

Factors Responsible for Endodontic Treatment Failure in Permanent Dentition among Under Graduates, General Dentists and Endodontists

Azzam Alrowdhan, Shahzad Ali Shah*

Department of Dentistry, Qassim University, Buraydah, Saudi Arabia.

ABSTRACT

OBJECTIVE

Endodontic failure is one of the major problems in dentistry. To reach an acceptable treatment, one should be focusing on factors that determine the success of endodontic and re - endodontic treatment. These involve periodontal disease, root fracture, residual necrotic pulp tissue, and presence of peri - radicular infection, broken instruments, mechanical perforations, root canal under - filling / overfilling, missed canals or unfilled canals. The aim of this study was to evaluate knowledge of responders towards the failure factors in permanent dentition among under graduates, general dentists, and endodontists.

METHODS

The study design was questionnaire based by using Google sheet form and published online in Saudi Arabia. The survey was conducted from February to September 2021. The sample size calculated was 420 by using epi - info software version 3 with 90 % of confidence level. The questionnaire was validated by using FDA online software.

RESULTS

Based to questionnaire submission, most common cause of endodontic failure was unfilled and missed canals (66.9 %). The main factor that affects endodontic treatment is the anatomy of root canal system (52.6 %).

CONCLUSION

Our study concluded that the knowledge is more related to qualification level, experience, and skill of operators. Therefore, we made this study to compare the knowledge of students, graduates and specialists and will help to improve knowledge and attitude in perspective to factors that affect treatment failure.

KEYWORDS

Overfilling, Periodical, Under - filling, Unfilled canal

*Corresponding Author:

Shahzad Ali Shah, Department of Dentistry, Qassim University, Buraydah, Saudi Arabia.

E-mail: s.mukhtiarshah@qu.edu.sa

How to Cite This Article:

Azzam A, Shahzad AS. Factors Responsible for Endodontic Treatment Failure in Permanent Dentition Among Under Graduates, General Dentists and Endodontists. *J Evid Based Med Healthc* 2022; 9(10):45.

Received: 04-Apr-2022,

Manuscript No: JEBMH-22-55872;

Editor assigned: 06-Apr-2022,

PreQC No. JEBMH-22-55872 (PQ);

Reviewed: 20-Apr-2022,

QC No. JEBMH-22-55872;

Revised: 02-Jun-2022,

Manuscript No. JEBMH-22-55872 (R);

Published: 14-Jun-2022,

DOI: 10.18410/jebmh/2022/09/10/45.

Copyright © 2022 Alrowdhan A, et al. This is an open access article distributed under Creative Commons Attribution License [Attribution 4.0 International (CC BY 4.0)]

INTRODUCTION

The Secret of good root canal management is thorough removal of infected tissue and shaping of root canals followed by hermetic sealing till cement - dentinal junction at the apex. Diagnosis and treatment planning is based on clinical and radiographic findings. Previous studies showed different factors that are responsible for root canal failures including remaining pulp tissue, apical or periodontal infection, vertical root fracture, engaged instruments, ledges or perforations and over / underfillings.¹ The literature shows that the anatomy of teeth and root canal system are considered factors that cause endodontic failure and major teeth associated were found in molars and premolars. The role of dentist is to diagnose and treat such problems and follow their treatments plan prognosis.² The importance of locating all canals is to obtain optimal prognosis, and the potential negative effects of untreated canals have been discussed in a number of studies with good evidence of missed canals in failed cases requiring endodontic retreatment.³⁻⁵ Missed canals act as a nidus of infection and may have a bad impact on the prognosis.⁶⁻⁸ The good sealing of coronal restoration has an effect on the periapical situations of the endodontic teeth.⁹ The quality of coronal seal has a significant impact on success of overall treatment prognosis of root - filled teeth. Study, revealed endodontic success not only depends on treatment quality, but also on coronal seal.¹⁰ canal debridement is very important step in root canal treatment. The most common irrigation solution, sodium hypochlorite is used in different concentrations, up to working length to help dissolve organic contents and flush inorganic particle out of the canal system.¹¹⁻¹³ Sodium Hypochlorite (NaOCl)

preparations available in the market contain Sodium Chloride (NaCl), existing with various osmolarity values.¹⁵ Therefore, the diffusion of active chlorine to the target areas is quiet variable.¹⁶ Ideal canal filling is one of indicators of successful root treatment. However, bad quality of the filling is still a common phenomenon in the work of general practitioners. However, the radiographic quality of canal filling is comparatively easy, since most obscuration materials are highly radio - opaque. This helps the evaluation of three dimensional filling root canals, its homogeneity, and condensation, as well as the presence of voids.¹⁷⁻¹⁹ Study revealed final year students did root canal treatment with high density and no voids, and only 6.7 % of apical perforation cases were recorded. Furthermore, present students will be the dentists of future. It is, therefore, of prime importance that excellent endodontic treatment be completed consistently.²⁰

