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Original Research Article

Comparison of posterior superior alveolar and greater palatine nerve block with local infiltration for extraction of maxillary molars in oral surgery – A randomized controlled trial

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ABSTRACT

Background and Objective: Administration of local anesthetic drug that prevents pain during dental treatment is of absolute importance. Act of injecting local anesthetic should be nonpainful and atraumatic. The maxilla is very porous and highly vascular. Therefore, anesthesia of maxillary teeth can be accomplished more easily than with mandibular teeth. The aim of this study is to determine the anesthetic efficacy of the conventional technique of posterior superior alveolar (PSA) and greater palatine nerve(GP) block anesthesia as compared to the buccal and palatal technique in terms of pain during injection, after extraction, after 15mins of the procedure and quality of anesthesia during the extraction procedure. The study also intends to determine the incidence of positive aspiration in the infiltration technique.
Materials and Methods: This randomized clinical study was carried out on 154 patients who reported to the Department of Oral and Maxillofacial Surgery, Sri Rajiv Gandhi College of Dental Sciences & Hospital Bangalore, requiring extraction of maxillary second and third molar teeth. The patients received anesthesia using the conventional nerve block technique and infiltration technique randomly on each side of the mouth. Patients were assessed for pain during the injection, after extraction, and after 15mins of the procedure with each technique using Visual Analog Scale (VAS). The patients were also assessed for pain using the Verbal Response Scale (VRS). The positive aspiration was assessed for each technique. During tooth extraction, quality of anesthesia was assessed using an eight-point category rating scale.
Results: The results obtained were analyzed using Chi-square test. It was concluded that the buccal infiltration technique is less painful for the patient as compared to the posterior superior alveolar nerve block. This technique has a lower frequency of positive aspiration as compared with the PSA nerve block. However, the PSA nerve block technique provides better-quality of anesthesia.
Conclusion: It can be concluded that the infiltration technique appears to be a successful alternative with additional advantages, as compared to the nerve block technique.

1. Introduction

The ability to provide safe, effective and adequate local anesthesia is the cornerstone of clinical oral surgical practice. Anesthesia is essential for both the patient and the dental professional. The opinion of patients about their dental treatment is strictly related to their experience with local anesthesia. Authors have reported that many patients select their dentists based on their ability to offer a painless dental treatment. [1]

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Predictable and adequate local anesthesia is accomplished relatively easily for procedures in the maxillary arch as less dense bone covers the apices of roots of maxillary teeth along with relatively easy access to large nerve trunks.[2]

There are several methods of obtaining pain control with local anesthetics.[3]

The site of deposition of the drug relative to the area of operative intervention determines the type of injection administered. Three major types of local anesthetic injection can be differentiated – local infiltration, field block and nerve block.[3]

The maxilla is very porous and highly vascular. Therefore, anesthesia of maxillary teeth can be accomplished more easily than with mandibular teeth. Buccal infiltration of anesthetic solution over the root apices of teeth is quite effective because the bone is very porous. Many pharmacologic strategies have been developed to prevent peripheral and central sensitization, thereby attenuating or even preventing the postoperative amplification of pain sensation.[4]

Clinically, maxillary anesthesia is more successful than mandibular anesthesia, and the infiltration is by far the dominant approach.[5]

The supraperisoteal injection is indicated whenever dental procedures are confined to a relatively circumscribed area in either the maxilla or the mandible.[3]

The success rate for infiltration technique is more than 95%. Being a technically easy injection, it is usually entirely atraumatic.[3]

The infiltration technique provides anesthesia by the diffusion of local anesthesia solution into the cancellous bone via porous thin cortical plate. The posterior superior alveolar (PSA) nerve block is a commonly used dental nerve block. Although it is a highly successful technique (>95%), several issues should be weighed when its use is considered. These include the extent of anesthesia produced and the potential for hematoma formation.[3]

When used to achieve pulpal anesthesia, the PSA nerve block is effective for the maxillary third, second, and first molars (in 77% to 100% of patients).[6]

Selection of the specific technique to be used is determined by the nature of treatment to be provided.

Anesthesia of the hard palate is necessary for dental procedures involving manipulation of palatal soft or hard tissues. Greater palatine nerve block is more effective for palatal soft tissue anesthesia in dental procedures because of the greater density of the palatal soft tissues and their firm adherence to the underlying bone.[7]

This study has been designed to compare the efficiency of posterior superior alveolar and greater palatine nerve blocks with buccal and palatal infiltration for extraction of maxillary second and third molars in oral surgery.

