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Knowledge and Practice of Access Cavity Preparation Among Senior Dental Students

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Abstract: *access cavity preparation is the first and most important stage of root canal preparation. A proper coronal access forms the foundation of pyramid of endodontic treatment. Inadequate access can impair the instrumentation, disinfection and therefore obturationresulting to failure of the treatment. Good access design will assist cleaning, shaping and obturation of the root canal system and lead to good prognosis of the treatment and maximum success.*
Objective: *The aim of this study was to evaluate the knowledge and practice of senior dental student in Al-farabi colleges(KSA) about access cavity preparation.*
Methods:*A questionnaire -based survey form about access cavity preparation was distributed among 109 senior dental students, the questionnaire comprised 21 multiple-choice questions related to: gender, academic year, and detailed questions regarding to student' awareness about access cavity preparation; variations in canal anatomy, complications, errors, instruments, ideal requisites for access cavity, shape of access cavity etc.,*
Results:*The results show that all respondents (100%) have knowledge about access cavity preparation, (88.1%) know about variations in canal anatomy of posterior teeth, (87.2%) know about complications in access preparation, and (87.2) find the access for maxillary and mandibular anterior is easier.*
Conclusion:*0ur students showed good knowledge towards endodontic access cavity preparation. The skill of general dental practitioners based on academic understanding before students enter the clinics.*
Keywords:*Access cavity preparation,Burs,Knowledge,Straight line access.*

I. Introduction

Access cavity is defined as 'The opening prepared in a tooth to gain entrance to the root canal system for the purpose of cleaning, shaping and obturating'[1].The aims of access cavity preparation are to 1- provide direct straight line access to the apical foramen, 2- complete deroofing of pulp chamber which help in identification and location of canal orifices, remove all caries and prevent discoloration of teeth because of remaining pulpal tissue,3- Conserve sound tooth structure as much as possible[2].Inadequate access can impair the instrumentation, disinfection and therefore obturation resultingultimately in failure of the treatment. Therefore good access design will improve cleaning, shaping and obturation of the root canal system and lead to good prognosis of the treatment and maximum success [3, 4].If access cavity preparation done properly, a thorough assessment of the restorative needs of every tooth can be made (e.g., the need for crown lengthening, a post, or simply a bonded core or composite to ensure the structural integrity of the tooth after root canal procedures)[2].

The design and the outline of the access cavity preparation determined by the shape of the pulp chamber of each individual tooth.Some publications have highlighted the possibilityto perform root canal treatment through a conservative endodontic cavity (CEC) and suggested that this method might decrease the susceptibility of the treated teeth to fracture, although CEC may compromise adequate instrumentation of the canals[5, 6]. According to European Society of Endodontology (ESE); to improve the standards in clinical practice, undergraduate training in endodontics should be undertaken in a way that a minimum level of competence as well as an ethos of continued learning is instilled in the graduate. Standardized undergraduate endodontic training is important for preventing disparities in endodontic treatment carried out by general dental practitioners from different universities in a country or even different countries [7]. Access cavity preparation one of the most challenging and difficult aspects of endodontic treatment, however it is one of the keys to endodontic success[3]. Hence, the aim of this study was to evaluate the knowledge, awareness, and attitude of senior dental student in Al-farabi colleges(KSA) about access cavity preparation.

II. Materials and methods

This was a questionnaire based cross-sectional study on senior undergraduate dental students at Al-Farabi Colleges, Riyadh Saudi Arabia, during the academic year 2016–2017.

The study was approved by the Al-Farabi research Ethical committee, and consent forms were obtained from all the participants.The questionnaire distributed in this study was similar to study conducted by Madhavan andChandana[8]A questionnaire survey form was distributed among 109 senior dental students during 3months. The students were instructed not to put their names on the questionnaire form and asked to complete questionnaireform. The participants were requested to answer 21 multiple-choice questions contain:gender,academic year, and detailed questions regarding to student' knowledge about access cavity preparation; variations in canal anatomy, complications, errors, instruments, ideal requisites for access cavity, shape of access cavity etc.Data was coded computerized and analyzed using methods of descriptive statistics.

