

การเตรียมเยื่อบุช่องปากก่อนการฉีดยาและการรับรู้ความเจ็บปวด: การศึกษานำร่อง

เมธัส ลิ้มมณี* พิชชานันท์ พิศาลรวัดณ์* อลิตพรรณ ทะแดง* นิสดา ธเนศวร**
 บนิษฐ์ ธเนศวร***

บทคัดย่อ

วัตถุประสงค์: การศึกษานี้มุ่งที่จะเปรียบเทียบผลของการใช้ยาชาชนิดทา การทำให้เยื่อบุฟันด้วยน้ำแข็ง และการไม่เตรียมเยื่อบุฟัน โดยการเปรียบเทียบคะแนนความเจ็บปวดของผู้ป่วยขณะฉีดยาทางทันตกรรม

วัสดุและวิธีการ: ผู้ป่วยผู้ใหญ่จำนวน 56 คน (อายุ 18-82 ปี, อายุเฉลี่ย 47 ปี) ที่มารับการถอนฟันภายใต้การฉีดยาเฉพาะที่ด้วยเทคนิคอินฟิลเตรชันในคลินิกศัลยกรรมช่องปาก คณะทันตแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ได้รับการคัดเลือกเข้าการศึกษา และแบ่งเป็นสี่กลุ่มแบบสุ่ม กลุ่มแรกไม่มีการเตรียมเยื่อบุฟันก่อนการฉีดยาเฉพาะที่ กลุ่มที่สองได้รับการทายาชา และกลุ่มที่สามและสี่ได้รับการทำให้เยื่อบุฟันก่อนด้วยน้ำแข็งเป็นเวลา 5 และ 10 วินาทีตามลำดับ จากนั้นประเมินและบันทึกค่าคะแนนความเจ็บปวดขณะฉีดยาด้วยวิธีวิซวลแอนาลอกสเกล และวิเคราะห์ข้อมูลด้วยวิธีครัสคัล-วัลลิส โดยโปรแกรมเอสพีเอสเอส

ผลการศึกษา: คะแนนความเจ็บปวดในทุกกลุ่มไม่แตกต่างกันอย่างมีนัยสำคัญทางสถิติ โดยกลุ่มที่หนึ่งซึ่งไม่ได้มีการเตรียมเยื่อบุฟันมีค่าเท่ากับ 3.30 ± 2.38 กลุ่มที่สองซึ่งใช้ยาชาชนิดทามีค่าเท่ากับ 2.81 ± 2.25 ส่วนกลุ่มที่ทำให้เยื่อบุฟันก่อนด้วยน้ำแข็งเป็นเวลา 5 และ 10 วินาทีมีค่าเท่ากับ 3.90 ± 1.90 และ 2.67 ± 2.20 ตามลำดับ

สรุปผลการศึกษา: การใช้ยาชาชนิดทา หรือ การทำให้เยื่อบุฟันก่อนเป็นเวลา 5 กับ 10 วินาที ก่อนการฉีดยาเฉพาะที่ในช่องปาก ไม่มีผลต่อการรับรู้ความเจ็บปวดของผู้ป่วย การลดขั้นตอนนี้จะช่วยลดค่าใช้จ่ายเวลาและความเสี่ยงที่จะเกิดผลข้างเคียงจากการใช้ยาชาชนิดทาได้

คำสำคัญ: การทำให้ชาด้วยความเย็น การฉีดยา ความเจ็บปวด เยื่อเมือกช่องปาก

*นิสิตทันตแพทย์ คณะทันตแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย เลขที่ 34 ถนนอังรีดูนังต์ แขวงวังใหม่ เขตปทุมวัน กรุงเทพมหานคร 10330

**รองศาสตราจารย์ ภาควิชาโสตศูรวิทยา คณะทันตแพทยศาสตร์ มหาวิทยาลัยศรีนครินทรวิโรฒ เลขที่ 114 ถนนสุขุมวิท 23 เขตวัฒนา กรุงเทพมหานคร 10110

***อาจารย์ ภาควิชาศัลยกรรมทันตกรรม คณะทันตแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย เลขที่ 34 ถนนอังรีดูนังต์ แขวงวังใหม่ เขตปทุมวัน กรุงเทพมหานคร 10330

Mucosal preparation methods before dental injection and pain perception: A pilot study

Metas Limmanee* Pitchanun Pisarnvorawat* Lalitpan Tadang* Nirada Dhanesuan**
Kanit Dhanesuan***

Abstract

Objective: This study aimed to compare the effect of topical anesthesia application, ice application and no mucosal preparation on patients' pain perception during infiltration anesthesia.

