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RESEARCH ARTICLE

Restorative Treatment Decisions on Approximal Caries Among Practicing Dentists in the College of Dentistry Clinics, Ajman University, United Arab Emirates

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Abstract:

Objectives:

To assess restorative treatment decisions on approximal caries by dental practitioners in College of Dentistry at Ajman University regarding treatment threshold, restorative techniques and restorative materials, and to evaluate the characteristics of dentists relative to their treatment decisions.

Materials and Methods:

Questionnaires were completed by a population of 180 dentists working in the university's clinics. The questionnaire assessed responses to the treatment threshold for a hypothetical approximal carious lesion, the most preferred types of cavity preparation and restorative materials.

Results:

Out of the 180 participants, 57.9% were females, and 42.2% were males. Eighty-three percent were 35 years old or less, 12.2% were between 36 and 50 years, and 4.4% were 50 years or older. Most participants were UAE graduates (84.4%). Majority of the participants would delay surgical intervention of the approximal carious lesion until it reaches the dentine-enamel junction (41%), and 27% would wait further until it reaches into the outer dentine, while only 21% would intervene when the lesion is limited to enamel. The majority of the participants preferred simple box preparation (72.8%), and most of them chose composite as the restorative material (85%).

Conclusion:

There is some variation among restorative treatment decisions of approximal caries by Ajman University's dentists, but the majority tend to delay restorative intervention until caries reaches dentine, they prefer minimally invasive restorative techniques, and prefer composite as a restorative material.

Keywords: Dental caries, Restorative treatment threshold, Diagnosis, Treatment planning, Restorative dentistry, Dental education.

Article History

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1. INTRODUCTION

Caries management continues to be a challenge in restorative dentistry [1]. One of the most difficult types of carious lesions to detect and manage is approximal caries that progress underneath sound marginal ridges. When it comes to this type of caries, the use of bitewing radiographs is required because visual examination alone is insufficient [2 - 5]. Other than clinical and radiographic examinations, additional factors can influence the dentist's decision when it comes to treating

dental caries, such as the patient's age, diet, oral hygiene, caries activity level, and other factors [6]. Currently, there are variations among dentists regarding caries diagnosis and treatment. Also, recent technologies and advancements in dentistry are shifting towards prevention and more conservative treatment decisions [7]. More clinicians in different parts of the world are accepting the minimally invasive treatment concepts, and they are delaying the surgical intervention of carious lesions to more advanced stages [8 - 10].

Categorizing carious lesions at a non-cavitated phase can help dentists assess if noninvasive methods would be successful [10, 11]. If cavitation is not present, caries that have

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penetrated enamel or dentine can be treated by means of remineralization without surgical intervention, using fluoride treatment and patient education, with a higher success rate for lesions that are confined to enamel [12, 13]. The International Caries Classification and Management System and Caries Management by Risk Assessment recommend minimal invasive treatment based on the patient's caries risk level [14].

Anonymous Questionnaires can be used to help investigators evaluate the restorative treatment thresholds of dentists and management approaches. They have been performed in many countries and revealed wide variations. The treatment decision variations exist among countries and dentists within each country [15 - 22].

This study was intended to evaluate Ajman University dentists' restorative treatment decisions regarding the treatment threshold that they use for approximal caries, and which design of cavity preparation and type of restorative materials they prefer when they consider a carious lesion is advanced enough to require restoration.

2. MATERIALS AND METHODS

Ethical approval was obtained from the ethical committee of the College of Dentistry at Ajman University, Ajman, United Arab Emirates (reference number RD-2017/18-04-S). A questionnaire was distributed along with a consent form to 227 dentists at Ajman University (Ajman and Fujairah campuses) including restorative specialists and general practitioners working as clinical supervisors and residents. Dentists who were also working in private practices additional to the

university clinics were included. Participants were asked not to complete the questionnaire if they were not normally working with caries diagnosis and treatment planning. The questionnaires assessed the dentists' treatment threshold for a hypothetical approximal caries, the most preferred type of cavity preparation design and restorative materials. The questionnaire consisted of a consent form, followed by the biodata of the participant like gender, age, year of graduation, years of practice, type of practice, place of graduation and country of graduation. The questionnaire then asked three questions, and all questions referred to a 20-year-old patient who visited the dentist regularly, had good oral hygiene, had low caries activity and used fluoride toothpaste.

