



Differences in Pain between Topical Gel and Chlor Ethyl in Paedodontic Patients before Infiltration Anesthesia

Sri P. Utami,^{1,2} Sherly Horax,³ Marhamah,³ Amelia⁴

¹Department of Paedodontics, Faculty of Dentistry, Universitas Baiturrahmah, Padang, Indonesia

²Dentistry Doctoral Education – S3 By Research, Universitas Hasanuddin, Makassar, Indonesia

³Department of Paedodontics, Faculty of Dentistry, Universitas Hasanuddin, Makassar, Indonesia

⁴Faculty of Dentistry, Universitas Baiturrahmah, Padang, Indonesia

Email: panduutamidrg@yahoo.co.id

Received: May 29, 2023; Accepted July 31, 2023; Published online: August 5, 2023

Abstract: Pain control during invasive and non-invasive dental procedures is very important since discomfort can cause patients to refuse treatment. Local anesthesia (LA) is required in any dental practice, including paedodontics, to reduce pain during dental procedures such as extractions, pulpotomy, root canal treatment, pulpectomy, abscess drainage, and minor oral surgical procedures. Application of flavoured topical anesthetic gel is most frequently used in pediatric dentistry. There are various types of topical anesthetics according to the medicinal ingredients in the forms of liquid, gel, and spray. This study aimed to find out the difference between the use of topical gel and chlorine ethyl in paedodontic patients before infiltration anesthesia at Paedodontics Department of RSGM Baiturrahmah. This was a descriptive and observational study with a cross sectional design. The topical anesthetics used were topical gel and chlorine ethyl; each for 10 patients. Data were obtained directly from student observations of the patient's face during topical anesthesia using the Visual analog Scale (VAS). The results showed that most patients were 9 years old (35.0%); female (65.0%). Most of the VAS results were found in the "like" criterion namely as many as eight respondents (40.0%); six of them were female (75%). Topical gel was the most topical anaesthetic type used with "like" criterion of VAS, as many as eight respondents (100%). In conclusion, most of the VAS results in the "like" criterion for topical gel indicating that topical gel is an effective anesthetic to reduce pain in pediatric patients.

Keywords: pain; anxiety; children; topical gel; chlor ethyl; visual analogue scale

INTRODUCTION

Over the last decade there has been a steady increase in the number of procedures performed under local anesthesia that were conventionally performed under general anesthesia. Local anesthetic injection is one of the most feared or anxiety-provoking stimuli in dental surgery. The fear of pain associated with the injection of anesthetic agents has been cited as a barrier to provide proper dental care.¹ Pain control during both invasive and non-invasive dental procedures is very important because discomfort can cause patients to refuse treatment and stop receiving it. To prevent patients from missing dental work, it is important to develop techniques that reduce pain during injections.² Local anesthesia (LA) is required in any dental practice, including pedodontics, to reduce pain during dental procedures such as extractions, pulpotomies, root canal treatment/pulpectomy, abscess drainage, and minor oral surgery procedures.³

Although new dental injection procedures are being developed, many patients continue to experience pain and discomfort, which have been linked to dental anxiety. To eliminate or reduce needle pain, a topical anesthetic must be applied. Topical anesthetic gels are commonly used in dentistry, although their effects are uncertain/unknown. Topical anesthetics do not guarantee painless injection, and success is based on timing (injection velocity) and needle gauge.⁴ Although new dental injection techniques are continuously being developed, local anesthetic injection still causes discomfort and pain for many patients and has been described as a major reason for dental anxiety. Therefore, a topical anesthetic should be used to eliminate or minimize the pain caused by needles.⁵

The application of flavored topical anesthetic gels is most frequently practiced in pediatric dentistry. Application of ice is a common practice to reduce signs of inflammation. This technique is used as the first aid in the treatment of sprains, fractures, and bruises of soft tissues. Cooling with ice causes vasoconstriction, reduces tissue metabolism, slows the entry of inflammatory mediators, and activates inhibitory pain pathways, which in turn suppresses pain perception.⁶ Reducing the perception of pain during the injection of local anesthetic will reduce anxiety and discomfort.⁷

Additionally, dental anxiety can persist into adulthood, and lead to tooth abandonment. In Pediatric Dentistry, injecting local anesthetics is the most common cause of anxiety affecting the quality of care provided. Therefore, control of pain and anxiety is an important consideration in the administration of local anesthetics to child's dental care.⁸ Various types of anesthetics according to the medicinal ingredients are chloride ethyl, xylesthesin ointment, xylocain ointment, xylocain spray, and benzocaine (liquid, gel, spray). The child's level of acceptance of the anesthetic procedure for removing milk teeth can be measured by the face image scale indicator in the form of the facial hedonic scale.⁹

Based on the background of the problems that have been described, the authors are interested to find out the differences in pain between using topical gel and chlor ethyl in paedodontic patients before infiltration anesthesia at Paedodontic Department of *Rumah Sakit Gigi dan Mulut Baiturrahmah* (Baiturrahmah Oral and Dental Hospital), Padang, Indonesia.