MATERIAL AND METHODS

Descriptive e - questionnaire survey was conducted from February to September 2021. The sampling frame consists of 416 questions and 416 were respondents. The survey was published in different cities of Saudi Arabia. The inclusions criteria were from the dental students of final year, internship, general dentists, and endodontists. Exclusions criteria were 1st, 2nd, 3rd and 4th years. The e -

questionnaire was sent randomly by text message to participations in different cities in Saudi Arabia at different time. The data collection and analysis by using Google sheet form. The questions were validation by using FDA online software.

RESULTS

The defect of endodontic treatment occurs if this treatment has not been done up to proper criterion.^{21,22} Biochemical preparation of Root canal shaping is important step in endodontic therapy and the Main factor that affecting periodical healing process. To achieve the apical healing it shall to be cleaning and modeling of the root canal system.²³ In the present study, the most common cause that affects endodontic treatment were unfilled and missed canals (66 %) and poor coronal restoration (52.6 %). The study, showed that Sub - analysis of each changing separately revealed that 176 (50.4 %) has Acceptable length of the filling (0 – 2 mm within the apex), 149 (42.7 %) were under - filled, and 24 (6.9 %) were overfilled.²⁴ Another study. showed that Common causes of endodontic failure were under - filled (56 %) and unfilled (42 %).²⁵ Behind that is why the clinician's missed canals are the inability to localize all the root canals caused by complex anatomy of root canal system, poor visualization, and design of access cavity. The study showed that the prevalence of missed canals was 12.0 %, and teeth with untreated canals were associated with periapical pathology in 82.6 % of the cases.²⁶ Inaccurate working length measurement will lead to Under filling (more than 2 mm short of the radiographic apex) which result as improper chemo mechanical preparation and inadequate irrigation of the root canal system and all of things will result as endodontic failure. Systematic reviews done, Short of the radiographic apex (root canal obscuration at 1 - 2 mm inferior to the apex) and associated with good root canal preparation and filling have better prognosis (higher success rates).²⁷ improperly instrumented and incompletely filled canals are cause peri - apical tissue irritation as a result of remaining necrotic and infected pulp tissues.²⁸ About tooth involvement, in the present study, the most tooth involved was max molar (47.1 %) then mand (36.4 %). The study showed that inadequate quality of root canal obturation for upper molars were 25 % while lower molars 43.1 %.²⁹ The most widely endodontic defect in molar teeth was untreated or unfilled canals then under filling of the root canal system. In molar teeth, the reasons for the high endodontic defect rate are complex anatomy and difficult accessibility.²⁴ about irrigation solutions, this study showed that the NaOCl with 2.5 % concentration was (51.4 %), then saline (6.9 %), then EDTA (4.3 %), and Chlorhexidine (4 %). showed that Nuclear magnetic resonance studies show that the use of ultrasonics resulted in increased chemical degradation of NaOCl as compared to the Self - Adjusting File system and non - agitated samples. The prevalence of chemical activation in the ultrasonic group over the SAF group was almost 3 times higher, 3.11 to 1.20, respectively.³⁰ another study, showed that the NaOCl with all concentrations was superior to EDTA, saline, chlorhexidine, and saline.³¹

