

Clinical and Radiological Evaluations of Coronectomy for Impacted Mandibular Third Molars

Dr. Prasanna Kumar P

Professor and Head of the
Department Oral And Maxillofacial Surgery, Coorg
Institute Of Dental Sciences, Virajpet Karnataka

Dr. Joon Sunil

PG Trainee Department Of Oral
And Maxillofacial Surgery ,Coorg Institute Of
Dental Sciences, Virajpet Karnataka

Dr. Jambu Keshwar Kumar B

Associate professor Department Of Oral And
Maxillofacial Surgery, Coorg Institute Of Dental Sciences,
Virajpet Karnataka

Dr. Swathi Priya V V

PG Trainee Department Of
Oral And Maxillofacial Surgery Coorg Institute Of
Dental Sciences, Virajpet Karnataka

Dr. Shreya HR

PG Trainee Department Of Oral
And Maxillofacial Surgery Coorg Institute Of Dental
Sciences, Virajpet Karnataka

Abstract:-

Introduction: The Coronectomy is a popular approach used in surgical removal of an impacted wisdom teeth which is in close proximity to the Inferior alveolar canal. Over the years many surgeons performed this technique to remove mandibular third molars which is in proximity to the IAN canal. The first published description of coronectomy was by Ecuver and Debien in 1984. The aim of the study was to observe and assess the surgical outcome of coronectomy. Thus this study aims in assessing the prognosis of coronectomy and to evaluate the effectiveness of coronectomy in protecting IAN, to estimate the incidence of injury, to assess the intensity of pain, to ascertain possible post-operative complications and the long term behavior of retained roots.

Materials and Method: In the present study we included 8 healthy individuals with consent in the age group of 18 to 35 years who were indicated to undergo coronectomy for lower third molars which is nearer to the Inferior alveolar nerve canal under local anaesthesia at department of Oral and Maxillofacial surgery, Coorg Institute of dental sciences.

Results & Conclusion: After statistical analysis the result revealed that coronectomy could minimize the injury to Inferior alveolar nerve. Coronectomy seems to be a good option than conventional method when tooth is adjacent to the Inferior alveolar nerve canal.

Keywords:- Coronectomy. Nerve damage.

I. INTRODUCTION

Removal of Impacted wisdom teeth is a commonly performed procedure for therapeutic or preventive procedure. The prevalence of Impacted lower third molars are of 33% to 58.7%¹. Third molar eruption and continuous positional changes after eruption can be related not only with the race but also with the nature of diet, the intensity of the use of the masticatory apparatus, and possibly due to genetic background. Many theories were proposed for impaction such as phylogenetic theory, Mendelian's theory, Nodines theory, pathological theory, Endocrinal theory and orthodontic theory².

The mandibular molar Impaction can be due to the inadequate space between the distal aspect of second molar and anterior border of ascending ramus of the mandible. Inferior alveolar nerve (IAN) injury is known for its complication of surgical removal of deeply impacted lower third molars concerning patients and clinicians alike.³ In the beginning of the third molar surgery, Surgeons were aware of the risk of Inferior alveolar & lingual nerve injury. Incidence of Inferior alveolar nerve injury Ranges from 0.4% to approximately 8.4%³.

Surgical procedure tends to lower these risks which gains the attention of patients and dental surgeons contemplating elective third molar removal, Several researchers have tried to correlate radiographic markers to the relationship between the IDN and the root of the tooth. The aim is to minimize the degree of trauma to the patient with a reduction in post-surgical complications and enhanced clinical outcome. It is a conservative surgical procedure.

A. Aim & Objectives

The goal of the present study was to assess both clinical and radiological evaluations of the surgical outcome of coronectomy of the impacted mandibular third molars in which the roots were in close proximity to the IDN, in terms of associated surgical complications and neurosensory disturbances and to ascertain possible post-operative complications and management of the same.

II. METHODOLOGY

The present study is a prospective study, in which we have included 8 healthy consenting individuals of age 18-35 years who were indicated to undergo surgical coronectomy of mandibular third molars under local anaesthesia.

Healthy adults between 18 to 35 years of age, Patients who are having impacted third molars., Patients who consented to the study protocol., Patients with risk of nerve injury during the procedure which was assessed by the radiography (OPG) were included in the study whereas medically compromised conditions such as diabetes, chemotherapy, previous radiotherapy, immunological diseases, Patient with any plan for orthognathic surgery, Teeth associated with periapical pathologies, periapical cystic or neoplastic lesions, Roots that become mobile during the procedure are excluded as it acts as an external agent and becomes a source of infection or migration, Pregnant and lactating mothers & Patients with alcoholism, drug abuse and smoking were excluded from the study.

