

CAUSES OF ENDODONTIC TREATMENT FAILURE — A STUDY

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ABSTRACT

The aim of this study was to determine different causes of endodontic treatment failure in patients who approached the Department of Operative Dentistry, Khyber College of Dentistry, Peshawar, for re-treatment.

This study was carried out from December 2009 to February 2010 and included seventy five patients of both genders with different post endodontic treatment complaints. Clinical and radiographic examination was used to confirm treatment failure. The most common clinical symptoms were tenderness, tenderness and pain, or swelling (72%, 29.3% and 22.7% respectively). The common causes of endodontic treatment failure were poorly filled (40%), under filled (34.7%) and no root canal filling (17.3%). Root canal failure due to overfilling was 5.3%. Most of these failed cases were either treated by internees (House officers) in the teaching institutes (34.7%) or general dental practitioners (57.3%).

Key words: *Under filled, poorly filled, endodontic failure, periapical radiolucency.*

INTRODUCTION

According to the European Society of Endodontology (1994) the assessment of root canal treatment need clinical as well as radiographic follow-ups at regular intervals. It is generally accepted that outcome of endodontic treatment is positively correlated with the technical quality of root canal sealing which is supposed to provide a hermetic seal against bacterial ingress.¹ Studies have shown that unprepared areas of the root canal system may harbor bacteria and necrotic tissue that may result in root canal treatment failure.² Thus the primary goal of root canal treatment should be to eliminate completely or reduce the microbial population within the root canal system and to prevent re-infection by providing tight seal. The most common causes of endodontic treatment failure are insufficient cleaning and inadequate sealing of the root canal system.³ It has been suggested that quality of coronal restoration may also have an impact on periapical status of the root filled teeth.⁴ When the quality of coronal restoration is good, this may allow for a favor-

able outcome even when a root filling quality is poor.⁵ A bio-mechanically well cleaned and prepared root canal system with poor obturation but excellent coronal restoration may remain successful for many years. On the other hand a well prepared and well obturated root canal with poor coronal restoration may fail within a short time.

Criteria used to assess quality of root fillings often are based on the radiographically assessed characteristics of density (the extent to which the root filling material uniformly and completely fills the canals) and extension (the distance from the end of the root filling material to the radiographic apex). Root filling considered as inadequate by these criteria do not necessarily fail, nor do root fillings designated as adequate by these criteria results in satisfactory endodontic results. However, many clinical studies on root canal fillings suggest that poor root canal filling density and extension are associated with post operative apical periodontitis.⁶⁻⁸ Voids in the root fillings represent spaces where residual micro-flora inhabit and subsequently trans-

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port endotoxins to the root apex, stimulating an inflammatory response.⁹ In cases of under-obturation, if spaces left behind are free of micro-organisms, under-obturation is unlikely to increase the risk of periapical inflammation.

Root canal failure may also occur due to some other reasons such as missed canal, vertical root fracture, procedural errors, and separated instrument. Procedural errors and separated instrument will ultimately result in under filled root canals. No study on the causes of failure of root canal treatment was done in our institution before. The aim of this study was to see the most common causes of root canal failure among the patients, reported to the Department of Operative Dentistry, Khyber College of Dentistry, Peshawar, for re treatment.

METHODOLOGY

Subjects included in the study were seventy five patients who reported for re-treatment of endodontically treated teeth. The teeth with tenderness to pressure, pain, swelling, and active sinus tract were declared as an endodontic failure cases. This was a descriptive study and the duration of the study was three months. The subjects were selected on convenience sampling method. The sample size was not predetermined, however cases of endodontic treatment failure recorded during pre-determined period of three months was the sample size.

Informations regarding the failed cases were collected on a questionnaire prepared with the help of Department of Statistics, University of Peshawar. Informed consent was taken from the subjects and the study was approved by the institutional ethical committee. The teeth and the surrounding tissues were examined for the presence of tenderness, swelling, fracture of crown of tooth or sinus tract. Teeth with

vertical root fracture, split crown, periodontal diseases were excluded. The quality of coronal restoration was also observed. A well developed radiograph was taken for each case and was thoroughly read under illumination with the help of magnifying mirror by the principle author, to determine the cause of failure by observing the status of root canal filling or any other abnormality in the root canal system.

The root filling more than 2 mm short of the radiographic apex were considered under filled while filling that ends beyounded the radiographical apex were considered overfilled. Any voids or radiolucent space running along the entire or some of the working length of root filling were considered poorly filled. Any undesirable deviation from natural canal path was considered ledge. Perforation and separated instrument were also looked for. The subjects were then scheduled for re-root canal treatment.

