IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 25, Issue 2 Ser. 1 (February. 2026), PP 20-27
www.iosrjournals.org

"Efficacy Of Frontozygomatic Maxillary Nerve Block Techniques And Its Applications In Oral And Maxillofacial Surgery."

Dr. Anamika Juhi, Dr. Ajay Kumar Pillai, Dr. Priyanka Sharma,
Dr. Shivangini Nayak, Dr. Amit Kumar Giri, Dr. Md Shaklin Mustak Hussain
Postgraduate Resident, Department Of Oral & Maxillofacial Surgery, People's Dental Academy, Bhopal, India
Professor, & Head, Department Of Oral & Maxillofacial Surgery, People's Dental Academy, Bhopal, India
Reader, Department Of Oral & Maxillofacial Surgery, People's Dental Academy, Bhopal, India
Senior Lecturer, Department Of Oral & Maxillofacial Surgery, People's Dental Academy, Bhopal, India
Senior Lecturer, Department Of Oral & Maxillofacial Surgery, People's Dental Academy, Bhopal, India
Postgraduate Resident, Department Of Oral & Maxillofacial Surgery, People's Dental Academy, Bhopal, India

Abstract
Background: *Achieving profound and predictable maxillary anesthesia is essential for Oral and Maxillofacial surgical procedures. Although intraoral maxillary nerve block techniques are commonly practiced, they may be associated with multiple injections, patient discomfort, and technical limitations in certain clinical situations. Extraoral maxillary nerve block techniques offer a potential alternative with wider anesthetic coverage.*
Objective: *To evaluate the efficacy, safety, and clinical applicability of extraoral maxillary nerve block in patients undergoing unilateral maxillary Oral and Maxillofacial surgical procedures.*
Materials and Methods: *This prospective pilot study included 15 patients undergoing unilateral maxillary surgical procedures. Extraoral maxillary nerve block was administered via the frontozygomatic approach. Outcome measures included pain during injection, onset of anesthesia, adequacy of anesthesia, and procedure-related complications. Statistical analysis included descriptive statistics, Wilcoxon signed-rank test, and Student paired t test.*
Results: *The mean age of the study population was 33.7 ± 9.4 years, with a male-to-female ratio of 9:6. Successful anesthesia without supplemental injection was achieved in 14 patients (93.3%). Pain during injection was minimal, with a mean VAS score of 2.5 ± 1.4. The mean subjective onset time of anesthesia was 159.14 ± 78.08 seconds, while the mean objective onset time was 383.57 ± 99.97 seconds; this difference was statistically significant (p = 0.00002). Minor complications in the form of transient localized hematoma were observed in two patients (13.3%),transient visual disturbance in one patient(6.7%) and discomfort in one patient(6.7%).*
Conclusion: *Extraoral maxillary nerve block using the frontozygomatic approach is a safe, effective, and well-tolerated anesthetic technique for unilateral maxillary oral and maxillofacial surgical procedures. The technique demonstrates a high success rate, minimal patient discomfort, and a low incidence of complications. Larger randomized controlled studies are recommended to further validate these findings.*
Keywords: *Extraoral maxillary nerve block, Frontozygomatic approach, Regional anesthesia, Oral and maxillofacial surgery, Pilot study, Moore's technique*

Date of Submission: 25-01-2026 Date of Acceptance: 05-02-2026

I. Introduction

Pain control is a fundamental component of Oral and Maxillofacial Surgery (OMFS), directly influencing patient comfort, operating conditions, and postoperative recovery.[1,2] Conventional intraoral local anesthetic techniques are effective for most minor procedures; however, they may present limitations in cases requiring multiple extractions, extensive surgical exposure, presence of infection, trismus, or when distortion of surgical anatomy is undesirable.[3,4]

Regional anesthesia of the maxillary nerve provides anesthesia to the entire maxillary quadrant, including the maxillary teeth, alveolus, palate, and associated soft tissues. Intraoral maxillary nerve block techniques, such as the greater palatine canal approach, are technically demanding and may be associated with patient discomfort and potential complications. Extraoral approaches to the maxillary nerve, particularly via the frontozygomatic or suprazygomatic route, have been described as reliable alternatives that provide wider anesthetic coverage with a single injection.[8,9] Despite documented advantages, these techniques remain underutilized due to perceived technical difficulty and concerns regarding complications.[10] The present pilot study was undertaken to evaluate the efficacy, safety, and clinical feasibility of the extraoral maxillary nerve block using the frontozygomatic approach in maxillary Oral and Maxillofacial surgical procedures.

