

## PARESTHESIA DUE TO INFERIOR ALVEOLAR NERVE DAMAGE AFTER EXTRACTION OF MANDIBULAR THIRD MOLAR AMONG PATIENTS SHOWING DARKENING OF ROOT IN ORTHOPANTOMOGRAM

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### ABSTRACT

**Background:** Paresthesia is an abnormal dermal sensation with no apparent physical cause. One of the everyday practices in any oral surgery setup is the extraction of the impacted mandibular 3<sup>rd</sup> molars surgically. Precise measurement of bone present for support of the implant coronal to the inferior alveolar nerve (IAN) canal is a pertinent way to prevent IAN injuries.

**Objective:** To assess the frequency of paresthesia due to IAN damage after mandibular 3<sup>rd</sup> molar's surgical extraction particularly in those patients having a darkening of root on orthopantomogram.

**Methods:** The study was a descriptive case series type which took place in Oral and Maxillofacial Surgery department at Sharif Medical and Dental College, Lahore in a time frame of 6 months i.e., from December 2020 till May 2021. After meeting the inclusion/exclusion criteria, 200 patients were made part of the study program. Informed consent and demographic information were recorded. Surgical procedure of all these patients was done. Assessment was done post-operatively first after one week when patient came for suture removal by inquiring about the subjective perception of abnormal feeling or sensation on lower lip and chin area. Patients were then reappointed for a follow-up visit after 1 month as well.

**Results:** Patients' mean age was 28.05±3.94 years. 104 (52%) males and 96 (48%) females were present in the study population. 38 (19%) patients were of distoangular impaction, 39 (19.5%) had horizontal impaction, 55 (27.5%) had mesioangular impaction while 68 (34%) had vertical impaction. The IAN paresthesia after 1<sup>st</sup> month of surgery was found in 13 (6.5%) patients.

**Conclusion:** According to this study, the frequency of paresthesia after 1<sup>st</sup> month of surgery was 6.5% due to IAN injury after mandibular 3<sup>rd</sup> molar surgery in patients with root darkening as observed on orthopantomogram.

**Keywords:** Inferior alveolar nerve, Orthopantomogram, Paresthesia, Mandibular third molar surgery.

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### INTRODUCTION

Among the commonly carried out clinical procedures in any oral surgery setup is the extraction of impacted mandibular 3<sup>rd</sup> molars via a surgical technique.<sup>1-3</sup> As every surgical procedure bears its own set of possible

complications, inferior alveolar nerve (IAN) rupture and the resultant paresthesia is one of the prevalent complications in this regard which significantly renders the life quality of the patient undergoing this surgical procedure through eliciting problems with sensations in the cheek and chin area, speech and mastication.<sup>4,5</sup>

IAN is the branch of mandibular nerve's posterior division. Mandibular division itself is one of the three main sub-branches of V nerve which runs along the Inferior alveolar nerve/mandibular nerve canal (IANC).<sup>6</sup> Paresthesia can simply be explained as any abnormal

sensation of a particular area of skin as experienced by the individual.

One of the pre-requisites of the molar extraction surgery is the pre-operative evaluation of the impacted tooth with either a plain periapical radiograph or an orthopantomogram. Few radiological variables described by different researchers that are of significant value in assessing the proximity of roots to IANC are darkening of roots where they cross IANC, interruption of white cortical lines of IANC, canal's grooves or bends, canal's tapering and presence of roots which are bifid or hooked.<sup>2, 4-6</sup> Roots of mandibular 3<sup>rd</sup> molar being intimately present to IANC is the most pertinent reason of trauma to the nerve undergoing surgery. This damage causes numbness or paresthesia of the chin and lower lip which can be temporary or permanent depending upon the degree of insult. Up till now, only a few researches indicate the incidence of this particular injury to be less than 1%.<sup>7</sup> Along with that, some research concludes that for paresthesia to occur post-operatively, there should be at least 2 to 3 positive radiographic findings on Orthopantomogram.<sup>4</sup> In most cases, assessment of nerve damage cannot be made at the time of surgical procedure but is identifiable mostly on the next 1-2 post-operative days.<sup>5</sup> Therefore, being able to predict the chances of nerve injury by radiographic means is of significance.<sup>2</sup> Predicting the intra-operative IAN damage leads to minimizing the risk of paresthesia.<sup>8</sup>

According to a research by Costa et al, the root darkening of mandibular 3<sup>rd</sup> molar is one of the determining factor of IAN damage with the resultant deficit to be of 29.2%.<sup>4</sup> Another study done in Brazil, showed it to be almost 46.82%.<sup>7</sup> However, in a study in India done by Kanagasabapathy showed that darkening of the root is of least significance with the resultant paresthesia to be only of 6.5%.<sup>9</sup> In another study, done by Sarikov et al depicted that the chances of damage to the IAN after mandibular third molar's surgical removal was about 0.35 - 8.4%.<sup>10</sup> A study published by Jerjes et al, concluded that the prevalence of paresthesia after this particular surgery at a follow up period of about 6 months had reduced considerably to 45%.<sup>11</sup> Moreover, a study published by Kjolle et al stated that after removal of mandibular third molar from 864 patients, only 1.15% patients reported hypoesthesia, anesthesia, paresthesia, or dysesthesia of any kind postoperatively.<sup>12</sup>

