INFERIOR ALVEOLAR NERVE DEFICIT AFTER REMOVAL OF LOWER THIRD MOLARS-FREQUENCY AND FACTORS AFFECTING NERVE DAMAGE IN PROSPECTIVE CLINICAL STUDY OF 1487 EXTRACTIONS IN 1185 PATIENTS

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ABSTRACT

Objective: *To determine the Frequency of inferior alveolar nerve injury and to assess the relationship of the nerve deficit with contributory risk factors like causes of removal, patient's age, and anesthetic modality.*

Materials and Methods: *All the procedures were carried out in Maroof International Hospital from January 2016 to August 2020. About 1185 consecutive patients were included in the study who were treated over a period of 5 years. A total of 1487 surgical extractions were performed. Surgery was done either under local anesthesia (72.1%) or IV sedation with local anesthesia (27.9%). All the procedures were performed by the same single senior consultant with the same two nurses. Follow up was done at one, three, and six weeks and six months.*

Results: *Eight cases (0.53%) had temporary inferior alveolar nerve deficit which settled within six weeks. No permanent neurological damage was observed. Cases with pericoronitis were significantly associated with postoperative temporary nerve damage ($p<0.001$). Age, gender, and anesthetic modality were not significantly related to nerve injury.*

Conclusion: *Patients with preoperative pathology like pericoronitis have more chances of temporary nerve injury after removal. Preoperative counseling about possible nerve damage shall be done.*

Keywords: *Neurosensory deficit, third molar removal, inferior alveolar nerve damage*

INTRODUCTION

The lower third molar often requires removal due to recurrent pain, dental caries, pericoronitis, root resorption and cystic lesion.(1) Nerve damage during this procedure can be a frequent postoperative complication.(1-4) Inferior alveolar nerve and lingual nerve both lie in close proximity to third molar; hence there are chances of injury to these nerves during removal of the third molar. (5, 6)

Injury of the inferior alveolar nerve can have various sensory disturbances such as temporary or permanent anesthesia, dysesthesia, hypoesthesia, paresthesia in the ipsilateral chin, lower lip and buccal gingiva which are quite distressing for the patients.(7, 8)Sensory loss in the inferior alveolar nerve causes numbness in the lower lip. (8),(9).Factors like deeply impacted teeth and inexperienced surgeons are also related to increased Frequency of damage.(6, 10, 11) For the inferior alveolar nerve,

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the relationship of roots of the tooth and the nerve bundle is of paramount importance[1]. The Roods radiographic predictors on OPG and CBCT are used to assess the status of nerves before surgery.[12-14]These radiographic assessments help inaccurate positioning of nerve about the tooth before surgery and reduce the risks of injury[15]

Studies from different countries have reported the prevalence of inferior alveolar nerve injury after third molar removal from 0.4 to 8 %.[1] Study by Bruce et al shows that surgical morbidity also increases with increase in age of patients.[16] However there is no published data about inferior alveolar nerve injury after removal of third molars in Pakistan. So we conducted with the aim to record the Frequency of temporary and permanent inferior alveolar nerve damage after lower third molar removal. Our study question was whether inferior alveolar nerve damage after third molar extraction is affected by age, the reason for extraction and type of anesthesia while our second aim was to assess contributory risk factors and to investigate relationship between causes of removal, age and anesthesia type with the possible inferior alveolar nerve injury after third molar surgery.

MATERIALS AND METHODS

The patients included in this study were those who came for third molar removal to dental OPD at Maroof International Hospital, Islamabad. About Eleven hundred and eighty-five patients were included in this study from the period of 2016-2020. Criteria of inclusion were the removal of at least one or more than one mandibular third molar tooth. Exclusion criteria included preexisting sensory disturbances due to previous orthognathic surgery and mandible fractures likely to have inferior alveolar nerve affected. Patient with preexisting psychological conditions was also excluded from the study.

The patient's biographic data, relevant medical and dental history were recorded on customized Performa. All the patients were examined by the consultant and panoramic radiographs were used to assess the surgical difficulty by means of WHARFEE assessment. The type of anesthetic modality was also noted. A surgical procedure was explained to all patients and informed consent was taken. All surgical extractions of lower third molars were performed by the same consultant under local anesthesia or IV sedation with local anesthesia. In the case of local anesthesia, inferior alveolar nerve block and infiltration on the buccal side was given with epinephrine 1:80000. In case of IV sedation with local anesthesia, Midazolam was used on a titration basis. An intrasulcular mucoperiosteal flap with a lateral releasing incision on the buccal side was given. A periosteal elevator was placed on the lingual side to prevent injury to the lingual nerve. Minimal or no retraction was done on the lingual side. The external oblique line was preserved whenever possible. Bone was removed from buccal and distal side and a tooth was sectioned when necessary. Luxation/ elevation of tooth, irrigation, bone smoothening was done and sutures were placed. Bilateral removals were performed in the same setting. Postoperative antibiotics and analgesics were given for 5-7 days. Patients were advised to do warm saline rinses for 3-5 days. Postoperative instructions were given verbally and in written form and patients were recalled after two weeks.

