The Temporo-Masseteric Nerve Block (TMNB) for Alleviating Acute Postextraction Masticatory Myalgia: A Case Series

Gayathri Subramanian, BDS, PhD, DMD;[1] and Samuel Y. P. Quek, DMD, MPH[2]

[1]Associate Professor, Department of Diagnostic Sciences, Rutgers School of Dental Medicine, Newark, NJ; [2]Professor, Department of Diagnostic Sciences, Rutgers School of Dental Medicine, Newark, NJ

This case series describes the ability of the temporo-masseteric nerve block (TMNB) to expeditiously relieve acute postextraction myogenous pain of masseteric or temporalis origin. In addition, the TMNB injection technique is also briefly reviewed. Briefly, 4 patients with no baseline temporalis or masseter muscle pain developed severe masseteric/temporalis pain during the first postoperative week on the side(s) of their dental extraction(s). The pain was accompanied by trismus. Both the pain and limitation in mouth opening were relieved by the TMNB injection, and symptom alleviation persisted beyond the brief duration of action of the administered local anesthetic. In conclusion, the TMNB injection can potentially serve as a valuable nonopioid adjunct to manage acute postextraction pain of masseteric or temporalis origin. It may be important to delineate acute myogenous postextraction pain from surgical site pain to optimize postoperative pain management and best alleviate trismus. Systematic validation of the TMNB's utility in postextraction pain management is warranted.

Key Words: Temporo-masseteric; Nerve block; Extractions; Acute; Myogenous; Facial pain; Masseter; Temporalis; Trismus.

The temporo-masseteric nerve block (TMNB), previously known as the twin block, is a local anesthetic nerve block targeting the deep temporal and masseteric branches of the mandibular division of the trigeminal nerve (V3). These branches carry mixed innervation to the temporalis and masseter muscles and traverse the infratemporal fossa near one another before they diverge superiorly and inferiorly to respectively innervate their target muscles. The TMNB, first introduced in 2014 and subsequently refined, is a regional nerve block technique that delivers local anesthetic in proximity to these branches before they diverge.[1,2] Emerging evidence supports comparable efficacy of the TMNB to trigger point injections for alleviating pain associated with chronic myofascial pain of temporalis and masseteric origin.[3,4]

Early data has also emerged that support the analgesic potential of the TMNB in alleviating pain and trismus secondary to dental extractions. Using a series of cases, we document the ability of the TMNB to alleviate acute postextraction myogenous pain of masseteric/temporalis origin. If validated, the TMNB may provide an alternative opioid-free analgesic strategy for managing postextraction pain.

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Address correspondence to Gayathri Subramanian, BDS, PhD, DMD, D867, Rutgers School of Dental Medicine, 110 Bergen Street, Newark, NJ 07103; subramga@sdm.rutgers.edu.

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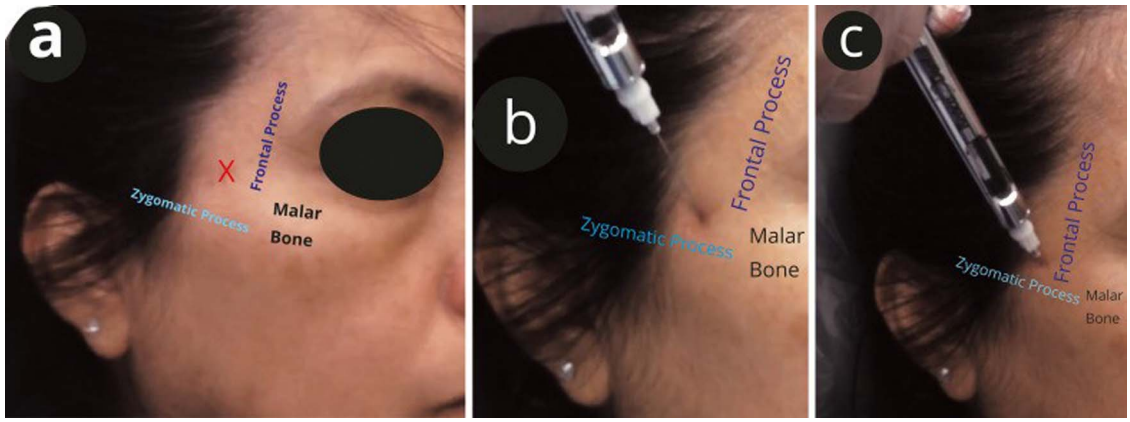
CASE PRESENTATIONS

