

Painful Injection for a Painless Extraction: Can It Be Avoided? A Randomized Split-Mouth Case Control Study

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ABSTRACT

Background: Many advanced techniques in local anaesthesia have been introduced for the painless intra oral injections. To date, palatal injections are known to be the most painful injections due to firm adherence of mucoperiosteum and abundant nerve supply. The aim of the present study is to assess the requirement of palatal injection with 2% lidocaine for the extraction of maxillary premolars and third molars.

Materials and Methods: This prospective randomized single blinded split mouth case control study was done on 150 patients which were allocated in to four groups. Group 1 included patients indicated for extraction of maxillary premolars with buccal infiltration and without palatal infiltration. Group 2 included patients indicated for extraction of maxillary premolars with buccal infiltration and palatal infiltration / greater palatine block. Group 3 included patients indicated for extraction of maxillary third molars with buccal infiltration and without palatal infiltration / greater palatine nerve block. Group 4 included patients indicated for extraction of maxillary third molars with buccal infiltration and palatal infiltration / greater palatine nerve block. Pain during injection and extraction was assessed through Visual Analog Scale (VAS). Results were subjected to statistical analysis and unpaired t test was done.

Results: VAS score during injection in control groups (2 and 4) were high when compared to test groups (1 and 3) and the values were statistically significant ($p=0.0001$, $p=0.0001$). VAS values after extraction in both test (1 and 2) and control groups (3 and 4) were found to be statistically insignificant ($p = 0.15$, $p = 0.92$)

Conclusion: The routine use of painful palatal injection for the removal of maxillary premolars and third molars can be avoided in most of the cases.

Keywords: Lignocaine, palatal injection, infiltration, extraction.

INTRODUCTION

According to International Association for the Study of Pain, pain is “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage”.¹ One of the most significant entity that patients recognize and grade a dental care professional is effective painless management. Local anaesthetic agents in different delivery systems are

the most commonly used drugs to achieve painless dental procedures. Along with pain, fear and anxiety at sight of injection and during administration cause uncomfortable and unpleasant stimuli. Multiple needle penetrations for local anesthesia not only causes discomfort to the patient but also have significant psychological impact on further dental procedures. Effective painless intraoral injections

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are important for the success of various dental procedures which makes the patient comfortable throughout the procedure.

Many techniques have been implemented for the painless injections which include topical anaesthetics,² application of cold at the site,³ Eutectic Mixture of Local anesthesia (EMLA) mixture,⁴ pressure application at the site of injection and advanced methods like Transcutaneous electric nerve stimulation (TENS).⁵ These methods are not very effective in the palatal region. Palatal mucoperiosteum is firmly attached to underlying bone which causes more pain at site of injection.⁶ Articaine (4%) has high diffusibility rate, hence when administered on the buccal aspect also establishes anaesthesia of the palatal gingiva.^{7,8,9} Very few studies are present in the literature regarding penetration of 2% lidocaine through both buccal and palatal cortical plates, resulting in palatal soft tissue anaesthesia. The prospective study was conducted to assess the requirement of palatal injection with 2% lidocaine during therapeutic extraction of maxillary premolars and maxillary third molars.

MATERIALS AND METHODS

This prospective randomized split mouth study was conducted in 150 patients who reported to oral and maxillofacial surgery department for the extraction of maxillary premolars and third molars in between september 2015 and august 2016. Patients were randomly allocated in to four groups in which Group 1 included patients indicated for extraction of maxillary premolars with buccal infiltration and without palatal infiltration / greater palatine nerve block. Group 2 included patients indicated for extraction of maxillary premolars with buccal infiltration and palatal infiltration / greater palatine nerve block. Group 3 included patients indicated for extraction of maxillary third molars with buccal infiltration and without palatal infiltration / greater palatine nerve block. Group 4 included patients indicated for extraction of maxillary third molars with buccal infiltration and palatal infiltration / greater palatine nerve block. Among four groups, group 1 and 3 were test groups and group 2 and 4 were control groups. Out of 150 patients, 98 (group 1 and 2) patients underwent extraction of maxillary premolars in which 56 were females and 21 were males. Patients who underwent extraction of

maxillary third molars were 52 (group 3 and 4) in which 31 were females and 21 were males. Inclusion criteria were bilateral maxillary premolars indicated for orthodontic extraction and bilateral maxillary third molars which were clinically erupted / partially erupted or with carious lesion, ASA I and ASA II patients. Patients with known history of drug allergy and patients who refused to give informed consent were excluded from the study.

