Asian Journal of Periodontics and Orthodontics
2024, Volume 4, Page No: 42-51

Available online at: www.tsdp.net

ISSN: 3062-3499

Original Article

Awareness and Clinical Competency of Dental Students in Crown Lengthening Procedures

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Received: 16 August 2024; **Revised:** 16 October 2024; **Accepted:** 17 October 2024

ABSTRACT

Articles assessing the understanding of interns and undergraduate students about crown lengthening in Riyadh were lacking in previous years. This study targeted senior students and interns in three dental colleges (KSU, REU, and KSAU) to assess their expertise. One question in a cross-sectional questionnaire-based study asked participants whether they had ever seen a case in their clinic where crown lengthening was recommended. Three clinical and radiographic photographs were also included, each showing different potential management (crown coverage, extraction, and crown lengthening versus crown coverage). The responses of the participants varied. Participants who are interns generally showed greater awareness of crown lengthening. In one instance (the one about crown lengthening), a significant difference was observed between male and female participants; male students were more aware than female students (Chi-square = 15.804, P-value = 0.000). Overall, the majority of participants' responses to the questions were accurate. Additionally, 57% of participants decided that crown lengthening is necessary before speaking with the consultant. The findings showed that interns knew more about the necessity of clinical crown-lengthening treatments than senior students.

Keywords: Crown lengthening, Periodontics, Dental students, Interns, Knowledge

How to Cite This Article: Al-Mubarak AM, Alkhaldi FA, Alghamdi AA, Almahmoud MA, Alghamdi FA. Awareness and Clinical Competency of Dental Students in Crown Lengthening Procedures. Asian J Periodontics Orthod. 2024;4:42-51. https://doi.org/10.51847/r5cLVpz1UT

Introduction

Many students have witnessed instances of the need for crown lengthening through their undergraduate clinical experience; however, some of them struggled to choose the best course of action in these situations [1, 2]. To preserve intact suprarenal tissue connection, crown lengthening is a popular periodontal treatment used to heal teeth with short clinical crowns and severely damaged teeth [3, 4]. In this study, we will evaluate dental students' and interns' understanding of the necessity of crown-lengthening treatments [5, 6].

Clinical crown lengthening is the term used to describe procedures that increase supragingival tooth structure for restorative or cosmetic purposes [7, 8]. Clinicians frequently have to prolong crowns while delivering dental treatment [9, 10]. They must consider each case's biological, functional, and cosmetic requirements while choosing a course of therapy [11, 12]. Crown lengthening was first proposed by D.W. Cohen in 1962 and is now a procedure that frequently combines orthodontics, osseous surgery, and/or tissue reduction or removal to expose teeth. At least 4 mm of tooth structure must be seen above the osseous crest to provide a stable dentogingival complex and sufficient biologic breadth to permit appropriate tooth preparation and account for an adequate marginal placement. This will provide both temporary and permanent restorations with a solid marginal seal with retention [13].

Ernesto proposed that since there is sufficient gingival tissue coronal to the alveolar crest in type I, the gingival

boundary levels may be surgically changed without the need for osseous recontouring. A gingivectomy or gingivoplasty procedure is frequent enough to establish the optimal gingival margin position and avoid the biological width violation. In type II, despite a biologic width violation, this situation is characterized by soft tissue dimensions that allow for the surgical relocation of the gingival edge without osseous recontouring. This kind essentially entails dividing the crown lengthening procedure into two phases, known as stage 1 and stage 2. In step one, the required quantity of crown is exposed by a gingivectomy. Step 2, which includes a flap procedure and any required ostectomy to maintain the biologic width, is carried out once the tissues have completely healed [14].

A procedure known as “crown lengthening” exposes enough tooth structure to enable restorative procedures. It is important to handle the different crown lengthening techniques and treatments to avoid violating biologic width, which might damage the periodontium and cause gingival irritation, loss of attachment, and alveolar resorption. To give the restorative dentist adequate clinical crowns to allow for the best possible tooth restoration, surgical crown lengthening is performed. Reasons for surgical crown lengthening include subgingival caries, subgingival fractures, teeth that have been severely carried or fractured, and naturally short clinical crowns because they have not been exposed to the anatomic crown. Surgical crown lengthening can be achieved via an apically positioned flap with or without bone reduction, external bevel gingivectomy, internal bevel gingivectomy with or without bone reduction, or a combination surgery (orthodontic and surgical). Several requirements must be met before using these tactics. The next step is to choose the approach that works best for the situation. Initial documentation of all hard tissue and soft tissue parameters is necessary to evaluate the case's requirements. CLS can also be performed in a variety of methods. Examples include lasers, scalpels, and cautery. Wounds have been found to heal faster using lasers than with scalpels. Furthermore, there is less post-operative discomfort when lasers are used rather than scalpels [15, 16].

