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Original Research Article

Knowledge and attitudes of senior dental students and interns regarding the causes of endodontic procedural errors across various regions in Saudi Arabia

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ABSTRACT

Background: Aim of this study was to evaluate the knowledge of dental students among procedural errors and complications during endodontic treatment in Saudi Arabia.
Methods: A questionnaire was sent to senior dental students and interns in different regions of Saudi Arabia. The questionnaire evaluated the knowledge of them in file separation, ledge, coronal perforation, sodium hypochlorite accident, and flare up.
Results: The 88% believe that cone beam computer tomography (CBCT) is better than other types of radiographs in diagnosis root canal treatment errors. Additionally, root canal treatment errors are multifactorial. 60.2% of respondents experienced endodontic errors. Most participants (66.9%) believe that stainless steel file has higher chance to fracture than NiTi file. The most common reason that was chosen regarding file separation is "using old files". In term of ledge, the respondents think that under-prepared access cavity is the main reason leading to a ledge. Regarding coronal perforation, the canal inclination was chosen as the most common reason. The respondents believe that "Stick the needle inside the canal with a heavy pressure" is the most common reason of sodium hypochlorite accident. Finally, the participants think that incomplete cleaning and shaping play important role in flare up.
Conclusions: Depends on the results, the senior dental students and dental intern lack important information about some endodontic errors which are file separation and flare up. However, they have acceptable overall knowledge about ledge. Further studies should be performed regarding the managements and preventions.

Keyword: Root canal treatments errors, Root perforation, Ledge, Broken file, Flare up

INTRODUCTION

Once the bacteria or its byproducts reach the dental pulp, the pulp starts inflammation which will necrotize without sooner intervention.[1-3] The bacteria can reach the pulp thorough different ways such as caries, bacterial leakage, or trauma.[4-6]

In these situations, root canal treatment (RCT) is mandatory to save the tooth.

RCT reduces the amount of the intra-radicular bacteria and eventually periapical healing.[7] RCT must provide multiple factors to prevent future infection such as adequate apical and coronal seal.[8] In addition, instrumentation, and irrigation the whole length of the root in essential.[9,10]

However, some errors and complications may prevent RCT to provide these requirements. First, perforation prevents sealing which causes in and out movement of the

bacteria. In perforation cases, multiple factors affect the outcome which are time, size, and location.[11,12] Also, the material that is used in sealing the perforation play a major role in perforated teeth. The repair material should provide adequate seal, biocompatible, able to produce osteogenesis, bacteriostatic, radiopaque, and easy to place.[13] Multiple studies were published comparing between different materials. MTA material has been proofed as an adequate root repair material.[14-18] Biodentine and bioceramic also has been tested and both showed sufficient properties in perforation.[19,20] Therefore, perforation must be sealed as soon as possible with calcium silicate cement.

Secondly, broken instrument is another intraoperative error that may happen with both rotary files and hand files. However, the prevalence of NiTi rotary files separation is seven time more than hand files separation.[21] Fouad et al. found that the temperature of the rotary file has no effect on the cyclic fatigue of the file.[22]

In general, broken files do not affect the outcome with experienced endodontist.[23]

Additionally, ledge is another error that results in improper cleaning and shaping. Ledge is created when the original pathway of the canal has been deviated. Ledge formation has multiple reasons such as ignore the root curvature during instrumentation, not following the proper steps of cleaning and shaping, instrumentation shorter than the working length, and forcing the instruments. Bypassing the ledge can be providing by using small hand file with bended tip.[24]

Also, overfilled canals may affect the outcome of RCT.[10,25] Generally, the whole canal must be cleaned and shape. Overextension is different than overfilling. Overextension occur when the root canal is 3-dimentionally filled but there is obturation material beyond the apex. Multiple studies showed that overextension does not affect RCT outcome.[10,26] On the other hand, overfilled occurs when the canal is not filled properly. Subsequently, the RCT will not success. Regarding underfilling, Chugal et al showed that there is 14% increased chance in failure with each 1-millimeter loss in working length in necrotic cases.

Swallowed or aspirated endodontic instruments also considered as a serious procedural error which may require surgical intervention. 0.001 is the incidence of aspiration of endodontic instruments and the incidence of incidence of ingestion is 0.12. No fatal outcome was reported in 100.000 RCT.[27]

Being aware of all these procedural accidents can be useful to prevent them. Therefore, the aim of this study was to evaluate the knowledge of dental students among procedural errors and complications during endodontic treatment in Saudi Arabia.

