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International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Lingual Nerve Injury During Mandibular Third Molar Extraction: A Review

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DOI: https://doi.org/10.55248/gengpi.4.1223.123321

ABSTRACT

The potential occurrence of lingual nerve injury represents a surgical risk associated with the removal of mandibular wisdom teeth. This compilation of studies and discussions provides a comprehensive exploration of lingual nerve injuries associated with mandibular third molar surgery. Various factors influencing the incidence, management, and outcomes of lingual nerve damage are scrutinized. The studies highlight the diverse range of complications, from temporary paresthesia to permanent deficits, emphasizing the need for vigilance in surgical approaches. Factors such as tooth impaction, surgeon experience, anatomical variations, and surgical techniques significantly contribute to lingual nerve injuries. This review article aims to provide a comprehensive overview of the current literature on lingual nerve injuries, focusing on their etiology, risk factors, clinical presentation, diagnosis, management, and prevention strategies.

Keywords: Lingual nerve injury, mandibular third molar surgery, paresthesia, surgical techniques, anatomical variations

INTRODUCTION

Mandibular third molar extraction, a commonly performed oral surgical procedure, is not without its challenges, and lingual nerve injury stands out as a notable complication associated with this routine intervention. The lingual nerve, a branch of the mandibular division of the trigeminal nerve, innervates the anterior two-thirds of the tongue and plays a crucial role in taste perception and oral sensation.[1] The lingual nerve, responsible for the sensory functions of the anterior two-thirds of the tongue and a portion of gustatory stimuli, follows a distinct anatomical course. Originating within the mobile part of the tongue, it traverses the buccal floor in a sub-mucosal position, running above the mylohyoid muscle in the sub-mandibular space.[2] Notably, the lingual nerve intersects with the canal of the sub-mandibular gland in this space before entering the pterygoid space. Significantly, its proximity to the mandibular third molar socket is a critical consideration, with findings indicating its presence at the crestal level of the third molar in 8% to 17% of cases.[3] Among nerve injuries associated with surgical practices, injuries to the branches of the mandibular nerve are the most frequently reported. Lingual nerve lesions, in particular, are a well-recognized and feared complication arising from mandibular wisdom teeth extraction procedures, occurring in approximately 0.5% to 8.9% of cases according to various authors.[4] Mandibular wisdom teeth extraction is identified as the primary cause of lingual nerve injury. In instances where a direct nerve section is observed during the procedure, prompt nerve suture is recommended. However, more commonly, the awareness of nerve injury occurs during the postoperative review, whether the procedure is conducted under local or general anesthesia. Some authors advocate for early intervention in nerve repair after a monitoring period. In cases where early repair is deemed necessary, the initial operative challenge lies in locating and addressing nerve fragments. It is noteworthy that most nerve suture procedures are performed under general anesthesia, typically at least three months after the tooth extraction. Despite advancements in surgical techniques and increased awareness of anatomical considerations, lingual nerve injuries continue to be a significant concern, causing sensory disturbances that can have a lasting impact on a patient's quality of life.[5] This review aims to provide a comprehensive examination of the current state of knowledge surrounding lingual nerve injuries during mandibular third molar extraction.

ANATOMY

The lingual nerve (LN) encompasses various nerve fiber types, serving mechanosensitive, thermosensitive, and nociceptive afferents, along with sympathetic vasodilator efferents, supplying the anterior two-thirds of the tongue.[6] Additionally, it interacts with the chorda tympani branch of the facial nerve and lingual fibers of the glossopharyngeal nerve, exhibiting anastomoses with the hypoglossal nerve in the body of the tongue. The LN's course begins laterally to the medial pterygoid muscle, joined by the chorda tympani, proceeding down to lie closely along the medial surface of the mandibular ramus. Variations in its path are common, impacting local anesthesia and surgical procedures like third molar (3M) surgery. Cadaveric and clinical studies confirm the variability in LN position, with distances from the mandibular crest showing significant variability. The LN may be in direct contact with the lingual plate of the third molar socket, ranging from 0% to 62%. Importantly, the contralateral LN's position is unpredictable, emphasizing the challenges

of anticipating its location during surgical interventions, even with standard approaches. This variability underscores the difficulty in avoiding LN encounters during 3M surgery, despite adherence to established medical and dental care standards.[7]

