Outcome of root canal obturation by warm gutta-percha versus cold lateral condensation: a meta-analysis
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CRD summary
This review, which compared warm gutta-percha versus cold lateral condensation for root canal obturation, concluded that overextension was more likely with warm gutta-percha obturation. No differences were observed for post-operative pain, long-term outcomes and obturation quality. The authors appear to have considered methodological limitations, presenting the results as a preliminary analysis, and their conclusions are likely to be reliable.

Authors' objectives
To compare the effect of warm gutta-percha (GP) versus cold lateral condensation (CLC) techniques for root canal obturation.

Searching
MEDLINE (1966 to 2006), EMBASE (1984 to 2006), Science Citation Index (1995 to 2006), CNKI (1994 to 2006) and the Cochrane Library (2005) were searched; the search terms were reported. References were checked for further potentially relevant studies.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) and preliminary quasi-RCTs were eligible for inclusion. The included studies were clinical trials, two of which were considered to have used reliable randomisation methods.

Specific interventions included in the review
Studies comparing warm gutta-percha and CLC techniques for root canal obturation were eligible for inclusion. The included studies used several different warm GP techniques, such as thermomechanical compaction and ultrasonic condensation of GP.

Participants included in the review
Studies of participants with pulp disease or chronic apical periodontitis, and who had not received previous root canal treatment, were eligible for inclusion. Studies using extracted teeth or simulated models (in vitro) were excluded. The studies included in the review were conducted in clinical patients (in vivo).

Outcomes assessed in the review
Studies reporting healing rates based on clinical symptoms and/or radiographic evidence were eligible for inclusion. The included studies measured post-operative pain, long-term outcomes, obturation quality and rate of overextension. The latter was assessed using the distance between the root apex and end of GP, and was defined as a filling beyond the root apex.

How were decisions on the relevance of primary studies made?
At least two reviewers independently screened studies for relevance.

Assessment of study quality
Two reviewers independently assessed validity according to the Jadad scale, which includes items on randomisation, blinding, and the reporting of withdrawals and loss to follow-up. Reviewers were blinded to prevent identification of the studies.
Data extraction
Two reviewers independently extracted the data and any disagreements were resolved through discussion. Dichotomous data for warm GP versus CLC were converted into relative risk (RR) values with 95% confidence intervals (CIs).

Methods of synthesis
How were the studies combined?
Pooled RRs and corresponding 95% CIs were calculated using a fixed-effect model (Peto method) when statistical heterogeneity was not evident. A random-effects model (DerSimonian and Laird) was used if statistically significant heterogeneity was observed, and quality scores were taken into account when weighting the studies. An assessment of publication bias was not reported.

How were differences between studies investigated?
Statistical heterogeneity was assessed using the Q statistic.

Results of the review
Ten clinical trials were included (1,748 teeth: 874 treated with warm GP obturation, 874 with CLC filling).

Scores on the Jadad scale ranged from 1 to 4, with the majority of studies scoring 2 out of a maximum of 5. Only two studies used a blind assessment of the outcomes, and none provided details of allocation concealment. The sample sizes were small, ranging from 60 to 340 teeth, and it was unclear whether the studies were appropriately powered.

A statistically significant larger number of overextension cases was observed for patients treated with warm GP obturation compared with patients treated with CLC (RR 1.98, 95% CI: 1.33, 2.93, p=0.0007). There was no statistically significant difference between the two obturation techniques for any other outcomes.

Authors' conclusions
A higher rate of overextension was observed in patients treated with warm GP obturation compared with patients treated with CLC. Findings reported for post-operative pain, long-term outcomes and obturation quality were similar for the two groups.

CRD commentary
The review question was clear and appropriate inclusion criteria were reported for the participants, interventions, outcomes and study design. Some relevant sources were searched for studies but unpublished studies were not specifically sought, which means that potentially relevant papers might have been missed. Validity was assessed according to published criteria, and attempts were made to minimise errors and bias at each stage of the review process.

The majority of the studies were of a low quality. However, the authors appear to have considered such limitations, presenting the findings as a preliminary analysis, and their conclusions are likely to be reliable.

Implications of the review for practice and research
Practice: The authors suggested that the rate of overextension with warm GP can be reduced through accurately defining the working length, ensuring the narrow part of the apical foramen remains intact during preparation, and using an appropriate insertion rate of warm GP.

Research: The authors stated that future studies should conform to the CONSORT (Consolidated Standards of Reporting Trials) guidelines in order to improve the quality of the studies and the reliability of their conclusions. Future research should also carry out subgroup analyses to investigate different warm GP techniques and long-term outcomes.

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