

## CROSS SECTIONAL STUDY OF ENDODONTIC FAILURES IN PATIENTS REPORTING AT RAKCODS DENTAL CLINIC

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### ABSTRACT

*This study was conducted to evaluate the possible reasons for failure of Root canal treatment in patients screened at RAKCODS dental clinic. Clinical observation of endodontic failure reveals multiple etiologies. (Stabholz, Lin, Torabinejad). The Washington Study of endodontic success and failure suggests percolation of periradicular exudate into the incompletely filled canal as the greatest cause of endodontic failure. 547 patients with pain were examined clinically and radio-graphically for signs of failed root canal treatment over a period of eight months on a standard criterion by three different observers. 128 patients were found with post endodontic complaints and were included in the study. The inclusion criterion was; root canal therapy done more than six months ago; pain on percussion, outcome of thermal test and presence of periradicular radiolucency. The quality of root filling and the radiographic apical periodontitis was accessed according to the criteria proposed by De-Moor at el. In molars the most common reason for failure was inadequate obturation (44.7%) followed by fractured instruments (21.1%) and overextended fillings (13.2%). In premolars the most common reason for failure was inadequate coronal sealing (30%) and inadequate obturation (30%). Test of Homogeneity of Variances, Welch & Brown-Forsythe were done which yielded significant results. Appropriate measures for the control and prevention of infection are essential to maximize the success of retreatment; including strict asepsis, complete chemomechanical preparation using antimicrobial irrigants, intracanal medication, adequate root canal filling, and proper coronal sealing.*

**Key Words:** Root canal failure, inadequate obturation.

### INTRODUCTION

Clinical observation of endodontic failure reveals multiple etiologies.<sup>1-3</sup> The Washington Study of endodontic success and failure suggests percolation of periradicular exudate into the incompletely filled canal as the greatest cause of endodontic failure. The study also found no failures among those well-obliterated cases in which the filling terminated slightly short of the apex, whereas 3.85% of the failures were caused by overfilling.

The indications for root canal retreatment are stated in a Consensus report of the European Society of Endodontology:<sup>4</sup>

- Teeth with inadequate root canal filling with radiological findings and/or symptoms
- Teeth with inadequate root canal filling when the coronal restoration requires replacement
- Teeth with coronal dental tissue that is to be bleached

The causes of endodontic failure include coronal leakage, radicular fractures, post errors due to diameter, length and direction, missed canals, short fills, over-extensions with internal underfilling, blocks, ledges, perforations, transportations, broken instruments, surgical failures, and hopelessly involved periodontal teeth. Despite the various etiologies stated above, the end result is leakage and endodontic failure.<sup>1-3,5-10</sup> In rare cases factors related outside the tooth can impede healing after conventional endodontic treatment. Table 1.1 shows six biological factors that lead to recalcitrant asymptomatic radiolucencies.

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There is also strong evidence that bacteria may not be completely eliminated after thorough cleaning, shaping, and disinfection.<sup>11-13</sup> Moreover, when obturation is postponed, bacteria may be able to recolonize in the canal.<sup>14</sup> Furthermore, try as one might, no preparation technique can totally eliminate the intracanal irritants, and a “critical amount” can sustain periradicular inflammation.<sup>15-16</sup>

A significant factor in endodontic failure is coronal micro leakage. In recent years the role of coronal leakage has become a center of discussion and research in attempt to account for coronal microleakage.<sup>17-20</sup> It has been claimed that the success rate of the root canal treat-

**BIOLOGICAL FACTORS LEADING TO  
RECALCITRANT ASYMPTOMATIC  
RADIOLUCENCIES IDENTIFIED BY NAIR<sup>12-15</sup>**

1. Continued intraradicular infection inside the root canal system
2. Extraradicular infection such as periapical actinomycosis
3. Foreign body reaction due to extrusion of endodontic materials
4. Accumulation of endogenous cholesterol crystals
5. True cyst with no connection to the root canal space
6. Scar tissue remaining after healing of a lesion.

ment is decreased in cases of overfilling.<sup>23,24</sup> Bacteria located in areas such as ramification may sometimes be unaffected by endodontic treatment procedures.<sup>13,21-22</sup> This maybe an additional source of leakage that often goes unaddressed either following obturation of the canals or during the restorative phase. On the other hand, infected dentin chips, maybe extruded from over-instrumentation, which may also be the “root” cause of refractory infections.<sup>23</sup> The presence of infected dentine or cementum chips in the periradicular lesion has been associated with impaired healing.<sup>23</sup>

## METHODOLOGY

The study was approved by ethical department of RAK Medical and Health Sciences University. 547 patients with pain were examined clinically and ra-

dio-graphically for signs of failed root canal treatment over a period of eight months on a standard criterion by three different observers. 128 patients were found with post endodontic complaints and were included in the study. The inclusion criterion was; root canal therapy done more than six months ago; clinically pain on percussion, outcome of thermal test and presence of periradicular radiolucency. The quality of root filling and the radiographic apical periodontitis was accessed according to the criteria proposed by De-Moor et al.<sup>24</sup> Inadequate or over obturation, fractured instruments and missed canals were confirmed based on radio-graphical findings. Presence of post endodontic complaint and only two obturated canals in a mandibular or maxillary molar would signify at least one missed canal. Inadequate coronal seal was determined by the lack of a coronal restoration on the root canal treated tooth, provided all the other factors leading to root canal failure were not present.

