ORIGINAL RESEARCH

Comparison Of Analgesic Efficacy Of Topical Anaesthetics (Gel, Spray) With Infiltration Anaesthesia During Subgingival Periodontal Procedures.

Priyanka Pampani,[1] Santhosh Shenoy B,[2] Biju Thomas,[3] Beena Ani Mathew,[4] Reema M Rao,[5] Saravanan.R,[6]

ABATRACT BACKGROUND: To compare the analgesic efficacy of Lignocaine spray 15% and Benzocaine20% gel with infiltration anaesthesia and to know which of the topical anaesthetic agent is as nearly efficient as 2% Lignocaine infiltration anaesthesia during sub-gingival periodontal procedures.

MATERIAL AND METHODS: Randomised spilt – mouth design trial for 20 patients was conducted. Patients were selected based on inclusion and exclusion criteria. Three quadrants in each patient were selected randomly for application of topical local anaesthetic agents like 2% lignocaine spray and 20%benzocaine gel and control group(lignocaine local infiltration technique). Sub-gingival periodontal procedures were performed for these patients. Overall pain was assessed by the patient using numerical pain rating scale(NRS).

RESULTS: Comparing the three groups, significant difference was observed between gel vs spray, gel vs control(infiltration), spray vs control (infiltration) (p value< 0.05). There is significant difference in the three groups as evidenced by kruskal-wallis test. The highest median is in the spray followed by gel and the control group. There is significant difference seen in all the subgroups as assessed by dunns test.

CONCLUSION: Our study concludes that 20% benzocaine gel can be used as an alternative to conventional 2% lignocaine infiltration anaesthesia when compared to 15% lignocaine spray.

Key words: Benzocaine, Lignocaine, Topical Anaesthesia, Gel, Spray, Pain, Scaling and Root Planning.

INTRODUCTION

Periodontitis is defined as an inflammatory disease of the supporting tissues of teeth caused by specific microorganisms or groups of specific microorganisms, resulting in progressive destruction of the periodontal ligament and alveolar bone with pocket formation, recession or both.[1] Periodontal pockets require frequent mechanical supragingival and subgingival scaling in order to eradicate and control periodontal disease and to avoid additional tissue destruction.[2]

Non-surgical treatment, periodontal debridement that is scaling and root planning (SRP) is the universal conventional practice which is used to treat gingivitis and periodontitis.[3] Supragingival scaling is commonly associated with discomfort, not necessarily pain; where as subgingival scaling and root debridement are more painful when compared to the former. Studies have documented that nonsurgical treatments are more painful.[4-7] The concern of pain during treatment has been keyed out as a major component in preventing patients from seeking dental care. Pain control is intended to be an extremely important outcome measure for successful periodontal therapy.[4-7] Efforts to relieve or reduce pain during such treatments are essential to successfully complete the treatment and for further periodontal maintenance and patient recall.

Subgingival periodontal procedures require some form of anaesthesia. The anaesthetic techniques utilized in subgingival periodontal procedures are either nerve block or infiltration or topical anaesthetics such as gel or spray.

Lignocaine HCL was synthesized by Nils Lofgren in 1943 and 1948. It was the first amide local anaesthetic to be marketed. Lignocaine HCL is available in different formulations.[8] Sufficient anaesthesia is provided by infiltration and nerve block procedures but the main disadvantage is pain associated with needle insertion and long duration of numbness of the soft tissues.[9] To overcome the side effects of

injectable local anaesthesia, topical anaesthetics were used.

Topical anaesthetics are the most commonly used for pain control in subgingival periodontal procedures. They are available in variety of commercial forms like gels, ointments, sprays, creams, liquids, and lozenges. Topical anaesthetics like benzocaine and lignocaine base are insoluble in water, but soluble in alcohol, propylene glycol, polyethylene glycol. Benzocaine is the ethyl ester of p-aminobenzoic acid (PABA) first synthesized in 1890 by the German chemist Edward Ritsert.[10]

Lignocaine is available in two forms for topical application: lignocaine base which is poorly soluble in water available in 5% concentration and lignocaine hydrochloride which is water soluble used in different concentrations.[11] In our study we used water soluble 15% lignocaine spray because it penetrates tissue more efficiently than the base form. Uses of topical anaesthetics include anaesthesia of mucosa prior to incision and drainage of abscesses, elimination of pain from local anaesthetic injections. The major disadvantage of topical anaesthetics is its limited efficacy, difficulty in administration, uncontrolled spreading and undesirable taste.