	Students answers	Frequency	Percentage of failure	Endodontists answers	Frequency	Percentage of failure 2	P - value
In your opinion, which is the most common tooth involved in endodontic failure?	Max molars	92		Mand molars	16		
On the basis of clinical signs and symptoms and radiographic findings of root canal treated tooth, choose one or more common causes that effect endodontic treatment?	unfillid and missed canals	125		unfillid and missed canals	25		
Based on your clinical practice, which of the following irrigation solutions are usually used ?	NaOcl after dilution (2.5 %)	100	1	NaOcl at full concentration (5.25 %)	34	0.3	P > 0.05
In your opinion, which instruments do you prefer for endo - therapy with pulpal disease?	Rotary hand - piece	112		Rotary hand - piece	35		
In your opinion, what is the most important factor determining the success of endodontic treatment?	Quality and extent of apical seal	96		Quality and extent of apical seal	18		
During your endodontic practice. Which of the following tools you prefer to use ?	Apex locator and periapical radiograph	89		Both	30		
Based on your experience, which is the main factor that cause root canal failure ?	Anatomy of tooth and root canal system	68		Debridement of root canal	18		
Total		682			176		

Table 1. The knowledge of Students Have High Failure Rate (64 %) While Endodontists Have The Least Failure Rate (31 %) And There Is No Significant (P > 0.05).

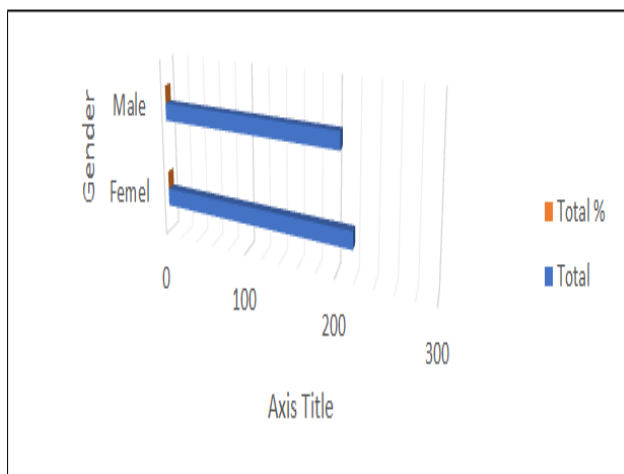


Figure 1. Show that the Female were 217 (51.7) and male Were 203 (48.3%),

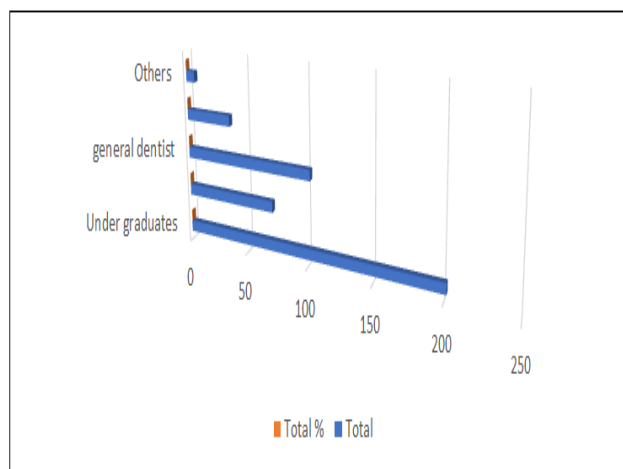


Figure 3. Shows That Under Graduated were 191 (4.5 %), Intern Were 69 (17.2 %), General Dentist Were 99 (24.6 %), and Endodontic were 37 (9.2 %) Other was 7 (1.5%).

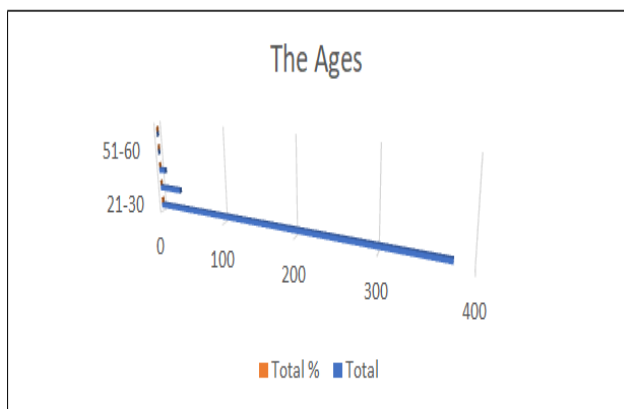


Figure 2. Show that from 21 to 30 Were Greatest Ages Around 379 (90.2 %) Then 31- 40 (7.6 %) From 41 – 50 Were 9 (2.1 %).

