and prospective case series would have been useful. The effect of various confounders was assessed. Most of the included studies were small. In view of the potential for missed studies, uncertain quality of included studies and limitations of the review process, the extent to which the authors' conclusions are reliable is unclear.

Implications of the review for practice and research
The authors did not state any implications for practice.

Research: The authors stated that more large-scale randomised prospective studies were required to clarify whether use of dental operative microscope and endoscope magnification were more successful than use of loupes. Additional large-scale prospective clinical studies were needed to evaluate possible predictors of success and failure.

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