

Knowledge and Attitude Among the Saudi Dentists Towards Coronectomy of Impacted Mandibular Third Molars

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Purpose: Compared to the complete extraction of impacted third molars that are in close proximity to the mandibular canal, the coronectomy procedure is used as an alternative, owing to its minimal risk of damaging the Inferior alveolar nerve. Despite clear coronectomy concepts mentioned in the literature, the procedure is debatable. This study aimed to assess the knowledge and attitude towards the coronectomy procedure among dentists in Saudi Arabia.

Patients and Methods: The 16 close-ended questionnaire was distributed electronically to 377 dentists over the country. It included the demographic data and the options given to their patients with complicated impacted third molars, and the number of coronectomy they have performed. The retrieved data were exported and transferred to the SPSS software program for analysis. The Chi-squared and Fisher's exact tests were used as appropriate for comparisons. A P-value <0.05 was considered significant.

Results: Only 54 (15%) participants performed coronectomy procedure, and only 28.3% of the participants advised their patients to do coronectomy. Nearly two-thirds of the participants (71.9%) were aware of coronectomy procedures, with no significant differences ($P > 0.05$) between the groups. About 68.9% of the participants agreed that coronectomy aims to protect inferior alveolar nerve damage. More than 60% of participants believed that coronectomy is a reliable technique, while 40.6% of participants claimed that they were capable of deciding whether to do coronectomy or extraction. No significant differences were found between the groups concerning most of the study variables ($P > 0.05$).

Conclusion: Knowledge of Saudi dentists towards coronectomy is good, while their attitude is still low. More learning strategies about coronectomy should be implemented.

Keywords: coronectomy, impacted teeth, knowledge, attitude, inferior alveolar nerve damage, complicated exodontia, third molars

Introduction

Extraction of mandibular wisdom teeth is a common practice in dentistry.¹⁻⁴ However, this procedure might be associated with multiple complications such as bleeding, dry socket, pain, and swelling.^{3,5,6} The most disturbing complication is temporary or permanent paresthesia and anesthesia of the inferior alveolar nerve (IAN).⁷⁻⁹ This complication is considered as an injury to the nerve, which might also accompany painful sensations related to the lower lips, including the skin covering the chin and gingiva.¹⁰⁻¹² The incidence of IAN injury when removing impacted third molars has been reported from 0.41% to 8.1% for the temporary lack of sensation and from 0.014% to 3.6% for prolonged signs and symptoms. However, with high-risk teeth, the incidence of IAN injury may raise up to 20%.¹³⁻¹⁵ To overcome the previously mentioned complications, a new surgical approach was developed decades ago known as coronectomy or partial odontectomy.¹⁶ Coronectomy is defined as the removal of the coronal part of the mandibular third molars leaving

the roots untouched by positing the tooth 3 to 4 mm under the alveolar bone and always leaving the vitality of pulp tissue intact^{13,17–19}. Panoramic and CBCT radiographs are used to evaluate the roots shape of the third molars indicated for coronectomy, their proximity to the inferior alveolar nerve, and the curvature or narrowing in the inferior mandibular canal.^{20,21}

Although there are no signs of inferior alveolar nerve injury following coronectomy, some short-acting complications include pain, alveolitis, bleeding, swelling, and redness. However, the long-term complication mainly includes roots migration along the long axis of the tooth.^{16,19,22–24} Moreover, failure rates of coronectomy varied greatly in the literature, ranging from 2.3% to 38.4%.²⁵ The direction of migration was found to be further away from the nerve towards the level of the bone, which appears to be the reason behind periodontium diseases and deep pockets. This, in turn, leads to a second surgical procedure to remove the roots, and it is considered the main disadvantage of the coronectomy^{19,26,27}. Although coronectomy is still not evidence-based practice, it has recently gained popularity in dental practice and attracts many researchers.^{13,26,28–34} In a study by Cramer et al,²⁹ conducted among maxillofacial surgeons in Switzerland to evaluate their attitudes toward this procedure, 51.6% considered coronectomy a non-reliable technique. However, 40.6% accept to propose this procedure in situations where a high risk of inferior alveolar nerve injury might happen.

