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RESEARCH ARTICLE

EVALUATING THE EFFICACY OF 5% EMLA VERSUS 20% BENZOCAINE AS TOPICAL ANESTHESIC IN IMPLANT SURGERY-A SPLIT MOUTH TECHNIQUE

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ABSTRACT

In modern dentistry, control of pain becomes a constitutive part of any surgical procedure. One of the main problems in most dental procedures is the fear of pain during local anesthetic injections which has been revealed as the major cause of apprehension. Pragmatically, various methods have been advocated to provide a painless needle insertion to reduce the source of anxiety and assurance of patients. Desensitization of the area using a topical anesthesia is among one of those methods. **Aim:** The main aim of the study was to compare the efficacy of two locally available topical anesthetics in reducing the needle insertion pain during an implant placement surgery. **Material and Methodology:** A split mouth technique was conducted on 20 subjects who visited the Department of Periodontology and Implantology for implant placement. Patients with bilateral edentulous either maxillary or mandibular areas were selected for the study. 5% EMLA cream and 20% Benzocaine gel were applied before the administration of local anesthesia and assessment of pain was done during needle insertion by facial expressions of the patients. **Results:** The data was collected and undergone statistical analysis using mean, frequency, percentage, and standard deviation, while continuous variable were correlated using chi square and student t test. On evaluation, a statistically significant result was obtained in patients when a topical application of 5% EMLA was done before the insertion of needle when compared to 20% benzocaine. **Conclusion:** Within the limitations it was concluded that though benzocaine has the rapid onset of action when compared, EMLA has a superior action in pain reduction.

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INTRODUCTION

Good planning and meticulous techniques is the main criteria for successful implant surgery. The extreme demand for implants have grown since past few decades with more patients interested in fixed prosthetics rather than the removable ones.¹The surgical time usually vary between the operators and the need of the case from a single stage to two stage procedures. Most implant surgeries are performed under local anesthesia, although some may require general anesthesia or sedation. Of the higher successful rates of implant placement and its outcomes, pain perception during local anesthesia remains an important reason for dental anxiety.² Management of pain during any dental treatment is exceptionally supreme, though a number of advancements in pain control modalities, the fear of pain still persisted. Domoto et al, related dental fear in a survey of Japanese student to needle phobia. Dental patients complain pain caused by injection as one and only major uncomfortable part in any dental procedure.³

Perception of pain during the administration of local anesthesia has become an important cause of anxiety which is caused by puncture of tissue, velocity of fluid along with the pressure applied while injecting, the temperature of anesthetic and the operator skill. In case of implant surgery, these problems can affect multi-stage treatment modality complicating the situation for both the dentist and the patients.⁴Clinicians and investigators have always tried various techniques to reduce anxiety and pain associated with dental injections in patients. Local anesthetics usually prevent the nociception generated during the dental procedure. For the association of pain at the time of local anesthetic, most dentist pursues the use of topical anesthetic prior to injection in reducing anxiety and pain.⁵ A number of topical anesthetics have been tested but a little or no agreement on their effectiveness due to application procedure, concentration or individual variations have been seen, though psychological factors helps in increasing the pharmacological efficiency.⁶ Eutectic mixture of local anesthetic (EMLA) is an admixture which melts at temperature lower than any of its component, empowering a higher concentration of anesthetic for use. It is a mixture of two anesthetics of amide in nature, with 25 mg/ml of prilocaine and lignocaine respectively.

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It is widely used in sinus punctures, dermatology, minor surgical procedures over the gingival tissues and in reducing any discomfort related to rubber dam clamps.⁷ Benzocaine has been used widely since 1903 and is an ester type of anesthetic, insoluble in water and indicated as a topical anesthetic. Used on orotracheal, nasal and oral mucosa with psychological and pharmacological effects to minimize the adverse effects of needle punctures. When applied locally, it significantly reduces the pain without obvious clinical relevance in reduction.

MATERIAL AND METHODOLOGY

Randomized 20, subjects reporting to the Department of Periodontology and Implantology, Desh Bhagat Dental College and Hospital, Punjab for replacement of their missing teeth using implants were selected for the study. A split mouth technique was used and subjects with bilateral edentulous areas, either in the maxilla or mandible were included in the study. The age being no bar, the subjects reported were with a minimum age of 21 with maximum being 60 years of age. Before the selection of subjects, a brief discussion about the study procedure was done and an informed consent was signed by them. Subjects with the history of contact dermatitis to any allergen were excluded from the study. Systematically healthy subjects, subjects on proper medication and with maintainable oral hygiene were selected for the study, subjects were asked to rinse with 0.2% chlorhexidine followed by complete oral examinations along with recording of the vitals before the procedure.

Subjects were seated comfortably on a dental chair and pilot examinations of their facial expressions were done using a probe for assessing pain. A tossed coin procedure was used and grouping was done accordingly, group I on left side 5% EMLA topical anesthetic was used and on other right side group II, 20% benzocaine was used after drying the mucosa with gauze. One minute of application time was used in both the groups for obtaining adequate and appropriate topical anesthesia as suggested by ADA and FDA. Local anesthetic of 1:100,000 epinephrine was injected using a syringe and the immediate reaction on patients face was observed by the observer standing next to the dental chair. After the assessment normal surgical procedure for implant surgery was followed.

