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Nerve Damage Associated with Third Molar Removal Review

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Abstract: **Consequently, the purpose of this study was to systematically review the comprehensive overview of literature data about injury to the inferior alveolar nerve and lingual nerve after mandibular third molar extraction to find out the prevalence and classification of nerve injury, diagnosis and alternative methods of treatment. A literature review was conducted using PubMed, Science Direct, and Google Scholar to search for studies concerning with "Nerve damage associated with third molar removal" published up to November, 2017. The surgical elimination of lower 3rd molars endangers both the lingual and inferior alveolar nerves. Patients sustaining an injury to either of these nerves must be managed correctly, and this needs a diagnosis of the injury type and regular monitoring of the healing of sensation. Surgical intervention for a harmed inferior alveolar nerve is not usually suggested but may be undertaken: if the nerve is totally divided and the severed ends are misaligned; if a bony fragment has compressed the mandibular canal; or if the patient struggles with persistent neuropathic pain. In contrast, after injury to the lingual nerve, if sensory screening shows no neural recovery within 3- 4 months, exploration of the injury site and microsurgical repair of the damaged nerve is indicated.**

Keywords: **nerve injury, diagnosis, Patients, alveolar nerves.**

1. INTRODUCTION

Extraction of affected or erupted mandibular 3rd molars (M3s) is among the most often performed dentoalveolar surgical procedures [1].There are well-established signs [2] for removal of affected M3s, and the debates regarding prophylactic removal of asymptomatic M3s are based on evaluating the costs and risks of elimination against the consequences of non-removal. The reasons for prophylactic surgical procedure include the need to reduce the risk of disease (cysts and tumors), the reduction of the risk of mandibular angle fracture, increased difficulty of surgery with age, non-restorable caries or periodontal illness, which M3s could be of less importance for mastication [2].Within 4 - 8 weeks after surgery, 96% of inferior alveolar nerve (IAN) injuries recuperate [3], and the recovery rates are not affected by gender and just a little by age. Some injuries may be permanent, lasting longer compared to 6 months, and with differing results ranging from mild hypoesthesia to complete anaesthesia and neuropathic responses resulting in chronic pain [4].The M3 is close to essential structures such as the IAN, linguistic nerve, and adjacent 2nd molar. The lower it is, the more difficult it is to extract and even more issues might take place during operation or postoperatively. Amongst them, injury of the IAN is of most concern for specialists. Sometimes it is inevitable and is probably to result in legal disputes between physicians and patients [5].The risk of IAN injury (IANI) issue depends primarily on the setting of the influenced tooth in connection with the mandibular canal (MC) before surgical treatment. The IAN travels within the MC in the mandible, and is thus sustained by the alveolus and the neurovascular bundle. Anatomically, the inferior alveolar vein is the most superior structure in the canal. When rotating instruments penetrate the canal, the bleeding will alert the cosmetic surgeon that the superior aspect of the bony canal has been breached and the vein is harmed. Nonsurgical elimination of the M3 is not likely to trigger any damage to the nerve unless excessive force has been used. The radiographic placement of the M3 in relationship to the MC has been revealed to be helpful in assessing the risk of damage to the IAN complying with extraction [6].If the IAN is injured, unless it is displaced by bony fragments from the roof of the MC or displaced right into the outlet, it will remain within the canal and regrow. The IAN neuropathy related to M3 surgery with a reported occurrence of 1 - 20% short-lived and 0 - 2% long-term [7] IANI, and a subsequent sensory disturbance, might happen

after straight or indirect trauma during M3 elimination. For example, it might result from compression of the nerve by root lifts and bring about blunt nerve trauma or elevated origins. The IAN may be damaged by rotating tools used for the procedure or after IAN regional anaesthetic block injections. Clinical monitoring of the neurovascular bundle throughout surgical treatment may notify the surgeon regarding a raised risk of postoperative IANI. Tay and Go [8] located that if an intact IAN bundle is observed during M3 surgery, this shows an intimate relationship with the M3 and has a 20% threat of postoperative paresthesia, and with a 70% chance of recovery within one year. Damages to the nerve is additionally most likely when the tooth is totally influenced in the bone and/or the apices of the tooth extend into or below the level of the neurovascular bundle. IAN paresthesia happens extensively from 0.35% to 8.4% [9].

Consequently, the purpose of this study was to systematically review the comprehensive overview of literature data about injury to the inferior alveolar nerve and lingual nerve after mandibular third molar extraction to find out the prevalence and classification of nerve injury, diagnosis and alternative methods of treatment.

2. METHODOLOGY

A literature review was conducted using PubMed, Science Direct, and Google Scholar to search for studies concerning with "Nerve damage associated with third molar removal" published up to November, 2017. searched included following terms; 'Molar removal", "Nerve damage". The reference lists from original and review articles were also reviewed to identify other relevant studies.

