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[Intervention Review]

Endodontic procedures for retreatment of periapical lesions

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ABSTRACT

Background

When primary root canal therapy fails, periapical lesions can be retreated with or without surgery. Root canal retreatment is a non-surgical procedure that involves removal of root canal filling materials from the tooth, followed by cleaning, shaping and obturating of the canals. Root-end resection is a surgical procedure that involves exposure of the periapical lesion through an osteotomy, surgical removal of the lesion, removal of part of the root-end tip, disinfection and, commonly, retrograde sealing or filling of the apical portion of the remaining root canal. This review updates one published in 2008.

Objectives

To assess effects of surgical and non-surgical therapy for retreatment of teeth with apical periodontitis.

To assess effects of surgical root-end resection under various conditions, for example, when different materials, devices or techniques are used.

Search methods

We searched the following electronic databases: the Cochrane Oral Health Trials Register (to 10 February 2016), the Cochrane Central Register of Controlled Trials (CENTRAL; 2016, Issue 1), MEDLINE Ovid (1946 to 10 February 2016) and Embase Ovid (1980 to 10 February 2016). We searched the US National Registry of Clinical Trials (ClinicalTrials.gov) and the World Health Organization (WHO) International Clinical Trials Registry Platform for ongoing trials (to 10 February 2016). We placed no restrictions regarding language and publication date. We handsearched the reference lists of the studies retrieved and key journals in the field of endodontics.

Selection criteria

We included randomised controlled trials (RCTs) involving people with periapical pathosis. Studies could compare surgery versus non-surgical treatment or could compare different types of surgery. Outcome measures were healing of the periapical lesion assessed after one-year follow-up or longer; postoperative pain and discomfort; and adverse effects such as tooth loss, mobility, soft tissue recession, abscess, infection, neurological damage or loss of root sealing material evaluated through radiographs.

Data collection and analysis

Two review authors independently extracted data from included studies and assessed their risk of bias. We contacted study authors to obtain missing information. We combined results of trials assessing comparable outcomes using the fixed-effect model, with risk ratios (RRs) for dichotomous outcomes and mean differences (MDs) for continuous outcomes, and 95% confidence intervals (CIs). We used generic inverse variance for split-mouth studies.

Main results

We included 20 RCTs. Two trials at high risk of bias assessed surgery versus a non-surgical approach: root-end resection with root-end filling versus root canal retreatment. The other 18 trials evaluated different surgical protocols: cone beam computed tomography (CBCT) versus periapical radiography for preoperative assessment (one study at high risk of bias); antibiotic prophylaxis versus placebo (one study at unclear risk); different magnification devices (loupes, surgical microscope, endoscope) (two studies at high risk); types of incision (papilla base incision, sulcular incision) (one study at high risk and one at unclear risk); ultrasonic devices versus handpiece burs (one study at high risk); types of root-end filling material (glass ionomer cement, amalgam, intermediate restorative material (IRM), mineral trioxide aggregate (MTA), gutta-percha (GP), super-ethoxy benzoic acid (EBA)) (five studies at high risk of bias, one at unclear risk and one at low risk); grafting versus no grafting (three studies at high risk and one at unclear risk); and low energy level laser therapy versus placebo (irradiation without laser activation) versus control (no use of the laser device) (one study at high risk).

There was no clear evidence of superiority of the surgical or non-surgical approach for healing at one-year follow-up (RR 1.15, 95% CI 0.97 to 1.35; two RCTs, 126 participants) or at four- or 10-year follow-up (one RCT, 82 to 95 participants), although the evidence is very low quality. More participants in the surgically treated group reported pain in the first week after treatment (RR 3.34, 95% CI 2.05 to 5.43; one RCT, 87 participants; low quality evidence).

In terms of surgical protocols, there was some inconclusive evidence that ultrasonic devices for root-end preparation may improve healing one year after retreatment, when compared with the traditional bur (RR 1.14, 95% CI 1.00 to 1.30; one RCT, 290 participants; low quality evidence).

There was evidence of better healing when root-ends were filled with MTA than when they were treated by smoothing of orthograde GP root filling, after one-year follow-up (RR 1.60, 95% CI 1.14 to 2.24; one RCT, 46 participants; low quality evidence).

There was no evidence that using CBCT rather than radiography for preoperative evaluation was advantageous for healing (RR 1.02, 95% CI 0.70 to 1.47; one RCT, 39 participants; very low quality evidence), nor that any magnification device affected healing more than any other (loupes versus endoscope at one year: RR 1.05, 95% CI 0.92 to 1.20; microscope versus endoscope at two years: RR 1.01, 95% CI 0.89 to 1.15; one RCT, 70 participants, low quality evidence).