METHODS

This was a descriptive study with a cross sectional design. Respondents were pediatric patients who came to the Paedodontics Department of *Rumah Sakit Gigi dan Mulut Baiturrahmah* (RSGM) in April - May 2023. In this study, the sample size was set at 20 samples. A questionnaire (list of questions) which had previously passed validity and reliability tests was used as a measuring tool in this study after completing the informed consent.

Data were obtained directly from student observations of the patient's face during topical anesthesia using Visual Analog Scale (VAS) and then be recorded into a checklist compiled by the researchers, and further analyzed using the univariate analysis with the SPSS program.

RESULTS

There were 20 respondents in this study consisting of seven male (35.0%) and 13 female

(65.0%) children. Based on the topical anaesthetics used namely topical gel and chlor ethyl, there were 10 respondents for each type of anesthetic. Table 1 showed the frequency distribution of respondents based on age. Most respondents were 9 years old (35.0%).

Table 1. Frequency distribution of respondents by age

| Age (years) | f | Percentage (%) |
|-------------|----|----------------|
| 7 | 4 | 20.0 |
| 8 | 2 | 10.0 |
| 9 | 7 | 35.0 |
| 10 | 6 | 30.0 |
| 11 | 1 | 5.0 |
| Total | 20 | 100 |

Table 2 showed the frequency distribution of respondents based on anaesthetic action before infiltration anesthesia. The results of VAS obtained that the highest percentage was found on the VAS criterion of "like" (40.0%), "dislike" (30.0 %), "not sure" (20.0 %), "like very much" (5.0 %) and "dislike very much" (5.0 %).

Table 2. Frequency distribution of respondents based on VAS

| VAS criteria | f | % |
|-------------------|----|------|
| Dislike very much | 1 | 5.0 |
| Dislike | 6 | 30.0 |
| Not sure | 4 | 20.0 |
| Like | 8 | 40.0 |
| Like very much | 1 | 5.0 |
| Total | 20 | 100% |

Table 3 showed the frequency distribution of respondents based on sex related to the results of VAS. Females with the VAS criteria of "like" were the most frequent (75%).

Table 3. Frequency distribution of respondents' VAS results based on sex

| VAS criteria | Sex | | Total |
|-------------------|-----------|----------|-----------|
| | Male | Female | |
| Dislike very much | 0 (.0%) | 1 100.0% | 1 100.0% |
| Dislike | 2 (33.3%) | 4 66.7% | 6 100.0% |
| Not sure | 3 (75.0%) | 1 25.0% | 4 100.0% |
| Like | 2 (25.0%) | 6 75.0% | 8 100.0% |
| Like very much | 0 (.0%) | 1 100.0% | 1 100.0% |
| Total | 7 (35.0%) | 13 65.0% | 20 100.0% |

Table 4 showed the frequency distribution of respondents based on the VAS criteria related to the type of topical anesthetic used. The highest percentage was found on the VAS criteria 'like' for the topical gel (100%).

DISCUSSION

Achieving proper anesthesia is very important in clinical dentistry; therefore, various anesthesia techniques have been tried to provide adequate local anesthesia in children.¹⁰ Topical anesthetics act on the peripheral nerves and reduce the sensation of pain at the application site. Department of Pediatric Dentistry, School of Dentistry, Kyung Hee University, Seoul, Korea is used for performing local pain control caused by punctures, placement of orthodontic bands, gag reflex, oral mucositis, and placement of rubber-dam clamps. Traditional topical anesthetics

Table 4. Frequency distribution of respondents VAS results based on type of topical anesthesia

| VAS criteria | Type of topical anesthesia | | Total |
|-------------------|----------------------------|-------------|-------------|
| | Topical gel | Chlor ethyl | |
| Dislike very much | 0 (.0%) | 1 (100.0%) | 1 (100.0%) |
| Dislike | 0 (.0%) | 6 (100.0%) | 6 (100.0%) |
| Not sure | 1 (25,0%) | 3 (75,0%) | 4 (100.0%) |
| Like | 8 (100%) | 0 (.0%) | 8 (100.0%) |
| Like very much | 1 (100%) | 0 (.0%) | 1 (100.0%) |
| Total | 10 (50.0%) | 10 (50.0%) | 20 (100.0%) |

containing lidocaine or benzocaine as active ingredient are used in the form of solutions, creams, gels, and sprays. Mixed eutectic local anesthetic creams, blends of various topical anesthetics, have been reported to be more potent than other anesthetics.¹¹