2. Objectives

1. To determine the anesthetic efficacy of the posterior superior alveolar and greater palatine nerve blocks as compared to buccal and palatal infiltration in terms of quality of anesthesia during the extraction procedure.
2. To evaluate and compare pain during the different injection.

3. Materials and Methods

This randomized clinical study was carried out in the Department of Oral and Maxillofacial Surgery, Sri Rajiv Gandhi College of Dental Sciences & Hospital Bangalore, requiring extraction of maxillary second and third molars.

3.1. Inclusion criteria

1. Patients in whom extraction of maxillary second and third molars are indicated.
2. Patients not taking any medication that would alter pain perception.
3. Patients who are medically fit to undergo extraction under local anesthesia.

3.2. Exclusion criteria

1. Patients not willing to be part of the study.
2. Patients unable to give a valid response for pain experienced during the procedure
3. Patient taking medication that would alter pain perception.
4. Allergic reactions to local anesthetic.
5. Medical history of cardiovascular and kidney diseases, gastrointestinal bleeding or ulceration.
6. Patients who are pregnant.

If patient satisfies the inclusion criteria, informed consent was taken.

3.3. Method of collection of data

Patients were enrolled for the study consecutively as and when they reported to the department. All the patients were informed with regards to the purpose of the study and effects of the drug used. The study group consisted of 154 patients falling in the age range of 18 -70 years, of whom 57 were males and 97 were females. The randomization was decided based on the flip of a coin.The patients received anesthesia with two techniques randomly for apparently difficult extraction of maxillary molars to be done. 2% lignocaine with 1:80000 epinephrine with 26 gauge needle on a luer lock syringe was used for injection. Topical anesthesia was sprayed at the site, 2ml of 2% lignocaine was injected using Posterior Superior alveolar and Greater palatine nerve block as well as buccal and palatal infiltration for extraction of maxillary second and third molars. All the

cases were performed by a single operator

After the administration of local anesthetic injection, each patient was given a proforma with 5cm VAS scale marked 0 (no pain) to 5 (severe pain). Patients were asked to mark the scale according to the pain experienced during injection.

The pain score was assessed at three intervals –

1. During injection.
2. At the end of extraction procedure.
3. After 15mins of extraction.

Tooth extraction procedure was completed followed by assessment of quality of anesthesia on an eight point category rating scale.

The rate of positive aspiration was noted after the buccal infiltration and PSA nerve block technique in all the cases.

After the extraction procedure was completed, the patients were asked to mark the Verbal Response scale as either acceptable or unacceptable.

3.4. Methodology of data analysis

For statistical analysis, data was entered in Microsoft excel and analyzed using SPSS (Statistical Package for Social Science Version 17.0) package.

Normality of data was tested using Kolmogorov-Smirnov test and Shapiro-Wilk test.

Data was represented as count, percentage, mean, standard deviation etc. Proportions were compared among two groups by using Chi-Square test. Mean pain experienced (VAS) and quality of anesthesia was compared using Mann-Whitney U test. “p” value less than 0.05 was accepted as indicating statistical significance.

4. Results

A randomized controlled trial was conducted to determine the anesthetic efficacy of the buccal and palatal infiltration compared to the Posterior Superior Alveolar and Greater palatine nerve block in patients requiring extraction of maxillary second and third molars.

A total of 154 patients in the age range of 18 – 70 years, with the mean age of 35.86 ± 10.48 (group I) and 35.95 ± 12.79 (group II) were included in the study.

The study comprised of 64.9% (50) female and 35.1% (27) male patients in group I. However the group II comprised of 61.0% (47) female and 39.0% (30) male patients.

Data was represented as count, percentage, mean, standard deviation etc. Proportions were compared among two groups by using Chi-Square test. Mean pain experienced (VAS) and quality of anesthesia was compared using Mann-Whitney U test.“ p” value less than 0.05 was accepted as indicating statistical significance.

The mean pain experienced by patients with the buccal infiltration technique and with the PSA nerve block technique during injection was 0.51 ± 0.599 and 1.18 ± 0.899 respectively. The pain experienced with buccal infiltration was highly significant with p – value less than 0.001(Figure 1).

