

Numb Chin Syndrome – A Dentist Perspective

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ABSTRACT

Mental nerve neuropathy or numb chin syndrome has been mentioned and talked about in the medical literature since ages and still has happened to receive little attention. It can present itself in varied forms and can be a small piece of a larger puzzle. As dentists and oral physicians it becomes our responsibility to take this entity more seriously and to never miss and/or ignore the history and symptoms of numbness, hypoesthesia or pain over the lower lip, chin and lower labial mucosal regions.

Keywords: neuropathy, numbness, paraesthesia

INTRODUCTION

Numb chin syndrome (NCS), also termed as mental neuropathy, is a sensory neuropathy characterized by numbness encompassing the distribution of the mental nerve and is an infrequent and often neglected manifestation of metastatic malignancy.¹ It was first described by Charles Bell in 1830 “the nervous system of the human body”, when a lady with breast cancer presented with numbness of one side of the lower lip. On investigating presence of a hard glandular mass on the jaw was seen, which was most likely pressing against the inferior alveolar nerve and causing the numbness.² The main features include numbness, hypoesthesia, paraesthesia, and also pain in the distribution of the mental nerve, though pain is a rare feature. The chin numbness may be caused by several dental, both odontogenic and non-odontogenic, factors but in absence of an obvious dental cause malignant insinuation of the inferior alveolar nerve sheath, nerve compression by jaw metastases, local tumor or intracranial involvement of the mandibular nerve at the level of base of skull by any lesion may be the culprit.^{3,4} Thus, it is an important clinical indicator and can be a tell-tale sign of a serious metastatic disease.

ANATOMY OF MENTAL NERVE

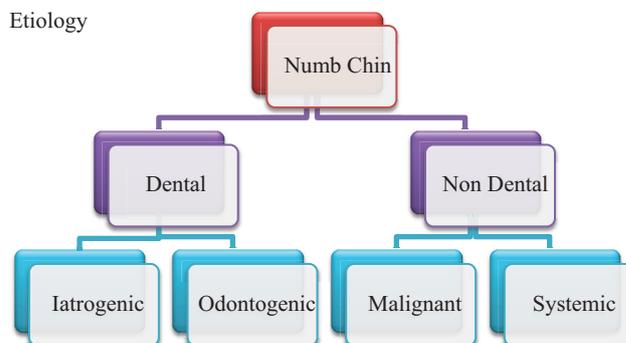
The mental nerve (MN) is one of the terminal branches of the inferior alveolar nerve. The mental foramen (MF) is incomplete until the twelfth week of gestation when the MN separates into several fasciculi at that site.⁵ The nerve then emerges from the mandibular bone at the MF and divides beneath the depressor angulioris muscle into three branches: one distributed to the skin of the chin, the other two to the skin and mucous membrane of the lower lip.⁶ MN usually divides into two branches, the inferior labial and the mental, the inferior labial branch runs toward the angular regions and sometimes divides into angular branches.⁷ According to a recent article MN is said to give four branches: the angular, medial inferior labial, lateral inferior labial, and mental.⁵ These nerve branches were classified into five types on the basis of their distribution patterns. Won et al. found that the inferior labial branches innervated most of the lower lip.⁵ According to a nomenclature by Alsaad et al. three branches of

the MN were identified as the vertical, the horizontal, and the oblique (Fig. 1).⁸ Accessory Mental Foramen may be defined as any foramen other than the mental foramen in the lateral body of mandible. According to literature the incidence of AMFs is 2.0–13.0%.⁴ In a recent study it was found that the mean area of the 15 AMFs studied was 1.7 mm² and that of the ipsilateral MFs was 7.5 mm², whereas the mean area of MFs without ipsilateral AMFs was 9.4 mm.^{3,9} The innervation patterns of AMNs can differ depending on how the locations of the MF and the AMF are related, because the fibers of the AMN supplement some areas where the MN is not distributed.⁷ Also a recent report described a case in which an AMF was detected on CBCT, but under gross anatomical observation no branch of the MN was detected, only an artery.¹⁰

Dental causes

Periapical infection before and after endodontic therapy resulting in mental and inferior alveolar nerve paraesthesia is well documented.^{11,12} Secondly, the role of pro-inflammatory cytokine interleukin-2 and tumor necrosis factor-alpha in painful neuropathies is well recorded, and paraesthesia is part of the spectrum of symptoms seen in such patients.¹³ The effect of altered microenvironment associated with infection in terms of decreased pH and elevated temperature can also sensitize the neurons.¹¹ This would illuminate the reported association of mental nerve paraesthesia with mandibular premolars and second molars, with one retrospective study reporting

