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Anesthetic Effectiveness of Buccal Infiltration Alone Vs Combined Buccal and Palatal Infiltration on Symptomatic Maxillary Teeth

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Declaration

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ABSTRACT

Objective: To evaluate the effectiveness of two distinct methods of local anesthesia. The effects of buccal and palatal infiltration with pulpal anesthesia on symptomatic maxillary molars (Maxillary first, and second molar) were compared with buccal filtration alone. **Study Design: A** Cross-sectional study**. Setting and Duration of Study:** From October 2023 to September 2024 at Operative dentistry and Endodontics Department, Sandeman Provincial Hospital / Bolan Medical College/ Hospital, Quetta. **Materials & Methods:** This Cross-sectional study conducted in Operative Dentistry and Endodontics Department, Sandeman Provincial Hospital / Bolan Medical College/ Hospital, Quetta lasted from October 2023 through September 2024. Two hundred patients suffering from irreversible pulpitis in maxillary first molars took part in the research. The study subjects possessed an average age of 35.6 years with a standard deviation of ± 6.4 years. Subjects randomly received division into two separate groups for the experiment. Buccal infiltration-alone entered one experimental group whereas the other group received buccal and palatal infiltration. Subjects used Heft Parker Visual Analogue Scale (VAS) to rate their pain experience immediately after local anesthetic application during access cavity preparation and pulp removal. **Results:** The individuals' mean age was 32 years ± 10 SD. Buccal infiltration had an 85% success rate, whereas buccal infiltration and palatal infiltration had an 80% success rate. A p-value of 0.592 indicated that there was no statistically significant difference between the two groups. **Conclusion:** According to the findings, pulpal anesthesia for symptomatic maxillary molars (Maxillary first and second molar) teeth is not more successful when palatal infiltration is added to a traditional buccal infiltration.

INTRODUCTION

Anxiety and fear are common challenges faced by many dentists [1,2]. A patient's prior negative dental experience or a widely held belief about how painful dental procedures are may cause them to delay a visit [3,4]. Local anesthetic (LA) administration is a crucial component of any painful dental operation. Needles and injections can cause discomfort and make people anxious [5–7]. Reducing pain and suffering during surgery is essential for any dental procedure [8,9]. Recent years have seen several changes to dental research methods and agents [10,11].

Maxillary teeth may usually be extracted under Local anesthetic because of their thin bone and advantageous root shape [12,13]. Typically, the operation includes a larger palatine nerve block, a nasopalatine, or a buccal side nerve block infiltration with a supplementary palatal infiltration. The palatal infiltration was the most painful intraoral Local anesthetic injection. The palatal gingiva's strong attachment to the underlying bone, which is unwilling to let even a small amount of drug solution pass through, maybe a major contributing factor to this significant pain, which cannot be solely attributed to the dental needle breaking through the oral mucosa. In order to make room for the solution, the palate tissues must separate from the bone, which causes significant stress.

This explains the increased pain, pressure, and discomfort that was felt both before and after the palatal Local anesthetic injection [14].

Clinicians will constantly be concerned about the effectiveness of local anesthesia because of the rising demand for endodontic treatment. According to records, the number of teeth in need of endodontics has considerably increased. Thus, it has become crucial to improve the efficacy of maxillary infiltration anesthesia in endodontics. The electric pulp tester was used in earlier research to assess maxillary infiltration success, and the results varied from 85% to 100% [15–17]. The author [18] used 2% lignocaine and 1:80,000 epinephrine to assess the efficacy of combined buccal and palatal infiltration. The study found that buccal infiltration had a success rate of 78.6%, but a combination of buccal and palatal infiltration achieved a success rate of 92.8%. The results of the study showed that the efficiency of buccal infiltration anesthesia was increased when 0.5 ml of a 2% lidocaine solution with epinephrine (1:80,000 dilution) was used for extra palatal infiltration.

