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Effectiveness Of Eutectic Mixture Of Local Anaesthetics Vs Lidocaine As A Topical Anaesthetic Agent In Dentistry

Research Article

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Abstract

Background: Pain management is one of the most critical aspects of modern dentistry which might affect patient's quality of life. Various methods are suggested to provide a painless situation for patients. Desensitization of the oral site using topical anaesthetics is one of those methods.
Aim: To compare the efficacy of EMLA and lidocaine gel in the same patient with bilateral injection.
Materials and Methods: 30 healthy patients,[Male-15,Female-15] aged 20 to 60 years old, received application of topical anaesthetic agents applied in the palatal area for their dental treatment. Pain responses were compared based on subject self report using visual analogue scale (VAS).Duration of onset of action for the 3 groups were recorded.
Results: EMLA is more effective than lidocaine gel as a topical anaesthetic agent.There is not much difference after a waiting period of 1 minute or 3 minutes.
Conclusion: Patients experienced less pain during the time of injection prick on application of EMLA than on application of lidocaine gel. Hence for palatal infiltration, on block application of EMLA topically before injection prick to avoid pain and discomfort to the patient,so that patient experiences a painless dental procedure.

Keywords: Topical Anaesthetics; Eutectic Mixture Of Local Anaesthetics; Pain; Visualanalogscale; Palatal Infiltration.

Introduction

Pain control is an integral part of modern dentistry. Injecting local anesthesia is in itself an anxiety evoking procedure. The dentist can overcome the issue of injection pain by altering the pH and temperature of local anesthetic solution and by reducing the speed of injecting the solution into the tissues. Another technique is to prepare the tissues before injection, i.e., surface anesthesia, which includes refrigeration, transcutaneous electronic nerve stimulation (TENS), and topical anesthesia. Hence, it is important to resort to a pain free method of administering local anesthesia for a patient.

The oral mucosa is thinner than dermal tissue and has a more underlying blood supply that facilitates rapid absorption of lipophilic drugs. Palatal anesthesia is important in allowing pain-free manipulation of the soft tissues on the palatal side of the tooth. In addition, accessory nerve supply to the dental pulps may arise from the greater and naso-palatine nerves. Therefore, palatal injections are sometimes required to allow painless operative procedures on the teeth.

Various agents are available today for topical analgesia. Generally, there are 13 types of topical analgesic and anesthetic with different bases which can be applied on mucosal tissues for the pain associated treatments.Lignocaine serves as the gold stand-

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ard, benzocaine is also known for its excellent surface anaesthetic properties. EMLA (Eutectic mixture of local anesthetics) was introduced into the anesthetic armamentarium in the 1980s for dermal analgesia . Eutectic mixture of local anesthetics (EMLA) is a eutectic combination of 2.5% lidocaine and 2.5% Prilocaine which has gained aficionados for dental procedures, lately. It consists of a mixture of two crystalline powders (2.5% lidocaine and 2.5% prilocaine), which has a melting point below room temperature which turn into a liquid oil. In this way, it would be able to penetrate intact skin or mucosa into a depth of 5 mm. EMLA provides sufficient local anesthesia in a variety of painful superficial procedures including superficial surgery, laser surgery, epilation, cautery of condylomata, debridement of leg ulcers, and venipuncture.[4, 5] EMLA represented a very favorable tolerability profile with transient and mild skin blanching.

Multiple topical anaesthetic agents are freelyavailable.Hence the purpose of the study,to compare the efficacy and duration of onset of action of EMLA and lidocaine as topical anaesthetic agents for palatal infiltration.

Materials And Methods

The present study was a split mouth experimental study, conducted in Saveetha Dental College and Hospital, Chennai from Oct 2020 to Jan 2021. A total of 30 patients [males (15), Females(15)] referred to the Department of Oral and Maxillofacial Surgery were recruited for the study.

An informed and written consent was taken before enrolment of study. The demographic and clinical parameters like age, gender, medical history, procedure of removal of tooth were identified and recorded in proforma.

Inclusion criteria

Patients who required removal of infected or prophylactic teeth maxillary third molars were included in the study.

Exclusion criteria

Patients who had co- morbid diseases like diabetes, renal failure, epileptic, cancer, endocarditis, immune compromised, pregnant women, patients who had prophylactic radiotherapy and who were extremely uncooperative were excluded from the study.

