



COMPARISON OF EFFICACY OF POSTERIOR SUPERIOR ALVEOLAR NERVE BLOCK TECHNIQUE AND LOCAL INFILTRATION TECHNIQUE FOR MAXILLARY MOLAR EXTRACTIONS

Md Sohaib Shahzan¹, Dr. Santhosh Kumar M P^{2*}

Article History: Received: 12.12.2022

Revised: 29.01.2023

Accepted: 15.03.2023

Abstract

Objectives: Extraction of teeth can be either uneventful and uncomplicated, or difficult, with considerable postoperative pain. Fear of a dental injection and postoperative pain can prevent patients from seeking dental care and often this fear is related to the feeling of needle penetration and pain during the injection. Local anesthesia plays an essential role in making dental treatment comfortable. The common techniques for providing pulpal anesthesia in maxillary molars include posterior superior alveolar (PSA) nerve block and infiltration anesthesia. The aim of this study was to compare the efficacy of two anesthesia methods for the extraction of maxillary molars: PSA nerve block technique vs local infiltration technique.

Materials and methods: The present study was conducted to evaluate the efficacy of PSA nerve block technique and infiltration technique for extraction of maxillary molars. In our study total sample size was 40 who underwent extraction of maxillary molars age ranged between 18 and 30 years. They were divided into 2 groups 20 patients who underwent extraction under infiltration and 20 patients who underwent extraction under PSA. Patients who were healthy and non-Smokers having no medications and were free from active local inflammatory lesions, were included in the study. Before the commencement of study, patients were informed about the study and informed consent was taken before extraction. The palatal injection was combined to both techniques. Preoperative pain assessed by a professional operator who was different from the surgeon who performed the extraction. Each record was repeated three times on every case: during the injection, at the end of operation and after 15 minutes from the end of operation by using visual analogue scale. The data was analyzed using SPSS version 22. The pain VAS scores were analyzed by analysis of variance (ANOVA).

Results: In our study total participants were 40 in which maxillary molar extraction was done. Patients with weak pain intensity during injection was more in infiltration 22.5% than PSA. Patients with no pain at the end of operation was more with PSA (32.5%). Patients with no pain after 15 minutes of the procedure was more with PSA (42.5%). Frequency of injection was less in PSA than compared to infiltration.

Conclusion: Within the limitations of the study, the statistical analysis of the results confirmed the extraction of maxillary molars with PSA nerve block and infiltration technique with the mean advantages of PSA with Minimum number of necessary injections and patients with no pain at the end of operation and after 15 minutes from extraction was more with PSA however the risk of a potential complication also must be considered whenever the PSA block is used.

Keywords: Infiltration, PSA block, extraction, anesthesia, maxillary molars

¹Graduate student Saveetha Dental college and hospital, Saveetha Institute of medical and technical science, Saveetha university, Chennai - 600077 Tamil Nadu, India.

^{2*}Professor, Department of Oral and Maxillofacial surgery, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha university, Chennai - 600077 Tamil Nadu, India

DOI: 10.31838/ecb/2023.12.s2.190

1. Introduction

Extraction of teeth can be either uneventful and uncomplicated, or difficult, with considerable postoperative pain¹. Fear of a dental injection and postoperative pain can prevent patients from seeking dental care and often this fear is related to the feeling of needle penetration and pain during the injection². Local anesthesia plays an essential role in making dental treatment comfortable³. Also it has been called the most important drug in dentistry³. Local anesthetics have made it possible to perform many surgical procedures quickly, with less preparation and a shorter recovery time³. Local anesthesia is routinely used to provide effective pain control, but it causes pain and discomfort during administration⁴.

