

Difficulties Faced by Dental House Officers During Clinical Endodontics



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OBJECTIVE: The objective of this study was to determine the difficulties faced by house officers during endodontic procedures and refine the quality of therapy provided to masses.

METHODOLOGY: A detailed survey form was given out to a total of 350 dental house officers, collected from seven different dental institutes in Karachi. A total of 60-80 survey forms were given out to each college, depending on the strength of house officers present, out of which 50 forms, on average, were returned and results were tabulated. The supervisor to house officer ratio recorded on average from these institutes was 1:7. WHO Calculator was used on the sample size of 350 entries and SPSS Version 22 was used to analyze the results.

RESULT: The current study displays that majority of the house officers faced immense difficulties in the cleaning and shaping task of the endodontic procedure such as in cleaning and shaping and less problems were encountered when access opening and initial instrumentation were concerned. The most common difficulty faced by the house officers was that apical perforation resulted during the procedure (51.4%) followed by loss of estimated WL (51.1%), ledge formation (40.9%), file separation (39.1%), whereas using accessory GP while obturations was recorded as the most frequently encountered problem (56%).

CONCLUSION: The current study displays the most commonly faced difficulties by fresh dental graduates during their house job. The major difficulties were faced during cleaning and shaping owing to increased incidence of ledge formation, apical perforation and loss of working length. Majority of the cases revealed gutta purcha extruding or short of the apex. Difficulty in administering IANB was also highly noted.

KEYWORDS: Education, Difficulty, House Officers, Clinical Endodontics

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INTRODUCTION

Dentistry as a profession requires a comprehensive strategy which is mostly a collection of vigorous struggles, persuasion and sufficient clinical exposure.¹ Endodontics has been widely described as a

troublesome branch of dentistry due to diverse procedures and protocols. Adequate instrumentation, complete removal of chemical debris and satisfactory root canal filling, keeping in mind the anatomical variations of different teeth, guarantee a successful endodontic procedure.²

With adequate clinical experience and exposure comes the knowledge to evaluate the likely outcome of a tooth which is scheduled for an endodontic procedure. Apart from rare cases which are termed as high risk conditions, majority of the cases can be managed and prognosis prior to the treatment can be predicted. However, where there are certain factors which are not in control of the operator, a lot of components of a successful root canal depend on the way the operator executes the treatment plan.³

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Lack of early clinical exposure, stressful working environment, a more curriculum based learning, which focuses on more theoretical work rather than a practical approach and an overall compromised student-teacher relationship⁴ are just some of the major factors contributing towards the ongoing fear and generalized discomfort while conducting any dental care procedure. In addition to these, there are conventional limitations faced by dental house officers while performing endodontic treatment, especially by those who have minimal or no previous clinical experience. During Endodontic procedures, each step requires immense care and attention on behalf of the operator, which leads to a generalized lack of self-confidence among house officers who have inadequate clinical exposure and expertise. Previous studies, focusing on the inadequacy of the root canal filling, have shown that a large number of students face problems due to procedural errors.

Previous studies conducted by Mozayeni et al⁵, Konstantinos Dervenis et al⁶, Mothanna K. AlRahabia⁷ have allocated many procedural errors as being common during endodontic procedures such as ledge formation (26%)⁵, (10.1%)⁶, voids (27.3%)⁵, (12.6%)⁷, overfilling (15.3%)⁵, (21.6%)⁶, (24.1%)⁷, under filling (23.3%)⁵, (49.9%)⁷ and broken instruments (0.7%)⁶, (9.2%)⁷. Transportation was also commonly observed in such studies, (8.7%)⁵, (3.1%)⁶, (2.3%)⁷.

The study focuses on the routine difficulties faced by dental house officers when performing endodontic procedures and evaluate the reasons for these problems. By thorough evaluation of the issues faced by dental graduates, the goal of this study is to create a more comfortable and stress free clinical environment for the operators, which in return will help improve the quality of oral health care services provided to the community. This study will help improve overall skills and help freshly graduated dental officers overcome fears associated with root canal procedures. Its main objective is to prevent mishaps in the future by evaluating the problems faced by house officers on a daily basis and refine the quality of therapy provided to masses.

