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Radiographical Study of Success and Failure with Evaluation the Cause of That Failure of Endodontically Treated Teeth

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Original Research Article

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Abstract: The present study is planned to analyze radiographically examined success and failure of endodontically treated teeth among the patients who came at Taibah dental clinics, Saudi Arabia. One hundred (N=100) endodontically treated teeth were clinically examined by using dental mirror, dental explorer and periodontal probe. The periapical radiographs of these teeth were radiographically examined. Several reasons including defective restoration, periodontal disease, recurrent caries, under filling, poor density obturation, over filling and many others of each root filled canal were recorded in the patient data sheets. Chi square test was applied to determine statistical significance if any. Our study demonstrates 20% success rate of endodontic treatment while failure was recorded in 65% and potential failure in 15% of cases. Clinical data revealed defective restoration in 84% followed by periodontal disease (62%), recurrent caries (52%). When endodontic treatment was radiographically evaluated, periodontal lesion was observed in 74% followed by recurrent caries (73%), under obturation (50%), poor density obturation in (48%) of the cases. Defective restoration, poor density obturation, under obturation and periodontal diseases were significantly (p=0.001) associated with endodontic failure while periodontal disease is posing significantly higher risk of potential failure in this study. The success rate of endodontic treatment was found only in 20% and the most common cause of its failure was defective restoration followed by periodontal lesion, recurrent caries, under filling, poor density obturation etc.

Keywords: Endodontic treatment, Root canal treatment, success, failure, radiographic.

INTRODUCTION

Dental health problem is a rising global public health issue because of its medical, economic, and ethical impacts on human [1]. The endodontic treatment reduce the risk of infection by eliminating the microbes from root canal space by chemo mechanical preparation which prevent re-infection and promote periapical healing by hermetically sealing the root canal space [2]. It also prevents apical periodontitis (AP) however, its persistence after a certain period may be considered as the sign of root canal treatment (RCT) failure [1]. Therefore, frequency of AP estimation may be helpful in evaluating endodontic treatment needs and success/failure of procedure. The several controlled clinical studies have shown that the success rates of endodontic procedures may reach up to 90% or even more when the standard procedure is followed however, in general population the epidemiological studies revealed comparatively lower success rate ranging up to 80% [1, 3].

Dental radiographs are essential for performing root canal therapy and are also needed to evaluate teeth for restorations. To reduce the prevalence of AP, it is necessary to improve the quality of RCT in general dental practice which promotes periradicular health [4]. The success criteria for endodontic treatment is illusive however, failure has been defined in some studies as a recurrence of clinical symptoms along with the presence of periapical radiolucency [5]. Besides the clinical evaluation, the radiographical evaluation for RCT would be recommended to an endodontically treated tooth for its deemed success. The success and failure of RCT are evaluated mainly based on radiographic evaluation. It provides contrast, density, taper and homogeneity of the quality of root canal filling [6]. The quality of root canal filling is directly related to periapical health and healing. The research has proved a direct relationship between low quality of root canal filling and periapical changes. Patient should be scheduled for follow up to ascertain that the treatment is a success and the tooth in question is functional. The factors like persistence of bacteria, inadequate filling of the canal, over extensions of root filling materials, improper coronal seal, untreated canals, iatrogenic procedural errors such as poor access cavity design, complications of instrumentation are reported risk factors for the failure of endodontically treated teeth [7]. The endodontic treatment is purposely performed for the cleaning of the root canal system of

any infected pulp tissue so the canal space can be shaped and prepared to be filled with an inert material. Thus, the primary goal of endodontic treatment is to eliminate or reduce the microbes from root canal space by chemo mechanical preparation and to prevent re-infection and promote periapical healing [6].

Only few studies have evaluated the radiographic success and failures in endodontic treated teeth among Saudis [6, 8, 1, 9]. Hence, the present study was designed to investigate the success and failure of endodontically treated teeth by evaluating clinical and radiographical outcomes at Taibah dental clinic, kingdom of Saudi Arabia.

