Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies *NLM ID: 101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Indian Citation Index (ICI) Index Copernicus value = 100

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

Comparative clinical evaluation of two different topical intrapocket anaesthetic agents during non-surgical periodontal therapy: A randomized split mouth study

[1]Ashlesha Arekar, [2]Nikesh. N. Moolya, [3]Nilima Rajhans, [4]Nilima Daule, [5]Asawari Lawande, [6]Richa Bhosale

[1,6]Post Graduate Student, [2]Professor, [3]Professor and Head of the Department, [4,5]Senior Lecturer, Department of Periodontics and Oral Implantology, Y.C.M.M & R.D. F's Dental College & Hospital, Ahmednagar, Maharashtra, India

ABSTRACT:

Background: Dental anaesthesia is among the main procedures associated with patient phobia in dental offices. A eutectic mixture of local anesthetics (EMLA) is an anaesthetic formulation defined as a eutectic mixture of local anaesthetic drugs composed of a combination of 2.5% Prilocaine and 2.5% lidocaine. This novel study was carried out to evaluate the effectiveness of the topical administration of a combination of 8.7% choline salicylate as an anti- inflammatory agent with 2% lidocaine and EMLA as intrapocket anaesthetic agents prior to non-surgical therapy. This split mouth randomized controlled study compared the anesthetic effect of two gels by using a visual analog scale (VAS). **Materials and Methods:** A randomized split-mouth clinical trial was carried out with 17 volunteers. Before to and during topical anaesthetic application, sensory and quantitative tests were conducted. Preparation of a reservoir within a splint on each side of the mouth and insertion of splints. **Results:** A comparative analysis between the treatments with the two drugs demonstrated a slight increase in the tactile perception in the combination of 8.7% choline salicylate with 2% lidocaine-treated side. P value was less than 0.05. No significant difference was observed in visual analogue scale (VAS) between the two groups in pain control. **Conclusion:** EMLA gel is effective as a topical intrapocket anaesthetic gel during non-surgical procedures. Comparing the effect of EMLA gel and gel as topical intrapocket anaesthetic gel during non-surgical procedures, both the gels are equally effective as topical intrapocket anaesthetic gel.

Received: 19 July, 2024 Accepted: 16 August, 2024

Corresponding author: Ashlesha Arekar, Post Graduate Student, Department of Periodontics and Oral Implantology, Y.C.M.M & R.D. F's Dental College & Hospital, Ahmednagar, Maharashtra, India

This article may be cited as: Arekar A, Moolya NN, Rajhans N, Daule N, Lawande A, Bhosale R. Comparative clinical evaluation of two different topical intrapocket anaesthetic agents during non-surgical periodontal therapy: A randomized split mouth study. J Adv Med Dent Scie Res 2024;12(9):61-70.

INTRODUCTION

Pain control is an important outcome for successful periodontal therapy.[1] Periodontal therapy usually involves supra or subgingival scaling and root planing (SRP), which can be performedusing curettes or sonic and ultrasonic instruments.The reasons for pain during SRP include tissue trauma caused by instrumentation, dentin hypersensitivity, unpleasant noise and sensation produced by area specific curette and sonic or ultrasonic instruments when they come into contact with the tooth structure.[3]

Various clinical procedures in dentistry carried out on patients require the utilization of palatal injections for achieving local anaesthesia. These palatal infusions can be painful owing to the thick keratinized palatal mucosa, particularly for paediatric patients whose participation is a fundamental challenge of treatment. Therefore, effective sedative anaestheticscs have been advocated to lessen pain from needle prick penetration.[3]

Topical anaesthetic based on combination of 2.5% lidocaine and 2.5% prilocaine (L/P) (Figure 1) have shown promising clinical outcomes in dentistry. The eutectic combination of L/P has been utilized as a skin pain relieving cream to reduce pain, anxiety and discomfort related with venous cannulation in adult and children.[3] In addition, the L/P cream has shown viable outcomes in maxillary sinus and minor gynaecologic procedures.[3] A. S. McMillan in 2000 has conducted a study to compare the efficacy of 5%

EMLA & 5% Lignocaine which served that EMLA is more effective as compared to lignocainee L/P mix has additionally beenutilized as an intraoral pain relieving during dental techniques, for example, extraction of gingival tissues, gingival biopsy, scaling, and root planning, and other clinical techniques in periodontics.[4] It has been recorded that the L/P cream could successfully reduce pain intensityfrom sedative needle prick in the maxillary vestibular mucosa.