All patients were operated by same surgeon using same technique. Every patient underwent pre-surgical preparations consisting of case history, clinical evaluations, complete hemogram and both preoperative and post-operative radiological evaluation. All patients were undergone routine hemogram before the procedure and under standard aseptic conditions, and were painted intraorally and extraorally with 5% Betadine and draped. Patients were anaesthetized with 2% of lignocaine hydrochloride and 1:80000 adrenaline by administering Inferior alveolar nerve block, lingual nerve block and long buccal nerve blocks. A full thickness mucoperiosteal flap was raised by placing a Wards incision to expose the buccal bone and the impacted mandibular third molar tooth. A 702-type fissure bur is used to achieve buccal guttering under copious saline irrigation adjacent to buccal side of the tooth to expose the amelo-cemento junction. Crown of the tooth was transected at an angle of 45°. The same bur is then used and drilled in to the pulp at the buccal groove intersection. The incision is then lateralized to form a horizontal groove in the tooth.

The size of the incision should be into the pulp followed by lateralized and not more than the length of the fissure bur in order to avoid perforation of the lingual and cortical plate, the distal and mesial aspects of the tooth.

Too much torque to the tooth at this point should be avoided so the risk of root mobilization is reduced. The crown of the mesio-angular impacted tooth may be needed further sectioning to avoid damage to the second molar tooth. A rose head bur is used to remove enamel spurs and to take the remaining level of the root a 2-3 millimeters below the alveolar crest. The pulpal tissue should be left untouched and untreated during smoothening of the tooth surface in order to maintain the vitality of the root. Then the area is irrigated with

saline, ensure all debris is removed and closed primarily with tension free interrupted sutures (4-0 vicryl). Patients were prescribed standard Amoxicillin and potassium clavulonate combination antibiotics for 5 days followed by analgesic, Aceclofenac with Paracetamol combination for 3 days postoperatively. Patients were evaluated on the immediate post-operative, 1st, 3rd, 7th post-operative day and 2 months after the day of surgery.

Variables were taken as post-operative bleeding during immediate Post-operative, 1st day, and 7th post-operative visits, pain was assessed during immediate Postoperative, 1st day, and 7th post-operative follow up day, wound healing was checked during the 3rd and 7th post-operative days and Inferior alveolar nerve sensory deficit were assessed on 1st day post-operative, 3rd day post-operative, 7th day post-operative and 2 months post operatively.

Postoperative bleeding was recorded as (Visual Analog scale)⁴²

- 0- No Bleeding
- 1- Oozing
- 2- Accidental low bleeding
- 3- Continues low bleeding
- 4- Massive bleeding.

Absence of pain was assessed as 0 to 10 expressed as maximum pain.

- 0- Absence of pain
- 1-pain assessment less than 5
- 2-pain assessment greater than 5

The patients were given a subjective pain scale ranging from 0 to 10 (Visual analog scale – won baker scale).⁵ Healing of the wound was checked on the 3rd and 7th day after the procedure. Wound healing was assessed according to the Landry and Turnbull criteria.³²

- Score 1- Very poor
- Score 2- Poor
- Score 3- Good
- Score 4- Very Good
- Score 5- Excellent

Light touch test is used to test tactile stimulation by gently touching the skin. Cotton wisp is used for the test and evaluating the threshold of the patients.

A. FIGURES



Fig. 1: (A)



Fig. 1: (B)



Fig. 1: (C)

Fig. 1: A. Intra operative site, B. sectioned crown, C. suturing of the area

III. RESULTS

The patients were followed up on the immediate postoperative, 1st day, 3rd day, 7th day and 2 month for postoperative periods for signs and symptoms of bleeding, pain, wound healing and altered sensation. All the results were accurately recorded and statistical analysis was done using Chi-Square test.

The age of the patients included in our study was between 18 years to 35 years. The mean age of the patients was 27.

A. POSTOPERATIVE BLEEDING:

Comparison of postoperative bleeding between immediate postoperative day, 1st day postoperative, 7th day postoperative is shown in Table-1. During immediate postoperative day, 3 patients had oozing and score was 1.

		Mean Difference	SE	T	p Value
Immediate	First day	0.500	0.154	3.240	0.018
	Seventh day	0.500	0.154	3.240	0.018
First day	Seventh day	-2.220e-16	0.154	1.439	1.000

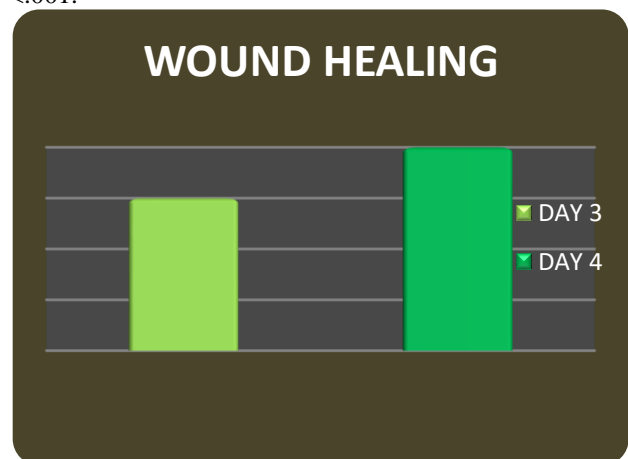
Table 1: Post hoc comparisons – Bleeding

