



## RESEARCH ARTICLE

### ACCEPTANCE AND EFFICACY OF DIFFERENT TOPICAL ANESTHETIC AGENTS IN CHILDREN: A COMPARATIVE STUDY

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#### ABSTRACT

**Introduction:** Due to local anesthetic injection, many of the children turn up to a negative behaviour due to fear of pain. Pain and anxiety can reduce the efficacy of anesthesia in children. This fear of anesthesia is often manifested as a behaviour management problem. Topical anesthesia is widely advocated in paediatric dentistry practice to reduce pain and anxiety. Various agents are used as topical anesthetic agents prior to administration of local anesthesia. However there is sparse evidence showing the preferences of children over them and their pain perception for it.

**Aim:** To evaluate the efficacy of different topical anesthetic agents chose by children and their effect on pain perception.

**Methodology:** This observational study included 120 children aged 6-10 years. All 120 children underwent the application of 4 topical agents in each of the quadrant. These were FS (Flavoured spray), US (Unflavoured spray), FG (Flavoured Gel), UG (Unflavoured gel). FS was used in maxillary right side, US was used in maxillary left side, FG used in mandibular right side and UG was used in mandibular left side. The child's pain response was assessed using Visual analogue pain scale. Results: Flavoured spray (0.43) and flavoured gel (0.51) have shown lower mean scores in the pain assessment, and were statistically significant ( $p=0.031$ ). There was no significant difference seen between the unflavoured gel and spray. However in case of preferences, the flavoured gel was the most preferred agent followed by flavoured spray, unflavoured gel and unflavoured spray.

**Conclusion:** Flavoured spray is the most effective agent for pain control while flavoured gel is the most preferred agent amongst children of this population.

**Key words:** Topical Anaesthesia, Flavoured topical agent, unflavoured agents, VAS.

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#### INTRODUCTION

Administering local anesthetic injection in the dental practice produces the most negative reactions in children (Leopold et al., 2002). Pain and anxiety can reduce the efficacy of anesthesia in pediatric patients (Meehan, 2000). This fear of anesthesia is frequently disregarded as a behaviour management problem (McDonald et al., 2011). The child may fear by the sight of the needle as well as by the pain associated with the insertion of it (Meehan, 2002). Topical anesthesia is widely used in dentistry to eliminate or lessen this anxiety of needle insertion. They are applied in various forms, some of them being gel, spray, patch, ointment, pre cooling agent etc. Their role is blocking signal transmission in the terminal fibres of sensory nerves which further sends the signal for pain. The advantages of topical anaesthetics are not just pharmacological but psychological as well (Martin et al., 1994).

Topical anaesthetics have a drawback of unpleasant taste; however with the availability of various flavoured preparations this has been overcome and they have become more acceptable to children. There has been continuous research on methods that evade the painful experience of anesthetic injection and that it becomes more comfortable to the child patients (Bagesund and Tabrizi, 2008). Children may have their own preferences over the choice of topical agent in terms of flavors as well as for the use of agent that is gel or spray. The pain perception for various topical agents may also vary hence it needs to be evaluated as to which agent is the most acceptable and efficacious in case of children. Hence this study is aimed to evaluate the efficacy of different topical anesthetic agents chose by children and their effect on pain perception using visual analogue scale.

#### MATERIALS AND METHODS

The present study was an observational clinical study. 120 children aged 6 to 10 years were selected for the study, of which 74 were males and 46 were females. Ethical clearance

