

Influence of Nerve Stimulation on Joint Dislocation: A Case Report

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Abstract

Pain is a distressing feeling often caused by intense or damage stimuli. It motivates a living being to withdraw from the stimulus causing pain and thereby protecting the body or a part of it. When the noxious stimulus is removed some pain resolves itself whereas some need assistance. An acute pain can last for a few moments whereas chronic pain may last longer. Sometimes in order to avoid the pain or the stimulus causing pain the actions performed by the individuals may result in further complications which may or may not be bigger than the actual level of pain. This is because various individuals react differently to pain and pain threshold levels vary accordingly. Out of the various never blocks used in dental surgery, nasopalatine nerve

block is the most painful. The temporomandibular joint is a synovial joint which helps in opening and closing of the jaws. Any disharmony in this joint can lead to difficulty in closing or opening of the mouth.

Keywords: Nasopalatine Nerve Block, Temporomandibular Joint Dislocation, Pain

Introduction

Temporomandibular joint (TMJ) is a specialized joint where the condyle articulates bilaterally within the concavity, commonly known as the mandibular fossa or the glenoid fossa.¹

The biomechanics of the TMJ is completely under the neuromuscular control involving the muscles of mastication (Masseter, Lateral pterygoid, Medial

pterygoid, Temporalis) and the ligaments (sphenomandibular ligament, stylo-mandibular ligament) with the neural transmission carried by the mandibular division of the trigeminal nerve. These components help in regulating and delivering the desired functional movements of the mandible.¹

The mandibular division of the trigeminal nerve supplies motor innervation to the muscles of mastication and the anterior belly of the digastric muscle. Branches of the auriculo-temporal nerve are responsible for sensory innervation of the TMJ; this nerve arises from the mandibular division in the infratemporal fossa and sends branches to the capsule of the joint. The deep temporal and masseteric nerves supply the anterior portion of the joint. The auriculo-temporal nerve, a branch of the mandibular portion (V3) of the trigeminal nerve, provides innervation of the TMJ.²

About 75% of the time, the masseteric nerve, a branch of the maxillary division of the trigeminal nerve (V2), innervates the anteromedial capsule of the TMJ. In about 33%, a separate branch from V2 comes through the mandibular notch and innervates the anteromedial capsule. These nerves are primarily motor nerves, but they contain sensory fibers distributed to the anterior part of the TMJ capsule. These sensory & motor nerves bring about movement of the capsule, muscles & ligaments, thereby causing opening and closing movements of the mandible. Whenever there is dysfunction in one of the components of the joint, it leads to joint disorders.²

Dislocation is defined as the complete loss of articular relationship, during mouth-wide opening, between the articular fossa of the temporal bone and the condyle disk complex.^{3,4} Disarticulation of the mandible is a common maxillofacial emergency.^{3,5}

The pathophysiology of dislocation is the movement of the condylar process in front of the articular eminence and

inability to descend back to its normal position. It can be partial (subluxation) or complete (luxation), bilateral or unilateral, acute, and chronic protracted or chronic recurrent.^{1,5,6,7} The most common is anterior dislocation. The other types such as medial, lateral, superior into the middle cranial fossa, and posterior are mostly associated with trauma and is rare.^{1,8,9}

The primary cause for dislocation in aged patients is due to the loss of dentition and changes occurring due to the same.^{1,10,11} Secondary causes include forceful wide opening of the mouth, yawning, laughing, vomiting, seizures, lengthy dental treatments, endotracheal intubation, laryngoscopy, and trans oral fiber optic bronchoscopy.^{1,12,13,14,15,16}

Herein, we present a case of mandibular dislocation, caused during an implant placement procedure and further discuss in detail its cause and its impact.

Case Report

A female patient aged 56 years reported with a chief complaint of missing teeth in the upper and lower jaw past 3 years and wanted it to be replaced for functional and esthetic reasons. On examination, the patient was partially edentulous and had a few teeth with grade 3 mobility. A full mouth extraction followed by rehabilitation was planned and all the extraction protocol went as planned without any hindrances. After, a revival period of 3 months, implant placement was carried out quadrant-wise to provide implant supported prosthesis. All the implants were uneventful except while placing in the anterior maxillary region. While administering the nasopalatine nerve block prior to implantation in anterior region, the patient had a very painful experience. The impact was such that the patient opened her mouth in reaction to pain to the maximum leading to lockjaw. This can be attributed to the severe pain experienced by the patient while administering the local anesthetic nerve block. Further, the

patient revealed that it was the first time that such an incident had happened and never before had the patient experienced lockjaw. Lockjaw was corrected by manual reduction of the jaw and during further follow up no such recurrence of lockjaw occurred with the patient. To the best of our knowledge this is the first case wherein we report such a reflex action of the mandibular jaw for the nasopalatine nerve block, which has really created a stir. There may be some instances where this has occurred but none of them have been reported and recorded in the databases currently available.