Furthermore, several studies^{1,15,18,25–27,35–45} concluded that the complete removal of the mandibular wisdom molars has a greater risk of injuring the inferior alveolar nerve, and coronectomy procedure is considered a viable technique in managing such cases. To the best of our knowledge, no study has investigated the knowledge and attitude of Saudi dentists regarding coronectomy. This study aimed to assess the knowledge and attitudes toward the coronectomy procedure among a sample of dentists in Saudi Arabia.

Materials and Methods

This was a cross-sectional questionnaire-based study conducted among dentists in Saudi Arabia. The required sample size was calculated using an online Raosoft® sample size calculator, with a P-value of 0.05 (95% confidence interval), marginal error of 5%, and the target population was 19,622 dentists, based on the Ministry of Health statistical yearbook 2020. Thus, a total of 377 dentists were required for the study. The questionnaire was constructed based on the available literature on this topic.^{13,29,31} It was electronically prepared using Google forms and disseminated to the target dentists. The electronic survey consisted of 16 close-ended questions divided into three main sections. The first section was related to the demographic data, including age (≤ 30 years and > 30 years), gender (males and females), place of work (government and private), experience (< 5 years and ≥ 5 years), and specialty (general practitioner and specialist). In the second section, participants were asked about their awareness of coronectomy (coronectomy purpose, indications, surgical procedures, and complications). The third section included questions about their attitude (if the coronectomy is a reliable technique, their capability to decide to do coronectomy or extraction, their willingness to attend continuing education courses about coronectomy and using 3D imaging systems to diagnose third molar impaction). The participants were also asked if they have performed coronectomy, their satisfaction with the results, and the options given to patients with mandibular wisdom teeth in close positional relationship to the inferior alveolar nerve (IAN) and at risk of nerve damage (multiple-choice question). Data were collected in a master sheet (MS. Excel 2016), double-checked, and transferred to statistical software (SPSS v25, IBM Corp.) for further analysis. Descriptive data were tabulated and presented as frequencies and percentages. The differences between the groups were utilized using the Chi-squared test and Fisher's exact test, as appropriate. The significance level was set at P-value < 0.05 .

Results

A total of 360 responses were valid for analysis, with a response rate of 95.5%. Table 1 shows that most of the participants (88.1%) were under 30-year age group, had clinical experience of less than 5 years (87.2%), and were general practitioners (89.7%). More than half of the participants were males (51.7%), and 59.4% worked in the government sector.

As presented in Tables 2 and 3, nearly two-thirds of the participants (71.9%) were aware of coronectomy procedures, with no significant differences ($P > 0.05$) between the groups. 65.6% were aware of coronectomy indications, with no

Table 1 Characteristics of the Study Sample

		N	%
Age	≤ 30 yrs	317	88.1
	> 30 yrs	43	11.9
Gender	Male	186	51.7
	Female	174	48.3
Place of work	Governmental	214	59.4
	Private	146	40.6
Experience	< 5 yrs	314	87.2
	≥ 5 yrs	46	12.8
Specialty	General practitioner	323	89.7
	Specialist	37	10.3

significant differences ($P > 0.05$) between the groups. However, less percentage (53.9%) were aware of coronectomy complications; also, with no significant differences ($P > 0.05$) between the groups. About two-thirds of the participants (68.9%) agreed that the purpose of coronectomy is to protect against IAN damage (Table 2) with no significant differences ($P > 0.05$) were found between the groups.

More than 60% of participants believed that coronectomy is a reliable technique. No significant differences ($P > 0.05$) were found between the participants concerning age groups, gender, and place of work. However, a significant difference ($P = 0.024$) was found in relation to experience, where dentists with more than 5 years of clinical experience stated that coronectomy is not a reliable technique (Table 3). Also, a significant difference ($P = 0.021$) was found concerning specialty, where more than half (56.8%) of specialists stated that coronectomy is not a reliable technique (Table 3). Only 40.6% of participants claimed that they could decide whether to do coronectomy or extraction (Table 2), with no significant differences ($P > 0.05$) between the groups. However, most participants (77.6%) were willing to attend continuing education courses about coronectomy, with no significant differences between the groups except for specialty ($P < 0.001$), where higher percentages 81.7% of general practitioners were more willing for these courses (Table 3). Less than half of participants (49.4%) claimed that they used 3D imaging for third molar diagnosis (Table 2), with only a significant difference ($P = 0.001$) between participants concerning the place of work, where a higher percentage (56.5%) of participants in the governmental sector tend to use 3D imaging systems (Table 3).

