Impacted Mandibular Third Molar: Comparison of Coronectomy with Odontectomy

Abstract

Aim: Damage to the inferior alveolar nerve (IAN) while extracting lower third molars is often caused by the intimate relationship between the nerve and the roots of the teeth. The aim of this study was to compare the sequelae of coronectomy with odontectomy in impacted mandibular third molars.

Patients and Methods: This study included thirty patients which were divided into two groups, Group-I (test group) including 15 patients undergoing coronectomy and Group-2 (control group) of 15 patients undergoing odontectomy. Investigations included digital orthopantomogram. The parameters for this study included pain, swelling, nerve paresthesia, trismus, postoperative infection, postoperative wound dehiscence, postoperative pocket depth, and migration. Results: In Group-I (coronectomy group), the patients underwent follow-up for 6 months to evaluate migration of the retained mandibular third molar root which was in proximity with the IAN. There was a mean increase in migration when the distance from the inferior border of IAN until the apex of the retained mandibular third molar root was measured which was by 3.43 mm after 6 months of follow up. Conclusion: On statistical analysis, the result in this study showed no statistical difference in both the groups in all the parameters that were taken.

Keywords: Coronectomy, impacted mandibular third molar, inferior alveolar nerve, migration, odontectomy

Introduction

Third molar surgery is one of the most common oral surgical procedures, with a prevalence of 35.9%–58.7%.[1] Surgical removal of the lower third molar is a commonly performed procedure in oral and maxillofacial surgery clinics and hospitals.

Prophylactic removal or retaining the third molar is a controversial issue and should be carried out depending on each case individually. However, removal of impacted third molar is unarguably indicated when deemed to be close to the inferior alveolar nerve (IAN) is a dilemma for the oral surgeon. In such cases, either the tooth is sectioned in such a way that the roots of impacted mandibular third molars are left in situ or the impacted mandibular third molars are sectioned. The former procedure is known as coronectomy and latter as odontectomy.

The aim of this study was to compare the sequelae of coronectomy with odontectomy in impacted mandibular third molars.

Patients and Methods

Patient sample

A randomized prospective study was carried from September 2013 to September 2015 in which thirty patients were included which were divided into two groups, Group-I including 15 patients undergoing coronectomy (test group) and Group-2 (control group) of 15 patients undergoing odontectomy. Routine blood investigation was done for all patients and digital orthopantomogram (OPG) was obtained.

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Patient demographics

In this study, a total of thirty patients were taken with 15 patients each in both the groups with a mean age of 24.9 ± 3.933 years with total 43.3% (13) males and 56.7% (17) females.

- In group 1 (coronectomy group), 33.3% (5) were male and 66.7% (10) were female
- In group 2 (odontectomy group), 53.3% (8) were male and 46.7% (7) were female.

Criteria

The patients in this study were selected based on the following criteria—

**Inclusion criteria**

1. All the patients having mandibular third molars in proximity with the IAN as assessed radiographically using OPG
2. All the patients in the age group between 18 and 40 years and in good health
3. Patients having a vital tooth without periapical radiolucency
4. Patients with recurrent pericoronitis
5. Patients having vertical, mesioangular, or distoangular mandibular third molar teeth.

**Exclusion criteria**

1. Patients who are allergic to any of the local anesthetic solutions and/or allergic to medications prescribed in the study
2. Presence of acute infection or swelling at the site at the time of extraction
3. Medically compromised patients
4. Patients with mobile teeth
5. Patients with horizontally impacted mandibular third molars teeth.

All the patients underwent a thorough medical and dental evaluation including the history of allergy to any drug. Routine blood investigations were carried out before the surgery. Only the patients who were categorized as the American Statistical Association I (ASA I) and ASA II according to Saklad, Rovenstine and Taylor (1941) were included in the study. All the parameters and complications of the study were explained in detail to the patients. A signed written informed consent was obtained from each of the included patients in the presence of an independent witnesses.

Radiological criteria

All the cases were selected on the basis of the seven radiological signs as described by Rood and Shehab, to determine the proximity of IAN with the impacted mandibular third molar.

In one of the patients, cone beam computed tomography was done in which proximity of the IAN was seen as shown in Figures 1 and 2. In Figure 1, the IAN was seen medial to the root of the third molar tooth. In Figure 2, division of the root of the third molar seen due to the IAN.

Technique

All the patients of both the groups were operated under local anesthesia. Lignocaine 2% with 1:200,000 adrenaline was used for IAN block along with long buccal nerve block and lingual nerve block.