METHODOLOGY

A detailed survey form was given out to a total of 350 dental house officers, collected from seven different dental institutes in Karachi. A total of 60-80 survey forms were given out to each college, depending on the strength of house officers present, out of which 50 forms, on average, were returned and results were tabulated. The supervisor to house officer ratio recorded on average from these institutes was 1:7. Sample size of 350 was calculated using WHO Calculator and results were analyzed using SPSS Version 22.

INCLUSION CRITERIA

1. All house officers who have completed their house job with a mandatory posting of 2 months in Endodontics Department.
2. Completed at least 15 root canal treatment cases.
3. Both male and female house officers were included.
4. Performed conventional endodontic method.

EXCLUSION CRITERIA

1. Graduates who had started or were in the middle of their House Job were not included in this study. Graduates who were incompetent in completing their required period of house job were excluded.
2. Cases involving use of only conventional methods of endodontics were included in this study where cleaning and shaping of the root canal was done using Crown-Down technique. Preparations of canals using rotary files were excluded.
3. House officers who did not maintain adequate record of their cases were not included in the study. Minimum requirement for eligibility was 15 endodontic cases performed under direct supervision in the department.

The questionnaire contained 35 questions which were meant to focus on the level of difficulty faced by each dentist during 6 different stages of the treatment. These stages included Anesthesia (3 questions), Pre-operative assessment (6 questions), Chamber opening (5 questions), Working length establishment (3 questions), Cleaning and shaping (11 questions) and Obturation (7 questions). Each response was numbered according to the level of difficulty as shown in Figure.1.

RESULTS

A total of 350 house officers participated in this research out of which 164 were male (47%) and 186 were female (53%). Descriptive statistics were used to calculate the percentage of difficulty faced by each house officer while performing each task. The results are displayed in tables 1-6.

According to the results, our study showed that 48% of house officers faced difficulty in administering effective IANB and 45.7% found the need to give accessory anesthesia (Table 1). Time management was another difficulty faced by 42% of the house officers (Table 2). During access opening 29.1% of the recorded responses showed difficulties encountered while de-roofing the pulp chamber (Table 3) and 19.4% had struggled while using the apex locators (Table 4). The highest percentage of difficulty was observed during cleaning and shaping processes (Table 5) with the

Table 1: Local anesthesia related difficulty

QUESTIONS	DIFFICULTY GRADING %				DIFFICULTY GRADING CRITERIA
	NEVER	RARELY	OCCASIONALLY	FREQUENT	
1 Difficulty with success of IANB	8 (2.3)	65 (18.6)	109 (31.1)	168 (48)	Maximum difficulty in success of IANB – 48% -> Need for accessory anesthesia with IANB – 45.7% ->Difficulty in success for infiltration – 38.6%
2 Need for accessory means of anesthesia with IANB	37 (10.6)	55 (15.7)	98 (28.0)	160 (45.7)	
3 Difficulty with success of infiltration	30 (8.6)	53 (15.1)	132 (37.7)	135 (38.6)	

Table 2: Patient related difficulty

QUESTIONS	DIFFICULTY GRADING %				DIFFICULTY GRADING CRITERIA
	NEVER	RARELY	OCCASIONALLY	FREQUENT	
1 Difficulty in correct diagnosis	190 (54.3)	141 (40.3)	17 (4.9)	2 (0.6)	Maximum difficulty in time management – 42% -> Difficulty in pain management – 34.3% -> Difficulty in patient counseling – 31.4% -> Difficulty to understand preoperative radiograph – 8% -> Difficulty in rubber dam placement – 1.7% -> Difficulty in correct diagnosis – 0.6%
2 Difficulty to understand preoperative radiograph	48 (13.7)	167 (47.7)	107 (30.6)	28 (8.0)	
3 Difficulty in pain management	29 (8.3)	89 (25.4)	112 (32)	120 (34.3)	
4 Difficulty in patient counseling	35 (10.0)	63 (18.0)	142 (40.6)	110 (31.4)	
5 Difficulty in rubber dam application	38 (10.9)	138 (39.4)	168 (48.0)	6 (1.7)	
6 Difficulty in time management	35 (10.0)	56 (16.0)	112 (32.0)	147 (42.0)	

