

## Evaluation of endodontic work in Mosul city

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### ABSTRACT

**Aims:** To evaluate different steps of endodontic procedures done by the dentists in Mosul city.

**Materials and Methods:** A dental questionnaire sheet that consisted of 21 questions regarding numerous steps of endodontics starting from pre-operative (diagnostic) phase to post-operative (final restoration) phase was distributed randomly to 150 dentists working in Mosul city. The dentists involved in the study were both specialists and non-specialists. Then, the sheets were collected and the data analyzed. **Results:** Revealed that there was a difference in performing specific steps of endodontics between the dentists. In some questions there was no great difference between specialists and non-specialists, but in other procedures, a great difference could be observed. This difference was not only between specialists and non-specialists groups, but also inside these groups as well.

**Conclusions:** The dentists in Mosul city generally lack information about some important steps in endodontic work that may affect negatively the outcome of the procedure as a whole. This deficiency can be compensated for by holding continuous education programs in addition to the dentists' responsibility in staying in contact with the most modern advancements in different fields of dentistry.

**Key Words:** Endodontic evaluation, Mosul.

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### INTRODUCTION

Root canal therapy may be defined as the complete removal of the irreversibly damaged pulp followed by thorough cleaning, shaping and obturation of the root canal system so that the tooth may remain as a functional unit within the dental arch.<sup>(1)</sup>

The key factor in the development of pulpal inflammation and apical periodontitis is the presence of bacteria.<sup>(2)</sup> It has been widely accepted that bacteria and/or their products are the main etiological factors in the initiation and progress of these diseases.<sup>(3)</sup>

Consequently, the central focus of root canal treatment has been directed towards the elimination of bacteria and their substrates from the pulp canal system. This may involve removal of necrotic pulp and tissue debris, removal of an inflamed pulp

or, in elective treatment, the removal of healthy tissue.

Historically, a mechanistic approach to root canal treatment was frequently adopted, but in recent years a greater awareness of the complexities of the root canal system has led to the development of newer techniques, instruments and materials. These new developments have greatly enhanced the clinician's ability to achieve the biologically-based objectives of root canal treatment, which include:

1. Removal of all tissue, bacteria and bacterial products and substrates from the root canal system.
2. Shaping of the root canal system to facilitate placement of a root canal filling.
3. Filling of the shaped canal system coupled with an adequate and timely coronal restoration.

Traditionally the 'endodontic triad' concept of cleaning, shaping and filling has been promulgated widely. However, considering that a major goal of root canal treatment is removal of microorganisms from the complex root canal system, it would therefore appear that 'shaping to facilitate cleaning and filling' might be a more appropriate concept. These objectives must be achieved while ensuring conservation of tooth structure and maintaining canal shape.<sup>(4)</sup>

The aim of this study was the evaluation of different endodontic steps performed by the dentists in Mosul city, beginning with diagnosis and ending with final restoration.

### MATERIALS AND METHODS

For this study a questionnaire sheet (Figure 1) that concerned with different steps of endodontic treatment were prepared and delivered to 150 dentists who were selected randomly and worked in Mosul city exclusively in different centers ( health centers and dentistry college). The dentists involved in the study were both specialists and non specialists.

To be a blind study, the questionnaire sheet did not contain the name of the dentist who fills it. After one week the sheets were collected from the respondents and subjected to analysis, arrangement and tabulation.

### RESULTS AND DISCUSSION

From 150 dentist involved 140 sheets considered in the study, 10 sheets were discarded because they lacked complete information.

#### Dentists' information:

The total number of dentists involved in the study was 140. About 68% of them spent 5 years or less in the profession while 32% spent more than 5 years. Private clinics were owned by 116 (83%) dentists and the rest had no private clinics. Regarding specialty, 80 (57%) respondents were specialists and 60 (43%) were not.