Many local anesthetic injection techniques are available to provide adequate anesthesia to the teeth, soft tissues, and hard tissues⁴. Conversely, local anesthetic injections are seen by many patients as stressful and a reason for avoiding dental treatment⁴. A range of local anesthetic drugs have been used in dentistry amongst which lidocaine is the most popular⁵. The first amide anesthetic to be synthesized was lidocaine by Nils Lofgren in 1943⁶. The amide anesthetic gained popularity and was started being widely used and was considered the gold standard for usage and comparison⁶. The onset of action of lidocaine varies from 2 to 3 min and the duration of its anesthesia is 85 minutes at the pulpal level, with addition of epinephrine as vasoconstrictor⁷.

The common techniques for providing pulpal anesthesia in maxillary molars include posterior superior alveolar (PSA) nerve block and infiltration anesthesia⁸. The PSA block aims at depositing the anesthetic solution near the division of the PSA nerve from the maxillary second division nerve and its entry into the posterior maxilla⁸. It involves the insertion of the needle into the buccal mucosa above the second molar and directing the needle in an upward-backward direction at an angle of 40 to the sagittal plane of the head⁸. Pfeil et al found that the PSA block with 1.8 mL of 2% lidocaine with 1:100,000 epinephrine provided 77% and 97% anesthetic success rates for maxillary first and second molars, respectively⁹. Adatia reported an anesthetic success rate of 97% for maxillary first molars using a PSA block with 1.5 to 1.8 mL of 2% lignocaine with 1:80,000 epinephrine¹⁰. The majority of authors have reported that PSA alone can provide effective pulpal anesthesia for maxillary first molars¹⁰.

Maxillary buccal infiltration anesthesia is a commonly used technique for providing pulpal anesthesia for maxillary teeth¹¹. The infiltration technique provides anesthesia by the diffusion of local anesthesia solution into the cancellous bone via

the porous thin cortical plate. The buccal infiltration anesthesia has been shown to provide a success rate of 72% to 100% in healthy pulps¹². Moreover, buccal infiltration anesthesia shows an equivalent effect for different anesthetic solutions (with epinephrine) including lidocaine, articaine, and prilocaine for maxillary first molars¹³. The maxilla is very porous and highly vascular. Therefore, anesthesia of maxillary teeth can be accomplished more easily than with mandibular teeth. Our team has extensive knowledge and research experience that has translate into high quality publications¹⁴⁻²³. Therefore, the aim of this study was to compare the efficacy of two anesthesia methods for the extraction of maxillary molars: PSA nerve block technique vs local infiltration technique.

2. Materials and Methods

The present study was conducted to evaluate the efficacy of PSA nerve block technique and infiltration technique for extraction of maxillary molars. In our study total sample size was 40 who underwent extraction of maxillary molars age ranged between 18 and 30 years. They were divided into 2 groups 20 patients who underwent extraction under infiltration and 20 patients who underwent extraction under PSA. Patients who were healthy and non-smokers having no medications and were free from active local inflammatory lesions, were included in the study. Before the commencement of study, patients were informed about the study and informed consent was taken before extraction. The palatal injection was combined to both techniques. A topical anesthetic gel 5% lidocaine was placed with a cotton tip applicator. After reaching the target area, aspiration was performed in all the planes during the administration of the injection. In the infiltration technique, after two minutes of buccal infiltration, a palatal infiltration was administered. A 1.8 mL of 2% lidocaine hydrochloride with 1:80,000 adrenaline solutions was deposited at a rate of 1 ml/min. After 5 minutes of the injection of a determined dose of local anesthesia, the extraction was performed. The extraction was similar in all cases and was performed by the same surgeon. After extraction, all the patients were advised to take an oral antibiotic amoxicillin 500 mg t.i.d and non-steroidal anti-inflammatory drug Diclofenac potassium 50 mg t.i.d for 3 days. Preoperative pain assessed by a professional operator who was different from the surgeon who performed the extraction. Each record was repeated three times on every case: during the injection, at the end of operation and after 15 minutes from the end of operation by using visual analogue scale (Figure 1). The data was analyzed using SPSS version 22. The pain VAS scores were analyzed by analysis of variance (ANOVA).

