

Original Article

Effectiveness of Three Topical Anaesthetic Agents in reducing injection pain in children: A Comparative Study

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ABSTRACT

Pain is a complex phenomenon; physical maturation, cognitive development and emotion all influence the ways in which pain is experienced and expressed. An important part of performing dental treatment without patient suffering pain is the administration of local anaesthesia. Paradoxically, administration of local anaesthetic drugs itself produces pain and anxiety that may cause subsequent unfavorable behaviour in children. Topical anaesthetics may achieve beneficial effects prior to needle penetration and shown to reduce the discomfort of infiltration anaesthesia. This study evaluates the acceptability of three topical anaesthetic agents commercially available in India, and also determines whether assessments of pain severity by children correlate with similar assessments made by independent observer.

Introduction

Control of pain is the most important aspect of guiding child behaviour. However various methods of managing paedodontic patients have evolved over the years, prevention and elimination of pain still remain fundamental to good behavior management, and local anaesthesia forms the major part of pain-control techniques in dentistry. Paradoxically, administration of local anaesthetic drugs itself produces pain and anxiety that may cause subsequent unfavorable behaviour.¹ For this reason, paediatric dentists are on a

constant search of tools for painless administration of local anaesthesia, and topical anaesthetics have proven to be a boon in this attempt. Topical anaesthetics reduce the slight discomfort that may be associated with the insertion of the needle before the injection of the local anaesthetic. Some topical anaesthetics, however, present a disadvantage if they have a disagreeable taste to the child. Also, the additional time required to apply them may allow the child to become apprehensive concerning the approaching procedure.²¹ Topical anaesthetics are available in gel,

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liquid, ointment, and pressurized spray forms. However, the pleasant-tasting and quick-acting liquid, gel, or ointment preparations seem to be preferred by most dentists. These agents are applied to the oral mucous membranes with a cotton-tipped applicator. A variety of anaesthetic agents have been used in topical anaesthetic preparations, including ethyl aminobenzoate, butacaine sulfate, cocaine, dyclonine, lidocaine, and tetracaine.

This article reports a study conducted with the following aims:

- ✦ To evaluate the acceptability of three topical anesthetic agents commercially available in India.
- ✦ Determine whether assessments of pain severity by children correlate with similar assessments made by independent observer.

Material & Methods

This study was carried out in the Department of Pedodontics & Preventive Dentistry, Buddha Institute of Dental Sciences & hospital, Patna, after obtaining the approval of the ethical committee of the institute. Three topical anaesthetic agents used to evaluate pain responses of and acceptance by children prior to palatal infiltration.

A total of 45 children, independent of sex, race, and ethnicity characters, who satisfied the following inclusion criteria were included in this study:

- Age group of 6-12 years
- First dental visit
- Absence of any systemic illness
- Exhibited positive behavior (according to Frankl's Behavior Rating Scale) in dental clinic
- Required extraction of maxillary molar tooth and would receive palatal infiltration anaesthesia

Written, informed consent was obtained from the parents and the children were divided into 3 groups of 15 children each. Each group was assigned to one of the three test agents as follows

- GROUP A - Lignocaine Jelly
- GROUP B - Lignocaine Spray
- GROUP C - Lignocaine Flavoured Jelly

Gel application was done after drying of site of application with rubbing the motion for ½ min. For better penetration, it was left over the mucosa for another ½ min after which it was swiped off. Patient's acceptance of each agent used was noted.

After topical application of local anaesthetic agent in each group was done, palatal infiltration administered and pain assessment was done using the following scales:

- Numeric Pain Scale (NPS)
- Pain Faces Scale (PFS)
- Sound Eye Motor Scale (SEM)

Results

Regarding patient acceptance, the following observations were made

- Group A
 - Not difficult to introduce, but did not generate any excitement
 - No improvement on acceptance on application
- Group B
 - Not difficult to introduce
 - Decline in acceptance on application
- Group C
 - Did generate excitement
 - No decline in acceptance

Table 2 depicts the mean pain scores recorded in the three groups. The pain felt by group C patients was significantly lesser than that of the other two groups.



Figure 1: Local Anaesthetic Agents Used

Table 3 shows between-group comparisons of grades of pain in different groups. Statistically significant differences were seen when values obtained by Sound Eye Motor Scale of group C was compared with that of group A and group B.

There was a statistically significant difference favoring use of the flavored lidocaine jelly in the category of observed pain-sounds. However, there were no statistically significant differences in reported pain (Faces Pain Scale and Numerical Pain Scale).

Discussion

Local anaesthesia has been defined as a loss of sensation in an area of the body caused by a depression of excitation in nerve endings or an inhibition of the conduction process in peripheral nerves.³ The simplest and most effective method of reducing pain during dental procedures is by an injection of local anaesthetic solution, which, unfortunately, causes the greatest negative response in children.⁴

Age-appropriate “nonthreatening” terminology, distraction, topical anesthetics, proper injection technique, and nitrous oxide/oxygen analgesia/analxiolysis can help the patient have a positive experience during administration of local

anesthesia.⁵ While various agents are available today for topical analgesia, lignocaine serves as the gold standard.⁶

Topical anesthesia is a fundamental part of local anesthesia administration as it has both psychological and pharmacological impact. Topical anesthetics control pain perception and hence, alter the reaction to pain by blocking the transmission of signals from the terminal fibers of the sensory nerves. Their effects are limited to the control of painful stimuli occurring on or just beneath the mucosa.⁷

Evaluation of the data gathered from the Faces Pain Scale and the Numeric Pain Scale indicates self-evaluation of pain, while documented in several studies post-surgery, may not be a valid measurement of perceived pain in pediatric dental patients. In this study, the Faces Pain Scale and Numeric Pain Scale were completed after the painful event while studies which have found self-evaluation of post-surgery pain to be a reliable indicator of pain involve completing the scales during the painful event.⁸ However, the application of this scale in younger children may be difficult as their response to painful situations may not only be dependent on the pain experienced during the procedure but may also be influenced by many other factors.⁹

It is clinically important to note that uncooperative children can give inaccurate pain assessment,¹⁰ all the children selected for this study were cooperative (positive or definitely positive according to the Frankel’s Behavior rating scale).