There was no evidence that antibiotic prophylaxis reduced incidence of postoperative infection (RR 0.49, 95% CI 0.09 to 2.64; one RCT, 250 participants; low quality evidence).

There was some evidence that using a papilla base incision (PBI) may be beneficial for preservation of the interdental papilla compared with complete papilla mobilisation (one RCT (split-mouth), 12 participants/24 sites; very low quality evidence). There was no evidence of less pain in the PBI group at day 1 post surgery (one RCT, 38 participants; very low quality evidence).

There was evidence that adjunctive use of a gel of plasma rich in growth factors reduced postoperative pain compared with no grafting (measured on visual analogue scale: one day postoperative MD -51.60 mm, 95% CI -63.43 to -39.77; one RCT, 36 participants; low quality evidence).

There was no evidence that use of low energy level laser therapy (LLLT) prevented postoperative pain (very low quality evidence).

Authors' conclusions

Available evidence does not provide clinicians with reliable guidelines for treating periapical lesions. Further research is necessary to understand the effects of surgical versus non-surgical approaches, and to determine which surgical procedures provide the best results for periapical lesion healing and postoperative quality of life. Future studies should use standardised techniques and success criteria, precisely defined outcomes and the participant as the unit of analysis.

PLAIN LANGUAGE SUMMARY

Procedures for retreatment of failed root canal therapy

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Review question

We aimed to find out the best way to retreat patients for whom root canal therapy has failed. We wanted to know whether surgical or non-surgical retreatment was better, and if using specific materials, devices or procedures in surgery might improve healing of the lesion or reduce patient discomfort after surgery. This review updates one published in 2008.

Background

In root canal therapy, the infected pulp of a tooth is removed, and the root cavity is disinfected and filled with a sealing material. However, if micro-organisms that caused the infection are not completely removed, after some time they may cause a disease at the tip of the root, called a periapical lesion. Treatment for this requires a second intervention, which can be performed in the same way as the first treatment, from the crown into the root canal, to remove the existing filler and clean and disinfect as well as possible before sealing again. Alternatively, should this procedure fail, or if it is not feasible, a surgical intervention can be used.

Study characteristics

We conducted a wide search of medical and dental literature up to 10 February 2016. We identified 20 studies that randomised participants to groups receiving different forms of retreatment of periapical lesions. These studies evaluated nine different comparisons: surgical versus non-surgical treatment (two studies, one monitoring participants for up to 10 years); two diagnostic radiographic techniques (one study); the occurrence of postoperative infection with or without antibiotics (one study); use of different devices for enhancing the surgeon's view during the most critical steps of the surgical procedure (one study); the aesthetic appearance of the gum next to the treated tooth and pain after operation when two different types of gingival incision were used (two studies); use of minimally invasive ultrasonic devices or traditional rotating burs to manage the tip of the root (one study); use of different materials for filling the root-end (seven studies); filling of the periapical lesion with a grafting material (four studies); and exposure of the surgical site to a low energy level laser to reduce pain (one study).

Key results

There is no evidence that a surgical approach leads to better results compared with non-surgical retreatment at one year (or at four or 10 years) after intervention. However, people treated surgically reported more pain and swelling during the first week after treatment.

Different surgical techniques were evaluated. Healing at one-year follow-up seemed to be improved by use of ultrasonic devices, instead of the traditional bur, for root-end preparation. There was some evidence of better healing at one-year follow-up when root-ends were filled with mineral trioxide aggregate compared with their being treated by smoothing of orthograde gutta percha root filling.

Use of a graft composed of a gel enriched with the patient's own platelets applied to the defect during the surgical procedure significantly reduced postoperative pain. Exposure to a low energy level laser did not apparently reduce pain at the surgical site.

A small gingival incision may preserve the gum between two adjacent teeth, improving the aesthetic appearance and causing less pain after surgery.

There was no evidence that use of antibiotics reduces the occurrence of postoperative infection (although when the procedure is done well, infection is an extremely rare event).

Different ways of enhancing the surgeon's view did not lead to different results at least one year after operation, and results of retreatment were independent of the radiographic technique used to make the diagnosis.

Quality of the evidence

We judged the quality of the evidence to be poor; therefore we cannot rely on the findings. Only one study was at low risk of bias; we judged the majority to be at high risk of bias.

Author conclusions

It is difficult to draw conclusions, as the evidence currently available is of low to very low quality. More randomised controlled trials conducted to high standards are needed to find out the effects of the surgical versus non-surgical approach and, when surgery is used, which materials, devices or operative protocols are best for improving lesion healing and reducing patient discomfort.