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Coronectomy of Impacted Lower Third Molar in Close Proximity to Inferior Alveolar Nerve: Evaluation of Outcomes and Complications After One-Year Follow-Up

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Author`s Contribution

[1,2]Substantial contributions to the conception or design of the work; or the acquisition, analysis or interpretation of data for the work, [2]Final approval of the study to be published, [3,4]Drafting the work or revising it critically for important intellectual content, [5,6]Active participat,3ion in active methodology,

Funding Source: None
Conflict of Interest: None

Received: Sept 26, 2024
Accepted: Jan 10, 2024

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ABSTRACT

Objectives: This current study was performed to evaluate the outcome after coronectomy of mandibular third molars in terms of complications met during or after the procedure, IAN injury, root migration and need for re operation.

Methodology: This present clinical study was conducted in Oral and Maxillofacial Surgery Department of private dental hospital of Islamabad for 02 years from June 2022 to June 2024. Forty-five mandibular third molars of patients having high risk of IAN injury between the age group of 18 to 45 years, were involved in the study. Preoperatively the lower third molars were assessed clinically and radio graphically. Coronectomy was done and primary closure was achieved. Patients were evaluated postoperatively at 01 week, 06 months and 01 year. Post-operative pain, IAN and lingual nerve injury or any other complications were observed and recorded.

Results: Not a single patient had IAN and lingual nerve injury. Although 03 patients had infection at the coronectomy site after few months and required another surgical removal. However, 3 of our patients were categorized as failed coronectomy due to intra operative mobilization of roots, which were were removed.

Conclusion: The procedure of Coronectomy is effective in avoiding inferior alveolar nerve injury following removal of lower third molars in high risk cases with very low prevalence of complications.

Keywords: Impacted mandibular third molar, Coronectomy, Inferior alveolar nerve, Inferior alveolar nerve injury.

Cite this article as: Aslam F, Farooq U, Farooq N, Ain-us-Saba, Shuja E, Bibi J. Coronectomy of Impacted Lower Third Molar in Close Proximity to Inferior Alveolar Nerve: Evaluation of Outcomes and Complications After One-Year Follow-Up. Ann Pak Inst Med Sci. 2024; 21(1):87-91. doi. 10.48036/apims.v21i1.1428.

Introduction

Mandibular third molars(MTM) are considered the most commonly impacted teeth in humans. The surgical extraction of MTM, being one of the most regularly performed dentoalveolar procedures is allied with various post-operative sequelae. A well-recognized grave complication of surgical extraction of MTM is inferior alveolar nerve (IAN) injury, resulting in nerve dysaesthesia or sensory deficit.[1] These sensory disturbances results in problems with mastication and speech and may coldly shake the patient's life quality and are also most numerous causes of litigation and complaints.[2] Various Risk factors for IAN injury have been identified like advanced age, patient's gender and cutting of the bone required in surgery guided by the difficulty index, but an vital risk factor is the third molar proximity to the IAN canal and the occurrence of direct connection between IAN and roots of the tooth.[3] The most commonly used radiographs for preoperative assessment of patients undergo surgical extraction of mandibular impacted teeth are Periapical x-ray and

orthopantomogram (OPG) often labeled as the standard diagnostic imaging technique in clinical practice.[4]

Coronectomy initially proposed by Debien and Ecuyer[5] in 1984 avoids damage of the nerve as it eludes the IAN canal by safeguarding roots retention which are adjacent to the canal.[3] According to studies it has been proven that the risk of damage to IAN decreases with coronectomy in comparison to the routine extraction.[6] In spite of numerous studies supportive of effectiveness of coronectomy, the procedure remains debatable due to the likelihood of infection and other odontogenic pathology resulting from the remaining roots.[7]

The aim of our study was to evaluate the outcome of coronectomy of in terms of complications met during or after the procedure, infection rate, IAN injury, root migration and need for re operation.

Methodology

This present clinical study was conducted in Oral and Maxillofacial Surgery Department of private dental hospital of Islamabad for 02 years from June 2022 to June 2024. Hospital ethical committee approval was received before the starting the study. Patients were selected from the Oral & Maxillofacial Surgery department. After thorough explanation of the procedure, Informed consents of the patients was taken on consent form. Demographic profile (age, gender, address) was recorded on the performa.

The study comprised of the patients who were judged to be at high risk of injury to IAN, based on roods criteria such as the proximity of the MTM to the IAN canal as determined by routine dental radiographs including periapical view and panoramic image. These features comprised of darkening of the root, deflection of the root, narrowing of the roots, bifid root apex, canal diversion, canal narrowing, and disruption of lamina dura. Exclusion criteria of the study was patients predisposed to local infection (such as those with diabetes, immunocompromised conditions like HIV and undergoing chemotherapy, previous head and neck radiotherapy, osteopetrosis or osteosclerosis), patients with non-vital and carious third molars, those with former or existing inferior alveolar nerve defects, and patients with neuromuscular disorders.