III. Results

The study included 109 senior dental students in dental hospital of Al-farabi colleges (Riyadh, KSA), out of a total of 109 subjects 84(77.1%) were males and 25(22.9%) werefemales. The participants in this questionnaire were 23(21.1%) in sixth academic year and 86(78.9%) in fifth academic year. The results show that all respondents (100%) have knowledge about access cavity preparation, (88.1%)know about variations in canal anatomy of posterior teeth, (87.2%) know about complications in access preparation,91.7%considered the straight line access cavity preparation is important. And (87.2) find the access for maxillary and mandibular anterior is easier.

(75.9%) of subjects considered the perforation is the most error can occur during access cavity preparation, and (78.9%) say that to minimize the errors during access cavity preparation the one should know the internal anatomy of the tooth, proper orientation of the burs, and use proper armamentarium.In this survey (92.7%) of respondents confirmed the importance of pre-operative radiograph before access opening. (48.6%) answered that palatal canal is the largest and located first in maxillary molar, and (47.7%) admitted that distal canal is easy to find in mandibular molar.Table (1) summarize the students' answers to questions comprised in the study related to access cavity preparation.

IV. Discussion

Endodontic access cavity Preparation is a key stage in root canal treatment in which the root canal entrances will be identified. An error in this preliminary step would compromise all subsequent work.Therefore, the aim of this study was to assess senior dental student' knowledge about access cavity preparation including variations in canal anatomy, complications errors, instruments, ideal requisites for access cavity, shape of access cavity etc.It is important to be familiar with variations in tooth anatomy and characteristic features in root canal system of each tooth type as this knowledge can aid location, negotiation and management of canals during root canal treatment. In this study the majority of respondents (88.1%) confirm knowing variations in tooth anatomy.

Unfortunately, errors can occur in the preparation of an access cavity. Most are the result of failure to follow the access guidelines; others reflect a lack of understanding of the internal and external tooth morphology[2]. Numerousmistakeshappenthrough access preparation due to under-extension i.e., the desire to prevent removal match tooth structure. This would result in limitation of direct access to the apical part, causing incomplete removal of debris, inadequate preparation of dentin walls, in ability to find extra canals, and failure to produce best compaction of the obturation.Further mistakes in access preparation include gouging, perforation, ledge formation, instrument separation and these errors happen because of inability to follow to the guidelines of access opening. In this survey (87.2%) of respondents admitted that they are aware the complications in access preparation, and (75.9%) of respondents know the perforation are the most common error occur during access cavity preparation.

Numerous burs have been developed exclusively for access cavity preparation. Round carbide or diamond burs are used in the preparation of access cavities. They are used to excavate caries and to make the initial external outline shape. They also are beneficial for penetrating through the roof of the pulp chamber and for deroofing. A few clinicians select to use a fissure carbide or a diamond bur with a rounded cutting end to accomplish these procedures. The advantage of the fissure carbide and diamond round-end burs is that they also can be used for some of the axial wall extensions of the access cavity preparation. Fissure carbide and diamond burs with safety tips are safer choices for axial wall extensions[2]. In the current study (96.3%) of respondents confirmed using round bur in access opening.It is recognized that good access cavity design and preparation associated with knowledge of internal and external anatomy of the tooth[9] , skill and experience of the operator , and using proper armamentarium [10]as hand pieces , proper burs , A pre-operative periapical radiographs ,dental operation microscope[9], or loupes which providing magnification and better illumination, Most of subjects(78.9%) in this questionnaire suggested all this ideas to minimize accidental procedures during endodontic access cavity .Lingual shoulder is a prominence of dentin formed by removal of lingual roof in anterior teeth which extends from the cingulum to approximately2 mm apical to the orifice[10, 11] . The lingual shoulder prevents straight line access to the apical part of the canal and bends files labially, mostly causing ledge formation or perforation, therefore lingual shoulder must be removed to gain access to the lingual wall of

the root canal [2]. This study revealed good understanding of dentinal shoulder in the students, (89%) of respondents confirmed the necessary to remove the lingual dentinal shoulder and (51.4%), (11.9%) of respondents claimed respectively that the importance of dentinal shoulder is related to straight line access and preventing ledge formation.

