Dentapen versus traditional syringe infiltration – which LA technique is preferred by patients?

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A Commentary on

O'Neal L Y, Nusstein J, Drum M, Fowler S, Reader A, Ni A. Comparison of Maxillary Lateral Incisor Infiltration Pain Using the Dentapen and a Traditional Syringe: A Prospective Randomized Study. *J Endod* 2022; **48:** 840–844.

Practice points

- Within the scope of this study, the Dentapen caused less pain during solution deposition of local anaesthetic compared to a traditional syringe technique.
- Although memory bias can affect statistic validity, patient preference still matters to the patient and clinician as it represents how patients communicate their clinical experience to clinicians and people in their social circles.

Abstract

Design Single-blind randomised cross-over trial.

Intervention The study compared solution deposition pain of a maxillary lateral incisor infiltration between a computer-controlled local anaesthesia delivery device (Dentapen) and traditional syringe. The Dentapen was given with a slow flow rate of 1.8 mL/162 sec and ramp-up mode, and the traditional syringe infiltration was delivered at a flow rate of 1.8 ml/60 sec. Patients were randomly assigned to a sequence to receive both interventions at two separate appointments, with each participant acting as their own control. Patients rated the pain of each intervention using a Heft-Parker visual analogue scale and completed a preference survey at the conclusion of the second appointment.

Case selection A total of 130 adult patients with ASA I or II were included in the study. Criteria for exclusion were patients under 18 years of age or older than 65, allergies to local anaesthetics or sulphites, pregnant or nursing, history of significant medical conditions (ASA III or higher), taking any medications that may affect pain assessment, active pathosis at the injection site, or inability to give informed consent.

Data analysis Differences in pain of solution deposition for the Dentapen and traditional infiltration techniques were analysed using paired t-tests and odds ratios. Interactions between study groups, gender and anxiety were analysed using a linear mixed-effect model with a P value <0.05.

Results Solution deposition pain was significantly less (P <0.001) with the Dentapen infiltration than the traditional infiltration. The preference survey revealed that 75% of patients preferred the Dentapen infiltration over the traditional technique.

Conclusions The findings of this clinical trial suggest that pain during maxillary lateral incisor infiltrations can be reduced by using the Dentapen with a slow flow rate and ramp-up mode compared with the traditional syringe technique.

Commentary

The most painful phase of local anaesthetic (LA) infiltration is solution deposition and studies have reported moderate to severe pain 26–67% of the time for injections in the maxillary lateral incisor region.[1,2] Electronic LA devices such as the Dentapen (Fig. 1) are designed to administer anaesthetic solution at a slower rate, reducing pressure and therefore pain in the tissues.[3,4] This study aimed to test this hypothesis by directly comparing the pain of solution deposition between the Dentapen and traditional syringe in a commonly painful infiltration site.

The title and abstract of the study are potentially misleading as a cross-over trial design is not mentioned in either. However, the title clearly states the interventions being compared and that randomisation was carried out. A cross-over design was appropriate as it compared two short-acting treatment periods. Each participant served as their own control and variability was reduced further by addressing within-subject differences during statistical analysis.

It is not clear how the random allocation sequence for the interventions or site of injection was generated, who enrolled and assigned participants or what steps were taken to conceal the sequence until patients were assigned. A participant flow diagram or access to the full trial protocol would have given the allocation and randomisation processes more transparency.

To ensure blinding in this single-blind study, patients were blindfolded during the infiltrations and high-volume suction units were activated throughout to disguise the humming noise of the Dentapen. Both interventions were carried out with identical LA needles and cartridges using a traditional grip and aspiration technique. The overall time for each injection was consistent. To standardise injection times, once the traditional infiltration was delivered over 60 seconds, it remained inserted into the tissues for the remainder of time (102 seconds). However, it raises the possibility that pain scores for the traditional technique may reduce if solution deposition was conducted over the full 162 seconds.

Each LA technique is clearly described to allow replication in future studies. The subjects were told when each infiltration stage was completed so they could focus on rating the pain of solution deposition only. However, relying on patients to interpret proprioceptive differences between the stages is challenging, thus reducing validity of the results. Anxiety-reducing adjuncts such as topical LA and distraction were not used to validate comparisons

GRADE rating 

Fig. 1 The Dentapen

between the groups, and the study recognised that this may have resulted in more pain experienced during needle insertion and placement.

The power calculation was based on a previous study;[5] therefore, it is unclear how suitable the sample size was to assess solution deposition pain in this patient cohort. The statistical tests used were appropriate, with t-tests comparing pain outcomes and clearly reported P values. Odds ratios were used to analyse the pain scores and confidence intervals of 95% were given, considering within-subject correlation. However, the raw data for the odds ratios was not presented and may have provided further insight. Outcomes were clearly presented as percentages in tables for both Dentapen and traditional methods, and separate results for each period were shown. Interactions between study groups, gender and anxiety were analysed with an appropriate linear mixed-effect model; however, these secondary outcomes were not pre-specified in the methodology, therefore this exploratory analysis could be interpreted as data dredging.

Two treatment periods over 21 months took place; however, the time between the interventions was not specified, other than at least two weeks apart. Within the trial timeframe, memory bias and the period effect could have impaired data validity. The risk of an unequal carryover effect was considered by the authors and tested in a mixed-effect model. The interaction between treatment and period for the visual analogue scale at deposition was found to be not significant (P = 0.136). Anxiety levels between the infiltration appointments were also analysed and deemed not significantly different; however, an exact P value was not reported.

Operator bias was introduced as the clinician delivering the interventions was aware of the technique used. The authors cannot accurately measure or confirm that a 1.8 ml/60 sec flow rate was used for each manual infiltration. Although keeping the same operator reduces the risk of inter-operator variability, calibration was not described. Participants were not blinded to the operator; therefore, expectation bias (positive or negative) may have impacted the results of the second intervention.

With such extensive exclusion criteria, the results become less generalisable and valid only to the demographic of the participants. However, the demographic is difficult to decipher as the location of data collection and baseline characteristics of the subjects were not specified in the methodology. Excluding pathology at the injection site reduces the number of clinical reasons for maxillary lateral incisor infiltrations, leading the reader to question the clinical relevance of the study. The authors acknowledge these issues when they report pain scores may be higher in the general population and emergency endodontic patients than in the sample group.

The authors recommend that patient preference should be considered as an important aspect of patient care during decision-making. Patients completed the preference survey after the second intervention; however, the data collection form is not shown, therefore the reader cannot see what responses were required. The discussion implies that free comments were given as some participants revealed their opinion regarding length of infiltrations. Failing to disclose this data is a major cause for information bias in this study.

Overall, the findings of this cross-over trial are based on a very specific demographic of patients and lack generalisability. Cost implications should also be considered for clinicians weighing up the potential risks and benefits of implementing a new device. One cannot conclude from this study alone that Dentapen syringes will reduce maxillary infiltration pain better than traditional techniques for all patients in all settings.

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Ethics declaration

The authors declare no conflicts of interest.

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