RESULTS

Among 75 subjects included in the study, 57.3% were male and 42.7% were females (Fig1) with mean age 31 years (max. 62 and min. 12 yrs). Sixty percent (60%) of the failed teeth were treated at teaching institutes followed by private clinics 34.7 %. A negligible number of subjects (2.7%) were those who were treated at periphery hospital or unqualified persons (Table 1). Out of seventy five failed cases 57.3% were treated by general dental practitioners (GDPs) and 34.7% by interneees (Table 2). The subjects presented with various complaints and the most common complaint (72 %) was tenderness to percussion (Table 3). In some of the cases both pain and tenderness were present. In 86.7% of cases an obvious radiolucency was present at the apex of failed teeth.

In 14.7% cases the coronal restoration was lost while in three cases a part of crown of the tooth was fractured. Twelve percent (09 subjects) were hav-

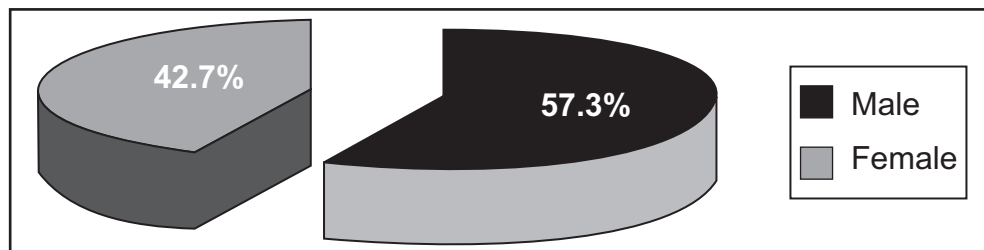


Fig 1: Gender Distribution

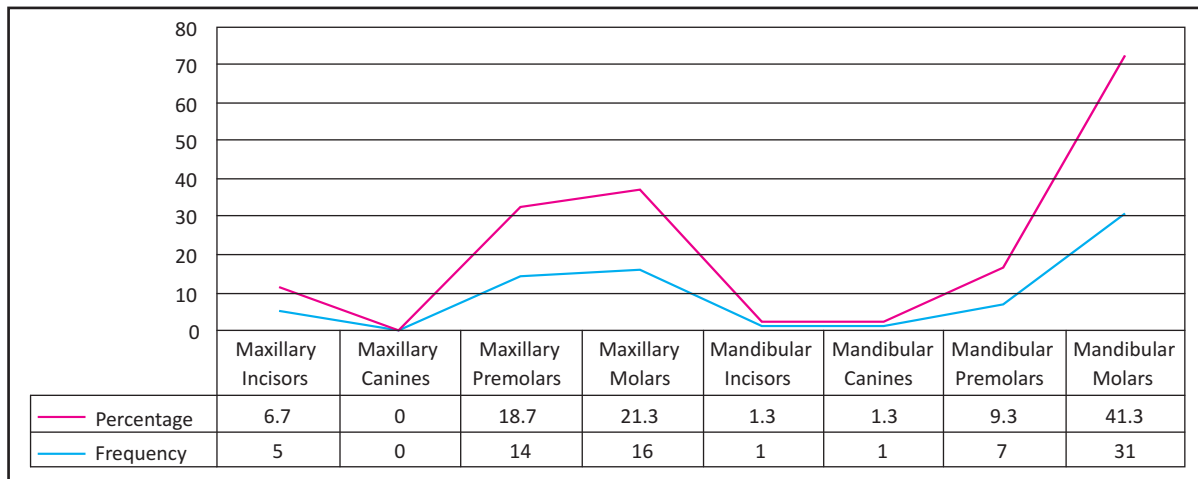


Fig 2: Distribution of the Failed Teeth

TABLE1: DISTRIBUTION OF FAILED RCT ACCORDING TO TYPE OF PRACTICES

	Frequency	Percent
Teaching institutes	45	60.0
Periphery Hospital	2	2.7
Private Clinic	26	34.7
Unqualified	2	2.7
Total	75	100.0

TABLE 2: DISTRIBUTION OF FAILED RCT ACCORDING TO PRACTITIONER

	Frequency	Percent
G.D.P.	43	57.3
Specialist	2	2.7
Unqualified	4	5.3
Student	26	34.7
Total	75	100.0

TABLE 3: POST ENDODONTIC TREATMENT COMPLICATIONS

Complications	Frequency	Percent
Tenderness	54	72.0
Pain	22	29.3
Swelling	17	22.7
Mobility	01	01.3
Sinus Formation	08	10.7
Loss of restoration	11	14.7
Split Tooth	01	01.3
Fractured Crown	03	04.0

TABLE 4: RADIOGRAPHIC INTERPRETATION

Defects	Frequency	Percent
Poorly Filled	30	40.0
Under Filled	26	34.7
Over Filled	4	5.3
Not Filled	13	17.3
Fracture Instrument	1	1.3
Perforation	1	1.3
Total	75	100.0

ing metal ceramic crown on their root canal treated teeth.

Failure was observed commonly in mandibular and maxillary molars (41.3% and 21.3% respectively) followed by maxillary premolars (Fig 2). The most common defects found in the root canal filling were either poor root canal filling, under filling or no root canal filling (40%, 34.7% and 17.3% respectively). Failure due to over filling was 5.3 (Table 4).