Table 3: Chamber (access) opening related difficulty

QUESTIONS	DIFFICULTY GRADING %				DIFFICULTY GRADING CRITERIA
	NEVER	RARELY	OCCASIONALLY	FREQUENT	
1 Difficulty in adequately De-roofing the chamber	26 (7.4)	86 (24.6)	136 (38.9)	102 (29.1)	Maximum difficulty in adequately de-roofing chamber – 29.1% -> Gouging on the floor – 18.9% -> Difficulty in locating canals – 10.9% -> Difficulty in using Endo Explorer – 8.3% -> Perforation – 7.7%
2 Difficulty in locating canals	75 (21.4)	92 (26.3)	145 (41.4)	38 (10.9)	
3 Difficulty in using Endo explorer (DG 16)	29 (8.3)	137 (39.1)	155 (44.3)	29 (8.3)	
4 Gouging on the floor	7 (2.0)	109 (31.1)	168 (48.0)	66 (18.9)	
5 Perforation	105 (30.0)	162 (46.3)	56 (16.0)	27 (7.7)	

Table 4: Working length related difficulty

QUESTIONS	DIFFICULTY GRADING %				DIFFICULTY GRADING CRITERIA
	NEVER	RARELY	OCCASIONALLY	FREQUENT	
1 Difficulty to reach original working length	6 (1.7)	91 (26.0)	199 (56.9)	54 (15.4)	Maximum difficulty in using apex locator – 19.4% -> Difficulty to reach working length – 15.4% -> Difficulty to feel apical constriction – 1.1%
2 Difficulty to feel apical constriction	36 (10.3)	147 (42.0)	163 (46.6)	4 (1.1)	
3 Difficulty using apex locator	38 (10.9)	110 (31.4)	134 (38.3)	68 (19.4)	

most common mishap being apical perforation (51.4%), loss of estimated WL (51.1%), ledge formation (40.9%), file separation (39.1%), whereas using accessory GP while obturations were recorded as the most frequently encountered problem (56%) (Table 6). Inability to control the master cone was seen as well where extrusion beyond apex was seen in 40% of the responses and short master cone was seen in 36.6% of the responses.

Table 5: Cleaning and shaping related difficulty

QUESTIONS	DIFFICULTY GRADING %				DIFFICULTY GRADING CRITERIA
	NEVER	RARELY	OCCASIONALLY	FREQUENT	
1 Ledge Formation	20 (5.7)	85 (24.3)	102 (29.1)	143 (40.9)	-> Most common difficulty faced is Apical Perforation – 51.4% -> Loss of WL during C/S – 51.1% -> Ledge Formation – 40.9% -> Difficulty in achieving continuous taper – 40.0% -> File Separation – 39.1% -> Canal Blockage – 38.3% -> Zipping – 30.9% -> Apical Transportation – 12% -> Strip Perforation – 4.9% -> Flare Up – 1.4% -> Sodium Hypochlorite Accident – 2.3%
2 Apical Perforation	5 (1.4)	30 (8.6)	135 (38.6)	180 (51.4)	
3 Zipping	25 (7.1)	54 (15.4)	163 (46.6)	108 (30.9)	
4 Canal Blockage	13 (3.7)	89 (25.4)	114 (32.6)	134 (38.3)	
5 File Separation	18 (5.1)	87 (24.9)	108 (30.9)	137 (39.1)	
6 Strip Perforation	100 (28.6)	144 (41.1)	89 (25.4)	17 (4.9)	
7 Loss of WL during C/S	23 (6.6)	47 (13.4)	101 (28.9)	179 (51.1)	
8 Apical Transportation	25 (7.1)	126 (36.0)	157 (44.9)	42 (12.0)	
9 Flare Up	143 (40.9)	162 (46.3)	40 (11.4)	5 (1.4)	
10 Difficulty in achieving continuous taper preparation	8 (2.3)	71 (20.3)	131 (37.4)	14 (4.0)	
11 Sodium Hypochlorite Accident	150 (42.9)	167 (47.7)	25 (7.1)	8 (2.3)	

