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Assessment of Nerve Injuries after Surgical Removal of Mandibular Third Molar: A Prospective Study.

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ABSTRACT

Third molar surgeries are most common procedures performed by oral and maxilla facial surgeon in his/her dental practice; however this procedure requires expertise and proper clinical diagnosis and planning, because of spectrum of complications that are associated with the removal of third molar teeth. Hence it’s Imperative that proper pre -surgical evaluation is needed and all surgical measures required are ascertained to avoid any nerve injury or other complications thereof, in this article Assessment of Nerve Injuries after Surgical Removal of Mandibular Third Molar is conducted in A Prospective Study.

Keywords: Third Molars, Nerve Injury, Complications.

INTRODUCTION

Third molar surgeries are commonly performed in dental clinics as well as dental hospitals so the complications associated with the surgical removal of third molars have to be evaluated with proper assessment to predict the injury outcome and have better prognosis. However impacted mandibular third molar teeth are mostly found in close proximity to the lingual, inferior alveolar, mylohyoid and buccal nerves,therefore During surgical removal of third molars, each of these nerves are at greater risk of damage and most of complications result from inferior alveolar or lingual nerve injuries. The majority of injuries result in transient sensory disturbance however in some cases, permanent paraesthesia (abnormal sensation), hypoaesthesia (reduced sensation) or, even worse, some form of dysaesthesia (unpleasant abnormal sensation) can also occur.

Many studies have reported the frequency of nerve injury during the removal of third molars (for review see Robinson 19971) and most indicate that inferior alveolar nerve function is disturbed after 4–5% of procedures (range 1.3–7.8%). Most patients will regain normal sensation within a few weeks or months and less than 1% (range 0–2.2%) have a persistent sensory disturbance.

It is therefore imperative that patients undergoing third molar surgeries are properly assessed for nerve injuries and are managed correctly, and this includes proper clinical evaluation, diagnosis of the type of impaction, post surgical monitoring and recovery, and the treatment in appropriate cases for better prognosis.

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MATERIALS AND METHODS

The prospective study data was collected from 110 patients visiting the Department of Oral and Maxillofacial Surgery, indira Gandhi government Dental College &Hospital, jammu, for surgical extraction of mandibular third molars. In this study,patients were selected during normal OPD hours after proper clinical and radiographical examination .All demographic and preoperative variables were recorded with data record of name, age, gender, and type of impaction BASED ON seven radiographic indicators of a close relationship between the impacted 3rdmolar and the inferior alveolar canal as reported to our department figure (A,B,C,D,E,F,G)

Postoperative assessment was done after one week at the time of suture removal for paresthesia/anesthesia by proper questioning and evaluation about tongue, chin, and lip sensibility and performing neurosensory tests like 2-point discrimination,

pinprick, Sharp or blunt discrimination and light touch. Patients showing any signs of any neurosensory disturbance were followed up for 3 months and further 6 months.

After informed consent from Patients provided in accordance with the local ethical committee of the hospital, question's were asked and patients were examined by a single examiner (to avoid inter-operator variability) at each visit ,in a completely free and silent room of the oral and maxillofacial surgery department, at an ambient room temperature.

Proper investigations and clinical evaluation was done at each post operative sitting which included: identifying the area affected, symptoms (paraesthesia, anaesthesia, dysaesthesia), two-point discrimination, light touch perception threshold PinPrick Test (PP). sharp blunt discrimination was done. Each test was carried out in random order, on alternating sides. the subject was asked to close the eyes as the tests were performed As per criteria laid down.[1]

2.1. Two-Point Discrimination Test (TPD).

In this neurosensory test, 2PDT was applied, without movement on the mucosa. Test started with orientation of the calipers HELD Initially 2 mm apart followed by a gradual increase in interprobe distance by 1 mm until the patient reported two points by showing one or two fingers as the probes of caliper device were drawn across the surface of skin or mucosa at constant pressure and patient was asked whether one or two points are felt.

Probes were gently applied to skin and mucosa to elicit any response from the patient who responded by raising her hand,if perceived.

