Case Report

Mental Nerve Neuropathy Following Dental Extraction

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Mental nerve neuropathy (MNN), colloquially referred to as numb chin syndrome, is an uncommon neurologic condition that may arise secondary to multiple local and systemic etiologies, and may mimic other pain conditions affecting the mandible. Early recognition of mental nerve neuropathy in conjunction with accurate etiologic identification is crucial, as early pain management may prevent the transition from an acute to a chronic pain condition.

In this article, we will describe the clinical courses of 2 patients who presented to the pain clinic with chronic painful numbness in the mental nerve sensory distribution following dental extraction. After a period of failed conservative medical management and repetitive successful nerve blocks at the mental foramen, we decided to proceed with radiofrequency nerve ablation. In both cases, performance of radiofrequency nerve ablation demonstrated a significant decrease in pain.

Within interventional pain medicine, nerve blocks are often utilized to assist with pain generator identification, and resultantly also play an integral role in treatment planning. For instance, nerve blocks are often utilized to establish accurate identification of nerve tissue viability, a preliminary role essential for the determination of whether to proceed with an ablative peripheral nerve procedure. In this article, we will additionally review these important usages of nerve blocks within interventional pain medicine.

The objective of our article is to help clinicians identify and properly manage early stage mental nerve neuropathy. Moreover, we aim to advance general medical knowledge of this important pain medicine topic. During the process of preparing this article we reviewed all existing pertinent medical literature related to MNN.

Key words: Mental nerve, neuropathy, radiofrequency, nerve ablation, chronic pain

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The cutaneous nerve supply of the facial region is largely contributed to by the supraorbital, infraorbital, and mental nerves. These nerves exit their respective foramina to innervate the skin of the face and may be injured during various surgical and anesthetic procedures or by a number of different benign or malignant pathologies (Table 1).

The mental nerve, a terminal branch of the inferior alveolar nerve, is a pure sensory nerve which exits the mandibular canal through the mental foramen. It divides into many branches and supplies the skin of the chin and lower lip, as well as the mucous membranes on the buccal surface of the lower lip (Figs. 1, 2).

The position of the mental foramina in relation to the mandibular teeth varies. Most authors agree that it can be found inferior to the first premolar, between the first and second premolar, inferior to the second premolar, between the second premolar and

Table 1. *Causes of mental nerve neuropathy reported in the literature (References 2-4,6-8,10-13, 15).*

Benign mental nerve neuropathy	Malignancies and MNN
Iatrogenic / repetitive mandibular nerve block	Leukemias – AML, ALL, CLL
Dental disease/ Dental extraction	Hodgkin's Lymphoma, Lymphosarcoma
Cysts	Breast cancer
Trauma	Hypernephroma
Mandibular atrophy	Prostate cancer
Temporomandibular disorders	Colorectal cancer
Neurological disorders	Lung cancer
Diabetes	Melanoma
Sarcoidosis	Ovarian cancer
Amyloidosis	Nasopharyngeal cancer
Sickle cell anemia	Sarcoma
Neuritis	Reticulum cell sarcoma
Herpes zoster neuropathy	Squamous cell carcinoma (SCC) of the esophagus

Fig. 1. *Marked area shows mental nerve skin dermatomal sensory distribution.*

Fig. 2. *Mental nerve exposure, exiting from mental foramen marked by tip of the scalpel (picture taken by Foad Elahi MD, from University of Iowa Pain Center Cadaver Study, January 2013).*

the first molar, or inferior to the first molar (1-3).

Mental foramina were found on average to be 25.8 mm lateral to the midline and about 13 mm superior to the inferior mandibular margin (4).

The distances of the foramina from the midline were similar on both sides, demonstrating facial symmetry. In about 80% of skulls, the supraorbital, infraorbital, and mental foramina were along the same vertical line. These measurements may be of value to clinicians in localizing and safeguarding these nerves, in addition to providing effective nerve blockade. It is more practical to consider that both the infraorbital and mental foramina are most often on a vertical line with the second premolar. Reliance upon surface anatomy alone may be considered sufficient guidance for the performance of mental nerve blockade; however, an essential step for performance of radiofrequency ablation of the mental nerve involves identification of the mental foramen by fluoroscopic imaging to confirm correct placement of the radiofrequency electrode.