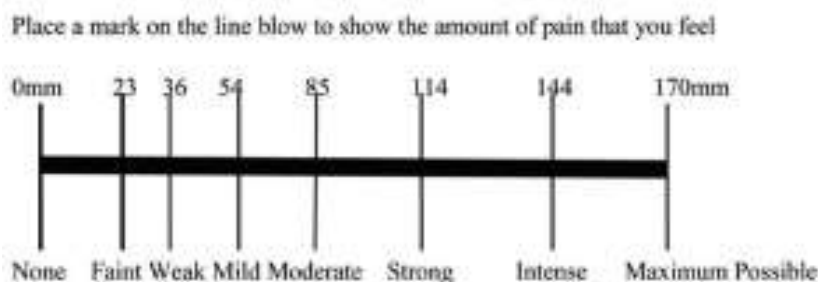


Figure 1. Heft-Parker visual analog scale (VAS) used for assessment of pain. The millimeter demarcations were not shown on the patient’s VAS.

3. Results

In our study, total participants were 40 in which maxillary molar extraction was done. The outcomes of our study are depicted in Table 1 and Figures 2 – 5. Patients with weak pain intensity during injection

was more in infiltration (22.5%) than PSA. Patients with no pain at the end of operation was more with PSA (32.5%). Patients with no pain after 15 minutes of the procedure was more with PSA (42.5%). Frequency of injection was less in PSA than compared to infiltration.

Type of injection	VAS during injection	VAS at the end of extraction	VAS after 15 minutes
Infiltration			
no pain	6	12	16
weak	9	6	4
moderate	5	2	0
PSA Block			
no pain	5	13	17
weak	8	4	3
moderate	7	3	0