Only 54 (15%) participants performed coronectomy, with only 5% ($n = 18$ participants) performing more than 5 cases (Table 2). A significant difference was found between participants with increased age ($P = 0.028$), with a higher age group performing more cases (Table 2). Also, a significant difference was found in relation to experience ($P = 0.018$), with more experienced dentists performing more coronectomy procedures (Table 3). Among dentists who performed coronectomy, most of them (86.2%) were satisfied with the results, with no significant differences ($P > 0.05$) between the groups.

63.6% of the dentists referred the patients having risky mandibular third molars, 28.3% opted to “Leave and wait”, 39.2% opted for “coronectomy”. Surgical removal was advised by only 11.7% participants (Figure 1).

Discussion

The reported prevalence of impacted third molars in Saudi Arabia varied greatly from one region to another, ranging from 5% to 64.87%.^{46–50} In a study among Saudi subpopulations, Oyeibunmi et al⁵¹ reported the complications associated with third molar impaction with more frequency of distal root caries of the second molar and pocket formation between the impacted tooth and the second molar. However, Alfadil and Almaged, in their study⁴⁷ about the reasons for third molars extraction in Saudi Arabia, reported that the most common reason for extraction was for a prophylactic purpose

Table 2 Response to the Study Questions for All Participants According to the Age and Gender

	All	Age			Gender		
		≤30 yrs	>30 yrs	P	Male	Female	P
Aware of coronectomy procedures							
Yes	259 (71.9)	232 (73.2)	27 (62.8)	0.204	127 (68.3)	132 (75.9)	0.127
No	101 (28.1)	85 (26.8)	16 (37.2)		59 (31.7)	42 (24.1)	
Aware of coronectomy indications							
Yes	236 (65.6)	207 (65.3)	29 (67.4)	0.865	118 (63.4)	118 (67.8)	0.437
No	124 (34.4)	110 (34.7)	14 (32.6)		68 (36.6)	56 (32.2)	
Aware of coronectomy complications							
Yes	194 (53.9)	171 (53.9)	23 (53.5)	1.000	101 (54.3)	93 (53.4)	0.916
No	166 (46.1)	146 (46.1)	20 (46.5)		85 (45.7)	81 (46.6)	
Purpose of coronectomy is to protect IAN damage							
Yes	248 (68.9)	221 (69.7)	27 (62.8)	0.495	118 (63.4)	130 (74.7)	0.069
No	21 (5.8)	19 (6.0)	2 (4.7)		13 (7.0)	8 (4.6)	
Do not know	91 (25.3)	77 (24.3)	14 (32.6)		55 (29.6)	36 (20.7)	
Coronectomy is a reliable technique							
Yes	220 (61.1)	199 (62.8)	21 (48.8)	0.095	116 (62.4)	104 (59.8)	0.666
No	140 (38.9)	118 (37.2)	22 (51.2)		70 (37.6)	70 (40.2)	
Capable of deciding whether to do a coronectomy or extraction							
Yes	146 (40.6)	127 (40.1)	19 (44.2)	0.623	80 (43.0)	66 (37.9)	0.336
No	214 (59.4)	190 (59.9)	24 (55.8)		106 (57.0)	108 (62.1)	
Willing for continuing education about coronectomy							
Yes	284 (78.9)	254 (80.1)	30 (69.8)	0.161	145 (78.0)	139 (79.9)	0.699
No	76 (21.1)	63 (19.9)	13 (30.2)		41 (22.0)	35 (20.1)	
Using 3D imaging for diagnosis							
Yes	178 (49.4)	162 (51.1)	16 (37.2)	0.104	100 (53.8)	78 (44.8)	0.093
No	182 (50.6)	155 (48.9)	27 (62.8)		86 (46.2)	96 (55.2)	
Have you performed coronectomies ?							
None	306 (85.0)	275 (86.8)	31 (72.1)	0.028 ^a	151 (81.2)	155 (89.1)	0.103
< 5 cases	36 (10.0)	29 (9.1)	7 (16.3)		24 (12.9)	12 (6.9)	
≥ 5 cases	18 (5.0)	13 (4.1)	5 (11.6)		11 (5.9)	7 (4.0)	
Have you been satisfied with the results (N= 54)							
Yes	47 (87.0)	38 (90.5)	9 (75.0)	0.175	30 (85.7)	17 (89.5)	1.000
No	7 (13.0)	4 (9.5)	3 (25.0)		5 (14.3)	2 (10.5)	

Notes: 0.028^a - A significant difference was found between participants with increased age (P= 0.028), with a higher age group performing more cases (Table 2).