Charles Bell is often credited as the first to have described mental nerve neuropathy (MNN) in 1830, in an elderly woman with breast cancer. Since then, several isolated case reports and a few retrospective case series have also been published. MNN is caused by dysfunction of the terminal sensory branch of the mandibular division of the trigeminal nerve. The clinical presentation classically consists of tolerable numbness around the chin and lower lip that may be associated with significant neuropathic pain. Maxillofacial literature attributes the etiology of MNN as mostly related to the compression of the mental or inferior alveolar nerve from a lesion present in the mandible or skull (5,6).

Distinguishing between true MNN corresponding to the territory of the mental nerve, and more extended lesions involving the teeth, gums, and the posterior half of the mandible corresponding to the territory of the inferior alveolar nerve, is challenging and not always possible.

Obtaining a thorough history and performing a detailed physical examination is imperative for accurate diagnosis. In patients with symptoms suggestive of MNN, imaging with a mandibular x-ray or panoramic films may be diagnostic. Moreover, a panoramic view is of significant value as a screening method because it has tomographic effects and visualizes the entire mandible, both temporal–mandibular joints, and maxillary sinuses all on one film, allowing for a more reliable comparison of anatomic structures. However, many maxillofacial surgeons prefer the more comprehensive radiographs found in a standard mandibular series, consisting of right and left lateral oblique, posterior-anterior (PA), reverse Towne's, and submental vertex views. In patients with no identifiable cause or with the possibility of cancer, radiographic evaluation should include a computed tomography (CT) scan of the mandible, basal skull, head, and neck, if possible. A particular advantage of CT technology is that it provides images of thin sections of both hard and soft tissues without superimposition. Other modalities like magnetic resonance imaging (MRI), including brain and posterior fossa MRI, or MR neurography can be considered in order to rule out the possibility of vascular compression or localized neuritis.

A detailed patient history and clinical examination has, thus far, been the only established method of diagnosing nerve lesions.

Below we will present and chronicle the management of 2 unique cases of MNN that developed subsequent to dental extraction.

Case 1

A 64-year-old woman underwent a right second molar tooth extraction in April of 2011 with subsequent development of insidious pain and numbness around the right chin and right lower lip the day following the procedure. Multiple dental visits ensued, with no sign of remnant or infection clinically. Several recommendations were given, including non-steroidal anti-inflammatory medication, and short-acting opioid medications, neither of which provided her any pain relief. In June of 2011 she had a CT scan done that was reported as suspicious for a right masticator space infection. Due to persistent pain and the possibility of infection, she was empirically prescribed a course of antibiotic therapy with no resultant pain relief.

After a year of persistent pain and unpleasant numbness, the patient was finally referred to the pain clinic. She reported her pain as located along the right side of the chin and lower lips, associated with numbness, tingling, and at times, constant burning pain with intensity rated 10 on a numerical scale; mastication was reported to exacerbate the pain. Furthermore, unremitting pain contributed to disturbed sleep, which negatively impacted her quality of life. Treatment with indomethacin, hydrocodone, and acetaminophen provided partial pain alleviation; whereas treatment with gabapentin provided no pain alleviation – despite taking the maximum prescribed dose – while also being associated with unpleasant drowsiness, prompting her to cease its use.

On physical examination, significant tenderness to light touch and hyperalgesia to pinprick was noted in the area supplied by the mental nerve on the right side. No facial muscle weakness was evident. The remainder of the neurological examination was normal. A diagnosis of neuropathic pain due to mental nerve involvement was made and treatment options were discussed. A multimodal approach was initiated at the first visit with a combination of antiepileptic and antidepressant medications, topical Lidoderm cream, and instruction on desensitization techniques.

At initial follow-up, only a partial response to the suggested multimodal treatment strategy was reported. Consequently, a series of right mental nerve blocks were trialed as a diagnostic tool. After proper sterilization and prepping, a 25-gauge needle was placed in the right submental foramen — identified by its close relation to the second premolar — and one mL of 2% lidocaine was injected with near 100% pain reduction. A subsequent repeat confirmatory injection with one mL of 0.25% bupivacaine provided the same positive response.