Anatomy

The frontozygomatic approach to the maxillary nerve is considered one of the safer extraoral techniques, allowing access to the pterygopalatine fossa with minimal risk when performed correctly. The frontozygomatic (extra-oral) maxillary nerve block targets the maxillary nerve (V2) within the pterygopalatine fossa.[12] The maxillary nerve arises from the trigeminal (Gasserian) ganglion in the middle cranial fossa and exits the skull through the foramen rotundum to enter the pterygopalatine fossa, where it lies high, medial, and anterior in relation to the fossa. The pterygopalatine fossa is bounded anteriorly by the posterior surface of the maxilla, posteriorly by the pterygoid process of the sphenoid, medially by the perpendicular plate of the palatine bone, laterally by the pterygomaxillary fissure, and superiorly by the inferior orbital fissure. In the frontozygomatic approach, the surface landmark is the frontozygomatic suture, located at the junction of the frontal and zygomatic bones, just lateral to the outer canthus of the eye.[15]

From this point,(Fig1) the needle passes through the skin, subcutaneous tissue, temporalis fascia, and temporalis muscle, traverses the infratemporal space, and enters the pterygopalatine fossa by being directed medially, inferiorly, and posteriorly. Within the fossa, the maxillary nerve is closely related to the maxillary artery and the pterygoid venous plexus, and gives off branches including the posterior superior alveolar nerve, zygomatic nerve, infraorbital nerve, and palatine nerves, resulting in anesthesia of the maxillary teeth, palate, maxillary sinus, and midfacial region. This pilot study was conducted to assess the efficacy, safety, and feasibility of extraoral maxillary nerve block using the frontozygomatic approach in a limited cohort group of patients undergoing maxillary Oral and Maxillofacial surgical procedures.

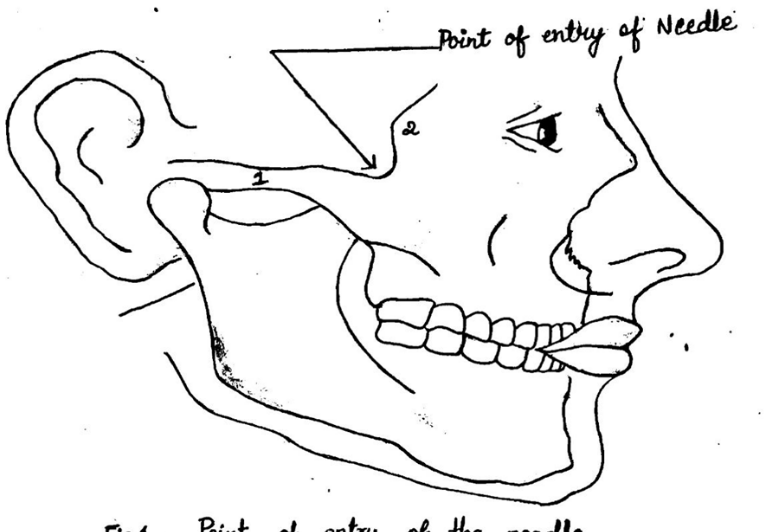


Fig1- Point of entry of the needle
Label 1- Zygomatic arch
Label 2- Lateral orbital rim

II. Materials And Methods

Study Design:

A prospective clinical study was conducted in the Department after obtaining approval from the Institutional Ethical Committee. Written informed consent was obtained from all participants prior to inclusion in the study, and all patients agreed to comply with the follow-up protocol. A total of 15 participants were recruited as a sample to assess the feasibility of the technique and to evaluate preliminary clinical outcomes before planning a larger-scale study. Patients aged between 18 and 50 years requiring unilateral maxillary surgical procedures, such as multiple tooth extractions, cyst enucleation, or alveoloplasty, were included in the study. Patients with a known allergy to local anesthetic agents, bleeding disorders or those on anticoagulant therapy, presence of infection at the injection site, or those unwilling to participate or comply with follow-up were excluded from the study.