Patients who were selected for coronectomy, were made mindful of the procedure and the possibility of post-operative problems including pain, infection, migration of the root, reoperation and intraoperative failure of coronectomy procedure.

Patients' assessment was done by clinical and radiographic examination. The procedure was performed by single operator i.e. the researcher. After securing local anesthesia Full thickness mucoperiosteal flap was elevated. Buccal osteotomy was done till full crown exposure was achieved. Coronectomy procedure was done by performing tooth transection with the help of fissure bur with controlled force. The pulp was left untouched after crown has been detached. While performing the procedure, if the roots became mobile or unintentionally removed, it was reflected as a failed coronectomy. The socket irrigation was done with normal saline and mucoperiosteal flap closure done with 3/0 vicryl suture. Patients were prescribed antibiotics and analgesics post-operatively for 05 days. The function of IAN was assessed after one week by objective and subjective neurosensory testing done by light touch test, two-point discrimination test and pain threshold test. These patients then followed up after 06 months and 01 year, to assess the outcomes of coronectomy of MTM in terms of complications such as Inferior alveolar nerve injury, bone formation, root migration and requirement for re-operation. The distance between the root apex and IAN canal, including the distance among the sectioned crown of the 3rd molar and the 2nd molar were recorded on a standardized intra oral radiograph for assessment of migration of root. If the remaining roots required removal at a later date due to infection or exposure, again IAN damage was assessed by neurosensory testing.

Patient operational outcomes were concised by linked complications by means of descriptive statistics. Percentages and Counts were used to summarize categorical variables.

Results

A total of 44 patients (male and female ranging in age from 18 to 46 years) who wanted removal of MTM, whose apices of the root had adjacent approximation with the IAN canal were included in the study. 27.6 year was found to be the mean age of the patients. Coronectomy was done on 44 MTM. Out of 44 patients, 03 patients had failed coronectomy and the mobile roots were extracted. All of the failed coronectomy cases were female patients having conical root morphology. None of the patients developed IAN and lingual nerve injury. In all patients healing of the procedure site was uneventful, except 1 case in which patient developed dry socket which after

symptomatic treatment was healed within a week. Three of our patients started having pain at the coronectomy site after 3 to 4 months of the procedure. They underwent root removal at 6, 8 and 10 months respectively. All patients accomplished a minimum of one year follow up. Of the 42 asymptomatic teeth, radiographic assessment showed coronectomy was satisfactory in all cases. Bone growth around the retained roots were observed in 12 of our cases and root migration estimated 1mm-2mm away from the nerve was observed in 8 of our cases at 01 year follow-up. Second surgery required in Three of our patients due to pain and discomfort at coronectomy site and none of them developed IAN nerve injury after reoperation.

Table I: Coronectomy complications and associated number of operating sites.

Complications	No of teeth
Mobility of the root fragment during surgery	3(6.8 %)
Delay healing/dry socket	1(2.27%)
IAN injury	0
Injury to Lingual nerve	0
Damage to neighboring structures	0
Bone formation	12(27%)
Migration away from Mandibular canal	8(18%)
Reoperation of the remaining fragments	3(6.8%)
IAN and LN injury after reoperation	0

Figure 1. Pre op lower right 3rd molar.

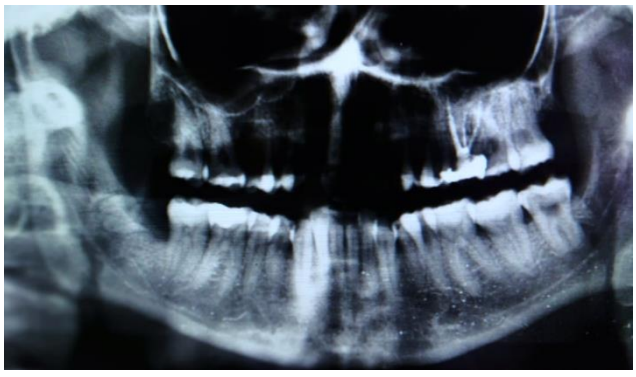

Figure 2. Immediately post op.

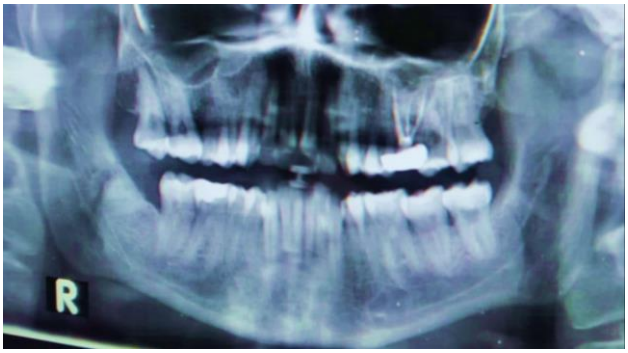

Figure 3. year post-operative.

