**Long buccal nerve block injection pain in patients with irreversible pulpitis**

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**Objectives.** The purpose of this study was to determine the pain associated with needle insertion (with or without topical anesthetic) and solution deposition for the long buccal nerve block injection in patients with irreversible pulpitis. Initial pain and any differences by age and gender were also studied.

**Study design.** One hundred twelve emergency patients with irreversible pulpitis received long buccal nerve block injections using 2% lidocaine with 1:100,000 epinephrine. The patients recorded pain of needle insertion and solution deposition on a Heft-Parker visual analog scale (VAS).

**Results.** Moderate-to-severe pain occurred from 41% to 46% of the time with the long buccal nerve block. The use of topical anesthetic did not statistically decrease the pain of needle insertion.

**Conclusions.** In conclusion, 41% to 46% of patients presenting with irreversible pulpitis have the potential for moderate-to-severe pain with the long buccal nerve block. (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2011; 112:e51-e54)

The long buccal nerve block (buccal nerve block) is commonly used for soft tissue anesthesia of the buccal surface of molar teeth during rubber dam clamp placement. The buccal nerve is a branch of the anterior division of V3 and supplies sensory innervation to the buccal gingiva of the mandibular molars. The nerve does not supply sensory innervation to the lower lip. Generally, the buccal nerve block is administered immediately after the inferior alveolar nerve block.

Fear of a dental injection can prevent patients from seeking dental care. Often this fear is related to the feeling of needle penetration and pain during the injection. The long buccal nerve block has 2 phases: initial needle insertion through the alveolar mucosa and deposition of the anesthetic solution at the target site.

Although the pain of injection associated with the inferior alveolar nerve block has been studied in patients with irreversible pulpitis, there are no objective studies addressing injection pain of the long buccal nerve block in patients presenting with irreversible pulpitis. The purpose of this study was to determine the pain associated with needle insertion and solution deposition for the long buccal nerve block in patients presenting with irreversible pulpitis.

**MATERIAL AND METHODS**

One hundred twelve buccal nerve block injections from 112 emergency patients with irreversible pulpitis were studied. The patients were in good health as determined by a written health history and oral questioning. Exclusion criteria were as follows: younger than 18 years of age; allergies to local anesthetics or sulfites; pregnancy; history of significant medical conditions (ASA Class II or higher); taking any medications (over-the-counter pain relieving medications, narcotics, sedatives, or antianxiety or antidepressant medications) that may affect pain assessment; active sites of pathosis in area of injection; and inability to give informed consent. The patients were part of 2 anesthetic studies conducted at The Ohio State University. The Ohio State University — Human Subjects Committee approved each study and informed consent was obtained from each patient.

Each patient had a vital mandibular molar tooth, was actively experiencing pain, and had a prolonged response to cold testing with Endo-ice (1,1,1,2 tetrafluoroethane; Hygenic Corporation, Akron, OH). Patients with no response to cold testing or periapical pathosis (other than a widened periodontal ligament) were excluded from the study. Therefore, each patient had a tooth that fulfilled the criteria for a clinical diagnosis of irreversible pulpitis.

Before the injections, patients were instructed to rate their initial presenting pain and the pain experienced for each phase of the long buccal nerve block injection:
initial needle insertion into the alveolar mucosa and deposition of the anesthetic solution at the target site. The patients rated their pain on a 170-mm Heft-Parker visual analogue scale (VAS) (Fig. 1). The VAS was divided into 4 categories. No pain corresponded to 0 mm. Mild pain was defined as greater than 0 mm and 54 mm or less. Mild pain included the descriptors of faint, weak, and mild pain. Moderate pain was defined as greater than 54 mm and less than 114 mm. Severe pain was defined as equal to or greater than 114 mm. Severe pain included the descriptors of strong, intense, and maximum possible.

One operator placed topical anesthetic gel (20% benzocaine, Patterson Dental, Supply, Inc., St. Paul, MN) at the buccal nerve block injection site for 60 seconds using a cotton tip applicator after the site was dried with a 2 × 2 sterile gauze (48 subjects).5 The other operator did not use topical anesthetic (64 patients).6 For the long buccal nerve block, each operator used a standardized method of administering the long buccal nerve block1 as follows. The area of insertion was the mucous membrane distal and buccal to the most distal molar tooth in the arch. The target site for this injection was the buccal nerve as it passes over the anterior border of the ramus and continues forward to innervate the buccal soft tissue of the mandibular molars. The injection was administered using a 27-gauge 1-inch needle (Monoject, Sherwood Medical, St. Louis, MO). One quarter (0.45 mL) of a standard cartridge of 2% lidocaine with 1:100,000 epinephrine (AstraZeneca LP, York, PA) was administered with a conventional aspirating syringe (AstraZeneca LP). All anesthetic solution cartridges were checked to ensure that expiration dates were acceptable.

For needle insertion and solution deposition, the technique used was as follows. After initial needle penetration to a depth of 2 to 3 mm, the anesthetic solution (0.45 mL) was injected over a period of 15 seconds. The principal investigator5,6 of the respective studies administered each buccal nerve block injection. All patients received an inferior alveolar nerve block before receiving the buccal nerve block.

Comparisons between the 2 studies5,6 for patient age, initial pain, long buccal nerve block needle insertion pain, and deposition pain were made using independent t tests, whereas comparisons for patient gender were made using the χ² test. With the patients of both studies combined, we made gender comparisons for age, initial pain, long buccal nerve block needle insertion pain, and deposition pain again using the independent t tests. Comparisons were considered significant if P was less than .05.