The thirty selected patients were divided into 3 groups of 10 patient each. Each group was assigned based on:

Group I: Were those in which in time interval was 30 seconds.
Group II: Were those in which in time interval was 1 minute.
Group III: Were those in which in time interval was 3 minutes.

The experiment was conducted by a single operator, who was trained to position the needle insertion. The participants were blind to the formulations applied as they were asked to close their eyes during application of topical anesthesia. During the experiment, each participant was set in an upright position with the assistant holding the suction tip to prevent swallowing of any of the topical anesthetics. Before topical anesthesia application, the palatal mucosa was dried with a sterile gauze. 5% EMLA or 5% lidocaine gel were applied randomly on either side, palatal to the maxillary first premolar between gingival margins 10 mm toward midline using a cotton swab .The first insertion was done using short needle gauge 26, at 10 seconds for Group I patients, 30 seconds for Group II patients, after 3 minutes for Group III patients. The extraction procedure was carried after giving a buccalsubperiosteal infiltration concerning the tooth to be extracted. While extraction was carried if the patient felt any pain, it was recorded in the Visual analogue scale.The participant rated the degree of pain on the VAS.

Assessment protocol

All the patients were reviewed for complications in terms of pain during injection prick, duration for the onset of action of EMLA and lidocaine gel.

Pain

Intensity of pain is measured by using Visual Analogue Scale (VAS) (McCormack et al., 1988) whereby the intensity of pain is divided into 10 scales with 0 indicates no pain at all and 10 as the most severe pain that the patient has ever suffered. Patients were asked to fill according to their experience on the respective evaluation days.

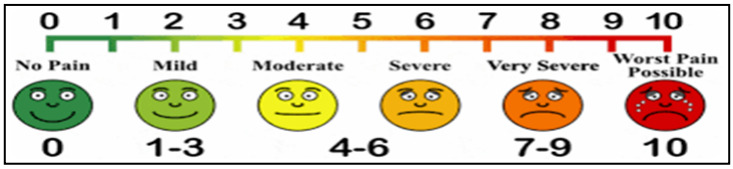
Each patient quantified the pain perceived during the injection using a 10-point visual analogue scale (VAS). The pain score for each of the patient was recorded.

Duration of onset of action

The duration of onset of action of local anaesthesia was measured using stop watch. Needle insertion was used to check the onset of anaesthesia. The onset of action for each patient was recorded.

Statistical Analysis

The sample size was calculated using the software G Power version 3.1.9.2. Paired t-Test was applied to compare mean values between time points and to analyse the mean values between the groups. We recorded the data of the patients and added to the database SPSS (IBM SPSS Statistics for Windows, Version 23.0, and Armonk, NY: IBM Corp. Released 2015). Significance level was set at 5% ($p = 0.05$).



Results

A majority of the patients in groups I and II were males (52% and60%, respectively). In group III, a majority of the patients werefemales (60%). The gender distribution of the studied populationwas not significant (p = 0.8139). The age of the studied populationwas in the range of 20-60 years. On application of EMLA, the VAS score was found to be reduced after 1 minute (1.6) and 3 minutes (1.2). After 30 seconds, it was (2.64) (Fig. 1). The VAS score was found to be reduced with timeafter application of lignocaine gel. It was decreased from 3.48 to 2.6 and 2.4 after 1 minute and 3 minutes, respectively (Fig. 2). In all the groups, VAS scores were higher in patients treated with Lignocaine gel as compared to EMLA. This difference wasfound to be statistically significant in all the groups according to thepaired t test (Table 1).

Figure 1. VAS score after application of EMLA.

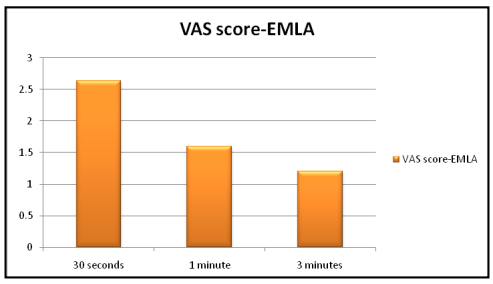


Figure 2. VAS score after application of Lignocaine gel.

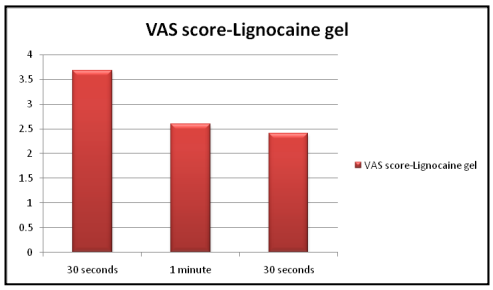


Table 1: Comparison of efficacy of EMLA and lignocaine gel (VAS scores).

