Coronectomy versus total odontectomy of impacted lower third molars with close relation tothe inferior alveolar canal: An open clinical trial

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Background and Objective: Coronectomy is the surgical removal of the crown part of deeply impacted tooth to preserve the inferior alveolar nerve. This study aims to evaluate the consequences of coronectomy compared to complete surgical removal in patients with high risk of inferior alveolar nerve injury.

Method:This clinical study is performed in the department of oral and maxillofacial surgery, Dentistry College, Hawler Medical University. Forty patients (20-30 years old) enrolledin this study. All patients presented with mesio-angular impacted mandibular third molar with intimate relation to the inferior alveolar nerve. The patients were subdivided randomly into two groups, each group consisting of twenty patients. Group A underwent conventional surgical removal of the lower third molar, while group B underwent coronoctomy. Postoperative sequels of pain, swelling, trismus, nerve injury, and root movement were recorded.

Results:The mean age (± SD) of the studied sample was 25.5 ± 4.1 years. Incidence of severe pain on day 1 was more in the study group than the control group but the difference was not significant (p = 0.091). There was higher incidence of post-operative swelling in the control group than in the study group, but all the differences were not significant starting from day 1 to day 5. Regarding trismus All the differences between the two study groups were not significant.No case of nerve injury was recorded. Coronal root movement was recorded in 5 cases (25%). Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 19).

Conclusion: Coronectomy is a predictable way to preserve IAN in cases with intimate relationship between the inferior alveolar nerve and symptomatic impacted wisdom tooth, where high risk of IAN injury is suspected.

Key words: Impacted third molar, Coronectomy, Inferior alveolar nerve, Odontectomy

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Introduction

Extraction of an impacted mandibular third molar has the potential risk of causing temporary or permanent neurologic disturbances of the inferior alveolar nerve (IAN) [1] The incidence of IAN injury (IANI) reported in the literature ranges from 1.3% to 5.3% [2] The risk of this complication depends mainly on the position of the impacted tooth in relation to the inferior alveolar canal before surgery [2]. If there is close proximity between the IAN and the roots, the incidence may be as high as 19% [3]

Anthropologists have hypothesized that an evolutionary reduction in jaw size is the likely cause of frequentwisdom tooth impaction in modern humans.Complications, such as pericoronitis, caries, and periodontaldisease, are commonly associated with impacted thirdmolars, and these contribute to the indications thatmake third molar surgery the most common oral surgical procedure performed. Damage to the inferior dental nerve (IDN) is a well-known complication of surgical removal of deeply impacted wisdom teeth.[4]

Coronectomy or intentional partial odontectomy is a procedure whereby the root(s)

of a lower third molar tooth that is deemed close to the inferior alveolar canal on radiographic imaging is left in-situ. Coronectomy is a relatively new procedure and to date there have only been a handful of publications that investigate its' effectiveness as a treatment modality. As a result, it is still not commonly practiced worldwide.[5]

Coronectomy is an alternative procedure to complete extraction. The method aims to remove only the crown of an impacted mandibular third molar while leaving the root undisturbed, thereby avoiding direct or indirect damage to the IAN. Although coronectomy gain popularity because of surgeons concerns about the outcomes short - and long-term complications. However, outcomes related to treatment of neurosensory disturbance after wisdom tooth surery remain variable; so coronectomy if proven to be safe could be useful in minimizing the occurrence of neurosensory deficit of wisdom teeth that are at high risk of nerve damage.[1]

Precise localization of the third molars in relation to the inferior alveolar nerve canal is critical from a clinical point of view and strongly affects the surgical treatment outcome. Recently by cone beam computed tomography (CT), the relationship between third molar root apices and inferior alveolar nerve canal can be better understood.[6]

Panoramic and CBCT radiograph are the imaging method of choice to assess impacted lower third molars and their relationship with the inferior alveolar nerve. Several studies have evaluated the diagnostic accuracy of the panoramic radiographic findings in identifying patients at risk of inferior alveolar nerve injury after extraction of the lower third molars.[7]

The study aimed to evaluate the consequences of coronectomy procedure compared to complete surgical removal of impacted mandibular third molars.

Methods

This clinical study was performed in the department of oral and maxillofacial surgery, Dentistry College, Hawler Medical University with 5 years of follow up .

The surgery was done by the same surgeon, and forty patients (20-30 years old) wereenrolled in this study after taking their approval in a signed consent form. All patientswere healthy and free from any systemic disease.All the impactedteeth were mesioangular impaction. The pain was the main complain of the patients and that mandate surgical intervention.Impacted teeth with intimate relation with the IAN included in this study(confirmed with panoramic X-ray and CBCT), (Figure 1 and 2).

Patients were subdividedrandomly into two groups; each group consisted of twenty patients. Group A (control group)underwent conventional surgical removal of lower third molar, while group B (study group) underwent coronoctomy.