There is little information on the specific purpose of pulpal anesthesia from a palatal injection for the maxillary first and second molar, and there isn't much research evaluating the effects of combining palatal infiltration with buccal infiltration for endodontics. The author [19] used an electric pulp test (EPT) score of 80 as a criterion to assess the efficacy of pulpal anesthesia in the maxillary first molar. Participants were given either buccal or combined buccal-palatal infiltration with 2% lidocaine and 1:100,000 epinephrine in a randomized, single-blind study. Although the difference was not significantly different, the success rates for buccal and buccal-palatal infiltration were 88% and 95%, respectively. The teeth chosen were neither indicative of irreversible pulpitis, nor did the authors perform endodontic access to verify the anesthetic efficacy. This study is important since previous research did not accurately depict a clinical setting. The study aims to see if combining palatal anesthesia with buccal infiltration improves pulpal anesthesia for a symptomatic maxillary molar (Maxillary first and second molar). The objective of endodontic therapy is to give the patient a tooth that is pain-free both during and after treatment. Patients will be more comfortable throughout treatment if maxillary infiltration is more successful. Additionally, the effectiveness of anesthesia is closely correlated with the clinician's confidence throughout the surgery. Overall, this improves the success rate of the treatment. This study is important since pain is an important factor in the effectiveness of endodontic treatment.

MATERIALS AND METHODS

the Department of Operative Dentistry, SPH, Quetta. There were 200 participants in all, 100 in each group, selected using sequential non-probability sampling. Patients with symptomatic irreversible pulpitis who required endodontic treatment for their first or second maxillary molars met the inclusion criteria. However, the research did not include teeth with periapical pathosis on pre-operative radiographs. The hospital's ethical review committee (SPH) gave its approval. The subjects were fully informed about the study's goals and procedures, and selection was only carried out with their full agreement in writing. The participants' spontaneous discomfort caused a referral from the outpatient department to the operative dentistry department. The patient was assigned at random (using the coin technique) to one of our two groups following a thorough history taking and examinations (periapical radiography and pulp vitality tests). Before treatment started, the patient was informed that the visual analogue scale (VAS) would be used to rate their level of discomfort during the trial. To evaluate the data, the visual analogue scale was separated into four groups. On the visual analogue scale, 0 cm (centimeters) represented no discomfort. Pains that are more than 0 cm but less than 4 cm are considered mild. Less than 7 cm and more than 4 cm are considered moderate pain. Pain was considered severe if it was 7 centimeters or more. MEDICAINER Inj, Huon Co., Ltd., Korea, provided 1.3 mL (75% of the cartridge) of 2% lidocaine with 1:100,000 epinephrine for a typical buccal infiltration anesthetic, and 0.5 mL (25% of the cartridge) of 2% lidocaine with 1:100,000 epinephrine for a palatal infiltration. A mocked palatal infiltration (needle insertion only) and buccal infiltration using 1.8 mL 2% lidocaine with 1:100,000 epinephrine was performed for the second group. About seven to ten minutes were allotted for induction following infiltration. Electric pulp testing (EPT) and inter-dental probing were used to corroborate this. Endodontics began when a rubber dam was put in place. The patient used the VAS to assess their level of discomfort, and the treatment would be halted right away if they experienced any pain. Patients' pain levels were assessed at baseline before treatment and during the operation (file placement and pulp chamber entry). When the operator was able to enter the pulp chamber and insert the first file with no pain (VAS score of 0) or minimal discomfort (VAS rating < 4 cm), the anesthesia was deemed successful. SPSS version 20 was used to analyze the data that was gathered. For the patient's age, the mean ± SD was computed and displayed. Gender was one of the categorical variables for which frequency and percentage were computed. To compare the two research groups based on how much pain each group felt as measured by the VAS, the chi-square test was utilized. Less than 0.05 was regarded as a significant p-value.

RESULTS

The research had 200 individuals in total. With an

average age of 32 ±10, the majority of participants (N=108, or 54%) were female. The age ranges were further divided into three groups: 18–30, 31–50, and 51–60 years. Participants were more prevalent in the 18–30 age range. It was 115/200, or 57.5%. The average buccal pain score before beginning treatment was 7.5 ± 1.5 SD. However, 2.4 ± 2.6 SD was the mean amount of discomfort experienced by the buccal group throughout treatment. 7.2 ± 1.3 SD and 2.1 ± 2.7 SD were the pain levels for the group that had both buccal and palatal infiltration. Of the 100 participants in each group, 82 achieved anesthesia success (85%) following buccal infiltration, while 79 (80%) achieved both buccal and palatal infiltration. We compared the two groups using the chi-square test. With a P value of 0.592, this difference was statistically not significant (Table 1). Because they experienced either no pain (VAS score 0 cm) or minor discomfort (VAS score 4 cm or less) during access cavity preparation and pulp extirpation, 80% of participants (160/200) were able to achieve effective pulpal anesthesia. However, the procedure was deemed ineffective for 20% of individuals (40/180) who reported moderate discomfort (VAS score 4–7 cm) to severe pain (VAS score >7 cm). This was consistent across all techniques (Table 2). P-value was 0.592.

