Effect of long acting local anesthetic on postoperative pain in teeth with irreversible pulpitis: Randomized clinical trial

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Abstract Objective: The objective of this study was to compare the effect of long acting anesthetics on postoperative pain in teeth with irreversible pulpitis.

Methodology: Forty patients were randomly assigned into two groups of twenty patients each. Each patient who fit the inclusion criteria was administered local anesthesia before undergoing root canal treatment. The anesthetic solution was either 2% lidocaine with 1:80,000 epinephrine or 0.5% bupivacaine with 1:200,000 epinephrine. Patients were instructed to complete a VAS pain score at 6, 12, 24 h after single visit root canal treatment. Data were analyzed by Mann–Whitney, Cochrane Q analysis and $t$ test to compare qualitative and quantitative data between the groups.

Results: The results showed the levels of pain of the patients who received lidocaine as the anesthetic agent and had significantly more postoperative pain after root canal treatment ($P < 0.05$) but had significantly decreased pain by 24 h compared to the bupivacaine group patients who had significantly lower postoperative pain levels at 6 and 12 h.

Conclusion: The use of long acting local anesthetic can significantly reduce the postoperative pain in teeth with irreversible pulpitis.

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(Attar et al., 2008) and occlusal reduction (Rosenberg, 2002; Rosenberg et al., 1998) have all been advocated. Most of these studies were done on the teeth extraction model (Bouloux and Punnia-Moorothy, 1999; Volpato et al., 2005; Gregoorio et al., 2008; Trullenque-Eriksson and Guisado-Moya, 2011).

Only a few articles investigated the effect of long-acting anesthetics on pain control after root canal treatment. These articles have several shortcomings such as insufficient sample size and included upper and lower teeth with variable diagnosis (Dunsky and Moore, 1984). Therefore, the objective of this study was to compare the effect of long-acting anesthetics on postoperative pain in teeth with irreversible pulpitis.

2. Methodology

This study was approved by the Ethics Committee of College of Dentistry Research Center, Deanship of Research, King Saud University.

Inclusion criteria included healthy patients having a first or second mandibular molar tooth with normal periapical radiographic appearance and irreversible pulpitis without sensitivity to percussion. The clinical diagnosis of acute irreversible pulpitis was confirmed by a prolonged exaggerated response (> 5 s) with moderate-to-severe pain to a cold test (Roeko Endo-Frost; Roeko, Langenau, Germany) after the stimulus had been removed.

The exclusion criteria were the presence of a periapical radiolucency, unrestorable tooth, pregnancy, the use of any type of analgesic medication during the last 12 h before treatment, teeth with a necrotic, infected pulp or swelling, the presence of any systemic disorders that prevented administration of lidocaine and bupivacaine as anesthetic agents, sensitivity to either lidocaine with 1:80,000 epinephrine or bupivacaine with 1:200,000 epinephrine.

Patients were selected randomly from the emergency clinics of College of Dentistry at King Saud University, Riyadh, Saudi Arabia. All patients included in the study signed informed consent before the treatment and were fully explained the nature of the procedure and the possible risk and discomforts.

All patients were randomly divided into two groups of 20 patients each and each patient was assigned a number randomly to either group. All inferior alveolar nerve block (IANB) injections were administered blindly by covering the caruples with a covering tape. A visual analog pain scale (VAS) was given to each patient to rate their pain level before treatment.

The root canals were instrumented initially to file size no. 15, followed by the use of the ProTaper rotary system (Maillefer, Switzerland) and instrumentation was carried out to the file F3. The root canals were then dried and filled with gutta-percha and AH26 (Dentsply De Tery, Konstanz, Germany) root canal cement.

Patients were instructed to complete a VAS pain score at 6, 12 and 24 h after root canal treatment. The following criteria were outlined for the patients to rate their pain: 0, no pain; 1–3, mild pain; 4–6, moderate pain; 7–9, severe pain (Jalalzadeh et al., 2010; Asgary and Eghbal, 2010). Data were analyzed by Mann–Whitney, Cochrane Q analysis and t-test to compare qualitative and quantitative data between the groups.

3. Results

A total of 40 patients participated in the study after exclusion of other patients who did not fit the inclusion criteria initially. The average age of the patients in the lidocaine group was 41.5 years and 39.5 years in the bupivacaine group. In the lidocaine group, 19 patients were male and 21 were female whereas in the bupivacaine group, 16 patients were male and 24 were female. No significant differences between age and gender (P > 0.05) were found in both groups. The summary of the demographic data of all patients in both groups is shown in Table 1.

Almost half of the patients in the lidocaine group had no pain at all time intervals while in the bupivacaine group, more than two thirds of the patients had no postoperative pain at all time intervals.

In the lidocaine group, 12.5% of patients had no pain, 50% had mild pain, 12.5% had moderate pain and 25% had severe pain at 6 h. While at 12 h, 25% had no pain, 40% had mild pain, 20% had moderate pain and 15% had severe pain. At 24 h, 50% had no pain, 25% had mild pain, 15% had moderate pain and 10% had severe pain (Table 2 and Fig. 1).