Newer anaesthetic formulations have been developed to improve treatment conditions and ameliorate the patient's level of acceptance of dental procedures. A topical anaesthetic made up of 2.5% lignocaine and 2.5% prilocaine in a eutectic mixture of local anesthetics (EMLA) has been used as an oral analgesic during clinical procedures such as periodontal probing and scaling. 8.7% choline salicylate with 2% lidocaine is the composition of commercially available combination of 8.7% choline salicylate and 2% lignocaine gel used for non-surgical procedures. The combination of choline salicylate and lidocaine is primarily used to reduce mild to moderate pain. 8.7% choline salicylate with 2% lidocaine gel is an antiseptic oral gel. It is specifically indicated as medication in mouth ulcers, toothaches and abrasions in the mouth. It helps in mitigating pain in conditions such as teething pain and abrasions. The contents of the gel include benzalkonium chloride 0.01 %W/W, choline salicylate 8.7 %W/W which act as anti-inflammatory agent and lignocaine 2 %W/W as a local anaesthetic. Cholinesalicylate works by blocking the effect of cyclo-oxygenase (COX) proteins that produces another synthetic prostaglandin (PG). These prostaglandins are produced at injury sites and cause agony and swelling. By blocking the impact of cyclooxygenase enzymes, lesser prostaglandins are produced, which lessens mild to moderate pain and inflammation at the damaged and injured site. Lidocaine impedes the pain signals from the nerves to the brain, in this way it helps in diminishing the pain sensations. Combination of 8.7% choline salicylate with 2% lidocaine gel helps in treating mouth ulcers.

A novel anaesthetic gel was developed to provide pain control in conjunction with periodontal scaling and root planning, following local application into periodontal pockets. EMLA is an anaesthetic formulation defined as a eutectic mixture of local anaesthetic drugs composed of a combination of 2.5% prilocaine and 2.5% lidocaine. The anaesthetic gel, a thermos reversible gelling system is a low viscosity fluid at room temperature which becomes an elastic gel at room temperature.[5]

The main purpose of using topical anaesthetic drugs is to reduce the painful stimulus caused by needle penetration, leading to significant control of pain and anxiety of the patient. Therefore, the aim of the split mouth study was to compare the effectiveness of two different topical intrapocket anaesthetic agents during non-surgical periodontal therapy.

MATERIALS & METHODS

A randomized, split-mouth clinical trial was carried out with 17 volunteers sensorial and quantitative tests were applied before the contact with topical anaesthetic and after the application. After obtaining verbal and written informed consent, patients were recruited from the outpatient clinic of the department of periodontics and the study continued with 17 volunteers, including 10 women and 7 men with an average age of 22.8 year. The volunteers served as their own controls, and the sides used for each anaesthetic was chosen randomly.

The inclusion criteria included minimum of 20 permanent teeth, systemically healthy individuals, no history of allergies with local anaesthetics, no reports of dysesthesia in the faceor oral cavity. The exclusion criteria included pregnant or lactating women, smokers, individuals with history of alcoholism, individuals with cardiac, neurologic or haematological disorders, presence of ulcerative lesions or acute infections, individuals with dentin hypersensitivity and ongoing endodontic treatment.

Initially, impression of the mandibular arch was taken of all the participants who fulfilled the inclusion criteria, followed by the preparation of a model in plaster and acetate moulding, with involvement of the teeth (Figure 2). A relief area was then created in plaster and placed on the cast model on the palate, at 2 mm from the gingival margin, between the teeth 34 and 35 and 44 and 45, to create a reservoir for the local anaesthetic drug. The participants were comfortably seated in the dental chair at 45° in relation to the ground, with the head resting on a flat surface, they were instructed to keep their eyes closed and focus on the examination. Application of 2.5% lignocaine and 2.5% prilocaine (EMLA) to the reservoirs on left side and on the right side we deposited combination of 8.7% choline salicylate with 2% lidocaine (Figure 3). The mucosa was dried beforehand with gauze, and then the tray was positioned andkept for 5 mins.

ASSESMENT OF PAIN STIMULUS CONSISTS OF THREE QUATITATIVE TESTS

1. Superficial Tactile Perception:

This parameter was evaluated through the application of black braided silk suture (SUTURA) (Figure 4). The suture was horizontally applied at the predetermined points until perception and identification of the stimulus by the participant (Figure 5). The patient who was being evaluated measured the level of pain using a visual analogue pain scale.

2. Sensitivity to mechanical pain:

The sensitivity to mechanical pain was determined through application of black silk suture in contact with the mucosa, for 2 seconds. The evaluated patient quantified the level of pain through the visual analogue scale (VAS), which assigns a value of 0 for "no pain" and 10 for "unbearable pain."

3. Sensitivity to needle penetration:
A short 30G dental needle was vertically inserted at the points that had contact with the topical anaesthetic drugs, at a depth of 2 mm (Figure 6). Using a visual analogue pain scale, the evaluated patient measured their level of pain. Measurements were taken for each side. The measurements started before the tray was applied and after contact with the topical anaesthetic drugs at 5, 10, 20 and 30 minutes.

4. Pain sensation:
A pressure-sensitive periodontal probe of 'DISPODENT' (Figure 7) was used to apply a known force to the buccal gingival papillae between teeth 34 and 35 and 44 and 45. The stimulus was applied perpendicular to the test region on the centre of the gingival papilla to find out whether any sensation had been perceived. A sensation of pain was defined as present or absent.

Personal protective equipment was used for the safety of operator as well as subjects. All participants underwent ultrasonic scaling as the first treatment of the day.

STATISTICAL ANALYSIS

Statistical analysis of the collected data was done using SPSS version 24.0 (Armonk, NY: IBM Corp). Mann-Whitney U Test was used to compare two groups.

