

Knowledge and Awareness of the Importance of Final Restoration after Root Canal Treatment of the Population in Madinah

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Abstract

Background: Root canal treatment is a procedure that involves elimination of infected or necrotic tissue followed by well-condensed obturation. The ultimate goal of endodontic treatment is to remove all microorganisms and their byproducts from the root canal system and attempt to maintain the tooth in this disinfected state by blocking any further penetration of microorganisms during and after treatment.

Objective: The aim of this cross-sectional study was to assess the knowledge and awareness of the importance of final restoration following root canal treatment in Madinah population.

Methods: Self-administered electronic questionnaire in Arabic language was created by a web-based survey (Google). Both male and female adults at Madinah, Saudi Arabia, whether Saudi or non-Saudi national, were included in this study.

Results: 75.73% of root canal treated teeth were restored with permanent restoration. The majority (60.6%) of participants strongly agreed that restoring endodontically treated teeth is necessary. About one third of participant believed that "white" restorations are permanent restorations, while only 6.65% thought that full coverage crowns were permanent restorations.

Conclusion: There was a general believe that final restorations are essential to prevents microbial leakage. This is a good indication that the majority of the studied population realize that final restoration is a subsequent to root canal treatment to complete the treatment. Root canal treatment solely without coronal seal would not be sufficient. Lack of coronal seal may cause bacterial leakage, tooth fracture and/or recurrent caries.

Keywords: Knowledge and Awareness; Importance of Final Restoration; Treatment of the Population in Madinah

Introduction

Root canal treatment is a procedure that involves elimination of infected or necrotic tissue followed by well-condensed obturation [1]. The main goal of endodontic treatment is to remove all microorganisms from the root canal system and attempt to maintain the tooth in this disinfected state by blocking any further penetration of microorganisms during and after treatment [2]. Each root canal filled tooth must have an apical and coronal seal to maintain the tooth in disinfected state and achieve a better outcome [2,3]. Watertight apical seal is essential to prevent the remaining microorganisms and their endotoxins within the root canal system from reaching the preapical area [3]. Moreover, the coronal seal is essential to prevent microbial ingress within the root canal system from the oral cavity [3]. Compromised coronal or apical seal can affect the outcome of treatment [2].

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Among the commonly attributable causes of endodontic failure and endodontic reinfection are poor mechanical debridement, persistence of bacteria in the root canal system and preapical area, poor obturation quality, and coronal leakage [3]. The concept of microleakage having an effect on the success of endodontic treatment has been well known over the last decades [3,4]. Controversial studies were conducted in regards of the main factor contributing to endodontic reinfection [5,6]. Apical leakage thought to be the main factor related to endodontic reinfection [7]. However, recent study suggested that coronal leakage has gained focus over the last decade [8]. Torabinejad, *et al.* studied the leakage of different microorganisms in the absence of coronal seal [9]. They found that coronal leakage resulted in 50% penetration of *Staphylococcus epidermidis* and *Proteus vulgaris* in 19 and 52 days respectively on single root canal filled teeth [7]. Final restorations were considered primarily to restore function, but they might affect the outcome of root canal treatment [11]. Ray and Trope conducted a study to find out the relationship between the quality of the coronal seal and the absence of apical pathology [11]. They concluded that the quality of the endodontic treatment is significantly less important than the quality of the coronal restoration for periapical health [11]. Root canal treated teeth with good quality restorations have a higher success rate than teeth with poor-quality restoration [10]. An impermeable seal at the coronal area is important for a successful prognosis of an endodontically treated teeth [10].

The aim of this cross-sectional study was to assess the knowledge and awareness of the importance of final restoration following root canal treatment in Madinah population.

Materials and Methods

A Descriptive cross-sectional observational study was conducted through anonymous self-administered electronic questionnaire created by a web-based survey (Google). Both male and female adults at Madinah, Saudi Arabia, whether Saudi or non-Saudi national, were included in this study.

Sample size was calculated according to the estimated population size with the predetermined confidence level and confidence interval, pretested online questionnaires were used in data collection.