Even though topical anaesthetics can reduce pain associated with intraoral injections, there are very limited studies which evaluated the analgesic efficacy of different topical anaesthetic agents like lignocaine spray 15% (Nummit ICPA Ltd) and benzocaine20%gel (Mucopain ICPA Ltd.) during subgingival periodontal procedures. Hence the aim of this randomized, split-mouth study is evaluate the analgesic efficacy of different topical local anaesthetic agents like lignocaine spray 15% (Nummit ICPA Ltd) and benzocaine20%gel (Mucopain ICPA Ltd.) in comparison with infiltration anaesthesia during subgingival periodontal procedures.

OBJECTIVES OF THE STUDY ARE

1. To estimate the analgesic efficacy of different topical anaesthetic agents like lignocaine spray 15% (Nummit ICPA Ltd) and benzocaine20%gel (Mucopain ICPA Ltd.) during subgingival periodontal procedures.

2. To compare the analgesic efficacy of different topical anaesthetic agents like lignocaine spray 15% (Nummit ICPA Ltd) and benzocaine20%gel (Mucopain ICPA Ltd) and to know which of the topical anaesthetic agent is as nearly efficient as 2% lignocaine infiltration anaesthesia during subgingival periodontal procedures.

MATERIALS AND METHODS :

The randomized split-mouth design includes a total of 20 subjects with chronic periodontitis and the different forms of local anaesthetic agents were applied in three quadrants, in each subject. Patients reporting to Department of Periodontics, A.B Shetty Memorial Institute of Dental Sciences, Deralakatte, Mangalore were screened and periodontal examination was done. Quadrants in each patient were selected randomly based on lottery method where 2 bowls were given to the patient, one bowl consist of chits for selecting the quadrant and another bowl consist of equal number of chits to select the mode of anaesthetic agent (topical, infiltration) and type of anaesthetic agent (benzocaine, lignocaine). A written informed consent was obtained from all the participants at the beginning of the study. A total of 20 patients were selected based on the following selection criteria.

Inclusion criteria included participants with age group of 20 to 60 yrs, with a minimum complement of 20 natural teeth, who were diagnosed with moderate form of chronic periodontitis showing the presence of more than 30% of sites with clinical attachment loss >3mm and probing depth >4mm measured by a William's graduated periodontal probe and who have not undergone any periodontal therapy in earlier six months. [14]

Exclusion criteria included patients requiring prophylactic antibiotics before periodontal probing, suffering from any psychiatric disorders or with chronic pain problems, coagulation disorders or on anticoagulation therapy, pregnant or lactating women, congenital or idiopathic methemoglobinemia

or those receiving treatment with methemoglobin-inducing agents, allergies to dental anaesthetics, non-steroidal anti-inflammatory drugs in the 3 days before participation in the study, and who are diagnosed with acute periodontal pain, pulpitis, abscesses, or other acute infections.

Patients received local anaesthetics like 2% lignocaine with 1:80000 epinephrine infiltration technique, 20% benzocaine gel (Mucopain ICPA Ltd), 15% lignocaine spray (Nummit ICPA Ltd) in each of the three quadrants randomly. 2% lignocaine with 1:80000 epinephrine anaesthetic agent was used for infiltration technique for the control group composed of lignocaine hydrochloride 24.64mg, adrenaline 0.0125mg, methylparaben 1mg as preservative and water for injection. 15% lignocaine spray (Nummit ICPA Ltd) composed of lidocaine USP 15% w/w, inert solvents and propellant gas. Mucopain ICPA Ltd composed of 20% benzocaine gel w/w in gel base.[10] Gauze and cotton rolls were used to isolate buccal surfaces of lips and cheek and lingual surfaces of tongue to prevent the contact of these tissues with the topical anaesthetic agents. 20% benzocaine gel was applied on the respective quadrant with the help of cotton swab applicators. Full mouth subgingival periodontal procedure was carried out in each patient after 2 minutes of application of anaesthetic agents. [15] After completion of the subgingival periodontal procedure, the subjects were then asked to rate the degree of pain/ discomfort using numerical pain intensity rating scale. NRS is verbally administered scale which measures pain intensity (Fig 1). Data was collected and subjected to statistical analysis. [16]

RESULTS:

Descriptive statistics of the parameters study was calculated and presented with suitable diagrams and graphs. The level of significance was assessed at 0.05. Comparison of the 3 parameters gel, spray and control groups was done using Kruskal –Wallis test, there is statistically significant difference was seen with a P value of ($P<0.0001$) (table 1), which indicates that there is significant difference seen in the three groups gel, spray and the control. Kruskal –Wallis test is a rank based non-parametric test that can be used to determine if there is statistically significant differences between two or more groups of independent variable on a continous or ordinal dependent variable. Comparing the medians the highest level of pain score was noticed in spray (2.5) followed by gel (1) and last control (0) (Table 1).The median values are depicted in the middle line of the graph. The middle line with in the rectangle is the median in the graph (Fig 2). Posthocdunns test was done to understand which subgroup shows statistically significant difference. The significant difference was observed in all the subgroups; between gel vs spray, gel vs control(infiltration), spray vs control (infiltration) with a p value < 0.05 (Table 2).The estimated difference in rank sum values for gel vs spray(-12.95),gel vs control (17.98) and spray vs control was(30.98). No local or systemic side effects were seen after the application of local anaesthetic agent.

There is significant difference in the three groups as evidenced by kruskal- wallis test. The highest median is in the spray followed by gel and the control group. There is significant difference seen in all the subgroups as assessed by Dunns test.

DISCUSSION:

Pain is an undesirable side effect of subgingival periodontal procedures.[17] With the appropriate judgment in interpreting the findings from this study, a few important conclusions can be drawn. Acute pain can be influenced by psychological factors, such as anxiety, fear, and perceived control over the stimulus, which may account for the equivocal findings of dental topical analgesic efficacy.[18] No participant needed more than 1 dose of anaesthetic agent.

In a study done by Van Steenberghe, periodontal debridement was considered to be painful or at least

uncomfortable form of treatment with 8 to 9% of patients reporting severe pain and 10% to 21% of the patients reporting moderate pain. [19] A survey was conducted in Belgian, results concluded that 64% of maintenance patients reported willingness to accept mild to moderate pain than opting for an injectable anaesthetic. Management and prevention of acute pain is definitely less difficult than treatment of chronic pain. [17] Measurement of treatment associated pain was the primary means of determining the analgesic efficacy. The use of numerical rating scale for scoring pain has been validated in a variety of studies for different conditions. [20]

Numerical rating scale is one of the simplest and most frequently used pain intensity scale in clinical practice for children and adults .NRS is a valid measure for pain intensity and unpleasantness. [16]

The results of our study demonstrated that control group (infiltration anaesthesia 2% lignocaine with 1:80000 adrenaline) was significantly found to have superior analgesic efficacy when compared to topical anaesthetics, 20% benzocaine gel and 15% lignocaine spray. Local injection of anaesthetics is a highly effective method to block small terminal nerve endings in the area of dental treatment. Epinephrine is frequently used as a vasoconstrictor for hemostasis during surgical procedures. The injection of 2% lignocaine with epinephrine leads to predominent α-receptor stimulation and hemostasis, but the injection technique is unfortunately preceded by penetration of the tissue surface by a sharp needle. [21] A study done by Stoltenberg et al suggested that injectable anaesthetic is more effective, yet patients might accept periodontal instrumentation without anaesthesia when a needle prick could be avoided. [22] Most common reasons for postponing dental treatment in fearful patients is needle phobia. [23-24] Erten et al reported that the sight of the dental injection needle and feeling of being injected were the most fear producing stimuli.[25] If the dental treatment requires a relatively short working time and involves many different sites, local injections may not be the most appropriate way to manage pain.

Varieties of agents are available for topical analgesia like 15% Lignocaine spray, Benzocaine 20 %gel. 20% benzocaine gel is the most commonly used topical anaesthetic agent worldwide.[26] Lignocaine serves as the gold standard,[21] benzocaine is known for its excellent surface anaesthetic properties.[22] In our study, we compared 20% benzocaine gel with 15% lignocaine spray, the results suggested that there is statistically significant difference($p<0.05$) seen, even the median pain score of 20% benzocaine gel(1) is low compared to 15%lignocaine spray(2.5) during subgingival periodontal procedures. 20% benzocaine gel act by stimulation of nerve endings which causes pain leading to entry of sodium into the neuron, causing depolarization of the neuron and subsequent initiation of action potential. The action potential is propagated down the nerve toward the central nervous system which interprets this as pain. Esters of PABA act as a chemical barrier by stopping the entry of sodium into the nerve ending.[27,28] Topical anaesthetics control pain perception and alter the pain reaction of an individual and act by reducing the permeability of sodium ions to the nerve cell, resulting in decreased depolarization finally blocking the transmission of signals from terminal fibers of sensory nerve.[29]