The minimum separation betweentwo points of the probes and as reported by patient was termed as two-point discrimination threshold. The separation distance at which the subject was capable of distinguishing two points in five or six trials was recorded for that particular zone.

Any variation in answers on perception led to change in distance between probes for every incorrect answers, the probe with the next large separation distance was selected and for every correct answer probe with the next smaller separation distance was selected [Figure 1].

Figure 1: Two-Point Discrimination Test.

2.2. PinPrick Test (PP).

In this neurosensory test, a sharp dental probe was selected and gently applied to the skin in a quick and short pricking movement to elicit pain and assess the response. Each area selected was pricked three to four times bilaterally, and subject was asked to raise hands on sensing any difference between the sides. Sensory perception was assessed by pricking over tongue, mucosa, lip, and skin over chin region. Paresthesia was defined as any postoperative change in sensitivity of tissues innervated by the trigeminal nerve after test evaluation [Figure 2].

Figure 2: PinPrick Test.

2.3. Light Touch Assessment (LT).

IN This method tactile stimulation of the skin and mucosa was checked by gentle touch response and evaluating the detection threshold of the patient. For this purpose, cotton swapped dental probe was used to perform the test. Stimuli were applied at randomly and area of anesthesia was mapped by moving outward in small steps until stimulus is felt [Figure 3].[2]

Figure 3: Light Touch Assessment.

2.4 Sharp or blunt discrimination (S/B) A sharp right angle dental probe was applied to the selected area, with indentation but with no breach of the mucosa, the patient was then asked to compare this sensation to that produced by the sharp or blunt region of the probe. The test was considered positive if the patient recognised three out of five of each stimulus correctly.

Figure 5: Relationship of inferior alveolar nerve with roots of impacted third molar. (A) no relationship with canal (b)darkening of roots (C)narrowing of roots (D)narrowing of canals (E)deflection of roots (F)bifid root apex (G)interruption in white line of canal.

Table 1: Gender distribution.

Gender	Number	%
Male	78	70.9%
Female	32	29.%
Total	110	100%

Table 2: Type of Impaction

Type	Number	%
Mesioangular	48	43.6%
Horizontal	29	26.36%
Vertical	21	19.09%
Distoangular	09	8.1%
Linguoversion	02	18%
Inverted	02	0.9%

Table 3: Sample distribution of nerve damage complication.

Type of nerve injury	Male	Female	%
Lingual nerve	0	1	0.9%
Inferior alveolar nerve	1	0	0.9%

RESULTS

The prospective study data that was collected from 110 patients visiting the department of Oral and Maxillofacial surgery,indira Gandhi government dental college jammu, for surgical extraction of impacted mandibular third molar.

Out of 110 patients,78 were male patients and 32 were female patients. Patient's age ranged from 18 to 60 with mean of 26.3 years [Table 1]. Out of total 110 patients, 48 (43.6%) patients had mesioangular type of impaction, 29 (26.6%) were horizontal, 21 (19.09%) were vertical, 09 (8.1%) patients had distoangular impaction, and 2 (1.8%) patient of linguoversion and 1 (0.9%) of inverted type of impaction [Table 2].

Lingual nerve paresthesia was reported in 1 patients (0.9%) out of 110 cases, and the type of impaction was horizontal class III, position C and Disto-angular class II, position B. inferior alveolar nerve paresthesia was reported in 1 patient (0.9%) having distoangular -angular, class II, position A type of impaction [Table 3].

DISCUSSION

In early 1954 Mead has defined an impacted tooth as a tooth that is prevented from erupting into position because of malposition,[2] lack of space, or other impediments. Later Peterson,[3] characterized impacted teeth as those teeth that fails to erupt into the dental arch within the expected time. In 2004 Farman wrote that impacted teeth are those teeth that prevented from eruption due to a physical barrier within the path of eruption.[4]

Invariably, third molar surgeries are commonly performed by oral and maxilla facial surgeons ,so the removal of third molars has often been involved with risks and complications associated with neurosensory deficit.