#### Endodontic questions:

The average number of teeth treated per month ranged from 1 tooth (12 dentists) to 30 teeth (4 dentists). However, the largest number of dentists (28) treated 5

teeth/month (Table 1). The dentists who treated 30 teeth endodontically per month were specialist in conservative dentistry which may explain this high number when compared with other groups. The teeth most commonly treated were premolars for the upper arch (63.8%) and first permanent molars for the lower arch (42.3%). This can be ascribed to the deep fissures anatomy of upper premolars, and the lower first molars, they are the first to erupt and exposed to oral environment. Generally speaking, upper teeth were more subjected to endodontic treatment compared to the lowers. None of the dentists questioned did endodontics for upper or lower third molar tooth which may be due to the difficulty encountered during the procedure.

When the respondents were asked about building up of the badly broken tooth before starting root canal therapy, a total of 76 dentists (54.28%) replied that they perform this modality. The higher percentage were among the non-specialists (28.57%) compared with (25.71%) for the specialists. Even when conservative dentists were considered, 16 out of 28 agreed to do build up. Leaving the tooth without build up was the answer of 44(31.42%) specialists and 40(28.57%) non specialists (Figure 2). This agree with the fact that" it is much easier to complete the radicular preparation through an open cavity than through a restored crown".<sup>(5)</sup> Although building up the tooth is in contrast to the previous fact, but it might be done by some dentists to reduce tooth contamination during endodontic procedure.

The use of rubber dam is essential for the success of endodontic procedure. The advantages and absolute necessity of the rubber dam must always take precedence over convenience and expediency, a rationale often cited by clinicians who condemn its use.<sup>(6,7)</sup> Only 20 (14.3%) of the respondents used rubber dam isolation and 120 (85.7%) didn't use it during procedure. The reasons for not using rubber dam were: not available in the clinic (34.14%); patient's unwilling (21.96%); time consuming (14.63%); difficult in application (4.88%); and 24.39% of the dentists chose all of the above causes (Figure 3).

ENDODONTIC QUESTIONNAIRE

Dentists' information:

1. How many years in the profession?
2. Do you have a private clinic? Yes  No
3. Are you a specialist? Yes  No  If yes, field of specialty:

Endodontic questions:

1. What is the average number of teeth you treat endodontically per month?
2. What are the most common teeth you treat endodontically?
3. Do you make tooth build up (for badly broken teeth) before starting endodontic treatment?  
Yes  No
4. Are you using rubber dam for isolation during root canal therapy? Yes  No
5. Do you spend a time for persuading the patient to save the tooth? Yes  No
6. If the patient refused endodontic treatment and wanted to extract the tooth, then you:  
a. Extract the tooth  b. refer to another dentist for extraction
7. According to your opinion, why patients refuse endodontics?  
Fear from pain  high cost  long procedure  patient thinks that extraction is the only solution  all of the above  other causes
8. Do you always depend on radiograph for diagnosis in root canal treatment? Yes   
No
9. How do you determine the working length?  
Tactile sensation  radiograph  average tooth length  all of them  non of them
10. Do you prefer to do pulp extirpation and instrumentation in one appointment for vital teeth? Yes  No
11. What type of irrigating solution you use?  
NaOH+H<sub>2</sub>O<sub>2</sub>  chlorhexidine  normal saline  distilled water
12. Between appointments you prefer to place: a. dry cotton pellet  b. cotton pellet with medicament
13. Tenderness is the most common complain in the second appointment: Yes  No
14. Do you make trial point measurement before obturation? Yes  No
15. Type of sealer you use during obturation: ZOE  Ca(OH)<sub>2</sub>  glass ionomer sealer   
resin sealer
16. How do you carry the sealer to canal walls? Lentulospiral  file or reamer  painting gutta percha with sealer
17. During obturation of fine canals, you prefer: Gutta percha  silver point
18. Do you place permanent restoration immediately after obturation? Yes  no
19. Do you think that every endodontically treated tooth must be crowned? Yes  no
20. In case of tooth with pulpal involvement only, you prefer to complete endodontic treatment in single appointment? Yes  no
21. Do you prefer to do endodontic treatment for periapically involved teeth? Yes  no

Figure (1): Endodontic questionnaire

Table (1): Average number of endodontically treated teeth per month by the dentists

Number of Dentist	Tooth /Month
12	1
24	2
8	3
12	4
28	5
8	7
12	8
20	10
4	12
8	15
4	30