Discussion

Injury to IAN is a well-known serious complication of prophylactic or therapeutic MTM extraction. The risk of injury to inferior alveolar nerve increases immensely, when the lower third molar root have close approximation to the nerve canal as identified by the Rood's Criteria. It is important to do pre-operative assessment to prevent inferior alveolar nerve injuries while performing surgical removal of impacted MTM.

Coronectomy has been promoted to lower the incidence of IAN injury in cases having MTM roots in juxtaposition to the canal with mutable outcome. Coronectomy procedure is a rational and safe treatment substitute for high risk patients according to many authors.[8,9] This procedure captivated unusual consideration in the last decade, because of its reported advantage and success rate, in disparity to the current acceptance that the remaining roots will cause problem. Numerous studies have shown that coronectomy expressively reduces the risk of iatrogenic IAN injury, with many studies also suggestive of a lesser complications.[10]

In our study coronectomy was done in 44 patients having impacted third molars. This study was conducted in department of oral and maxillofacial surgery. It was designed in a way to gauge the success and the associated complications of coronectomy as an alternate to surgical removal of impacted MTM, carrying a high risk of damage to the IAN. In this study female to male ratio was 1:1, this finding is comparable to the studies carried out by Dolanmaz D et al., and Hatano Y et al., [11,12] Our study showed slightly higher female predilection of impacted MTM with close proximation to the IAN having a male to female ratio of 1:1.2.

Inferior alveolar nerve injury was not observed in any of our patients who underwent coronectomy. The finding is

similar with Rentol et al.[13], who compared the incidence of IAN injury as a result of conventional removal of lower third molars and coronectomy in a randomized controlled clinical trial. His conclusion was that the coronectomy conserves the Inferior alveolar nerve without adding the risk of infection or dry socket. According to literature some studies account 0% permanent IAN injury, however according to other authors the rates ranging from 0.5 to 3.5%.[14 15 16]

In literature root mobilization has been defined as the most common intraoperative coronectomy complication. In our study we also observed 3(6.8%) patients of failed coronectomy due to mobilization of roots during the surgical removal in our series, which can be the outcome of the technique utilized for tooth sectioning. Root mobilization takes place when substantial force is used during the procedure to fracture the tooth crown. This complication can be avoided by using a Piezzo instrument with angulated cutting head which warrants clean sectioning of the coronal portion of the tooth, needing decreased force to remove the crown of the tooth. In our study all 3 cases of failed coronectomy were females having conical roots. Intraoperative challenges may arise due to inadequate case selection concerning root morphology, particularly short and conical roots. Removing horizontally impacted wisdom teeth below the crestal bone by 3 mm presents procedural difficulties. Conical roots are more susceptible to intraoperative movement after crown removal. In addition to the association with the IAN, careful consideration of root angulation, morphology, and operator expertise is essential when evaluating coronectomy as a management strategy for lower third molars.[17]

The most frequently observed and reported enduring consequence of coronectomy is root's coronal migration,[18,19] which is often asymptomatic and is seldom a cause for re-operation. In our study coronal migration occurred in 18 % of our cases. This finding is different in literature ranging from 5.3 %[3] to 85 %.[12] Singh et al.[20] and Kang et al.[21] in their studies found that over half of the roots migrated rapidly during the initial 3–6 months after surgery, with migration rates gradually decreasing afterward until stabilization about 12 to 24 months, attributed to deposition of bone and connective tissue coverage. They observed root migration distances from the IAN canal ranging from 2.33 mm to 3.43 mm within the first six months postoperatively.

In our study re-operation rate was 6.8% which is in line with other studies showing reoperation rate ranging from 0.5 to 11.8%.[22,23,24] Renton et al. revealed 0% of re-operation rates. In our study there was no IAN damage after re operation.

This study suggests that coronectomy may offer a simpler, easier, and potentially more effective alternative to traditional extraction method for diminishing the risk of injury to the IAN and other post-operative complications associated with impacted molars. However, the duration of this study is insufficient to evaluate the possibility of late eruption, which can happen up to 10 years after coronectomy. A longer follow-up duration is necessary to measure the outcomes of retained roots, which could potentially erupt, cause delayed infections, or necessitate later removal.

Conclusion

Coronectomy is preferred over surgical extraction in specific cases where the MTM roots are closely associated with the IAN, resulting in fewer complications.

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