B. PAIN:

Pain was assessed based on visual Analogue scale. On the immediate postoperative day, 5 patients had pain and 3 patients had no pain. Pain assessment was found to be <5 (87.5). When pain was assessed on 1st day postoperative all the patients (100%) had no pain and the score was 0 (12.5%). When the patient was assessed on 7th day postoperative all the patients (100%) had no pain and the score was 0(12.5%). This was found to be highly significant with a p value of <.001.

C. WOUND HEALING:

Wound healing was assessed on 3rd day and 7th day postoperative using Landry criteria. Wound healing was good for all the patients (100%), and the score was given 3 on 3rd day postoperative with a mean rank of (.00). Wound healing was very good for all the patients (100%), and the score was given 4 on 7th day postoperative with a mean rank of (.00). This was found to be highly significant with a p value of <.001.



Graph 1: Comparison of wound healing

D. ALTERED SENSATION:

Altered sensation was assessed on 1st, 3rd, 7th and 2 months postoperatively and there was no injury to Inferior alveolar nerve for all patients (100%). The test used here was Pinprick and Light Touch Test, all patients had normal sensations. The cumulative percent was 100.

IV. DISCUSSION

The reported frequency of IDN deficit after wisdom tooth surgery has ranged from 0.4% to 8.4%.⁷ A notable risk of this procedure is permanent or temporary diminished sensation to the skin of the chin, lower lip, teeth and gingiva on the surgical side caused by damage to the Inferior alveolar nerve.⁸ Possible mechanism of nerve injury in a patients who suffered sensory deficits after third molar surgery with an intact IAN bundles include compression injury or crush injury.⁹

Adverse effects regarding such events is very commonly assessed by radiographic evaluation as a part of the treatment planning on an OPG. Research had stated that on a panoramic diversion of the inferior alveolar canal, darkening of the root, interruption of white lines, narrowing of the canal, deflection of the root indicated a possible nerve relationship to the tooth.⁸

In a prospective study by **Rood and Shehab** in the year 1990 of 125 impacted teeth, with pre-operative radiological signs suggested an increased risk of nerve involvement, 14% developed a nerve injury.¹¹

IAN injury should be prevented and the mandibular third molars approximate to the inferior alveolar canal should be extracted carefully as trigeminal sensory neuropathies result in long term disability of the patient.¹²

Coronectomy (partial tooth removal, deliberate vital root retention & partial odontectomy) has become a routine oral surgical procedure with the aim to minimize the risk of IANI in relation to removal of high risk impacted mandibular third molars.¹² The technique of coronectomy has been studied in the past. The first description of this technique was by Ecuyer and Debien in 1984. Coronectomy of impacted teeth is significantly safer than conventional total removal when the impacted third molar shows radiographic signs of close proximity of the IDN to the root.⁷

In 2009 **Renton T** has observed a root migration of about 8 percentage of the tooth in coronectomy cases with a migration distance of 2mm. Case reports suggest that it can take years for the root fragments to erupt but the advantage is that they can be easily removed under local anaesthesia without the risk of the nerve.¹²

Porgel MA in 2007 has shown that in 30 percent of the cases there is a genuine coronal migration of the root fragments away from the Inferior alveolar nerve. Coronectomy (partial tooth removal, deliberate vital root retention & partial odontectomy) has become a routine oral surgical procedure with an aim to minimize the risk of IANI in relation to removal of high risk impacted mandibular third molars.¹² The technique of coronectomy has been studied in the past.

In this prospective study we included 8 healthy consenting individuals of age group of 18-35 years who were indicated for coronectomy under local anaesthesia as their radiographs revealed a close proximity of the mandibular third molar roots to the IAN.

Bleeding can occur from pulp after removal of crown or from the bone or may occur due to poor healing. In our study bleeding was assessed by VAS Scale. Three patients had bleeding from the pulp during immediate post-operative period which was controlled by pressure packs. When bleeding was assessed on 1st post-operative day, none of the patients had bleeding (100%) and the score was 0 and on 7th post-operative day too none of the patients had bleeding (100) and the score being 0. This was found to be highly significant with a p value of 0.018.

Subhadeep Mukherjee, Bhaskarapandiyan Vikraman in their study on evaluation of the outcome following coronectomy found that one patient had profuse bleeding intra-operatively which can be possible manipulation of Inferior alveolar canal and subsequently the bleeding was under control by pressure application and placement of oxidized cellulose.¹³

Surgical removal of bony impacted mandibular third molars carries a higher risk of postoperative complications than all other extractions, one of such post - surgical morbidity expected after third molar surgery is pain. The post-surgical pain begins when the effects of the local anaesthesia weaken off and reaches peak levels in 6 to 12 hours. Pain is assessed with visual analog scale of 10 units.