RESULTS

A comparative analysis between the treatment with the two drugs demonstrated a slight increase in the tactile perception in the combination of 8.7% choline salicylate with 2% lidocaine treated side. P value is <0.05. (Table No. 1). In the superficial tactile perception, (Figure 8) a comparative outcome between the side treated with EMLA and the side that was treated with combination of 8.7% choline salicylate with 2% lidocaine addressed by a decreaseof tactile perception in the oral mucosa in the five minutes time interval, acquired with the utilization of silk braided nylon suture. When comparing two groups EMLA vs choline salicylate and lignocaine, no measurable repercussions were seen at the evaluated times.

At some point when we compare the group singly, we observed that at five minutes point of estimation, there was statistically significant values in the decrease of superficial tactile perception when compared to the moment prior to the application of anaesthetic agents, whichwere not significant for other times different times (10, 20, and 20 minutes) (Table No. 2). The sensitivity to mechanical pain that the patients introduced negligible discomfort as validated by the analogue scale. (Figure 9) A comparative analysis between the treatment with two drugsshowed no difference in mechanical sensitivity. In the test of sensitivity to needle penetration no significant difference was observed. (Figure 10) At the point when we assessed each group singly that's what we observed, the side in touch with EMLA had no factual difference in duration of 30 minutes, when looked at to the time prior contact with the effective sedative. No other data with statistical relevance was noticed for the other time evaluated and, in the group,treated with EMLA.

Table No. 1 Comparison between the two groups using Mann-Whitney U Test

	Groups	N	X^2	P value
STP	1	17	85.500	.019
	2	17		
	Total	34		
SMP	1	17	135.000	.720
	2	17		
	Total	34		
SNP 5min	1	17	105.000	.144
	2	17		
	Total	34		
SNP 10 min	1	17	129.000	.561
	2	17		
	Total	34		
SNP 20 min	1	17	142.500	.926
	2	17		
	Total	34		
SNP 30 min	1	17	144.500	1.000
	2	17		
	Total	34		
PS	1	17	144.500	1.000
	2	17		
	Total	34		

Table No. 2 Comparison between two groups based on parameters

Descriptive Statistics					
Groups		N	Minimum	Maximum	Median
2	STP	17	3	4	4.00
	SMP	17	2	4	3.00
	SNP 5min	17	2	5	3.00
	SNP 10 min	17	2	5	3.00
	SNP 20 min	17	2	4	2.00
	SNP 30 min	17	2	3	2.00
	PS	17	1	2	1.00
	AGE	17	24	50	30.00
1	STP	17	2	4	3.00
	SMP	17	2	4	3.00
	SNP 5min	17	2	4	3.00
	SNP 10 min	17	2	4	3.00
	SNP 20 min	17	2	3	2.00
	SNP 30 min	17	2	3	2.00
	PS	17	1	2	1.00
	AGE	17	24	50	30.00

Figure 1: Combination of 2.5% lidocaine and 2.5% prilocaine (L/P)

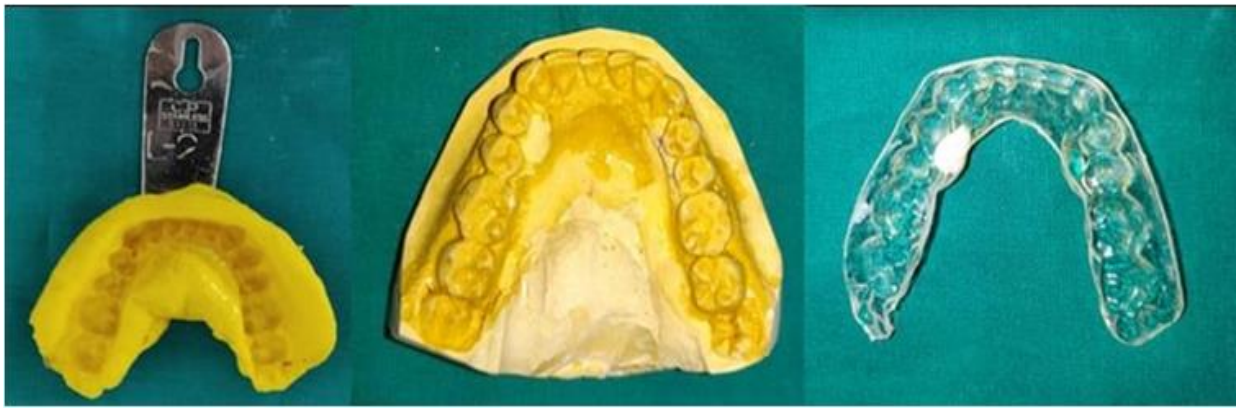

Figure 2: Impression of the mandibular arch, followed by the preparation of a model in plaster and acetate moulding, with involvement of the teeth.

