Dental Research Journal

Original Article

The most painful site of maxillary anterior infiltrations

Roohollah Sharifi[1], Hesamedin Nazari[2], Peik Bolourchi[3], Saber Khazaei[4,1], Masoud Parirokh[5]

Departments of [1]Endodontics and [2]Oral and Maxillofacial Surgery, School of Dentistry, Kermanshah University of Medical Sciences, [3]Student Research Committee, School of Dentistry, Kermanshah University of Medical Sciences, Kermanshah, [4]Department of Endodontics and Dental Research Center, School of Dentistry, Isfahan University of Medical Sciences, Isfahan, [5]Endodontology Research Center, School of Dentistry, Kerman University of Medical Sciences, Kerman, Iran

Received: May 2016
Accepted: October 2016

Address for correspondence:
Dr. Saber Khazaei, Department of Endodontics and Dental Research Center, School of Dentistry, Isfahan University of Medical Sciences, Hezar Jerib Street, 81746-73461, Isfahan, Iran.
E-mail: saber.khazaei@yahoo.com

ABSTRACT

Background: The purpose of this study was to determine the most painful site of infiltration injection in the anterior part of maxilla.

Materials and Methods: This single-blinded clinical trial was conducted on thirty healthy volunteers. The participants received three maxillary infiltrations injected at the region of central and lateral incisors as well as canines at three separated appointments with a 2-week interval. The outcome variable was pain that measured immediately after needle insertion (time = 0) and during injection of anesthetic solution in 5, 30, and 55 s by a visual analog scale. Data were analyzed by SPSS software version 16 using Friedman test.

Results: There was no statistically significant difference in terms of needle insertion pain and during injection (time = 0, 5, 30, and 55 s) ($P = 0.319$, $P = 0.849$, $P = 0.627$, and $P = 0.939$, respectively) in the three injection sites.

Conclusion: The pain intensity of infiltration was not associated with injection sites in the anterior maxilla.

Key Words: Anesthesia, infiltration, maxillary, pain, teeth

INTRODUCTION

Providing an effective, safe, and painless anesthesia is one of the most important skills of a dentist. Anesthetic injection is probably the most significant cause of patients' fear, and an inability to favorably control the pain with minimal discomfort in patients has still remained a noticeable challenge for dentists. Providing a proper anesthesia depends on sufficient knowledge about the anatomy of nervous system, familiarity with the anesthetics, and recognition of existing techniques.[1] The importance of a desired and painless anesthesia for patients is revealed when two factors of "patient's health" and "a painless injection" have been reported by patients while selecting their dentist.[2]

Pain is an unpleasant sensation and an exciting experience accompanied by actual or possible tissue damages.[3] It has been shown that pain on injection prevents patient's cooperation, but successful anesthesia enhances patient's cooperation, which can lead to facilitation of treatment procedures by dentist.[4] Given the importance of pain control during dental treatments, several studies have been performed

Access this article online

Website: www.drj.ir
www.drjjournal.net
www.ncbi.nlm.nih.gov/pmc/journals/1480

How to cite this article: Sharifi R, Nazari H, Bolourchi P, Khazaei S, Parirokh M. The most painful site of maxillary anterior infiltrations. Dent Res J 2016;13:539-43.

on pain reduction during infiltration, including mild needle tremor and controlled injection technique by a machine,[5] using topical anesthesia to reduce pain during injection[6,7] and comparison of various anesthetic injection techniques in similar areas.[8]

Injection site has been reported as a factor affecting the pain perceived by the patient.[5,9,10] The dentists' awareness of the painful injection sites makes them more cautious and relaxed in their verbal and behavioral control to reduce pain, which contributes to improvements in the treatment process.[10]

It is necessary to identify painful injection sites and to make an attempt to minimize the pain on injection clinically. To our knowledge, few studies have been conducted about the effect of injection site on pain intensity.[11] Moreover, no investigation has been carried out to compare the pain intensity of infiltration in different sites of anterior portion of maxilla at the same time. Hence, the aim of the present study was to determine the most painful injection sites and to evaluate pain intensity at different infiltration sites in the anterior portion of maxilla.

MATERIALS AND METHODS

This single-blinded clinical trial was carried out on thirty volunteered samples. The participants were called over and selected based on the inclusion criteria of a clinical trial. This study was approved by the Regional Bioethics Committee of Kermanshah University of Medical Sciences and has been registered in the Iran Registry for Clinical Trial (IRCT2014091714333n20). All clinical analyses were carried out at the Endodontic Department of Kermanshah School of Dentistry, Kermanshah, Iran, from June to September, 2014. Participants in the study were volunteers and were allowed to quit at any stage of the study. Informed consent was also taken from the participants.