A suitable designed access cavity assures unobstructed straight-line access to the apical third of the root canal. Such an access is important for both manual and rotary instrumentation of the root canals as it increases shaping and cleaning effectiveness and decreases the risk of procedural errors [12, 13]. Internal tooth anatomy dictates access shape; therefore, the first step in preparing an access cavity is visualization of the position of the pulp space in the tooth. This visualization requires evaluation of angled periapical radiographs and examination of the tooth anatomy at the coronal, cervical, and root levels [2] .The following generalizations of the pulp chamber anatomy as suggested by Krasner and Rankow 1. The pulp chamber is always at the center of the tooth at the level of the cement-enamel junction (CEJ), 2. The walls of the pulp chamber are always concentric to the external surface of the crown at the (CEJ), 3. The distance from the external surface of the clinical crown to the wall of the pulp chamber are the same throughout the circumference of the tooth at the level of the (CEJ)[14].In this survey the majority of subjects (66%) assured that the ideal requisite for access cavity preparation are straight line access, visualization of coronal and incisal anatomy, and evaluation of cementoenamel junction (CEJ).On the other hand, (92.7%) of subjects emphasized the importance of preoperative radiograph that will provide information on the size of the pulp chamber and amount of dentine that makes up the pulp chamber roof and floor.findings in regard to knowledge of access cavity and about variations in canal anatomy of teeth are similar to that reported byMadhavan andChandana[8]although they survived dentalpractitioner rather than of dental students.Dental students are given both theoretical and practical knowledge in their dental course. Endodontics has always been a challenging subject for undergrad students and this course needs development of diagnostic and practical knowledge along with clinical skills. Research on the quality of endodontic performed in preclinical and clinical years are limited. Consideration should be given to increasing the academic understanding before students enter the clinics[15].

V. Tables

Table (1) Responses to questions regarding to access cavity preparation.

Factors	**Options**	**Percent**
participants according gender	Male	77.1%
	Female	22.9%
The participants according academic year	5^{th}	78.9%
	6^{th}	21.1%
Do you have any knowledge on endodontic access? cavity preparation	Yes	100%
	No	0
How do you find the access cavity preparation for mandibular and maxillary anterior?	easy	87.2%
	difficult	12.8%
Do you know about the variations in canal anatomy of premolars and molars?	Yes	88.1%
	No	11.9%
Do you know what errors can occur during access cavity preparation?	perforation	75.9%
	gouging	24.1%
How to minimize the errors?	should know the internal anatomy of tooth	11.9%
	proper orientation of bur	7.3%
	using proper armamentarium	1.8
	all of the above	78.9%
The access cavity is easier for	anterior	78.9%
	posteriors	21.1%
Name the bur used in access opening	round bur	96.3%
	245 bur	0.9%
	finishing bur	0.9%
	pear shaped bur	1.8%
Is straight line access cavity preparation important?	Yes	91.7%
	No	8.3%
Is it necessary to remove the dentinal shoulder?	Yes	89%
	No	11%
What is the significance of dentinal shoulder	Straight line access	51.4
	Remove the pulp tissue	13.8
	Prevent ledging	11.9

	all options are incorrect	22.9
What are the ideal requisites for access cavity preparation ?	Straight line access	19.3%
	Coronal &incisal anatomy & evaluation of CEJ	7.3%
	Smooth gliding path	7.3%
	all answers are correct	66.1%
How to enlarge the orifice of access cavity preparation?	Gates glidden	36.7%
	Round bur	18.3%
	Peeso reamer	10.1%
	all answers are incorrect	34.9%
Do you know about the various complications in access cavity preparation?	Yes	87.2%
	No	12.8%
Is it important to have a knowledge about the root canal anatomy using a pre-operative radiograph before access opening?	Yes	92.7%
	NO	7.3%
Which orifice is the largest and is located first in the maxillary molar?	buccal	21.1%
	palatal	48.6%
	mesial	20.2%
	distal	10.1%
Which orifice is easy to find in mandibular molar?	distal	47.7%
	mesial	33.9%
	buccal	11%
	Lingual	7.3%

VI. Conclusion

1. Within the limitations of this study. 0ur students showed good knowledge towards endodontic access cavity preparation.
2. The skill, attitudes, and approaches of general dental practitioners and dental specialist rely on academic understanding before students enter the clinics.
3. 2. Well-designed endodonticaccess cavity preparation is essential for root canal treatment Failure to produce an adequate access cavity can lead to difficulty in locating and negotiating root canals, which in turn will result in inadequate cleaning and shaping of the root canal system.

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