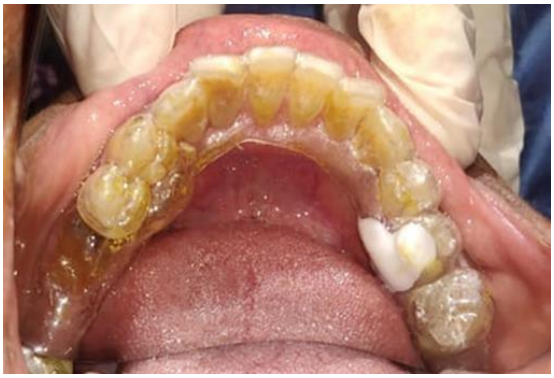

Figure 3: Application of 2.5% lignocaine and 2.5% prilocaine (EMLA) to the reservoirs onleft side and on the right side we deposited combination of 8.7% choline salicylate with 2%lidocaine

Figure 4: Black braided silk suture (SUTURA)

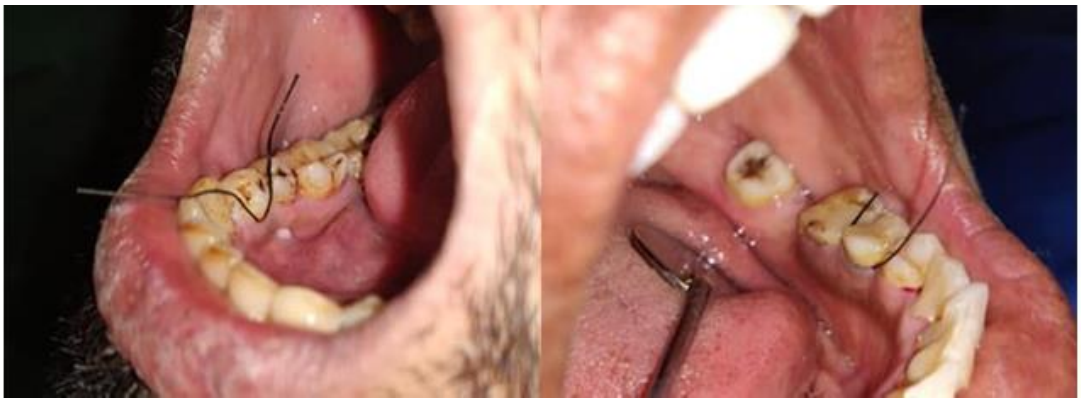

Figure 5: Horizontal placement of suture at predetermined sites.

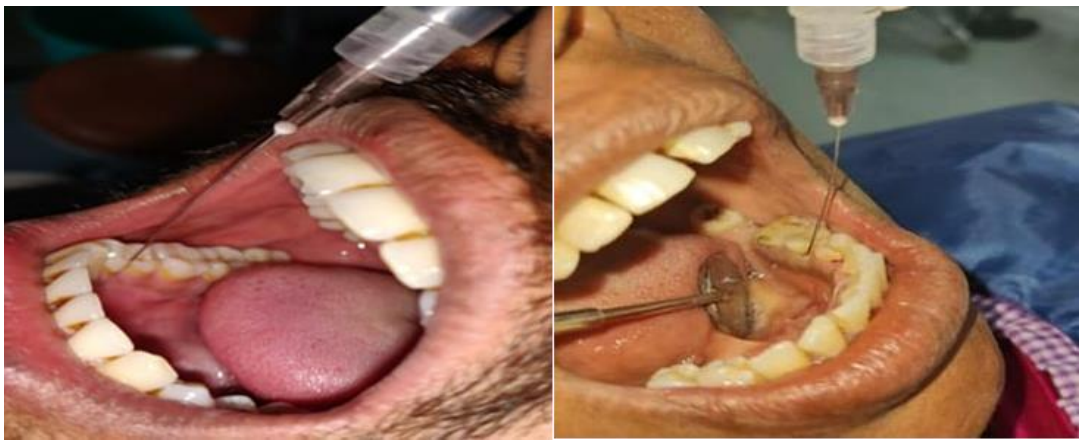

Figure 6: Vertical insertion of short 26-gauge needle containing topical anaesthetic.

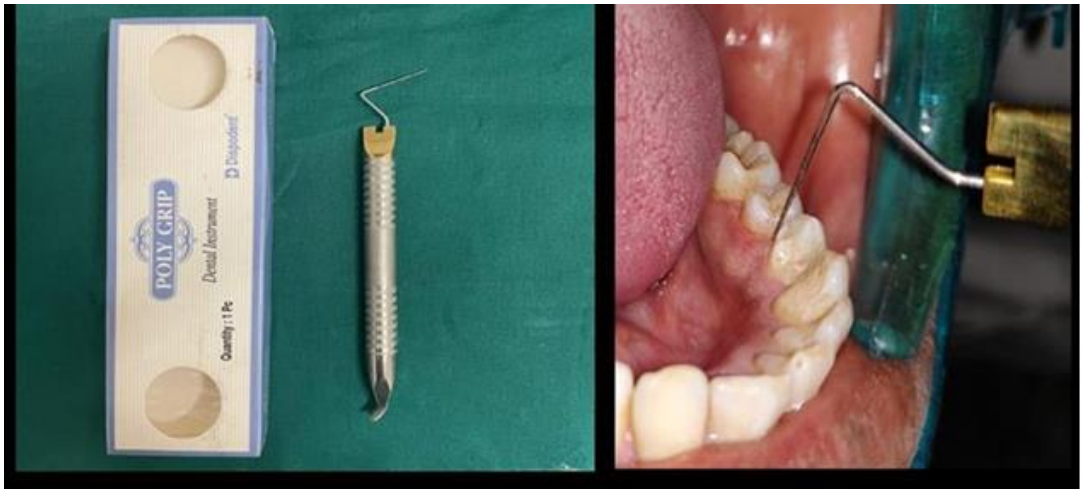

Figure 7: Pressure-sensitive periodontal probe of 'DISPODENT'