The findings of the present study are in accordance with a study done by Milton Hodosh et al where in the same anaesthetic gel was found to be effective for pain control.[30] A study done by Nayak R et al., they evaluated three topical anaesthetic agents against pain where in Benzocaine, Lignocaine and Eutectic mixture of local anaesthesia (EMLA) cream were used. The results suggested that benzocaine has the most rapid onset of action followed by lignocaine and EMLA cream.[31]

The results were in accordance with a study conducted by Varma et al which evaluated the efficacy of a

TABLE 1: COMPARISON OF THE 3 PARAMETERS GEL, SPRAY AND CONTROL GROUPS WAS DONE USING KRUSKAL –WALLIS TEST

Mode of application	N	Minimum	25*	Median	75*	Maximum	Kruskal-wallis statistics	p value
GEL	20	0	0.25	1	2	5	34.14	≤ 0.0001
SPRAY	20	0	2	2.5	3	6		
CONTROL (INFILTRATION)	20	0	0	0	0			

* - Percentile

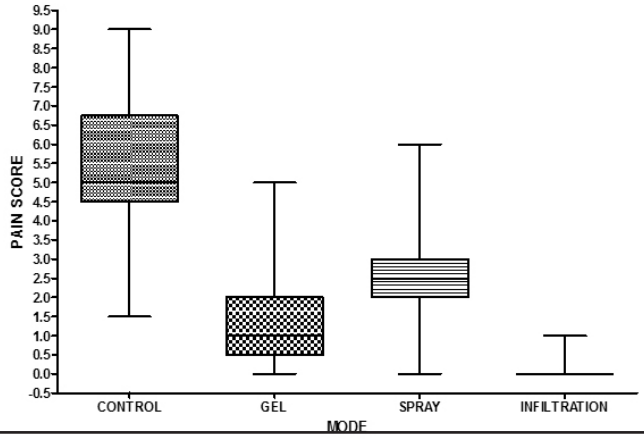
TABLE 2: POSTHOC DUNNS TEST: TO UNDERSTAND WHICH SUBGROUP SHOWS SIGNIFICANT DIFFERNCE

Dunn's Multiple Comparison Test	Difference in rank sum	Significant? P<0.05?	Summary
Gel vs Spray	-12.95	Yes	*
Gel vs Control(infiltration)	17.98	Yes	**
Spray vs Control(infiltration)	30.93	Yes	***

FIGURE LEGEND

Figure 1: Numeric Pain Rating Scale

Figure 2 : The x- axis indicate the mode of application and the y-axis denote the pain score. The central dark line inside the box is the median, upper and lower end of the box is 75th and the 25th percentile, the tails represent the maximum and the minimum values.



topical gel containing potassium nitrate, benzocaine and tetracaine in patients undergoing scaling and root planning (SRP),[32] however this could be attributed to pharmacological properties of benzocaine which is a simple ester formula, poorly soluble in water because of absence of nitrogen group. Because of this, drug not only prolongs anaesthesia but also reduces its overdose reactions.[10]

In our research paper, control group (2% lignocaine local infiltration anaesthesia) was statistically significant when compared to 15% lignocaine spray. The advantages of infiltration anaesthesia are they block terminal nerve endings, easy and simple, success rate is very high and it has good control of bleeding. Major disadvantages of 15% lignocaine spray are they block only the superficial nerve endings, the depth of penetration is around 2-3mm, the solution is spread over more extensive area than the desired and as it is water soluble it gets rapidly absorbed into the blood stream which enhances the toxic properties.[33]

This study involved relatively few participants and the results need to be confirmed in larger population. Nonetheless, we found the control group (2% lignocaine with epinephrine 1:80000(LIGNOX* 2% A) infiltration anaesthesia) showed significant difference when compared to topical anaesthetics and provided excellent pain control during subgingival periodontal procedures, but fear of pain is a common reason why patient avoids professional dental care. In such cases, 20% benzocaine gel can be used as an alternative to 2% lignocaine with epinephrine 1:80000(LIGNOX* 2% A) infiltration anaesthesia when compared to 15% lignocaine spray. Hence it can be considered as a good choice during periodontal examination and maintenance visits to increase the patients comfort. However, further studies needed to explore the analgesic efficacy of different topical anaesthetics during subgingival periodontal procedures in larger population.