Anesthetic Technique

Frontozygomatic angle approach (Fig 3) Skin over the anterior temporal region, lateral orbital rim and zygomatic arch was prepared with Povidine-liodine 5% solution followed by a standard draping procedure. An indelible marker was used to scribe the position of the posterior border of the frontal process of zygoma (Lateral orbital rim) and the superior border of the zygomatic arch. The area just above and lateral to the junction of these two lines(Jugal Point) served as the reference point for needle puncture.

The injection was administered using a 20 gauge 89mm long spinal needle fitted to a 5ml disposable syringe (DISPOVAN, Hindustan Medical Devices, India). 3ml of 2% lignocaine with 1:200000 adrenaline (LA) was used for a single block. Prior to procedure, a pre-sterilized endodontic rubber stopper was passed over the needle to lie at 40mm distance from the needle tip.

A skin wheal was raised at the needle entry point indicated above, by depositing 0.5 ml of the LA solution. After a minute, the needle was inserted percutaneously, and advanced perpendicular to the saggital and horizontal planes to the required depth as indicated by the stopper. A few drops of LA solution were deposited after every few millimeters of needle advancement to anesthetize the needle pathway. If the needle made contact with bone, it was withdrawn to a point just under the skin, and reinserted at a 10 degree inferior angulation. Upon reaching the required depth, 2 ml of LA solution was slowly deposited over 3 minutes, this being indicative of the target i.e., pterygopalatine fossa.(Fig 4) If the patient complained of bitterness in the throat during this final injection, the needle was withdrawn by about 2 mm and a few drops readministered to confirm needle position within the fossa.

Needle was finally withdrawn after completion the injection and an firm finger pressure with an isopropyl alcohol swab was applied at the puncture site for minute.Surgical procedure was undertaken after verifying subjective symptoms (ipsilateral infra orbital and upper lip numbness) and objective signs of anesthesia (lack of pain on firm probing with a sharp probe at 4 designated points; buccal and palatal gingiva in tuberosity region and buccal an palatal gingiva in canine region).

Fig 2- Spinal needle 20 G

Fig 3-Frontozygomatic Approach with landmarks

Fig 4- Final position of needle for block

Outcome Measures

- Pain during injection assessed using a visual analogue scale (VAS: 0–10)
- Time to onset of subjective and objective anesthesia (seconds)
- Need for supplemental anesthesia
- Intraoperative and postoperative complications

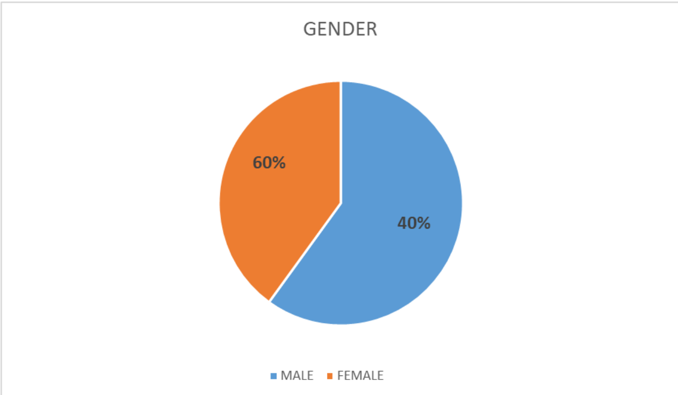
Statistical Analysis

Data were analyzed using descriptive statistics. Wilcoxon signed-rank test compared onset times. Spearman's correlation assessed association between pain scores. $P < 0.05$ was considered significant.