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was obtained from the ethical institute of the college. Children with Frankel’s behaviour rating III (positive) and IV (definitely positive) and without any relevant medical history were only included in the study. Written Informed consent was obtained from the parents or guardians of all the children who were included in the study. The selected children were explained about the procedure to a level of their understanding using euphemisms and also about the visual analogue scale. All the 120 children underwent application of four topical anesthetic agents that were: Flavoured gel (FG) on the maxillary left arch, unflavored gel (UG) on the mandibular left arch, flavoured spray (FS) on maxillary right arch and unflavored spray (US) on the mandibular right arch. For the Flavoured spray (Lidain 100gm) that is lidocaine spray was used, the unflavored spray (Lox 10%) contained 10% lidocaine, Unflavored Gel (Lox 2% Gel) and Flavoured Gel (Precaine strawberry flavoured gel) that contained a combination of lidocaine 8% and 0.8% dibucaine. The agents were applied on the mucobuccal fold area for both maxillary as well as mandibular arch. Before the application of any agent, the area was cleaned and dried using sterile cotton. The topical gels were applied using an applicator and rubbing it over the area. The topical sprays were simply sprayed over the area taking care that only a single puff was used. After the application of these agents, the subjective and objective signs and symptoms for pain were checked using a blunt periosteal elevator in the vestibular region. Later the pain perception on VAS (visual analogue scale) scale was noted by asking the patient about his/her pain. As soon as the application and procedure was completed, the children were asked to show their pain perception on the visual analogue scale. The application of all the agents was done by a single operator. Also after the completion of the procedure, the agents were swished using water and sterile cotton.

**RESULTS**

The scores and data obtained were entered in an excel spread sheet, entered into a computer and analyzed using the SPSS software. Descriptive and inferential statistical analyses were carried out in the present study. Results on continuous measurements are presented on Mean ± SD and results on categorical measurements will be presented in Number (%). Level of significance will be fixed at p=0.05 and any value less than or equal to 0.05 was considered to be statistically significant.

Chi square analysis was used to find the significance of study parameters on categorical scale. Student t test (two tailed, independent) were used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. The comparison of the pain assessment ratings for all the four topical anaesthetic agents using ANOVA test was done (Table 1). Flavoured spray shows minimum pain (0.43) followed by the flavoured gel (0.51) and the unflavored spray (0.56), whereas the unflavored gel shows maximum pain (0.63). These results were statistically significant with p value- 0.031. Comparison of the pain scale ratings for preferred agents among the children using chi square test was done (Table 2).

The results revealed that most accepted agent by the children was the Flavoured gel (n=37) and the least accepted agent was Unflavored spray (n=14). A good pain control is very essential for the operator while doing any procedures in children as well as adults. Pain control using local anaesthetic agents is most commonly employed. It instils a positive attitude towards dental treatment in the children. Painless anesthesia administration will further augment patient’s cooperation and ease their fear. Hence this study was conducted to assess and compare the patients’ preferences and pain control for various flavoured and unflavored topical agents that were gels and sprays in children. Topical anesthesia is used in dentistry to reduce or eliminate the discomfort of needle penetration. These are available in several forms today like gel, spray, patch, ointments etc. The local anaesthetics in routine clinical use are classified into two broad groups: agents containing an ester linkage like benzocaine and agents containing an amide linkage like lidocaine and dibucaine. Lidocaine has great anesthetic efficacy along with its faster action, its allergic potential is also very less. Dibucaine is commonly used in dermatological field. The drawback of it being delayed onset of action, however the duration of anesthesia is much. So in the present study we have used the topical flavoured and unflavored spray as well as unflavored gel containing only lidocaine while the flavoured gel contained a combination of dibucaine and lidocaine. Yamamura et al have conducted a study and stated that pain relief of oral ulcers by a dibucaine film lasted for 2–5 hours after its application. Also Adriani et al have affirmed the longest duration of Dibucaine by conducting electric stimulation on mucous membrane by different topical agents.