Table 6: Obturation related difficulty

QUESTIONS	DIFFICULTY GRADING %				DIFFICULTY GRADING CRITERIA
	NEVER	RARELY	OCCASIONALLY	FREQUENT	
1 Difficulty in application of sealer	173 (49.4)	133 (38.0)	39 (11.1)	5 (1.4)	-> Maximum difficulty in using accessory GP - 56.0% -> Master GP beyond Apex – 40.0% -> Master GP short of Apex – 36.6% -> Voids in Obturation – 8.3% -> No Tug Back – 3.4% -> Difficulty in application of Sealer – 1.4% -> Difficulty using spreader – 0.9%
2 Master GP short of apex	14 (4.0)	56 (16.0)	152 (43.4)	128 (36.6)	
3 Master GP beyond apex	10 (2.9)	41 (11.7)	159 (45.4)	140 (40.0)	
4 No Tug back	35 (10.0)	161 (46.0)	142 (40.6)	12 (3.4)	
5 Difficulty using spreader	165 (47.1)	154 (44.0)	28 (8.0)	3 (0.9)	
6 Difficulty using accessory GP	5 (1.4)	30 (8.6)	119 (34.0)	196 (56.0)	
7 Voids in Obturation	9 (2.6)	161 (46.0)	151 (43.1)	29 (8.3)	

DISCUSSION

Routine assessment and criticism from freshly graduated doctors is always encouraged by institutes in order to better themselves by making adjustments to their curriculum and teaching methods. In our study, house officers were asked to score the level of difficulty they each faced by answering 35 close-ended questions as shown in Figure.2. The difficulty criteria varied from 'never' to 'frequently' with a scale of 0-3 as shown in Figure.1.

Administration of local anesthesia is a routine dental practice when Endodontics is concerned. A pain free state ensures maximum comfort level of the patient which is the

Figure 1: The scale of difficulty

DIFFICULTY GRADING CRITERIA	
0	NEVER
1	RARELY
2	OCCASIONALLY
3	FREQUENTLY

actual goal of all dental practices. However, the rate of failure of local anesthesia in the mandible is generally high and is one of the major problems that were faced by the house officers in our study. A thorough knowledge of the anatomical variations and meticulous skill is required for one to achieve absolute anesthesia. Failure of IANB has the highest rates in our study (48%) and is the most technique sensitive method of administering local anesthesia. In most cases where irreversible pulpitis of mandibular teeth is concerned, there is failure of achieving a full anesthetic state with just an IANB and there is need for supplemental anesthesia.⁸

Causes of failure can be categorized as patient related and operator related. Patient factors usually include any pathology in the form of infection, inflammation, trismus or they may be psychological. Patient anxiety and needle phobia also lead to failure of anesthesia.⁹ Pre-operative pain can lead to a higher chance of failure of achieving complete anesthesia.¹⁰ However, patients with specific pathologies are rare and failure is more often seen as a fault from the operator's end. Since the house officers are only given practical exposure to local anesthesia during surgery and periodontology departments, many do not have the full skill set developed to achieve absolute anesthesia. Faulty placement of the needle, sudden changes in the direction of needle placement and inserting the needle too deep into the tissue folds are just some of the most common mistakes performed by house officers when administering IANB.^{11,12} Inadequate mouth opening and failure to locate the pterygomandibular raphe also contribute to increased rates of failure of IANB. Due to the increased percentages of failure of IANB in our study, there was a higher percentage found for need of accessory means of anesthesia after IANB.¹³ Buccal infiltrations along with intra ligamentary anesthesia were given in cases where repeating the IANB was ineffective.¹⁴

In Table 2, which focused on patient related difficulties, it was seen that the major problems arose in time management, pain management and in patient counseling. It was observed that house officers having the highest number of root canal cases, as recorded by the responses of the survey (Fig.2), stated that over time and practice they were able to manage their time effectively. Since the house officers are fairly new to the procedures of root canal therapy on patients, they faced major problems in managing time they spent on each patient, a complication which arises initially but resolves with time and learned skill.