3. DISCUSSION

- **CLASSIFICATION OF NERVE INJURY:**

The effects and succeeding healing complying with nerve damages depend on the seriousness of the injury, and this is the basis for the categories of nerve injury suggested by Seddon [10] and Sunderland [11]. The last classification is important as it emphasizes the significance of each structural element of the nerve trunk [12]. Each of the five levels of nerve injury, described by Sunderland, could be created throughout the elimination of an affected third molar tooth:

- Compression injuries might take place during the elevation of a 3rd molar with roots near to the mandibular canal. Small compression of the nerve, or first degree injuries, will certainly generate a short-term transmission block, which is referred to by Seddon [10] as neurapraxia.

- More severe compression or crush injuries) cause the axon distal to the site of the injury to degenerate (Wallerian deterioration) and recuperation of experience is dependent upon regeneration of the harmed axons. Seddon [10] describes this 2nd level injury as axonotmesis.

- Stretch injuries can occur, for instance, when raising a lingual mucoperiosteal flap, and might generate rupture of the endoneurium and perineurium to produce 3rd or 4th degree injuries, specifically.

- Complete area of the nerve trunk or fifth degree injuries, referred to by Seddon [10] as neurotmesis, could take place if the inferior alveolar nerve penetrates the origin of a third molar and is severed throughout tooth removal.

- Many nerve injuries that do not fit nicely right into this category and are a lot more made complex. For example, a turning bur may not just partially divide the lingual nerve but likewise extend the nerve. Inflammation around the nerve, brought on by infection or international bodies, might likewise modify neural function and raise the discomfort experienced [13].

- **SEQUELAE OF NERVE INJURY:**

Temporary block of nerve transmission (1st level injury) could be accompanied by some local thinning of the axons and segmental demyelination, however these adjustments are reversible [12].Recovery of sensation usually occurs within a couple of days of the surgical trauma, although recovery could be a little slower if segmental demyelination takes place [14].

The cellular occasions that follow axonal discontinuity (2nd to 5th level injuries) have been studied thoroughly [15].Wallerian deterioration occurs distal to the site of the injury and usually prolongs centrally for a few millimetres [16].This axonal degeneration consists of disintegration of both the axon and myelin, phagocytosis of the particles by the

macrophages and Schwann cells, and then proliferation of the Schwann cells within the endoneurial sheath to form the bands of Büngner. Central to the site of the injury, the rest of the neurone goes through chromatolytic changes from which it could or could not recuperate. Regrowth of the axons that survive takes place after an initial delay, that includes a healing period and the time needed for development of the axon as for the damaged zone. There is after that a delay during which the regenerating fibres go across the hurt area. The initial delay before regeneration, and the success of axons in crossing the injury website, depends on the nature of the injury. Crush injuries will certainly recover more rapidly compared to section injuries as the endoneurial sheaths generally continue to be intact and for that reason the regrowing axons are assisted back to the correct receptor type at the correct area [17].In contrast, after nerve area injuries, the regenerating axons go into the endoneurial sheaths of the distal stump, evidently at random, and may be guided to an improper receptor at a new location. This might generate abnormalities in localization and the sensation viewed in response to a particular stimulus. Healing from crush injuries may take months and may not be complete. Recovery from nerve section injuries will advance for at least a year and will certainly never be complete.

- **METHODS USED TO MONITOR NERVE RECOVERY:**

The majority of cases of nerve damages throughout wisdom tooth elimination are not determined at the time of 3rd molar removal but in the post-operative period. The level of injury is therefore unidentified and it is important both to evaluate residual function and monitor succeeding recovery to form a reasoning regarding whether the nerve is likely to recoup spontaneously, or if surgical intervention will certainly be required. If there is only partial sensory loss, this generally suggests that there has been a first degree injury, and total recuperation is likely. If there is total anaesthesia in the early period after the injury, it is difficult to determine whether this has been triggered by a crush or section injury. Nevertheless, mindful tracking of sensory healing over a three month duration must distinguish between these various kinds of injury.

Checking sensory healing is taken on by the application of stimulations to the denervated location. Feedbacks of the patient will show initially the arrival of the regenerating axons then subsequently the degree of healing. Nevertheless, the most delicate indication of a sensory abnormality is the patient's very own subjective report, as minor sensory disturbances could not be found by screening.

Simple Sensory Testing:

A standard protocol for sensory screening does not exist, however a collection of simple tests are described below. The patient should be sittinged in a silent room with both the patient and examiner comfy. Examinations should be undertaken with the patient's eyes closed and the discovery of a stimulation is shown to the examiner by the patient increasing a finger. The results of each examination are then compared to the normal (unscathed) side. Preferably, the initial sensory examinations must be taken on within two weeks of the injury in order to develop a base-line where to keep an eye on adjustments. However, the devices needed to perform several of these tests is not easily offered and have to be built by individual clinicians [18].