In the bupivacaine group, 75% of patients had no pain, 20% had mild pain and 5% had moderate pain at 6 h. While at 12 h, 50% had no pain, 42.5% had mild pain and 6.5% had moderate pain. At 24 h, 87.5% had no pain, 7.5% had mild pain and 5% had moderate pain (Table 3 and Fig. 2).

There was no significant difference between age, gender and the level of postoperative pain in both the lidocaine and bupivacaine groups (P > 0.05).

Cochrane Q test of the patients’ levels of pain showed that the patients who received lidocaine as the anesthetic agent had significantly more postoperative pain after root canal treatment (P < 0.05), although this had significantly decreased by 24 h. The bupivacaine group patients reported significantly lower postoperative pain levels at 6 and 12 h compared with the patients who had received lidocaine (P < 0.05).

4. Discussion

This research was designed to test the effect of using long-acting anesthetics compared to short acting one on postoperative pain in patients with irreversible pulpitis. Most of the evidence based on Pubmed search is on the effect of using long acting anesthetics on postoperative pain after tooth extraction and this is why such a study is important where the model used is on postoperative pain after root canal treatment (Bouloux and Punnia-Moorothy, 1999; Volpato et al., 2005).
This study had shown that the bupivacaine group patients reported significantly less pain during the postoperative periods (6 and 12 h) after root canal treatment with irreversible pulpitis compared with the lidocaine group patients ($P < 0.05$), whereas no significant differences were found at 24 h time intervals ($P < 0.05$).

The pain experienced by the patients was assessed using VAS in this study. Several investigations have used it for pain ratings after root canal treatment (Jalalzadeh et al., 2010; Asgary and Eghbal, 2010). A meta-analysis and systematic review on pain after root canal treatment reported that during the first 24 h after treatment, pain is minimum (Pak and White, 2011). Another systematic review and meta-analysis reported that the incidence of pain in patients after single-visit root canal treatment was significantly lower than in patients who received multiple-visit endodontic treatment (Su et al., 2011). This is the reason why all the teeth in this study were treated in a single appointment.

In the present study, pain killers were prohibited to avoid result bias although one might argue that analgesic medication should be prescribed for patients to use if they feel pain after root canal treatment. This aspect was made clear to all patients before starting the study and they were given the right to withdraw from the study at anytime. This analgesic aspect is contrary to many previous studies where they prescribed or allowed patients to use medication if they felt pain to assess the effect of either medication or procedures on the pain of a patient’s experience (Rosenberg et al., 1998; Ince et al., 2009; Jalalzadeh et al., 2010).

Several approaches were used to control pain after root canal treatment and one of them is to use long acting anesthetics. The underlying principle for this is to obstruct the passage of nociceptive impulses for a longer period of time to prevent central hyperalgesia at the early stage of inflammation after root canal treatment (Keiser and Hargreaves, 2002).

The evidence of using long acting anesthetic agent in endodontic is sparse and has many flaws. Most of pain control studies were conducted using the tooth extraction model (Gregorio et al., 2008; Trullenque-Eriksson and Guisado-Moya, 2011) while this study used the root canal treatment model. Few studies were done using bupivacaine as a local anesthetic to control post endodontic pain and these studies have many flaws such as using teeth in both the maxillary and mandibular arches, teeth with various pulp conditions (infected canals and pulpitis), several endodontic procedures (periapical surgery, root canal preparation), the studies had small sample size in each group, the patients were mostly women, and use of analgesic (Rosenberg et al., 1998; Parirokh et al., 2012). All of these factors can influence the results of the study (Ng et al., 2004; Alaçam and Tinaz, 2002). Hence, in the present study, only mandibular molar teeth were used with irreversible pulpitis and no history of analgesic within the last 24 h.

In the present study most of the patients who had moderate-to-severe pain were the patients who received lidocaine rather than the patients who received bupivacaine. This study...
confirmed the investigation made by Parirokh et al., 2012 that most patients reported the highest postoperative pain levels in the early stages after root canal treatment. As the duration progresses, the number of patients with mild or no pain increases and the number of patients with moderate-to-severe pain decreases (Parirokh et al., 2012). Likewise, this present study observed the same pain pattern. The only difference in this study is that no pain killers were used to avoid another effect on the patients.

In the present study, more patients who received bupivacaine felt no pain at 6 h after root canal treatment than patients who received lidocaine ($P < 0.05$). This would give the patients an alternative to choose between having long duration of anesthesia and no pain, for as long as the dentist has explained to the patients the advantages and disadvantages prior to the treatment.

The results of the present study have shown that patients who had been anesthetized with bupivacaine reported significantly lower pain rate after root canal treatment ($P < .05$) even if the patients did not have sensitivity to percussion before starting treatment or did not experience spontaneous pain. Therefore, the use of bupivacaine is recommended to be one of the main strategies to control pain whether patients feel sensitivity to percussion or they are free of preoperative pain.

In conclusion, the use of long acting local anesthetic can significantly reduce the postoperative pain in teeth with irreversible pulpitis. Using bupivacaine will cause less pain when used for long periods compared to lidocaine when used in the early postoperative periods after treatment of the root canal.

**Conflict of Interest**

The authors have no known conflicts of interest associated with this study and there has been no significant financial support for this work that could have influenced its outcome.

**References**