PAIN ASSESEMENT: Wong-Bakers face rating scale (figure 1) was used to assess the pain in patients.⁹ The observer standing next to the chair observed the facial expression immediately after the needle puncture and rated the patient accordingly. The readings obtained were based on the facial expression as 0-no hurt, 1-hurts little bit, 2-hurts little more, 3-hurts even more, 4-hurts whole lot and 5-hurts worst.

SAMPLE SIZE CALCULATION: the sample size of the study population was calculated according to the formula $n = z^2 * p * (1 - p) / e^2$, where $z=1.96$ for confidence of interval (α) of 95%, p =population, e =margin of error.

$$Z=1.96, p=0.013, e=0.05$$

$$n=1.96^2*0.013*(1-0.013)/0.05^2$$

$n=0.0493/0.0025=19.71 \approx 20$. Thus, the sample size came out to be 20.

STATISTICAL ANALYSIS

The readings obtained were collected and transferred into a Microsoft excel sheet. Statistical examination was performed utilizing SPSS software rendition 20.0 (IL, CHICAGO, USA). Descriptive analysis was done using mean, standard deviation, standard error, frequencies and percentages. Categorical comparison was done using student t test and chi square test. Two tailed p value <0.05 was considered to be significant. **RESULTS:** A total 20 subjects selected for study, aged between 21-60 years, around 10% of subjects were of the age group 21-30, 15% were of the age 31-40 years, 30% were of 41-50 age and 45% were of 51-60 years of age with mean and standard deviation of 46.200 ± 9.720 and standard error of 2.174. A total of 80% were males and 20% were females, with mean \pm SD of 1.200 ± 0.410 and standard error of 0.092. The patients who reported to the department, 40% had bilateral edentulous maxilla and 60% were with edentulous mandible (Table 1). On comparison between the pain assessment using 5% EMLA cream and 20% benzocaine, 14 patients out of 20 sites presented a little bit pain on needle insertion using 5% EMLA, while 5 presented little more while 1 site had a score of 3 which presented expression more pain. In case of 20% benzocaine 9 sites had a little bit, 7 sites had little more and 4 sites were with more pain on needle insertion. A statistically significant difference was found between the facial expressions observed when two anesthetic were used while a non-significant difference of 0.199 representing no major variance between the efficacies of the two.

DISCUSSION

In 1995, Hamilton defined needle phobia as one of the formal conditions which affects approximately 10% of the population and was associated with unavoidable physiologic and behavioral changes. Local anesthetic infiltration using a syringe induces pain, especially in the palatal mucosa which is keratinized, thick layered and resists the effect of topical anesthesia.¹⁰ The present study was conducted to investigate the efficiency of two topical anesthetics to assess the pain to prick of the needle before an implant surgery. 5% EMLA and 20% Benzocaine were used in our study due to the easy availability and no side-effects. The whole study was performed by one trained observer to avoid any error and easy observation of the facial expression. No difficulty was obtained in application of any of the agent, however it was seen that the flow of benzocaine was more than that of the eutectic mixture (EMLA) which gave more advantages over the handling properties of EMLA. It was observed due to the less bitter taste and lack of odor of EMLA, its ability to be applied to different areas in the oral cavity and in required amounts was easy.¹¹ In the present study it was observed that, application of 5% EMLA before the needle injection was found to be significant more effective than benzocaine, when observed via Wong Baker scale. The results were in consistent with the studies done by Al Melhet al¹¹, Abu et al¹² and Saurabh et al¹³ who compared topical anesthetic in palatal mucosa and maxillary vestibular mucosa. Similar studies were conducted by McMillan *et al* in 2000, where they concluded that EMLA was found to be more efficient to be used in minor gingival tissue surgeries.⁷ While Lim *et al* found that the use of EMLA proved to be logical in decreasing the discomfort caused in children due to the use of dental dam clamp.¹⁴