The inclusion criteria of the present study were general health, lack of allergy to lidocaine and epinephrine, no use of any anesthetic, sedatives, and antidepressants over the past 2 weeks, having at least six healthy maxillary anterior teeth without restoration and with proper response to vital tests, not feeling of pain in these six teeth in response to percussion and palpation stimuli, and no history of surgery on the anterior maxilla. The diagnosis of healthy pulp was performed via responses to electrical pulp tester (Parkell, Farmington, USA).

Infiltration was performed on each participant in one of the three regions adjacent to the apex of the maxillary central and lateral incisors and canines over three separated appointments with a 2-week interval. Fifteen participants received injection in the right maxilla and the other 15 participants received injection in the left maxilla. The selection of injection sites, whether right or left region, in each time and classification of participants were carried out randomly (simple method).

A cartridge containing 1.8 mL of 2% lidocaine and 1:80,000 epinephrine (persocaine-E, Daru Pakhsh, Tehran, Iran) was used for anesthetic administration. Needle 27 G (C-K JECT Korea) was used. The injections were performed in the vestibule at the root of maxillary central and lateral incisors and canines under similar conditions (beveled tip of the needle toward the bone, needle penetration depth of 4 mm, and cartridge discharge time of 1 min). The injection speed for all cases was the same (1.8 mL/1 min), and all injections were performed by one person (RSH).

Immediately after needle insertion, the perceived pain level was evaluated in participants through a visual analog scale (VAS) with 0 (no pain) to 10 (maximum pain) calibration by another person (PB) 5, 30, and 55 s during administration of anesthetic solution.[12,13] The participant has shown the amount of pain level which was on the VAS from 0 to 10 using his/her hand digits. The study was carried out with a single-blind design, and the evaluator of pain intensity was unaware of the injection sites. A VAS number was determined for each person, and pain intensity was classified into four levels: 0 = no pain; 1–3 = low pain; 4–6 = moderate pain; and 7–10 = severe pain.

Descriptive and bivariate statistics were computed by SPSS 16 (SPSS Inc., Chicago, IL, USA) using Friedman test with $P = 0.05$.

RESULTS

This study was performed on thirty healthy volunteers (17 male and 13 female) with the age range of 25–40 years during three stages with 2-week interval. There were no significant differences in pain level immediately after needle insertion between central incisors, lateral incisors, and canines [$P = 0.319$, Table 1]. The level of the pain during the injection on central and lateral incisors and canines in 5, 30, and 55 s was measured. The results of pain level comparison have shown no

significant difference between the central and lateral incisors and canines in each corresponding time of 5, 30, and 55 s [$P > 0.05$, Table 2]. There were significant differences between the times of interest (5, 30, and 55 s) during injection on central incisors, lateral incisors, and canines and the result has shown that the maximum level of pain was in 5 s and the minimum level of pain was in 55 s of injection time ($P < 0.001$) [Table 3, Figure 1].

DISCUSSION

The main aim of this study was to determine the most painful site of maxillary anterior infiltrations. Administration of anesthetics prior to dental treatments is one of the most common procedures during dental treatments, which can basically, due to induction of pain, prevent the patient from visiting the dentist, or cause the incidence of such problems as anxiety during treatment. Several methods have been introduced to reduce the pain due to anesthetic injection, including the use of topical anesthetic gel such as benzocaine,[7] heating the anesthetic agents,[14] buffering the anesthetic,[15] distraction technique,[16] and regulation of injection speed.[17] The type of anesthetic solution, needle size, injection speed, and using topical anesthetics are some factors that have been investigated.[18]

Table 1: Pain level immediately after needle insertion

Region	*n*	Pain level (%)				Mean rank	*P**
		No pain	Low	Moderate	High		
Central	30	1 (3.3)	23 (76.7)	6 (20)	0	2.07	0.319
Lateral	30	7 (23.3)	17 (56.7)	5 (16.7)	1 (3.3)	1.87	
Canine	30	2 (6.7)	21 (70)	7 (23.3)	0	2.07	