INCIDENCE AND MANAGEMENT

When the lingual nerve is knowingly severed during wisdom tooth removal, immediate repair using epineurial sutures is recommended, although practical constraints may limit this option, warranting prompt referral to an experienced maxillofacial surgeon. In most cases, the injury becomes apparent post-operatively. During early review, the presence of some sensation upon tongue stimulation suggests partial nerve integrity, requiring sensory monitoring without immediate treatment. Complete anesthesia, resulting from crush or section injuries, doesn't initially warrant surgical intervention. However, if progressive sensory recovery is absent by 3–4 months post-injury, surgical exploration at a maxillofacial unit is indicated. Surgical findings may reveal an intact yet constricted nerve, allowing for external neurolysis and wound closure, albeit an uncommon scenario.[8] More frequently, nerve division is observed, potentially with neuroma development, necessitating excision of the neuroma and damaged nerve segment. Epineurial sutures (8/0 or 9/0) are then employed for nerve repair without requiring grafts for segments of 10–15 mm. Surgical outcomes vary, with some patients experiencing substantial sensory improvement. Studies suggest a success rate of 80%, supporting the consideration of surgery for patients with limited signs of spontaneous recovery from lingual nerve injuries. The literature reveals a wide-ranging reported incidence of lingual nerve (LN) temporary deficit following third molar (3M) surgery, spanning from 0% to 23%, with the reported percentage of permanent LN sensorial disturbances varying between 0% and 8%. There is a lack of consensus regarding the management of postoperative lingual nerve deficit and the optimal timing for potential microneurosurgical repair. Monitoring and observation of postoperative nerve function over time are recommended, especially when a patient reports improving sensation or an acceptable sensory deficit. Microneurosurgical repair becomes a consideration when a permanent deficit is confirmed, categorized as a Sunderland grade 4 or 5 lesion.[9] However, due to a current lack of definitive evidence, the decision to observe without intervention is considered as valid as the decision to operate. Indications for microneurosurgical repair include complete anesthesia beyond 3 months, profound hypoesthesia with no improvement beyond 4 months, dysesthesia beyond 4 months, and clinically observed nerve severance. Reconstruction is contraindicated in the presence of improving sensation, an acceptable sensory deficit for the patient, central neuropathic pain, unresolved dysesthesia despite local anesthesia nerve block, medical neuropathy, a medically compromised patient, or excessive delay following injury. The choice of reconstruction technique and materials remains controversial, encompassing autogenous nerve grafts, autogenous vein grafts, skeletal muscle interpositional grafts, and various nerve conduits and cuffs. Surgical intervention may be indicated for dysesthesia, and pharmacologic approaches, such as tricyclic antidepressants and carbamazepine, can offer partial relief, despite potential side effects.[10]

DISCUSSION

In a study led by Itaru Tojyo, the investigation aimed to discern the etiology and assess the risk of severe iatrogenic lingual nerve injuries during mandibular third molar extraction through the analysis of clinical data.[3] Conducting a retrospective chart review of patients who underwent microsurgical repair for lingual nerve injuries, the study analyzed various factors, including patient demographics, nerve injury side, and the type of impaction based on Winter's classification and Pell and Gregory's classification. The lingual nerve injury group, consisting of 24 males and 58 females, exhibited a significantly higher rate of injuries in female patients compared to the control groups. Additionally, the study identified distoangular impaction, particularly in females aged 30s, 40s, and 50s, as a notable risk factor for severe lingual nerve injury during mandibular third molar removal. A study led by Ana Cláudia Amorim Gomes found that lingual nerve damage was present in 9.1% of cases where lingual flap retraction was performed during mandibular third molar surgery in the experimental group. In contrast, no lingual nerve damage was observed in the control group.[7] The study concluded that lingual nerve retraction posed a risk factor for temporary lingual nerve damage in the context of mandibular third molar surgery. Juodzbalys et al. highlighted in their research that the incidence of lingual nerve injury was most pronounced in cases involving distally impacted lower wisdom teeth (4.0%,), followed by horizontal impaction (2.8%), mesial impaction (2.4%), and vertical impaction (1.9%) .[4] In contrast, Jerjes et al. found a significantly higher prevalence of permanent lingual nerve paresthesia in patients with horizontally impacted third molars (6.3%). Other identified risk factors for lingual nerve injury included male patients, close radiographic proximity to the inferior alveolar canal, and treatment performed by trainee surgeons .[5] In a study led by Eduard Valmaseda-Castellón, it was found that among the extractions performed, 2.0% resulted in temporary nerve damage, with no lesions lasting beyond 13 weeks. The risk of nerve damage was significantly increased by factors such as lingual flap retraction, vertical sectioning of the tooth, surgeon inexperience, lingual angulation of the tooth, and prolonged operating time .[11]The study incorporated these factors into a predictive logistic regression model. The conclusions highlight that anatomical factors like lingual angulation of the third molar, specific surgical maneuvers such as lingual flap retraction or vertical tooth sectioning, and surgeon inexperience contribute to an elevated risk of lingual nerve damage.[12] However, it was observed that permanent lesions appeared to be very rare in the context of these risk factors. The incidence of lingual nerve damage following third molar removal has led to confusion in dental literature regarding its true frequency and preventive measures. Published studies, predominantly retrospective and involving large patient cohorts, lack randomized clinical trials and significant associations between lingual nerve damage and certain risk factors remain challenging to establish. While some studies suggest an increase in lingual nerve damage with age, no consistent correlation with preoperative patient characteristics has been identified. Lingual angulation of the third molar emerged as a notable risk factor, likely due to manipulation of the lingual flap during surgery. Distoangular impaction was not associated with lingual nerve damage in the discussed study.[13] In a study conducted by Jeevan Lata involving 90 patients, six individuals were diagnosed with lingual nerve paraesthesia, resulting in an overall incidence rate of 6.6%.[14] The research concluded that lingual nerve paraesthesia may manifest irrespective of whether the lingual flap is reflected or not, despite efforts to protect it during surgical procedures. The occurrence of lingual nerve paraesthesia was attributed to anatomical variations in the lingual nerve.[15] Contrary to expectations, the depth of impaction did not clearly