The mechanism of action of topical anesthetics, both chlorethyl and benzocaine gel, is to reversibly inhibit nerve conduction, when used locally on nerve tissue with sufficient concentrations. Conduction of nerve impulses is blocked by decreasing the permeability of the nerve cell membrane to sodium ions, possibly by competing with calcium bonds that control sodium permeability. This change in permeability results in a decrease in depolarization and an increase in the excitability threshold, which of course prevents the formation of an action potential. The difference between the two materials related to the anesthetic procedure is the composition, and the taste sensations given by the two materials which can cause differences in the level of anxiety received by the child during the anesthetic procedure for extracting milk teeth.¹²

Pain is an unpleasant sensory and emotional experience resulting from tissue damage, either actual or potential or described in terms of such damage. The mechanism of onset of pain is based on multiple processes, namely nociception, peripheral sensitization, phenotypic changes, central sensitization, ectopic excitability, structural reorganization, and decreased inhibition. Between the tissue injury stimulus and the subjective experience of pain there are four distinct processes, namely transduction, transmission, modulation, and perception.¹² Mechanism of action of anesthesia both the topical chlorethyl and benzocaine gels are reversible inhibited nerve conduction, when used locally on nerve tissue with sufficient concentration. conduction of nerve impulses is blocked by decreasing permeability nerve cell membranes for sodium ions possibly by competing with calcium bonds that control sodium permeability. This change in permeability results in a decrease in depolarization and an increase in the excitability threshold, which of course prevents the formation of an action potential. The difference between the two materials related to the anesthetic procedure is the composition, and the taste sensations given by the two materials which can cause differences in the level of anxiety received by the child during the anesthetic procedure for extracting milk teeth.¹²

The results of this study showed that the highest percentage was found on the VAS of “like” as many as eight respondents (40.0%) consisting of two males (25%) and six females (75%). This study is in line with the research conducted by Bansal et al⁷ regarding the comparative evaluation between ice and anesthetic gel topical in pain reduction before injection. Using the unpaired t test showed that the mean VAS score was significantly higher in women than in men. In line with the research conducted by Krisyudhanti et al⁹ concerning comparison of the acceptance rate of child patients using chloride ethyl and benzocaine gel before milk tooth extraction based on the facial image scale revealed that as many as 53.3% of respondents somewhat disliked (dislike a little) the use of ethyl chloride before extraction of milk teeth, while for benzocaine gel as many as 66.67% of respondents rather like it (like a little). Based on the researchers' observation of patients when the extraction was carried out, at the time the operator put a cotton swab that had been sprayed with chlorethyl on the mucosa, an expression of surprise was often seen which was sometimes

accompanied by clenched fists, gripping the dental chair, moving legs restlessly, and body language indicating that they did not like chloroethyl. attached to the mucosa. This may be due to the drastic temperature changes produced when chloroethyl attached to the mucosa. Meanwhile, researchers observed that when patients were anesthetized using benzocain gel, the patients often did not realize that they were being anesthetized when the operator applied benzocaine gel on the mucosa of the gingival tooth that was going to be extracted and without realizing it the baby tooth had been removed. The patient only felt a slightly thick feeling on the tongue if he/she happened to lick the gel. Preparation of benzocaine gel which has a fruity aroma such as melon, apple, grape, orange, and strawberry is very liked by children and also makes children feel comfortable in receiving anesthesia procedures.⁹

This study showed that the most topical type used was topical gel with the VAS of "like" as many as eight respondents (100%) indicating that based on the VAS, generally many patients like it. In line with research conducted by Krisyudhanti et al⁹ which revealed that although benzocain gel was more acceptable than chloride ethyl, using that anesthetic had to be accompanied by good therapeutic communication, to avoid rejection of tooth extraction. Especially for pediatric patients with a high level of anxiety, it is better to avoid using chloride ethyl anesthetic before baby teeth extraction, in consequence that the child is not shocked and becomes afraid or refuses to have his/her teeth removed. It can be concluded that benzocain gel is preferred by pediatric patients in the extraction of milk teeth.