- ▣ Nonspecialists:Don't build
- ▣ Nonspecialists:Build
- ▣ Specialists:Don't build
- ▣ Specialists:Build

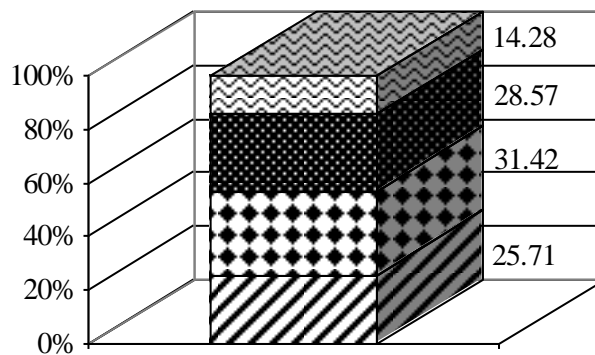


Figure (2): Percentage of building up of badly broken teeth

- ▣ Dentists using rubber dam
- Causes for not using rubber dam:
- ▣ Difficult in application
  - ▣ Time consuming
  - ▣ Patients' unwilling
  - ▣ Not available in the clinic
  - ▣ All of the above

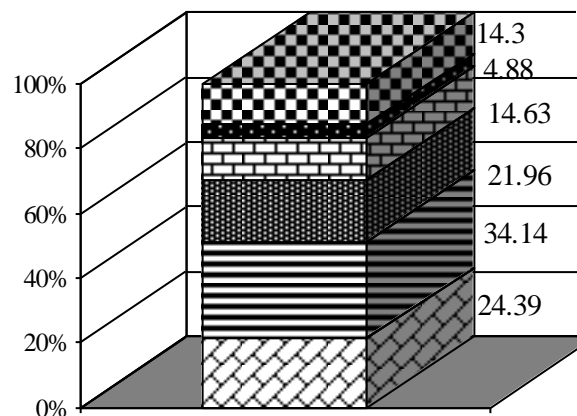


Figure (3): The use of the rubber dam

As dentists became increasingly aware that natural teeth function more efficiently than any replacement, they found it worth additional effort to retain pulpally involved teeth.<sup>(8)</sup> Hence, convincing the patients to keep their teeth instead of extraction should be a major concern to all dentists. This may explain the result obtained in this study that 108 (77.15%) of the respondents spent time in persuading patients to save their teeth by root canal treatment (42.86% for specialists and 34.29% for non-specialists), while only 32 (22.85%) respondents didn't spend time in doing so (14.28% for specialists and 8.57% for non-specialists) (Figure 4). In relation to

the previous question, about 80% of dentists would extract the tooth by themselves if the patient refused root canal treatment and chose extraction. The remaining 20% answered that they would send the patient to another dentist to do the extraction. It appears that the majority of the respondents who will extract the tooth themselves are going to do so after having no alternative since the patient refused endodontics. The minority who preferred to send patients to other dentists to perform extraction may reveal the insistence on their opinion that the best treatment for tooth is root canal therapy rather than extraction.

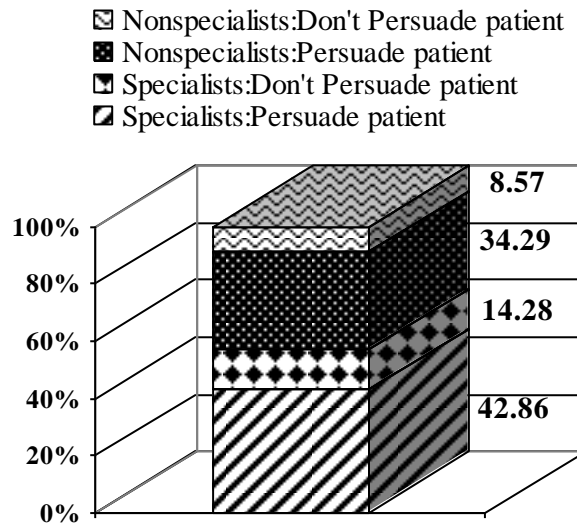


Figure (4): percentage of dentists persuading or not the patients to save their teeth

Refusing endodontic treatment by the patients due to financial causes (high cost) was the major reason in about 49% of dentists' opinion. Long procedure was the second in order (15%); fear from pain was the third (9%); and lastly is the reason that patients think that extraction is the only solution for treatment (4%). However, 23% of the respondents stated that all of the aforementioned reasons may contribute to the rejection of the endodontic therapy (Figure 5).