Table 1: Pain intensity with different type of injection

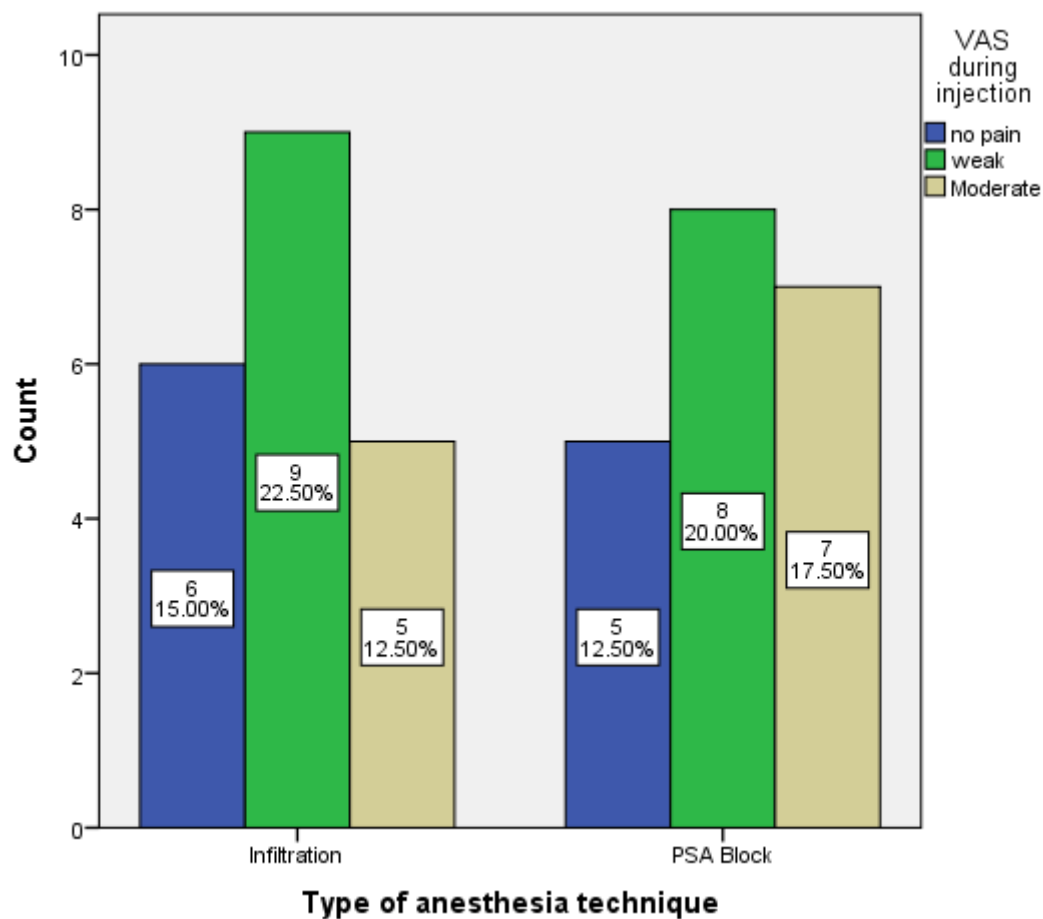


Figure 2 denotes pain intensity during injection using infiltration and PSA block techniques.

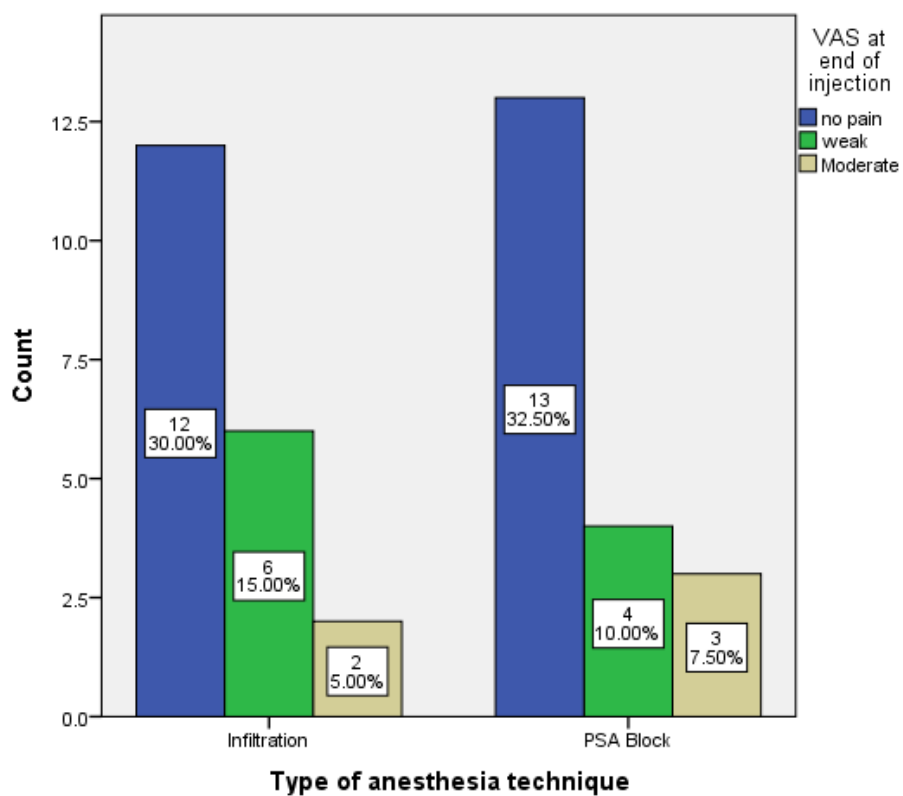


Figure 3 denotes the pain intensity after injection using infiltration and PSA block techniques.

