



## Prevalence of different reasons for a tooth to undergo root canal retreatment

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### ABSTRACT

Dental caries is the most common dental disease which has made non-surgical root canal treatment prevalent. However, a considerable number of cases undergo failure of root canal therapy and report to the dental operator for retreatment. The aim of the present study was to evaluate the prevalence of different reasons to undergo root canal retreatment. A total of 269 teeth were analyzed for possible reasons for retreatment from dental archives with the study period. The inclusion criteria included that the patient should have been treated in Saveetha Dental College and should have undergone root canal retreatment within the study period. The data were statistically analyzed using SPSS by IBM version 20. From the present study, it was evident that the most common reason is incomplete obturation (54.6%) the most common tooth to undergo root canal retreatment is 21 (12.6%) Further studies and programmes are to be carried out to bring about more knowledge and prevent the occurrence of failure of root canal therapy prevalence of different reasons for a tooth to undergo root canal retreatment.

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### INTRODUCTION

Dental caries is the most common dental disease in humans and India (Grewal *et al.*, 2009) patients' most of the time does not recognize the lesion and only reports to the dental operator when it has reached the pulp and inflammation has set in (Ramesh *et al.*, 2018) as well as other defects in the tooth (Nandakumar and Nasim, 2018; Manohar and Sharma, 2018). As a result, the need for performing conventional non-surgical root canal has

increased. Hence, the vast numbers of teeth are salvaged by this procedure (Wong, 2004). Before resorting to appropriate treatment, it is essential to come to a consensus regarding the diagnosis, various modalities can be used for the same. (Janani *et al.*, 2020a)

The healing and success rate of conventional non-surgical root canal therapy has been reported in the range of 81-95%. However, these figures are through a controlled setting, such as a dental school setting or a specialist's practice. When general practice is considered the occurrence of post-treatment infection is considered to be high at 36% (Al-Ali *et al.*, 2005). There are various reasons for endodontic failure and the presence of clinical signs and symptoms along with radiographic evidence of periapical bone destruction indicates the need for re-intervention of the cause for endodontic failure. On a broad scale, the etiological factors for failure can be categorized under, (i) persistent or reintroduced intraarticular microorganisms (ii) extraradicular infection (iii) foreign body reaction and (iv) true cysts (Orstavik, 2008)

Among the various reasons, studies have reported that the most common cause for failure was persistent microorganisms in the root canal or periradicular lesions (Lin *et al.*, 1992; Orstavik, 2008). Endodontic failures related to microorganisms can be caused by anatomical difficulties such as optical ramification, isthmus, curved canals and other morphological irregularities (Kumar and Antony, 2018) and procedural errors such as missed canals and separated instruments (Lin *et al.*, 1992). Based on the cause for failure, the further intervention by the clinical may be non-surgical endodontic retreatment, surgical treatment or extraction (Gorni and Gagliani, 2004). It is very important to keep the patient at the centre of the equation and ensure an era of painless dentistry (Ramamoorthi *et al.*, 2015; Baskaran and Pradeep, 2016; Rajendran *et al.*, 2019; Janani *et al.*, 2020b) Post endodontic restoration is also very important as the end product of the root canal treatment (Nasim *et al.*, 2018; Ravinthar and Jayalakshmi, 2018; Jose *et al.*, 2020).

The aim of the present cross-sectional study was to estimate the prevalence of different reasons for a tooth to undergo root canal retreatment.

## MATERIALS AND METHODS

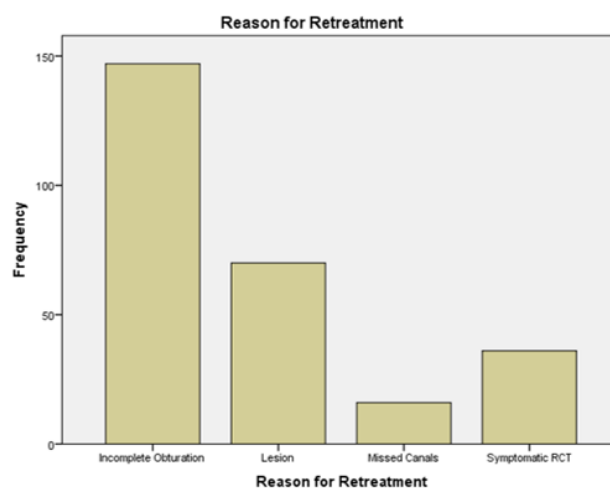
The present cross-sectional study involved 269 teeth in patients that reported for root canal retreatment. The study was performed in a university setting, (Saveetha University, Chennai, India) and hence all the data that was available, all patients were from similar ethnicity. Ethical approval was obtained from the institutional Ethics board for the retrospective data.