III. Results

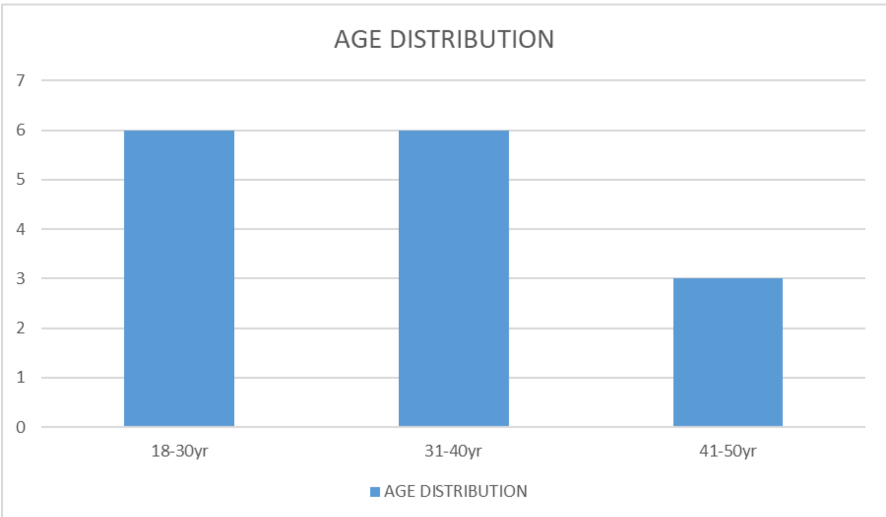
Demographic Data

The study included total of 15 participants, all the participants came for follow-up, out of 15 paticipants 9 were male (60%) and 6 were female (40%), Graph 1.



Graph 1- Gender

The participants represented a young to middle-aged adult population, with the mean age recorded as 33.7 ± 9.4 years, indicating a moderate age variability within the study group, 6(40%) were 18-30year, 6(40%) were 31-40year, and 3(20%) were 41-50year, Graph 2.



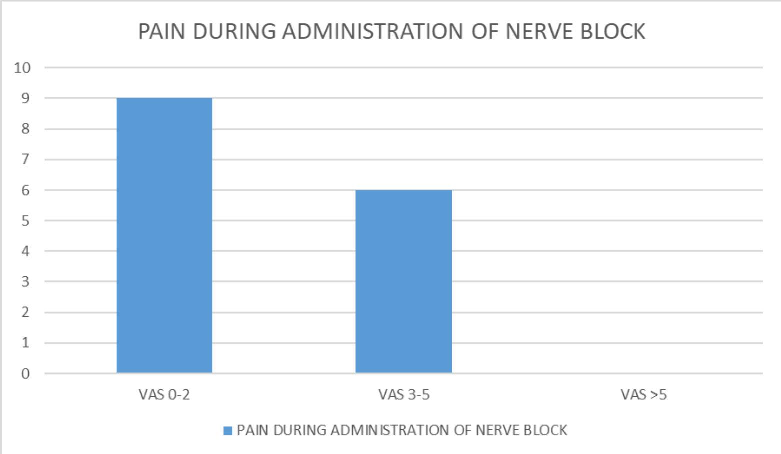
Graph 2- Age distribution

Pain During Administration of Nerve Block

Pain experienced during the administration of the extraoral maxillary nerve block was assessed using a 10-point Visual Analogue Scale (VAS). Overall, the procedure was well tolerated by the study participants, with most patients reporting minimal discomfort.

The mean pain score during injection was 2.5 ± 1.4, indicating a low level of pain perception.

On analysis of VAS scores, 9 patients (60%) reported scores in the range of 0–2, which was interpreted as no pain, while 6 patients (40%) reported scores between 3–5, corresponding to mild pain, Graph 3. Notably, no patient reported a VAS score greater than 5, indicating the absence of moderate to severe pain during the procedure. Additionally, none of the participants experienced severe discomfort during needle insertion or anesthetic deposition. These findings suggest that the frontozygomatic approach for extraoral maxillary nerve block is associated with minimal procedural discomfort and good patient tolerability.



Graph-3 Pain during administration of nerve block

Time to Onset of Anesthesia (Graph 4)

The onset of anesthesia was evaluated using both subjective and objective assessment criteria to comprehensively determine anesthetic efficacy.

Subjective Onset of Anesthesia

Subjective onset was defined as the time at which patients first perceived numbness in the maxillary region.

- Mean subjective onset time: 159.14 ± 78.08 seconds
- Subjective onset could not be assessed in one patient (6.7%) due to failure to secure anesthesia.