In spite of the development of modern injection techniques, palatal injection is still a painful experience for patients, because of the density of the palatal soft tissues and their strong adherence to the underlying bone. Our study showed that the vast

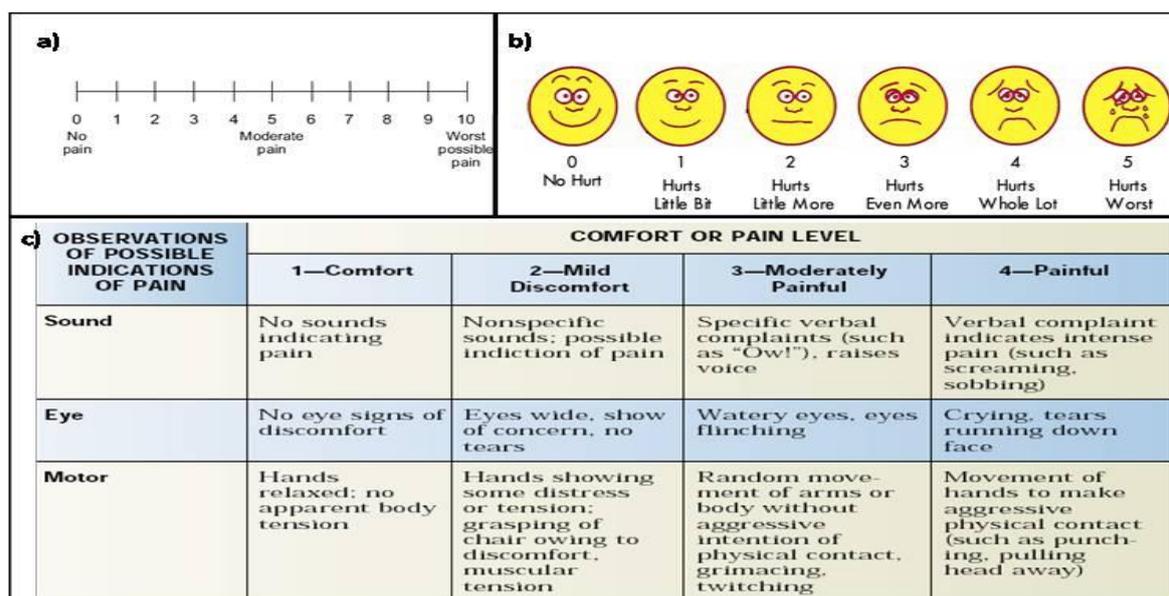


Figure 2: Scales Used for Pain Assessment Numerical Pain Scale b) Pain Faces Scale c) Sound Eye Motor Scale

Patient Response	On Introduction			On Application		
	Group A	Group B	Group C	Group A	Group B	Group C
	<i>Acceptable</i>	12	9	15	12	1
<i>Not-acceptable</i>	0	4	0	0	8	0
<i>Can't say</i>	3	2	0	3	6	0

Table 1: This table shows child's acceptance of topical anaesthetic agents on being introduced to the anaesthetic agent and after application of the agent. Children of group B changed their opinion from acceptable to not acceptable on application of lignocaine spray.

	Numeric Pain Scale	Facial Pain Scale	Sound Eye Motor Scale
GROUP A	3.73	2.07	2
GROUP B	3.73	2.31	2.15
GROUP C	3.67	1.73	1.33

Table 2: This table shows mean pain scores of all three groups. The children of group C (flavoured anaesthetic jelly) reported lesser values of pain than the other groups

Groups	Paired t-test p value		
	<u>NPS</u>	<u>PFS</u>	<u>SEM</u>
A & B	0.479	0.374	0.421
A & C	0.480	0.298	0.00061
B & C	0.458	0.202	0.0162

Table 3: This table reports between-group comparisons made based on the mean value of pain by each pain recording scale. Difference was not statistically significant in case of reported pain scales. In case of SEM, statistically significant ($p < 0.05$) difference was seen when group C was compared individually with group A & B.

majority of children rated the injection experience as positive after application of topical lidocaine, and this result is in agreement with previously conducted studies as well.¹¹

The pre-procedural information given about action of topical anesthetics have been reported to decrease the pain response.¹² Hence, benefits of topical anesthetics were explained to children according to their level of understanding before gel application. Gel application was done for 1 minute, since to gain benefits of topical anesthetics in relieving anesthetic injection pain at least 1 min application time has generally been recommended.¹³

Some topical anaesthetics present a disadvantage if they have a disagreeable taste to the child and hence, to mask the less acceptable taste of topical anesthetics, many flavored formulations have been introduced.

One such preparation is precaine which contains lidocaine and dibucaine in combination.¹³ We observed that flavoured jelly was most acceptable to the patient on introduction as well as on application.

Conclusion

All the three method were found acceptable, flavoured jelly being the most preferred one.

Sound Eye Motor Scale was found to be a reliable method of pain assessment along with self report.

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