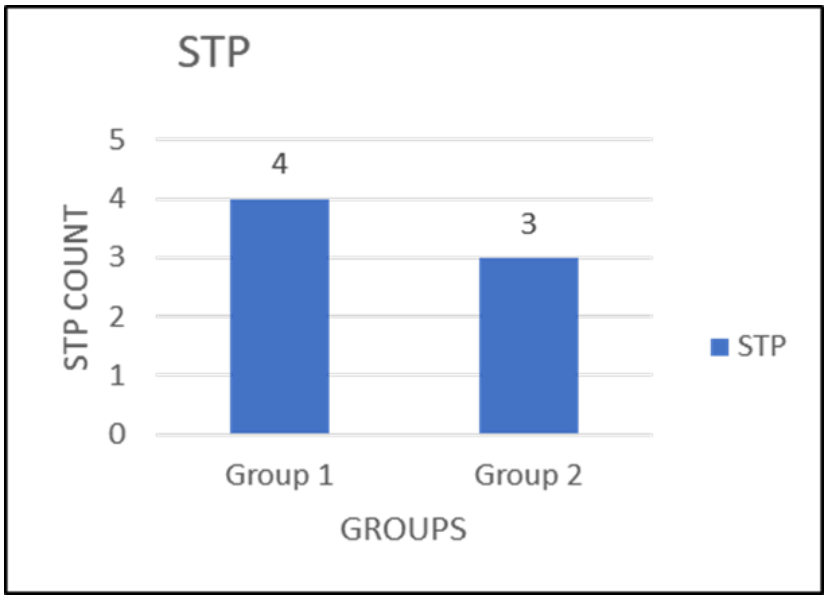

Figure 8: Comparison of sensitivity to tactile perception

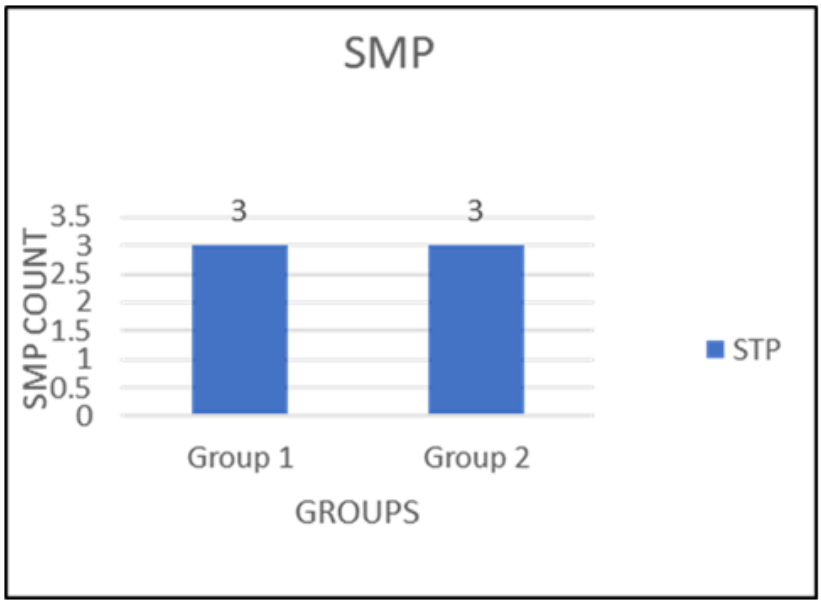

Figure 9: Comparison of sensitivity to mechanical pain.