METHODS AND MATERIALS

The present observational analytical cross sectional study was conducted at Taibah University dental clinics, Medina, Kingdom of Saudi Arabia. A total number of one hundred (N = 100) endodontically treated teeth were clinically examined and radiographically evaluated among the females patients who came seeking dental treatment at Taibah University dental clinics. All the patients in this study were not treated in Taibah University clinics, they have done their RCT prior to admission to the university. They were examined between January and May 2016. The subjects were recruited by following the strict inclusion and exclusion criteria. The patients with good oral hygiene, having permanent dentition and close apices of the teeth, periapical status of the teeth on periapical radiographs, came for routine dental care, age lying between 18 to 60 years was included in this study. The patients having apicoectomy, cyst enucleation, vertical root fracture and non-restorable teeth were excluded from our study. The institutional ethical clearance was obtained prior to start the study. Informed consent was taken from the all patients. After taking the medical and dental history, the teeth and soft tissues were clinically examined by using dental mirror, dental explorer and periodontal probe for tenderness, swelling, sinus and crown fracture. The data sheet was designed to collect data related to endodontic treatment failure. Demographic characteristics such age, gender, total number of affected teeth and problems and the reason /reasons of endodontic treatment failures were recorded in patient data sheets. The root canal obturation more than 2 mm from the radiographic apex was considered under filling while extending beyond the radiographic apex was considered over filling. Presence of voids, non-homogenous root canal fillings were considered as poor filling. Furcation perforation was diagnosed when extrusion of filling material through the furcation area was detected in multi-rooted teeth. Strip perforation was diagnosed when extrusion of filling material was detected in the lateral wall of any root. Presence of a separated instrument was diagnosed when one was detected inside a root canal or its tip extending into the periapical area. To assess the rate of RCT success the data were classify it into successful, failure or potential failure.

Statistical analysis

Data were collected during clinical examination by researcher, then it was coded, entered and analyzed by Statistical Package for the Social Sciences (SPSS). Descriptive analysis was performed to report sample characteristics, such as mean value and percentage.

RESULTS

The present study includes a total number of hundred (N = 100) endodontically treated teeth. The success rate of endodontic treatment was reported in 20% while failure was reported in 65% and potential failure in 15% of the cases (Figure-1).

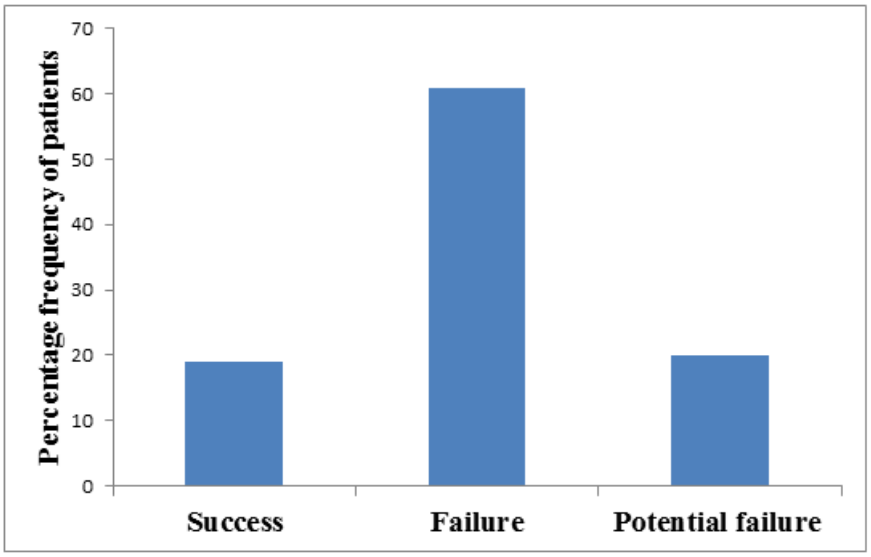

Fig-1: Percentage frequencies of different categories of the endodontically treated teeth

When the clinical outcomes of the patients were compared for the endodontic failure, defective restoration was found in 84% patients followed by periodontal disease (62%), recurrent caries (52%). Furthermore, Radiographical basis of evaluation of RCT failure reflects periodontal lesion in 74% of patients which is followed by recurrent caries (73%), under obturation (50%), poor density obturation (48%). The role of missing canal was observed in only 1% of the cases.

However, root fracture was not observed as a reason for RCT failure in this study (Table-1).

Table-1: Shows the most common cause of success and failure of edodontically treated teeth

Variable	Frequency	Percent
Clinical aspect		
Recurrent caries		
Yes	52	52
No	48	48
Periodontal disease		
Yes	62	62
No	38	38
Defective restoration		
Yes	84	84
No	16	16
Radiographic aspect		
Recurrent caries		
Yes	73	73
No	27	27
Periodontal lesion		
Yes	74	74
No	16	16
Root fracture	0	0
Yes		
No	100	100
Mechanical error		
Yes	2	2
No	98	98
Poor density obturation		
Yes	48	48
No	52	52
Missing canal		
Yes	1	1
No	98	98
Over obturation		
Yes	2	2
No	98	98
Under obturation		
Yes	50	50
No	50	50

The reasons for failures and potential failure of RCT were analyzed in patients. We found that defective restoration, recurrent caries, periodontal disease, poor density obturation, under obturation were significantly ($p<0.05$) higher in patients while over obturation, missing canal, mechanical error, root fracture were not associated with RCT failure. In the present study, periodontal disease is posing significantly ($p<0.05$) higher risk of potential failure (Table-2).