METHODS

This study has been approved by Taibah University, College of Dentistry Research Ethics Committee (TUCDREC/20200324/MMAlanazi). A cross-sectional comparative study that is conducted among senior dental students and interns at Colleges of Dentistry in different regions in Saudi Arabia from 28 March 2020 to 28 March 2021. An electronic self-administer English questionnaire was used. Personal emails of students and interns as well as social media was used to reach the target sample and invite them to share voluntarily in the study.

Exclusion criteria

Male and female of junior students (fourth year, fifth year, and pre-clinical students), and dentists were excluded.

Study tools

The research tool was a self-administrated anonymous questionnaire.

The questionnaire has been designed of three sections have been sent (in an electronic questionnaire).

The first section the participants have been asked to consent to participate in the study and provide their demographic information regarding to their age, gender, and level of education.

The second section has seven questions are formulated to investigate general information of the participants regarding their basic knowledge and experiences during the clinical educational path.

The third section has seven questions concerned with causes of endodontic accidents during clinical practice for the participants and it is contained the most common endodontic accidents and complications.

RESULTS

The 435 senior students and interns responded.

Section 1: Personal information of dental students

Age distribution of respondents indicate that highest number of participants are dental interns. 185 participants (42.5%) were 25 years old followed by 167 students (38.4%) who were 24 years old. 38 students (8.7%) respondents were 26 years old, 35 respondents (8.0%) were 23 years old, 6 (1.4%) were 27 years old, and only 4 (0.9%) were 28 years in age.

Out of 435 respondents, 230 (52.9%) were females while 205 (47.1%) were males.

The respondents were enquired about their education level. 293 (67.4%) were in their internship year, followed by 125 (28.7%) who were in their sixth year. Only 17 (3.9%) chose other option.

Multiple educational institutions over Saudi Arabia were involved. There were highest number of respondents, 346 (79.5%) who went to Taibah university for their highest level of education.

Section 2: General information

This section represents some general information about the endodontic information and accidents.

What does endodontic mishaps mean?

Out of 435 dental interns, maximum number of respondents 323 (74.3%) mentioned that it means endodontic accident. 93 respondents (21.4%) thought it is an irregularity, and 19 respondents (4.4%) believe that it is a modification.

Do you regularly inspect your instruments (files) before starting an endodontic treatment?

The results indicate that majority of participants, 362 (83.2%) answered Yes while 73 (16.8%) answered No in response to regularly inspecting their instruments while they are going to treat a patient.

Are you aware enough about teeth tilting and inclination?

The results of this question indicate that 312 (71.7%) students and interns were aware of these while 123 (28.3%) did not have enough information about teeth tilting and inclination.

Have you encounter endodontic accident before?

Out of 435 dental students and interns, 262 participants (60.2%) have an experience of going through an endodontic accident while 173 (39.8%) answered no to this question.

Do you think CBCT is more beneficial in detecting endodontic accidents than Panorama?

383 (88.0%) respondents agreed to this while 45 (10.3%) think that panorama was more beneficial. 7 (1.6%) chose “no different between Panorama and CBCT”

Accidents are unpredictable and can happen anytime.

The respondents were asked to give their opinion on this statement on scale from 1-10 (1=strongly disagree, 10=strongly agree). The results show that 43 (9.9%) respondents strongly disagreed, 102 (23.4%) disagreed, 121 (27.8%) agreed and 169 (38.8%) strongly agreed. This indicates that more respondents agree that accidents can happen at any time during the treatment, and they cannot predict them.

Section 3: Causes of endodontic accidents during clinical practice

Which of the followings can cause file separation?

A multiple response question was asked from the respondents about the possible causes of file separation. The respondents were allowed to choose more than one option. 139 (37.4%) choose using an old file, 97 (26.1%) chose curved canal, 108 (29.0%) chose improper access cavity, 20 (5.4%) pre-curve the file and 8 (2.2%) chose using a new file.

What size of Gates Glidden (GG) do you think it's more likely to break?

Regarding the size of GG that is most likely to break, most respondents (68.7%) chose size 0.50, and size 0.70.