*Test Friedman

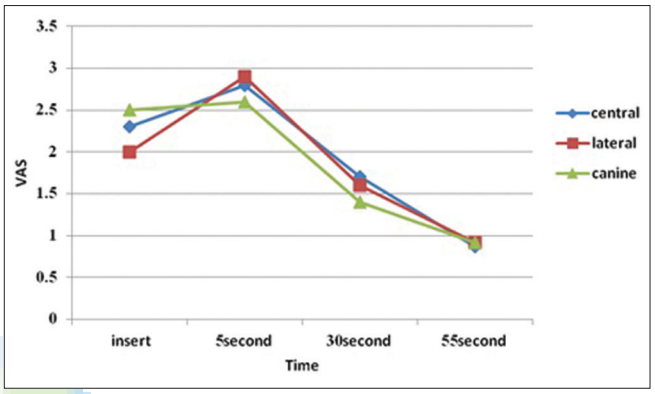

Figure 1: Level of pain during the injection on central incisors, lateral incisors, and canines at the three time periods.

Table 2: Injection pain in different sites at 5, 30, and 55 s after injection

Time (s)	Region	*n*	Pain intensity (%)				Mean rank	*P**
			No pain	Low	Moderate	High		
5	Central	30	5 (16.7)	16 (53.3)	7 (23.3)	2 (6.7)	1.95	0.849
	Lateral	30	3 (10)	17 (56.7)	9 (30)	1 (3.3)	2.05	
	Canine	30	2 (6.7)	21 (70)	6 (20)	1 (3.3)	2.00	
30	Central	30	8 (26.7)	19 (63.3)	2 (6.7)	1 (3.3)	2.07	0.627
	Lateral	30	9 (30)	17 (56.7)	4 (13.3)	0	2.02	
	Canine	30	10 (33.3)	17 (56.7)	3 (10)	0	1.92	
55	Central	30	17 (56.7)	11 (36.7)	2 (6.7)	0	2.02	0.939
	Lateral	30	17 (56.7)	12 (40)	1 (3.3)	0	1.97	
	Canine	30	16 (53.3)	13 (43.3)	1 (3.3)	0	2.02	

*Test Friedman

Table 3: Injection pain in different injection sites in terms of the time after administration

Region	Time (s)	*n*	Pain intensity (%)				Mean rank	*P**
			No pain	Low	Moderate	High		
Central	5	30	5 (16.7)	16 (53.3)	7 (23.3)	2 (6.7)	2.38	<0.001
	30	30	8 (26.7)	19 (63.3)	2 (6.7)	1 (3.3)	2.05	
	55	30	17 (56.7)	11 (36.7)	2 (6.7)	0	1.57	
Lateral	5	30	3 (10)	17 (56.7)	9 (30)	1 (3.3)	2.53	<0.001
	30	30	9 (30)	17 (56.7)	4 (13.3)	0	1.97	
	55	30	17 (56.7)	12 (40)	1 (3.3)	0	1.50	
Canine	5	30	2 (6.7)	21 (70)	6 (20)	1 (3.3)	2.50	<0.001
	30	30	10 (33.3)	17 (56.7)	3 (10)	0	1.93	
	55	30	16 (53.3)	13 (43.3)	1 (3.3)	0	1.57	

*Test Friedman

The findings of the present study showed a similar pain level immediately after injection (0 time) and infiltration in the central and lateral incisors and canines, indicating no significant difference between them. Given the lack of similar studies in this regard, it was not possible to compare the results with other studies. Primosch and Robinson[19] showed no significant difference in terms of needle insertion pain during maxillary buccal infiltration and palatal injections in canines. Aminabadi *et al.*[11] compared pain on injection in different areas of oral cavity and reported the minimum level of pain for the posterior maxilla, followed by an increase of pain in the posterior mandible, anterior mandible, and anterior maxilla. Different levels of pain on injection in the anterior and posterior maxilla can be attributed to the anatomical differences in innervation and blood supply system as well as different injection techniques.

Pain perception is different in various areas of oral cavity, which depends on the distribution of nerve fibers of pain perception. For instance, oral mucosa and periodontal ligament contain the highest amount of nerve terminals, but the number of these nerve terminals is significantly low in submucosal areas.[20] Accordingly, lack of difference in the pain level between the three studied areas can be explained by rather similar location of the teeth in the anterior maxilla and similar injection technique in terms of tissue and injection depth.

The findings also showed that the maximum level of pain was in 5 s of injection, followed by a reduction in 30 and 55 s in central incisors, lateral incisors, and canine areas, which was statistically significant. To explain the reduction trend of pain over time, Kudo[3] reported that a time interval is required for diffusion of the administered solution to induce anesthesia. Accordingly, the least time needed to induce anesthesia in the oral mucosa can be attributed to the time required for the anesthetic diffuses and reach the receptors in the oral mucosa.