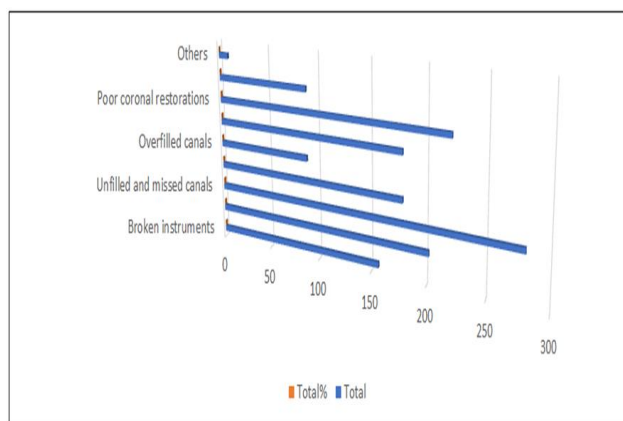


Figure 4. Shown that Regarding to Tooth Involved, the Most Tooth Involved was Max Molar (47.3 %), Followed by Mand Molar (36.8 %), Max Premolar (7.2 %), Mand Premolar (2.2 %) and Mand Canine, Max Incisor (0.5 %).

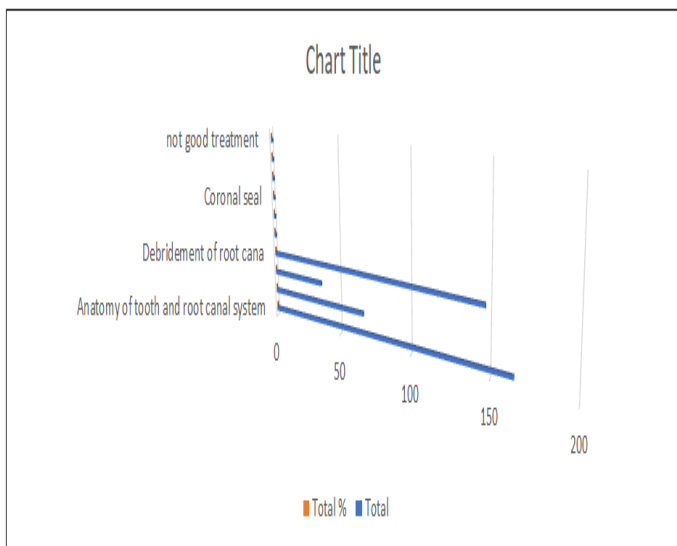


Figure 5. Shows that Based Oil Clinical Signs, Symptoms and Radiographic Finding were Shows That the Most Common Cause that Effects Endodotic Treatment was Unfilled and Missed Canals (67.2 %) and then Poor Coronal Restorations (53.5 %).

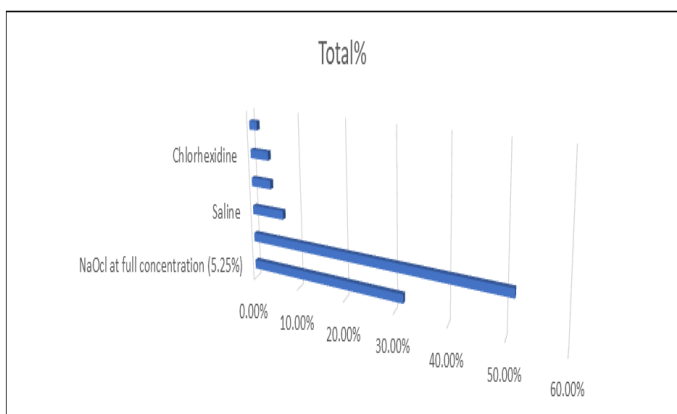


Figure 6. Shows that Based on Participations Experience's, the Most Common Main Factor that Cause Root Canal Failure was Anatomy of Tooth and Root Canal System (38.8 %) and then Debridement of Root Canal (35.1 %), Diagnosis and Treatment Planning (16.2 %), Radiographic Interpretation (8.7 %), and Anatomy and Dentist Skills, Lake of Experience, Coronal Seal Were (0.5 %).