In light of the patient's persistent, unbearable pain complaints — now scored as a 7 out of 10 on the numerical pain scale — and worsening quality of life, the decision to perform a trial right mental nerve radiofrequency ablation (RFA) at the mental foramen was undertaken. Under fluoroscopic and surface anatomy guidance, one mL of 1% lidocaine was used to anesthetize the skin in the region of the mental foramen. A 50 mm RFA needle with 4 mm active tip (Baylis Medical Co. Cooksville, ON, Canada) was then inserted into the region of the mental foramen, and RFA needle location was confirmed by a posterior-anterior-fluoroscopic view. Electrical stimulation at 50 hertz produced sensory stimulation at 0.2 volt, confirming accurate RFA needle tip localization at the mental foramen, while additionally serving to importantly confirm the presence of viable nerve tissue. Next, using a continuous radiofrequency current, the right mental nerve was ablated at 80 degrees Celsius for 90 seconds. The patient tolerated the procedure well without any noted complications.

Significant symptomatic improvement with an absence of pain, numbness, and tingling was reported at the initial follow-up post RFA treatment. Moreover, sensory examination of the right mental branch territory also showed marked objective improvement, with noticeably less tenderness and hyperalgesia to light touch and pinprick testing. These improvements were sustained for 6 months. At the 8 month follow-up, a modest yet tolerable complaint of right lower lip and chin numbness was reported. Overall, the patient was extremely satisfied with the near 100% pain relief and quality of life improvements resultant from treatment with RFA.

Case 2

An 80-year-old man was referred to the pain clinic with chronic, non-radiating, pain and numbness around the right chin and lower lip that began 1 — 2 weeks following a right third molar tooth extraction in July of 2010. The pain was characterized as burning and described as “like a cold sore.” Pain intensity was rated as 8 out of 10 on the numerical pain scale and persisted at this intensity since onset. Pain exacerbation was associated with consumption of hot and cold foods or drinks, while no particular jaw movement appeared to make the pain better or worse. Functionally, the pain was noted to interfere with the patient’s ability to shave. Past medical history was significant for multiple successful tooth extractions — the most recent of which was followed with the onset of the patient’s current pain presentation – and placement of maxillary partial dentures. The remainder of the patient’s past medical history was noncontributory.

Over the course of 2 years, the patient was treated by several specialists, including other pain physicians and neurologists. During that time period multiple medications were prescribed. Initially, topical capsaicin and Lidoderm creams were trialed and subsequently discontinued secondary to minimal to no pain relief. Most recently, Pregabalin and tramadol were begun with improvement in baseline pain intensity, documented by a decrease to 6 out of 10 on the numerical pain scale. Despite this modest pain alleviation, the patient remained extremely frustrated and continued to ask for better pain control.

On physical examination, initial inspection revealed markedly more facial hair on the right chin, consistent the patient’s purported difficulty shaving due to pain. Palpation of the right chin and lower lip, including their associated buccal mucosa and gingiva revealed tenderness to light touch without evidence of allodynia. No facial muscle weakness was evident. The remainder of the neurological examination was normal.

The history and physical examination findings were suggestive of right MNN, likely secondary to the patient’s previous dental extraction. A series of diagnostic right mental nerve blocks were subsequently performed to confirm the target pain generator. After proper sterilization and prepping, a 25-gauge needle was placed in the right submental foramen — identified by its close relation to the second premolar — and one mL of 2% lidocaine was injected with near 100% pain reduction. A subsequent repeat confirmatory injection with one mL of 0.25% bupivacaine provided the same positive response.

Considering the positive diagnostic nerve block responses, the decision was made to perform RFA of the right mental nerve using the same procedural protocol as in case one. The procedure was tolerated well without any noted complications. During follow-up assessments, the patient reported complete pain relief for 6 months duration, as well as a marked decrease in adjuvant pain medication usage. Overall, the patient was extremely satisfied with the pain relief and quality of life improvements resultant from treatment with RFA.

Discussion

In 1943, Sir Herbert Seddon (1903 – 1977) described 3 basic types of peripheral nerve injury: neurapraxia, axonotmesis, and neurotmesis. In 1951, Sunderland expanded Seddon’s classification to 5 degrees of peripheral nerve injury (7).