Many theories have been proposed owing to high incidence of mandibular third molar impaction. One of the most popular theory is insufficient development of the retromolar space.[5,6]

Mandibular ramus growth is related to resorption at its anterior surface and deposition at its posterior surface, but in case of disbalance of this process, the mandibular third molars don't get enough space to erupt.[7] Proper mandibular third molars eruption also depends on their favourable path of eruption. For example, if the tooth bud is medially angulated during the initial stages of calcification and root development the path of eruption will be unfavourable.[8] However, impaction of mandibular third molars can develop due to a decrease in the angulation of the mandible and an increase in the angulation of the mandibular plane.[9] Yamaoka et al.[10] found the relation between the root angulation and impaction: angulated roots were more common in impacted mandibular third molars as compared to erupted mandibular third molars. Some authors indicates other important third molar impaction causes: malposition of the tooth germ, hereditary factors,[11] lack of sufficient eruption force for third molars, and the theory of phylogenetic regression of the jaw size - insufficient mesial movement of the dentition of modern human due to lack of interproximal attrition,[12,13]

It may affect either the inferior alveolar nerve or more commonly the lingual nerve that leads to numbness of the ipsilateral anterior two-thirds of the tongue and taste disturbance.[14]

In a landmark article by Howe and Poyton in 1960,[15] it was determined after evaluating 1,355 impacted Mandibular molars clinically at the time of extraction and radiographically that a true relationship existed in approximately 7.5 percent. A "true relationship" was defined as the visualization of the neurovascular bundle at the time of tooth removal.

An "apparent" relationship was defined by radiographs as a circumstance in which the roots of the teeth appeared to be in an intimate relationship to the IAN.This occurred in 61.7 percent of the teeth.

Of the 70 cases that developed postsurgical nerve impairment, over 50 percent of them had a true relationship which represented 35.64 percent incidence. This was a 13 times greater incidence than that occurring with those teeth exhibiting an apparent one. They further noted increased incidences in older patients: teeth that were deeply impacted, those which exhibited grooving, notching, or perforation, and a three- and four-time increase inmesial and horizontally impacted teeth with linguoversion.[15]

In 1990, Rood and Nooraldeen Shehab,[16] in a literature review, collected seven radiographic indicators of a close relationship between the impacted 3rdmolar and the inferior alveolar canal. Four signs were observed in the tooth root (darkening, deflection and narrowing of the root, and a bifid root apex) and theother three inthe canal (diversion, narrowing, and interruption in thewhite line of the canal) [Figure 4].

The authors collected retrospective data on 553 patients and prospective data on 552, observing the appearance of some of the radiographic indicators of a close relationship between the impacted 3rd molar and the inferior alveolar canal in the OPG in 9.1% and 16.4% of cases, respectively.

In the retrospective study, nerve damage was statistically related to all the radiographic signs except bifid root apex and darkening of the canal. In the prospective study, nerve damage was related to diversion of the canal, followed bydarkening of the root and interruption of the canal.

Although the symptomsmay resolve with time in most of the cases, an estimation of the type of injury has to be made to establish the treatment plan and allow recovery. Judgment can be made based on various systems for classification of nerve injuries, first among which to be introduced in 1943 was Seddon's classification that involves the following three categories.

1. Neuropraxia. It is an interruption in conduction of the impulse down the nerve fiber. The recovery in such cases takes place without Wallerian degeneration, and, hence, it is considered to be the mildest form of nerve injury.
2. Axonotmesis. It is loss of the relative continuity of the axon and its covering ofmyelin, but preservation of the connective tissue framework of the nerve.
3. Neurotmesis. It is loss of continuity of not only the axon, but also the encapsulating connective tissue.[17–19] Another system was given by Sunderland in 1951 which includes five classes as follows.[17]

First Degree. It is similar to Seddon's neuropraxia and due to compression or ischemia, a local conduction block and focal demyelinization occur which recovers in 2-3 weeks.

Second Degree. It is similar to Seddon's axonotmesis and recovery occurs at the rate of 1mm/day as the axon follows the "tubule."