Table 1

Illustrates the Effectiveness of the Proposed Approach Used to Achieve Pulpal Anesthesia

Based On the Visual Analogue Scale Method Effectiveness	Infiltration Method		Sum
	Buccal	Buccal and Palatal	
No (Visual Analogue Scale ≥4cm)	18 (15%)	21 (20%)	39 (19.5)
Yes (Visual Analogue Scale 0-3cm)	82 (85%)	79 (80%)	161 (80.5)
Sum	100	100	200

Figure1

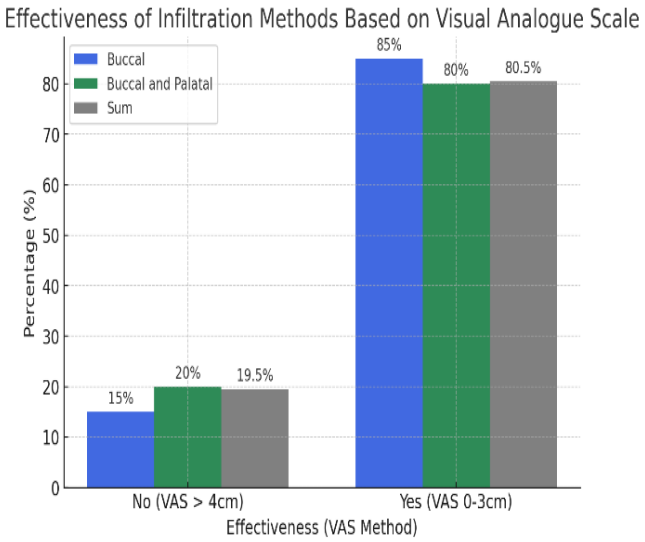
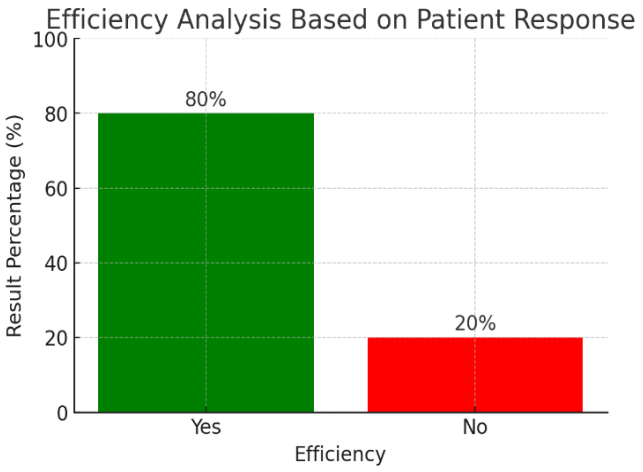


Table 2

Illustrates the efficacy of maxillary infiltration despite the method utilized

Efficiency	No of Patients	Result Percentage %
Yes	160	80%
No	40	20%
Sum	200	100

Figure 2



DISCUSSION

Research suggests that local anesthesia may not always be effective in dentistry [20]. Infiltration anesthesia is likely to be more successful due to its ease of administration and lack of reliance on collateral nerve supply [15]. However, Infiltration injection results are not always 100% effective. According to reports, maxillary tooth success rates range from 50% to 100% [21]. This variance can be explained by individual differences in reaction to the medicine provided, as well as variations in the density, porosity, and thickness of the bone around the maxillary teeth. The state of the tooth before surgery was another crucial element. Every participant in this research had teeth with irreversible pulpitis and symptoms. According to the research, inflammatory mediators and their effects like tetrodotoxin (TTX) have an impact on the effectiveness of local anesthesia. This was recently investigated by [22], who evaluated the impact of traditional local anesthetic methods for teeth with symptoms and found that success was considerably reduced.