correlate with lingual nerve damage. Anesthesia, whether general or local, was not a primary cause of lingual nerve injury. However, the surgical technique played a pivotal role, with the buccal approach in this study and the lingual split technique in the UK both having implications.[15] Lingual flap retraction was considered protective by some, but recent studies questioned its efficacy, and avoiding retraction was associated with lower lingual nerve injury rates. Ostectomy and tooth sectioning during surgery significantly increased the risk of lingual nerve damage. [16] Surgeon inexperience was identified as a risk factor, with less experienced operators causing more lesions. Notably, differences in lingual nerve damage rates were observed among surgeons, emphasizing the influence of surgical technique.[17] The study introduced a predictive model to assess the risk of lingual nerve damage based on preoperative factors, although further validation is necessary. All observed nerve injuries were reversible, classified as first-degree or second-degree injuries according to Sunderland's classification, and as low-severity axonotmesis or neurapraxia according to Seddon's classification.[18] In conclusion, the study highlighted the multifaceted nature of lingual nerve damage, underscoring the significance of surgical technique, surgeon experience, and specific anatomical factors in determining the risk and outcomes of this complication.

PREVENTIVE STATERGIES

Preventing lingual nerve injury during mandibular third molar extraction necessitates a comprehensive approach. A thorough preoperative assessment, including a detailed examination of patient history and advanced imaging studies like cone-beam computed tomography (CBCT), lays the foundation for a tailored surgical plan.[19] Surgeons must possess a nuanced understanding of the anatomical variations in the mandibular third molar region, particularly the course of the lingual nerve. Skillful surgical techniques, characterized by gentle tissue handling and precise maneuvers, are crucial in minimizing the risk of trauma.[20] The implementation of protective measures, such as retractors and barriers, shields the lingual nerve during extraction. Caution against excessive force, especially with impacted molars, and continuous communication with the patient during the procedure contribute to early detection of potential nerve injury. Postoperative monitoring and regular follow-ups enable the assessment of neurosensory function, allowing for timely intervention if lingual nerve injury occurs. Ongoing professional training ensures oral surgeons stay informed about the latest techniques and best practices, reinforcing a commitment to patient safety and optimal treatment outcomes.[21]

CONCLUSION

Recognizing the importance of promptly restoring nerve continuity for optimal recovery of lingual sensitivity is acknowledged. In instances of direct nerve transection, swift and specialized management appears crucial in minimizing the potential consequences associated with this unintentional occurrence. While not all surgeons conducting third molar avulsions possess the technical capabilities and expertise for microsurgical sutures, the application of a suture on the accessible nerve endings using the finest thread could potentially facilitate subsequent reconnection, even under local anesthesia. It is imperative to give due consideration to lingual nerve injury as a significant complication of mandibular wisdom tooth removal when assessing the appropriateness of the procedure. In conclusion, this comprehensive review provides valuable insights into lingual nerve injuries during mandibular third molar extraction. By understanding the complexities surrounding this complication, clinicians can improve patient outcomes and contribute to the ongoing advancements in oral surgery practice.

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