A visual analogue scale (VAS) was used to indicate the degree of pain and swelling by the patients. Trismus was measured by patients own fingers.

SurgicalProcedure

1-Conventional inferior alveolar nerve block technique was used along withlong buccal nerve block.

2-A conventional triangular flap withmesial releasing incision was elevated.

3-Using medium sizefissure bur, the crown of the tooth transected at an angle of approximately 45degrees. The crown was totally transected so that it could be removed with tissue forceps alone and did not need to be fractured off the roots. Roots were carefully mobilized and removed in control group, while in study group the roots were left in situ below the level of the bone to ensure bone formation over the retained roots.

4-Following a periosteal release, a primary closure of the socket was performed with interrupted sutures.

In all groups of patients, postoperative complication were recorded at intervals 1, 2, 3 and 7 days depending on visual analogue scale, 6 months, one year and two years ,5 years followingthe surgery (figure 3).Medications given to the patients after surgery included:Ciprofloxacin(Ciprodar) tablet 500 two times daily. Acetaminophen (Panadol) two tablet on need.

Statistical Analysis Data were analyzed using the Statistical Package for Social Scences (SPSS, version 19). Chi square test

of association was used to compare between proportions. When the expected count of more than 20% of the cells of the table was less than 5, Fisher's exact test was used. Student's t test of two independent samples was used to compare means of the two study groups. A p value of ≤ 0.05 was considered statistically significant.

Results

Forty patients participated in the study (20 underwent coronectomy, as the study group; and twenty patients underwent total removal of the impacted lower wisdom tooth, as the control group). The mean age of the studied sample was 25.5 ± 4.1 years, ranging from 20 to 36 years. The median was 25 years. No significant difference was detected between the mean age of the groups (p = 0.852). Table 1 shows that around half (47.5%) of the whole sample aged less than 25 years, with no significant difference in the age distribution of the two study groups (p =1). The proportion of males was 60% in both groups (p = 1).

Table 2 shows that in day 3, 75% of patients in the control group developed severe pain compared with 30% among patients of the study group (p = 0.007). On day 5, none of the patients had severe pain, but the incidence of moderate pain was more in the controlgroup (60%) than the study group (25%) (p = 0.025). The incidence of severe pain on day 1 was more in the study group (80%) than the control group (55%) but the difference was not significant (p = 0.091).

Figure 1: Preoperative panoramic view

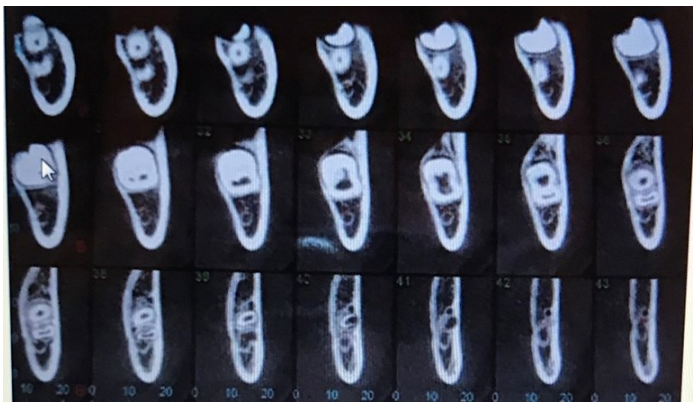

Figure2: CBCT view

Table 1: Distribution of the two study groups by age and gender.

		Study		Control		Total		
		No.	**%**	**No.**	**%**	**No.**	**%**	**P**
Age (years)	20-24	10	50.0	9	45.0	19	47.5	1*
	25-29	6	30.0	7	35.0	13	32.5	
	≥ 30	4	20.0	4	20.0	8	20.0	
Gender	Female	8	40.0	8	40.0	16	40.0	1
	Male	12	60.0	12	60.0	24	60.0	
Total		20	100.0	20	100.0	40	100.0	

Table 2: Incidence of post-operative pain in the two study groups.

		Study		Control		Total		
Pain	**Severity**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**P**
Day 1	Moder-ate	4	20.0	9	45.0	13	32.5	0.091
	Severe	16	80.0	11	55.0	27	67.5	
Day 2	Mild	1	5.0	0	0.0	1	2.5	0.480*
	Moder-ate	6	30.0	4	20.0	10	25.0	
	Severe	13	65.0	16	80.0	29	72.5	
Day 3	Mild	3	15.0	0	0.0	3	7.5	0.007*
	Moder-ate	11	55.0	5	25.0	16	40.0	
	Severe	6	30.0	15	75.0	21	52.5	
Day 4	Mild	6	30.0	4	20.0	10	25.0	0.215
	Moder-ate	14	70.0	13	65.0	27	67.5	
	Severe	0	0.0	3	15.0	3	7.5	
Day 5	None	0	0.0	1	5.0	1	2.5	0.025*
	Mild	15	75.0	7	35.0	22	55.0	
	Moder-ate	5	25.0	12	60.0	17	42.5	
Total		20	100.0	20	100.0	40	100.0	

*By Fisher's exact test

Table 3 shows higher incidence of post-operative swelling in the control group than the study group, but all the differences were not significant starting from day 1 to day 5. On day 5, 35% of the control group had moderate swelling compared with 20% of patients in the study group.