On the first follow-up visit, evidence of nerve injury was recorded. Postoperative nerve damage was assessed by asking the standard questions: Is the feeling on lip and chin normally? If the inferior alveolar nerve was affected, the second question was: Do you feel abnormal sensation in lip only or in both lip and chin. The patient was also asked about the type of sensation: numb, tingling or pain. Patients with altered sensations were followed up for six months.

The collected data was stored and analyzed in SPSS version 23 for windows. Patients were divided into five age groups (11-20, 21-30, 31-4 , 41-50 and 51 or above). The outcome variable was the postoperative status of inferior alveolar nerve coded as "normal" or "abnormal" confirmed by subjective analysis. Nerve deficit due to third molar removal was stratified among age group, gender, indications for removal and tooth involved(left, right lower third molar or both) and anesthetic modality using chi-square test to see the effect modifications.P value $\leq$ 0.05 was taken as significant.

RESULTS

In this study a total 185 patients were enrolled. A total number of surgical extractions done was 1487. The female gender was predominant with 734(61.9%) cases. Most of the patients were between 21 and 40 years; 633 (53.4%) between 21 to 30 years

and 405 (34.2%) between 31 and 40 years. The mean age of patients was 30.7 ± 8.1years (Table 1).

The main indications were recurrent pain;811(54.5%), pericoronitis;385(25.9%), orthodontic reasons;135(9.1%) and grossly carious;123 (8.3%). There were 400 (26.9%) patients whose lower left molar teeth were involved, another 483 (32.5%) had lower right involvement while in 302 patient, both teeth were involved and in these patients 604 teeth were extracted (40.6%). In majority of the cases local anesthesia was given 854 (72.1%) while in 331(27.9%) patients, IV sedation was utilized. Table 2 The overall Frequency of temporary inferior alveolar nerve deficit was seen in 8 cases while no case of permanent nerve deficit was seen. The temporary nerve damage was settled within six weeks to three months. Details in Table 3.

Further analysis was done to measure the association of demographic and clinical features with the temporary nerve damage. Gender distribution was slightly variable between patients with and without nerve damage, females were more likely to have temporary nerve damage post-procedure 75% vs. 61.9% whereas males were less likely to experience it 25.0%vs.38.1% (P-value, 0.59). Age distribution was found equal in both nerve damage and without nerve damage categories; (P-value, 0.91).Table 4.Patients having indications of pericoronitis and recurrent pain were significantly associated with temporary nerve damage whereas those with indications of gross caries and orthodontic reasons were less likely to experience any nerve damage. There was no nerve damage associated with indications like cystic removal, prophylactic removal and internal resorption. These findings were highly significant; p-value <0.001. Proportionately, lower left third molar teeth were more likely to experience temporary nerve damage 62.5 % vs. 37.5%, however, this difference was not statistically proven. Table 5.Similarly, local anesthesia was found more related to temporary nerve damage (100.0%), however this was also not proven statistically significant p-value, 0.51.

DISCUSSION

Neurosensory damage is the most important postoperative complication after lower third molar removal. Either inferior alveolar nerve or lingual nerve is affected, resulting in lip, chin and tongue nerve damage along with loss of taste sensation.[17]

The frequency of permanent inferior alveolar nerve after lower third molar removal ranges from 0.5% to 8%.[8] Another study has a reported incidence of nerve damage during removal as 0.27-8.4%.[18] Robinson et al did a study on 300 patients and reported incidence of inferior alveolar nerve damage to be 1.3%. Howe and Poyton extracted 1355 teeth and nerve damage was observed to be 5.2%.[19] Carmichael and colleagues performed removal of 1339 third molars and inferior alveolar nerve deficit was 5.5% at six to twenty four hours and 3.9% at seven to ten days.[19] In our study the Frequency of temporary nerve damage was 0.53% and permanent nerve damage was 0.0%. To the author's knowledge, this study has the biggest published sample and it is the only study in Pakistan that has evaluated the prevalence of inferior alveolar nerve deficits after third molar removal in the region. The frequency of temporary inferior alveolar nerve deficit was 0.53%, much lower than most studies done previously on international level. This suggests that lower third molar surgical procedures in author's center better than the international standards.