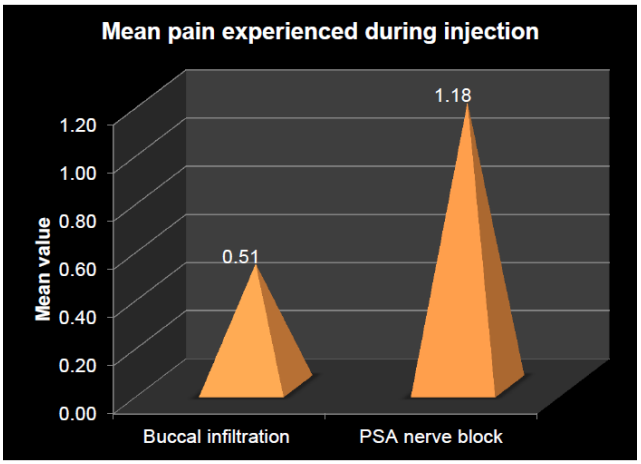

Fig. 1: Mean pain experienced during injection

The mean pain experienced by patients with the buccal infiltration technique and with the PSA nerve block technique at the end of extraction was 0.19 ± 0.399 and 0.87 ± 0.750 respectively. The pain experienced with buccal infiltration was highly significant with p – value less than 0.001(Figure 2).

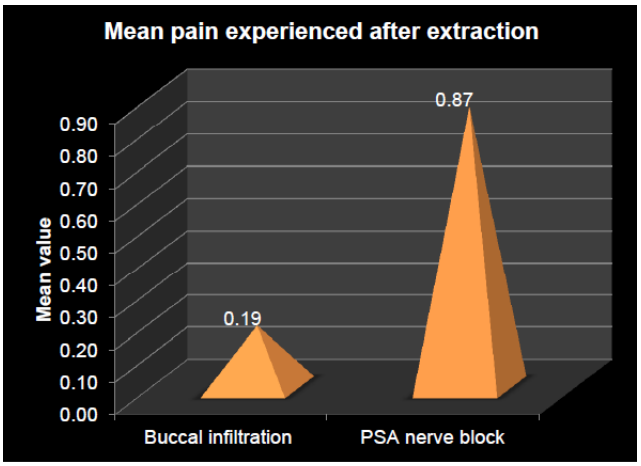

Fig. 2: Mean pain experienced after extraction

The mean pain experienced by patients with the buccal infiltration technique and with the PSA nerve block technique after 15mins of extraction was 0.08 ± 0.315 and 0.22 ± 0.476 respectively. The pain experienced with buccal infiltration was significant with p – value 0.018 (Figure 3).

A verbal response scale (VRS) was additionally used after extraction, by asking 2 additional questions to assess

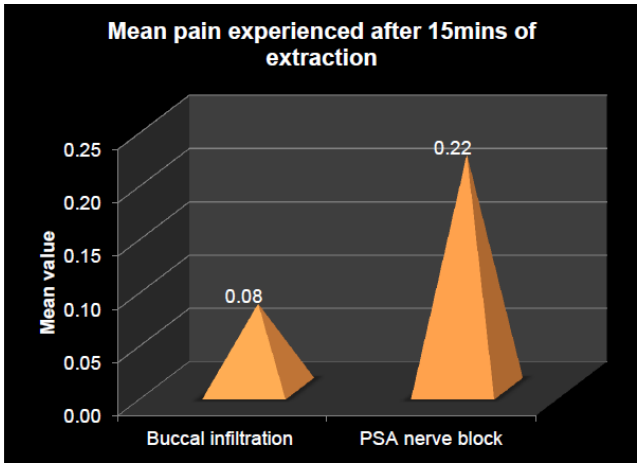

Fig. 3: Mean pain experienced after 15mins of extraction

whether the procedure was "acceptable" or "unacceptable. In both the groups 92.2% (71) patients rated the procedure to be acceptable, where as 7.8% (6) patients rated the procedure to be unacceptable. Hence, the overall procedure according to the VRS were similar in both the groups (Figure 4).

We encountered 3.2% (5) cases with positive aspiration in case of PSA block and no cases with positive aspiration in the infiltration group. The positive aspiration was statistically significant in the infiltration group with p – value being 0.023 (Figure 5).

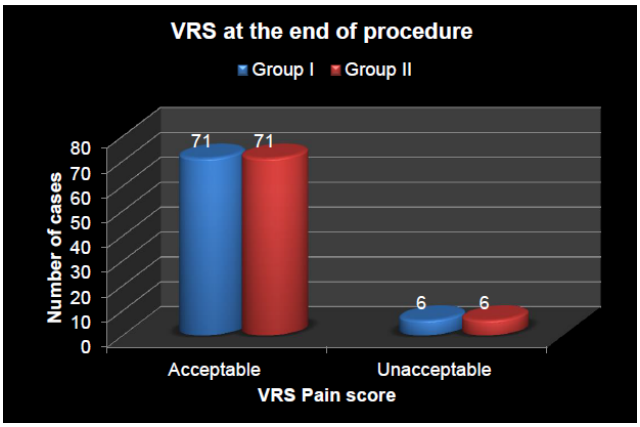

Fig. 4: Verbal response scale (VRS) at the end of procedure

The quality of anesthesia for the buccal infiltration and PSA nerve block was evaluated using an eight point category rating scale. 37.7% (29) of the patients receiving anesthesia by the nerve block technique experienced no pain throughout the procedure in contrast to 24.7% (19) of the patients receiving anesthesia by infiltration technique (Figure 6).