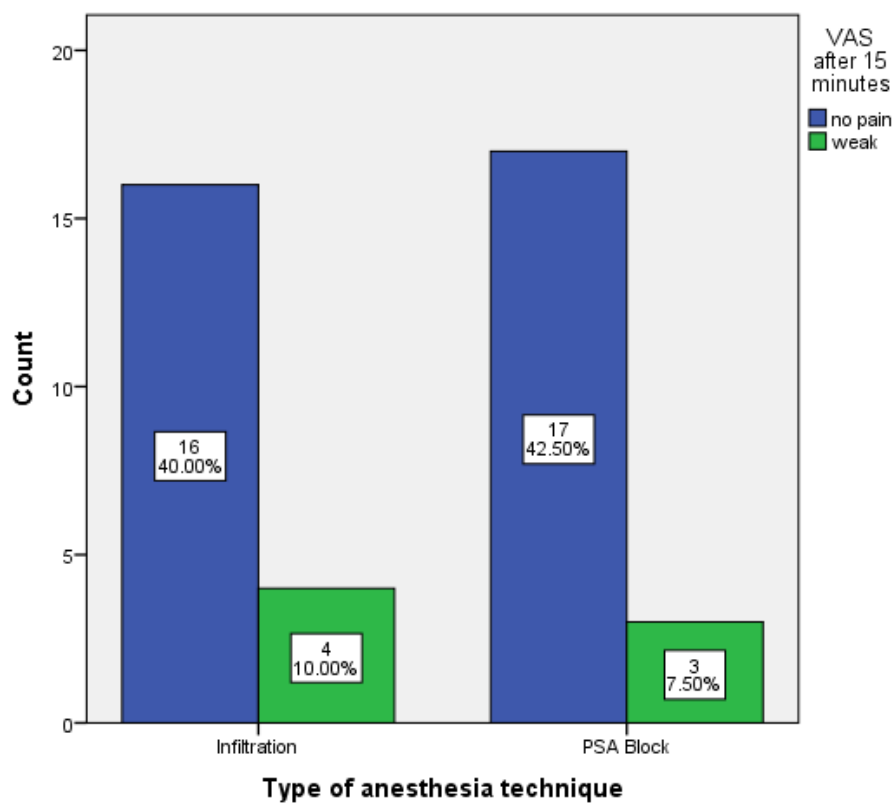


Figure 4 denotes the pain intensity after 15 minutes of extraction using infiltration and PSA block techniques.