Etiology



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Dental causes		Non Dental causes	
Iatrogenic	Odontogenic	Malignant	Systemic
<ul style="list-style-type: none"> • Facial trauma • Wisdom teeth extraction (0.68-4.4%) • Mechanical injury secondary to Endodontic treatment.Implants • Mandibular surgeries • Orthodontic treatment (due to excess pressure) • Flawed dentures (compressing mental foramen during mastication) 	<ul style="list-style-type: none"> • Periapical abscess • Osteomyelitis • Benign tumours 	<ul style="list-style-type: none"> • Head and neck cancer • Breast cancer • Haematological malignancies • Lung cancer • Renal tumours • Multiple myeloma • Melanoma • Gastrointestinal cancer 	<ul style="list-style-type: none"> • Diabetes mellitus • Amyloidosis • Aneurysms • Sickle cell anaemia • Vasculitis • Sarcoidosis • Syphilis • Demyelinating disorder

afrequency of 0.96% with mandibular premolars.¹¹ Further, the presence of lowdensity trabeculations in cancellous bone along with abundant bony vacuoles in molar region favor the dissemination of extruded irrigant and obturation materials towards the IAC.¹⁴ In this regard the small field view of cone beam computed tomography offers better sensitivity and specificity in detection of peri-radicular changes, root resorption, canal morphology and anatomical vicinity to the nerve bundle than orthodox radiography.^{15,16} Thermal injury to inferior alveolar nerve with overextension of thermo plasticized gutta percha and prospect of bone necrosis with escalation in root surface temperature has also been reported.¹¹ Nerve mutilation can also occur from physical trauma to a nerve during administration or from neurotoxicity of the anesthetic solutions. The incidence of paraesthesia following local anesthesia in dentistry is stated to be in a wide range of 1 in 27,000 to 1 in 785,000 with a reported recent increase in numbers.¹¹

Non Dental Causes

Unilateral nonpainful mental nerve numbness can be of viral origin. Such numbness is often prompt in onset and typically lasts for 6-8 weeks with full recovery. Varicella zoster infection presenting with unilateral paraesthesia, facial or dental pain alone without vesicular eruptions can be a diagnostic dilemma as the initial presentation is indicative of a dental disease.¹⁷ Pain if present, can be intense. Vesicular eruptions, which typically occur within a few days, help confirm the diagnosis, but these can be commonly delayed for some time. The possibility that numb - chin syndrome categorized by hypoesthesia or paraesthesia of the lower lip, chin and gingival mucosa might represent the initial manifestation of malignancy should always be considered.^{3,18} Mental paraesthesia which is increasing in intensity or distribution over time warrants cautious investigation. Hematological disorders, comprising of sickle cell anemia, thalassemia and megaloblastic anemia have been associated with mental nerve paraesthesia.¹⁹

Multiple sclerosis diabetic neuropathy, sarcoidosis, Sjogren's syndrome, trigeminal neuropathy, Lyme's disease and temporal arteritis can also manifest as numb chin syndrome.¹¹ Mental nerve neuropathy has also been reported to occur following hepatitis B vaccination.²⁰ Hyperparathyroidism may also be supplemented with paraesthesia but this is usually circum-oral in distribution, as is the case in hyperventilation syndrome and patients on the antiretroviral drug like, Ritonavir.¹¹

The use of metronidazole has also been implicated as a cause of unexplained neuropathy. The precise mechanism of toxicity is uncertain, however one hypothesis is that it is secondary to

metronidazole binding to ribonucleic acid and impeding protein synthesis.^{21,22}

'NCS is a potentially significant symptom because of its association with metastatic malignancies. Only about 1% of all tumors metastasize to the maxillofacial region where mandible is the most commonly affected bone. In adults, metastatic breast cancer (64%) and lymphoma (14%) account for most cases of NCS whereas acute lymphoblastic leukemia accounts for a substantial number of cases in children.²³

One large study of NCS in cancer patients reported metastasis in 64% of patients having breast cancer and 14% in lymphoma patients; 50% of patients with NCS had mandibular metastases and 36% had a tumor mass or leptomeningeal involvement in the area of the trigeminal nerve root.²⁴ Diagnosis of NCS precedes malignancy in up to 47% of cases.³ Numb chin syndrome in the milieu of metastatic disease is a serious diagnosis with a poor prognosis. Only 15% of patients having metastatic disease who present with NCS are found to survive more than nine months.²⁵ Few authors have suggested that due to the presence of rich red bone marrow posterior mandible is rendered more susceptible to tumour embolization.²⁶