All patients in the study routinely will receive postoperative dose of oral antibiotics in a combination of capsule ampicillin 250 mg and capsule cefuroxime 250 mg and tablet metronidazole 400 mg 3 times daily for 5 days and analgesics in a combination of tablet ibuprofen 400 mg and paracetamol 325 mg 3 times daily for 3 days.

In group-I patients, deliberate vital root retention will be carried out in cases where the mandibular third molars are in close proximity with the inferior alveolar canal in coronectomy cases. Following removal of the crown of the mandibular third molar, the fissure bur was used to reduce the remaining root fragments so that the remaining roots are at least 3 mm below the crest of the lingual and buccal plates in all places in case of coronectomy as described by Pogrel et al. [Figures 3-6].

For Group II patients, the impacted mandibular third molars were completely removed by Moore and Gilbe’s collar technique.

Measurement of parameter

The parameters for this study included pain, swelling, nerve paresthesia, trismus, postoperative infection, postoperative wound dehiscence, postoperative pocket depth, and migration. All these parameters were assessed on the 1st postoperative day, 7th postoperative day, 1st postoperative month, 3rd postoperative month, and 6th postoperative month.

![Figure 1: Inferior alveolar nerve seen medial to the root of the third molar tooth. (Inferior alveolar nerve denoted by green)](http://www_ijdr_in)
The pain was assessed on a 100 mm long visual analog scale (VAS), which was marked by the patient himself/herself, as per the pain experienced by the patient. The VAS was used to measure their current pain intensity from 0 (“no pain”) to 10 (“worst possible pain”).

The facial dimensions was measured using suture material and/or measuring tape. The distance from the base of the mandibular angle until the tragus, lateral canthus, alar, and pogonion will be noted. The difference between each postoperative measurement and the baseline will indicate the facial swelling for that day.

Migration of the remaining root portion was evaluated by taking two standard points. Superiorly, the superior aspect of the root portion of mandibular third molar and inferiorly the lower border of the inferior alveolar canal. This was measured on a dental OPG.

Data collection and statistical analysis

The data obtained were compiled systematically, transformed from a precoded proforma to a computer and a master table was prepared. The total data were distributed meaningfully and presented as individual tables along with graphs. Results on continuous measurements were presented on mean ± standard deviation (min-max) and results on categorical measurements were presented in numbers (%). Significance was assessed at 5% level of significance. Mann–Whitney U-test, independent t-test, and Friedman test were used. Mann–Whitney test was used for statistical analysis of pain. Independent t-test was used for statistical analysis of swelling, nerve paresthesia, inter-incisal opening, infection, pocket depth, and wound dehiscence. Friedman test was used for statistical analysis of migration.

Results

Thirty patients were enrolled in this study, of which fifteen patients underwent coronectomy and other fifteen patients underwent odontectomy.

The inter group comparison of pain intensity as measured in VAS was statistically analyzed using Mann–Whitney
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Test and $P$ values were found to be 0.024, 0.353, and 0.243 at pre- and post-operative interval of the 1st day and on 7th day, respectively. The result was statistically not significant thereby implicating that there was no difference in the intensity of pain in both groups either pre- or post-operative periods as shown in Table 1.

The inter group comparison of swelling was measured and was statistically analyzed using independent sample test and $P$ values were found to be 0.247, 0.243, and 0.308 at pre- and post-operative interval of 1st day and at 7 days, respectively. The result was statistically not significant thereby implicating that there was no difference in the intensity of swelling in both groups either pre- or post-operative periods as shown in Table 2.

The inter group comparison of the inter-incisal opening was measured on 1st and 7th postoperative day and was statistically analyzed using independent sample test and $P$ values were found to be 0.377, 0.212, and 0.284 at pre- and postoperative interval of 1st day and on the 7th day, respectively. The result was statistically not significant thereby implicating that there was no difference in the intensity of swelling in both groups either pre- or post-operative periods as shown in Table 3.

There was no incidence of nerve paresthesia, postoperative infection, and postoperative wound dehiscence in both the groups.

The inter group comparison of pocket depth distal to mandibular second molar was measured and was statistically analyzed using independent sample test and $P$ values were found to be 0.261 and 0.364 at postoperative interval of the 1st day and on the 7th day, respectively. The result was statistically not significant thereby implicating that there was no difference in the intensity of swelling in both groups either in the pre- or post-operative periods.

The intra group comparison of migration of retained root of impacted mandibular third molar was measured and was statistically analyzed using Friedmann test. The result showed an increase in the mean value depicting that there was an increase in the rate of migration of retained root from the 1st day postoperative interval to 6th month postoperative interval as shown in Table 4 and Graph 1.

After 1 year in three patients, the retained roots were removed. All the patients were asymptomatic but were willing to get the roots removed. In rest of the patients of coronectomy group, the roots were retained in the oral cavity.