37.7% (29) of the patients receiving palatal anesthesia by the nerve block technique experienced no pain

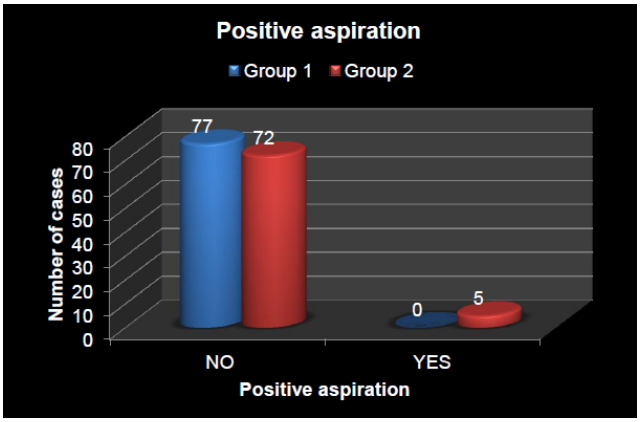

Fig. 5: Positive aspiration

throughout the procedure in contrast to 40.3% (31) of the patients receiving palatal anesthesia by infiltration technique (Figure 7).

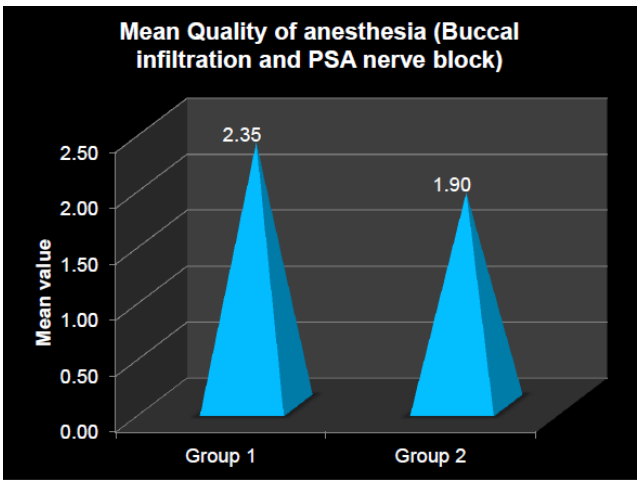

Fig. 6: Mean quality of anesthesia (Buccal infiltration and PSA nerve block)

5. Discussion

Oral surgical and dental procedures are routinely performed in outpatient settings. Regional anesthesia is the most common method to anesthetize the area of surgery before the office-based procedures. Many techniques can be used to achieve anesthesia of the dentition and surrounding hard and soft tissues of maxilla and mandible. Goals of administration of local anesthesia are to provide clinically adequate pain control without unnecessarily increasing the risk or provoking any immediate or delayed complications in the patient. Any technique that meets these two criteria is acceptable.[3]

The science of pain control has continued to evolve since the introduction of local anesthesia into dentistry. Pain

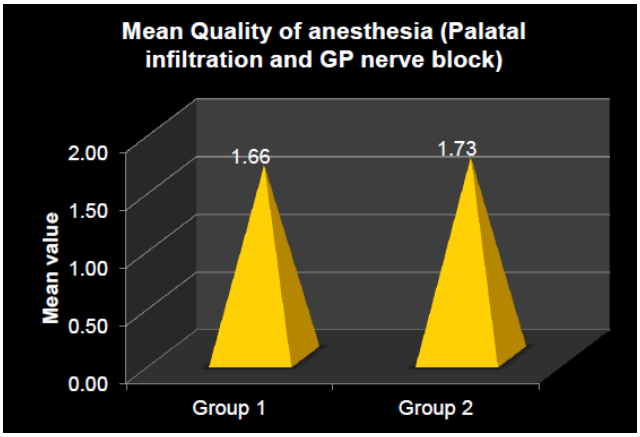

Fig. 7: Mean quality of anesthesia (Palatal infiltration and GP nerve block)

is a complex psychologic phenomenon. Pain perception levels are not constant. Pain threshold as well as reactions to pain change significantly under various circumstances. The pain reaction threshold is significantly altered by past experiences and present anxiety levels. The dental profession continually explores new methods to help meet the challenges faced by dental care providers. Traditional methods of anesthetizing maxillary teeth include supraperiosteal infiltration over a specific targeted tooth or a nerve block.[4]

In the study done by Aggarwal et al.,[7] results showed that there was no statistical significance between the anesthetic success of PSA nerve blocks (64%) and buccal plus palatal infiltrations (70%). But in this study, the quality of anesthesia was statistically significant in the PSA nerve block group.