In our study on the immediate postoperative day, 5 patients had pain and 3 patients had no pain. Pain assessment was found to be <5. When pain was assessed on 1st day postoperative no patients (100%) had pain and the score was 0. When the patient was assessed on 7th day postoperative no patients (100%) had pain and the score was 0. The mean VAS score was significantly lower in our study. Pain was assessed with a visual scale analog.

Our results are similar to a study by **Yuko Hatano & Kenichi Kurita** in 2009 which revealed that the occurrence of postoperative pain was greater in coronectomy group which might have been due to tight closure, high pressure inside the wound²³ however; all pain had decreased within one week post- surgery.

In the present study we also assessed wound healing on 3rd day and 7th day postoperative by Landry criteria.¹⁵ Wound healing was found to be good for all the patients (100%), and the score was 3 on 3rd post- operative day. Wound healing was very good for all the patients (100%), and the score was 4 on 7th day postoperative. In our study none of the patient had signs of dry socket or infection and the healing was uneventful. Our results were similar to **Yiu Yan Leung & Lim K Cheung**⁷ study on safety of coronectomy where no case of dry socket noted.

Another post- operative complication of third molar surgery is neurosensory disturbances which can lead to permanent or transient sensory damage of the inferior alveolar nerve. Patients suffer from varying degrees of the following symptoms: numbness in the chin, lower teeth and lower lip with biting injuries, problem with Chewing, Difficulty to control food and liquid.

In our study the Inferior alveolar nerve injury was assessed by Light touch and pin prick test with a scale such as normal or abnormal sensation in it. The region we tested with both techniques was lower lip and chin asking the patient whether sensation is Normal or Abnormal.⁹ The outcome of Inferior alveolar nerve injury was evaluated in all the follow up that is 1st day postoperative, 3rd day postoperative, 7th day postoperative and 2nd month postoperatively and the incidence of Inferior alveolar nerve injury was 0 percent with 100 percent success rate and there was no altered sensation seen in any individuals post coronectomy.

The results of our study was consistent with the study by *Yiu Yang & Lim K.Cheung* in the year 2009 on safety of coronectomy versus extraction of wisdom teeth where they found significantly lower rate of IDN deficit for coronectomy than for total extraction of the third molar.⁷

No patients had suffered IAN injury after coronectomy. This reduction in the injury to the IAN in the study was in accordance to Renton et al. Coronectomy is a surgically efficient, proved and evolving technique that minimizes IAN injuries. Patient's acceptance is difficult for coronectomy and time should be taken to explain the risks and benefits of the procedure. Coronectomy prevents the nerve canal by confirming retention of the roots when they are close to the canal as evaluated using radiographs.¹⁴ In the study we conducted the crown was sectioned at cement enamel junction, with the remaining enamel grinded off at 2-3 mm below alveolar crest level. The enamel act like a foreign body, which is a cause of infection as the socket is not healed yet. Root fragments at least 3mm inferior to the crest of bone seems appropriate and appears to encourage bone formation over the residual root fragments. Our aim is to leave the root behind and allow for osseous-cementum formation over the retained root.

V. LIMITATIONS & RECOMMENDATIONS

The small sample size, possible consequences of coronectomy such as Root migration or late eruption and shorter period of follow up were limitations of the study. Future studies can be performed with larger control group using compute tomography with higher risk cases to extrapolate the results obtained from the study to a larger population to evaluate safety and long term clinical outcomes of coronectomy. The periodontal health of the second molar and the quality of the bone distal to second molar should also be evaluated in future studies to assess the requirement of growth factors or bone grafting during coronectomy procedures.

VI. CONCLUSION

The incidence of Inferior alveolar nerve injury was absent in all the subjects during all post-operative visits. Post-operative parameters like bleeding, pain and wound healing had superior result on coronectomy. Coronectomy procedure requires an operator with good tactile sense and take should take precautions to control the bur from penetrating the Inferior alveolar nerve, soft tissue.

Our results revealed that coronectomy minimizes the injury to Inferior alveolar nerve and can safely be used as an alternative to extraction for the preservation of the IAN in high risk cases and shows coronectomy is less extensive than surgical extraction and should be accepted as a validated treatment option in highly risky cases.

Our results concluded that the technique of coronectomy in the mandibular third molar had no excessive complications and had a lower incidence of problems that was predicted in cases where radiographic signs indicate a high risk of nerve damage. To suggest that this technique should be taken seriously and meantime can be confidently used in cases where Inferior alveolar nerve is judged in high risk of damage.

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