Light Touch Sensation:

Light touch is most frequently tested by gently applying a wisp of cotton woollen to the skin or mucosa. Nevertheless, it is difficult to use this stimulation in a reproducible manner and using a cotton woollen wisp on wet oral mucosa is difficult. Greater uniformity and reproducibility can be acquired utilizing Von Frey hairs and the method of making these tools with a standard force of 20 mN (2g) has been explained [18].Stimuli are applied at random and the area of anaesthesia can be mapped by relocating outwards in little actions till the stimulation is felt.

Pin prick sensation:

Testing pin prick limit is frequently executed utilizing a dental probe or needle, but once again reproducibility is poor. A simple device, defined by Sunderland [12], conquers this problem. A pin is affixed to a spring, which allows it to be applied at a recognized pressure of up to 150 mN (15 g). At first, stimulations of as much as 150 mN can be used arbitrarily over the examination areas to figure out whether or not any kind of sensation is perceived. By doing this, locations of anaesthesia can be mapped. If sensation is present within the affected location on the injured side, then the pin prick feeling limit is established. For this test the pin is used at progressively enhancing pressures and the patient asked to show the factor at which the experience ends up being sharp instead of dull. The pin prick sensation threshold is kept in mind for a series of arbitrarily chosen factors on both the injured and the uninjured side.

- **TREATMENT:**

Inferior alveolar nerve:

If an inferior alveolar nerve passes through the origins of a wisdom tooth and is accidentally separated at the time of surgical procedure, repair is indicated if the nerve finishes do not continue to be in consistency within the canal. This should ideally be done at the same time as the tooth removal, yet if this is not possible the patient ought to be referred urgently to an appropriate maxillofacial unit.

If a sensory disruption wases initially kept in mind at evaluation, recovery needs to be checked using the sensory examinations defined above. Patients with paraesthesia in the distribution of the inferior alveolar nerve (evoked by touching the lip or chin) normally need no surgical intervention. Patients with total anaesthesia postoperatively should be assessed radiographically to ensure that the roof of the mandibular canal has not been displaced inferiorly to create an obstruction to regrowth [19].In the extremely unusual event that this has taken place, removal of the bony fragment would certainly appear to be proper, without undue delay. Reference to a maxillofacial surgeon familiar with this sort of treatment is essential. The patient needs to likewise be educated that complete recovery might not follow this procedure which some recovery may occur even if surgical 'decompression' is not done.

If, by 3 months after the injury, checking exposes little or no sensory healing, referral is again indicated. A further radiograph to evaluate the continuity of the mandibular canal is obtained, and surgical expedition and 'decompression' of the nerve is taken into consideration if the canal is disrupted, if there is very little healing of sensation, or if there is considerable dysaesthesia [20].Nevertheless, the outcomes of surgery are variable and in some cases unsatisfactory.

Lingual Nerve:

A lingual nerve that is intentionally transected throughout knowledge tooth removal should be immediately repaired using epineurial sutures. Once again, this may not be feasible in practice, and prompt recommendation to an appropriate skilled maxillofacial surgeon is shown. In the majority of patients, the injury is only uncovered post-operatively.

At early evaluation, the presence of some sensation in reaction to stimulation of the tongue suggests that the nerve goes to least partially intact; no treatment is indicated but sensory monitoring is required. As explained above, complete anaesthesia could be brought on by both a crush or section injury, and so surgical intervention is not suggested at first. Nonetheless, the absence of modern sensory healing by 3-4 months post injury is an indication for surgical exploration at a proper maxillofacial unit. If, at the time of surgery, the nerve is found to be intact and of rather uniform thickness however simply restricted by mark tissue, it should be released (outside neurolysis) and the wound closed. This is unusual, nonetheless, and much more typically the nerve is discovered to have been separated [21].If a neuroma has developed, this can be considereded as a significant development at the website of the injury and need to be excised, along with the damaged segment of the nerve. The severed ends of the nerve could then be mobilized and repair of the nerve ought to be performed utilizing 8/0 or 9/0 epineurial sutures. A sector of 10- 15 mm in size can be excised without causing excessive tension at the repair site and without the demand for any kind of type of nerve graft. The outcomes of surgical procedure are extremely variable; some patients regain good sensation, while others show little if any renovation. Nevertheless, the multicentre retrospective research of LaBlanc & Gregg [22] disclosed a success rate of 80% and a recent potential research study has shown that the majority of patients take into consideration the surgical procedure worthwhile [21].Surgery needs to therefore be provided to all patients with lingual nerve injury that show couple of signs of spontaneous recuperation.