Discussion

Transalveolar extraction of impacted mandibular third molar is a very common procedure. There are a number of complications associated with the surgical extraction of impacted mandibular third molars. Complications are found to be more with mandibular than maxillary third

Table 1: Depicts inter group comparison of pain intensity

| Pain   | Group   | Mean | P     |
|--------|---------|------|-------|
| PREOP  | Coronectomy | 19.10| 0.024 |
|        | Odontectomy | 11.90|       |
| 1st day| Coronectomy | 16.97| 0.353 |
|        | Odontectomy | 14.03|       |
| 7th day| Coronectomy | 17.33| 0.243 |
|        | Odontectomy | 13.67|       |

Table 2: Depicting inter group comparison of swelling

| Swelling | Group    | Mean±Std. deviation (mm) | P     |
|----------|----------|--------------------------|-------|
| PREOP    | Coronectomy | 8.804±0.8460             | 0.247 |
|          | Odontectomy | 9.119±0.5894             |       |
| 1st day  | Coronectomy | 9.404±0.7707             | 0.243 |
|          | Odontectomy | 9.709±0.6241             |       |
| 7th day  | Coronectomy | 9.054±0.6640             | 0.308 |
|          | Odontectomy | 9.232±0.5932             |       |

Table 3: Depicting inter group comparison of inter-incisal opening

| Inter-incisal opening | Group    | Mean±Std. deviation (mm) | P     |
|-----------------------|----------|--------------------------|-------|
| PREOP                 | Coronectomy | 36.13±8.231             | 0.377 |
|                       | Odontectomy | 37.8±3.998              |       |
| 1st Day               | Coronectomy | 29.67±7.257             | 0.212 |
|                       | Odontectomy | 29.33±9.045             |       |
| 7th Day               | Coronectomy | 36.33±8.658             | 0.284 |
|                       | Odontectomy | 39.27±5.750             |       |

Table 4: Depicting intra group comparison of migration of retained root of impacted mandibular third molar

| Migration | Mean rank | P     |
|-----------|-----------|-------|
| 1st day   | 1.53      | 0.000 |
| 1st month | 2.07      |       |
| 3rd month | 2.97      |       |
| 6th month | 3.43      |       |
molars. Injury to IAN or lingual nerve accounts to about 0.1%–17.0%. Carmichael and McGowan\(^6\) in their study found that the incidence of injury to inferior dental nerve when removing mandibular third molars varies from 0.41% to 8.1% for temporary lack of sensation and 0.014% to 3.6% for prolonged signs and symptoms.

Odontectomy is the removal of impacted mandibular third molar surgically by employing either lingual split technique or Moore and Gilbe technique. Ostectomy was earlier employed for removal of an impacted mandibular third molar with proximity to IAN. However since the incidence of risk to IAN damage increased, so sectioning of the tooth was recommended.\(^7\)

Howe and Poyton\(^8\) compared the radiographic appearance of the tooth root and the IAN to whether or not the nerve was visible in the socket at operation. In their study, the perforation of the root by the canal contents was characterized by the following radiographic signs:

- Radiolucent band crossing the root above the apex
- Loss of both white lines where the canal crosses the root
- Constriction of the canal maximal in the middle of the root.

Renton et al.\(^{9}\) carried out a prospective randomized study of 128 patients requiring surgery on mandibular third molars which had radiographic evidence of proximity to IAN. Patients were assigned into either extraction group or coronectomy group. Approximately 19% of the IAN was damaged in cases after extraction and none after successful coronectomy. Carmichael and McGowan\(^6\) reported 0.9% of IAN injury. In a study done by Pogrel et al.,\(^5\) 41 patients had 50 lower third molars treated by coronectomy. There were no cases of IAN damage in any of the cases, but one patient showed transient lingual nerve involvement, probably due to lingual retractor use. In this study, most of the cases of impacted mandibular third molars had root interruption of the white line, and there was no IAN involvement thereby leading to no paresthesia.

In this study, a series of thirty patients were asked for an OPG preoperatively, 7\(^{th}\) day postoperatively, 1\(^{st}\) month postoperatively, 3\(^{rd}\) month postoperatively, and 6\(^{th}\) month postoperatively to determine the relationship of impacted mandibular third molars with the inferior alveolar canal. The radiological signs in our study which determined proximity to inferior alveolar canal were:

- Darkening of the root (8 out of 30 patients)
- Interruption of the white line of the canal (22 out of 30 patients)

Some difficulties and complications may follow surgical removal of the impacted third molar. Among the difficulties encountered may be pain, swelling, or trismus. Curran et al.\(^{10}\) indicated that trismus and swelling were associated with increased difficulty of extraction. Renton et al.\(^{9}\) found pain in 22 patients (21.6%) of the control group (\(n = 102\)) in respect to eight patients (13.8%) of the coronectomy group and four patients (11.1%) of the failed coronectomy group. The difference was not statistically significant.