Several researchers looked at dentistry students' understanding of various dental treatments. They use several methods to collect the data.

1. Islam Saad in his research, Saad employed a web-based cross-sectional survey to gauge participants' awareness and understanding of dental implants and the problems they might cause. He discovered that institutions taking part in the study had varying answers [17].
2. In his research, Naif A. Almosa distributed a self-made questionnaire to King Saud University dental students to gauge their understanding of dental ergonomics and work-related musculoskeletal disorders (WRMSDs). He discovered that the students lacked this knowledge, and he suggested that dental students be taught the fundamentals of dental ergonomics before beginning clinical practice [18].
3. To evaluate the knowledge, understanding, and attitude of dental interns in Nepal regarding dental implants, Arati Sharma employed a cross-sectional questionnaire study [19]. According to their findings, most dental interns possess a sufficient understanding of dental implants.

Articles assessing the understanding of interns and undergraduate students about crown lengthening in Riyadh were lacking in previous years. This study targeted senior students and interns in three dental colleges (KSU, REU, and KSAU) to assess their expertise.

Materials and Methods

A cross-sectional questionnaire-based study (Google Forms) contains one question asking the participant if they had seen a case indicated for crown lengthening in their clinic and three clinical and radiographic photos, each one of them showing different possible management. The first case is not indicated for the crown lengthening procedure. The second case indicated extraction. The last case indicated a crown lengthening procedure. The participants will be asked about the best management. All three cases were taken from published case reports. The questionnaire was conducted among interns and undergraduate students of the largest 3 dental school students in Riyadh Saudi Arabia (King Saud University, King Saud bin Abdul-Aziz University, and Riyadh Elm University). Our sample consisted of 2 different groups representing different levels and their respective clinical knowledge, Intern and 5th-year students. Each group ranges from 300 to 400 individuals making the total sample size 600 to 800. We calculated the minimum sample size with a 95% confidence level, and the sample size was 215 participants.

Limitations of the method

1. We were unable to determine the precise number of dental interns and undergraduate students at the universities we were targeting.
2. It's unclear to us whether the majority of participants are taking the questionnaire seriously.

3. Not all potential therapy management options, including ortho extrusion, could be included in the questionnaire.

Future implication

1. Using clinical situations to assess dentistry students' and interns' present knowledge.
2. A potential change to the university curriculum that would make it more subject-specific.
3. No published studies evaluating dentistry students' understanding of the necessity of crown-lengthening operations were found.

Data analysis

SPSS software (version 25) was used to verify, clean, and analyze the raw data once it was collected. The questionnaire questions and respondent characteristics were described using percentages and frequencies. When there were substantial correlations between parameters, chi-square was used. P-values < 0.05 were deemed significant.

Participants profile

The participant characteristics listed in **Table 1** were as follows:

Table 1. Participants' profile (n = 215)

Variables	No.	Percentage
Gender		
Male	137	63.7%
Female	78	36.3%
Academic level		
Intern	108	50.2%
5th year	107	49.8%
College		
KSU	139	64.7%
REU	50	23.3%
KSAU	26	12.1%

There were 78 (36.3%) females and 137 (63.7%) men in the study population. KSU 139 accounted for the bulk of participants (64.7%), followed by REU (23.3%) and KSAU (12.1%). Our participants were divided into two groups, 108 interns (50.2%) and 107 fifth-year students (49.8%), each of whom represented a distinct batch and level of clinical expertise.

According to **Figure 1**, just 9.8% of individuals do not choose the proper plan, which is crown lengthening, whereas the majority of participants (90.2%) do.

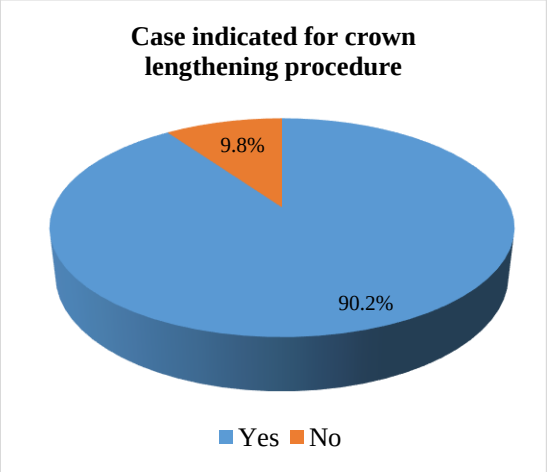

Figure 1. Participants' responses to the case indicated crown lengthening.