The first question: Which carious lesion(s) should be restored immediately? In other words, under any circumstances, which lesion(s) you would not postpone the restorative treatment. Assuming the patient has adequate oral hygiene and low caries activity. The choices that were given: 1) Outer half of enamel; 2) Inner half of enamel; 3) Dentine-enamel junction; 4) Outer 1/3 of dentine; 5) Middle 1/3 of dentine; 6) Inner 1/3 of dentine. This question was supported by a figure that presented each of the 6 carious lesions (Fig. 1) [16].

The second question: Which type of preparation would you prefer for the lesion(s) that you decided to drill and restore? Assuming the lesion is located at the distal surface of the maxillary second premolar and the marginal ridge is intact. The choices that were given: 1) Conventional class II preparation; 2) Simple box preparation (saucer-shaped); 3) Tunnel preparation. This question was supported by a figure that presented each of the three cavity preparations (Fig. 2) [23].

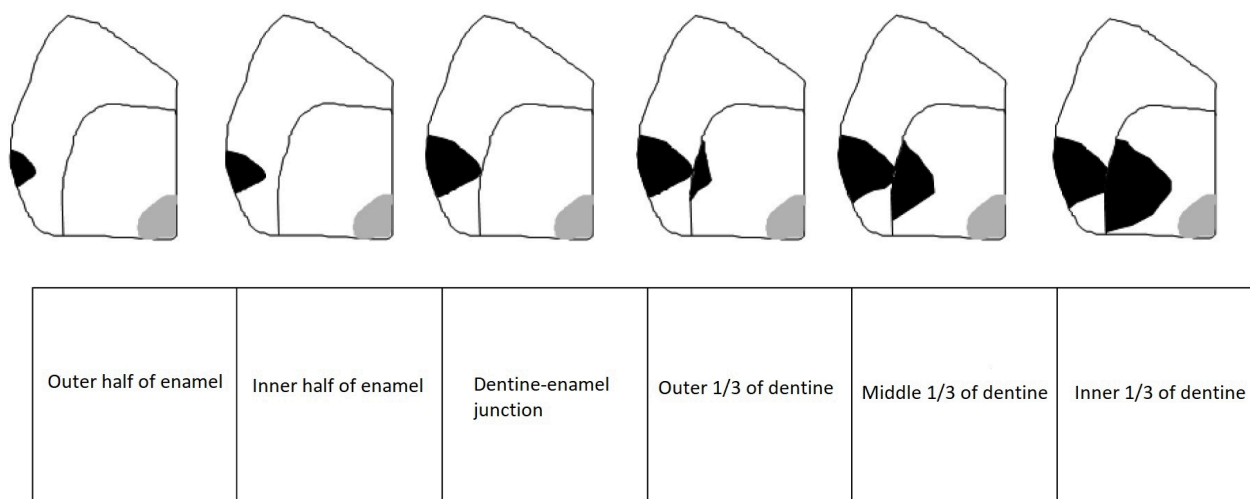


Fig. (1). Six different radiographic stages of approximal caries lesion. Used to determine responder's criteria for initiation of restoration treatment in question 1.