Which type of files separate more frequently

Out of 435 respondents, only 65 (14.9%) believe that NiTi separates more frequently. On the other hand, 291 (66.9%) think that stainless steel separates more frequently and 79 (17.9%) believe that both types of files have equal prevalence.

Which of the following can lead to a ledge?

92 (40.4%) of the respondents think that under-prepared access cavity is the main reason that is leading to a ledge. 77 (33.8%) selected Cleaning and shaping shorter than the working length (Figure 1).

Perforation in the crown

Maximum number of respondents, 125 (46.0%) think that inclined crown can cause perforation while 88 (32.4%) chose calcified pulp chamber and/or canals. 59 (21.7%) selected weak tooth structures (Figure 2).

Sodium hypochlorite accident

Dental interns were enquired about the happening of Sodium hypochlorite accident. 139 (39.7%) of respondents believe that sticking the needle inside the canal with a heavy pressure is the most common reason, followed by 118 (33.7%) chose open apex, 85 (24.3%) selected Type of irrigation needle and 8 (2.3%) selected Sticking the needle inside the canal with a light pressure (Figure 3).

The main cause of flare up

Regarding the main cause of flare up, the main reason that was picked by the participants was “not finishing cleaning and shaping in the first visit” (Figure 4).

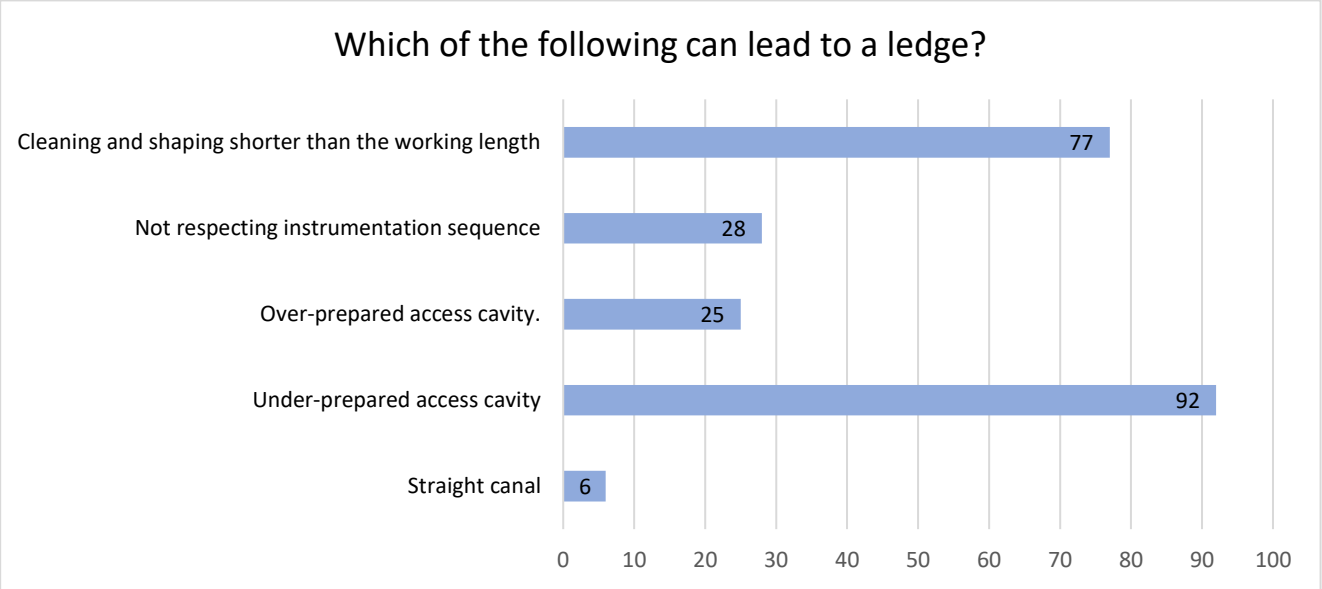

Figure 1: Number of respondents about each reason in canal ledge.

