Original Article

Effects of Waiting Time for Definitive Restorations After Completion of Root Canal Treatment (RCT)

Muhammad Zubair Ahmad and Durr-e-Sadaf

ABSTRACT

Objective: To evaluate the effects of different placement timings of definitive coronal restorations on endodontically treated teeth (ETT) and analysis of other factors resulting in extraction of such teeth.
Study Design: Retrospective study.
Place and Duration of Study: This study was conducted at the College of Dentistry, Qassim University, Saudi Arabia from May 2012 to January 2018.
Materials and Methods: Data of 4,012 patients who received endodontic treatment and final coronal restorations were gathered from dental records. Reasons and time of extraction of ETT were noted.
Results: significant association was found between extraction of ETT and female gender ($p < 0.00$) and 60+ days waiting time of final coronal restoration ($p < 0.00$). Year of dental students and number of visits of RCT did not have significant association with extraction of ETT ($p = .366$ and $.654$ respectively).
Conclusion: Final coronal restorations should be placed within first two weeks after completion of RCT. This reduces the risk of extraction of ETT.

Key Words: Crown, root canal treatment, tooth extraction, resin composite, buildup

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INTRODUCTION

The survival and functionality of root treated teeth are emerging aspects of endodontic treatment outcome, rather than periapical healing alone[1,2]. Untoward events, like extraction, retreatment and apical surgeries occur within first three years of root canal treatment[3]. There are only few studies in literature that have analyzed the survival of endodontically treated teeth (ETT) and reasons of extraction of such teeth[4]. In a recently done systematic review Zhu, have reported the protective role of post placement when restoring ETT with mutilated coronal structure[5]. Because endodontic treatment and crown placement procedures are primarily performed to restore functionality and to prevent tooth extraction, it is important to analyze the relationship of survival of endodontically treated tooth with the waiting time of crown placement.

The objectives of the present retrospective study, involving Saudi adults, were to investigate the distribution of reasons for extraction of ETT, time delay between endodontic treatment and placement of final coronal restoration and influence of time delay and other factors (patient's gender, location of tooth in the arch, type of tooth and year of dental student providing treatment) on the extraction of ETT.

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MATERIALS AND METHODS

After getting ethical approval, data were collected from 4,012 patients who received endodontic treatment and final coronal restoration from May 2012 to January 2018 at College of dentistry, Qassim University, Saudi Arabia.

The authors considered the reason mentioned in the patient's file as the main reason for extraction. The reason was confirmed by again examining the tooth's periapical radiograph from the patient's database by checking the reason that was noted in the clinics procedure list on the day of extraction of ETT. If more than one reasons were found, the more untreatable condition was chosen (e.g. root fracture over recurrent caries).

Patient's gender, age, type of tooth (molar, premolar or anterior), location of tooth in dental arch (maxillary and mandibular), year of treating dental student (4^{th} year and 5^{th} year), quality of root canal treatment (length of obturation, presence or absence of voids), type of final coronal restoration (core buildup or crown), type of crown (PFM or all ceramic), presence or absence of opposing dentition, waiting time of crown placement after completion of root canal treatment (0-14 days, 15-

59 days and 60+ days), date of extraction and presence or absence of post were obtained from patient's file.

Data were pooled and analyzed by SPSS 25 (SPSS, Chicago, IL). The association between extraction reasons (crown fracture, prosthetic reasons and endodontic reasons) and patients characteristics (male, female), tooth characteristics (maxillary vs mandibular, location of tooth and type of tooth) or restoration characteristics were examined using a Chi Square tests and Z-tests. A value of $P < .05$ was considered to be statistically significant at 95% confidence interval.