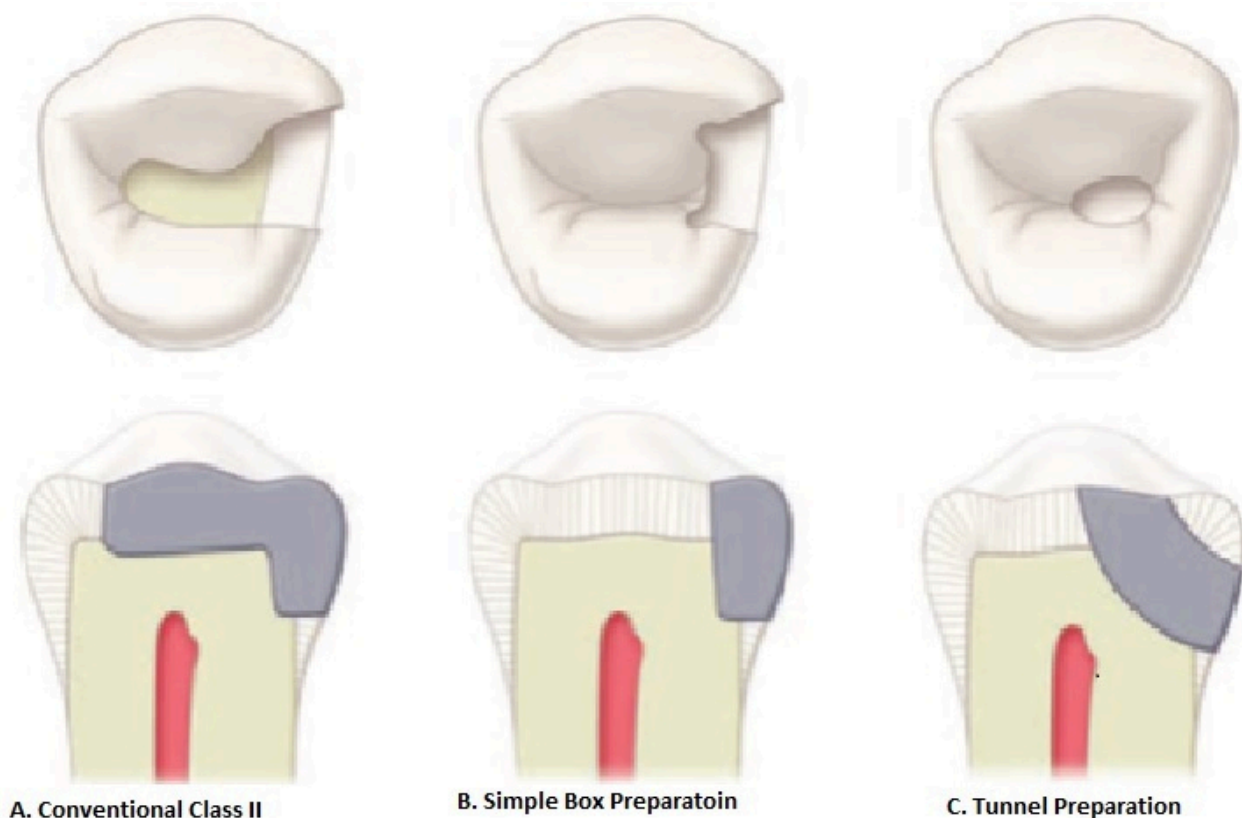


Fig. (2). The 3 different possible cavity designs for approximal caries on a premolar. Used to determine responder's criteria for selection of preparation technique in question 2.

The third question: Which restorative material do you prefer for the approximal lesion that you chose to restore? The choices that were given: 1) Amalgam; 2) Composite resin; 3) Conventional GIC (glass ionomer cement); 4) Resin-modified GIC; 5) Composite resin in combination with GIC. 6) Others (specify).

Data were analyzed using the statistical analysis software (SPSS Inc., version 20.0; Chicago, IL, USA). Descriptive data analysis was performed to characterize the dentists' population and their responses to the questions. Data were found not normally distributed using Shapiro-Wilk normality test. Chi-square test was used to compare results for treatment threshold, preferred cavity design, and preferred restorative materials for different groups of dentists defined by age, sex, country of study and type of practice. The level of significance was set at 5%.

3. RESULTS

A total of 180 dentists out of 227 (79%) completed the questionnaire. Table 1 displays the demographic data for the participants. Out of the 180 participants, 104 dentists (57.8%) were females and 76 dentists (42.2%) were males. The statistical analysis showed no significant difference between males and females in the answers for all 3 questions ($p > 0.05$).

The dentists were divided into 3 age groups; 35 years or less ($n = 150$; 83.4%), 36 to 50 years ($n = 22$; 12.2%) and 50 or more ($n = 8$; 4.4%). The statistical analysis showed no significant difference in the answers of the treatment threshold and cavity design questions between the age groups ($p > 0.05$). However, there was a statistically significant difference in the answers of the restorative materials question ($p < 0.05$). Young dentists preferred composite as a restorative material more than older dentists. Out of the 180 dentists, 152 (84.4%) were UAE graduates while 28 (15.6%) had their dental education outside the UAE. The statistical analysis showed no significant difference in the answers of all questions between those who received their degrees from the UAE and those who received it from outside the UAE ($p > 0.05$). Furthermore, 126 (70%) of the sample were practicing in the university's clinics only (public practice), while 54 (30%) were practicing in a private practice in addition to the university's clinics. The statistical analysis showed no significant difference in the answers of the cavity design and restorative materials questions between dentists who are doing private practice and those who do not ($p > 0.05$). However, there was a statistically significant difference in the answers to the treatment threshold question between them ($p < 0.05$). Dentists who were working in private practice tended to restore carious lesions confined to enamel more than dentists who did not.