Table 1: Demographic features of patients n=1185

Gender	No of cases	%age
Female	734	61.9
Male	451	38.1
Age years		
11-20	34	2.9
21-30	633	53.4
31-40	405	34.2
41-50	75	6.3
51 or above	38	3.2

Table 2: Clinical presentation of patients

Indications of removal of each tooth	No:	%age
Recurrent pain	811	54.5
Pericoronitis	385	25.9
Orthodontic reasons	135	9.1
Grossly carious	123	8.3
Cystic lesion	10	0.7
Prophylactic	19	1.3
Internal resorption	4	0.3
Teeth involved		
Lower Left third molar	400	26.9
Lower right molar	483	32.5
Both(left and right lower third molars)	604*	40.6
Anesthetic modality of the patients		
Local Anesthesia	854	72.1
Iv Sedation plus LA	331	27.9

Table 3: Incidence of Temporary and permanent nerve deficit

Number of Removals	Temporary Nerve deficit	Permanent Nerve deficit
1487	8(o.53%)	0 (0.0%)

Table 4: Association of age and gender with nerve damage

	No nerve damage	Nerve damage n=8	p-value
Gender			
Female	728(61.9%)	6 (75.0%)	0.59
Male	449 (38.1%)	2 (25.0%)	
Age years			
11-20	34 (2.8%)	0 (0.0)%	0.91
21-30	628 (53.6%)	5(62.5)%	
31-40	403 (34.2%)	2 (25.0%)	
41-50	74 (6.2%)	1 (12.5%)	
51 or above	38 (3.2%)	0 0.0%)	

Table 5: Association of clinical features with temporary nerve damage

Indications	No nerve damage N=1177	Nerve damage N=8	p-value
Recurrent pain	809(54.69%)	2 (25.0%)	<0.001
Pericoronitis	381(25.87%)	4 (50.0%)	
Ortho	134 (9.06%)	1 (12.5%)	
Grossly carious	122(8.24%)	1 (12.5%)	
Small cystic lesion	10(0.67%)	0 (0.0%)	
Prophylactic	19(1.2%)	0 (0.0%)	
Internal resorption	4(0.27%)	0 (0.0%)	

Table 6: Site of teeth inoloved

Teeth Involved	No nerve damage	Nerve damage	p-value
Lower Left third molar	395 (33.5%)	5 (62.5%)	0.21
Lower right molar	480 (40.7%)	3 (37.5%)	
Both	302 (25.6%)	0 (0.0%)	

Increase in age been associated with higher risk of nerve damage in third molar removal.[20] Studies by Black showed a strong association among age and inferior alveolar nerve damage and suggested earlier removal of 3rd molars.[21] Investigations done by Bruce et al showed that there is increase in surgical morbidity as the patient age increases.[16] Chipasco believes that this is because there is decrease in elasticity of bone with increase in age.[22] Germectomy during adolescence has been advocated by some authors to reduce the chances of nerve deficit after removal.[22, 23] However in our study, there was no significant relationship found between age and nerve injury which is consistent with many other studies.[24-26] As there is no significant association of nerve damage with prophylactic removal of third molars so we do advocate prophylactic removal of third molar.

A few studies have concluded that females have increased risk of nerve deficit after third molars surgery.[18, 27] Nakagawa et al reported that the reason for this is that the thin mandibular corticalization in females result in lesser distance between teeth and canal, which enhances the chances of nerve damage.[27] In our study, females also had more temporary nerve damage as compared to males but the differences were not statistically significant.

The common reported indications for third molar removal include caries, pericoronitis, odontogenic cysts and orthodontic reasons like crowding.[28] Our study showed similar results. The main indications for third molar removal were recurrent pain, pericoronitis, orthodontic reasons and gross caries. Patients having indications of pericoronitis and recurrent pain were significantly associated with nerve damage (p value <0.001) whereas those with gross caries and orthodontic indications were less likely to experience nerve damage. Increased nerve damage in cases of periocoronitis and recurrent pain can be explained by the fact that pericoronitis is commonly associated with distoangular or deeply impacted teeth which are difficult to remove and need sectioning. Tooth sectioning and excessive bone removal predispose to nerve injuries more as compared to atraumatic removal.

In previous studies, right sided molar teeth were more commonly removed as compared to left.[9] This was consistent with our findings as well. In our study, lower left third molar teeth were more likely to experience temporary nerve damage 62.5% vs. 37.5%, however, this difference was not statistically proven.

In the literature, permanent nerve damage is more commonly observed in cases operated under general anesthesia.[25] However there was no statistical difference in temporary and permanent nerve damage associated with patients operated under IV sedation and local anesthesia in our findings. This shows that careful technique and experience of surgeons is more important than anesthetic modality to prevent nerve associated complications.

Inexperienced surgeons are also considered as a risk factor for postoperative nerve injury. Sisk et al reported that the less experience the surgeon is, more frequent are the complications.[29] Various authors have found significantly higher rate of nerve damage in procedures performed by trainees. On the contrary, studies done by K Rehman showed no significant relationship between nerve damage and seniority of operator.[30] In our study, all the procedures were carried out by single senior consultant and the frequency of temporary nerve injury was quite low compared to literature. Moreover, no frequency of permanent nerve damage was seen in our study.

CONCLUSIONS

Incidence of temporary inferior alveolar nerve injury (0.53%) in our study was low compared to similar studies. Pericoronitis is significantly associated with post removal nerve damage. In patients coming for removal due to pericoronitis, CBCT shall be utilized for nerve relationship to tooth and careful surgical technique shall be employed. Detailed counseling of patient shall be done preoperatively and postoperatively to avoid litigation.

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