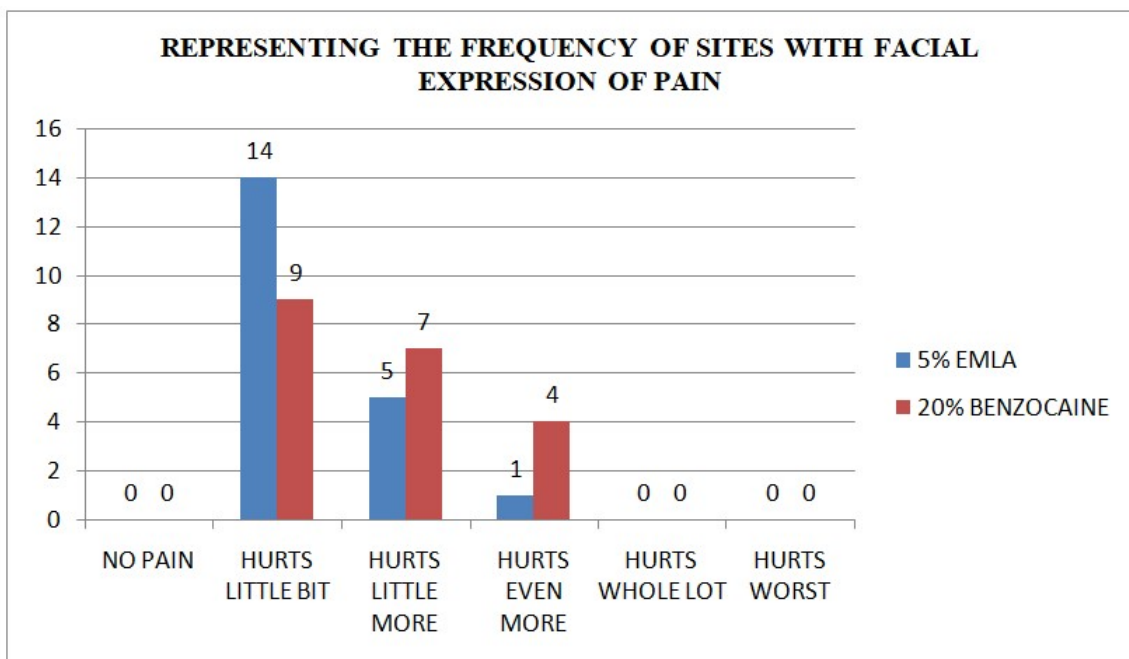
Figure 1.

Table 1. Depicting the descriptive data of the study subjects

| PARAMETER | | FREQUENCY | PERCENTAGE | MEAN±SD | STANDARD ERROR (SE) |
|-------------------|----------|-----------|------------|--------------|---------------------|
| AGE | 21-30 | 2 | 10 | 46.200±9.720 | 2.174 |
| | 31-40 | 3 | 15 | | |
| | 41-50 | 6 | 30 | | |
| | 51-60 | 9 | 45 | | |
| GENDER | MALE | 16 | 80 | 1.200±0.410 | 0.092 |
| | FEMALE | 4 | 20 | | |
| QUADRANT INVOLVED | MAXILLA | 8 | 40 | 1.600±0.503 | 0.112 |
| | MANDIBLE | 12 | 60 | | |
| TEETH INVOLVED | 16-26 | 5 | 25 | 2.700±1.218 | 0.272 |
| | 36-46 | 3 | 15 | | |
| | 17-27 | 5 | 25 | | |
| | 37-47 | 7 | 35 | | |

Table 2. Depicting the comparison between the pain assessment using topical anesthetic

| TOPICAL ANESTHETICS | NO PAIN (0) | HURTS LITTLE BIT (1) | HURTS LITTLE MORE (2) | HURTS EVEN MORE (3) | HURTS WHOLE LOT (4) | HURTS WORST (5) |
|---------------------|------------------------|----------------------|-----------------------|---------------------|---------------------|-----------------|
| | FREQUENCY/PERCENTAGE | | | | | |
| 5% EMLA | - | 14/70 | 5/25 | 1/5 | - | - |
| 20% BENZOCAINE | - | 9/45 | 7/35 | 4/20 | - | - |
| STUDENT T-TEST | - | <0.0001 | <0.0001 | <0.0001 | - | - |
| CHI-SQUARE TEST | 3.220 | | | | | |
| P-VALUE | 0.199/ NON-SIGNIFICANT | | | | | |



In 2003, Donaldson *et al* evaluated the VAS pain scores using 5% anesthetic gel and found that gel was more effective in reducing pain during periodontal debridement.¹⁵ Despite a number of technical problems, 5% EMLA proved to be superior over 20% benzocaine due to an increased pH. Setnikar *et al* in their study reported that the increased pH usually increases the potency of the topical anesthetic agent and a admixture of two local anesthetics in a single agent generally results in an increased efficacy.¹⁶ Hutchins *et al* in 1997⁸ and Fukayama *et al* in 2002¹⁷, in their study found no difference between topical application of 20% benzocaine and placebo on injection of local anesthetic solution. A randomized controlled study conducted by Freiras *et al* evaluated that 20% benzocaine was found to be ineffective in areas supplied by posterior superior alveolar nerve or greater palatine nerve, which was in consistent with our study where the facial expressions of the patients were much noticeable in case of insertion of needle for greater palatine nerve when compared with 5% EMLA.¹⁸

LIMITATIONS: The main limitation of our study was sample size. Another limitation was difficulty of finding the cases with bilateral edentulous areas. The topical application of EMLA was difficulty in its localization at the injection site due to its low viscosity and high pH.

CONCLUSION

A limited consensus about the routine application of topical anesthetics has not been supported by any investigator as such, but many are of the opinion that it can be used routinely before needle injection. Within the limitation of the study it was concluded that 5% EMLA was found to be more effective than 20% benzocaine in pain reduction during infiltrating injections for any surgical procedure.

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