Table 3 Response to the Study Questions According to Place of Work, Experience, and Specialty

	Place of Work			Experience			Specialty		
	Governmental	Private	P	<5 yrs	≥5 yrs	P	GP	Specialist	P
Aware of coronectomy procedures									
Yes	158 (73.8)	101 (69.2)	0.342	228 (72.6)	31 (67.4)	0.484	237 (73.4)	22 (59.5)	0.083
No	56 (26.2)	45 (30.8)		86 (27.4)	15 (32.6)		86 (26.6)	15 (40.5)	
Aware of coronectomy indications									
Yes	146 (68.2)	90 (61.6)	0.215	206 (65.6)	30 (65.2)	1.000	213 (65.9)	23 (62.2)	0.715
No	68 (31.8)	56 (38.4)		108 (34.4)	16 (34.8)		110 (34.1)	14 (37.8)	
Aware of coronectomy complications									
Yes	117 (54.7)	77 (52.7)	0.747	167 (53.2)	27 (58.7)	0.529	175 (54.2)	19 (51.4)	0.862
No	97 (45.3)	69 (47.3)		147 (46.8)	19 (41.3)		148 (45.8)	18 (48.6)	
Purpose of coronectomy is to protect IAN damage									
Yes	151 (70.6)	97 (66.4)	0.654	217 (69.1)	31 (67.4)	0.410	227 (70.3)	21 (56.8)	0.068
No	11 (5.1)	10 (6.8)		20 (6.4)	1 (2.2)		20 (6.2)	1 (2.7)	
Do not know	52 (24.3)	39 (26.7)		77 (24.5)	14 (30.4)		76 (23.5)	15 (40.5)	
Coronectomy is a reliable technique									
Yes	136 (63.6)	84 (57.5)	0.272	199 (63.4)	21 (45.7)	0.024 ^b	204 (63.2)	16 (43.2)	0.021 ^c
No	78 (36.4)	62 (42.5)		115 (36.6)	25 (54.3)		119 (36.8)	21 (56.8)	
Capable of deciding whether to do a coronectomy or extraction									
Yes	84 (39.3)	62 (42.5)	0.585	127 (40.4)	19 (41.3)	1.000	135 (41.8)	11 (29.7)	0.215
No	130 (60.7)	84 (57.5)		187 (59.6)	27 (58.7)		188 (58.2)	26 (70.3)	
Willing for continuing education about coronectomy									
Yes	166 (77.6)	118 (80.8)	0.512	253 (80.6)	31 (67.4)	0.052	264 (81.7)	20 (54.1)	0.000 ^e
No	48 (22.4)	28 (19.2)		61 (19.4)	15 (32.6)		59 (18.3)	17 (45.9)	
Using 3D imaging for diagnosis									
Yes	121 (56.5)	57 (39.0)	0.001 ^f	160 (51.0)	18 (39.1)	0.156	160 (49.5)	18 (48.6)	1.000
No	93 (43.5)	89 (61.0)		154 (49.0)	28 (60.9)		163 (50.5)	19 (51.4)	
Have you performed coronectomies?									
None	185 (86.4)	121 (82.9)	0.600	272 (86.6)	34 (73.9)	0.018 ^d	276 (85.4)	30 (81.1)	0.222
< 5 cases	20 (9.3)	16 (11.0)		30 (9.6)	6 (13.0)		33 (10.2)	3 (8.1)	
≥ 5 cases	9 (4.2)	9 (6.2)		12 (3.8)	6 (13.0)		14 (4.3)	4 (10.8)	
Have you been satisfied with the results (N= 54)									
Yes	25 (86.2)	22 (88.0)	1.000	38 (90.5)	9 (75.0)	0.175	42 (89.4)	5 (71.4)	0.220
No	4 (13.8)	3 (12.0)		4 (9.5)	3 (25.0)		5 (10.6)	2 (28.6)	