This case series consists of 4 case reports describing the ability of the TMNB to alleviate acute postoperative pain following dental extractions. Details are compiled into a case series and presented accordingly. Institutional review board (IRB) approval was obtained to publish the findings of this case series (IRB #Pro20170000938).

Injection Technique

The TMNB (formerly known as the "Twin Block"[2]) was administered in the following manner. The patient was seated in the dental chair in a near-upright position. The skin overlying the temporal fossa above the zygomatic arch and directly behind the frontal process of the zygomatic bone was disinfected with an alcohol wipe on the side of the injection. The surface landmark (directly above the superior border of the zygomatic arch and ~1 cm posterior to the posterior border of the frontal process of the zygomatic bone) was palpated, serving as the

Figure 1. Patient Positioning and the TMNB Entry Point and Direction



(a) Target site for the TMNB injection. The puncture point (X) is 1 cm above the zygomatic arch and 1 cm behind the frontal process of the orbit. (b) Orientation of the needle. The needle is 35–45° away from the temporal bone and 90° to the zygomatic arch. (c) Full insertion of the needle. (Reproduced from original publication by same authors in the journal Anesthesia Progress).[2]

needle entry point. The dental syringe with a 27- or 25-gauge long (32 mm) dental needle was loaded with 1.8 mL of 2% lidocaine with 1:100,000 epinephrine. It was then inserted along the coronal plane at the point of entry (surface landmark) at an angle of 35° to 45° medially and advanced to the full length of the needle before delivering the local anesthetic (total dose, 36 mg of lidocaine and 18 mcg of epinephrine; Figures 1 and 2).

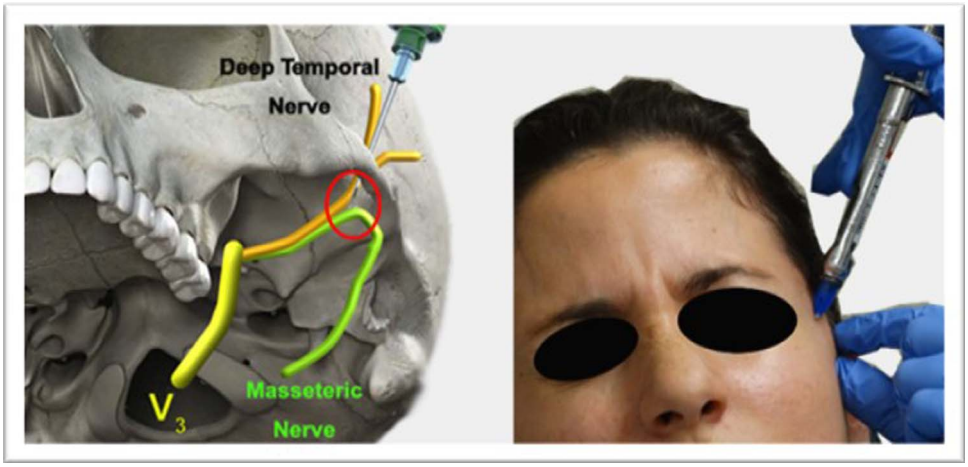
Palpation of Masticatory Muscles

Firm finger palpation over the anterior, middle, and posterior temporalis (ie, over the temporal fossa) and the superficial and deep masseter was used to elicit signs of muscle tenderness. Finger palpation of each muscle's respective tendinous insertions down the coronoid process/along the anterior border of the mandibular ramus and at/anterior to the angle of the mandible was also used. Palpation of the lateral and medial pterygoid muscles was not performed, especially given the risk of traumatizing recent extraction sites. Muscle palpation was performed as described, both before and 10 to 15 minutes after administration of the TMNB, consistent with the expected onset of local anesthetic action.