Material and methods: A total of 56 adult patients (age 18-82 years, mean age 47 years) scheduled for tooth extraction under local anesthesia injection by infiltration technique in Oral Surgery Clinic, Faculty of Dentistry, Chulalongkorn University, Thailand were included in this study. They were randomly divided into 4 groups. The first group was a control group with no mucosal preparation before local anesthetic injection. The second group received topical anesthesia. The third and the fourth group received ice application for 5 and 10 seconds consecutively. Pain perception during injection was evaluated by visual analog scale and analyzed by Kruskal-Wallis test using SPSS program.

Results: There was no statistically significant difference for pain scores among the 4 groups. The pain score for group 1 (no mucosal preparation), was 3.30 ± 2.38 . Group 2 (topical anesthesia) had the pain score of 2.81 ± 2.25 . The ice application groups for 5 and 10 seconds had the pain score of 3.90 ± 1.90 and 2.67 ± 2.20 , respectively.

Conclusion: For oral local anesthetic injection, topical anesthesia or ice application for 5, 10 seconds had no effect on patients' pain perception. Omitting this step would help to reduce cost, time and patients' risk of topical anesthesia side effects.

Key words: cryoanesthesia, injection, pain, mucous membrane

*Dental student, Faculty of Dentistry, Chulalongkorn University, 34 Henry-Dunant road, Wangmai, Pathumwan, Bangkok 10330, Thailand.

**Associate Professor, Department of Stomatology, Faculty of Dentistry, Srinakharinwirot University, 114 Sukhumvit 23, Wattana, Bangkok 10110, Thailand.

***Lecturer, Department of Surgery, Faculty of Dentistry, Chulalongkorn University, 34 Henry-Dunant road, Wangmai, Pathumwan, Bangkok 10330, Thailand.

Introduction

In dental practice, local anesthesia is required in many fields including operative treatment, periodontal treatment, endodontics and definitely surgical removal of the teeth. Although the main purpose for dental injection is to reduce the patients' pain, unfortunately the injection itself causes pain, fear and anxiety to most patients in general [1-5]. Fear, anxiety and pain perception varies among individuals. It is a complicated process which involves several factors including personal childhood background, parenting style and also ethnic differences [4,6,7]. Since one of the most common concerning issue for the patients is related to receiving injection [4], dentists constantly search for technique to alleviate the pain of needle injection. The application of topical anesthetic agent is commonly used due to its availability and the simplicity of the method [8,9]. In the field of Dentistry, topical anesthesia has been used for various purposes such as to reduce pain from dental procedures, to relieve the pain from superficial mucosal lesions as well as to mask the discomfort of local anesthetic injections [8]. Although topical anesthesia seems to produce little adverse effect on the mucosa, there have been several reports on patients' allergic reaction to the topical anesthetic agent such as an idiopathic swelling of the lower lip with abnormal clinical symptoms resembled allergic angio-edema and also, in non-dental case, a methemoglobinemia [10-13]. In addition, other factors including operating time and cost should be carefully considered rather than just using the topical anesthesia as a routine.

Cryoanesthesia or pre-cooling the mucosa with low temperature had also been used extensively in the field of Medicine [14-16] and to a lesser extent, in the field of Dentistry [17-21]. Its concept is the application of cold to a part of the body in order to block the local nerve conduction of painful impulses which could be induced either by the use of refrigerant sprays or with the use of ice. The benefits of using cryoanesthesia are its convenience, relatively non-invasiveness and immediate effect since it directly acts on the cells themselves, rather than the nerve cell as do other topical anesthesia. Although the duration of cryoanesthesia might be brief, it should be enough to alleviate the pain from needle insertion into the tissue.

The purpose of this study was to compare the effect of the topical anesthesia and ice application before dental injection in Thai adult patients' pain perception as compared to the injection without mucosal preparation. The results could help to find the proper method for mucosal preparation for dental infiltration anesthesia.

Materials and methods

This study has been approved by the Ethics and Research Committee of the Faculty of Dentistry, Chulalongkorn University (HREC-DCU P 2017-11).

Topical anesthesia and ice cube preparation

For topical anesthesia, 20% benzocaine gel (PacDent[®], USA) was used according to product direction. Ice cube was prepared in the size of 1x1x1 cm with sterilized water frozen for 24 hours and packed in a sealed package. The forceps were used for holding the ice cube on the patient's mucosa.