Figure 2 illustrates that 41.2% of participants said their consultants were in charge of determining the clinical situation initially, whereas 58.8% of people said they were the ones who did so.

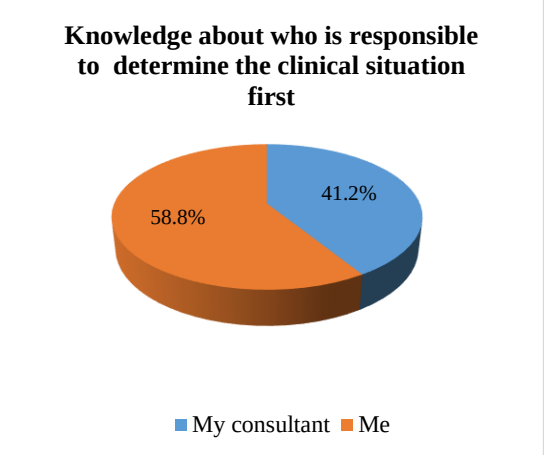

Figure 2. Knowledge about who is responsible for determining the clinical situation first.

Figure 3 demonstrates that over half of the participants (54.4%) believed that "crown coverage" was the best treatment for tooth number 46, while 37.7% believed that "crown lengthening then crown coverage" was the best treatment. Only 7.9% of participants believed that extraction was the best treatment for tooth number 46. Based on these findings, it can be said that over 50% of participants knew crown covering was the optimal course of action for tooth number 46.

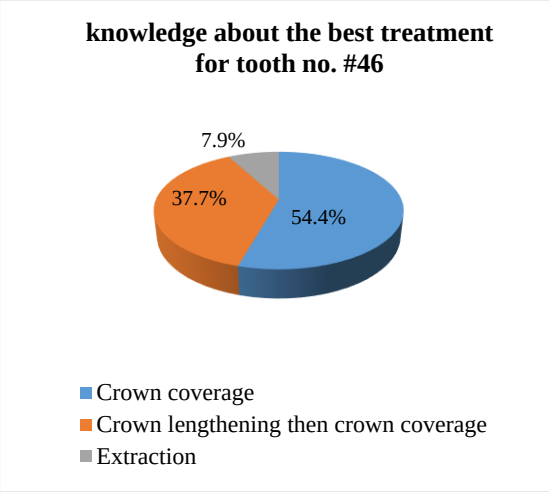

Figure 3. Knowledge about the best treatment for tooth no. 46

Dental students and interns' clinical knowledge toward crown lengthening according to academic level

Concerning the teeth that were recommended for crown lengthening, the findings in **Table 2** demonstrated a statistically significant correlation between the clinical knowledge of crown lengthening by dental students and interns and their academic level (Chi-square = 12.029, P-value = 0.000), with interns having more knowledge than fifth-year students. Furthermore, there was a statistically significant correlation between who determines the clinical situation first (Chi-square = 7.408, P-value = 0.006), with a higher proportion of fifth-year students reporting "My consultant" than intern students, but a higher proportion of intern students reporting "Me."

Table 2. Dental students and interns' knowledge according to an academic level

		Academic level		Chi-square	P-value
		Intern	5th year		
Have you ever seen a tooth indicated for crown lengthening in your clinic?	Yes	105	89	12.029	0.001**
		54.1%	45.9%		
	No	3	18		
		14.3%	85.7%		
Who is the one determining the clinical diagnosis first?	My consultant	34	46	7.408	0.006**
		42.5%	57.5%		
	Me	71	43		
		62.3%	37.7%		
Upon below clinical and radiographic photos, what is the best treatment for tooth no? #46?	Crown coverage (CA)	55	62	1.473	0.479
		47.0%	53.0%		
	Crown lengthening then crown coverage	45	36		
		55.6%	44.4%		
	Extraction	8	9		
		47.1%	52.9%		
Which surface is affected (*All answers were wrong*)	Distal	32	16	8.188	0.042*
		66.7%	33.3%		
	Lingual	2	2		
		50.0%	50.0%		
	Buccal	1	6		
		14.3%	85.7%		
	Mesial	10	12		
		45.5%	54.5%		
Upon below clinical and radiographic photos, what is the best treatment for tooth no? #11?	Crown coverage	2	9	6.164	0.046*
		18.2%	81.8%		
	Crown lengthening then crown coverage	15	20		
		42.9%	57.1%		
	Extraction (CA)	91	78		
		53.8%	46.2%		
Which surface is affected (*All answers were wrong*)	Distal	2	0	6.76	0.080
		100.0%	0.0%		

