Injectable local anaesthetic agents for dental anaesthesia

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A Commentary on

St George G, Morgan A, Meechan J et al.
Injectable local anaesthetic agents for dental anaesthesia. *Cochrane Database Syst Rev* 2018; **7:** CD006487.

*Cochrane Reviews are regularly updated as new evidence emerges and in response to feedback, the Cochrane Library (*www.thecochranelibrary.com*) should be consulted for the most recent version of the review.*

Practice point

Most local anaesthetics provide anaesthesia but there is a lack of high-quality evidence to determine whether one formulation of local anaesthetic is more effective than another.

Abstract

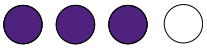
Data sources The following traditional databases were searched until January 2018; Cochrane Central Register of Controlled Trials (CENTRAL); the Cochrane Library; Issue 1, MEDLINE Ovid, Embase Ovid, CINHAL Plus and the Institute of Scientific Information (ISI) Web of Science. In addition, five more databases (IndMED, KoreaMED, Panteleimon, ANZCTR and Ingenta Connect) and bibliographies. References lists were also searched until January 2018 as well as handsearching of multiple relevant journals and potential sources of unpublished studies.

Study selection All included studies were randomised controlled trials comparing different agents, different dosage or different concentration of local anaesthetics in clinical procedures or simulated scenarios using parallel or cross-over design with no language or year of publication restrictions.

Data extraction and synthesis Two reviewers independently selected, reviewed and extracted data using a standardised form. Risk of bias was also assessed by two authors. Quality of the evidence was evaluated by the GRADE approach. Treatment effect was presented as odds ratios (OR) and risk ratios (RR) with 95% confidence intervals (CI) for binary data, while mean differences (MD) with 95% CI was used for continuous data. Statistical heterogeneity was calculated by the 'Q' statistic and I^2. 'Summary findings' tables were created for eight comparisons. Subgroup analysis was performed based on the tissue anaesthetised.

Results From the 123 studies (19,223 participants) on dental anaesthesia using commercially available formulations that met the inclusion criteria, 68 studies with 6615 participants were included for quantitative analysis. The comparison of 4% articaine, 1:100.000 adrenaline with 2% lidocaine, 1:100.000 adrenaline was reported as the main comparison and included the results of four studies with 203 participants with irreversible pulpitis during endodontic access and instrumentation. For the primary outcome of success, as measured by the absence of pain, the calculated RR of 1.60 (95% CI 1.10 to 2.32) favoured articaine with low heterogeneity. No evidence of difference was observed on pain during injection (MD 4.74 mm, 95% CI -1.98 to 11.46 mm) or following injection (MD 6.41 mm CI 95% 1.01 to 11.80 mm) based on three cross-over studies comparing the same formulations used for the evaluation of success.

Conclusions The authors concluded there is no sufficient high quality evidence to determine which formulation is more effective. Four percent, 1:100,000 adrenaline was superior to lidocaine 2%, 1:100,000 epinephrine when measuring success on posterior teeth with irreversible pulpitis. Two percent lidocaine, 1:100,000 epinephrine was superior to 3% prilocaine 0.03 IU felypressin during surgical procedures and 4% prilocaine plain during surgical and periodontal treatment.

GRADE rating 

Commentary

Not experiencing pain during a dental procedure depends on the efficacy of local anaesthetic agents and it is crucial to the patient.

Searching, study selection, data extraction and assessment of risk of bias have been undertaken using Cochrane's standard methodological approaches. It included parallel or cross-over randomised controlled trials of clinical procedures or simulated scenarios performed under local anaesthetics. Primary outcomes considered were absence of pain during a procedure and speed of onset, and the adverse events pain on or following injection, paraesthesia and allergic reaction. Data were analysed based on formulations, tissues anesthetised, type of dental intervention and type of injection technique. The quality of the data analysis is impeccable because of the use of a robust methodology.

As pointed out by the authors, the scope of the review was monumental in view of the number of outcomes considered and the number of formulations. In addition, there is a number of other relevant variables that were considered as well, like volume of the injection/s, the types of injections, the types of procedures, the tissues involved and if they were real treatments versus simulated scenarios.

In spite of the impressive number of studies included, the authors identified clear limitations of the evidence and as such are likely to change with further research.

The review reported eight major comparisons. The concentration of articaine remained 4% through all the studies including this agent, although with different adrenaline concentrations. The same formulations were used in all studies including lidocaine (2% ,1:100,000 adrenaline), those with

bupivacaine (0.5%, 1:200.000 adrenaline) and those with mepivacaine (2% 1:100,000).

Considered in this review as the main comparison, four studies (203 participants), comparing 4% articaine 1:100,000 adrenaline versus 2% lidocaine, 1:100,000 adrenaline measured absence of pain for posterior teeth with irreversible pulpitis, of those one used infiltration on upper teeth while the remaining studies used inferior alveolar nerve block (IANB) on lower teeth. The comparison favoured articaine (RR 1.6 95% CI 1.10 to 2.32) based on low quality evidence. Interestingly, no evidence of difference was found when considering the IANB studies only.

Adding to the limitations identified by the authors not all formulations are available in many countries and formulations with higher concentrations of vasoconstrictor may not be suitable for individuals on certain medications.

For the pain outcome, when measured on a continuous scale, it is not clear what detected difference was considered significant and if that difference is clinically relevant.

The clinician may benefit from more targeted evidence perhaps based on specific clinical scenarios and the type of tissue to be anaesthetised. Quality evidence can only come from trials with the adequate number of individuals to detect a difference, trials following transparent methodology and with careful selection of the way the outcomes are measured.

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