

A comparison of injection pain with articaine with adrenaline, prilocaine with phenylpressin and lidocaine with adrenaline

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Abstract

Objective: The objective of the present study was to investigate the pain on injection of articaine with adrenaline, prilocaine with phenylpressin, and lidocaine with adrenaline. **Study Design:** The study sample was comprised of 497 consecutively seen patients received 497 maxillary buccal infiltration injections or inferior alveolar block injections of 4% articaine with 1:200.000 adrenaline, 3% prilocaine with 1.08mcg phenylpressin, or 2% lidocaine with 1:100.000 adrenaline. Immediately after the injection, patients were asked to rate their injection pain on a six-point scale. **Results:** There were no significant differences among the anesthetic solutions for injection pain. Patients usually reported mild or no injection pain for all of anesthetic administrations. **Conclusion:** Under the conditions of this study that lidocaine with adrenaline, articaine with adrenaline and prilocaine with phenylpressin seemed to be similar for pain on injection and they could be quite painless.

Key words: Maxillary local anesthesia, inferior alveolar block injection, injection pain, articaine, prilocaine, lidocaine.

Introduction

Dental anxiety constitutes a major problem for patients and dental care providers alike (1). Pain control is an important factor for reducing the fear and anxiety associated with dental procedures (2). The discovery of local anesthesia has enabled modern dentistry to be performed painlessly. The improvements in agents and techniques for local anesthesia improve the dental treatment. However, needle was found to lead the anxiety-provoking stimulus in the dental situation (3).

A variety of anesthetic agents are available that provide rapid onset of surgical anesthesia with adequate duration. The 2% lidocaine with 1:100,000 epinephrine is considered the standard for comparison with newer anesthetics. Lidocaine with epinephrine rapidly induces oral anesthesia and provides surgical anesthesia that last 90-180 minutes. Prilocaine hydrochloride can provide excellent anesthesia with or without a vasoconstrictor. The 4% articaine with

epinephrine may provide practitioners with an alternative to the currently available dental local anesthetics (4).

Although the anesthetics effect can lead to a relatively painless dental procedure, the delivery of local anesthetic solutions can be uncomfortable, with pain resulting not only from the needle puncturing the mucosa, but also because of properties of the anesthetic solutions themselves (5). The choice of local anesthetic solution may influence the amount of discomfort produced during intraoral injection (6). The painfulness local anesthetic injections may be related to the pH of the injected solution (5, 7). Local anesthetic solutions with low pH have been thought to cause a burning sensation and thus more pain than anesthetics with more neutral pH (8).

There have been some studies comparing the pain on injection of different anesthetic solutions. In 1999, Kramp et al (9) reported that lidocaine with epinephrine caused significantly more pain than did prilocaine plain. In a

study with the same drugs Wahl et al. (10) showed a trend in the same direction, although the difference was not statistically significant. Haas et al. (11) did not find any statistical difference between articaine and prilocaine with respect to palatal anesthesia. Oliveira et al. (2) reported similar pain experience between articaine and lignocaine in relation to palatal pain sensitivity.

The objective of the present study was to investigate the pain on injection of articaine with adrenaline, prilocaine with phenylpressin, and lidocaine with adrenaline.

Materials and Methods

The study sample was comprised of 497 consecutively seen patients (247 male, 250 female) older than 18 years of age who had been in good health and not taken any medications. The patients were all scheduled for routine dental procedures with one of two dentists in oral and maxillofacial surgery department (Dentist 1 was male, Dentist 2 was female). Patients participating in this study had only one injection and they were asked to rate pain of the injection they had just received. Patients who had two or more injections were excluded from the study.

Before injection, in each case topical anesthetic were applied with a cotton applicator approximately five to 10 seconds. For maxillary teeth, buccal infiltration injections were used, for mandibular teeth, inferior alveolar block injections were used. Palatal or other types of injections were not included in the study. After aspirating, the dentist injected the anesthetic solution slowly to minimize discomfort and trauma. The local anesthetic injected was either 4% articaine with 1:200.000 adrenaline, 3% prilocaine with 1.08mcg phenylpressin, or 2% lidocaine with 1:100.000 adrenaline. To blind both the dentists and patients to the identify of the anesthetic used, the manufacturer’s sticker was removed from each anesthetic cartridge.

Immediately after the injection, the patients were asked to rate their injection pain on a six-point scale:

- 0 : no pain
- 1 : mild pain
- 2 : moderate pain
- 3 : distressing pain
- 4 : horrible pain
- 5 : unbearable pain.(12)

Data were statistically analysed using Mann-Whitney U and Kruskal Wallis test. Comparisons were considered significant at $p < 0.05$.