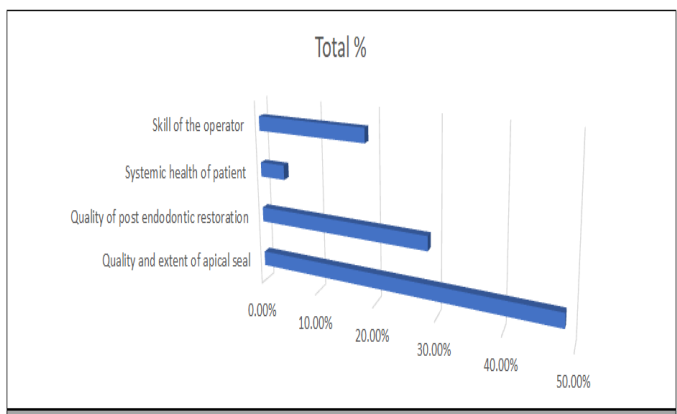


Figure 7. Shows that Based on Participation Opinions, the Most Factor that Determines the Success of Endodontic Prognosis was Quality and Extent of Apical Seal (48.3%) Followed by Quality of Post Endodontic Restoration (Coronal Seal) (29.4%) and then Skill of the Operators (18.4) and Systemic Health of Patient (4 %).

Root canal obturation aims to get the complete filling to prevent the abscess occurred between the root canal and

the peri - radicular tissue. Our study showed that based on the responder's experiences, the factor that determines the success of endodontic treatment is Quality and extent of apical seal (48.6 %) and it was superior of Quality of post endodontic restoration (coronal seal), the skill of the operators and systemic health of the patient. found similar findings in their study.³² In present study showed that the tooth morphology and root canal system (39 %) is the main factor that causes endodontic failure. showed that 27 % of the students say that anatomy of the tooth and root canal system is the main factor. While 23 % of them chose diagnosis and treatment planning. The present study comparing a factor that caused endodontic failure showed that is highly significant in the anatomy of the tooth and root canal system. In Present study showed that students' failure rate (64 %) while endodontists have the least failure rate (31 %). The study showed that the incorrect answers of students were (70.4 %).³³ The conflict of students Answers because, knowledge differences between students and endodontists. Also, students are lack experience and training in some instruments.

CONCLUSION

This study concludes that the knowledge is more related to qualification level, experience, and skills of operators. And also, related to the lack of proper specialized instruments and lack of proper training of these instruments.

REFERENCES

1. Iqbal A. The factors responsible for endodontic treatment failure in the Permanent Dentitions of the Patients Reported to the College of Dentistry, the University of Aljouf, Kingdom of Saudi Arabia. *J Clin Diag Res* 2016;10:146-148.
2. Aragon CE, Zibrowski EM. Does exposure to a procedural video enhance preclinical dental student performance in fixed prosthodontics? *J Dent Educ* 2008;72:67-71.
3. Hoen M, Pink F. Contemporary endodontic retreatments: an analysis based on clinical treatment findings. *J Endod* 2002;28:834-836.
4. Huuonen S, Kvist T, Grondahl K, et al. Diagnostic value of computed tomography in re-treatment of root fillings in maxillary molars. *Int Endod J* 2006;39:827-833.
5. Von Arx T. Frequency and type of canal isthmuses in first molars detected by endoscopic inspection during periradicular surgery. *Int Endod J* 2005;38:160-168.
6. Wolcott J, Ishley D, Kennedy W, et al. A 5 yr clinical investigation of second mesiobuccal canals in endodontically treated and retreated maxillary molars. *J Endod* 2005;31:262-264.
7. Cantarone G, Berutti E, Castelucci A. Missed anatomy: frequency and clinical impact. *Endodontic Topics* 2006;15:3-31.
8. Witherspoon D E, Small J C, Regan J D. Missed canal systems are the most likely basis for endodontic retreatment of molars. *Texas Dent J* 2013;130:127-139.
9. Gordon MPJ. Chandler Electronic apex locators. *Int Endod J* 2004;37:425-437.
10. Mujawar A, Hegde V, Srilatha S. A retrospective three-

dimensional assessment of the prevalence of apical periodontitis and quality of root canal treatment in Mid-West Indian population. *J Conserv Dent* 2021;24(2):184-189.

11. Saini M, Kumari M, Taneja S. Comparative evaluation of the efficacy of three different irrigation devices in removal of debris from root canal at two different levels: An in vitro study. *J Conserv Dent* 2013;16(6):509-513.

12. van der Waal SV, Jiang LM, de Soet JJ, et al. Sodium chloride and potassium sorbate: a synergistic combination against *Enterococcus faecalis* biofilms: an in vitro study. *Eur J Oral Sci* 2012;120(5):452-457.