PROCEDURE: In test group (group 1 and 3) 2ml lidocaine with 1:80000 epinephrine (lignox 2% A) was administered at root apices of maxillary premolar or third molar. In control group (group 2 and 4) conventional method of anaesthesia was given i.e 1ml of lidocaine with 1: 80,000 epinephrine on buccal side and 0.3 ml on palatal side. Local anaesthesia in all the groups was administered by the single surgeon. The operating surgeon was blinded and the extraction procedure was done with closed or forceps technique. None of the procedures involved bone removal or suturing. After an interval of 10 minutes, the extraction was carried out. Pain intensity during injection and during extraction was assessed using 10 cm visual analog scale (VAS). Visual analog scale was with 10 cm calibration in which 0 cm indicates NO PAIN and 10 cm calibration indicates ABSOLUTE PAIN. If patient experienced unacceptable level of pain during separation of palatal gingiva from the tooth, then 1ml lidocaine with 1:80000 epinephrine was given as second injection on buccal side. If pain was elicited after a waiting period of 10 minutes following second deposition of local anaesthetic solution on buccal side, 0.3 ml of local anaesthetic solution was deposited on palatal aspect to achieve satisfactory level of soft tissue anaesthesia and then extraction was done. All the patients underwent extraction using closed and forceps technique.

Results were subjected to statistical analysis using Graph pad calculator. Unpaired student t test was used to compare the mean VAS scores on test groups and control groups during local anaesthesia administration and after extraction.

RESULTS

Out of 150 patients, 98 patients have undergone therapeutic extraction of maxillary premolars

bilaterally, 52 patients have undergone third molar extraction. Pain during injection was assessed through VAS scale. In case of maxillary premolars, control group has shown mean VAS score of 5.55 ± 1.77 cm and test group has shown a value of 2.10 ± 1.08 cm. This implies that pain during palatal injection showed high mean VAS score than the test group. In maxillary third molar test group, mean VAS score was 2.58 ± 1.39 cm which was lower when compared to control group VAS value 4.04 ± 1.95 cm. The difference in mean VAS values in control and test groups have shown significant in both premolar ($p=0.0001$) and third molar ($p=0.0001$) groups (table 1)

Table 1 showing VAS score of all the four groups during injection technique.

	Group	N	Mean	SD	T	P
Premolar Test	1	98	2.10	1.08	3.45	0.0001
Premolar control	2	98	5.55	1.77		
Third molar test	3	52	2.58	1.39	-1.46	0.0001
Third molar control	4	52	4.04	1.95		

Table 2: showing VAS score of all the four groups after extraction.

	Group	N	Mean	SD	T	P
Premolar test	1	98	1.15	0.87	0.16	0.15
Premolar control	2	98	0.99	0.71		
Third molar test	3	52	1.27	0.99	-0.02	0.92
Third molar control	4	52	1.29	1.02		

Mean VAS score during extraction in group 1 and group 2 were 1.15 ± 0.87 cm and 0.99 ± 0.71 cm. In group 3 and group 4, the mean VAS scores were 1.27 ± 0.99 cm and 1.29 ± 1.02 cm. These values have shown statistically insignificant in both premolar and third molar groups ($p=0.15$, $p=0.92$). (table 2)

In premolar test group (group 1), 7 patients (8%) out of 98 and in third molar test group (group 3), 2 (4%) patients out of 52 showed failure of buccal infiltration alone during separation of palatal soft tissue. They received 0.3 ml of palatal injection after failure of even second buccal injection (1 ml) and extraction was carried out uneventfully. (graph I)