Pain management has been the second most troublesome job according to our study. Patients experiencing pulpal pathosis often have very low thresholds to anesthetic agents and achieving a complete sedative state is often troublesome.¹⁵ Failure to achieve local anesthesia is also dependent on the

house officer skill¹⁶ and inaccurate technique of administration of Inferior Alveolar Nerve Block can also be a factor for the increased incidence of difficulty in pain management in this study. Administration of intra pulpal anesthetic solution, given at intervals has proved to be of use in cases with pulp hyperemia.¹⁷

In a multicultural society, it often becomes difficult for the health care providers to properly explain a certain medical condition or treatment plan, due to patients having a language barrier. Lack of knowledge of any particular treatment creates a level of anxiety and fear amongst the patient, resulting in it being a difficult situation for the doctor. In our study, we found that 31.4% of dental house officers faced trouble in patient counseling and it was observed that with time and increasing number of patients this problem was gradually reduced.

Table 3 was focused more on problems faced during access opening. The highest percentages of difficulties were assigned to improper de-roofing of the chamber, gouging and difficulty in location of canals. Inadequate knowledge of root canal morphology and tooth anatomy can cause such problems.¹⁸ As dental undergraduate students, they perform routine Endodontics on extracted teeth and each tooth is prepped according to standard guidelines. When the house officers start performing treatment on patients the complexity increases according to the position, angulation of bur in mouth and extent of caries, as a result they face greater difficulty.

Lack of visibility and incorrect chair positioning of the dentist are major reasons for this problem. Gouging occurs due to incorrect angulation of the bur and can result in weakening of the remaining tooth structure. It occurs simultaneously with incomplete de-roofing of the chamber and can be avoided by using a large round bur.

Table 4 concentrates on issues associated with working length determination. The maximum difficulty faced by dental house officers was in using the apex locators. Since introduction to apex locators is only done in the clinical setting after graduation many house officers have trouble using it. Early awareness of apex locators and their widespread use can solve this problem.¹⁹ Inability to follow the true path of the root canal or excessive calcifications can lead to increased difficulties in reaching the desired working lengths.²⁰ Previous studies have shown a greater difficulty in determining the apical constriction however that was not the case in our study and only 1.1% of the total doctors found it hard to determine the apical constriction.^{7,21}

Table 5 displays results of difficulties faced during the cleaning and shaping process. The highest percentages of difficulty was allotted to apical perforations, loss of working length, ledge formation, achieving continuous taper, file

separation and canal blockage. Various other studies have previously stated that apical perforation is the leading cause of problems faced by dentists.^{17,22,23} When using stainless steel files, there are increased chances of loss of working length during cleaning and shaping, hence apical stop is usually missed leading to increased incidence of apical perforations.¹⁶ Radiographs taken by house officers also usually done using the non-parallel technique the bisecting angle technique which makes it harder for them to judge the actual working length via radiographs only.^{24,25} Loss of working length was commonly encountered by house officers as well since working length determination is done prior to cleaning and shaping and many stated that there was loss of working length when obturation was initiated. Crown-down technique of cleaning and shaping has been shown to be the most frequently used method by house officers,²⁶ which leads to increased deposition of debris apically and failure to adequately recapitulate the canals results in loss of working length. Since stainless steel files are rigid in nature, when compared to NiTi rotary files, they tend to extrude through the apical constriction leading to loss of apical stop and eventually loss of required working length.^{27,28}