RESULTS

The mean age of the patients was 37.27 (range 11-85) years. The gender distribution of the patients was 1305 (32.5%) males versus 2707 (67.5%) females. The distribution of analyzed teeth is presented in Fig. 1. The most commonly extracted teeth were molars (n=1087; 27%) followed by premolars (n=1015; 25.3%). Anterior teeth were least commonly extracted (n=698; 17.4%). 2319 (84.6%) extracted teeth had crown present and 431 (15.4%) extracted teeth had composite restoration/ build up present. 794 (28.4%) of extracted teeth had post present and 2006 (71.6%) of teeth had post absent.

The reasons for which decisions of extraction of teeth were made are presented in Fig. 2.

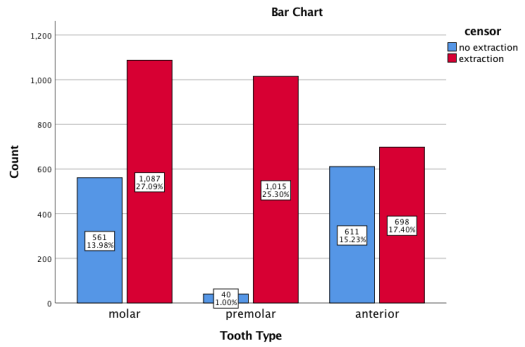

Figure No. 1: Distribution of 4,012 studied ETT. 27% extracted teeth were molars.

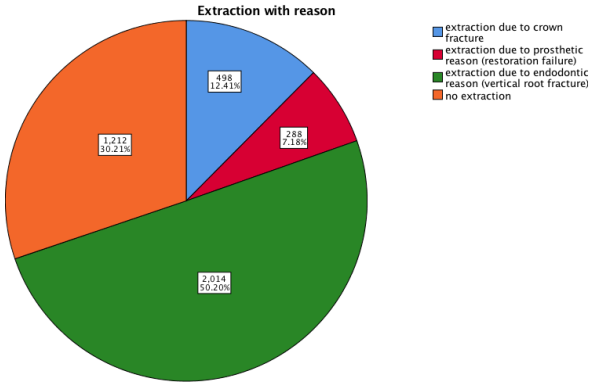

Figure No. 2: Reasons for extraction of 2,800 ETT.

Endodontic reasons (vertical root fractures) were the most common reasons (n=2014; 50.2%), followed by crown fractures (n=498; 12.4%). Prosthetic reasons or restoration failures were the least common reasons for extraction of ETT (n=288; 7.2%).

A Chi square test was applied to see the association of extraction of ETT with various variables (Table 1). Female gender, multivisit RCT's, permanent coronal restorations done after more than 60 days, absence of post have highly significant association with extraction of ETT ($P < 0.00$). Year of dental student was not associated significantly with extraction of ETT ($p = .366$).

Table No.1: Association of various factors with extraction of ETT (Level of significance $P < 0.05$; 95% CI)

Variables	N (%)	Chi square; *p*
Gender		
• Male	750 (26.8%)	< 0.00
• Female	2050 (73.2%)	
Year of dental student		
• 4th year	823 (29.4%)	.366
• 5th year	1977 (70.6%)	
Quality of root canal treatment		
• Overobturation	428 (15.3%)	
• Obturation within 2mm of apex	2204 (78.7%)	< 0.00
• Short obturation	168 (6%)	
No of visits of RCT		
• Single visit	652 (23.3%)	.654
• Multivisit	2148 (76.6%)	
Time of placement of coronal restoration		
• 0-14 days	1062 (37.9%)	
• 15-59 days	439 (15.7%)	< 0.00
• 60+ days	1299 (69.8%)	
Post		
• Present	794 (28.4%)	< 0.00
• Absent	2006 (71.6%)	

DISCUSSION

The present study was done at a government undergraduate dental college. Study is retrospective and all procedures were performed by 4th and 5th year dental students. This is therefore a limitation of the study.

Despite the limitations, this study shows an interesting picture of endodontic treatment outcome. The vast majority of ETT were extracted due to endodontic reasons and root fractures (50.20%). Other reasons were less common.