	Lingual	6	2		
		75.0%	25.0%		
	Buccal	1	3		
		25.0%	75.0%		
	Mesial	1	4		
		20.0%	80.0%		
Upon below clinical and radiographic photos, what is the best treatment for tooth no? #25?	Crown coverage	21	39	16.823	0.000**
		35.0%	65.0%		
	Crown lengthening then crown coverage (CA)	86	59		
		59.3%	40.7%		
	Extraction	1	9		
		10.0%	90.0%		
Which surface is affected for a tooth no? #25?	Distal	13	9	1.863	0.601
		59.1%	40.9%		
	Lingual	2	4		
		33.3%	66.7%		
	Buccal	4	2		
		66.7%	33.3%		
	Mesial (CA)	67	44		
		60.4%	39.6%		

** significant at 0.05 level, and ** significant at 0.01 level

Table 2 demonstrates that the intern students knew better about the optimal course of therapy for tooth number 11 than the fifth-year students did (Chi-square = 6.164, P-value = 0.05). Additionally, there was a statistically significant correlation (Chi-square = 12.029, P-value = 0.000) between the clinical knowledge of dental students and interns on the optimal therapy for tooth number 25, which was crown lengthening followed by crown covering. The findings showed that interns knew more about the best management than fifth-year students did. Also, compared to undergraduate students, interns have encountered more clinical situations. Additionally, interns get greater experience as a result.

Dental students and interns' clinical knowledge toward crown lengthening according to gender

The clinical expertise of dental students and interns on the optimal therapy for tooth number 25, which was crown lengthening followed by crown covering, was the only statistically significant link discovered, as indicated in **Table 3**. According to the findings, male students knew more about this clinical management than female students did (Chi-square = 15.804, P value = 0.000). Future studies must thus investigate the reasons behind the female participants' limited ability to recognize the necessity of crown lengthening.

Table 3. Dental students and interns' knowledge according to gender

		Gender		Chi-square	P-value
		Male	**Female**		
Have you ever seen a tooth indicated for crown lengthening in your clinic?	Yes	127	67	2.610	0.106
		65.5%	34.5%		
	No	10	11		
		47.6%	52.4%		
Who is the one determining the clinical situation first?	My consultant	47	33	2.714	0.099
		58.8%	41.3%		
	Me	80	34		
		70.2%	29.8%		
	Crown coverage (CA)	73	44	1.556	0.459
		62.4%	37.6%		

Upon below clinical and radiographic photos, what is the best treatment for tooth no? #46?	Crown lengthening then crown coverage	55	26		
		67.9%	32.1%		
	Extraction	9	8		
		52.9%	47.1%		
Which surface is affected (*All answers were wrong*)	Distal	37	11	4.617	0.202
		77.1%	22.9%		
	Lingual	2	2		
		50.0%	50.0%		
	Buccal	4	3		
		57.1%	42.9%		
	Mesial	12	10		
		54.5%	45.5%		
Upon below clinical and radiographic photos, what is the best treatment for tooth no? #11?	Crown coverage	6	5	0.463	0.739
		54.5%	45.5%		
	Crown lengthening then crown coverage	23	12		
		65.7%	34.3%		
	Extraction (CA)	108	61		
		63.9%	36.1%		
Which surface is affected (*All answers were wrong*)	Distal	2	0	2.283	0.516
		100.0%	0.0%		
	Lingual	5	3		
		62.5%	37.5%		
	Buccal	2	2		
		50.0%	50.0%		
	Mesial	2	3		
		40.0%	60.0%		
Upon below clinical and radiographic photos, what is the best treatment for tooth no? #25?	Crown coverage	29	31	15.804	0.000**
		48.3%	51.7%		
	Crown lengthening then crown coverage (CA)	105	40		
		72.4%	27.6%		
	Extraction	3	7		
		30.0%	70.0%		
Which surface is affected for a tooth no? #25?	Distal	13	9	4.413	0.220
		59.1%	40.9%		
	Lingual	5	1		
		83.3%	16.7%		
	Buccal	3	3		
		50.0%	50.0%		
	Mesial (CA)	84	27		
		75.7%	24.3%		

** significant at 0.05 level, and ** significant at 0.01 level

Dental students and interns' clinical knowledge toward crown lengthening according to college

The findings in **Table 4** revealed a statistically significant correlation between the clinical knowledge of crown lengthening among dental students and interns and their college (Chi-square = 8.571, P-value = 0.014), with KSU students having greater knowledge than REU and KSAU students.