Case Series

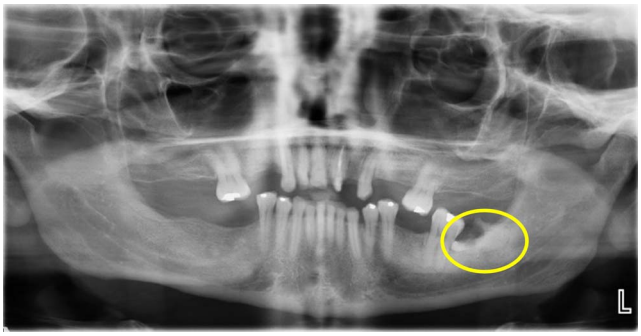
Case 1. A 45-year-old female patient with a past medical history of diabetes mellitus type I managed with insulin with suboptimal glycemic control (HbA1c = 9), asymptomatic HIV infection, and coronary artery disease presented with the

Figure 2. Targets of the TMNB



The TMNB targets the temporalis and masseteric branches of the mandibular nerve (V3) as they diverge to innervate these muscles.[1]

Figure 3. Preoperative Panoramic Radiograph for Case 1



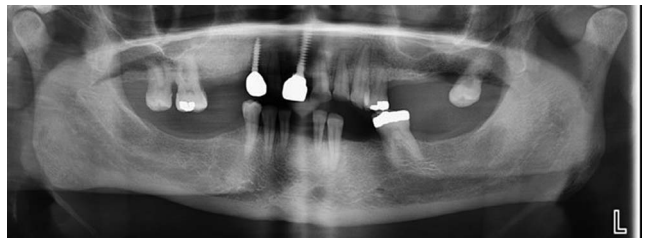
The yellow oval indicates the left mandibular third molar (#17) planned for extraction.

chief complaint of "I have pain near my lower left gums." A focused evaluation revealed the presence of a horizontally impacted and grossly carious mandibular left third molar (ie, tooth #17) with acute pericoronitis (Figure 3). No acute pericoronal abscess was noted. Subsequently, the patient underwent surgical extraction of the tooth with no complications. The patient was advised to take a combination of ibuprofen and acetaminophen for postoperative pain. However, the patient returned to clinic 3 days later (after the weekend) for an emergency evaluation with the complaint "my jaw hurts after extraction, so bad." She reported that her pain started the day following the extraction and that it did not seem to respond to the recommended analgesics.

Extraoral palpation tenderness was elicited over the temporalis and deep masseter on the left side in addition to tenderness at the surgical site. The patient had significant trismus, with a maximum mouth opening approximating 2 cm that was limited by pain. The surgical site did not demonstrate overt signs of infection. A periapical radiograph of the extraction socket was obtained with significant difficulty, confirming the absence of any residual root tissue. A diagnosis of acute postextraction myogenous pain of the temporalis and masseter was made. A single TMNB was administered on the left as previously described. The patient felt immediate pain relief, and her mouth opening increased to more than 30 mm. Homecare instructions were provided, and the patient was dismissed. She later resumed comprehensive dental care at our clinic and did not report any recurrence of the masticatory myalgia or trismus.

Case 2. A 50-year-old male patient with a recent diagnosis of stage 4 tonsillar cancer presented for dental evaluation and clearance prior to starting radiation treatments. All his teeth were deemed unrestorable secondary to caries, and he underwent a full mouth extraction of roughly 22 teeth performed in a single visit in the operating room under general anesthesia with local anesthesia administered intraoperatively for extraction pain. Following demonstration of adequate recovery from general anesthesia and sufficient pain control in the postanesthesia care unit (PACU), the patient was discharged home the same evening with instructions to take a combination of ibuprofen and acetaminophen for postoperative pain control. On postoperative day 3, he presented with significant trismus and soreness on the sides of his face. A panoramic radiograph was obtained at that time but was unremarkable. The patient's clinical exam was consistent with bilateral acute myogenous pain of the temporalis and deep masseter muscles and lacked any signs of acute infection. He received bilateral TMNBs which alleviated his pain and trismus. The patient went on to complete his radiation treatment as planned and eventually returned to our dental clinic for fabrication of complete dentures.