Common findings between the three observers were then tabulated. Apart from this, patient’s age, gender, social habits such as smoking, alcoholism, chewing betel quid and naswar were also recorded. All the recorded data was then transferred to SPSS software version 19 and Statistical analysis was done by using one way anova, robust test of equality of means and test of homogeneity of variance. The level of significance for all tests was set at  $p < 0.05$ .

## RESULTS

Out of 128 patients indicated for retreatment. 79.7% were males and 20.3% were females. The most common causes for endodontic failure as indicated in Fig 1 were; Inadequate obturation (43.8%) followed by Inadequate coronal sealing (17.2%), over extended filling (15.6%), fractured instruments (17.2%) and missed canals (6.3%) were found to be the least possible reason for failure.

In molars (Fig 2) the most common reason for failure was Inadequate obturation (44.7%) followed by fractured instruments (21.1%) and overextended filling (13.2%). In premolars (Fig 3) the most common reason for failure was inadequate coronal sealing (30%) and inadequate obturation (30%). In anterior (Fig 4) teeth

TABLE 1: ANOVA

Indications	Sum of squares	df	Mean square	F	Sig
Between group	7.025	2	3.512	2.061	.136
Within groups	103.975	61	1.705		
Total	111.000	63			

TABLE 2: TEST OF HOMOGENEITY OF VARIANCES

Levene static	df1	df2	Sig
4.490	2	61	.015

TABLE 3: ROBUST TESTS OF EQUALITY OF MEANS

	Static <sup>a</sup>	df1	df2	Sig
Welch	7.015	2	28.495	.003
Brown-Forsythe	3.251	2	45.221	.048