4. CONCLUSION

The surgical elimination of lower 3rd molars endangers both the lingual and inferior alveolar nerves. Patients sustaining an injury to either of these nerves must be managed correctly, and this needs a diagnosis of the injury type and regular monitoring of the healing of sensation. Surgical intervention for a harmed inferior alveolar nerve is not usually suggested but may be undertaken: if the nerve is totally divided and the severed ends are misaligned; if a bony fragment has compressed the mandibular canal; or if the patient struggles with persistent neuropathic pain. In contrast, after injury to the lingual nerve, if sensory screening shows no neural recovery within 3- 4 months, exploration of the injury site and microsurgical repair of the damaged nerve is indicated.

REFERENCES

[1] Grossi GB, Maiorana C, Garramone RA, Borgonovo A, Creminelli L, Santoro F. Assessing postoperative discomfort after third molar surgery: a prospective study. J Oral Maxillofac Surg. 2007 May;65(5):901-17.

[2] NIH consensus development conference for removal of third molars. J Oral Surg. 1980 Mar;38(3):235-6.

[3] Alling CC 3rd. Dysesthesia of the lingual and inferior alveolar nerves following third molar surgery. J Oral Maxillofac Surg. 1986 Jun;44(6):454-7.

[4] Hillerup S. Iatrogenic injury to oral branches of the trigeminal nerve: records of 449 cases. Clin Oral Investig. 2007 Jun;11(2):133-42. Epub 2006 Dec 22.

[5] Alessandri Bonetti G, Bendandi M, Laino L, Checchi V, Checchi L. Orthodontic extraction: riskless extraction of impacted lower third molars close to the mandibular canal. J Oral Maxillofac Surg. 2007 Dec;65(12):2580-6.

[6] Kipp DP, Goldstein BH, Weiss WW Jr. Dysesthesia after mandibular third molar surgery: a retrospective study and analysis of 1,377 surgical procedures. J Am Dent Assoc. 1980 Feb;100(2):185-922.

[7] Renton T. Oral surgery: part 4. Minimising and managing nerve injuries and other complications. Br Dent J. 2013 Oct;215(8):393-9.

[8] Tay AB, Go WS. Effect of exposed inferior alveolar neurovascular bundle during surgical removal of impacted lower third molars. J Oral Maxillofac Surg. 2004 May;62(5):592-600.

[9] Cheung LK, Leung YY, Chow LK, Wong MC, Chan EK, Fok YH. Incidence of neurosensory deficits and recovery after lower third molar surgery: a prospective clinical study of 4338 cases. Int J Oral Maxillofac Surg. 2010 Apr;39(4):320-6.

[10] Seddon HJ. Three types of nerve injury. Brain 1943; 66: 237–288.

[11] Sunderland S. A classification of peripheral nerve injuries producing loss of function. Brain Res 1951; 74: 491–516.

[12] Sunderland S. Nerves and Nerve Injuries, 2nd ed. London: Churchill Livingstone, 1978; pp.133–141.

[13] Tal M. A role for inflammation in chronic pain. Curr Rev Pain 1999; 3: 440–446.

[14] Ochoa J, Danta G, Fowler TJ. Nature of the nerve lesion caused by a pneumatic tourniquet. Nature 1971; 233: 265–266.

[15] Holland GP, Robinson PP. Peripheral nerve damage and repair. In: Clinical Oral Science. Harris M, Edgar M, Meghji S, eds. Wright, 1998; pp. 274–289.

[16] Lubinska L. Region of transition between preserved and regenerating parts of myelinated nerve fibres. J Comp Neurol 1979; 113: 315–335.

[17] Horch KW. Guidance of regrowing sensory axons after cutaneous nerve lesions in the cat. J Neurophysiol 1979; 42: 1437–1449.

[18] Robinson PP, Smith KG, Johnson FP, Coppins DA. Equipment and methods for simply sensory testing. Br J Oral Maxillofac Surg 1992; 30: 387–389.

[19] Merrill RG. Prevention, treatment, and prognosis for nerve injury related to the difficult impaction. Dent Clin North Am 1997; 23: 471–488.

[20] Labanc JP, Van Boven RW. Surgical management of inferior alveolar nerve injuries. Oral Maxillofac Surg Clin North Am 1992; 4: 425–437.

[21] Robinson PP, Loescher AR, Smith KG. A prospective quantitative study on the clinical outcome of lingual nerve repair. Br J Oral Maxillofac Surg 2000; 38: 255–263.

[22] LaBlanc JP, Gregg JM. Trigeminal nerve injuries. Basic problems, historical perspectives, early successes and remaining challenges. Oral Maxillofac Surg Clin North Am 1992; 4: 277–283.