DISCUSSION

In present study, clinical outcomes and periapical radiographs were analyzed for the evaluation problems and failures of root canal treatment. The European Society of endodontology guidelines instructed that the evaluation of root canal filling should be checked by radiograph which should be ending within 2-3 mm from the periapical region [10]. The clinical aspect of absence of pain and swelling is a well accepted indication of success of RCT [6, 11]. Further, RCT success and failure is confirmed by radiographic analysis but as any imaging modality, radiograph has some limitations of RCT that it can only show two dimensional images of a three dimensional structures and superimposition of adjacent anatomic structures; especially in area of maxillary molars makes it difficult

to interpret the radiographs [12, 13]. Therefore, clinical symptoms need to be investigated which indicate that there is existing post treatment disease that cannot be depicted on a two-dimensional radiographic image.

Table-2: Common reasons for failures and potential failure of endodontically treated teeth

Causes		Failure	Potential failure		P value
Defective restoration	Yes	57	20	7	
	No	4	0	12	0.085
Recurrent caries	Yes	54	19	0	0.001*
	No	7	1	19	
Periodontal disease	Yes	55	15	4	0.001*
	No	6	5	15	
Root fracture	Yes	0	0	0	NA
	No	61	20	19	
Mechanical error	Yes	2	0	0	0.615
	No	59	20	19	
Poor density obturation	Yes	44	4	0	0.001*
	No	17	16	19	
Missing canal	Yes	1	0	0	0.786
	No	60	20	19	
Over obturation	Yes	2	0	0	0.615
	No	59	20	19	
Under obturation	Yes	49	1	0	0.001*
	No	12	19	19	

*Shows data is significant at $p<0.05$, NA= not applicable

This study demonstrates only 20% success rate of RCT while it was failure in 65% and potential failure in 15% of cases (Figure-1). The other studies reported that RCT success rate was up to 35-92% of cases in general population which is very high with respect to our reports [14-16]. The reason for the low success rate of endodontic treatment in our study is due to less experienced dental doctors and the technical quality of the endodontic treatment. The success rate of RCT in this study is similar to previous study in Saudi population where the reported success rate is 27% [9]. The clinical outcomes analysis for the evaluation of endodontic treatment failure revealed that defective restoration in 84% of cases which is majorly involved reason for endodontic treatment failure followed by recurrent caries, periodontal disease (Table-2). A defective or inadequate restoration can allow bacterial growth or other contaminant to reenter the teeth. This is also known as coronal leakage which is considered as a potential factor resulting in endodontic failure [7]. Alafif, 2014 have suggested the importance of a good quality coronal restoration in the success and failure of endodontic treatment [17]. Radiographical analysis has shown comparatively more occurrence of recurrent caries i.e 73% of the cases, periodontal lesion in 74%, under obturation in 50% and poor obturation 48% of the cases (Table-1). Tabassum *et al*., have suggested that the quality of root canal obturation plays decisive role in the success of the endodontic treatment [7]. Previous study in Saudi population reported the occurrence of poor density obturations in 28.5% [6].

The over and under extended obturations have shown lower success rate of endodontic treatment in the previous studies. In the present study under obturation cases have posed more risk of RCT failure as compared to over obturation. In contrast to this study, Tabassum *et al*., 2016 reported over extended obturation has 4 times more risk of RCT failure as compared under obturated canals.[7] High occurrence of RCT failure in periodontal lesion in our study is corroborated with previous study where the presence of periradicular lesion has shown a worse prognosis in cases of inadequate filling and subsequently failure of RCT [11].

Defective restoration, poor density obturation, under obturation and periodontal diseases are significantly ($p = 0.001$) responsible for the endodontic treatment failure as compared to potential failure while periodontal disease is posing significantly ($p < 0.05$) more risk of potential failure in our study. In contrast to this, root fracture, mechanical error, missing canal, over obturation were not significantly associated with the failure and potential failure of endodontic treatment failure as shown in Table-2. Inadequate root canal obturation such as over and under obturation compromise the success rate of RCT. Our findings relate with the earlier reports on inadequate root canal obturation with under filling in 49.9% and overfilling in 24.1% of patients in Saudi population [18].

CONCLUSION

We conclude that lower success rate of endodontic treatment in our study may due to periodontal lesion, recurrent caries, under filling, poor density obturation etc. We recommend that to improve the assurance of the endodontic treatment quality so that success rate will increase. Regular follow ups at least

once in a year will be better in monitoring any changes which lead to endodontic problems. However clinical thoroughness during the treatment phase can potentially benefit the clinician and the patient in the long run.

Conflict of Interest: Authors have no conflict of interest

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