Patient selection

The subjects consisted of 56 healthy individual who attended the Oral Surgery Clinic, Faculty of Dentistry, Chulalongkorn University, Thailand. They all required local anesthetic infiltration on labial or buccal vestibule for tooth extraction. All the patients were cooperative and willing to participate in the study. They had no systemic disease or other conditions related to abnormal pain perception. They had neither recent oral trauma nor intraoral lesions around the injection sites and had not been taking any analgesic drugs 48 hours before the operation. The study procedure was explained to all patients and a written informed consent was obtained before the operation.

Patients grouping

All 56 patients were randomly divided into 4 groups (14 patients in each group) with different mucosal preparation before an injection. Group 1 received no mucosal preparation (the control group). Group 2 received topical anesthetic agents for 30 second. Group 3 and 4 received ice application for 5 and 10 seconds respectively. The injection process was performed by 5th year dental students who had been calibrated to inject 1 cartridge of the local anesthesia in 1 minute using gauge 27 needle. The demographic data of patients in all groups were shown in table 1.

Table 1. Patients' distribution in each groups.

	Sex		Age (yrs)
	Male	Female	
Group 1: Control	6	8	18-80 (average 49)
Group 2: Topical anesthesia	5	9	21-67 (average 50)
Group 3: Ice 5 s.	7	7	18-75 (average 42)
Group 4: Ice 10 s.	8	6	19-82 (average 47)
Total	26	30	18-82 (average 47)

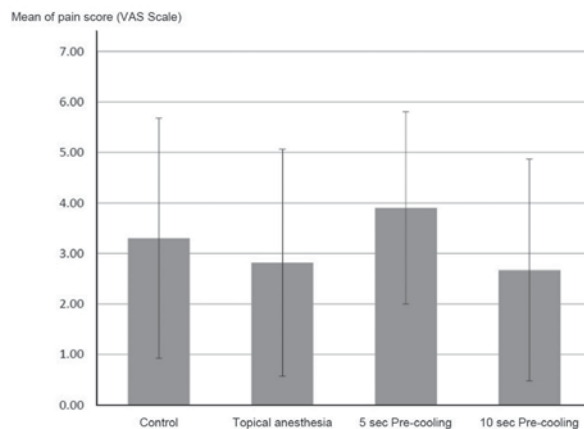


Fig 1. The mean pain score from visual analog scale according to methods of tissue preparation before injection.

Immediately after the injection, the patients were asked to rate their pain score on visual analog scale (VAS). In this system a 10-centimeter horizontal line was drawn on a paper with a number labeled at both as 0 and 10. Number 0 means no pain at all and 10 means the most unbearable pain. The patients were asked to place a line perpendicular to the VAS line at the point that represents their pain intensity. Using a ruler, the score is determined by measuring the distance (mm) on the 10-cm line between the "no pain" anchor and the patient's mark. After that, the tooth extraction was performed according to the treatment plan.

Results

Figure 1 showed the mean pain score for all groups. In group 1(control), the pain score ranged from (the minimum of) 0.1 to (the maximum of) 7.2 (mean 3.30 ± 2.38). In group 2 (topical anesthesia), the pain score were between 0 and 7.2 (mean 2.81 ± 2.25). Group 3 (5 seconds ice application) got the pain score between 0.5 to 6.7 (mean 3.90 ± 1.90) and in group 4 (10 seconds ice application), the pain score were between 0 to 6 (mean 2.67 ± 2.20).

There was no statistically significant difference for pain scores among the 4 groups ($P=0.624$).

Discussion

Dental fear and anxiety is a common phenomenon affecting a large proportion of a population especially children [2,3,7]. Studies showed that the highest fear and anxiety was dental injection [1, 2, 4] and the fear decreased with increasing age and experience [2]. Effective pain control has been a crucial aspect in

Dentistry and it will benefit both patients and dentists. Injection pain is related to many factors such as type and amount of injection fluid, injection pressure, expertise of the operator, location of the injection and methods of injection [1].