ACKNOWLEDGMENTS AND CONFLICTS OF INTEREST:

Acknowledgments : NONE

Conflicts of interest : NONE

REFERENCES

1. Novak JM. Classification of diseases and conditions affecting periodontium. In: Newman, Takei Carranza, 10th ed. Philadelphia: W.B.Saunders Company; 2006.p.103-104.

2. Jeffcoat MK, Geurs NC, Magnusson I, MacNeill SR, Mickels N, Roberts F, et al. Intrapocket anaesthesia for scaling and root planing: Results of a double-blind multicenter trial using lidocaine prilocaine dental gel. J Periodontol 2001;72: 895-900.

3. Canakçi CF, Canakçi V. Pain experienced by patients under-going different periodontal therapies. J Am Dent Assoc 2007;138:1563-73.

4. Heins PJ, Karpinia KA, Maruniak JW, Moorhead JE, Gibbs CH. Pain threshold values during periodontal probing: Assessment of maxillary incisor and molar sites. J Periodontol 1998;69:812-8.

5. Grant DA, Lie T, Clark SM, Adams DF. Pain and discomfort levels in patients during root surface débridement with sonic metal or plastic inserts. J Periodontol 1993;64:645-50.

6. Matthews DC, McCulloch CA. Evaluating patient perceptions as short-term outcomes of periodontal treatment: a comparison of surgical and non-surgical therapy. J Periodontol 1993;64:990-7.

7. Heft MW, Perelmuter SH, Cooper BY, Magnusson I, Clark WB. Relationship between gingival inflammation and painfulness of periodontal probing. J Clin Periodontol 1991; 18:213-5.

8. Malamed SF. Clinical action of specific agents. Handbook of local anaesthesia. 5th ed. St Louis: Mosby; 2004.p.62-3.

9. Magnusson I, Geurs NC, Harris PA, Hefti AF, Mariotti AJ, Mauriello SM et al. IntrapocketAnesthesia for Scaling and Root Planing in Pain Sensitive patients. J Periodontol 2003;74:597-602.

10. Malamed SF. Clinical action of specific agents. Handbook of local anaesthesia. 5th ed. St Louis: Mosby; 2004.p.75-6.

11. Malamed SF. Clinical action of specific agents. Handbook of local anaesthesia. 5th ed. St Louis: Mosby; 2004.p.78.

12. Van Steenberghe D, Bercy P, De Boever J. Patient evaluation of a novel non-injectable anesthetic gel: A multicenter crossover study comparing the gel to infiltration anesthesia during scaling and root planing. J Periodontol 2004;75:1471-8.

13. Milgrom P, Coldwell SE, Getz T, Weinstein P, Ramsay DS. Four dimensions of fear of dental injections. J Am Dent Assoc 1997;128:756-66.

14. Novak JM. Classification of diseases and conditions affecting periodontium.In: Newman, Takei Carranza, 10th ed. Philadelphia: W.B.Saunders Company; 2006.p.101.

15. Bhalla J, Meechan JG, Lawrence HP, Grad HA, Hass DA. Effect of time on clinical efficacy of Topical Anesthesia. AnesthProg 2009;56:36-41.

16. Page G, Katz J, Stinson J, Issac L, Martin Pichora AL, Campbell F. Validation of the Numerical Rating Scale for Pain Intensity and Unpleasantness in Pediatric Acute Postoperative Pain:Sensitivity to Change Over Time. J Pain 2012;13:359-69.

17. Svensson P, Petersen JK, Svensson H. Efficacy of a topical anesthetic on pain and unpleasantness during scaling of gingival pockets. AnesthProg 1994;41:35-9.

18. Guzeldemir E, Toygar HU, Cilasun U. Pain perception and anxiety during scaling in Periodontally healthy subjects. J Periodontol 2008;79:2247-55.

19. Van Steenberghe D, GarmynP, Geers L, Hendrickx E, Mare-chal M, Huizar K et al. Patients Experience of pain and discomfort during instrumentation in the diagnosis and non-surgical treatment of periodontitis. J Periodontol 2004;75:1465-70.