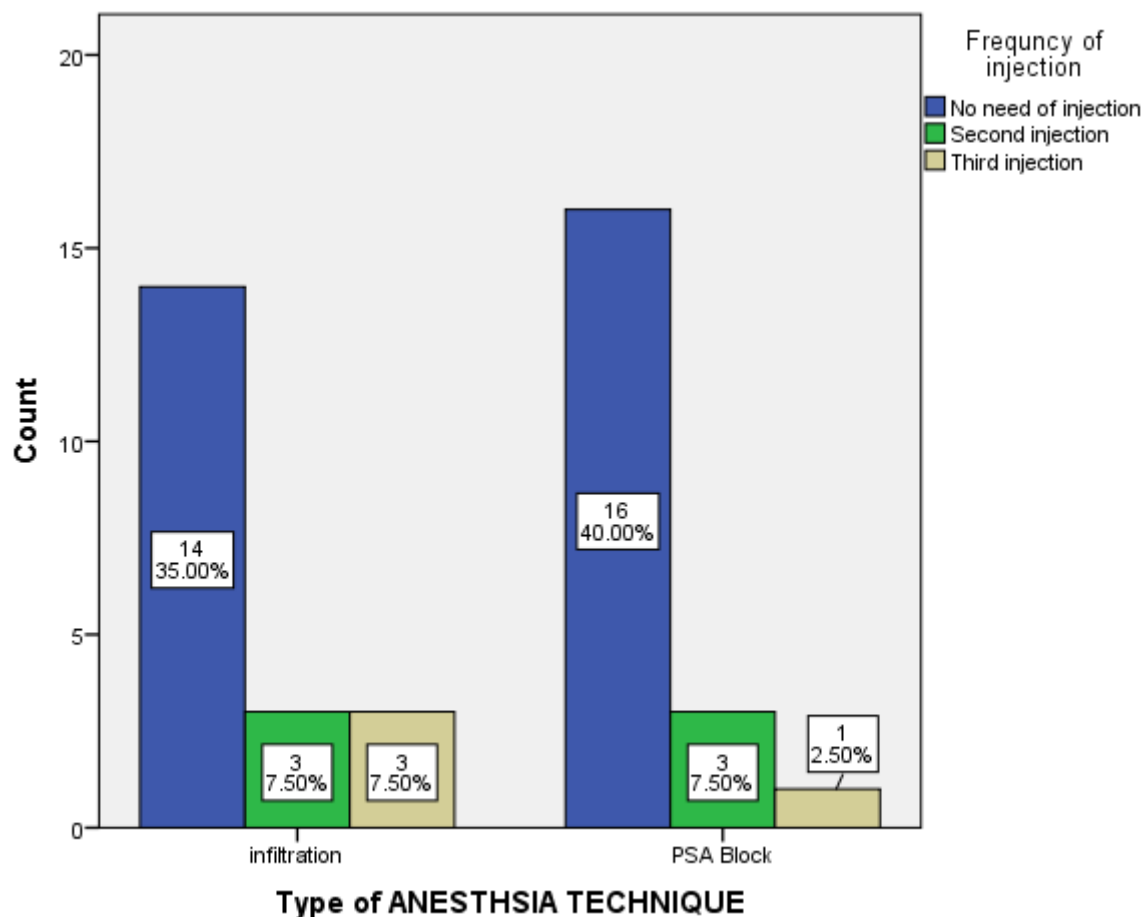


Figure 5 denotes the frequency of injection using infiltration and PSA block techniques.

4. Discussion

For the effective pain control, the choice of local anesthetic techniques may influence the amount of discomfort produced during intraoral injection in order to propose an easy and safe method to anesthetize the dentition and surrounding hard and soft tissues during management of surgical extraction²⁴. The various anesthesia techniques available in dentistry are nerve block anesthesia, infiltration anesthesia, intra-osseous anesthesia, subperiosteal infiltration, intraligamental, intra-pulpal, intranasal, sublingual, conscious sedation, general anesthetic techniques. Amongst these, the commonly used anesthetic techniques include nerve block and site-specific infiltration techniques. Maxillary infiltration anesthesia is a common method to anesthetize maxillary teeth²⁵. Also, the PSA nerve block has been advocated to anesthetize the first, second, and third molar teeth.

In our study total participants were 40 in which maxillary molar extraction was done. Patients with weak pain intensity during injection was more in infiltration (22.5%) than PSA. Patients with no pain at the end of operation was more with PSA (32.5%). Patients with no pain after 15 minutes of the procedure was more with PSA (42.5%). Frequency

of injection was less in PSA than compared to infiltration. In a study by Singh AK et al, Patients with weak pain intensity during injection was more with PSA (60%). Patients with no pain at the end of operation was more with PSA (80%). Patients with no pain after 15 minutes of the procedure was more with PSA (90%)²⁶. Halim SH concluded that the both methods have the same statistic equivalence for the surgical extraction of maxillary third molars with the significant advantages of PSA nerve block technique over infiltration technique that least number of necessary injections but at the same time the risk of a potential complication like hematoma also must be considered¹¹.

Al-Delayme RE concluded that although the average pain score for all studied times in PSA side was lower than the average pain score in infiltration technique, repeated statistical measures demonstrated that no significant pain reduction occurred in the two techniques¹². Numerous studies have demonstrated that infiltration injection of anesthetics results in 90%-95% successful anesthesia in maxillary teeth²⁷⁻²⁸. Descriptions of conventional techniques for maxillary anesthesia are available for review in numerous articles and textbooks. Clinically, maxillary anesthesia is more

successful than mandibular anesthesia, and the infiltration is by far the dominant approach.