In his study, Byahatti et al concluded that the impaction of 3<sup>rd</sup> molar which is of the most common type is the mesioangular impaction i.e., 49%. Moreover, in relation to the IANC, 50 (25%) teeth were superimposed, 41 (20.5%) were adjacent, 49 (24.5%) were grooving, 17 (8.5%) were notching and 30 (15%) were of perforating categories.<sup>13</sup> Ghaeminia et al conducted a study concluding that the frequency of inferior dental nerve damage in impacted molars is 9.0% and the associated paresthetic sensation lasting prevailing more than 6 months being rendered as definitive IAN insult was found to be present in a total of 6% of the patients.<sup>14</sup>

The rationale of this study is that although the extraction of the impacted mandibular 3<sup>rd</sup> molar is a routine

surgical procedure, post operative paresthesia due to IAN damage causes inconvenience to the patient and occurs quite frequently because of the proximity of this tooth to IANC. A lot of work has been done internationally to evaluate the relation of IANC to this particular tooth and the resultant paresthesia occurring post surgically. In this regard, there were found no statistical results for the population of Pakistan and there is observed a wide variation in results obtained from different populations of the world. Hence, this study allowed us to determine the frequency of paresthesia in our country leading to early evaluation of any possible chance of nerve damage so that the surgical technique can be modified well in time.

## METHOD

It was a descriptive case series study with non-probability/consecutive sampling which took place in department of Oral and Maxillofacial Surgery at Sharif Medical and Dental College, Lahore in a time frame of 6 months i.e., from December 2020 till May 2021. A sample size of 200 were calculated with level of significance being at 5% and 4% margin of error and taking the supposed frequency of paresthesia to be 9.0%.<sup>14</sup> Individuals, both male and female, between the age group of 22-35 years with the requirement of surgical removal of only the impacted mandibular 3<sup>rd</sup> molar showing root darkening on Orthopantomogram were incorporated in the study. Patients with pre-existing IAN deficit on history and clinical examination, those having any pathology associated with the tooth (cystic or neoplastic) seen clinically or on a radiograph, those on steroidal therapy as determined on history and pregnant patients were all not made the part of the study.

A total of 200 patients reporting to the Oral Surgery department for removal of their mandibular impacted 3<sup>rd</sup> molars were studied. Clinical history along with radiographic evaluation with the help of an Orthopantomogram was done pre-operatively. Demographic data of the patient was recorded. Informed consent was received from all the study participants pre-operatively. Surgical procedure of all these patients was done by the same oral & maxillofacial surgeon utilizing a commonly used local anesthetic adjuvant i.e., 2% lidocaine plus 1:100,000 epinephrine cartridge and the incision was closed using 3-0 silk suture. Post-operative assessment was carried out first, one week after when the patient came for removal of sutures by asking for subjective perception of abnormal feeling or sensation (SP) on lower lip and chin area. Moreover, neurosensory testing including light touch assessment (LTA), two-point discrimination (TPD) and pin prick test (PPT) were also done one week after the surgery and patient was then re-called for follow-up after 1 month. All the information was entered in a patient Performa which was properly structured.

Data was evaluated via SPSS version 21.0. Mean and Standard Deviations were assessed for numerical variables such as age. Frequency and percentages were

acquired for variables which were qualitative such as gender and paresthesia. Data was stratified for effect modifiers like type of impaction. Post stratification, Chi-square test was utilized to have a comparison for presence of paresthesia in the stratified groups. *p*-value of  $\leq 0.05$  was considered to be statistically significant.

## RESULTS

The patients' mean age who participated in the study was  $28.05 \pm 3.94$  years with the age range being 20 and 35 years respectively. A total of 104 (52%) patients were male while 96 (48%) patients were female. The ratio of male to female participants as per the gender prevalence of the study was 1.1:1. There were 38 (19%) patients of distoangular impaction, 39 (19.5%) had horizontal impaction, 55 (27.5%) had mesioangular impaction while 68 (34%) had vertical impaction.