**Table 1. Comparison of the pain assessment ratings for all the agents**

	N	Pain Scale Ratings for preferred agent			Mean Std. Dev	P value
		0 N(%)	1 N(%)	2 N(%)		
Flavored spray	120	68 (56.66%)	52 (43.33%)	0 (0%)	0.43±0.4	0.031*
Flavored gel	120	57 (47.5%)	63 (52.5%)	0 (0%)	0.51±0.5	
Unflavored spray	120	55 (45.83%)	63 (52.50%)	2 (1.66%)	0.56±0.5	
Unflavored gel	120	45 (37.5%)	73 (60.83%)	2 (1.66%)	0.63±0.5	
Total	480	225 (46.8%)	251 (52.2%)	4 (0.83%)	0.53±0.5	

(p< 0.05 - Significant\*, p < 0.001 - Highly significant\*\*)

**Table 2. Preferred agent and its pain scale ratings**

Preferred agent	Total N(%)	Pain Scale Ratings for preferred agent		
		0 N(%)	1 N(%)	2 N(%)
Flavored gel	45 (37.5%)	37 (82.2%)	8 (17.8%)	0 (0.0%)
Flavored spray	43 (35.83%)	35 (81.4%)	8 (18.6%)	0 (0%)
Unflavored gel	18 (15%)	16 (88.9%)	2 (11.1%)	0 (0.0%)
Unflavored spray	14 (11.66%)	12 (85.7%)	0 (0.0%)	2 (14.3%)

Chi square value: 18.131 p value: 0.006\*  
(p< 0.05 - Significant\*, p < 0.001 - Highly significant\*\*)

On the other side, benzocaine is absorbed slowly due to its low aqueous solubility and it has also reported few localized allergic reactions.<sup>2</sup> Hence, this study had planned to compare the effectiveness of a combination of lidocaine and dibucaine as one of the agents that show a synergistic action as an anesthetic agent. Topical anesthetics not only have a pharmacological effect but a psychological benefit as well. In the present study we had explained the children prior about the procedure to be done using euphemisms and substitute words. According to a study conducted by Pollack, he stated that children who were given pre procedural verbal reinforcement, reacted more calmly to the local anesthetic injection as compared to those who were not provided with that.<sup>11</sup> In the present study, children had good verbal communication with the investigator and explanation of the procedure using euphemisms could have reduced the influence of dental anxiety on pain scores.

The topical anesthetics in this study were applied to the mucobuccal fold after drying the area well. Also the agents were applied using a cotton applicator with moderate pressure in rubbing motion for around 30 seconds and were left for 60 seconds to increase the penetration which is based on the theory that the duration of application of the anesthetic affects the amount of diffusion. To reduce the sensation of pain from the injection it is usually suggested to use a topical anesthetic agent for at least 60 seconds.<sup>12</sup> Pain is associated with various physiological as well as psychological parameters and hence its measurement is not easy, also it is different with every individual experiencing it. Bayer CLV13 after conducting a study on children's pain intensity stated that the use of visual analogue scale showed better sensitivity and validity for most of the children. In the present study, we have used the visual analogue scale (VAS) in the children, we had asked the children to show their pain ratings in the form of scores given for the scale ranging from 0 to 3. We found that this scale is a reliable pain assessment tool for children. One more phenomenon that was observed in the study was that in some children while using the topical sprays, they tend to get frightened. However this problem was overcome by using the spray on cotton and then applying to the mucosa, rather than directly applying. This method calmed many of the children who were otherwise afraid by the spray. Giddon et al in a study compared topical anesthetic agents in different application and dosage forms and stated that there was no difference among 20% benzocaine, 5% lidocaine and placebo when applied for 30 seconds on palate using 25 gauge needle.<sup>14</sup> Subsequently, lidocaine and dibucaine blend can be utilized as adequately as the normally utilized lidocaine with a brief time of use in this way rendering pharmacological and also mental useful impacts clinically alongside limiting the conceivable antagonistic impacts.

### Conclusion

The following conclusions can be drawn from the present study: Flavoured gel (strawberry flavor, lidocaine 8% and 0.8% dibucaine) was the most preferred topical anesthetic agent by the children while Unflavoured spray (10% lidocaine) was the least preferred topical anesthetic agent in children. However the pain control was best achieved by Flavoured spray (lidocaine 10%) and least by unflavoured gel (2% lignocaine hydrochloride).

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