Notes: 0.024^b and 0.021^c – a significant difference (P= 0.024) was found in relation to experience, where dentists with more than 5 years of clinical experience stated that coronectomy is not a reliable technique (Table 3). Also, a significant difference (P= 0.021) was found concerning specialty, where more than half (56.8%) of specialists stated that coronectomy is not a reliable technique (Table 3). 0.018^d – A significant difference was found in relation to experience (P= 0.018), with more experienced dentists performing more coronectomy procedures (Table 3). 0.000^e – Most participants (77.6%) were willing to attend continuing education courses about coronectomy, with no significant differences between the groups except for specialty (P< 0.001), where higher percentages 81.7% of general practitioners were more willing for these courses (Table 3). 0.001^f – A significant difference (P= 0.001), where a higher percentage (56.5%) of participants in the governmental sector tend to use 3D imaging systems (Table 3).

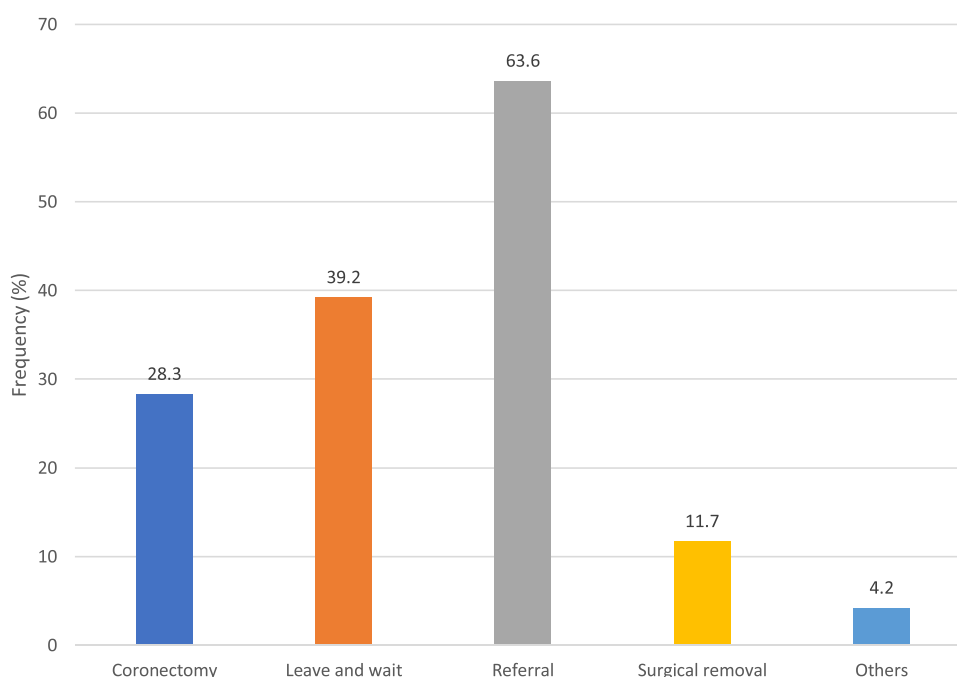


Figure I Response to the question of the options given to patients having complicated risky mandibular third molars.

(66.8%), followed by symptomatic pathology (33.2%). On the other hand, studies on coronectomy in Saudi Arabia are rare. A study by Braimah et al³⁹ investigated the sequelae of coronectomy after one year of evaluation and noticed rapid immigration of the remaining roots in most of the study sample.

In the current study, Saudi dentists' level of knowledge and readiness regarding the coronectomy procedure were assessed. Generally, the participants' knowledge about coronectomy was good (71.9%). However, fewer numbers (68.9%) were aware of its main purpose. The available literature on this subject is still scarce; hence, the comparison to other studies is limited. A study done in Brazil³¹ found similar findings of awareness (71.8%) among professionals, and 64.10% indicated that the main benefit of the procedure is to lower the risk of IAN injury. The authors of the Brazilian study concluded that a third of the participants rejected coronectomy. Our results, however, revealed that most of the participants (61.1%) found coronectomy a reliable technique. This finding is also higher than that observed in the study by Cameri et al in Switzerland,²⁹ in which only 42.6% indicated that coronectomy is a reliable technique. These differences might be related to the fact that our study is more recent, where coronectomy became more popular in recent years.^{12,15,19,28,52}