Leung and Cheung\(^{11}\) found that among the control group, 57.3% (102/178) of teeth were reported to be painful 1 week postoperatively. The corresponding proportion in the coronectomy group was 41.9% (65/155), which was statistically different (\(P = 0.005\)). However, there were no statistical differences between the two groups 1–24 months after surgery. Furthermore, Hatano et al.\(^{12}\) found significant differences in postoperative pain in the comparison between the control group (6.78%, 8/118) and the coronectomy group (18.6%, 19/102) with a \(P = 0.012\). In this study, postoperative pain had reduced in both the groups until the 7\(^{th}\) day. In coronectomy group, postoperative pain was present in 4 out of 15 patients as compared to the odontectomy group which was seen in 2 out of 15 patients. The incidence of postoperative swelling was seen to be more in odontectomy group until the 7\(^{th}\) day.

In a study by Leung and Cheung\(^{11}\) found that in the sagittal plane the average distance between the roots of the mandibular third molar and the inferior alveolar canal is 3 mm. However, in approximately 10% of the cases, the canal is located at or above the level of the mandibular third molar apices. Pogrel et al.\(^5\) noted root migration in approximately 30% of 41 coronectomy patients over 6 months period. O’Riordan\(^{13}\) conducted a retrospective study of 52 patients who were operated over 10 years period. Three of 52 patients had to have roots removed subsequent to the coronectomy procedure due to pain or infection. Renton et al.\(^{9}\) in their study showed the migration of five root segments after a follow up of 13 months. Dolanmaz et al.\(^{14}\) reported that root migration reached 4 mm at 24 months postoperatively. Coronal root migration after coronectomy was a common finding.

Leung and Cheung\(^{11}\) and Hatano et al.\(^{12}\) revealed that more than half of the roots migrated at high rate for 3–6 months postoperatively and then gradually stopped at 12–24 months. According to Goto et al.,\(^{15}\) all the studies that have evaluated the root migration have detected
actual migration of the root and all studies suggested that most migratory component would be present in the first 6 months postoperatively, with an average migration of 2–3 mm. Goto et al.\textsuperscript{[13]} affirmed that factors that correlated significantly with root migration were age, sex, and root morphology. With regard to sex, the mean migration was significantly greater in female than male patients and also greater in younger patients.

In this study, the total number of patients were between (18 and 32 years). Fifteen out of 30 patients had bifurcated roots and 15 patients had conical roots in both the groups. There was a gradual increase in distance of the retained third molar root from the inferior border of inferior alveolar canal. In 10 out of 15 patients, no migration of retained root was observed after the 3rd month. In five patients, the mean increase in distance from the inferior border of IAN until the apex of the retained root was 2.97 mm. There was a mean increase in the distance from the inferior border of IAN until the apex of the retained mandibular third molar root by 3.43 mm after 6 months of follow up.

In the study by Leung and Cheung,\textsuperscript{[11]} there was no incidence of infection in the coronectomy group from months 3 to 36 months postoperatively. Results by Renton et al.\textsuperscript{[9]} showed one case of infection in the control group (1%, 1/102), three cases in the coronectomy group (5.2%, 3/58). Hatano et al.\textsuperscript{[12]} found infection in 3.4% of the cases (4/188) in the control group and 1% (1/102) in patients undergoing coronectomy ($P = 0.376$).

Six out of 135 cases approximately 4.4% developed wound dehiscence in the first postoperative week in the study by Leung and Cheung.\textsuperscript{[11]} In this study, no cases of wound dehiscence were noticed 1 week postoperatively.

Coronectomy is an aggressive surgical approach, however, the validity of intentionally minimizing the surgical trauma, the resultant risk reduction and the long-term success confirm the usefulness of this procedure in selected cases.

The rationale of coronectomy lies in the fact that if the root is asymptomatic, is not associated with any pathology and if it will not become exposed by the normal and progressive resorption pattern of the bone, then the root should be retained in the socket without any surgical intervention which may increase the risk of postoperative complications.\textsuperscript{[16]}

**Conclusion**

Coronectomy is considered to be a treatment of choice for the removal of impacted third molar in proximity to the IANs. The retained vital root should be less of a potential risk to the patient than the attempted and unsuccessful removal of the tooth in toto. Thus, coronectomy has a sound rationale and can be utilized to prevent injury to the IAN in impacted mandibular third molars.

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**Conflicts of interest**

There are no conflicts of interest.

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