PSA block is associated with many complications. Some adverse events have been reported with the PSA block including transient diplopia, mydriasis, double vision, and hematomas¹³. Hematoma is usually produced by inserting the needle too far posteriorly into the pterygoid plexus of veins²⁹. 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 ptosis³⁰. With good technique, hematomas should not be a problem with the PSA nerve block. Most problems with maxillary anesthesia can be attributed to individual variances of normal anatomic nerve pathways through the maxillary bone. According to Waltor and Abbott, infiltration anesthesia of maxillary molars fails in situations where the palatal roots flare greatly toward the midline of the palate³¹. Studies have shown that PSA block provides consistently reliable pulpal anesthesia to the 2 maxillary molars, even in the presence of infection or widely flared palatal roots (22-31). Limitations of the present study includes, limited sample size and geographic limits.

5. Conclusion

Within the limitations of the study, the statistical analysis of the results confirmed the extraction of maxillary molars with PSA nerve block and infiltration technique with the mean advantages of PSA with minimum number of necessary injections and patients with no pain at the end of operation and after 15 minutes from extraction was more with PSA. However, the risk of a potential complication also must be considered whenever the PSA block is used.

6. References

- Papadogeorgakis N, Parara E, Perisanidis C, et al. A method for extraction of impacted upper third molars. *British Journal of Oral and Maxillofacial Surgery* 2011; 49: 150–151.
- Badcock ME, Gordon I, McCullough MJ. A blinded randomized controlled trial comparing lignocaine and placebo administration to the palate for removal of maxillary third molars. *Int J Oral Maxillofac Surg* 2007; 36: 1177–1182.
- McCartney M, Reader A, Beck M. Injection pain of the inferior alveolar nerve block in patients with irreversible pulpitis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2007; 104: 571–575.
- Meehan JG. Aspirations and solutions — A 20 year journey through dental local anaesthetics. *The Surgeon* 2009; 7: 358–361.
- Kanaa MD, Whitworth JM, Corbett IP, et al. Articaine and lidocaine mandibular buccal infiltration anesthesia: a prospective randomized double-blind cross-over study. *J Endod* 2006; 32: 296–298.
- Trullenque-Eriksson A, Guisado-Moya B. Comparative study of two local anesthetics in the surgical extraction of mandibular third molars: bupivacaine and articaine. *Med Oral Patol Oral Cir Bucal* 2011; 16: e390–6.
- Sierra Rebolledo A, Delgado Molina E, Berini Aytés L, et al. Comparative study of the anesthetic efficacy of 4% articaine versus 2% lidocaine in inferior alveolar nerve block during surgical extraction of impacted lower third molars. *Medicina Oral, Patología Oral y Cirugía Bucal (Internet)* 2007; 12: 139–144.
- Winter GB. Principles of exodontia as applied to the impacted mandibular third molar: a complete treatise on the operative technic with clinical diagnoses and
- Okouchi K, Fujiwara Y, Yamashiro M. ... computed tomography and conventional panoramic radiography in assessing the topographic relationship between the mandibular canal and impacted third molars. , *Oral Radiology, and* ..., <https://www.sciencedirect.com/science/article/pii/S1079210406004331> (2007).
- Malamed SF. Handbook of local anesthesia 5th ed MO. *St Louis: Elsevier Mosby*.
- Halim SH. ASSESSMENT OF EFFICACY OF PSA NERVE BLOCK TECHNIQUE AND LOCAL INFILTRATION TECHNIQUE IN PATIENTS UNDERGOING SURGICAL REMOVAL OF MAXILLARY THIRD MOLARS: A COMPARATIVE STUDY. *Journal of Advanced Medical and Dental Sciences Research; Amritsar* 2017; 5: 101–104.
- Al-Delayme RE. A comparison of two anesthesia methods for the surgical removal of maxillary, <https://roderic.uv.es/handle/10550/35365> (2014).
- Mikesell A, Drum M, Reader A, et al. Anesthetic efficacy of 1.8 mL and 3.6 mL of 2% lidocaine with 1:100,000 epinephrine for maxillary infiltrations. *J Endod* 2008; 34: 121–125.
- Ramesh A, Varghese S, Jayakumar ND, et al. Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study. *J Periodontol* 2018; 89: 1241–1248.
- Vijayashree Priyadharsini J. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. *J Periodontol* 2019; 90: 1441–1448.
- Priyadharsini JV, Vijayashree Priyadharsini J,