Table 4. Dental students and interns' knowledge responses based on each college

		College			Chi-square	P-value
		KSU	REU	KSAU		
Have you ever seen a tooth indicated for crown lengthening in your clinic?	Yes	131	40	23	8.571	0.014*
		67.5%	20.6%	11.9%		
	No	8	10	3		
		38.1%	47.6%	14.3%		
Who is the one determining the clinical situation first?	My consultant	50	22	8	4.031	0.133
		62.5%	27.5%	10.0%		
	Me	81	18	15		
		71.1%	15.8%	13.2%		
Upon below clinical and radiographic photos, what is the best treatment for tooth no? #46?	Crown coverage (CA)	74	29	14	1.970	0.741
		63.2%	24.8%	12.0%		
	Crown lengthening then crown coverage	56	16	9		
		69.1%	19.8%	11.1%		
	Extraction	9	5	3		
		52.9%	29.4%	17.6%		
Which surface is affected (*All answers were wrong*)	Distal	37	8	3	14.049	0.029*
		77.1%	16.7%	6.3%		
	Lingual	1	2	1		
		25.0%	50.0%	25.0%		
	Buccal	4	0	3		
		57.1%	0.0%	42.9%		
	Mesial	14	6	2		
		63.6%	27.3%	9.1%		
Upon below clinical and radiographic photos, what is the best treatment for tooth no? #11?	Crown coverage	3	3	5	17.273	0.002**
		27.3%	27.3%	45.5%		
	Crown lengthening then crown coverage	22	6	7		
		62.9%	17.1%	20.0%		
	Extraction (CA)	114	41	14		
		67.5%	24.3%	8.3%		
Which surface is affected (*All answers were wrong*)	Distal	2	0	0	3.246	0.777
		100.0%	0.0%	0.0%		
	Lingual	4	2	2		
		50.0%	25.0%	25.0%		
	Buccal	2	1	1		
		50.0%	25.0%	25.0%		
	Mesial	4	0	1		
		80.0%	0.0%	20.0%		
Upon below clinical and radiographic photos, what is the best treatment for tooth no? #25?	Crown coverage	24	28	8	42.582	0.000**
		40.0%	46.7%	13.3%		
	Crown lengthening then crown coverage (CA)	111	21	13		
		76.6%	14.5%	9.0%		
	Extraction	4	1	5		
		40.0%	10.0%	50.0%		
Which surface is affected for a tooth no? #25?	Distal	20	2	0	14.566	0.024*
		90.9%	9.1%	0.0%		
	Lingual	3	1	2		

		50.0%	16.7%	33.3%
Buccal		2	2	2
		33.3%	33.3%	33.3%
Mesial (CA)		86	16	9
		77.5%	14.4%	8.1%

** significant at 0.05 level, and ** significant at 0.01 level

Additionally, **Table 2** demonstrates that KSU students knew more about the optimal course of treatment for tooth number 11 than did REU and KSAU students (Chi-square = 17.273, P-value = 0.002).

Additionally, a statistically significant correlation (Chi-square = 42.582, P-value = 0.000) was discovered between the clinical knowledge of dental students and interns about the optimal therapy for tooth number 25, which was crown lengthening followed by crown covering. The findings showed that students at KSU knew more about clinical management than students at REU and KSAU. Additionally, KSU students knew more about clinical management than REU and KSAU students did, as well as which surface of tooth number 25 is impacted. The reason for this is that King Saud University accounted for the bulk of the participants in our sample.