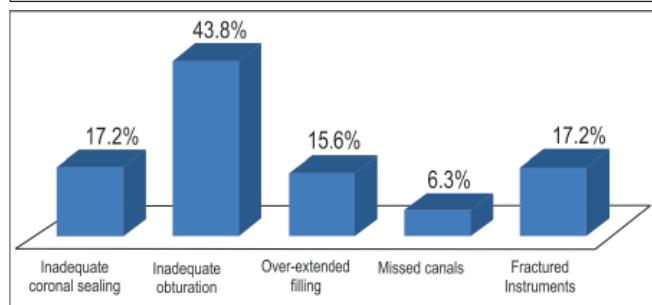


Fig 1: Causes of failed RCT

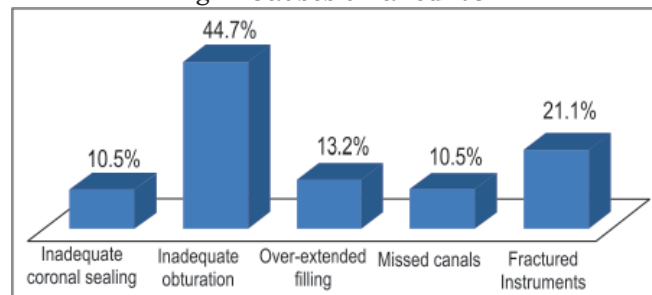


Fig 2: Causes of failed RCT in Molars

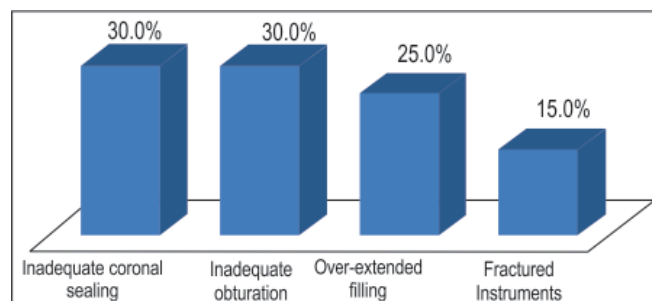


Fig 3: Causes of failed RCT in Premolars

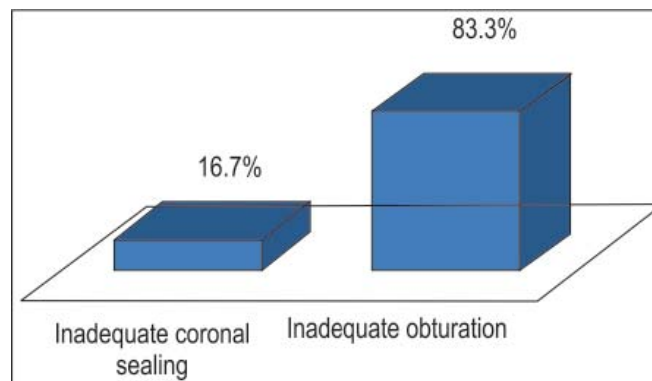


Fig 4: Reasons for RCT failure in Anteriors

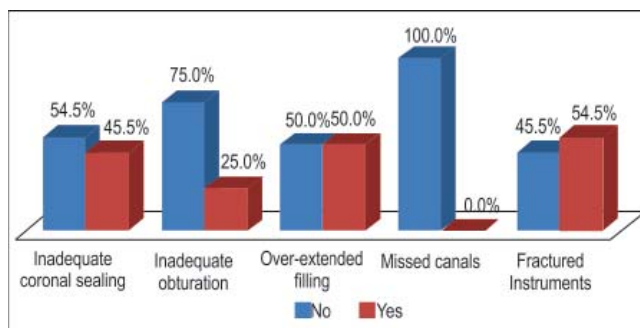


Fig 5: Reasons for failed RCT in smokers

the situation remained the same where inadequate obturation was the most common reason (83.3%).

Failure due to inadequate coronal sealing (Fig 5) was slightly more common in patients who smoked but there was no statistical significance present. Peri-radicular radiolucency was present in 76% of patients.

One-way anova was also employed to assess any correlation between tooth type and factors leading to failure of root canal therapy but there was no statistical correlation found. However Test of Homogeneity of Variances, Welch and Brown-Forsythe was also done which yielded significant results (Table 1,2,3).

**DISCUSSION**

The purpose of our study was to identify the various factors that are associated with failure of root canal therapy. An effective outcome for root canal therapy depends 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 homogeneously dense root filling and adequate coronal restoration.<sup>25</sup>

All the patients having post endodontic complaints had their root canal done more than six months ago. Inadequate obturation was found to be the most common reason followed by fractured instruments, inadequate coronal sealing and over extension of obturating material. This is in agreement with many other studies which show that quality of root canal filling influence the prognosis of endodontic therapy.<sup>26-28</sup> Missed canals were found to be the least possible factor however it was more common in molars. The etiology of endodontic failure is multi-faceted, but a significant percentage of failures are related to inadequate debridement of root canal systems.<sup>29</sup> Missed canals contain tissue, as well as bacteria and other irritants that inevitably contribute to clinical symptoms and lesions of endodontic origin.<sup>30,31</sup> In premolars and anteriors inadequate obturation was found to be the most common reason for failures.

With so much potential and materials for endodontic success, the fact still remains that clinicians are confronted with post-treatment diseases and complications.<sup>32</sup> Therefore before commencing with any treatment; it is wise to fully consider all the various treatment options.<sup>33-34</sup>

There was no significant correlation present between smoking and the rate of failures however failed cases due to lack of coronal restoration was slightly higher in patients who smoked. This can be signified to the microleakage that may take place if coronal restoration is not placed following root canal therapy. Various studies have proved that all crowns demonstrate some amount of coronal microleakage which may not be detected clinically.<sup>35-39</sup> Age was found to have no significant correlation with the factors causing the failure of root canal therapy.

One-way anova was also employed to assess any correlation between tooth type and factors leading to failure of root canal therapy but there was no statistical correlation found. However Test of Homogeneity of Variances, Welch & Brown-Forsythe was also done which yielded significant results where p value was <0.05.

Our study indicated that peri-radicular radiolucency was present in 70% of the cases. Since the patients were treated at different places and there was no previous radiographs or data available it is very difficult to say that the radiolucencies occurred pre or post endodontic therapy. Teeth having apical radiolucencies already have bacteria present in the apical region compared to the teeth without apical radiolucencies. Peak et al however, have reported a better endodontic treatment outcome in teeth with periapical radiolucencies (87%) than without (80%).<sup>40</sup>

In this study we found that four cases had adequate endodontic treatment but still 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 extraradicular infection.<sup>41</sup> Intracanal disinfection procedures or systemically administered antibiotics cannot 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.<sup>42</sup>

## CONCLUSION AND RECOMMENDATION

Appropriate measures for the control and prevention of infection are essential to maximize the success of retreatment; including strict asepsis, complete chemo-mechanical preparation using antimicrobial irrigants, intracanal medication, adequate root canal filling, and proper coronal sealing. Inadequate obturation and lack of a coronal seal were found to be the most common causes of endodontic failure. The endodontist should make sure that an adequate obturation is accomplished following cleaning and debridement. The permanent coronal restoration should be placed as rapidly as possible, ideally in the first week after treatment.

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