In 46 cases (61.3 %) failure occurred within six months of the treatment while 17 cases (22.7%) survived up to one year. Only 12 cases (16 %) remained symptomsless for more than a year.

DISCUSSION

A successful outcome for root canal treatment relies on adequate removal of micro-organisms from the root canal system and prevention of recolonization or propagation of residual micro-organisms through the placement of well extended homogenously dense root filling and adequate coronal restoration.¹⁰ In the

present study the most common causes of root canal treatment failure observed were either poor, under, or no root canal filling. This is in agreement with many other studies which show that quality of root canal filling influence the prognosis of endodontic therapy.¹¹⁻¹³ Inadequate preparation and filling of the root canal system mean that residual spaces and microorganisms are left behind which ultimately result in endodontic treatment failure. According to Cohen and Burns, 1mm of the canal with the diameter of 0.25mm can harbor nearly 80,000 Streptococci.¹⁴ Literature shows that 1mm loss in working length increased the chances of endodontic treatment failure by 14 % in teeth with apical periodontitis.¹⁵

The failure, in the present study, was determined by radiographic quality of the root canal filling. The teeth included in this study were filled by cold lateral condensation technique. This technique in conjunction with a root canal sealer is most widely accepted technique for root canal filling.¹⁶ It is simple and versatile technique. However, there is lacking of extensive preclinical endodontic practice at undergraduate level in the region where this study was conducted which results in inadequate endodontic treatment. Barrieshi et al have reported that technical quality of root canal treatment performed by student was adequate in less than 50%.¹⁷ Although it is agreed that radiographic technical quality of root canal filling influences the success outcome, there are other factors that may play role in the endodontic failure such as debridement and reduction in the population of microorganisms, adequacy of coronal restorations.¹⁸ Due to the limitation of the present study, these factors cannot be assess but they are definitely contributing to the success and failure of endodontic treatment.

The present study shows that most of the endodontic failure occurred in molars (Upper/Lower) and maxillary premolars. This may be due to the complex nature and numerous anatomical variations in the root canal system of these teeth. Curved, tight canals and presence of additional canals makes these teeth difficult to be treated successfully by interneers or GDPs. In the present study, 57.3 % of the failed cases were treated by general dental practitioners. Among this 34.7% were treated in private clinics. Lupi-Pegurier et al (2002), in a study of adequacy of root canal treatment in French population have found low values of adequate

root canal filling in general practice.¹⁹ Hayes et al (2001) believe that more specialist endodontist are needed to improve the treatment standard. Dugas et al (2003), however, have found no significant improvement in clinical success rate through specialist training and recommend that greater number of subjects must be included in the study to validate the results.²⁰ Teeth of complex nature definitely need referral to the endodontist or to the dentist who have taken intensive training in endodontics.

The present study also shows that periapical radiolucency was present in 86.7% cases. Since the patients were treated for root canal at different places and no previous radiographs or other record was available, therefore it is the limitation of the present study to comment on either the presence of perapical radiolucencies before or its occurrence after root canal treatment and also the possible role of these periapical radiolucencies on the endodontic treatment failure. Yan Zhong et al (2008), however, have seen a greater influence of apical radiolucency on the prognosis of root canal treatment.²¹ Teeth with apical radiolucencies presumably already have bacteria present in the apical region compared to the teeth with out apical radiolucencies which might or might not have bacteria present at the apical region. Peak et al (2001) however, have reported a better endodontic treatment outcome in teeth with perapical radiolucencies (87%) than without (80%).²²

Endodontic treatment failure due to separated instrument and perforation was 1.3% respectively. In two cases, treated by skilled person, although the root canal filling was adequate, failure occurred. In endodontically well treated teeth, failure occurs due to the presence of resistant strains of microorganisms in the periapical area. Literature has shown that endodontic treatment failures are frequently associated with gram-positive aerobic and facultative microorganisms.²³ Failure due to the presence of *Enterococcus faecalis* in adequately treated teeth is well reported.²⁴⁻²⁵

CONCLUSIONS

It was concluded from the present study that endodontic treatment failure occurs in poorly filled, under filled or missed root canal. Molars, both upper and lower and upper premolars have high failure rate than anterior teeth. Moreover, the endodontic treat-

ment done by both GDPs and interneers was not up to the standard.

RECOMMENDATIONS

1. Extensive preclinical endodontic practice at undergraduate level is needed at the teaching institutes.
2. Limited number of patient should be allotted to the interneers and they should be thoroughly supervised and guided by senior and experienced staff.
3. Extensive continuous medical education programmes should be arranged for general dental practitioners.
4. Endodontic treatment facilities should be provided at the District Headquarter Hospitals to reduce the burden on teaching or tertiary care hospitals. This will improve the quality of the endodontic treatment done by interneers.

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