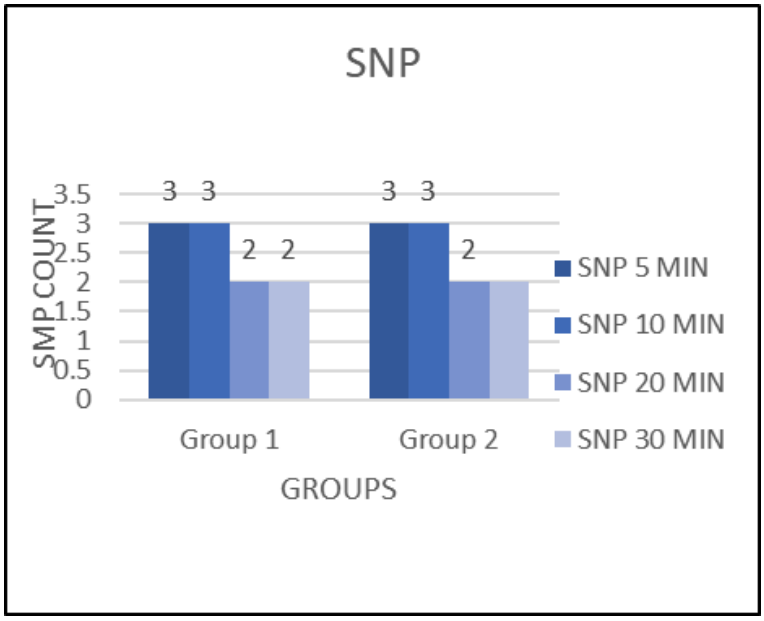

Figure 10: Comparison of sensitivity to needle perception

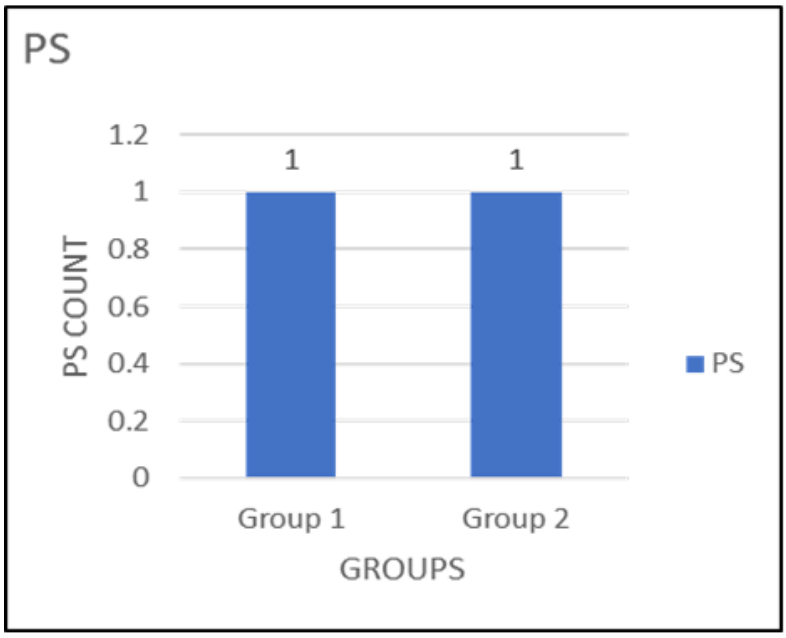

Figure 11: Comparison of Pain sensation

DISCUSSION

Topical anaesthesia has a main objective to annul pain prior to anaesthetic infiltration. This procedure optimizes infiltrative local anaesthesia by reducing the level of anxiety of the patient before needle penetration, as well as decreasing the number of perforations required and the amount of anaesthetic administered. J. K Peterson Svensson in 1994 clearly demonstrated the efficacy of a topical anaesthetic in a clinical situation, which may be recommended as a simple pharmacologic strategy to reduce pain and unpleasantness during scaling procedures.[6]

The use of L/P has been well recognized in the medical field, and its use in the oral cavity was first documented by Holst and Evers in 1985.[7] Since then in a number of clinical procedures, including the placement of rubber dam clamps, the removal of mobile primary teeth, soft tissue biopsies, and the removal of arch bars following inter-maxillary fixation, the use of L/P has been investigated. The action of EMLA-associated anaesthesia lasted longer than reported by Haasio et al. Pere et al. and Svenson et al. In previous studies, the anaesthetic times were shorter when EMLA was applied to the oral tissues with a toothbrush or cotton tip applicator, whereas they were slightly longer when a carmellose gelatine bandage was used to retain the topical agent. Choline salicylate and Lidocaine mouth gel is a topical gel. It contains a combination of two ingredients, 8.7% choline salicylate with 2% lidocaine. This gel provides temporary relief from pain and discomfort due to mouth ulcers, dentures or dental attachments like

dental braces. Mouth Gel should only be applied topically; it should not be ingested.

The low viscosity of EMLA and Choline salicylate and Lidocaine mouth gel makes it difficult for administration on the palate, requiring the formulation of a tray with a specific reservoir containing the gel. It seems likely that the oral splint was a more efficient reservoir and less likely to lose the agent during the application period, resulting in more effective anaesthesia. In spite of the fact that lidocaine/prilocaine with specific applicators are right accessible now, their utilization is confined to periodontics and they have restricted scope. Reports of local or systemic adverse effects are exceptional and so were not confirmed in this study. The assimilation and bio availability of the medication rely upon the contact surface, concentration and time of application. Therefore, the utilization of these medications on essential surfaces, for a short time period and at a low dose, as used in this study, is relativelysafe.

To monitor the degree of pain, the responses were measured using both visual analogue (VAS). The overall pain was assessed by the subjects using a 10 step VAS, with the left end point marked "no pain" and the right end point marked "unbearable pain" and midpoint as moderate pain as the primary efficacy parameter. Comparisons were made for every 5 minutes,10 minutes, 30 minutes estimating the group difference of VAS values using Mann Whitney U test. Level of significance was assumed to be <0.05. At the end of the procedure, the subjects were asked about their experience with regard to comfort, taste, and odour of the agents used.