The questionnaire was conducted in Arabic language, included questions about socio-demographic factors as well as awareness of Madinah population regarding the importance of final restoration after root canal treatment.

Statistical analysis

A non-probability sampling technique was employed to collect data from the participants. Data was coded, entered, and descriptively analyzed using the Statistical Package for Social Science (SPSS) version 26.0 (IBM Corp. NY, USA).

Results

A total of 373 people participated in the study 75.9% female, 24.1% male. Based on the social level of the participants, 62.7% held bachelor’s degree, and 56.6% had a monthly income of less than 3000 SR (Table 1).

	Factor	N (%)
Age	18-28	53.4%
	29-38	16.4%
	39-48	15.8%
	49-58	12.1%
	>58	2.4%
Gender	Male	24.1%
	Female	75.9%
Education	High school or less	21.4%
	Diploma	8%
	Bachelor	62.7%
	Master’s degree or higher	7.8%
Income	3000 SR or less	56.6%
	3001-6000 SR	10.2%
	6001-9000 SR	9.4%
	9001-12000 SR	9.4%
	More than 12000 SR	14.5%

Table 1: Demographic information of participants.

As shown in table 2, 81.5% received root canal treatment, only 35 (11.6%) have been treated under rubber dam isolation. Following root canal treatment, 75.73% of root canal treated teeth were restored with permanent restoration, 60.67% were fractured or reinfected. About 36.4% of responses to aesthetic satisfaction outcome of endodontically treated tooth were neutral.

Factor		N (%)
Have you ever received root canal treatment?	Yes	81.5%*
	No	18.5%
Did the dentist use a rubber dam during the treatment?	Yes	11.6%
	No	88.4%*
Did you restore your teeth with permanent restoration after root canal treatment?	Yes	75.73%
	No	15.65%
	IDK	8.62%
Have you experienced a fractured or reinfected endodontically treated tooth before?	Yes	60.67%*
	No	30.67%
	IDK	8.66%
Are you satisfied with the aesthetic outcome of your endodontically treated tooth?	Very unhappy	14.9%
	Unhappy	19.5%
	ok	36.5%*
	Happy	11.6%
	Very happy	17.5%

Table 2 Dental history of participant.
*The highest percentage.

Table 3 shows the knowledge and awareness of participants regarding the importance of final restoration after root canal treatment. The majority 60.6% of the participants strongly agreed that restoring endodontically treated teeth is necessary.

Factor		N (%)
Do you agree that restoring endodontically treated teeth is necessary?	Strongly disagree	(2.9%)
	Disagree	(5.1%)
	Neither	(17.2%)
	Agree	(14.2%)
	Strongly agree	(60.6%)*

What are the permanent fillings in your opinion?	Post	(6.65%)
	Crown	(11.98%)
	Bridge	(6.65%)
	White restorations	(36.12%)*
	Silver restoration (amalgam)	(17.11%)
	I do not know	(21.48%)
What is the importance of permanent filling after root canal treatment?	Final restorations prevent bacterial leakage	(29.16%)
	Final restorations prevent fracture of the tooth	(29.29%)*
	Final restorations extend the success of the root canal treatment	(15.40%)
	Failure of restoring the endodontically treated teeth will lead to tooth loss	(20.44%)
	IDK	(5.72%)
Do you know what are the consequences of not restoring the teeth after root canal treatment with permanent restorations?	Fracture	(24.51%)*
	Bacterial leakage	(24.17%)
	Tooth loss	(19.56%)
	Loss of function	(9.90%)
	Aesthetic failure	(13.92%)
	IDK	(7.94%)

Table 3: Knowledge and awareness of participant.

About one third (36.12%) believed that “white” restorations are permanent restorations, while only 6.65% thought that full coverage crowns were permanent restorations. On the other hand, 21.48% of the participants did not know what permanent restorations are.