The roentgen ray is used in endodontic therapy to aid in the diagnosis of hard tissue alterations of the teeth and periradicular structures.<sup>(5)</sup> Radiographs were used by 76 dentists (54.28%) to help diagnosing

endodontic problems and the rest didn't depend on it for diagnosis. They were employed by 36 specialist dentists (25.71%) and 40 non-specialists (28.57%). This indicates a general acceptance between both of these groups on the importance of radiography in endodontics (Figure 6).

The most critical act in assuring success of therapy is the accurate determination of the length of the tooth prior to radicular preparation.<sup>(5)</sup> Working length determines the extent of canal cleaning and shaping that will be accomplished.<sup>(9)</sup> Depending on tactile sensation was used by 21% of the questioned dentists to estimate tooth length; 47% used the radiograph; 14% relied on average tooth length; while only

18% employed a combination of the above methods (Table 2). Those results indicate that radiographic technique was most commonly employed and depending on average tooth length was the least. Also, the percentage of dentists 18% using a combina-

tion of the aforementioned techniques can be considered relatively low since only by correlating many confirming pieces of evidence can clinicians visualize the true terminus of root canals.<sup>(9)</sup>

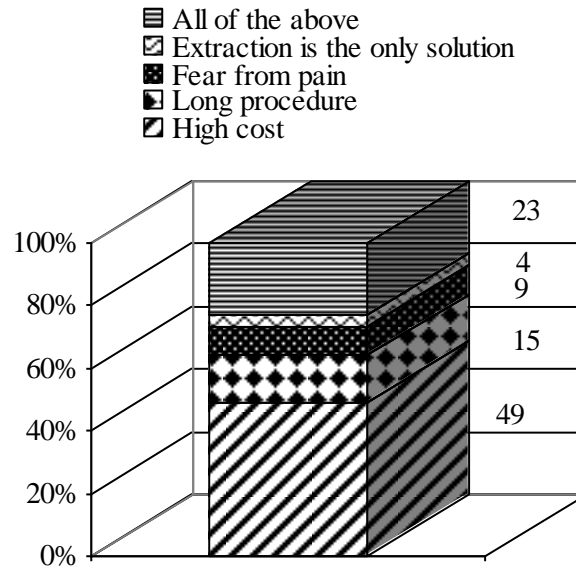


Figure (5): Causes for refusing endodontic treatment by the patient

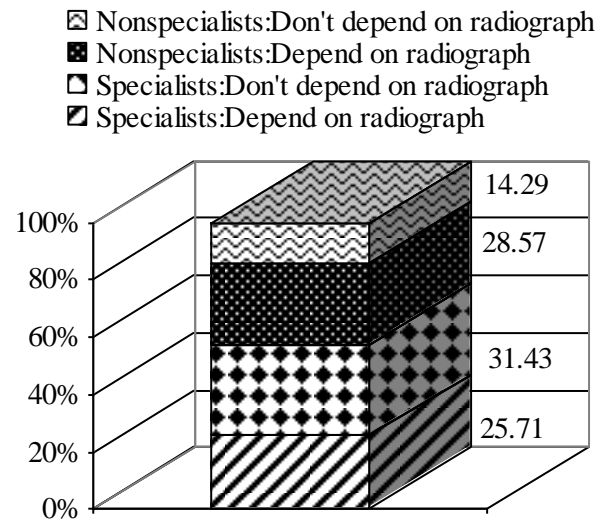


Figure (6): percentage of dentists depending on radiograph for diagnosis

Table (2): Methods used for working length determination

Method	percentage
Tactile sensation	21%
Radiograph	47%
Average tooth length	14%
Combination of the above methods	18%

There was no great difference in answers regarding pulp extirpation and instrumentation for vital teeth in single appointment, that's to say 51.42% of the respondents agreed and 48.58% didn't agree on doing so (Figure 7). A possible explanation for doing so in single visit is to ensure complete removal of pulp tissues as well as reducing the number of visits. While for the dentists who disagreed, the reason could be one of the followings: pulp extirpate-

on is an amputation procedure that could elicit a body response (pain); reducing inflammatory response by avoiding forcing debris into periapex; and, in addition, it will be a prolonged procedure. The difference was noticed when a comparison is made between the percentage of specialists and non-specialists who agreed to do pulp extirpation and instrumentation in single visit: 40% was for the specialists and 11.42% for the non-specialists.