Third Degree. In this class, the endoneurium gets disrupted while the epineurium and perineurium remain intact. Recovery may range from poor to complete and depends on the degree of intrafascicular fibrosis.

Fourth Degree. In this class there is an interruption of all the neural and supporting elements although the epineuriumis intact and the nerve becomes usually enlarged.

Fifth Degree.This class involves a complete transection of the nerve with the loss of continuity.[5–7]

Most studies have shown that if the paresthesia follows extraction, it is likely to be temporary and to be resolved within the first 6 months. However, if no improvement is seen after 2 years of followup, the altered sensation is likely to represent nerve dysfunction that may be in the form of permanent neurosensory disability, a complete loss of sensory function, and neurogenic symptoms.[20,21]

The incidence of reported postoperative dysaesthesia of the inferior alveolar and the lingual nerve varies widely in the studies published so far. In a study published in 2000 by Gargallo-Albiol et al., the incidence of temporary disturbances affecting the IAN or the LN was found to be in the range from 0.278% to 13%.[22]

In another study by Zuniga, the incidence of permanent injury to the IAN and LN has been mentioned to fall in the range between 0.4% and 25% and 0.04% and 0.6%, respectively.[23] Tay and Go carried out a study in 2004 to determine the incidence of inferior alveolar nerve paraesthesia in those patients where an exposed inferior alveolar nerve bundle is seen during third molar surgery, and it was concluded that such a situation hints a high probability of an intimate relationship of the nerve with the tooth and carries a 20% risk of paraesthesia with a 70% chance of recovery by one year from surgery.[24]

Recently Cheung et al. carried out a study in which it was seen that of all the lower third molar extractions performed by various grades of operators, 0.35% developed IAN deficit and 0.69% developed LN deficit. It concluded that distoangular impaction was found to increase the risk of LN deficit significantly, wherein the depth of impaction was related to the risk of IAN deficit. On the other hand, sex, age, raising of a lingual flap, protection of LN with a retractor, removal of distolingual cortex, tooth sectioning, and difficulty in tooth elevation were not found to be significantly related to IAN or LN injury.[25]

The study of Anwar Bataineh showed postoperative lingual nerve paresthesia that occurred in 2.6% patients.

There was a highly significant increase in the incidence associated with raising of a lingual flap. The incidence of inferior alveolar nerve paresthesia was 3.9%. The results of this study concluded that the elevation of lingual flaps and the experience of the operator are significant factors contributing to lingual and inferior alveolar nerve paresthesia, respectively.[26]

Considering angulation of third molars in our case series, Out of total 110 patients, 48 (43.6%) patients had mesioangular type of impaction, 29 (26.6%) were horizontal, 21 (19.09%) were vertical, 09 (8.1%) patients had distoangular impaction, and 2 (1.8%) patient of linguoversion and 1 (0.9%) of inverted type of impaction

In our study, Lingual nerve paresthesia was reported in 1 patients (0.9%) out of 110 cases, and the type of impaction was horizontal class III, position C and Disto-angular class II, position B. while inferior alveolar nerve paresthesia was reported in 1 patient (0.9%) having distoangular -angular, class II, position A type of impaction.also the incidence of injury to IAN and LN was comparatively very low, and all cases were of temporary dysthesia and transient paresthesia. patients were evaluated and properly assessed on all future visits and have recovered completely.

CONCLUSION

Impacted Third molar surgeries are most common surgical procedures undertaken in dental clinics and the incidence of risks associated with the surgical removal of third molars depend upon many factors-improper sterlisation,misdiagnosis ,improper assesement of type of impaction,poor pre operative evaluation,tissue injury,poor post operative follow up. Since impacted mandibular third molar teeth are seen to have close relationship to the lingual, inferior alveolar, mylohyoid and buccal nerves,therefore During surgical removal of third molars, each of these nerves are at greater risk of damage and most of complications result from inferior alveolar or lingual nerve injuries so its imperative that proper evaluation and assessment is done before carrying out any such surgical procedure.

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