The above mentioned study was carried out on maxillary first molars with irreversible pulpitis, where as in the present study, the teeth included were maxillary second and third molar, thus omitting the influence of PSA nerve block on the mesiobuccal root of first molar.

In our study the quality of anesthesia evaluated using the eight point scale shows that the PSA nerve block technique is more efficient than the infiltration technique. But the studies done by Padhye et al.,[4] Raed et al.[8] suggest that there is clinical equivalence between both the techniques.

In the study done by Padhye et al.[4] data relating to the pain during extraction obtained on a visual analog scale and a verbal response scale, requirement of repeated injection for anesthesia, efficacy of these injections in localized infections, and requirement of rescue analgesics 3 hours after extraction, confirmed clinical equivalence between infiltration and PSA nerve block.[4] However, in the present study, pain score according to VAS during injection and after the extraction procedure was statistically significant in the infiltration group than in the nerve block group. Also, the requirement of repeated injection for anesthesia in the infiltration and nerve block group showed clinical equivalence.

In the study done by Omer Sefvan et al., pain during injection and efficacy of transpapillary injection with palatal injection for maxillary tooth extractions were recorded using the Visual Analogue Scale and faces pain scale.[9] However, in this study, the efficiency of palatal infiltration and greater palatine nerve block was assessed using the eight point scale for the quality of anesthesia and the pain was recorded using the VAS and the VRS pain scales. The pain scores according to the VAS did not show any statistical significance in the infiltration group and the nerve block group. Hence, the clinical equivalence between the palatal infiltration and greater nerve block remains almost equal.

The rate of positive aspiration in the infiltration and nerve block technique were 0% and 3.2% in this study. This is in similarity with the study carried out by Padhye et al.[4] and Pfeil et al[10] which mentions that positive aspiration is negligible in case of supraperiosteal injection, although possible (<1%).[3] In case of PSA nerve block, positive aspiration is approximately 3.1%.

The rate of complications both in the infiltration and nerve block group were absent in this study. PSA block was used to overcome the variation in the anatomy of the roots and nerve pathways or even in the presence of infection. However, PSA block is associated with many complications. One of the complications noted by Prakasm et al. (2009) in a case of patient receiving posterior superior alveolar (PSA) block was temporary pupillary dilatation and ptosis.[11] They mentioned that this complication could be due to diffusion of local anesthetic into the orbital cavity via pterygomaxillary fossa or to direct deposition of local anesthetic into the PSA artery and thereby to the lacrimal artery and causing these symptoms.

In the present study, for the extraction of maxillary second and third molars, buccal and palatal infiltration was given using 2% lignocaine with 1:80000 adrenaline, but the study done by Fan S et al.[12] mentions that routine use of a palatal injection for the removal of permanent maxillary teeth may not be required when articaine/ HCl is used as the local anesthetic.

In our study, the results obtained have shown that pain score according to the VAS are statistically significant in the infiltration group both during the injection as well as after the extraction procedure. However, the study done by Raed et al[8] did not show any statistically significant difference between the infiltration and the nerve block groups.

The randomization in our study was done by the flip of a coin and was not a bilateral study, but the study done by Raed et al[8] was a randomized controlled trial involving bilaterally and symmetrically similar upper third molar. Hence, the physiological bias may be a contributing factor in our study.

All the cases in our study were carried out for the extraction procedure, however most of the cases mentioned in the literature[13–15] were carried out for the endodontic procedure. This could be a pointed out as a reason for the pain depending on the procedure.

In our study, we did not encounter any postoperative complications following the administration of PSA nerve block. In contrast, the study done by Padhye et al.[4] reports about 2 patients with postoperative complication. One reported with hematoma and another 1 with trismus after receiving this block on the fifth postoperative day.

The time of onset of anesthesia in both the techniques were not evaluated in our study. The study done by Oliveira et al.,[16] reports about the onset of anesthesia between 4% articaine and 2% lignocaine used for buccal and palatal infiltrations, showing no statistical difference. However, the study done by Costa et al.[17] reports significant differences with better results (shorter onset and longer duration periods) for articaine solution compared with the lidocaine solution.

6. Source of Funding

None.

7. Conflict of Interest

None.

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