About half (49.4%) of the participants would recommend 3D imaging in case of the risky positional relationship of impacted mandibular molars with IAN. This result is lower than that reported by Devine et al³⁰ in the UK (73%) and that reported by Cameri et al²⁹ in Switzerland (97.4%). These differences might be related to the limited access to 3D imaging systems in Saudi Arabia or the relatively high cost for the patient^{53,54}. However, most of our participants were willing to attend continuous education courses about coronectomy, which is higher than that reported by Cameri et al²⁹ in Switzerland (47.7%). This might be explained by the fact that the study by Cameri et al was carried among practitioners who are already aware of coronectomy. Moreover, in our study, most participants cannot decide to entirely remove the risky impacted third molars or perform a coronectomy.

In the current study, only 15% of participants performed coronectomy. This is actually a low number compared to the study by Cameri et al²⁹ among professionals in Switzerland, where 43.8% reported that they performed at least one coronectomy procedure. These differences might be related to the fact that part of our participants was not aware of the procedure, and most of them were not specialists. However, the satisfaction with the results of the coronectomy was almost similar in both studies (87.0% in the current study vs 88.6% in the Switzerland study). The frequency of coronectomy recommended by our participants for risky impacted third molars was lower (28.3%) than that reported

by Cameri et al²⁹ in Switzerland (40.6%), Devine et al³⁰ in the UK (73%), and Martin et al³¹ in Brazil (38.46%). On the other hand, Richards et al³³ and Beaumont et al²⁸ reported a wide variation in the number of coronectomies offered. These differences might be related, in part, to the lack of knowledge and attitude,³¹ or the lack of experience in reading the radiographic features that show possible risky involvement with the IAN.^{28,30,33}

Even though the surgical removal of impacted third molars is a complicated procedure, Manor et al⁵⁵ observed no significant difference between surgical removal compared to coronectomy groups in quality-of-life scores during the first post-operative week and no complications were reported in this period. This, in turn, makes coronectomy a better option than surgical removal. Furthermore, surgeons with better capability produce a lower prevalence of post-operative complications. For coronectomy success, the roots must be left entirely enclosed by a mucosa to prevent any localized infection⁵⁶. During the clinical and radiographic evaluation, the dentist ought to contemplate the advantages and disadvantages of complete removal or coronectomy to indicate the greatest alternative for the patient⁵⁷. Additionally, it is essential to enlighten the patients about the benefits and justifications for coronectomy procedure as many patients are still hesitant to agree to leave the roots.

Regardless of the indication from various studies that coronectomy is a harmless method in the long-term and involves the least injuries, even in low-risk cases of injuring the IAN, researchers are against it. In clinical facilities with the advantage of 3D imaging, it will most probably lessen the recommendation of coronectomy procedure in cases with roots demonstrating more risky signs on OPG radiograph where they are shown to be above the inferior alveolar canal.^{30,33} Even after the full removal of the tooth or a coronectomy procedure, sensory disruption might be noticed to the IAN, which is based on the operator and not on the radiographic method^{58,59}. Nevertheless, the option of executing coronectomy or complete extraction of lower wisdom molar is still upon the decision made between the surgeon and the patient.⁶⁰

Although the response rate in the current study was high, some limitations should be acknowledged. The study's cross-sectional nature with only self-reported (subjective) responses is considered a limitation. Another limitation is that the questionnaire did not include radiographic images for impacted mandibular third molars, which can help explore the participants' ability to assess the risk of impacted molars with IAN and advise complete removal or coronectomy. Therefore, future studies with a larger sample, radiographic images, and more related questions are highly recommended.

Conclusion

Within the limitation of this study, it can be concluded that the knowledge of Saudi dentists towards coronectomy is good, while their attitude is still low. The dental curriculum should include more details about coronectomy, and continuous education courses in this issue should be implemented.

Ethical Approval

The study was approved by the Institutional Review Board of Riyadh Elm University (Ref#: FUGRP/2020/149/97/98).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Disclosure

The authors report no conflicts of interest in this work.

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