20. Van Wijk AJ, Duyx MPMA, Hoogstraten J. The effect of written information on pain experience during periodontal probing. J Clin Periodontol 2004; 31: 282–5.

21. Malamed SF. Pharmacology of vasoconstrictors. Handbook of local anaesthesia. 5th ed. St Louis: Mosby; 2004.p. 51-3.

22. Stoltenberg JL, Osborn JB, Carlson JF, Hodges JS, Michalowicz BS. A preliminary study of intra-pocket topical versus injected anaesthetic for scaling and root planing. J ClinPeriodontol 2007;34:892-6.

23. Smith T, Getz T, Milgrom P, Weinstein P. Evaluation of treatment at a dental fears research clinic. Spec Care Dent 1987;3:130-4.

24. Moore RA, Brodsgaard I, Bim H. Manifestations, acquisition and diagnostic categories of dental fear in a self-referred population. Behav Res Ther 1991;29:51-9.

25. Erten, Akarslan ZZ, Bodrumlu E. Dental fear and anxiety levels of patients attending a dental clinic. Quitessence Int 2006;37:304-10.

26. Vickers ER, PunniaMoorthy A. A clinical evaluation of three topical anesthetic agents. Aust dent J 1992;37:266-70.

27. Cavino BG. Pharmacology of local anesthetic agents. Br J Anaest 1986;58:701.

28. Shaju JP, Amirishetty R, Zade RM. Factors influencing pain experienced during scaling and root planing: A correlative pilot trial. J Periodontol Implant Dent 2011;3:8-12.

29. Daithankar A, Shiradkar M, Gourkhede S. Evaluation of the Efficacy of Two Amide Group Local Intrapocket Anesthetic Gels in Non Invasive Periodontal Therapy. Int Journal of Contemporary Dentistry; 2011 : 2.

30. Milton H, Steven H, Alex J.Kno 3/Benzocaine/ Tetracaine gel use for maintenance visit pain control. Gen Dent 2007;55:312-5.

31. Nayak R, Sudha P. Evaluation of three topical anaesthetic agents against pain : A clinical study. Indian J Dent Res 2006;17:155-60.

32. Varma.S, Bhola.S, Mohitey J. Effectiveness of a novel topical anesthetic gel in patients undergoing non surgical periodontal therapy. Cumhuriyet Dent J 2013;16:99-103.

33. Chitre AP. Basic techniques of local anaesthesia. Manual of local anaesthesia in dentistry. 1st ed. New Delhi: Jaypee Brothers Medical Publishers;2006:127-31.

Address of Correspondence
Dr. Priyanka Pampani,
Department of periodontics, A.B. Shetty Memorial Institute Of Dental Sciences, Nitte University, Deralakatte, Mangalore-575018, India. Mobile: +91 9538404090.
E-mail: dr.priyankapampani@gmail.com.

Authors:
[1]PG Student, Department of Periodontics, A.B.Shetty Memorial Institute Of Dental Sciences , Nitte University, Deralakatte Mangalore-575018.
[2]Professor, Department of Periodontics , A.B.Shetty Memorial Institute Of Dental Sciences , Nitte University, Deralakatte Mangalore-575018.
[3]HOD & Professor, Department of Periodontics, A.B.Shetty Memorial Institute Of Dental Sciences, Nitte University, Deralakatte, Mangalore-575018.
[4]PG Student, Department of Periodontics, A.B.Shetty Memorial Institute Of Dental Sciences , Nitte University, Deralakatte Mangalore-575018.
[5]PG Student, Department of Periodontics, A.B.Shetty Memorial Institute Of Dental Sciences , Nitte University, Deralakatte Mangalore-575018.
[6]Senior lecturer, Dept of Oral and Maxillofacial Surgery. Indira Gandhi Institute of Dental Sciences, Sri Balaji Vidyapeeth, Puducherry.

How to cite this article :
Priyanka Pampani, Santhosh Shenoy B, Biju Thomas, Beena Ani Mathew, Reema M Rao, Saravanan.R, Comparison Of Analgesic Efficacy Of Topical Anaesthetics (Gel, Spray) With Infiltration Anaesthesia During Subgingival Periodontal Procedures. Journal of Scientific Dentistry 2015 ; 5(1) : 3-10

Source of Support : Nil, **Confliet of Interest :** None declared