Furthermore, the findings of this study indicated no difference between infiltration of maxillary central and lateral incisors and canines in terms of needle insertion pain and pain level during infiltration. It seems that selection of any of these areas for injection depends on the ability and skill of the dentist and clinical condition of the patient.

One of the limitations of this study was that although the study was conducted with a cross-over design, the anxiety level of the patients, which could affect the pain as a confounding factor, was not evaluated, and their psychological reaction to the anxiety resulting from injection or their compatibility with study conditions might be different during the three stages of the study.

CONCLUSION

The pain intensity of infiltration was not associated with injection sites in the anterior portion of the maxilla.

ACKNOWLEDGMENTS

This article is based on a thesis submitted to the graduate studies office in fulfillment of requirements for the degree of dentistry at the School of Dentistry, Kermanshah University of Medical Sciences, Iran.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or non-financial in this article.

REFERENCES

1. Saxena P, Gupta SK, Newaskar V, Chandra A. Advances in dental local anesthesia techniques and devices: An update. Natl J Maxillofac Surg 2013;4:19-24.
2. Reed KL, Malamed SF, Fonner AM. Local anesthesia part 2: Technical considerations. Anesth Prog 2012;59:127-36.
3. Kudo M. Initial injection pressure for dental local anesthesia: Effects on pain and anxiety. Anesth Prog 2005;52:95-101.
4. Meechan JG, Day PF. A comparison of intraoral injection discomfort produced by plain and epinephrine-containing lidocaine local anesthetic solutions: A randomized, double-blind, split-mouth, volunteer investigation. Anesth Prog 2002;49:44-8.
5. 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;44:87-9.
6. Nakanishi O, Haas D, Ishikawa T, Kameyama S, Nishi M. Efficacy of mandibular topical anesthesia varies with the site of administration. Anesth Prog 1996;43:14-9.
7. Parirokh M, Sadeghi AS, Nakhaee N, Pardakhty A, Abbott PV, Yosefi MH. Effect of topical anesthesia on pain during infiltration injection and success of anesthesia for maxillary central incisors. J Endod 2012;38:1553-6.
8. Shirmohammadi A, Faramarzi M, Lafzi A, Kashefimehr A, Malek S. Comparison of pain intensity of anterior middle superior alveolar injection with infiltration anesthetic technique in maxillary periodontal surgery. J Periodontal Implant Sci 2012;42:45-9.

9. Chen-Scarabelli C, Scarabelli TM. Neurocardiogenic syncope. BMJ 2004;329:336-41.
10. Okawa K, Ichinohe T, Kaneko Y. Anxiety may enhance pain during dental treatment. Bull Tokyo Dent Coll 2005;46:51-8.
11. Aminabadi NA, Farahani RM, Oskouei SG. Site-specificity of pain sensitivity to intraoral anesthetic injections in children. J Oral Sci 2009;51:239-43.
12. McCormack HM, Horne DJ, Sheather S. Clinical applications of visual analogue scales: A critical review. Psychol Med 1988;18:1007-19.
13. Revill SI, Robinson JO, Rosen M, Hogg MI. The reliability of a linear analogue for evaluating pain. Anaesthesia 1976;31:1191-8.
14. Colaric KB, Overton DT, Moore K. Pain reduction in lidocaine administration through buffering and warming. Am J Emerg Med 1998;16:353-6.
15. Bartfield JM, Crisafulli KM, Raccio-Robak N, Salluzzo RF. The effects of warming and buffering on pain of infiltration of lidocaine. Acad Emerg Med 1995;2:254-8.
16. Touyz LZ, Lamontagne P, Smith BE. Pain and anxiety reduction using a manual stimulation distraction device when administering local analgesia oro-dental injections: A multi-center clinical investigation. J Clin Dent 2004;15:88-92.
17. Courtney DJ, Agrawal S, Revington PJ. Local anaesthesia: To warm or alter the pH? A survey of current practice. J R Coll Surg Edinb 1999;44:167-71.
18. Parirokh M, V Abbott P. Various strategies for pain-free root canal treatment. Iran Endod J 2014;9:1-14.
19. Primosch RE, Robinson L. Pain elicited during intraoral infiltration with buffered lidocaine. Am J Dent 1996;9:5-10.
20. Kaufman E, Epstein JB, Naveh E, Gorsky M, Gross A, Cohen G. A survey of pain, pressure, and discomfort induced by commonly used oral local anesthesia injections. Anesth Prog 2005;52:122-7.