

# Effect of Cooled Topical Anesthetic Gel on Pain Perception During Administration of Local Anesthesia: A Clinical Trial

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## Abstract

**Background:** It is crucial to manage pain during both invasive and noninvasive dental procedures because discomfort may cause patients to refuse care or put off getting it altogether. As a result, it is imperative to develop techniques that lessen pain during injections in order to keep patients from skipping dental appointments. Pain is associated with both invasive and noninvasive dental operations, although it is more commonly associated with tooth extractions, surgeries, and other invasive procedures. The use of local anaesthetics is used to prevent and manage pain, and they are thought to be the safest and most effective medications available for these purposes.

**Aim:** To evaluate the effect of cooled topical anesthetic gel on pain perception of pediatric dental patients during the administration of local anesthesia.

**Material and Method:** In present split mouth clinical trail, 30 children between the ages of 6 and 10 year were enrolled. Uncooled topical anaesthetic was applied in one treatment session and cooled topical anaesthesia gel in the other session prior to the administration of local anesthesia. Lignocaine 2% gel was cooled and maintained at 4<sup>o</sup> C. A small sized topical anaesthetic gel was applied on tissue using a cotton pellet for 1 minute. Similarly in next treatment session uncooled anesthetic gel was applied on injection site. The procedure was followed by infiltration injection of 2% lidocaine with 1:80,000 adrenaline (LOX\* 2% ADRENALINE) using a short 27-gauge needle (Dispovan). Visual analog scale (VAS) was used to evaluate the participants' self-reports of injection pain. Children were asked to make a mark on the line that represented their level of perceived pain intensity, and the score was recorded after the treatment. Analysis of the data was carried out using SPSS version 20.0. In all the statistical tests used in this study the significant level was pre-set at P ≤ 0.05.

**Result:** The mean visual analog score for uncooled anesthetic gel group were 63.12 ± 4.63 and statistically significant lower score in cooled anesthetic gel group 38.23 ± 5.53 group (p< 0.001)

**Conclusion:** The results of the present study showed application of cooled topical anesthetic gel on injection site prior to the injection of local anesthetic agent did significantly reduce the pain perceived during administration of local anesthesia for routine dental procedures.

**Keywords:** Pain, Local Anesthesia, Local Anesthetics Gel

## Introduction

The control of pain during both invasive and noninvasive dental procedures is crucial because discomfort may cause patients to refuse care and stop getting it. To prevent patients from skipping dental care, it is imperative to develop techniques that reduce pain during injection.<sup>1</sup>

Dental treatment is seen as a hostile, psychological, emotional, or physiological sense that results from a specific provocation with a dental-related component. There is a link between pain and fear. Most people can withstand moderate to severe pain without seeking professional assistance. In dentistry, intrusive operations, such as tooth extractions and surgeries, are more frequently associated with pain than noninvasive ones. The use of local anaesthetics is used to prevent and manage pain, and they are thought to be the safest and most effective medications available for these purposes. However because many people are afraid of the needle used when injecting, the act of administering these medications also causes panic in the patients. Even in preverbal children, fear of pain is not unwarranted because untreated pain affects medical outcomes and is recalled by preverbal children.<sup>1,2</sup>

The most difficult aspect of pediatric dentistry practise appears to be administering local anaesthetic to young children.<sup>1</sup> The child's psychological development is negatively impacted by the feeling of an injection or needle. A proper dental procedure may be hampered by insufficient anaesthetic, which worsens the pain associated with needles.<sup>3</sup>

There are many ways to reduce pain during the administration of local anaesthetic agents, including topical anaesthetic application, warming and buffering the anaesthetic solution, adjusting the rate of infiltration, counter-irritation, vibration or pressure, acupuncture, hypnosis, computer-controlled delivery system (WAND), and using tools like vibraject, dental vibe, or jet injectors.<sup>3, 5-8</sup>

Topical gel application does not always ensure pain-free injections, and the numbing effect depends on several variables, including the pace of injection and the gauge size of the needle. In medicine, cooling the tissues has a long history. External cooling has been used to treat musculoskeletal discomfort, fractures, sports injuries, sprains, and other conditions. Although the idea of cooling soft tissue before injection treatments is well established, there is little evidence in the literature for such an application in pediatric dentistry.<sup>9</sup> Hence present was conducted to evaluate the effect of pain perception on application of cooled and uncooled topical anaesthetic gel during administration of anaesthesia.

## Material and Method

This split-mouth randomized clinical experiment was carried out in a department of pedodontics and preventive dentistry. Before starting treatment, all of the parents and guardians gave their informed consent, and the Institutional Review Board granted the study ethical approval. In the present study, 60 children between the ages of 6 and 10 year were enrolled.

### Inclusion Criteria

1. Children with good health (ASA I).
2. Children requiring maxillary buccal infiltration anaesthesia for dental procedures (extraction, crown preparation, and pulp therapy) in both quadrants.
3. Children with first dental visit with Frankl's behaviour rating grades III or IV.

### Exclusion Criteria

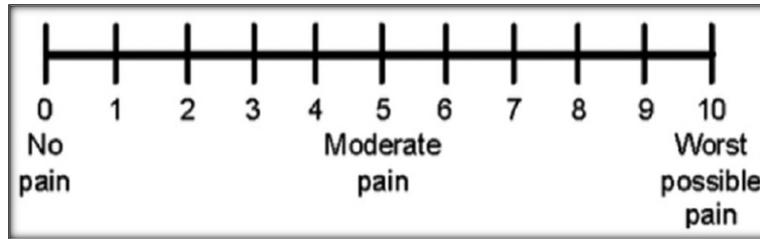
1. Medically or physically compromised patient.
2. Any allergy to local anesthesia.
3. Prior history of dental treatment.
4. Children with Frankl's behavior rating I or II.

