CROSS SECTIONAL ANALYSIS OF ENDODONTIC FAILURE IN PIMS

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ABSTRACT

The purpose of this study was to determine the different reasons for root canal failure in the department of dentistry at Pakistan Institute of Medical Sciences. It was a cross sectional study which was based on collection and interpretation of data.

Seventy patients of both genders were selected from dental out patient department of PIMS. All patients selected, presented with post endodontic complaints.

Majority of the endodontic failures, reported with periapical infection or pain on percussion. The main reason for endodontic failure was unfilled or untreated root canals, followed by underextended and overextended root canal fillings.

Key words: *Endodontic failure, Inadequate root canal filling,*

INTRODUCTION

It has been established beyond doubt that apical periodontitis is caused by bacteria within root canals [1]. .The success of endodontic treatment is directly contingent on the eradication of the infection before root filling [2] . The logical goal of treatment for the disease is to eliminate or substantially reduce the microbial population within the root canal system and to prevent reinfection by a tight seal of root canal space. The disruption of the biofilms and reduction of the microbial load are achieved by a combination of mechanical instrumentation, irrigation with various tissue-lytic and microbicidal solutions and application of antimicrobial medicaments in the root canal. Despite of taking these precautionary measures during root canal treatment, some times root canal failure may occur. The primary reason for negative outcome following root canal treatment is the persistence of bacteria or residual necrotic tissue within the root canal system [3]. The results of many cross sectional epidemiological studies, report a high percentage of root filled teeth with radiographic signs of apical periodontitis indicating a substantial need for endodontic re–treatment [4, 5,6].

The main causes of endodontic failure making retreatment necessary are insufficient cleaning and inadequate obturation [7]. Additionally, teeth with inadequate obturation, unfilled or untreated root canals or underextended root fillings may require retreatment before coronal restoration, as failure may occur in future. The reason many teeth do not respond to root canal treatment is because of procedural errors that prevent the control and prevention of intracanal endodontic infection. One of the requirements for a successful root filling is the achievement and maintenance of a tight seal, chemical and/or mechanical, along the root canal system and the tight seal should prevent the ingress of bacteria and their by-products to the periradicular tissues and hence prevent or heal apical periodontitis [8].

Studies have demonstrated that part of the root canal spaces often didn't prepared during chemomechinical preparation, unprepared areas may contain bacteria and necrotic tissue that may result eventually in the root canal failure [9]. Peciuliene *et al.* confirmed that there is a significant association between poorly obturated canals and polymicrobial infections. The composition of root-canal microbiota after failed treat-

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ment differs from that normally found in untreated teeth and Enterococcus faecalis were the most commonly isolated species from root canals of teeth with failed endodontic treatment [10]. The purpose of this study was to determine the different reasons for root canal failure and to determine the ways to reduce these failures. Such data have not been collected previously in this region and this information is necessary to access the effectiveness of dental care and development of future dental planning.

MATERIALS AND METHODS

This was a cross sectional study, examining the factors associated with endodontic failure conducted at Pakistan Institute of Medical Sciences over a period of eight months from May 2007 to February 2008. Seventy patients of both genders with post endodontic complaints were selected from the OPD of Dental Department, PIMS. Special proformas that included number of visits, type of intracanal medicaments and radiographs were used to get the detailed history of the patient. The previous dental record was also helped in collection of data in most of the patients. The duration of the root canal treatment (which included the time since the obturation completed) was also noted. The inclusion criteria were clinically pain on percussion, presence of periapical abscess and radiographically appearance of apical periodontitis. The quality of root filling and the radiographic apical periodontitis was accessed according to the criteria proposed by De-Moor at el [11]. The study protocol was approved by the ethical committee of the hospital and informed consent was obtained from all study participants.

RESULTS

Out of 70 patients, gender distribution was 39 (56 %) males and 31 (44%) females. The age range was 24—61 years with a mean of 37 years (Table 1). The most common teeth were first mandibular molar and second maxillary molar (Table 2).

There were 9 patients who had single rooted and 61 patients who had multi-rooted teeth with endodontic failures.

The most common cause of endodontic failure in multirooted teeth was untreated or unfilled root canals, followed by underextended root canal filling with periapical radiolucency (Table 3). Two cases were observed with adequate endodontically treated teeth, yet still resulted in endodontic failure. In overextended root canal filling cases, patients had pain on percussion shortly after the obturation. Out of 61 multirooted teeth only 7 patients had porcelain fused crowns and four patients had adequate coronal restoration, rest all patients either had broken crowns or inadequate / fractured coronal restorations. In single rooted teeth the most common cause of endodontic failure was underextended root canal filling (Table 4). Out of 9 patients with single rooted teeth, six patients had inadequate or fractured coronal restoration, rest three patients had properly filled coronal restoration. All

Age group	Number of patients	Percentage
24—34	09	13
35—44	11	16
45—54	32	46
55—64	18	25

TABLE 1: AGE DISTRIBUTION

Teeth involved	Maxillary	Mandibular
Incisors	2	1
1st premolar	4	3
2nd premolar	2	2
1st molar	11	21
2nd molar	14	10
Total no. of teeth	33	37

TABLE 2: DISTRIBUTION OF TEETH (n=70)