The present results are in agreement with Yoshino et al., who reported that very high prevalence of ETT (93.6%) were extracted due to endodontic related reasons e.g. vertical root fracture (VRF) and higher percentage of extraction of ETT (34.7%) in females[6]. Similarly Sjogren et al reported higher prevalence of VRF (31%) among extracted ETT[7].

This results of this study are in contrast with Fuss et al., who reported that 63% of ETT were extracted due to gross caries or cusp breakage: 44% were extracted entirely because of their unrestorability or restorative reasons, and 19% were extracted because of a combination of restorative considerations and endodontic failures[8]. Similarly, in Vire's study, 59% of ETT were extracted for restorative reasons, 9% for endodontic failures, and 13% of ETT were extracted because of VRF[9].

The aim of the present study was, beyond this cited literature, to study the possible influence of patient gender, tooth type, coronal restoration on the distribution of the reasons for extractions and the influence of any delay in placement of final coronal restoration on the extraction of ETT.

Significant association of female gender with extraction of ETT is in agreement with studies done previously when overall tooth loss is observed, patient's gender was reported as influencing factor[10,11].

There is highly significant association ($p < 0.00$) of extraction of ETT with delay of more than 60 days of placement of final coronal restoration after completion of RCT in this study. This study is in agreement with Pratt et al., who studied critical time lapse between placement of coronal restoration and RCT completion and concluded that this delay influence the survival rate of ETT negatively[4]. Our findings are also in agreement with several other studies who have studied the survival of ETT after completion of root canal treatment[12,16].

When we compared the reasons for extractions of molars and those of other teeth, the only significant difference was a higher prevalence of molars (55.9%) than premolars (48.9%) and anterior teeth (44%). This finding is similar to Tamse et al., who concluded higher prevalence of molars than other teeth[17]. The increased prevalence of VRF is reported to be due to presence of intracanal post (18). Our study is in disagreement with these findings. There is significant association of absence of post with extraction of ETT ($p < 0.00$).

Previous literature has concluded that final coronal restoration after completion of RCT affected the survival of these teeth[3,19]. Such studies have reported that ETT without full coverage cast restorations were lost at a rate of 5-6-fold higher than fully covered teeth[3,19,22]. In the present study marginally, significant association was found between presence of full coverage cast restoration (70.5%) when compared to composite restoration/ buildups (66.3%) ($p = .04$). This may be attributed to a higher sample size of our study as compared to other previous studies.

CONCLUSION

Endodontically treated teeth are prone to extraction mainly due to endodontic reasons and vertical root fractures when done by undergraduate students and to a lesser extent due to prosthetic related reasons, such as restoration failure or fracture of coronal restorations. It is in patient's best interest to place the definitive coronal restoration as soon as possible after completion of RCT.

Author's Contribution:

Concept & Design of Study:	Muhammad Zubair Ahmad
Drafting:	Durr-e-Sadaf
Data Analysis:	Durr-e-Sadaf
Revisiting Critically:	Muhammad Zubair Ahmad
Final Approval of version:	Muhammad Zubair Ahmad