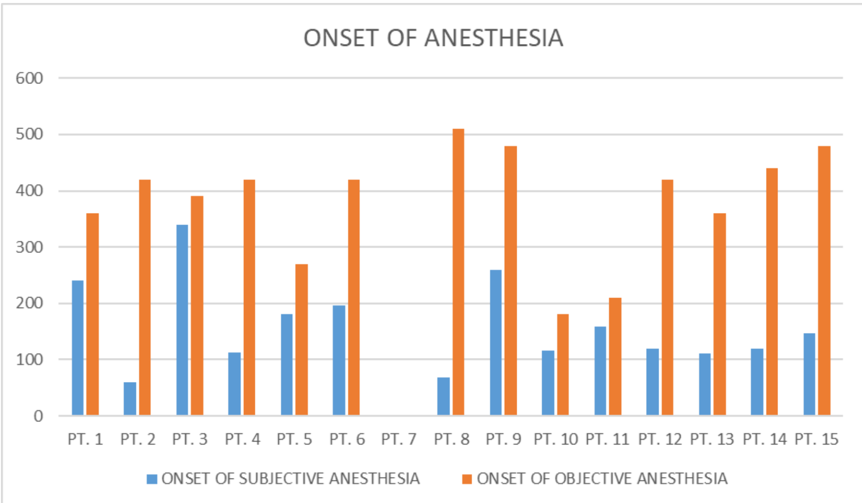
Objective Onset of Anesthesia

Objective onset was determined by loss of sensation to probing or pin-prick testing.

- Mean objective onset time: 383.57 ± 99.97 seconds
- Objective onset could not be assessed in the same patient due to block failure.

A paired comparison between subjective and objective onset times was performed using the Wilcoxon signed-rank test, which demonstrated a statistically significant difference $p > 0.05$ ($p = 0.00002$).

Objective onset of anesthesia was consistently delayed compared to subjective onset, emphasizing the importance of allowing adequate latency before surgical intervention.



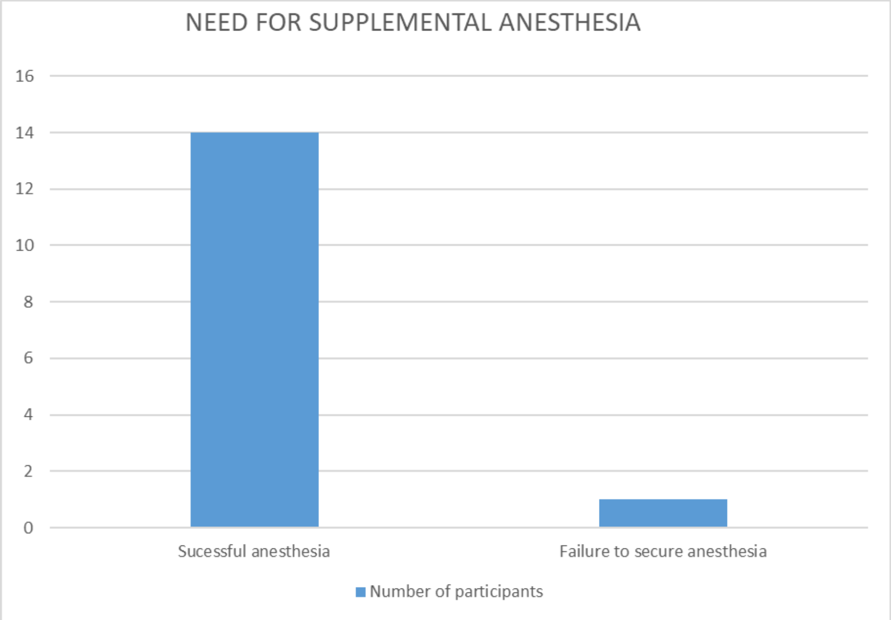
Graph 4- Onset of anesthesia in seconds

Need for Supplemental Anesthesia(Graph 5)

Adequacy of anesthesia was evaluated by assessing the requirement for additional local anesthetic supplementation.

- Successful anesthesia without supplementation: 14 patients (93.3%)
- Failure to secure anesthesia: 1 patient (6.7%)

One patient required alternative anesthetic management due to failure of the extraoral maxillary nerve block. Thus, the overall procedural success rate was 93.3%.