Children's behavior was modified through the treatment using the tell show do method and communication. The soft tissue site was dried with a sterile gauze before application of the anaesthetic gel.

In this crossover trial, Uncooled topical anaesthetic was applied in one treatment session and cooled topical anaesthesia gel in the other session prior administration of local anesthesia.

2% topical lignocaine gel was cooled and maintained at 4<sup>0</sup> C. A small sized topical anaesthetic gel was applied on tissue using a cotton pellet for 1 minute. Similarly in next treatment session uncooled anesthetic gel was applied on injection site. The procedure was followed by infiltration injection of 2% lidocaine with 1:80,000 adrenaline (LOX\* 2% ADRENALINE) using a short 27-gauge needle (Dispovan).

Visual analog scale (VAS) was used to evaluate the participants' self-reports of injection pain. (Figure 1) It is a simple assessment tool consisting of a 10-cm line with 0 on one end, representing no pain, and 10 on the other, representing the worst pain. It is determined by measuring in millimeters from the left-hand end of the line to the point that the patient marks. Children were asked to make a mark on the line that represented their level of perceived pain intensity, and the score was recorded after the treatment. Analysis of the data was carried out using SPSS version 20.0. In all the statistical tests used in this study the significant level was pre-set at  $P \leq 0.05$ .



**Figure 1:** Visual analog scale.

## Result

The mean visual analog score for uncooled anesthetic gel group were  $63.12 \pm 4.63$  and statistically significant lower score in cooled anesthetic gel group  $38.23 \pm 5.53$  group ( $p < 0.001$ ).

Intervention	N	Mean VAS Score	P value
Uncooled Anesthetic Gel	30	$63.12 \pm 4.63$	<0.001
Cooled Anesthetic Gel	30	$38.23 \pm 5.53$	

## Discussion

Hearing unfavorable comments from family, friends, and other people might be considered as unfavorable understandings, which can result in dental dread and anxiety. In several contexts, operations involving needles are seen as the primary causes of pain and suffering in children.<sup>9</sup> In a cross-sectional study involving 970 kids between the ages of 5 and 12, Colares et al. discovered a prevalence of dental dread and anxiety of 14.4%. Injections are the subject of the greatest anxieties.<sup>10</sup> It is crucial to manage pain during both invasive and noninvasive dental procedures because discomfort may cause patients to refuse care and stop receiving it.<sup>11</sup> Desensitizing the injection site is one of several techniques advised to lessen the discomfort of LA injection for dental treatments.<sup>12</sup>

Even administering local anaesthetic to youngsters can make them anxious.<sup>13</sup> Moreover, paediatric dentistry places a high priority on pain treatment. By adjusting the local anaesthetic solution's pH and temperature as well as its rate of injection into the tissues, the dentist can reduce the discomfort associated with injections.<sup>14</sup> Another method is surface anaesthesia, which comprises topical anaesthetic, transcutaneous electronic nerve stimulation (TENS), and chilling to prepare the tissues prior to injection. Topical anaesthetic gel or cream is widely accessible and technique independent. The "holy grail" of painless local anaesthesia in paediatric dentistry is topical anaesthetic gel or ointment. They have the capacity to penetrate the mucosal lining of the mouth and cause analgesia. They provide surface anaesthesia for a depth of 2-4 mm by blocking the signal transmission from the sense nerves' terminal fibres. The action-potential threshold increases as a result of a modification in transmission through voltage-sensitive sodium channels, which occurs secondarily to this change. This characteristic of topical anaesthetic enables it to efficiently reduce needle insertion pain.<sup>15,16</sup>

The aim of the study was to evaluate the effect of cooled topical anesthetic gel on pain perception of pediatric patients during the administration of local anesthesia for routine dental procedures. In the present study the subjects in the age group of 6-10 years were selected because dental problems are difficult to treat in this age group as they exhibit more disruptive behavior and dental anxiety and are most difficult to manage in dental clinic.

The results of the present study showed application of cooled topical anesthetic gel on injection site prior to the injection of local anesthetic agent did significantly reduce the pain perceived during administration of local anesthesia for routine dental procedures.

The unique method of cryoanesthesia, which is used to lessen pain perception, is based on the idea that chilling a limited location prevents the local neuronal transmission of painful stimuli. By activating pain pathways of inhibition and stimulating myelinated "A" fibres, the lower temperature successfully raises a person's pain threshold.<sup>17</sup> Also, it is thought that locally chilling the tissues will decrease or stop the transmission of pain signals as well as delay neuromuscular transmission. A decrease in the activity of the muscular tissue's spindles also results in a drop in muscle tone.<sup>18-21</sup> Harbert demonstrated that pre-cooling the soft tissues prior to palatal injection was an efficient method to relieve the pain caused during needle insertion.<sup>19</sup> Whereas other reports by Duncan et al. stated that application of a cotton pellet saturated with dichlorodifluoromethane spray for 5 seconds prior to administering palatal injections revealed less discomfort during needle penetration and similar results.<sup>20</sup>

From the result of the present study it was found that the Cooling the soft tissue site with anaesthetic gel helped reduce pain perception during administration of local anesthesia in children and was seen to be a more feasible technique. The result of our study in accordance to the study conducted by Prathyusha P. et al in 2021.<sup>17</sup> Gadheri et al. also suggest that cooling the injection site prior to infiltration anaesthesia in the buccal mucosa for a minimum of 1 minute, reduced the pain perception in paediatric patients.<sup>21</sup>

## Conclusion

Children experienced less pain during infiltration when the soft tissue site was cooled with anaesthetic gel, and this method was deemed to be more practical. When local anaesthesia is administered before dental operations, this approach can be utilised as a successful addition to that.

## Conflict of Interest

The authors declare no conflict of interest.

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