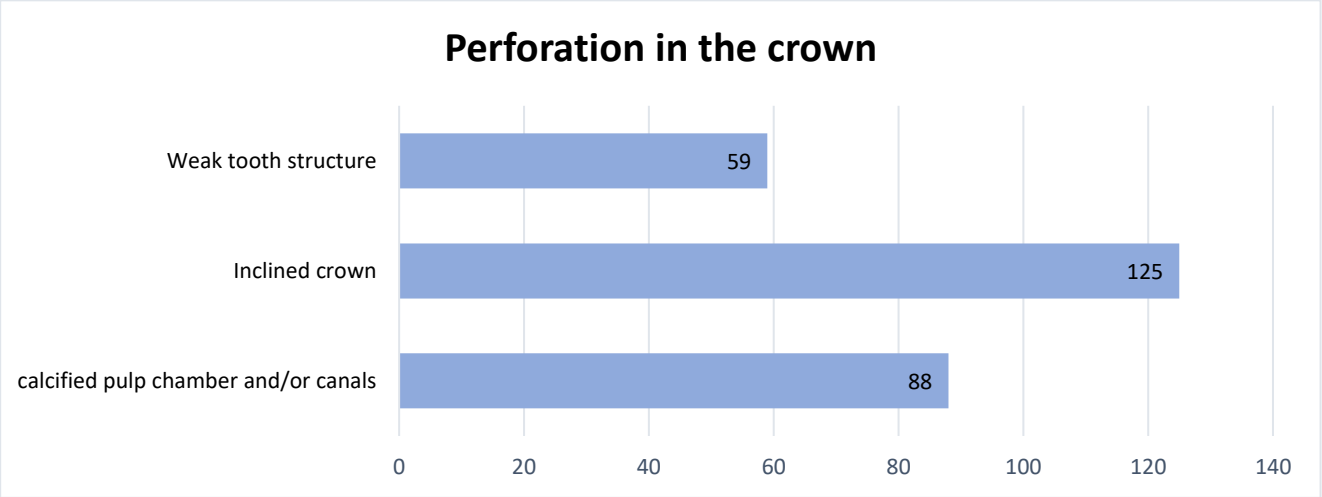

Figure 2: Distribution of respondents among crown perforation.

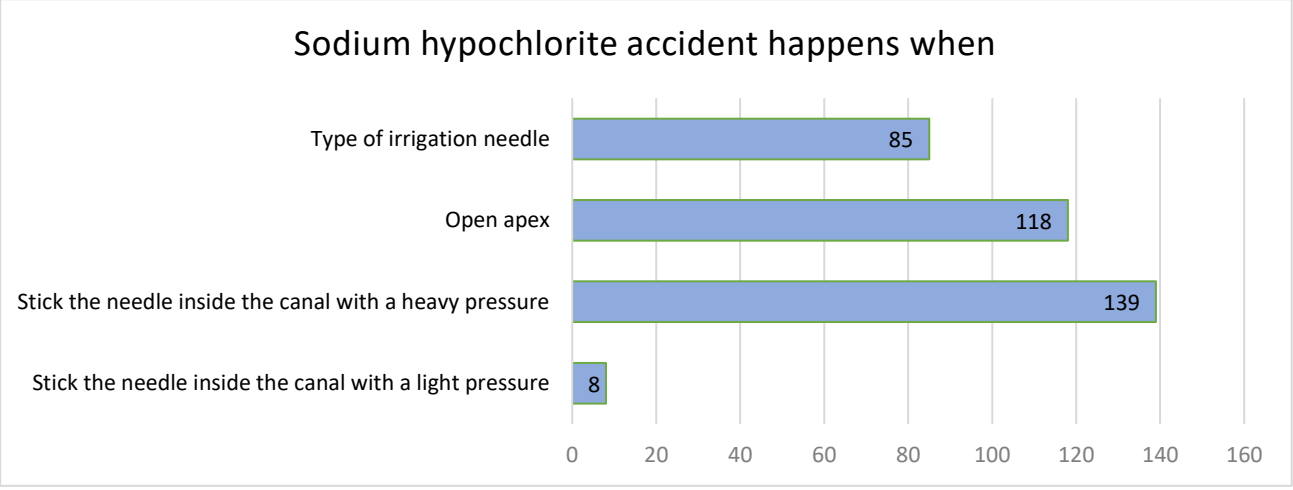

Figure 3: Frequency respondents among the reasons of sodium hypochlorite accident.