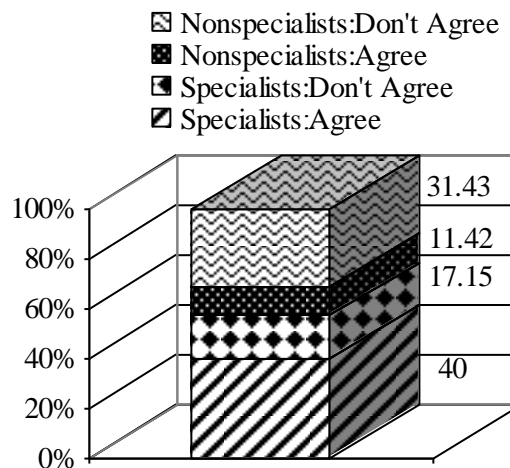


Figure (7): percentage of dentists agreed or not on doing pulp extirpation and instrumentation in single visit for vital teeth

Irrigation constitutes an important step in endodontic procedure since it flushes away loose, necrotic, contaminated materials before they are inadvertently pushed deeper into the canal and apical tissues.<sup>(10)</sup> Among the irrigants in question, chlorhexidine gluconate gained the major acceptance with 41%. Sodium hypochlorite coupled with the use of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) was the second in order with 33%. Normal saline and distilled water were the least used with a percentage of 17% and 9% respectively (Table 3).

Table (3): Types of irrigants used

Type of irrigant	Percentage
Chlorhexidine gluconate	41%
Hydrogen peroxide	33%
Normal saline	17%
Distilled water	9%

The popularity of chlorhexidine as an irrigant can be attributed to several factors, one of which its low toxicity (good biocompatibility).<sup>(11)</sup> Sodium hypochlorite with H<sub>2</sub>O<sub>2</sub> was less frequently used by the dentists that could

be the result of the caution needed to prevent irrigant extrusion beyond the apex as it may give rise to toxic effects on periapical tissues.<sup>(12)</sup> In addition, the procedure may be considered time consuming compared to other techniques using only one irrigant.

Between appointments, the majority of dentists preferred to place cotton pellet with medicaments (42.86% for specialists and 34.29% for non-specialists). Only mi-

nority of the respondents placed cotton pellet without medicaments (14.28% for specialists and 8.57% for non-specialists) (Figure 8). This high percentage for placing medicated dressing (77.15% in total) is in agreement with Delany *et al.*,<sup>(13)</sup> who stated that intracanal medicament is important in the control of bacteria since one cannot eliminate all microbes by instrumentation and irrigation alone.

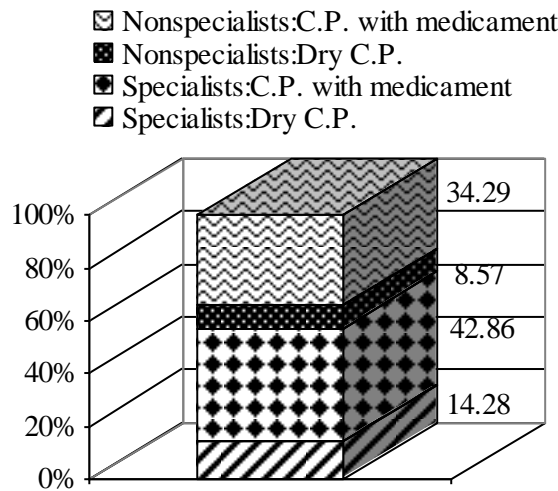


Figure (8): percentage of placing dry cotton pellet (C.P.) or with medicament

Pain between endodontic visits is not an uncommon event. About 96 respondents (68.5%) agreed that tenderness is the most common complain in the second visit whereas 44 dentists (31.5%) didn't agree. This pain could be the result of several factors such as inaccurate working length determination; body response to pulp tissue amputation in vital teeth; and forcing medicaments or necrotic materials into periapical tissues for non-vital teeth.