Topical anesthesia has been routinely used to reduce discomfort of potentially painful injection. Many studies had been conducted to determine the effectiveness of injection pain control and the results varied among the studies [22-27]. Hersh EV et al. reported lidocaine patches achieved significantly better analgesia before insertions of a 25-gauge injection than the placebo [24]. EMLA cream (a 5% mixture of prilocaine and lidocaine; Astra Pharmaceuticals, Kings Langley UK) was found to significantly alleviate the injection pain from intraligamental injection [27] as well as palatal injection [25]. Conversely, others found topical anesthesia had no effect on pain reduction as compared to the placebo [22,23,26]. A clinical trial by Mechaet D et al. [23] founded psychological methods enhanced the beneficial effects of topical anesthesia and the psychological technique should be employed whenever possible. One aspect of using topical anesthesia that cannot be overlooked is regarding its safety. The level of topical anesthesia entering the circulation after application is of interest [8]. Some allergic reaction and toxicity had been reported [10-13]. In fact, the toxicity of the drug depends on the amount administered and the topical agents are usually available in concentrations much greater than are found in injected formulations.

The ice application method used in this study stems from the cryoanesthesia principle that lowered the temperature at a localized part of the body in order to block the nerve conduction of painful impulses. There had been several

forms of the low temperature agents such as a refrigerant (1,1,1,3,3-pentafluoropropane/1,1,1,2-tetrafluoroethane), an iced cotton bud, ice pack or simple ice cube and they were reported to effectively reduce the injection pain [17-21]. Abbott et al reported the refrigerated topical anesthetic spray significantly reduced injection pain in children. The benefits of using ice cube include safety, low cost and general availability.

This study was conducted in a dental school setting and only the local infiltration was investigated in adult patients. No significant difference in pain score was found between the topical anesthetic group, the ice application groups (5 and 10 seconds) and the control without mucosal preparation group.

One of the limitations in this pilot study was a small sample size, in which we would need to expand our study further for confirmation. The negative result found, however, may be meaningful. It could imply that for buccal infiltration in adult patients, mucosal preparation either by topical anesthesia or ice application may not be necessary. As we routinely use topical anesthesia before infiltration anesthesia in our practice, omitting this somewhat unnecessary step may lead to reduction in the cost, time and especially the risk of topical anesthesia allergy. However, the results found in this study only imply to adult patients with local infiltration on the labial or buccal side. For palatal injection or dental injection in pediatric patients, the outcome could be different. Future studies would be needed.

Acknowledgement

This study was supported by the Dental Research Fund, Faculty of Dentistry, Chulalongkorn University.

References

1. Tuk J G, Lindeboom J A, Hoogendoorn L, Taylor B Wvan Wijk A J. Anxiety and pain related to mandibular block injections: comparison of self-reported measures and physiological response. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2017; 124(5): 456-463.
2. Kakkar M, Wahi A, Thakkar R, Vohra IShukla A K. Prevalence of dental anxiety in 10-14 years old children and its implications. *J Dent Anesth Pain Med* 2016; 16(3): 199-202.
3. Boka V, Arapostathis K, Kotsanos N, Karagiannis V, van Loveren CVeerkamp J. Relationship between Child and Parental Dental Anxiety with Child's Psychological Functioning and Behavior during the Administration of Local Anesthesia. *J Clin Pediatr Dent* 2016; 40(6): 431-437.
4. Armfield J Milgrom P. A clinician guide to patients afraid of dental injections and numbness. *SAAD Dig* 2011; 27: 33-39.
5. Milgrom P, Coldwell S E, Getz T, Weinstein PRamsay D S. Four dimensions of fear of dental injections. *J Am Dent Assoc* 1997; 128(6): 756-766.
6. Rahim-Williams B, Riley J L, 3rd, Williams A K Fillingim R B. A quantitative review of ethnic group differences in experimental pain response: do biology, psychology, and culture matter? *Pain Med* 2012; 13(4): 522-540.
7. Chapman H RKirby-Turner N. Psychological Intrusion - An Overlooked Aspect of Dental Fear. *Front Psychol* 2018; 9:501. doi: 10.3389/fpsyg.2018.00501.
8. Meechan J G. Intra-oral topical anaesthetics: a review. *J Dent* 2000; 28(1): 3-14.