Table 1. Distribution of Ajman University dentists (n = 180) who completed the questionnaire on management of approximal caries lesions by age, sex, country of study and type of practice.

Characteristic	Number (%)
Sex	
Male	76 (42.2%)
Female	104 (57.8%)
Age group	
<35	150 (83.4%)
36-50	22 (12.2%)
>50	8 (4.4%)
Country of study	
UAE	152 (84.4%)
Non-UAE	28 (15.6%)
Type of practice	
Public only	126 (70%)
Private and Public	54 (30%)

Table 2. Percentages of Ajman University Dentists choosing each of the possible responses in the questionnaire on management of approximal caries lesions. Percentages are for entire sample and for subgroups (age, sex, country of study and type of practice).

Responses to the questions	Entire sample N=180	≤35 y N=150	36-50 y N=22	>50 y N=8	Male N=76	Female N=104	UAE graduate N=152	Non-UAE graduate N=28	Public practice N=126	Public/Private Practice N=54
Q1. Which lesion(s) to be restored immediately?										
Outer half of enamel	7.8	8	9.1	0.0	9.2	6.7	7.9	6.9	5.5	13.0
Inner half of enamel	13.3	12.7	18.2	25.0	17.1	10.5	11.8	20.7	13.4	13.0
Dentine-enamel junction	41	44	27.3	25.0	39.5	42.9	45.4	20.6	37.8	50.0
Outer 1/3 of dentine	27.2	24.7	36.4	37.5	26.3	27.6	24.3	41.4	33.9	11.1
Middle 1/3 of dentine	6.1	5.3	9.1	12.5	6.6	5.7	5.3	10.3	3.9	11.1
Inner 1/3 of dentine	4.4	5.3	0.0	0.0	1.3	6.7	5.3	0.0	5.5	1.9
Q2. Preferred type of preparation										
Conventional class II	6.7	7.3	4.5	0.0	5.3	7.6	7.9	3.4	7.1	5.6
Simple box preparation	72.8	73.3	72.7	62.5	80.3	67.7	73.0	69.0	71.6	75.9
Tunnel preparation	20.6	19.3	22.7	37.5	14.5	24.8	19.1	27.6	21.3	18.5
Q3. Preferred restorative material										
Amalgam	10.6	7.3	22.7	25.0	7.9	12.5	8.6	20.7	9.4	13.0
Composite	68.9	72.7	54.5	50.0	71.1	67.7	69.7	65.5	70.1	66.7
Conventional GIC	0.6	0.0	0.0	12.5	1.3	0.0	0.0	3.4	0.8	0.0
Resin-modified GIC	3.9	4.0	0.0	12.5	3.9	3.8	3.9	3.4	3.9	3.7
Composite & GIC	16.1	16.0	22.7	0.0	15.8	16.2	17.8	6.9	15.7	16.7

Out of the 180 participants, majority (n = 74; 41%) would wait until it reaches the DEJ (Dentine-enamel junction), while 49 dentists (27.2%) would wait until the carious lesion reaches the outer third of dentine, and 38 dentists (21%) would restore the tooth when the carious lesion is confined to enamel. The most preferred cavity design was the simple box preparation (n = 131; 72.8%), followed by tunnel preparation (n = 37; 20.6%) and the least preferred was the conventional class II preparation (n = 12; 6.7%). The most preferred restorative material was composite (n = 153; 85%). Table. 2 shows descriptive data of the dentists' decisions about the restorative

threshold, preparation technique, and restorative material for approximal caries lesion for all the sample, according to age, sex and country of graduation.