Trial point testing is an important preliminary step before final obturation. The main reason for this testing is to be sure the point extends far enough for total obturation but will not extend beyond the apical foramen.<sup>(5)</sup> In this study it was surprising

to note that about half of the dentists (72 dentists, 51.43%) didn't make this testing and only 68 dentists (48.57%) used to do this step. The specialists who preferred doing this step were 28 out of 80 and 12 of them were conservative dentists (out of total 28 conservative dentists). Regarding non-specialists, two thirds (40) of them did trial point measurement and one third (20) didn't make it (Table 4). This also, interestingly, points out that the greater percentage was among the non-specialists and not the specialist dentists. The causes for not performing this step may be: time consuming procedure; x-ray not available nearby; or is the result of dentist's negligence about its importance.

Table (4): The number and percentage of dentists performing trial point measurement or not

Specialists		Non-specialists		Total
Make T.P.M.	Don't make T.P.M.	Make T.P.M.	Don't make T.P.M.	Make: (68) 48.57%
(28) 20%	(52) 37.15%	(40) 28.57%	(20) 14.28%	don't make: (72) 51.43%

T.M.P: Trial point measurement



The use of a sealer during root canal obturation is essential for success.<sup>(9)</sup> Many types are available but most of the respondents (88.5%) preferred to use zinc oxide eugenol (ZOE) sealer and 11.5% preferred calcium hydroxide sealer. The preference of ZOE type can be attributed to that it is available; cheap; and biocompatible. None of the dentists used glass ionomer or resin sealer which may be due to: unavailability in the market; high cost; or lack of information on the long term success and/or the manipulation of those types of sealers. In

relation to the latter question is how the sealer is carried into the root canal space. It was found that 80 dentists constituting 57.14% used gutta percha point painted with sealer to carry it to canal space; 44(31.43%) used file or reamer; and only 16 dentists(11.43%) used the lentulospiral which is the instrument of choice for transferring sealer into the canal space (Table 5). Using gutta pecha to carry the sealer could be due to its simplicity or that lentulospiral is not available in the clinic.

Table (5): The types of sealer used and methods for carrying it into root canal space

Type of sealer	percentage
ZOE	88.5%
Calcium hydroxide	11.5%
Method of carrying sealer into root canal	
Gutta percha painted with sealer	57.14%
Reamer or file	31.43%
Lentulospiral	11.43%

Obturation of fine canals could be one of the problems facing dentists during root canal therapy. A variety of materials are available but the most commonly used are gutta percha and silver point. In this study, gutta percha was preferred over silver point for obturating fine canals in the opinion of 84(60%) respondents while only 56(40%) preferred silver point. Although silver point is indicated in teeth with small or well calcified round tapered canals<sup>(10)</sup>, but this increased preference of gutta percha can be the result of its minimal toxicity; minimal tissue irritability; and is least allegerenic material when retained within the canal system.<sup>(9)</sup>

Dentists have come to realize that with proper endodontic therapy and adequate restoration, pulpless teeth can continue indefinitely as an integral part of the dental apparatus.<sup>(5)</sup> In this study a total of only 28 dentists (20%) placed permanent restoration immediately after obturation, the majority (24 dentists) of which were specialists. The rest of the respondents (112 dentists) comprising 80% favoured to delay placement of permanent restoration to a visit other than the obturation (Figure 9) visit and were equal in number (56) for both specialists and non-specialists. This delay can be

ascribed to several reasons: the obturation is a long procedure and the dentist or the patient may become tired; the dentist schedule is busy; or the tooth is left for a period of observation before placing permanent restoration.