**RESULTS**

A total of 112 adult patients, 53 men and 59 women, from age 18 to 76 years with an average age of 33 years, participated. One study6 enrolled 64 adult patients, 33 men and 31 women, from age 19 to 76 years of age with an average age of 35 years. The other study5 enrolled 48 adult patients, 20 men and 28 women, from age 18 to 68 years with an average age of 31 years. There was no significant difference in age between the 2 studies.

One study6 had an initial presenting pain rating of 111 and the other rating was 104.5 There was no significant difference between the 2 studies.

Combined results of both studies for mean VAS ratings and percentage of discomfort ratings for needle insertion and solution deposition are summarized in Table I. Needle insertion pain had an incidence of 31% moderate pain and 10% severe pain. The mean pain score was in the upper level of mild pain (Fig. 1). There was no statistical difference between the pain for males or females with respect to needle insertion pain. There was also no significant difference between the studies regarding needle insertion pain and the use of topical anesthesia.

Solution deposition pain had an incidence of 36% moderate pain and 10% severe pain. The mean pain score was in the upper level of mild pain (Fig. 1). There was no statistical difference between the pain for males or females with respect to solution deposition pain.

![Heft-Parker VAS used for assessment of pain. The millimeter demarcations were not shown on the patients’ VAS.](image-url)
DISCUSSION

The mean initial pain ratings of 1045 and 1116 would indicate moderate pain on the VAS (Fig. 1). This pain is representative of patients with an irreversible pulpitis who present for emergency treatment.7-10

Thirty-one percent of the patients rated the pain of needle insertion as moderate and 10% rated the pain as severe (Table I). No study has rated the pain of needle insertion for the long buccal nerve block in asymptomatic subjects or in patients presenting with irreversible pulpitis. However, in a retrospective study of 1635 injections, Nusstein and Beck11 reported a 13% to 19% incidence of moderate pain and a 1% to 3% incidence of severe pain on needle insertion for the inferior alveolar nerve block in asymptomatic subjects. For the inferior alveolar nerve block in patients with irreversible pulpitis, McCartney et al.4 reported 55% to 59% of patients rated the pain of needle insertion as moderate and 2% to 9% rated the pain as severe. The higher incidence of pain with needle insertion in the McCartney et al.4 and the current study may relate to the fact that patients were in pain and probably anxious.

The use of topical anesthesia did not eliminate needle insertion pain because there was no statistical difference between the study that used topical anesthesia (48 patients) and the one that did not (64 patients). Nusstein and Beck,11 Nakanishi et al.,12 and Meechan et al.13 reported that 20% benzocaine was not completely effective in reducing needle insertion pain for the inferior alveolar nerve block in asymptomatic patients. Martin et al.14 found that if patients thought they were receiving topical anesthetic, whether they did or not, they anticipated less pain on injection. Therefore, the most important aspect of using topical anesthetic agents may not be its clinical effectiveness, but rather the psychological effect on the patient who feels the clinician is doing everything possible to prevent pain. Further research needs to address ways to reduce pain during needle insertion for the long buccal nerve block.

For anesthetic solution deposition, 36% of the patients rated the pain as moderate and 10% rated the pain as severe (Table I). No study has rated the pain of anesthetic solution deposition for the long buccal nerve block in asymptomatic subjects or in patients presenting with irreversible pulpitis. Previous studies15-18 of solution deposition for the inferior alveolar nerve block in asymptomatic subjects have reported an incidence of moderate-to-severe pain ranging from 20% to 40% using 1.8 mL of 2% lidocaine with 1:100,000 epinephrine. For the inferior alveolar nerve block in patients with irreversible pulpitis, McCartney et al.4 reported 52% of patients rated the pain of solution deposition as moderate and 14% to 21% rated the pain as severe. Again, the higher ratings in the McCartney et al.4 and the current study could be related to anxiety and patients being in pain.

The rate of anesthetic solution deposition was 0.45 mL in 15 seconds. Perhaps a slower injection would decrease pain. Kanaa and coauthors19 found a slow inferior alveolar nerve block injection (60 seconds) was more comfortable than a rapid injection (15 seconds). One way to give a slow injection is to use a computer-controlled anesthetic delivery system. Hochman et al.20 advocated the use of the Wand (CompuDent; Milestone Scientific, Livingston, NJ, USA) computer-controlled local anesthetic delivery system to decrease the pain of injection. In general, the results have been favorable21-26 with the delivery system, with 2 studies showing no difference27,28 and 1 study showing higher pain ratings.29 However, the system does not produce a painless injection.21-26 Further research needs to address ways to reduce pain during anesthetic solution deposition.

CONCLUSIONS

In conclusion, for patients presenting with irreversible pulpitis, moderate-to-severe pain may occur from 41% to 46% of the time with the long buccal nerve block. The use of topical anesthetic did not statistically decrease the pain of needle insertion. Further research is indicated to reduce the pain associated with the long buccal nerve block.

REFERENCES


Table I. Mean visual analog scale and percentage of discomfort ratings for each injection phase of the long buccal nerve block (n = 112)

<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
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<tr>
<td>Mean (± SD)</td>
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<td>Needle insertion:</td>
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<td>47.4 (± 41)</td>
<td>14% (16/112)</td>
<td>45% (50/112)</td>
<td>31% (35/112)</td>
<td>10% (11/112)</td>
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<td>Solution deposition:</td>
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<td>49.8 (± 42)</td>
<td>15% (17/112)</td>
<td>39% (44/112)</td>
<td>36% (40/112)</td>
<td>10% (11/112)</td>
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*There were no significant differences (P > .05) for needle insertion or solution deposition pain.


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