Results

The mean age of the study participants was 31.94 years (range, 18-80). A total of 497 injections were included in the analysis. Dentist 1 administrated 246 injections (81 injections of 2% lidocaine with 1:100.000 adrenaline, 81 injections of 4% articaine with 1:200.000 adrenaline, and 84 injections of 3% prilocaine with 1.08mcg phenylpressin), and Dentist 2 administrated 251 injections (83 injections of 2% lidocaine with 1:100.000 adrenaline, 82 injections of 4% articaine with 1:200.000 adrenaline, and 86 injections of 3% prilocaine with 1.08mcg phenylpressin) (Table 1). There were no significant differences among the anesthetic solutions for injection pain ($p=0.459$) (Table 2).

Although the 40 to 59 year old patients had lower pain and the 18 to 39 year old patients had higher pain, there were no significant differences between the injection pain and age groups ($p=0.083$). The effect of injection location also was not significant ($p=0.423$). Data showed significant differences for injection pain between patient’s sex ($p=0.0002$). For each dentist, female patients had more injection pain than that of male patients. Although patients had rated lower pain for the male dentist’s injection, there were no significant differences between the injection pain and two dentists ($p=0.054$).

Table 1. Comparisons between subgroups.

Patient Variable	Lidocaine	Articaine	Prilocaine	All
Age in years				
18 to 39	128 (78.0 %)	128 (78.5 %)	116 (68.2 %)	372 (74.8 %)
40 to 59	29 (17.7 %)	24 (14.7 %)	38 (22.4 %)	91 (18.3 %)
60 to 85	7 (4.3 %)	11 (6.7 %)	16 (6.8 %)	34 (6.8 %)
Sex				
Female	82 (50.0 %)	81 (49.7 %)	87 (51.2 %)	250 (50.3 %)
Male	82 (50.0 %)	82 (50.3 %)	83 (48.8 %)	247 (49.7 %)
Location of Injection				
Maxillary anterior	29 (17.7 %)	25 (15.3 %)	30 (17,6 %)	84 (16.9 %)
Maxillary posterior	40 (24.4 %)	26 (16.0 %)	29 (17.1 %)	95 (19.1 %)
Mandibular	95 (57.9 %)	112 (68.7 %)	111 (65.3 %)	318 (64.0 %)
Administering Dentist				
1	81 (49.4 %)	81 (49.7 %)	84 (49.4 %)	246 (49.5 %)
2	83 (50.6 %)	82 (50.3 %)	86 (50.6 %)	251 (50.5 %)
TOTAL	164 (100.0 %)	163 (100.0 %)	170 (100.0 %)	497 (100.0%)

Table 2. Reported pain scores for lidocaine with adrenaline, articaine with adrenaline and prilocaine with phenylpressin.

ANESTHETIC	NUMBER (PERCENTAGE) OF PATIENTS					
	0 (No Pain)	1 (Mild Pain)	2 (Moderate Pain)	3 (Distressing Pain)	4 (Horrible Pain)	5 (Unbearable Pain)
Lidocaine with adrenaline n = 164	69(13.9%)	52(10.5%)	31(6.2%)	8(1.6%)	3(0.6%)	1(0.2%)
Articaine with adrenaline n = 163	56(11.3%)	67(13.5%)	25(5%)	13(2.6%)	1(0.2%)	1(0.2%)
Prilocaine with Phenylpressin n = 170	71(14.3%)	59(11.9%)	32(6.4%)	7(1.4%)	1(0.2%)	0 (0.0 %)

Discussion

This study showed that for inferior alveolar block injections and for maxillary buccal injections, there was not a statistically significant difference in pain response between patients who received lidocaine with 1:100.000 adrenaline, patients who received articaine with 1:200.000 adrenaline and patients who received prilocaine with 1.08mcg phenylpressin. There were two factors that may account this result. First, our study involved topical anesthetic administration before each injection because of routine used before injections in clinical practice. Although, there is no evidence that topical anesthetics have any value in reducing the discomfort of deep regional block administrations such as inferior alveolar nerve block injections, preparation of the surface tissues before needle penetration is important for overcoming dental injection pain (13). In Wahl et al. (10) study topical anesthetic was used and they found no significant difference in pain perception between the injection of prilocaine plain vs. that of lidocaine with 1:100.000 epinephrine. However, in Kramp et al. (9) study topical anesthetic was not used to eliminate that potential variable and they found that the injection of prilocaine plain was perceived as less painful that of lidocaine with 1:100.000 epinephrine. Second, there were no significant differences between the pH of lidocaine with 1:100.000 adrenaline (pH approximately 4.5), articaine with 1:200.000 adrenaline (pH 4 to 6) and prilocaine with 1.08mcg phenylpressin (pH 3.5 to 5.2). Wahl et al. (5) found that the pain of injecting bupivacaine with epinephrine (pH 3.3 to 5.5) was statistically significantly greater than that of prilocaine plain (pH 6.0 to 7.0) and they reported that the painfulness of local anesthetic injections might be related to the pH of the injected solution.