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Gillen BM, Looney SW, Gu LS, Loushine BA, Weller RN, Loushine RJ, et al. Impact of the quality of coronal restoration versus the quality of root canal fillings on success of root canal treatment: a systematic review and meta-analysis. J Endodontics 2011;37(7):895-902.
2. Bhandary S, Kakamari S, Srinivasan R, Chandrappa MM, Nasreen F, Junjanna P. A comparative evaluation of the effect of 8% and 17% ethylenediaminetetraacetic acid exposure for 1 min and 10 min on the fracture resistance of endodontically treated roots: An in vitro study. J Conservative Dentist 2017;20(1):21-4.
3. Salehrabi R, Rotstein I. Endodontic treatment outcomes in a large patient population in the USA: an epidemiological study. J Endodontics. 2004; 30(12):846-50.
4. Pratt I, Aminoshariae A, Montagnese TA, Williams KA, Khalighinejad N, Mickel A. Eight-Year Retrospective Study of the Critical Time Lapse between Root Canal Completion and Crown Placement: Its Influence on the Survival of Endodontically Treated Teeth. J Endodontics 2016;42(11):1598-603.
5. Zhu Z, Dong XY, He S, Pan X, Tang L. Effect of Post Placement on the Restoration of Endodontically Treated Teeth: A Systematic Review. Int J Prosthodontics 2015;28(5):475-83.
6. Yoshino K, Ito K, Kuroda M, Sugihara N. Prevalence of vertical root fracture as the reason for tooth extraction in dental clinics. Clinical Oral Investigations 2015;19(6):1405-9.
7. Sjogren U, Hagglund B, Sundqvist G, Wing K. Factors affecting the long-term results of endodontic treatment. J Endodontics 1990;16(10):498-504.
8. Fuss Z, Lustig J, Tamse A. Prevalence of vertical root fractures in extracted endodontically treated teeth. Int Endodontic J 1999;32(4):283-6.

9. Tirosh A, Shai I, Tekes-Manova D, Israeli E, Pereg D, Shochat T, et al. Normal fasting plasma glucose levels and type 2 diabetes in young men. The New Engl J Med 2005;353(14):1454-62.
10. Fardal O, Johannessen AC, Linden GJ. Tooth loss during maintenance following periodontal treatment in a periodontal practice in Norway. J Clin Periodontol 2004;31(7):550-5.
11. Hugo FN, Hilgert JB, de Sousa Mda L, da Silva DD, Pucca GA. Correlates of partial tooth loss and edentulism in the Brazilian elderly. Comm Dentist Oral Epidemiol 2007;35(3):224-32.
12. Naumann M, Schmitter M, Frankenberger R, Krastl G. Ferrule Comes First. Post Is Second! Fake News and Alternative Facts? A Systematic Review. J Endodontics 2018;44(2):212-9.
13. Belleflamme MM, Geerts SO, Louwette MM, Grenade CF, Vanheusden AJ, Mainjot AK. No post-no core approach to restore severely damaged posterior teeth: An up to 10-year retrospective study of documented endocrown cases. J Dentist 2017; 63:1-7.
14. Burry JC, Stover S, Eichmiller F, Bhagavatula P. Outcomes of Primary Endodontic Therapy Provided by Endodontic Specialists Compared with Other Providers. J Endodontics 2016;42(5):702-5.
15. Petersson K, Fransson H, Wolf E, Hakansson J. Twenty-year follow-up of root filled teeth in a Swedish population receiving high-cost dental care. Int Endodontic J 2016;49(7):636-45.
16. Fransson H, Dawson VS, Frisk F, Bjorndal L, EndoReCo, Kvist T. Survival of Root-filled Teeth in the Swedish Adult Population. J Endodontics 2016;42(2):216-20.
17. Tamse A, Fuss Z, Lustig J, Kaplavi J. An evaluation of endodontically treated vertically fractured teeth. J Endodontics 1999;25(7):506-8.
18. Heling I, Gorfil C, Slutzky H, Kopolovic K, Zalkind M, Slutzky-Goldberg I. Endodontic failure caused by inadequate restorative procedures: review and treatment recommendations. J Prosthetic Dent 2002;87(6):674-8.
19. Aquilino SA, Caplan DJ. Relationship between crown placement and the survival of endodontically treated teeth. J Prosthetic Dentist 2002;87(3): 256-63.
20. Vire DE. Failure of endodontically treated teeth: classification and evaluation. J Endodontics 1991;17(7):338-42.
21. Chen SC, Chueh LH, Wu HP, Hsiao CK. Five-year follow-up study of tooth extraction after nonsurgical endodontic treatment in a large population in Taiwan. J Formosan Med Assoc = Taiwan yi zhi 2008;107(9):686-92.
22. Trope M. Commentary. "Biological restoration": root canal and coronal reconstruction. J Esthet Restor Dent 2010;22(3):178.