In these 2 cases, we described MNN following dental extraction. In both cases we observed a direct link between pain and the dental surgery.

The removal of the molar is a common procedure in dental or oral and maxillofacial surgery. The majority of patients shows no post-extraction complications and fully recovers after a brief healing process.

In a recent prospective study, 1.3% of the extractions caused temporary nerve damage; 25% of the lesions were permanent (8). The underlying cause is the close proximity of the root of the molar and the mandibular canal. Parts of the root often extend around the canal so that the inner contents of the canal can be damaged when the tooth is removed.

The pain relief with RFA has been attributed to the thermocoagulation of the nerve fibers. Histologically, radiofrequency lesions appear as a local tissue burn, with a destruction of the nerve architecture and a Wallerian degeneration. Pain recurrence after initial successful RF medial branch neurotomy is due to nerve regeneration. In this scenario we recommend repeating RFA.

Pain related problems after dental extraction account for up to 80% of visits to dentists. Early diagnosis and proper treatment is crucial to prevent transition to a chronic pain state. The transition from acute to chronic pain occurs in discrete pathophysiological steps involving multiple signaling pathways. The duration and intensity of the initial stimulus leads to both peripheral and central sensitization that synergistically exacerbates pain perception. A multimodal therapeutic approach is best suited to target the complex mechanisms leading to the transition from acute to chronic pain.

In contrary to peripheral nerve root avulsion in extremities, direct surgical nerve reconstructions for the alveolar nerve or mental nerve is not indicated.

In the 2 cases described above, during a dental extraction procedure, partial nerve damage occurred.

The traction injury may stay limited to the area or can be continued along the inferior alveolar nerve with limited or widespread longitudinal nerve damage.

Traction nerve injury clinically presents mainly with a localized neuropathic type of pain that will resolve with conventional pain medications, but it potentially may progress in the severity of pain over time in some patients. A detailed patient's history and clinical examination has thus far been the only established method of diagnosing nerve lesions.

Fortunately, medication prescribed by dentists commonly can resolve neuropathic pain issues. When results are unsatisfactory with conventional pain medications, then consultation with pain physicians plays a major role for pain management delineation. It will be crucial to consult pain physician in the early stage to prevent chronic pain conditions.

Pain physicians who treat chronic neuropathic pain usually initiate multimodality and multidisciplinary managements that includes antidepressant, antiepileptic antalgic medications with local desensitization methods along with utilizing biofeedback, coping, and other neuropsychological techniques. In addition they recommend procedures like nerve blocks, radiofrequency nerve ablation, or cryo-nerve ablation if the nerve responsible for transduction and transmission of pain is easily accessible.

Nerve ablation can be the modality of choice in addition to multimodality pain management for non-responding patients.

Partial nerve damage with clinically appreciated partial sensory loss on the mental nerve dermatome is a subject for peripheral nerve interventions as we described in the above 2 cases. Mental nerve neurotmesis can cause total sensory loss. In that scenario, an expected clinical picture can be an example of anesthesia dolorosa with painful total dermatomal sensory loss.

In addition to the clinical findings of partial sensory loss on the dermatome related to mental nerve distribution, we observed total pain relief after a nerve block.

Based on the above observations, we think that there were viable remaining nerves in the mental foramen. We can consider a significant decrease in the pain score after a nerve block with local anesthetic injection as an important diagnostic test in the process of identifying the proper nerve target for ablation. Our clinical observation concludes that the mental nerve was the best target for the nerve ablation. To our knowledge, this is the first report of successful radiofrequency application to the mental nerve in 2 different patients for the treatment of chronic neuropathic pain post dental extraction.

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Chronic pain management physicians and patients are always looking for long-term solutions rather than short-lived interventions. There are 3 main non-surgical modalities to ablate nervous system elements. These involve the use of extreme cold (cryoablation), high temperature radiofrequency, and chemical neurolysis. Due to easy accessibility of the mental foramen and close proximity of oral cavity, radiofrequency can be the modality of choice.

The extension of the longitudinal nerve defect may be an interesting subject for maxillofacial surgeons and nerve reconstruction surgery in the future. Advancement in radiological techniques like MR neurography electrophysiological tools to identify the nerve damage location is the subject for future investigations.

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