- Smiline Girija AS, et al. In silico analysis of virulence genes in an emerging dental pathogen *A. baumannii* and related species. *Archives of Oral Biology* 2018; 94: 93–98.
- Teja KV, Ramesh S, Priya V. Regulation of matrix metalloproteinase-3 gene expression in inflammation: A molecular study. *J Conserv Dent* 2018; 21: 592–596.
- Manohar MP, Sharma S. A survey of the knowledge, attitude, and awareness about the principal choice of intracanal medicaments among the general dental practitioners and nonendodontic specialists. *Indian J Dent Res* 2018; 29: 716–720.
- Nandakumar M, Nasim I. Comparative evaluation of grape seed and cranberry extracts in preventing enamel erosion: An optical emission spectrometric analysis. *J Conserv Dent* 2018; 21: 516–520.
- Varghese SS, Ramesh A, Veeraiyan DN. Blended Module-Based Teaching in Biostatistics and Research Methodology: A Retrospective Study with Postgraduate Dental Students. *J Dent Educ* 2019; 83: 445–450.
- Panchal V, Jeevanandan G, Subramanian E. Comparison of instrumentation time and obturation quality between hand K-file, H-files, and rotary Kedo-S in root canal treatment of primary teeth: A randomized controlled trial. *J Indian Soc Pedod Prev Dent* 2019; 37: 75–79.
- Nair M, Jeevanandan G, Vignesh R. Comparative evaluation of post-operative pain after pulpectomy with k-files, kedo-s files and mtwo files in deciduous molars-a randomized clinical trial. *Braz Dent J*, <https://bds.ict.unesp.br/index.php/cob/article/view/1617> (2018).
- Felicita AS. Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor - The sling shot method. *Saudi Dent J* 2018; 30: 265–269.
- Kennedy M, Reader A, Beck M, et al. Anesthetic efficacy of ropivacaine in maxillary anterior infiltration. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2001; 91: 406–412.
- Guglielmo A, Drum M, Reader A, et al. Anesthetic efficacy of a combination palatal and buccal infiltration of the maxillary first molar. *J Endod* 2011; 37: 460–462.
- Singh AK, Jain G. Comparison of two anaesthesia methods for the surgical removal of maxillary third molars. *Journal of Advanced Medical and Dental Sciences Research* 2019; 7: 59–61.
- Mikesell P, Nusstein J, Reader A, et al. A comparison of articaine and lidocaine for inferior alveolar nerve blocks. *J Endod* 2005; 31: 265–270.
- Walton RE, Torabinejad M. *Principles and Practice of Endodontics*. Saunders, 2002.
- Costa CG, Tortamano IP, Rocha RG, et al. Onset and duration periods of articaine and lidocaine on maxillary infiltration. *Quintessence Int* 2005; 36: 197–201.
- Prakasm M, Managutti A, Dolas RS, et al. Temporary pupillary dilatation and ptosis: complications of PSA nerve block: a case report and review of literature. *J Maxillofac Oral Surg* 2009; 8: 181–183.
- Walton RE, Abbott BJ. Periodontal ligament injection: a clinical evaluation. *J Am Dent Assoc* 1981; 103: 571–575.
- Winter GB. Principles of exodontia as applied to the impacted mandibular third molar: a complete treatise on the operative technic with clinical diagnoses and radiographic interpretations. American medical book company; 1926.
- Gayathri MM. Knowledge and awareness among patients about dental implants. *Journal of Pharmaceutical Sciences and Research*. 2016 May 1;8(5):351.
- SK M. Knowledge, attitude, and practices regarding infection control among undergraduate dental students. *Asian J Pharm Clin Res*. 2016;9(1):220-4.
- Al-Delayme RE. A comparison of two anesthesia methods for the surgical removal of maxillary. 2014; Available from: <https://roderic.uv.es/handle/10550/35365>