4. DISCUSSION

The response rate for this study was high (79%), which means the results were representative of the treatment decisions for approximal caries in the college of dentistry at Ajman University. There was a high percentage of younger dentists included in the study (83.4% below 35 years), due to the fact

that a relatively large number of the dentists were dental residents and clinical supervisors which were all young general practitioners. Also, older dentists in the university were mostly specialists not general practitioners, and all specialists that do not treat participate in diagnosis and treatment planning of dental caries were excluded (like orthodontists, oral surgeons, prosthodontists, *etc.*). Therefore, a small number of old dentists were included. The treatment decisions that dentists report in questionnaires do not completely reflect their clinical decisions. However, they can still offer insight into their treatment philosophies [16, 17]. Practitioners' decisions also can be affected by age, dental status, and regular visits to the dentist [24]. To limit the response variance, the questionnaire was based on a hypothetical patient.

Although there was some variation in the management of carious lesion by Ajman University dentists, the results showed that the majority preferred restoring approximal caries at a considerably late stage, when the carious lesion reaches the DEJ or even beyond it into the dentine. This probably means they would leave the early lesions which are limited to enamel to be re-mineralized and get arrested. A small number of dentists would restore the teeth at an early stage when it was only limited to the enamel. A similar situation was found among the majority of dentists in Scandinavia and in Kuwait where they would postpone the operative treatment until caries reach the dentine [9, 16, 17, 19]. As opposed to this, a majority of dentists in California, Croatia, France, Iran and Brazil would intervene and start the operative treatment of carious lesions at an early stage [18, 20, 25 - 28]. The late operative intervention of most of Ajman University dentists shows that they are following the current recommendations, and the shift toward a more conservative and preventive approach when managing dental caries [29]. Even the older dentists in this study would choose to restore caries at a late stage contrary to what other studies have shown where older dentists tend to restore caries at an early stage compared to younger dentists [16, 17]. Those older dentists in this study are lecturers and clinical instructors, this indicates that recent recommendations to follow conservative and preventive approaches are being taught to dental students and dental residents in this institution.

The results showed that there was a difference regarding the restorative threshold between dentists who were working in private practice in addition to working a part-time practitioner in the university. A higher percentage of those who worked in private practice would restore the carious lesions at an earlier stage before it reaches into the dentine than those who only worked in the university clinics (public practice) as shown in Table. 2. Similar results were shown in other studies where dentists working in public services were more conservative and delayed the surgical intervention more than dentists working in private practices [9, 15].

When deciding a restorative approach to an approximal carious lesion, a minimally invasive cavity design should be the goal. The simple box preparation (saucer-shape) is successful in the long-term while preserving tooth structure [30 - 32]. Whereas the tunnel-shape preparation was not as successful because of the obliterated view of the preparation field, and recurrent carious lesions [30, 31]. The majority of dentists in Ajman University would choose the simple-box preparation (72.8%). Similar results were shown in the most recent studies in the Scandinavian countries. It was shown that

dentists shifted from the conventional class II and the tunnel preparations to the simple box preparation [9]. While in other studies, the most common preparation was the conventional class II such as in California and Kuwait, whereas tunnel preparation was the most common choice in Croatia [19, 20, 26].

The most preferred material to restore approximal cavities by Ajman University dentists was composite resin. Only a low proportion of the participants would choose amalgam or GIC as their material of choice. However, older dentists would choose amalgam or GIC more often than young dentists who prefer composite more as shown in (Table. 2). Similar results were shown in many recent studies with most dentists choosing composite over amalgam [8, 9, 19, 20]. This is different from older studies where a considerable percentage of dentists who chose amalgam as a restorative material [33].

CONCLUSION

In conclusion, this study showed that most of the dentists at Ajman University are practicing minimally invasive restorative dentistry, delaying the operative intervention to treat caries to a later stage, favoring a more preventive approach. Also, they would choose a minimally invasive cavity preparation, where most of them prefer a simple box (saucer shape). Also, the majority prefer composite resin as the restoration material, which also requires a less invasive cavity preparation compared to amalgam. This implies that restorative dentistry education in the college of dentistry in Ajman University is following the most recent concepts that the literature and research have showed. This study could be the first step to assess and monitor the dental restorative treatment in Ajman University, in the United Arab Emirates and in the region in the future. Also, it could help in the development of guidelines for dentists' education and promoting a modern approach to caries management.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the ethical committee of the College of Dentistry at Ajman University, Ajman, United Arab Emirates (reference number RD-2017/18-04-S).

HUMAN AND ANIMAL RIGHTS

Not applicable.

CONSENT FOR PUBLICATION

A consent form was signed by all participants.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the corresponding author, [A.A.], upon reasonable request.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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Declared none.

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