There was statistically no significant difference between the two groups in pain control. (Figure 11) Only the superficial tactile perception test showed sufficient sensitivity to reveal a difference in the anaesthetic effect between EMLA and combination of 8.7% choline salicylate with 2% lidocaine.To accomplish a reliable assessment of the topical anaesthetic action, the techniques for estimation ought to incorporate not just the response to pain throughthe visual analogue scale, yet in addition the effect on the somatosensory framework, assessed in this study by the superficial tactile perception verified by different works that showed great results for EMLA in the adequacy of changing tactile and pain threshold. David Gomes de Alencar Gondime in 2018 compared the effectiveness of the topical administration of EMLA on Oral Pain and tactile sensitivity.[8] The use of nylon suture in the estimation of the sensitive and painful response in the present study were viable and easy to acquire and apply. Likewise, prior reports confirmed the reliability and validation of these instruments for use in the oral cavity. However, electronic measurements have showed more accuracy in the outcomes. M.M Buckley in 1993 conducted a study on eutectic lidocaine/prilocaine cream which states that it is a novel formulation proven to be effective and well-tolerated in the relief of pain associated with various minor interventions in adults and children.[9]

In the needle penetration sensitivity test, the side in contact with EMLA revealed less pain stimulation. When correlated the percussion of the anaesthetic effect over the evaluated times(5, 10, 20, and 30 min), statistically insignificant outcomes were obtained in the first 5 minutes and 10 minutes after contact with the topical anaesthetic, when the needle penetration sensitivity test was applied. The impact of anaesthetic bases on nociceptors and C strands, both related with pain stimuli, were assessed by the sensitivity test to mechanical pain and needle penetration sensitivity. The first test was not sufficiently sensitive to affirm measurabledifferences among EMLA and combination of 8.7% choline salicylate with 2% lidocaine in thetwo modalities of assessment. In our study, the VAS was utilized exclusively to measure the intensity of pain. As seen in others reports if we had to measure the degree of discomfort and pain it might reflect more predictable values. Using a pressure sensitive probe, the stimulus was applied perpendicular to the test area on the centre of the gingival papilla to find out whether any sensation had been perceived and was marked as present or absent.

CLINICAL IMPLICATIONS

The clinical significance of this study warrants the use of topical intrapocket anaesthetic gel to prevent pain, particularly when dentists conduct non-surgical procedures.

Combination of 8.7% choline salicylate with 2% lidocaine gel can be used as analgesic, anaesthetic as well as antiseptic gel.

It is generally safe to utilise these medications in integral surfaces for a brief period of time a nd at modest doses, as was done in our study.

It is cost effective.

CONCLUSION

To the extent of our knowledge, there was no published literature on the role of combination of 8.7% choline salicylate with 2% lidocaine gel as an intrapocket anaesthetic gel. Both the gels were equally effective. It surely warrants further randomized controlled clinical trials for an authorized conclusion.

ADVANTAGES

The unpleasant taste of EMLA gel was one of the complaints of the participants, and the addition of flavour would facilitate their acceptance, so combination of 8.7% choline salicylate with 2% lidocaine gel may be used as a substitute.

Reports of local or systemic adverse effects of topical anaesthetic drugs are uncommon and were not evidenced in this study.

DISADVANTAGES

The patient might experience an unpleasant taste

sensation during the application of gel**.**

CONFLICTS OF INTEREST

There were no conflicts of interest.

LIMITATIONS

In this study to measure pain more than one scale could have been used to confirm that thevalues are correlated and reliable.

Electronic measurements show greater precision in the results as compared to the manualinstruments.

The study needs to be conducted on large no. of sample size for definitive conclusion.

ACKNOWLEDGEMENT

Authors are thankful to Department of Periodontology and Oral Implantology, Yashwantrao Chavan Dental College, Ahmednagar.