Figure 4. Preoperative Panoramic Radiograph for Case 3



The patient underwent extraction of remaining teeth and failed implants.

Case 3. A 51-year-old female patient with a past medical history of diabetes mellitus type II and hypertension presented with the chief complaint of "I need dentures." Her dental evaluation revealed partial edentulism, 2 failed maxillary implants, collapsed vertical dimension, and supra-eruption of the unopposed dentition (Figure 4). After consideration of all treatment options, the patient opted for extraction of her remaining teeth under general anesthesia with local anesthesia intraoperatively for extraction pain control. Following demonstration of adequate recovery from general anesthesia and appropriate pain control in the PACU, the patient was discharged home the same evening. At the postoperative visit 3 days later, she reported severe pain on both sides of her face that limited her mouth opening. Clinical evaluation demonstrated appropriate wound healing commensurate with the postoperative period and the presence of bilateral acute myogenous pain of temporalis and masseteric origin. Bilateral TMNBs were administered which promptly alleviated her pain and eased her trismus.

Case 4. A 54-year-old male patient with an unremarkable past medical history underwent extractions of the right maxillary first and second molars and mandibular first molar (ie, teeth #1, 31, and 32) at a private dental office. Four days later, he presented to the University Hospital Emergency Room in Newark, NJ, with complaints of severe pain on the right side of his face and considerable trismus that had failed to respond to pain medications per the patient. A focused evaluation demonstrated acceptable healing of the extraction sites with

no signs of any acute infection or undue inflammation. The temporalis and masseter muscles on the right were very tender to palpation (10/10 pain using the Numerical Pain Rating Scale). No panoramic or other intraoral radiographs were feasible in emergency room setting. The patient received a single TMNB on the right which resulted in considerable pain relief and alleviated his trismus.

DISCUSSION

The forceful luxation of teeth can precipitate acute muscle pain postoperatively. The mandible is routinely passively propped open on the contralateral side typically using a mouth prop during dental extractions. Protracted mouth opening during the procedure can precipitate muscle soreness due to excessive or unaccustomed eccentric muscle contractions while manipulating the mandible during extractions.[5–7] This can further be compounded by instructing the patient to bite down on the mouth prop while luxating or elevating a tooth in an attempt to stabilize the jaw against the extraneous forces, particularly during mandibular extractions. Such injury can be further exacerbated by reduced conscious control of muscle movement due to sedation, as in the case of extractions performed under sedation or general anesthesia. Furthermore, compromised access, the propensity for impaction, and the increased likelihood for third molars to be extracted under sedation or general anesthesia may all further compound the risk for stretch injury to the masticatory muscles, such as the temporalis and masseter, following such extraction procedures.

Increased pain following extraction(s) has been shown to correlate with subsequent trismus. This suggests that myogenous pain from the masseter/temporalis likely contributes to the severe pain observed postoperatively in at least some patients who underwent extractions.[8] Hence, there is potential for the TMNB to augment postextraction pain control.

Postoperative pain after dental extractions is commonly attributed solely to surgical site injury or inflammation and overlooks the need to rule out acute masticatory myalgia or muscle spasm as a potential source of pain or impairment. Hence, clinicians often infiltrate a long-acting local anesthetic like plain or liposomal bupivacaine near the surgical site(s) following the procedure, sometimes resulting in suboptimal pain control despite the use of oral analgesics.[9–13]

Evaluation of the masticatory muscles is often deferred to orofacial pain specialists due to their expertise in the diagnosis of temporomandibular disorders. The temporalis and masseter muscles lend themselves to easier evaluation because of their easy accessibility compared to the pterygoid muscles. Careful palpation can delineate pain originating from tenderness in these muscles as opposed to pain emanating from the surgical site(s).