The principle of removing milk teeth is not different from permanent teeth. It does not require a lot of energy, but it must be remembered that milk teeth have permanent tooth seeds whose crowns are very close to the roots of milk teeth, especially the second milk molar or its replacement, namely the second premolar, which is sandwiched between the roots of the milk teeth. In the treatment of pediatric patients, a psychological approach is extremely needed. Before carrying out tooth extraction it is necessary to do anesthesia first. In general, local anesthesia is given, but in certain circumstances general anesthesia is performed by a specialist anesthesia.⁹

Various topical anesthetic agents have been reported to be used on the oral mucosa with varying results; The properties of topical anesthetic agents have led to a decrease in the perception of pain by patients, resulting in greater acceptance during dental treatment. The precooling method of reducing injection pain is an effective, economical, and readily available method that can benefit nearly all patients.⁷

CONCLUSION

Most of the VAS results in the "like" criterion for topical gel indicating that topical gel is an effective anesthetic to reduce pain in pediatric patients.

Conflict of Interest

The authors affirm no conflict of interest in this study.

REFERENCES

1. Mohiuddin I, Setty JV, Srinivasan I, Desai JA. Topical application of local anaesthetic gel vs ice in pediatric patients for infiltration anaesthesia. *J Evol Med Dent Sci*. 2015;4(74):12934–40. Doi:10.14260/jemds/2015/1866
2. Nat KS, Khanal,D, Waraich GS. Effect of cooled topical anesthetic gel on pain perception during administration of local anesthesia: a clinical trial. *SVOA Dent*. 2023;1:40–4. Doi:10.58624/SVOADE.2023.04.0125
3. Virdikar S, Prabhakar SR, Basappa AN, Deepak BM. A comparative study on pain perception in children, after application of pre-cooled and plain topical anesthetic gel during needle insertion for local anesthetic administration- in-vivo trial. *J Updat Pediatr Dent (JUPD)*. 2021;1(1):39–46. Doi:10.54276/JUPD.2021.1107
4. Mohsin SF, Alodhaib TA, Alkhater FI, Alharbi AA, Alzahrani KT. Ice vs benzocaine 20 % gel as a topical anesthesia for the oral mucosa: a randomized clinical study. *Arch Pharm Pract*. 2022;13(S1):5–8.

5. Hindocha N, Manhem F, Bäckryd E, Bågesund M. Ice versus lidocaine 5% gel for topical anaesthesia of oral mucosa-a randomized cross-over study. *BMC Anesthesiol.* 2019;19(1):1–11. Doi: 10.1186/s12871-019-0902-8.
6. Amruthavarshini I, Vinay C, Uloopi KS, RojaRamya KS, Chandrasekhar R, Penmatsa C. Effectiveness of pre-cooling the injection site, laser biostimulation, and topical local anesthetic gel in reduction of local anesthesia injection pain in children. *Int J Clin Pediatr Dent.* 2021;14(1):81–3. Doi: 10.5005/jp-journals-10005-1913.
7. Bansal D, Mahajan M, Mathur S. A comparative evaluation of ice and topical anesthetic gel in the reduction of pain before the injection: a clinical trial. *SRM J Res Dent Sci.* 2020;11(1):1–6. DOI:10.4103/srmjrds.srmjrds_66_19
8. Nameeda KS, Nihala FK, Saseendran A, Nagar,P, Urs P. A comparative study on effectiveness of mucosal vibration and topical anaesthetic gel in reducing pain during administration of local anaesthetic in paediatric patients. *RGUHS J Dent Sci.* 2021;13(1):32–41. Doi:10.26715/rjds.13_1_6.
9. Krisyudhanti E, Variani R, Kristianto J, Barus A. Perbandingan tingkat penerimaan pasien anak penggunaan chloride ethyl dan benzocaine gel dalam pencabutan gigi susu berdasarkan facial image scale. *Qual J Kesehat.* 2018;1(1):43–8.
10. Anantharaj A, Sabu JM, Ramakrishna S, Jagdeesh RB, Praveen P, et al. A comparative evaluation of pain perception following topical application of benzocaine gel, clove-papaya based anesthetic gel and precooling of the injection site before intraoral injections in children. *J Indian Soc Pedod Prev Dent.* 2020;38(2):184-9. Doi: 10.4103/JISPPD.JISPPD_153_18.
11. Lee H-S. Recent advances in topical anesthesia. *J Dent Anesth Pain Med.* 2016;16(4);237. Doi:10.17245/jdapm.2016.16.4.237
12. Bahrudin M. Patofisiologi nyeri (pain). *Saintika Med.* 2018;13(1):7. Doi:10.22219/sm.v13i1.5449