13. Rossi-Fedele G, Guastalli AR. Osmolarity and root canal antiseptics. *Int Endod J* 2014;7(4):314-320.

14. Clarkson RM, Podlich HM, Moule AJ. Influence of ethylenediaminetetraacetic acid on the active chlorine content of sodium hypochlorite solutions when mixed in various proportions. *J Endod* 2011;37(4):538-543.

15. Jungbluth H, Peters C, Peters O, et al. Physicochemical and pulp tissue dissolution properties of some household bleach brands compared with a dental sodium hypochlorite solution. *J Endod* 2012;38(3):372-375.

16. Naicker D, Zilm P, Nagendrababu V, et al. Effects of Osmotic Stress and Sodium Hypochlorite on Endodontic Microbiota: An In-Vitro Study. *Eur Endod J* 2020;5(3):242-247.

17. Kelbauskas E, Andriukaitiene L, Nedzelskiene I. Quality of root canal filling performed by undergraduate students of odontology at Kaunas University of Medicine in Lithuania. *Stomatologija* 2009;11(3):92-96.

18. De Moor R, Hulsmann M, Kirkevang LL, et al. Undergraduate curriculum guidelines for endodontology. *Int Endod J* 2013;46(12):1105-1114.

19. Balto H, Al Khalifah Sh, Al Mugairin S, et al. Technical quality of root fillings performed by undergraduate students in Saudi Arabia. *Int Endod J* 2010;43(4):292-300.

20. Ribeiro DM, Reus JC, Felipe WT, et al. Technical quality of root canal treatment performed by undergraduate students using hand instrumentation: a meta-analysis. *Int Endod J* 2018;51(3):269-283.

21. de-Moor RJG, Homme GMG, De-Boever JG, et al. Periapical health related to the quality of root canal treatment in the Belgian population. *Int Endod J* 2000;33:113-120.

22. Siqueira JF Jr, Rocas IN, Ricucci D, et al. Causes and management of post - treatment apical periodontitis. *Br Dent J* 2014;216:305-312.

23. Holland R, Gomes JE Filho, Cintra LTA, et al. Factors affecting the periapical healing process of endodontically treated teeth. *J Appl Oral Sci* 2017;25(5):465-476.

24. Polyzos NK, Sarris KG, Pita AI, et al. Quality of Root Canal Fillings Performed by Undergraduate Students and the Related Factors on the Treatment Outcome: A 2- to 5-Year Follow-Up. *Eur Endod J* 2018;3:179-185.

25. Nathasha A, P Sivakumar, James David Raj. Awareness of factors affecting endodontic treatment failures among dental students. *Drug Invention Today* 2018;11:453-457.

26. Baruwa AO, Martins JNR, Meirinhos J, et al. The Influence of Missed Canals on the Prevalence of Periapical Lesions in Endodontically Treated Teeth: A Cross-sectional Study. *J Endod* 2020;46:34-39.

27. Schaeffer MA, White RR, Walton RE. Determining the optimal obturation length: a meta-analysis of literature. *J Endod* 2005;31(4):271-274.

28. Nie Q, Lin J. Comparison of intermaxillary tooth size discrepancies among different malocclusion group. *Am J Orthod Dentofacial Orthop* 1999;116:539-544.

29. AlRahabi MK. Evaluation of complications of root canal treatment performed by undergraduate dental students. *LibyanJ Med* 2017;12(1):1345582.

30. Gołabek H, Borys KM, Kohli MR, et al. Chemical aspect of sodium hypochlorite activation in obtaining favorable outcomes of endodontic treatment: An in-vitro study. *Adv Clin Exp Med* 2019;28(10):1311-1319.

31. Haapasalo M, Shen Y, Wang Z, et al. Irrigation in endodontics. *Br Dent J* 2014;216:299-303.

32. Holland R, Crivelini MM, Zampieri Jr M, et al. Qualidade do selamento marginal obtido com diferentes cimentos à base de hidróxido de cálcio. *Rev Paul Odont* 1991;13:27-35.

33. Mohammad Kashefi Nejad, Maryam Ehsani, Soraya khafri, et al. Evaluation of Dental Students Awareness of Endodontic Procedural Accidents in Babol University of Medical Sciences in 2013-2014. *J dent mat tech* 2016;5:112-161.