The participants were split into two groups for this clinical experiment with randomized control. Based on how well each group administered anesthesia, they were compared. According to the results, the buccal infiltration group had an 85% success rate, while the combined buccal and palatal group had an 80% success rate. The value was statistically insignificant (p-value = 0.592) when comparing the two groups. According to this, infiltration methods have little bearing on how well symptomatic maxillary molars (Maxillary first and second) respond to anesthesia.

Author [23] evaluate the efficacy of several anesthetic methods for pulpal anesthesia in maxillary first molars that exhibit symptoms of irreversible pulpitis (SIP). For comparison, a triple-blind, randomized clinical trial was carried out. Three methods were utilized by the authors: 2% lidocaine buccal infiltration, 2% lidocaine buccal plus palatal infiltration, and 4% articaine buccal infiltration. Although the differences were not statistically significant, the success rates for buccal infiltration, the combination method, and articaine were 69%, 85%, and 74%, respectively. The study discovered that while palatal infiltration reduced anesthesia by sixteen percent, it was unable to eliminate palatal canal pain. According to the authors' findings, 4% articaine did not significantly improve buccal infiltration over 2% lidocaine. The use of various epinephrine doses was a research limitation that could have affected the outcomes. Additional investigation is required to evaluate the effectiveness of different anesthetic methods and doses.

Author [24] compare and analyze the buccal infiltration method to the buccal plus palatal infiltration approach using 4% articaine and 1:100,000 epinephrine. The Heft-Parker Visual Analogue Scale was used to measure pain. With no statistically significant difference, the results demonstrated a 92% success rate in both groups, suggesting that BI with 4% articaine is just as effective as BPI without requiring a painful palatal injection. Although factors like epinephrine concentration and difficulties numbing inflamed pulp may have impacted the findings, both procedures indicated a 92% success rate with no significant difference, indicating that BI with 4% articaine is similarly effective while eliminating the pain of a palatal injection. Numerous factors have been linked by literature studies to the efficacy of anesthesia. The most significant factor in maxillary infiltration is the anesthetic agent's volume. This was maintained at 1.8 ml for both groups in our research. Sreekumar et al. [25] evaluated the effects of varying anesthetic solution quantities and observed that a larger volume enhanced the pulpal anesthesia's onset, duration, and success in maxillary molars. Vasoconstrictors' concentration in the anesthetic solution is another crucial element. However, regardless of the anesthetic solution utilized, Atasoy et al. [15] determined that this factor was negligible and that enough pulpal anesthesia could not be achieved in the palatal root canal of maxillary first molars with irreversible pulpitis with a single buccal infiltration. The absence of a double-blind design was one of the study's limitations, which might have resulted in some operator bias. Furthermore, the lack of a crossover design made it unable to manage variables like bone density and anatomical variances, which resulted in individual variability in the data that was obtained. Although the Visual Analogue Scale offers an objective evaluation of a subjective experience, it was not entirely controlled within the parameters of this investigation. The lack of local literature was another disadvantage, which prevented comprehensive comparisons. To improve understanding and reliability, more regional research on this subject is therefore essential.

CONCLUSION

According to the constraints of the research that was done. It may be said that there is no major difference between using buccal infiltration by itself or in conjunction with palatal anesthesia for pulpal anesthesia in symptomatic maxillary molars (Maxillary first and second). It might be said that in a clinical situation, buccal infiltration fails. The operator should consider alternative options, such as using additional anesthetic procedures or increasing the amount of the anesthetic substance. Both methods have been tried and shown effective in clinical trials.

Limitations

This study lacked a double-blind design, potentially introducing operator bias. Individual variability due to differences in bone density and anatomical variations was not controlled. The Visual Analogue Scale (VAS), while objective, cannot entirely quantify subjective pain experiences. Additionally, the limited regional literature restricted comprehensive comparative analysis.

Future Findings

Further research should explore alternative anesthetic techniques, such as articaine formulations, intraosseous injections, or supplementary nerve blocks, to improve pulpal anesthesia. Larger multicenter trials with diverse patient populations and advanced pain assessment tools could enhance clinical understanding and reliability of maxillary infiltration effectiveness.

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