Furthermore, 29.29% reported their knowledge that final restorations prevent fracture of the teeth after root canal treatment, while 5.72% did not know the importance of permanent restorations following root canal treatment. Around 24.5% of responses thought that fracture is a consequence of not restoring the tooth after root canal treatment, while 24.17% believe that bacterial leakage is one of the outcomes. Whereas 7.94% did not know the sequels of not restoring an endodontically treated tooth.

Discussion

This study aimed to investigate and assess the knowledge and awareness of the importance of final restorations following endodontic treatment in Madinah, Saudi Arabia. The First part of the study will aid in gaining information about the level of knowledge of the

participants. Based on that, the second part will assess the need to emphasize on public awareness for final restoration after root canal treatment (RCT).

Participants who answered that they haven't visited dentist before were excluded. Root canal filled teeth are structurally and aesthetically compromised due to significant loss of tooth structure, reduction of flexibility and tensile strength of ramming dentin [12]. Biomechanical alterations to dentin occur as a result of tissue loss at the crown level [11]. High incidence of fractures was observed [13]. Evidence showed that root canal filled teeth are more susceptible to fracture and, in consequence, the risk of tooth loss is significantly higher than that of teeth with vital pulps [13]. Using data from more than 46,000 patients from 28 dental practices, there was a good correlation between root filled teeth and subgingival fracture location [14]. Loss of internal tooth structure leads to increased cuspal deflection during occlusal function [15]. Deflection is more pronounced in root filled premolars with mesial, occlusal and distal (MOD) cavities, with doubling the depth of the MOD cavity, the cuspal deflection has been reported to increase by a factor of eight [16].

Although patient satisfaction with root canal treatment followed by tooth restoration is high, the procedure requires a significant investment [15]. Therefore, the overall treatment and tooth structure must be assessed to ensure a good long-term prognosis. Treatment planning should include a careful analysis of the implications of tooth restoration.

The results of a study conducted by Madarati [18] suggested that 88.4% of the RCTs were done without using rubber dam, indicating that the use of rubber dam is uncommon in general practice in Madinah, Saudi Arabia. Moreover, the data showed that most of the participant had restored their endodontically treated teeth. However, two thirds of the participants experienced reinfection or fracture of their endodontically treated teeth which might be due to improper isolation, lack of coronal seal or poor root canal treatment [18]. In a later study evaluated 100 referred patients to determine the frequency of various factors associated with continuing pain after the commencement of root canal treatment [17]. The results revealed 23 different factors of which the 'lack of use of rubber dam' ranked first and was observed in 87% of patients [17]. This highlights the importance of patients' education and awareness towards the use of rubber dam during endodontic treatment.

The results showed that the majority of respondents restored their endodontically treated teeth only with a tooth-colored restorative material, 20.2% their final restoration was amalgam, and 15.7% didn't restore their endodontically treated teeth with any final restoration. A study conducted by Christensen [21] and Goerig and Mueninghoff [22] concluded that when coronal structure damage is minimal, conservative treatment should be considered like composite resin and glass ionomer and They recommended to use post and core foundation when tooth loss is more than 50% of tooth structure. The main function of the post is to retain the core build up in a tooth with extensive loss of coronal tooth structure [23]. Another study comparing the longevity of endodontically treated teeth with or without crowns reported that teeth restored without crowns were lost 6 times more than those that were crowned [20]. This area needs further investigation to assess the ideal treatment plan after endodontic treatment.

Regarding the type of final restoration, 35.1% of the responses noted that the tooth was restored with white restoration. However, a limitation would be that we do not know the ideal post-endodontic restoration type for the tooth whether is it a direct or indirect restoration.

While analyzing the awareness of the studied population regarding the importance of final restoration after endodontic treatment, the majority believed that final restoration prevents bacterial leakage. Though only 5.8% did not know the importance of the final restoration of the endodontically treated tooth. This is a good indication that the majority of the studied sample realize that final restoration is a subsequent to treatment to complete the treatment, as root canal treatment solely without coronal seal wouldn't be a full treatment, which may cause bacterial leakage, tooth fracture and/or recurrent caries.

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