Pathogenesis is hypothesized to be compression of the nerve through the infratemporal fossa and skull base or compression of the nerve root during its intracranial course by direct causes or secondarily through an increase in intracranial pressure. Alternatively selective demyelination of the nerve in MS can cause NCS as a sequestered neurological sign.²⁵

SIGNS AND SYMPTOMS

Mental nerve neuropathy which is an infrequently recognized neurologic symptom is characterised by hypoesthesia, paresthesia, very often 'dead or cardboard'-like skin, or thermo-algesic anaesthesia of the chin and the lower lip, restricted to the region functioned by the mental nerve.³

Usually unilateral numbness of the skin of the chin, the lip, and, occasionally, the gingiva, but 10% of cases with neoplasia cause bilateral involvement. Pain and swelling may be present in cases of locally vicious processes such as malignancy or infection. Percussion-induced pain, loosening of teeth, presence of sequestra and mobility of fractured segments are few added symptoms that can effect these patients, depending upon the etiology.²³ Hypoesthesia or anesthesia is usually present over the chin, lip, and gingiva, but motor function of the lower face is intact.²⁷

If metastatic malignancy is present, patients may demonstrate symptoms such as weight loss, fever, fatigue and pain in addition

to the symptoms and signs associated with the primary tumor. However, symptoms of NCS may precede any other symptoms of malignancy.

DIAGNOSIS

Clinical diagnosis is principally based on a detailed case history along with systematic systemic and local examination. An observant physician can elicit many important details from a carefully taken history. History of all the systems, general health of the patient, recent illness and weight loss can point towards a source of primary malignancy if at all present. Oral physician is in a critical position and has a vital role to play in case of diagnosing numb chin syndrome as an oral physician is more familiar with both the anatomy and physiology of the mental region as well as signs and symptoms of other system involvement than is any other general or specialist dentist or general physician.

The diagnosis of NCS is largely clinical, however, various radiographic studies are helpful to confirm diagnosis. Panoramic radiography is a useful starting point. Underlying dental pathologies like thinning of lamina dura, tooth displacement have been discovered in more than 50% of patients with acute lymphoblastic leukemia.²⁸ Recent advances in dental 3-D imaging mainly cone-beam computed tomography (CBCT) has added a cutting edge to the field of dental radiography. CBCT can be mainly useful in cases of dental etiology esp. in cases of infections progressing from dental implants. The course of inferior alveolar canal and mental foramina can also be better visualized in the 3-D reconstructed view hence facilitating the diagnosis.

Computerized tomography (CT) scan or magnetic resonance imaging (MRI), with gadolinium administration, of the head and neck should be done if possible as these can yield an accurate anatomic image of the inferior alveolar nerve and its surroundings. Nuclear bone scintigraphy (bone scanning) may also benefit in identifying mandibular bone disease such as metastasis or osteomyelitis. FNAC and biopsy of the lesion are indispensable for confirmation of the diagnosis. Lumbar puncture and cytologic analysis of cerebrospinal fluid can be of assistance in cases where radiography is negative.²⁷

MANAGEMENT

Identification of the underlying pathology and its treatment formulate the basic principle for management of these cases. In NCS resulting from dental etiologies (e.g., after enucleation of a cyst or tumor), the prognosis is typically good. Treatment of any systemic etiology helps in resolution of NCS.²³

When NCS is caused by metastasis, the prognosis is grim, with average survival rate following diagnosis being approximately 5 months if caused by mandibular metastasis and 12 months if associated with leptomeningeal metastasis. Treatment does little to affect the outcome in these cases. Local radiotherapy has been utilized in patients with skull-base metastases and cranial irradiation has been tried to treat patients with leptomeningeal metastases or carcinomatous meningitis. Mandibular lesions do not classically require local radiotherapy because symptoms of NCS resolve spontaneously in many patients.²⁴

CONCLUSION

Mental nerve neuropathy or numb chin syndrome has been

mentioned and talked about in the medical literature since ages and still has happened to receive little attention. It can present itself in varied forms and can be a small piece of a larger puzzle. It can lead to early detection of a metastatic disease and provide a clue to the primary site. Thus, we see the importance of recognizing this seemingly minor symptom reported by the patients. We also can see how recognizing this and following indicated investigative procedures can make a difference of life and death for few. As dentists and oral physicians it becomes our responsibility to take this entity more seriously and to never miss and/or ignore the history and symptoms of numbness, hypoesthesia or pain over the lower lip, chin and lower labial mucosal regions.

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