DISCUSSION

Among all intraoral local anaesthetic blocks, palatal injections are considered as the most painful. The most common method to decrease the pain during palatal injection is application of topical anesthetics at the site of injection.² Inspite of surface anesthesia, pain during injection in palatal region showed ineffective. The second most commonly used method is the use of 30-gauge needle instead of 25 gauge. According to the study conducted by Hamburg et al,¹⁰ there was no much advantage with 30-gauge needle in reducing injection pain. Malamed also supports Hamburg et al study and stated that there is no specific recommendation for the use of 30-gauge needle.¹¹This ineffectiveness is due to firm attachment Of palatal mucosa to underlying mucoperiosteum. Eutectic mixture of local anesthesia (EMLA) includes combination of lignocaine and prilocaine. EMLA was considered effective in reducing pain during injection when applied for 5 minutes,¹² but its intraoral usage was limited because of its unpleasant taste.^{13,14} Transcutaneous electronic nerve stimulation (TENS) was first described in the year 1967 by shane and kessler.¹⁵ This technique provided painless procedure and became advantageous over conventional methods. The main disadvantage is its expensiveness, complex procedure and time consuming.¹²

In the present study, the success rate of painless removal of maxillary premolars and maxillary third molars were assessed with only buccal infiltration without palatal injection. VAS score during buccal and palatal injection in control groups (2 and 4) showed statistically significant values ($p=0.0001$, $p=0.0001$) than in the test groups (1 and 3) with buccal infiltration only. This increased pain scores in control group was suggestive of painful palatal injection. After extraction, the VAS scores in the control groups (2 and 4) and test groups (1 and 3) were statistically insignificant ($p=0.15$, $p=0.92$) which indicated that intra alveolar

extractions can be carried out without pain in both test and control groups. These results were in correlation with the study conducted by Sunil Yadav et al.¹⁶ This study was done only in maxillary third molars whereas the present study also included maxillary premolars along with maxillary third molars.

The possible reason for painless maxillary tooth removal without palatal injection is the porous nature of the maxilla facilitating high diffusibility rate which may also anesthetize palatal mucosa.¹⁷ In many instances, maxillary third molars can be removed with elevators alone which could involve minimal instrumentation on the palatal mucosa. In the study conducted by Fan et al,¹⁸ least VAS scores were recorded for the third molar and orthodontic extraction of maxillary premolars which was in accordance with the present study. In the present study, out of 98 patients in maxillary premolar group and 52 patients in maxillary third molar group, 7 (8%) patients in maxillary premolar test group and 2 (4%) patients in maxillary third molar test group received palatal infiltration as these patients showed intolerable pain even after second buccal infiltration. This failure might be because of variations in the individual perception levels of pain. In a study by Badcock et al,¹⁹ there was 100% success rate in maxillary third molar extraction with only a single buccal infiltration of lidocaine, which was correlating with the present study in which there was 96% success rate. The volume of lignocaine used in the same study was 2.2 ml, but in the present study it was 2ml of lidocaine. In a study by Kumaresan et al.²⁰ in 2015, the success rate with only by buccal infiltration of lidocaine was highest in orthodontic extraction teeth when compared to the teeth with carious, apical periodontitis. In the present study, there was 92% of success rate in maxillary premolar extraction. The therapeutic teeth extractions were straightforward when compared to carious and apical periodontitis teeth. In inflamed tissue region, there may be increase in number of tetrodotoxin resistant channels (Na 1.8 and Na 1.9)²¹ and also cause disassociation of local anaesthetic to a cationic form, which becomes impermeable to phospholipid membrane of neuronal cells.²²

The limitation of this technique when compared to conventional method is the latency period of 10 minutes for the bucco - palatal diffusion of lidocaine

when injected into the buccal vestibule of maxillary teeth. This latent period can be beneficial in preventing a painful palatal injection. Based on the results, the routine use of painful palatal injection for the removal of maxillary premolars and maxillary third molars can be avoided in most of the cases. Further studies with larger sample size can be done to validate the outcome.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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