The TMNB has emerged as a novel and practical tool in the diagnosis and management of myogenous pain of masseteric and/or temporalis origin.[14,15] It was originally intended for use primarily as a chairside diagnostic tool to delineate nonodontogenic pain from odontogenic pain. It was serendipitously observed to provide analgesia that lasted beyond the duration of action of the local anesthetic.[3] It is speculated that such prolonged pain relief may stem from the fact that this nerve block targets mixed innervation and hence has motor and sensory blockade effects, somehow "resetting" the muscle tone and relieving pain beyond the sensory blockade-related "numbness."

For the first time, we document the ability of the TMNB to alleviate acute myogenous postextraction pain of temporalis/masseteric origin. This suggests that acute postoperative myogenous masticatory pain can be encountered in patients who underwent dental extractions and is potentially treatable with TMNB(s). Further assessment with a prospective study is indicated to determine how common this phenomenon is following dental extractions.

The literature corroborates that the use of nonsteroidal anti-inflammatory drugs (NSAIDs) and muscle relaxants provide complementary analgesia for acute myalgia, consistent with the premise of the TMNB to support pain relief attained from conventional pain management following extractions.[16,17] If validated, the TMNB may help mitigate the need to resort to opioids as a rescue medication for recalcitrant pain following dental extractions, third molars in particular. In the United States, over 3.5 million predominantly young and healthy individuals annually undergo outpatient third molar extractions, with almost 65% of patients being prescribed 20 postoperative opioid pills.[18–22]

Safety and Effectiveness

Originally named the "twin block," the name for this regional nerve block (ie, the TMNB) was revised for 2 reasons. The first was to specifically identify the nerves being targeted with this injection, namely the deep temporal and masseteric branches of V3, that innervate the temporalis and masseter muscles.[1] The second was to minimize confusion due to sharing its name with a well-known removable orthodontic appliance.[23]

In clinical use for over 7 years since its introduction,[1] the TMNB has been well received and tolerated by patients. In a recently concluded institutional retrospective review of over 186 instances delivering the TMNB, transient adverse reactions were documented in only 4 cases (manuscript accepted for publication). These complications included 2 instances of orbicularis oculi weakening, 1 instance of a transient burning sensation at the injection site, and 1 instance of perceived eyelid "heaviness" in the absence of any visible sign of palsy or weakness of the palpebral musculature. The

temporal branches of the facial nerve traverse the temporal fossa superficially along a diagonal direction, approximately 1 cm posterior and superior to the injection site. Bearing this anatomy in mind while carefully identifying the site of the TMNB point of entry will help minimize the risk of this adverse event.[2]

In terms of effectiveness, pain alleviation 10 to 15 minutes following TMNB(s) was noted with a mean reduction of pain scores by over 70% (available in 52 such instances) and an improvement in qualitative pain descriptors (available in 66 such instances; manuscript accepted for publication).

Interestingly, pain relief for chronic masticatory muscle pain of masseter/temporalis origin that followed the administration of the TMNB seemed to last for several weeks, well beyond the expected duration of action of the administered local anesthetic.[3,4] The mechanism of action responsible for this sustained analgesia, noted to be comparable to that following trigger point injections, is currently being investigated. It is speculated that the TMNB targets mixed nerves, and somehow enables a "reset" of any aberrant motor muscle activity that may underlie myofascial pain and that the resulting analgesia lasts until the original etiological factor(s) reestablish myofascial pain. It is unclear whether a similar mechanism may be at play for acute masticatory myalgia relieved using the TMNB as described in this case series.

CONCLUSION

This case series underscores the need to ascertain the role masticatory myalgia plays in acute postextraction pain and trismus and to assess the ability of the TMNB to alleviate such pain. The TMNB can potentially serve as a valuable nonopioid adjunct to manage acute postextraction pain. It may be important to delineate acute myogenous postextraction pain from surgical site pain to optimize postoperative pain management and best alleviate trismus induced by masticatory myalgia/spasm. A systematic validation of the utility of the TMNB in postextraction pain management is warranted.

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