Reason for RCT failure	Number of patients	Percentage
Unfilled/ untreated RCF	25	40.9
Underextended RCF	18	29.5
Poor lateral condensation	09	14.8
Overextended RCF	04	6.6
Fractured instrument	03	4.9
Unknown reason	02	3.3
Inadequate coronal restoration	49	80

RCF= Root canal filling

TABLE 3: REASONS FOR ENDODONTIC FAILURE IN 61 MULTIROOTED TEETH

Reason for RCT failure	Number of patients	Percentage
Underextended RCF	05	56
Poor lateral condensation	01	11
Overextended RCF	02	22
Fractured instrument	01	11
Inadequate coronal restoration	6	67

RCF= Root canal filling

TABLE 4: REASONS FOR ENDODONTIC FAILURE IN 9 SINGLE ROOTED TEETH

patients were treated in three to four visits with different intracanal medicaments. Usually pulperyl or cresophene were the most common dressing placed in root canals. In few patients calcium hydroxide dressing was also placed.

Longevity of root canal treatment: The proformas included the history of duration which showed the time since root canal treatment was completed. From the history it was concluded that 38 out of 70 failures occurred after one and a half year, 19 after one year, 8 after four months and 5 failures occurred from the day when root canal treatment was completed.

DISCUSSION

The presence of bacteria is known to be essential for the development of apical periodontitis, it is generally accepted that the success of endodontic treatment relies on thorough elimination of bacteria from the root canal system before root filling largely because of the bacteria, which play role in the pathogenesis of apical periodontitis.

In our study most of the endodontic failures occurred mainly because of inadequate root canal filling such as untreated or unfilled root canals, under extended root canal fillings and poor lateral condensation.and over extended root canal filling. Firstly the most important factor that could relate to the periapical lesion in association with root-filled teeth seem to be the quality of the root fillings [12]. Underfilling or incomplete filling of the root canals (more than 2 millimeters short of the radiographic apex) often occurs as the result of incomplete instrumentation which is usually caused by inaccurate measurement of the working length or inadequate irrigation. In our study the inadequate root canal fillings (among them 33% was underextended filling) was the most common reason for endodontic failure. Many studies have shown a poorer prognosis for teeth with underfillings, especially those with necrotic pulp and a periradicular lesion, Chugal and colleagues reported that a 1-mm loss in working length increased the chance of treatment failure by 14 percent in teeth with apical periodontitis [13]. Studies also have shown that the quality of the root canal seal influences the prognosis for endodontic therapy. Adequate seals (that is, complete root canal obturation) have been associated with a higher success rate than have defective seals. Sjögren and colleagues reported that adequate root canal seals resulted in higher success rates (67 percent) than did inadequate seals (33 percent) in re-treatment cases [14]. Underfilling does not have a direct effect on the outcome of endodontic therapy; rather, it is the remaining infected necrotic tissue in the inadequately instrumented and incompletely filled canal that causes continuing irritation to the periradicular tissues [13]. According to the Segura-Egea 64.5% root canal treated teeth had apical periodontitis and were associated with inadequate adaptation of the filling or inadequate length of the root filling and when both root fillings and coronal restorations were adequate the incidence of AP decreased to 31.3% [15]. In our study 6.6 % of endodontic failure was because of overextended root canal fillings. Studies indicate that filling materials might act as a foreign body, causing irritation of the periradicular tissues [16] but not all overfilled teeth are doomed to treatment failure, because approximately 76 percent of overfilled teeth heal satisfactorily after proper endodontic therapy [14]. Lin and colleagues reported that although the apical extent of root canal fillings had no correlation with endodontic treatment failure, intraradicular infection was a critical factor which usually occurred during overinstrumentation and poses the risk of forcing infected root canal contents into the periradicular tissues, thereby impairing the healing process [17]. The second important factor that could relate to the periapical lesion in association with root-filled teeth seems to be the quality of coronal restoration [18]. The present study shows that about more than one third of the patients had inadequate coronal restoration. There are some situations in which the obturated root canals may be contaminated from the oral cavity like, leakage through the temporary or perma-

nent restoration, loss of temporary restorations or delay in the placement of permanent restoration. According to some authors, teeth that are permanently restored soon after root canal treatment are more successful than those which are not [19, 20]. According to the Kirkevang, at el adequate coronal restorations were associated with better periapical status (48% success rate) than inadequate restorations (63.9% failure rate)[4].

In this study two cases that had adequate endodontic treatment, yet resulted in endodontic failure. In well treated cases, failure of endodontic treatment is a result of microorganisms persisting in the apical portion of the root canal system or etraradicular infection [21]. Intracanal disinfection procedures or systemically administrated antibiotics can not easily affect the bacteria outside the apical foramen and also the placement of intracanal medicaments to eliminate microorganisms is inadequate because the antimicrobial effects of most medicaments are neutralized after apical extrusion. Therefore, extraradicular infections if present must be treated by means of periradicular surgery [7].

CONCLUSION

The principal aim of root canal treatment is to delivering antimicrobial agents in root canals to eliminate the causative microorganisms. Although the non-microbial factors may be implicated in endodontic treatment failure, the literature suggests that persistent intraradicular or secondary infections, and in some cases extraradicular infections, are the major causes of failure of both poorly treated and well-treated root canals.

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