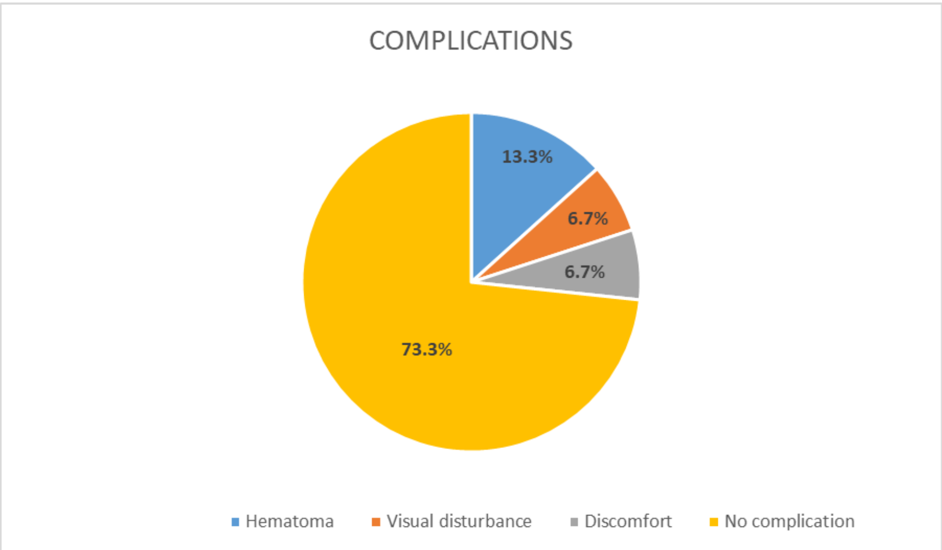


Graph 5- Need of supplemental anesthesia

Intraoperative and Postoperative Complications (Graph 5)

Minor complications were observed in 2 participants (13.3%), both of whom developed localized, transient hematoma at the injection site. These resolved spontaneously without the need for medical intervention.One patient (6.7%) experienced a transient visual disturbance following the procedure, which resolved spontaneously without intervention.One patient (6.7%) reported mild procedural discomfort during the administration of the nerve block. No serious or permanent complications were noted, and all patients were managed conservatively.

Overall, the extraoral maxillary nerve block using the frontozygomatic approach demonstrated a favorable safety profile.



Graph-5 Complications

VI. Discussion

The frontozygomatic approach to maxillary nerve block, also known as Moore's technique, was originally described by William F. Moore. The present study demonstrates that the extraoral maxillary nerve block administered via the frontozygomatic approach is an effective and reliable anesthetic technique for a variety of unilateral maxillary Oral and Maxillofacial surgical procedures. The high success rate observed in this study (93.3%) is comparable with previously published reports evaluating extraoral maxillary nerve block techniques, which have documented success rates exceeding 90%.[8,10] These findings confirm the ability of the frontozygomatic approach to achieve profound anesthesia of the maxillary nerve with a single injection.

Several other techniques for maxillary nerve block have been described in the literature, including intraoral approaches such as the high tuberosity approach and the greater palatine canal approach which also anesthetizes the maxillary nerve. While these intraoral techniques are widely used, to achieve complete maxillary anesthesia and may be associated with patient discomfort, particularly in the presence of trismus, infection, inflammation, or restricted mouth opening. In contrast, the frontozygomatic approach provides anesthesia over a broader surgical field with a single injection, making it especially advantageous for extensive maxillary procedures.

Compared with conventional intraoral techniques, the extraoral maxillary nerve block offers several clinical advantages, including reduced need for multiple needle penetrations, improved patient comfort, and avoidance of inflamed or sensitive intraoral tissues.[3,6] These benefits are particularly valuable in patients with limited mouth opening, extensive maxillary pathology, or when prolonged surgical procedures are anticipated.[4,17] In the present study, pain experienced during anesthetic administration was minimal, as reflected by a low mean VAS score and absence of moderate or severe pain. These findings are consistent with previous studies reporting good patient tolerance of extraoral approaches when accurate anatomical localization and controlled anesthetic deposition are employed.[10,15] The reduced pain perception may be attributed to avoidance of highly innervated intraoral mucosa and reliance on well-defined extraoral landmarks.

Assessment of anesthetic onset in this study demonstrated a statistically significant delay in objective onset compared with subjective onset of anesthesia. This observation underscores the importance of allowing adequate latency time following injection before initiating surgical procedures, even when patients subjectively perceive numbness. Similar findings have been reported in earlier studies and emphasize the need for objective confirmation of anesthesia to ensure optimal surgical conditions and patient comfort.[9,10]

The frontozygomatic approach demonstrated a favorable safety profile in the present study. Minor and transient hematoma formation,visual disturbances and patient discomfort was observed which resolves on its own without any intervention. These findings support previous anatomical and clinical studies indicating that this approach is safe when strict adherence to anatomical landmarks, aspiration protocols, and proper technique is maintained.[11,14] Nevertheless, clinicians must remain vigilant, as complications such as hematoma formation, transient diplopia, or visual disturbances have been also reported in the literature.[7,18]

Despite its advantages, the frontozygomatic maxillary nerve block has certain limitations. The technique is technically demanding and requires thorough knowledge of craniofacial anatomy and experience with extraoral landmarks. There is a potential risk of injury to adjacent structures, including the orbit and vascular plexuses, if needle direction or depth is inaccurate. Additionally, the presence of facial edema, scarring, or anatomical variations may obscure landmarks and also there is an additional need of spinal needle for the block.There is also risk of diplopia due diffusion of local anesthetia from pterygopalatine fossa into orbit affecting optic nerve or oculomotor nerve.Patient apprehension toward extraoral injections and visible facial puncture sites may also limit acceptance in some clinical settings.