In our study, ledge formation is another leading cause of loss of working length and is a major issue when house officers are concerned. There is a high percentage of ledge formation seen in our study (40.9%) as compared to other studies which show similar results such as Haji-Hassani N et al 3.6%,²¹ Reem Siraj Alsulaimani et al 34.5%.²⁹ Use of Gates Glidden burs are usually advised for coronal flaring of the canal orifice but this is not a common practice amongst house officers which tend to use larger number of K files for coronal flaring.³⁰ These, along with the reduced use of EDTA as a lubricating medium, are the major causes of ledge formation. Although, pre-curving of files is advised, especially when treating molars with curved canals, due to the inflexible nature of stainless steel files there is increased ledge formation when using larger number of K files.³¹

Use of NiTi instruments has proven to be beneficial in reducing procedural errors when compared to stainless steel instruments.²⁹ It is less time consuming, being more patient friendly^{32,33} and its flexible nature and excellent shape memory prove to be advantageous in cases with curved canals.³⁴ However, NiTi instruments have not been accepted widely by many institutes due to increased cost and maintenance and their increased risk of fracture where NiTi rotary instruments are concerned.³⁵ Many dentists have previously stated that repeated use of NiTi rotary files have resulted in fracture during cleaning and shaping and discarding the files after single use has been advantageous.³⁶ This results in increased cost of using NiTi files.

Cleaning and shaping of the root canal is a tedious

process and in order to speed up the procedure many house officers end up not giving proper attention to the methods, which results in loss of continuous taper of the canal. Incorrect sequencing of the files result in the preparation being flared apically but the middle third is left narrow. Proper sequencing of the files is mandatory to achieve a constant taper of the canal.

Over use of stainless steel instruments results in increased incidence of file separation as shown in our study 39.1%. A study conducted by Alhekeir, et al¹⁷ showed a similar result of broken instruments (31.8%) while Mothanna K. AlRahabi (9.2%)⁷, Haji-Hassani N et al (1.1%)²¹ and Alsulaimani

RS et al.²⁹ (1.8%) had lower rates of such accidents. Incorrect angulation of the files along with increased apical pressure makes these files more prone to breakage. This issue can be solved by ensuring the canal is patent and by constant recapitulation in order to remove any debris present apically so that the files do not get lodged or break. Teeth having chronic infections tend to get calcified over time, a problem commonly faced by house officers.^{37,38} Another reason for blocked canals is the failure of house officers to recapitulate the canals leading to heavy packing of debris apically.³⁹

Table 6 discusses difficulties routinely faced during obturation. The maximum difficulty was seen in using accessory GP which is mainly due to problems house officers face in visualization of the canal orifice once the master GP has been inserted. Gutta purcha of the smaller size tend to be very thin and more prone to bending which creates additional problems for the operator. Due to problems faced by house officers in determining the actual working length of the canal during cone fit radiographs there is a higher percentage of extrusion of the Master GP beyond the apex (40%) as compared to the Master GP being short of the actual apex (36.6%) in our study.

In order to counteract many of these problems it is recommended that the student to supervisor ratio should be increased in order to prevent mishaps occurring due to lack of knowledge of procedure. Certain changes in the curriculum are required to give undergraduate students adequate experience to use new techniques and methods along with the conventional methods. Use of NiTi rotary instruments can lead to prevention of many errors caused due to the rigid nature of stainless steel instruments. It is also suggested that proper evaluation of the teeth under consideration for endodontic treatment should be done prior to giving the case to a house officer.

Adequate supervision along with better guidance at each step of root canal treatment and use of more flexible instruments into the curriculum and preclinical labs can help to combat such issues in future.

CONCLUSION

The current study displays the most commonly faced difficulties by fresh dental graduates during their house job. Cleaning and shaping is the major difficulty faced by the house officers in achieving endodontic excellence. Difficulty in achieving IANB leads to higher percentage of accessory means of local anesthesia. A higher number of cases have revealed gutta purcha either beyond or short of the apex.

CONFLICT OF INTEREST

None declared.

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