Results and Discussion

To improve the look of the smile in cases with delayed passive eruption, periodontal crown lengthening might be done. Additionally, this procedure can provide a biological width and, if required, a ferrule length, which will make it easier to maintain prosthesis for teeth that have fractures, subgingival cavities, or both. Gingivectomy, gingivoplasty, and apically positioned prostheses—which can need osseous resection—are some of the surgical crown lengthening methods. Vertical development may take at least three months, and on average, three millimeters of supragingival soft tissue will return coronal to the alveolar crest [16]. The present study illustrates how a cross-sectional questionnaire-based study comprises three clinical and radiographic photographs that depict various potential management options (crown coverage, extraction, crown lengthening, and crown coverage), as well as a question asking the participant if they had seen a case where crown lengthening was indicated in their clinic. For patients with cosmetic issues, crown lengthening is a feasible treatment option, per the study's findings. Before consulting with the consultant, 57% of participants made the decision that they needed crown lengthening. The results showed that compared to senior students, internship program participants were more cognizant of the need for clinical crown-lengthening procedures. In contrast to previous research, Nethravathy *et al*. [20] demonstrate that the clinical crown is too short, which might lead to a poor retention form and inappropriate tooth preparation. Without sacrificing biological breadth, the crown-lengthening surgical treatment increases clinical height. Gingivectomy, apically displaced flap with or without corresponding osseous surgery, and surgical extrusion employing a peristome are the three different surgical procedures that have been proposed for crown lengthening therapies. Compare the three crown lengthening techniques—surgical extrusion, gingivectomy, and apically displaced flap with or without corresponding osseous surgery—from a clinical perspective. Fifteen patients who came to the periodontology department individually took part in the study. A random number generator was used to allocate patients to one of three groups: surgical extrusion employing a peristome (group C), apically relocated flap (group B), or gingivectomy (group A). The gingiva of patients in group A was extracted. Clinical parameters were assessed at the start and end of the trial, including gingival zenith, interdental papilla height, and clinical crown length. The surgical extrusion approach provides several benefits over traditional surgical techniques, according to the clinical and radiological assessments carried out in the third month. The preservation of the interproximal papilla, the location of the gingival edge, and the lack of marginal bone loss are some of these advantages. When a tooth fracture, dental cavities, or iatrogenic causes seriously impair a crown structure, this surgery can efficiently restore it. It is very important to use this technique in the frontal area, where aesthetics are important.

Crown-lengthening surgery may be indicated for exposure to a fracture, subgingival caries, cosmetic enhancement, or any combination of these conditions. Depending on the patient's goals, crown lengthening surgery can be either cosmetic or practical. The word “functional” describes the simultaneous appearance of a fissure, subgingival caries, or both. Crown lengthening in the anterior sextants is often mentioned concerning cosmetic surgery. Delays in the passive eruption process might result in an overabundance of gingival show. The perception of comparatively short

clinical crowns is given by the earlier literature. Those with a medium or high lip line are more likely to have this problem. Appropriate treatment that reveals the anatomical crowns may be warranted if the patient wants a more normal-length anterior dentition. The anatomical crowns' enamel is removed as part of this therapy [14, 21].

The majority of dental students who took part in different research [22] thought an asymmetric gingival edge was unsightly, with men having a lower threshold than females. In a different study, pharmacy students expressed far higher satisfaction with the decreased crown length than did dentistry students. Compared to preclinical students (first two years), clinical students (fourth, fifth, and sixth years of study) showed a greater overall perceptual threshold for facial and dental aesthetics. Minor alterations in (1) face symmetry, (2) gingival presentation, (3) buccal corridors (narrow and normal corridors), and (4) crown width discrepancy were noted by practitioners. The students' extensive exposure to clinical settings throughout their study helps to explain this. In general, the barrier to cosmetic components decreases with increasing dental education. For instance, Kokich *et al*. assessed the opinions of laypeople and dental experts on bilateral crown length modifications. According to their findings, the unattractiveness threshold was 2.0 mm for the general population, 1.5 mm for general dentists, and 1.0 mm for orthodontists. They came to this result by assessing how dental experts and non-specialists perceived changes in the length of the bilateral crown. An asymmetric gingival margin is seen differently by non-specialists and orthodontists by 1 mm and 0.5 mm, respectively. This fluctuation also affects how big the difference is. Due to their high perceptual thresholds, preclinical and clinical students found it difficult to detect frontal occlusal canting.

Conclusion

In general, the majority of participants' responses to the questions were accurate. Additionally, 57% of participants decided that crown lengthening is necessary before speaking with the consultant. The findings showed that fifth-year students were less conscious of the necessity of clinical crown-lengthening treatments than interns.

Acknowledgments: None

Conflict of Interest: None

Financial Support: None

Ethics Statement: None

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