The data showed that the effect of injection location was not significant. However, we did not include palatal injections in our study. In Wahl et al. (5) study patients reported that posterior palatal injections were more painful than maxillary buccal anterior infiltration, maxillary buccal posterior infiltration and inferior alveolar block injections.

Data showed statistically significant differences for injection pain between male and female patients. Female patients reported higher pain than did male patients for each dentist similar to Wahl et al study (5). Female patients might be sensitive to pain or tend to report more pain. However, a study (10) analysed the pain response showed no statistically significant differences for injection pain between patient's sex. Wahl et al. (10) found that older patients showed lower pain ratings than younger and middle-aged patients. However, Boronat López et al.(14) reported that the anesthetic efficiency is particularly related to the bone density of patients in terms of age. Patients with advanced age, present an increased bone density which leading to deficient anesthesia. In this study the 40 to 59 year old patients had lower pain and the 18 to 39 year old patients had higher pain. However, there were no significant differences between the injection pain and age groups. Although the injection pain values did not present a statistically significant difference ($p=0.054$), patients reported that injection administrations by Dentist 2 were more painful than injection administrations by Dentist 1. This might be related to the ability differences among the two dentists.

Conclusion

Under the conditions of this study it can be concluded that for inferior alveolar block injections and for maxillary buccal injections, there were no differences between lidocaine with 1:100.000 adrenaline, articaine with 1:200.000 adrenaline and prilocaine with 1.08mcg phenylpressin in relation to injection pain. Patients usually reported mild or no injection pain for all of anesthetic administrations. It may be because of the application of topical anesthetic before injections and the slow injection of anesthetic solutions. Lidocaine with 1:100.000 adrenaline, articaine with 1:200.000 adrenaline and prilocaine with 1.08mcg phenylpressin seemed to be similar for pain on injection and they could be quite painless.

References

1. Stabholz A, Peretz B. Dental anxiety among patients prior to different dental treatments. *Int Dent J*. 1999 Apr;49(2):90-4.
2. Oliveira PC, Volpato MC, Ramacciato JC, Ranali J. Articaine and lignocaine efficiency in infiltration anaesthesia: a pilot study. *Br Dent J*. 2004 Jul 10;197(1):45-6.
3. Peretz B, Efrat J. Dental anxiety among young adolescent patients in Israel. *Int J Paediatr Dent*. 2000 Jun;10(2):126-32.
4. Hawkins JM, Moore PA. Local anesthesia: advances in agents and techniques. *Dent Clin North Am*. 2002 Oct;46(4):719-32.
5. Wahl MJ, Schmitt MM, Overton DA, Gordon MK. Injection pain of bupivacaine with epinephrine vs. prilocaine plain. *J Am Dent Assoc*. 2002 Dec;133(12):1652-6.
6. Kennedy M, Reader A, Beck M, Weaver J. Anesthetic efficacy of ropivacaine in maxillary anterior infiltration. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2001 Apr;91(4):406-12.
7. Meechan JG. A comparison of ropivacaine and lidocaine with epinephrine for intraligamentary anesthesia. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2002 Apr;93(4):469-73.
8. Malamed SF. *Handbook of Local Anesthesia*. 4th ed. St Louis Mo: Mosby; 1997. p. 14-6.
9. Kramp LF, Eleazer PD, Scheetz JP. Evaluation of prilocaine for the reduction of pain associated with transmucosal anesthetic administration. *Anesth Prog*. 1999 Spring;46(2):52-5.
10. Wahl MJ, Overton D, Howell J, Siegel E, Schmitt MM, Muldoon M. Pain on injection of prilocaine plain vs. lidocaine with epinephrine. A prospective double-blind study. *J Am Dent Assoc*. 2001 Oct;132(10):1396-401.
11. Haas DA, Harper DG, Saso MA, Young ER. Comparison of articaine and prilocaine anesthesia by infiltration in maxillary and mandibular arches. *Anesth Prog*. 1990 Sep-Oct;37(5):230-7.
12. Hutchins HS Jr, Young FA, Lackland DT, Fishburne CP. The effectiveness of topical anesthesia and vibration in alleviating the pain of oral injections. *Anesth Prog*. 1997 Summer;44(3):87-9.
13. Meechan JG. Effective topical anesthetic agents and techniques. *Dent Clin North Am*. 2002 Oct;46(4):759-66.
14. Boronat López A, Peñarrocha Diago M. Failure of locoregional anesthesia in dental practice. Review of the literature. *Med Oral Patol Oral Cir Bucal*. 2006 Nov 1;11(6):E510-3.