9. Angelo Z, Polyvios C. Alternative practices of achieving anaesthesia for dental procedures: a review. *J Dent Anesth Pain Med* 2018; 18(2): 79-88.
10. Yaman Z, Kisnisci R S. Idiopathic swelling of the lower lip associated with topical anaesthesia. Report of three cases. *Aust Dent J* 1998; 43(5): 324-327.
11. Helfman M. Acquired allergic reaction to topical anesthesia--a case report. *N Y State Dent J* 1999; 65(10): 33.
12. Dahshan A, Donovan G K. Severe methemoglobinemia complicating topical benzocaine use during endoscopy in a toddler: a case report and review of the literature. *Pediatrics* 2006; 117(4): 806-809.
13. Jaffery Z, Ananthasubramaniam K. A rare side effect of transesophageal echocardiography: methemoglobinemia from topical benzocaine anesthesia. *Eur J Echocardiogr* 2008; 9(2): 289-290.
14. Abbott K, Fowler-Kerry S. The use of a topical refrigerant anesthetic to reduce injection pain in children. *J Pain Symptom Manage* 1995; 10(8): 584-590.
15. Cohen Reis E, Holubkov R. Vapocoolant spray is equally effective as EMLA cream in reducing immunization pain in school-aged children. *Pediatrics* 1997; 100(6): E5.
16. Wang X, Wu X, Liu K, Xia L, Lin X, Liu W, et al. Topical cryoanesthesia for the relief of pain caused by steroid injections used to treat hypertrophic scars and keloids. *Medicine (Baltimore)* 2017; 96(43): e8353. doi: 10.1097/MD.0000000000008353.
17. Kosaraju A, Vandewalle KS. A comparison of a refrigerant and a topical anesthetic gel as preinjection anesthetics: a clinical evaluation. *J Am Dent Assoc* 2009; 140(91): 68-72; quiz 112-113.
18. Ghaderi F, Banakar S, Rostami S. Effect of pre-cooling injection site on pain perception in pediatric dentistry: "A randomized clinical trial". *Dent Res J (Isfahan)* 2013; 10(6): 790-794.
19. Lathwal G, Pandit I K, Gugnani N, Gupta M. Efficacy of Different Precooling Agents and Topical Anesthetics on the Pain Perception during Intraoral Injection: A Comparative Clinical Study. *Int J Clin Pediatr Dent* 2015; 8(2): 119-122.
20. DiMarco AC, Wetmore AO. Clinical Comparison: Fast-Acting and Traditional Topical Dental Anesthetic. *Anesth Prog* 2016; 63(2): 55-61.
21. Jayasuriya NSS, Weerapperuma ID, Amarasinghe MGCK. The use of an iced cotton bud as an effective method for palatal anaesthesia: A technical note. *Singapore Dent J* 2017; 38: 17-19.
22. Kincheloe JE, Mealiea WL Jr, Mattison GD, Seib K. Psychophysical measurement on pain perception after administration of a topical anesthetic. *Quintessence Int* 1991; 22(4): 311-315.
23. Martin M D, Ramsay D S, Whitney C, Fiset L, Weinstein P. Topical anesthesia: differentiating the pharmacological and psychological contributions to efficacy. *Anesth Prog* 1994; 41(2): 40-47.

24. Hersh EV, Houpt MI, Cooper SA, Feldman RS, Wolff MS, Levin LM. Analgesic efficacy and safety of an intraoral lidocaine patch. *J Am Dent Assoc* 1996; 127(11): 1626-1634; quiz 1665-1626.

25. Meechan JG, Winter RA. A comparison of topical anaesthesia and electronic nerve stimulation for reducing the pain of intra-oral injections. *Br Dent J* 1996; 181(9): 333-335.

26. Meechan JG, Gowans AJ, Welbury RR. The use of patient-controlled transcutaneous electronic nerve stimulation (TENS) to decrease the discomfort of regional anaesthesia in dentistry: a randomised controlled clinical trial. *J Dent* 1998; 26(5-6): 417-420.

27. Meechan JG, Thomason JM. A comparison of 2 topical anesthetics on the discomfort of intraligamentary injections: a double-blind, split-mouth volunteer clinical trial. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1999; 87(3): 362-365.

ติดต่อขอความ:

อาจารย์ ทันตแพทย์ ชนิษฐ์ ธเนศวร
ภาควิชาศัลยศาสตร์ คณะทันตแพทยศาสตร์
จุฬาลงกรณ์มหาวิทยาลัย 34 ถนนอังรีดูนังต์
แขวงวังใหม่ เขตปทุมวัน กรุงเทพมหานคร 10330
โทรศัพท์ 02 218 8585
จดหมายอิเล็กทรอนิกส์ kanit.d@chula.ac.th

Corresponding author:

Dr. Kanit Dhanesu
Department of Surgery, Faculty of Dentistry,
Chulalongkorn University,
34 Henry-Dunant road, Wangmai, Pathumwan,
Bangkok 10330, Thailand.
Tel: +662-218-8585
E-mail: kanit.d@chula.ac.th