Paired t test (VAS score)	Group I	Group II	Group III
p-value	0.0026	0.0341	0.0039
$p < 0.05$	✓	✓	✓
One- or two-tailed p-value	Two tailed	Two tailed	Two tailed

Figure 3. Application of gel on the palate prior to local anaesthesia administration.

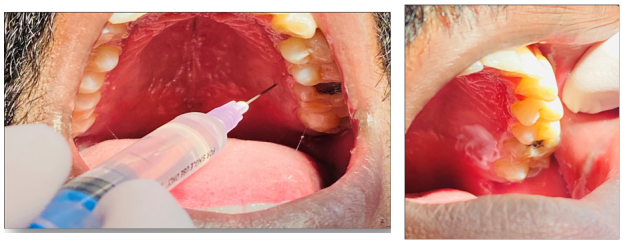


Figure 4. Needle insertion at 10 seconds,1 minute and 3 minutes followed by Palatal infiltration.

Discussion

There is a considerable amount of information available concerning the efficacy and duration of local anesthetics following intraoral injection.The efficacy and duration of intraoral anesthesia varies between different local anesthetic solutions and techniques. The duration of soft tissue anesthesia varies between regional block and infiltration techniques.

Needle injection during local anesthesia infiltration might induce a provoked pain, especially in the palatal mucosa with a thick, keratinized layer which resists to the effects of topical anesthetics (particularly the anterior region) rather than other intraoral sites [9, 10]. Painless administration of LA injection during any procedure is an important consideration. Topical anesthetics have been used for number of years for reducing pain during injections.The pain of palatal injection is mainly associated with the mucoperiosteum dislocation than with the puncture [13]. As the palatal penetration, it has become a special test for evaluating the efficacy of any kinds of topical anesthetic agents.

In another recent study, the topical anesthetic efficacy of following agents was evaluated prior to palatalinjection: Liposome-encapsulated 5% lidocaine, liposome-encapsulated 2.5% lidocaine, 5% xylocaine, and 2.5% EMLA. Similar result to the previous study was reported in which the liposome-encapsulated 5%lidocaine and EMLA showed the best anesthetic results than other agents. Again, in another clinical study, the efficacy of following topical anesthetics were evaluated when they were applied at buccal fold of maxillary canine tooth prior to local anesthesia infiltration: 20 mg of 1% ropivacaine gel, 60 mg of 1% ropivacaine gel, 20 mg of EMLA, 60 mg of EMLA, 20 mg of 20% benzocaine gel, and 60 mg of 20% benzocaine gel. The final results manifested that all of the topical anesthetics were similar in reducing the pain of needle penetration, however, EMLA 60 mg promoted longer duration of soft tissue anesthesia.

Placebo-controlled trial showed the application of EMLA on an oral adhesive bandage to palatal mucosa reduced the pain of palatal injections. In his investigation , he compared EMLA to 10% lignocaine in argon laser stimulation and reported EMLA was more effective in reducing the pain threshold of lower anterior labial gingiva (Svensson et al., 1992) [14]. David Donaldson [17] and John G. Meechan in their trial comparing topical use of EMLA and 5% lidocaine found EMLA cream was better in providing anaesthesia where gingival manipulation is required (Ehrenström-Reiz, Reiz, & Stockman, 1983).

In our study, we have compared EMLA with 2 % lignocaine palatal nerve blocks on providing anaesthesia to the palatal soft tissues. Asfar as we are aware, the use of EMLA as the sole means of palatal soft tissue anaesthesia for extraction has not been reported previously in the literature. In our present study, we have found that there was a significant difference in pain perception in favour of the EMLA group. So EMLA can be used as an alternative for palatal nerve blocks in the extraction procedure. While using topical anaesthetics in oral mucosa, it is absorbed systemically, and systemic effects are produced. Topical anaesthetic action will be ineffective if left for a period of only 30 seconds .There is not much difference after a waiting period of 1 minutes or 3 minutes.

Conclusion

To conclude,patients experienced less pain during the time of injection prick on application of EMLA than on application of lidocaine gel. Hence,this study suggests that EMLA may be advantageous in providing palatal soft tissue anaesthesia during prophylactic extraction, thereby avoiding painful palatal nerve blocks and preventing Local anaesthetic toxicity.

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