In our study, SP (subjective perception of abnormal feeling or sensation) after 1<sup>st</sup> week was found in 136 (68%) patients and SP after 1<sup>st</sup> month was found in 13 (6.5%) patients. LTA (light touch assessment) after 1<sup>st</sup>

week was found positive in 103 (51.5%) patients while LTA after 1<sup>st</sup> month was found to be positive in 13 (6.5%) patients. PPT (pin prick test) after 1<sup>st</sup> week was found evident in 13 (6.5%) patients and PPT after 1<sup>st</sup> month remained the same in these patients i.e., 13 (6.5%). Out of 200 patients, the two-point discrimination (TPD) after 1<sup>st</sup> week was found in 133 (66.5%) patients and TPD after 1<sup>st</sup> month was found in 13 (6.5%) patients. The IAN paresthesia after 1<sup>st</sup> month was found in a total of 13 (6.5%) patients. (Table 1)

Data was stratified on the basis of type of impaction and associated paresthesia cases encountered. In patients with distoangular impaction, IAN paresthesia was found in 4 (10.5%) patients, with horizontal impaction, IAN paresthesia was found in 1 (2.6%) patient, with mesioangular impaction, IAN paresthesia was found in 1 (1.8%) patient and with vertical impaction, IAN paresthesia was found in 7 (10.3%) patients. The difference observed among the various groups was found to be insignificant ( $p > 0.05$ ). (Table 2)

**Table 1:** Frequency (f) and percentage distribution (%) of SP (subjective perception of abnormal feeling or sensation), LTA (light touch assessment), PPT (pin prick test), TPD (two-point discrimination) and IAN (Inferior alveolar nerve) paresthesia.

Post-Operative Duration		SP (f)	SP (%)	LTA (f)	LTA (%)	PPT (f)	PPT (%)	TPD (f)	TPD (%)	IAN (f)	IAN (%)
After 1 <sup>st</sup> week	Yes	136	68	103	51.5	13	6.5	133	66.5		
	No	64	32	97	48.5	187	93.5	67	33.5	-	
	Total	200	100	200	100	200	100	200	100		
After 1 <sup>st</sup> Month	Yes	13	6.5	13	6.5	13	6.5	13	6.5	13	6.5
	No	187	93.5	187	93.5	187	93.5	187	93.5	187	93.5
	Total	200	100	200	100	200	100	200	100	200	100

**Table 2:** Comparison of IAN (Inferior alveolar nerve) paresthesia after 1<sup>st</sup> month of surgical extraction in various types of impaction strata.

		Type of surgical impaction				Total
		Distoangular	Horizontal	Mesioangular	Vertical	
IAN paresthesia	Yes	4 (10.5%)	1 (2.6%)	1 (1.8%)	7 (10.3%)	13 (6.5%)
	No	34 (89.5)	38 (97.4%)	54 (98.2%)	61 (89.7%)	187 (93.5%)
Total		38 (100%)	39 (100%)	55 (100%)	68 (100%)	200 (100%)

(Chi-square test = 5.602, *p*-value = 0.133)

## DISCUSSION

This present descriptive case series study was carried out at the department of Oral and Maxillofacial Surgery, Sharif Dental College, Lahore to assess the frequency of paresthesia due to IAN injury post mandibular third molar's surgical extraction in patients with darkening of root as observed on the orthopantomogram.

The surgical extraction of mandibular 3<sup>rd</sup> molars which are impacted is among the routine dentoalveolar procedures taking place in the oral and maxillofacial surgery department. Frequently, the surgeon may encounter multiple issues related to the surgical extraction of the mandibular impacted 3<sup>rd</sup> molars. One of the prime postoperative complaints is a neurosensory deficit. It may lead to an insult to the IAN or else the lingual nerve that ultimately renders numbness to one half of the anterior 2/3<sup>rd</sup>s of the tongue. The IAN is morphologically unusual in that it travels a significant distance within the bony canal of the mandible.<sup>15, 16</sup>

Tay and go found in their research analysis that if IAN nerve is studied during M3 surgery, a close relationship of IAN with the M3 was observed and thus had a postoperative paresthesia risk of 20%. Moreover, there was a recovery chance of 70% observed during one year period.<sup>17</sup> In our study, the IAN paresthesia after 1<sup>st</sup> month was found in 13 (6.5%) patients. Damage to IAN is frequent when the tooth is impacted entirely in the alveolar bone and/or the tooth's apices extend either into or beneath the neurovascular bundle's level. Paresthesia of IAN is found in approximately 0.35% to 8.4% of the cases as detected in some previously conducted studies.<sup>18, 19, 20</sup> This was in agreement with the observations of the current study.

Another study showed that the postsurgical paresthesia of the lingual nerve was observed in 2.6% of the patients. This nerve paresthesia was most likely found to be related with the incorporation of the lingual flap elevation during the surgical procedure. IAN's paresthetic incidence was found to be 3.9%. The results of this study focused on the fact that the

involvement of lingual flaps and the operator's experience were significant factors leading to lingual and IAN paresthesia, respectively.<sup>21</sup>

## CONCLUSION

According to this study, the frequency of paresthesia after 1<sup>st</sup> month was 6.5% due to IAN damage after mandibular 3<sup>rd</sup> molar surgery in patients where root darkening was observed on the orthopantomogram.

*Ethical Approval: Submitted*

*Conflict of Interest: Authors declare no conflict of interest.*

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## AUTHOR'S CONTRIBUTIONS

**SI:** Conceived, planning, manuscript writing, data collection

**SI:** Discussion, help in references

**IYK:** Proof reading, help in references

**KJ, MTS:** Critical revision, Proof reading

**SH:** Proof reading, data collection