It is known that the failure rate of restored root-treated teeth can be higher than for vital teeth.<sup>(14)</sup> Teeth with endodontic treatment are often severely broken down and can be vulnerable to fracture; they often require extensive restoration following root canal treatment.<sup>(15)</sup> The amount of tooth structure that remains after endodontic therapy and post preparation appears to be of prime importance, and the strength of an endodontically treated tooth is directly related to the bulk of residual dentin.<sup>(16)</sup> Meanwhile, endodontic treatment removes the vital contents of the canal, leaving the tooth pulpless and resulting in teeth with calcified tissue that contain significantly less moisture than that of vital teeth, but in vivo and in vitro studies of desiccation with subsequent reduction in the elasticity and increase in the brittleness are sparse. Rather, the variables of remaining tooth structure, root and pulp morphology, periodontal support, and occlusion are of far greater importance when evaluating restorati-

ve needs.<sup>(17)</sup> The complete cast crown is indicated on endodontically treated teeth<sup>(18)</sup> to overcome these problems but 80 of the questioned dentists (57.15%) don't think that crown is necessary for every endodontically treated tooth. The specialists

who agreed with this opinion were 44(31.43%) and the non-specialists 36(25.72%). The remaining 60 dentists stated that such teeth must be crowned and out of them 36(25.72%) were specialists and 24(17.13%) were not (figure 10).

- ▨ Nonspecialists:Don't Place immediate restoration
- ▩ Nonspecialists:Place immediate restoration
- ▧ Specialists:Don't Place immediate restoration
- ▦ Specialists:Place immediate restoration

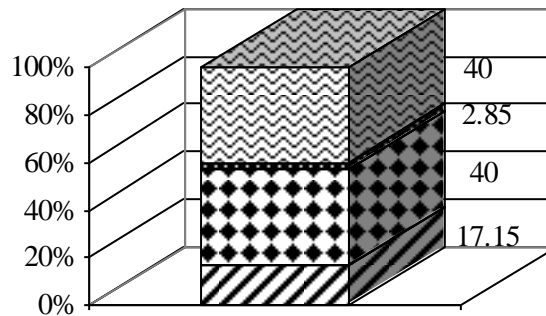


Figure (9): percentage of dentists placing immediate restoration after obturation

- ▨ Nonspecialists:Don't do crowning
- ▩ Nonspecialists:Do crowning
- ▧ Specialists:Don't do crowning
- ▦ Specialists:Do crowning

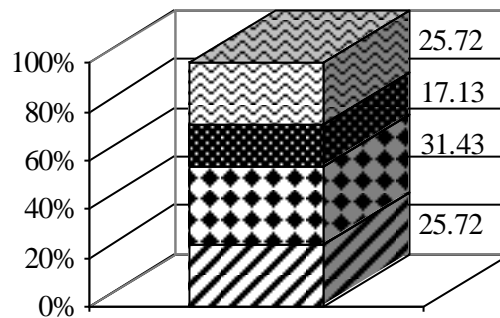


Figure (10): Percentage of crowning or not of endodontically treated teeth

Completing endodontic treatment in single appointment for teeth with lesions confined to the pulp was rejected by about 85.72% of dentists questioned with specialists comprising 45.71%. This high percentage of rejection can be attributed to that dentists may prefer to allow time before obturation to monitor the tooth condition. Only 16 specialists (8 were conservative dentists) and 4 non-specialists chose to do endodontic therapy in single appointment. This could be done to reduce the number

of visits taking in consideration that the lesion is confined only to the pulp.

Teeth with periapical lesions may constitute a dilemma regarding the method of treatment. Dentists initially treat most cases non-surgically<sup>(5)</sup>, but once the practitioner is certain that no better results can be achieved by using non-surgical treatment, the surgical option should be considered<sup>(15,19)</sup>. This is in agreement with the results obtained from this study in that the majority of dentists (71.42%) preferred

non-surgical (endodontic) therapy compared with only 28.58% for surgical intervention.

### CONCLUSIONS

The conclusions derived from this study are that some steps of endodontic work were not performed correctly by dentists. In some questions, even the specialists, did endodontic procedure in a wrong way which could result in failure of the treatment. There was an agreement between specialists and non-specialists in some questions, while in others, a difference could be noted between them. This indicates a lack in informations about these steps that should be compensated for by holding continuous education programs. In addition, the dentist himself must be in contact with the most recent advancement in dentistry fields in order to provide the best possible treatment for the patient.

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