The limitations of the present study include the small sample size and the absence of a control group for direct comparison with conventional intraoral maxillary nerve block techniques. As a pilot investigation, the findings provide preliminary evidence supporting the clinical utility of the frontozygomatic approach. Larger randomized controlled trials are required to further validate these results, compare efficacy and safety with intraoral techniques, and establish standardized clinical guidelines for routine clinical use.

VII. Conclusion

Extraoral maxillary nerve block using the frontozygomatic approach is an effective and safe anesthetic technique for selected oral and maxillofacial surgical procedures. This pilot study supports its clinical applicability and highlights the need for further large-scale comparative studies.

References

[1]. Malamed SF. Handbook Of Local Anesthesia. 6th Ed. St Louis: Elsevier; 2013.
[2]. Becker DE, Reed KL. Essentials Of Local Anesthetic Pharmacology. Anesth Prog. 2006;53(3):98-109.
[3]. Moore PA, Hersh EV. Local Anesthetics: Pharmacology And Toxicity. Dent Clin North Am. 2010;54(4):587-599.
[4]. Khoury JN, Mihailidis S, Ghabriel M, Townsend G. Applied Anatomy Of The Pterygopalatine Fossa And Related Structures. Clin Anat. 2013;26(3):384-394.

[5]. Neill RS. Regional Anesthesia Of The Maxilla. Anaesthesia. 1995;50(11):1524-1536.
[6]. Moiseiwitsch J. Clinical Significance Of The Pterygopalatine Fissure In Maxillary Anesthesia. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2001;92(3):325-328.
[7]. Haas DA. Complications Of Local Anesthesia. J Can Dent Assoc. 2002;68(9):546-551.
[8]. Stajcic Z, Todorovic L. Blocks Of The Foramen Rotundum And The Oval Foramen: A Reappraisal Of Extraoral Maxillary And Mandibular Nerve Injections. Br J Oral Maxillofac Surg. 1997;35(5):328-333.
[9]. Mesnil M, Dadure C, Captier G, Et Al. Bilateral Suprazygomatic Maxillary Nerve Block For Cleft Palate Repair In Infants. Paediatr Anaesth. 2010;20(4):343-349.
[10]. Dadure C, Captier G, Raux O, Et Al. Continuous Maxillary Nerve Block Via The Suprazygomatic Route For Postoperative Analgesia. Anesthesiology. 2005;103(6):1307-1309.
[11]. Captier G, Dadure C, Leboucq N, Et Al. Anatomic Study For Truncal Maxillary Nerve Blocks Via The Suprazygomatic Route. J Craniofac Surg. 2009;20(1):224-228.
[12]. Standring S, Editor. Gray's Anatomy: The Anatomical Basis Of Clinical Practice. 41st Ed. London: Elsevier; 2016.
[13]. Lang J. Clinical Anatomy Of The Pterygopalatine Fossa And Its Communications. Acta Anat (Basel). 1985;123(1):1-12.
[14]. Sicher H, Dubrul EL. Oral Anatomy. 8th Ed. St Louis: Mosby; 1997.
[15]. Chakranarayan A, Mukherjee B. Extraoral Maxillary Nerve Block Techniques: Clinical Considerations. J Oral Maxillofac Surg. 2014;72(1):123-129.
[16]. Nader A, Kendall MC, De Oliveira GS Jr. Anatomic Basis Of The Suprazygomatic Maxillary Nerve Block. Reg Anesth Pain Med. 2013;38(5):421-424.
[17]. Renton T. Dental (Odontogenic) Pain. Br Dent J. 2010;209(5):11-17.
[18]. Pogrel MA. Permanent Nerve Damage From Inferior Alveolar Nerve Blocks: A Current Update. J Am Dent Assoc. 2012;143(1):26-34.