REFERENCES

1. Chintala K, Kumar SP, Murthy KR. Comparative evaluation of effectiveness of intra-pocket anaesthetic gel and injected local anaesthesia during scaling and root planning–A split-mouth clinical trial. Indian Journal of Dental Research. 2017 May 1;28(3):281. https://www.ijdr.in/text.asp?2017/28/3/281/210680
2. Moraes GS, Santos IB, Pinto SC, Pochapski MT, Farago PV, Pilatti GL, Santos FA. Liposomal anesthetic gel for pain control during periodontal therapy in adults: a placebo- controlled RCT. Journal of Applied Oral Science. 2019 Nov 25;28. 10.1590/1678-7757-2019-0025
3. Al-Melh MA, Andersson L. Comparison of topical anaesthetics (EMLA/Oraqix vs. benzocaine) on pain experienced during palatal needle injection. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2007 May 1;103(5):e16-
4. 20. 10.1016/j.tripleo.2006.11.033
5. McMillan AS, Walshaw D, Meechan JG. The efficacy of Emla® and 5% lignocaine gel for anaesthesia of human gingival mucosa. British Journal of Oral and Maxillofacial Surgery. 2000 Feb 1;38(1):58-61. 10.1054/bjom.1999.0143
6. Derman SH, Lowden CE, Hellmich M, Noack MJ. Influence of intra-pocket anaesthesia gel on treatment outcome in periodontal patients: a randomized controlled trial. Journal of clinical periodontology. 2014 May;41(5):481-8. 10.1111/jcpe.12239
7. Svensson P, Petersen JK, Svensson H. Efficacy of a topical anaesthetic on pain and unpleasantness during scaling of gingival pockets. Anaesthesia progress. 1994;41(2):35.
8. Holst A, Evers H. Experimental studies of new topical anaesthetics on the oral mucosa. Swedish Dental Journal. 1985 Jan 1;9(5):185-91.
9. Gondim DG, Montagner AM, Pita-Neto IC, Bringel RJ, Sandrini FA, Moreno EF, Sousa AM, Correia AB. Comparative Analysis of the Effectiveness of the Topical Administration of Benzocaine and EMLA® on Oral Pain and Tactile Sensitivity. International journal of dentistry.2018 Feb 7;2018. 10.1155/2018/7916274
10. Buckley MM, Benfield P. Eutectic lidocaine/prilocaine cream. Drugs. 1993 Jul;46(1):126- 51. 10.2165/00003495-199346010-00008
11. Loveelen K, Guleri K. Topical gel: A recent approach for novel drug delivery Asian. J. Bio. Pharm. Sci. 2013; 3:1-5.
12. Pere P, Iizuka T, Rosenberg PH, Lindqvist C. Topical application of 5% eutectic mixture of lignocaine and prilocaine (EMLA®) before removal of arch bars. British Journal of Oral andMaxillofacial Surgery. 1992 Jun 1;30(3):153-6. 10.1016/0266-4356(92)90146-a
13. Donaldson D, Meechan JG. A comparison of the effects of EMLA cream and topical 5%lidocaine on discomfort during gingival probing. Anaesthesia progress. 1995;42(1):7.
14. Jeffcoat MK, Geurs NC, Magnusson I, MacNeill SR, Mickels N, Roberts F, Robinson P, Salamati A, Yukna R. Intrapocket anaesthesia for scaling and root planning: results of a double-blind multicentre trial using lidocaine prilocaine dental gel. Journal of Periodontology. 2001 Jul;72(7):895-900. 10.1902/jop.2001.72.7.895
15. Magnusson I, Geurs NC, Harris PA, Hefti AF, Mariotti AJ, Mauriello SM, Soler L, Offenbacher S. Intrapocket anaesthesia for scaling and root planning in pain-sensitive patients. Journal ofperiodontology. 2003 May;74(5):597-602. 10.1902/jop.2003.74.5.597
16. Heft MW, Perelmuter SH, Cooper BY, Magnusson I, Clark WB. Relationship between gingivalinflammation and painfulness of periodontal probing. Journal of clinical periodontology. 1991 Mar;18(3):213-5. 10.1111/j.1600-051x.1991.tb01137.x
17. Kumar PS, Leblebicioglu B. Pain control during nonsurgical periodontal therapy. Compendium of Continuing Education in Dentistry (Jamesburg, NJ: 1995). 2007 Dec 1;28(12):666-9.
18. Fukayama H, Suzuki N, Umino M. Comparison of topical anaesthesia of 20% benzocaine and 60% lidocaine gel. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2002 Aug 1;94(2):157-61. 10.1067/moe.2002.124858
19. Speirs AF, Taylor KH, Joanes DN, Girdler NM. A randomised, double-blind, placebo- controlled, comparative study of topical skin analgesics and the anxiety and discomfort associated with venous cannulation. British dental journal. 2001 Apr;190(8):444-910.1038/sj.bdj.4800999
20. Friskopp J, Huledal G. Plasma levels of lidocaine and prilocaine after application of Oraqix®, a new intrapocket anaesthetic, in patients with advanced periodontitis. Journal of Clinical Periodontology. 2001 May;28(5):425-9. 10.1034/j.1600-051x.2001.028005425.x
21. Andersson L, Behbehani E. Reduction of pain from needle stick in the oral mucosa by topical anaesthetics: a comparative study between lidocaine/prilocaine and benzocaine. The Journal of clinical dentistry. 2005 Jan 1;16(2):53-6.
22. Magnusson I, Jeffcoat MK, Donaldson D, Otterbom IL, Henriksson J. Quantification and analysis of pain in nonsurgical scaling and/or root planning. The Journal of the American Dental Association. 2004 Dec 1;135(12):1747-54. 10.14219/jada.archive.2004.0129
23. Vickers ER, Punnia-Moorthy A. A clinical evaluation of three topical anaesthetic agents. Australian Dental Journal. 1992 Aug;37(4):266-70.
24. Primosch RE, Rolland-Asensi G. Comparison of topical EMLA 5% oral adhesive to benzocaine20% on the pain experienced during palatal anaesthetic infiltration in

children. Paediatric Dentistry. 2001 Jan 1;23(1):11-4.
25. Haasio J, Numminen M, Rosenberg PH, Jokinen T. Topical anaesthesia of gingival mucosa by 5% eutectic mixture of lignocaine and prilocaine or by 10% lignocaine spray. British Journal of Oral and Maxillofacial Surgery. 1990 Apr 1;28(2):99-101. 10.1016/0266- 4356(90)90131-4
26. Goyal S, Sharma P, Ramchandani U, Shrivastava SK, Dubey PK. Novel anti-inflammatory topical herbal gels containing Withania somnifera and Boswellia serrata. International Journal of Pharmaceutical and Biological Archives. 2011;2(4):1087-94.