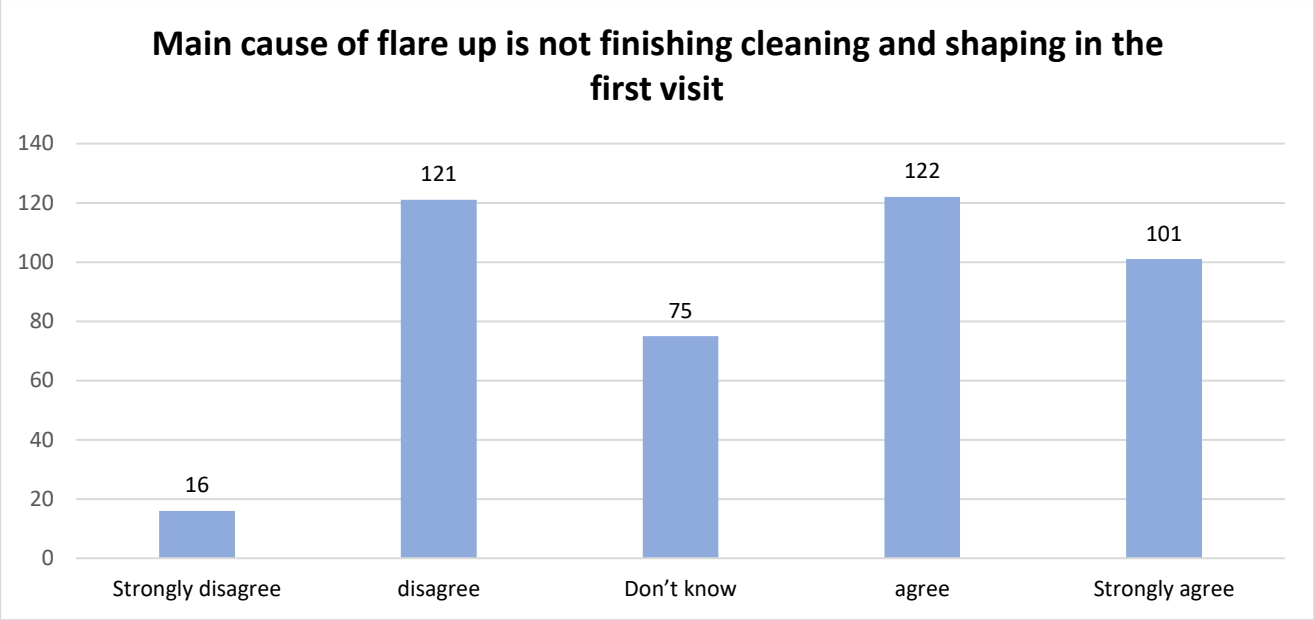

Figure 4: Frequency of respondents among flare up.

DISCUSSION

This article is a continuation of a group of articles that evaluated the knowledge and attitude of dental senior students and interns in Saudi Arabia among the managements, preventions, and prognosis of root canal treated teeth with endodontic errors or complications.

work Identification of endodontic complications is one of the indications of using CBCT as recommended by The American association of endodontists (AAE) and the American Academy of Oral and Maxillofacial Radiology (AAOMR). Our results showed that 88% of this study's participants follow with this indication.

Regarding file separation, the participant responded differently than Iqbal et al study.[21] In our study, they believe that the hand stainless steel files break more often comparing to rotatory NiTi files. This could be referred to the level of education of our participants who are only students and interns. Regarding, ledge formation, our results showed great understanding of reasons and prevention depends on Jafarzadeh and Abbott study.[24] Disrespecting the instrumentation sequence and incorrect working length determination are one of the major reasons as showed by both our study and Jafarzadeh and Abbott study.[24]

In this study we evaluated the perforation in the crown only. The participants believe that the crown angulation or tilting is a major factor which was mentioned in the textbook that they used in the educational undergraduate years (Cohen's Pathway of the pulp).

Sodium hypochlorite accident is not fully understood because all of the published studies are case reports or case series.[28] Our results show grate understanding of such a procedural errors and complication.

We use "agree or disagree" question to evaluate their knowledge about the reason of flare up. The 28% of the participants agreed but 27.8% disagreed which reflects the fair knowledge of such a complication. However, further questions or another type of questions should be used for better evaluation.

The major drawback of this study is about the study design which is a survey. In addition, the question is only about the reasons. We didn't ask about the management and the prevention. However, another part of this study will be published later regarding the management and prevention of endodontic iatrogenic errors.

CONCLUSION

Depends on the results, the senior dental students and dental intern lack important information about some endodontic errors which are file separation and flare up. However, they have acceptable overall knowledge about ledge. Further studies should be performed regarding the managements and preventions.

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