Discussion

Temporomandibular joint is a synovial, bilateral joint, which is considered as ginglimo-arthroidal joint.¹⁷ It rotates between the head of the mandible and the lower disc surface during the beginning of mouth opening and after the translation movement between upper disc surface and mandibular fossa until complete mouth opening.^{18,19,20,21,22} Muscle bundles and medial, lateral, anterior and posterior ligaments are bilaterally inserted and responsible to allow, and at the same time, limit eccentric mandibular movements.^{19,20,21}

Temporomandibular disorder (TMD) is characterized by pain in the temporomandibular joint and or surrounding muscle.²³ Normal mouth opening has been defined as the inter-incisal distance at maximal mouth opening.^{24,25} The mean maximal mouth opening for Indian males is 51.3±8.3 mm and for females is 44.3±6.7 mm.^{26,27,28,29,30,31}

In dislocation, the condyle is not in its regular position and may be placed anterior, posterior, superior, medial or lateral to the glenoid fossa. Dislocation represents a challenge not only to the health professionals but also to the patients, due to its unexpected manifestation in circumstances like yawning, singing and to its concomitant functional repercussions such as dysphagia, dysphonia.²¹

Displacement of the head of the condyle out of the glenoid fossa is also greatly influenced by the morphology of the condyle, glenoid fossa, articular eminence, zygomatic arch and squamo-tympanic fissure. The mentioned factors mainly determine the type and direction of dislocation. In addition age, dentition, cause and duration of the dislocation as well as the function of the masticatory muscles contribute significantly in the mechanism and management of temporomandibular joint dislocation.³²

The association between tooth loss and temporomandibular disorders (TMD) remains controversial. Some authors have stated that losing molar support was associated with the presence and severity of osteoarthritis.³³

The risk of clicking in the temporomandibular joint significantly increases in individuals who had lost more teeth.

Injection of local anesthetics into dense tissues such as those of the palate is a traumatic experience for most patients, and this is most exemplified in the nasopalatine block. When injecting using the standard syringes, the operator encounters significant resistance which is counteracted with more pressure on the plunger to deposit the solution. This results in pain, ischemia and possible tissue damage.^{34,35}

The area supplied by nasopalatine nerve includes the anterior palatal mucoperiosteum; specifically, the intercuspid region and the antero inferior part of the nasal septum. Nasopalatine blocks are normally employed for carrying out soft tissue procedures in the above regions and as supplemental anesthesia for extraction of upper six anterior teeth.³⁶ Dental cartridge of 3 mL/2 mL is very painful injection with pressures as high as 600 psi or even more. The density of tissues and the need to penetrate a compact neurovascular bundle have been cited as the most probable reasons for this extreme discomfort.³⁵

The reflex action of mouth opening to pain is somewhat new-fangled because no previous reports have been reported. However, it is somewhat synonymous to the jaw opening reflex, wherein stimulation of mechanoreceptors or nociceptors in the muscles triggers the jaw-opening reflex. The pathway is polysynaptic; the first synapse is either the trigeminal sensory nuclei or the adjacent reticular formation and the final synapse is in the trigeminal motor nucleus. Activity of the jaw-closing muscles is inhibited as a result of this reflex. To prevent injury when biting or chewing objects that may cause damage this reflex comes handy.²

This activity is thought to be more in the elderly age group as there is laxity of muscles as well as reduced height of articular eminence due to the age factor. Ageing has a significant effect on the tissues of the oral cavity.³⁴

Further, on correlation of the fast pain conduction by the A-delta fibers and the response action to it represents a classic example of the same. For example, when a person touches a hot object there is an immediate reaction and the person withdraws the hand immediately without any delay. The reaction of an uncontrolled excessive mouth opening is similar wherein the sensory receptors have reacted to the pain experienced by the patient.²

Alternatives proposed to avoid this problem:

1. Preparatory injections through the interdental papilla between upper central incisors.
2. Palatal infiltration bilaterally.
3. Computer Controlled Local Anesthetic Delivery (CCLAD) devices.
4. The use of disposable insulin syringes is also preferred, as the quantity of solution delivered per unit length movement of the plunger is about 1/3rd of that delivered by a 3 mL disposable syringe and the calibrations at 0.025 mL intervals allow fractionated and controlled

administration which can be visually monitored in contrast to the 2 mL/ 3 mL disposable syringes which have calibrations at 0.1 mL intervals.³⁵



Figure 1: Patient unable to close mouth after nerve block



Figure 2: OPG of the patient.



Figure 3: Intra Oral photo.

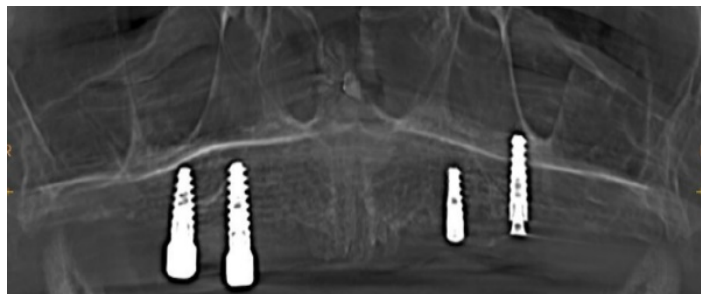


Figure 4: CBCT after placing of implant.

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