Pre-operatively, the mean of trismus in the study group was 3.13 fingers, and that of the control group was 3.15 fingers (p = 0.809). On day 5, the means in the study and control groups were 1.9 and 1.75 respectively (p = 0.223). All the differences between the two study groups were not significant, as shown in Table 4.

Table 3: Incidence of post-operative swelling in the two study groups.

		Study		Control		Total		
Swelling	**Severity**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**P**
Day 1	Moderate	9	45.0	4	20.0	13	32.5	0.091
	Severe	11	55.0	16	80.0	27	67.5	
Day2	Moderate	9	45.0	6	30.0	15	37.5	0.327
	Severe	11	55.0	14	70.0	25	62.5	
Day 3	Mild	1	5.0	0	0.0	1	2.5	1*
	Moderate	15	75.0	15	75.0	30	75.0	
	Severe	4	20.0	5	25.0	9	22.5	
Day 4	Mild	7	35.0	6	30.0	13	32.5	1.000
	Moderate	13	65.0	14	70.0	27	67.5	
Day 5	None	2	10.0	2	10.0	4	10.0	0.651*
	Mild	14	70.0	11	55.0	25	62.5	
	Moderate	4	20.0	7	35.0	11	27.5	
Total		20	100.0	20	100.0	20	100.0	

Table 4: Means of trismus of the two study groups.

	Study		Control		
Trismus	**Mean (fingers)**	**SD**	**Mean (fingers)**	**SD**	**P**
Pre-operative	3.13	.28	3.15	.37	.809
Day 1	1.25	.44	1.20	.41	.714
Day 2	1.25	.44	1.20	.41	.714
Day 3	1.40	.50	1.25	.44	.324
day 4	1.90	.31	1.75	.44	.223
Day 5	2.13	.28	2.10	.31	.788
Day 7	2.80	.41	2.85	.37	.687

*By Fisher's exact test

In control group, no case of inferior alveolar nerve injury was reported. X ray reports, six months after surgery, showed that root movement occurred in 5 out of 20 patients (25%) of the study group.No further migration was noted thereafter (Figure 3).

Figure 3: One year follow up after surgery

Discussion

The primary outcome of interest of many studies about coronectomy of mandibular third molars versus complete removal of the tooth was inferior alveolar nerve injury, defined as paresthesia, dysesthesia, analgesia and anesthesia; but in the present study in addition to the possibility of injuring inferior alveolar nerve, other complications like postoperative pain, swelling, trismus,and root movement were studied.

Regarding the postoperative pain, patients with coronectomy shows less pain than patients with conventional extraction of the impacted lower third molar, but the results were not significant. probably because of the small sample size, *Renton T, et al* shows different results "Surgical pain within the first postoperative week generally is expected by the patients. Arandomized clinical trialhas shown that pain incoronectomy cases is actually less compared with thetotal excision of third molars.[8]

Regarding trismus and swelling there were no significant difference between the two group and this is probably because of small sample size, or the technique of coronectomy. Monaco et al.reported postoperative swelling in 4.6% of cases.[9] Based on the results of Long et al, the injury of the inferior alveolar nerve was significantly lower in the coronectomy group , whereas the postoperative infection and postoperative pain were statistically similar in both groups.[10]

In present study X-ray reports, six months after surgery, showed that root movement in 5 out of 20 patients (25%) of the study group, while none developed root movement 1 year after surgery. Similar results reported by Giuseppe Monaco et al they mentioned thatmigrationseemed to show a discontinuous movement pattern.[11]Leung YYandCheung KYstudy reported that most root migration was found to occur within 6 months (91.1%) and 12 months (61.4%) postoperative. From 24 months onwards, less than 5% migrated further.[12]

No cases of nerve injury was reported. The use of the coronectomy as a technique for extracting mandibular wisdom teeth seems to significantly decrease the risk of nerve damage in cases of proximity between IAN and the dental roots without increasing the intraoperative or postoperative complications.[12]

In the present study age and gender had no effect on the outcome of the surgery. Leung YYand Cheung KYreported age as a factor affecting root migration: migration decreased with increasing age (by 0.203 mm less per year increase in age).[13]

Conclusion

Coronectomy is a predictable way to preserve IAN in cases with intimate relation between the inferior alveolar nerve and

symptomatic impacted wisdom tooth, where high risk of IAN injury is suspected

Conflict of interest

The author reported no conflict of interests.

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