The data available from June 2019 to April 2020 is analysed and the case sheets were verified with the help of photographs by two external reviewers to eliminate sampling bias. The inclusion criteria were laid out that the patient should have visited within the study period, should have been above 18 years, should have undergone failure of root canal treatment & treated for the same. The archives of the Department of conservative dentistry and endodontics at Saveetha Dental College was obtained from an online patient management software after the verification process was completed the non-specific data was excluded from the study and data was verified. All patients were handled by postgraduates.

The tabulated data was then statistically analyzed using SPSS by IBM. Descriptive statistical parameters were assessed, followed by checking for correlation or association using the Chi-Square test. The obtained results were then analysed.

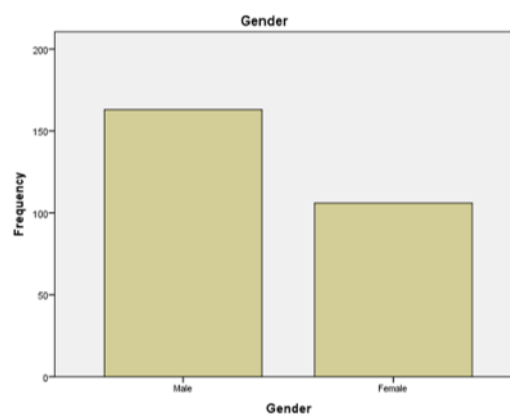
## RESULTS AND DISCUSSION

In the present retrospective study including 269, it was observed that the most common cause for root canal retreatment is incomplete obturation (54.6%) followed by lesion formation after root canal treatment (26.0%) symptomatic patients (13.4%) missed canals (5.9%). The most common reason for retreatment in the present study is incomplete obturation (Figure 1).



**Figure 1: Bar Graph shows the distribution of different reasons for a tooth to undergo retreatment with the reason in the x-axis and number of patients in the y-axis.**

It was also observed when gender distribution is considered, males (60.6%) reported for retreatment more than females (39.4%). Males reported more commonly than females for retreatment in the present study (Figure 2). Gender in the x-axis and number of patients in the y-axis



**Figure 2: Bar Graph Shows Distribution of Different Genders Reporting for Root Canal Retreatment with gender.**

When individual teeth and being considered, it was shown that the most common tooth which ends up

**Table 1: Different teeth to undergo root canal retreatment**

	Tooth Number	Tooth Number			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11	31	11.5	11.5	11.5
	12	20	7.4	7.4	19.0
	13	7	2.6	2.6	21.6
	14	5	1.9	1.9	23.4
	15	8	3.0	3.0	26.4
	16	16	5.9	5.9	32.3
	17	1	.4	.4	32.7
	21	34	12.6	12.6	45.4
	22	15	5.6	5.6	50.9
	23	6	2.2	2.2	53.2
	24	5	1.9	1.9	55.0
	25	6	2.2	2.2	57.2
	26	15	5.6	5.6	62.8
	27	2	.7	.7	63.6
	31	3	1.1	1.1	64.7
	32	1	.4	.4	65.1
	33	2	.7	.7	65.8
	34	6	2.2	2.2	68.0
	35	6	2.2	2.2	70.3
	36	16	5.9	5.9	76.2
	37	14	5.2	5.2	81.4
	41	2	.7	.7	82.2
	43	1	.4	.4	82.5
	44	5	1.9	1.9	84.4
	45	9	3.3	3.3	87.7
	46	24	8.9	8.9	96.7
	47	9	3.3	3.3	100.0
Total	269	100.0	100.0		

going for retreatment is 21 (12.6%), followed by 11 (11.5%), 46 (9.9) 12(7.4%), 36(8.9%) Thus it is seen that the most common tooth to report for retreatment in the upper arch would be incisors, and lower arch would be molars. The most common tooth to undergo root canal retreatment is Maxillary left central incisor. The next most common tooth to undergo root canal retreatment is Maxillary right central incisor. The least common tooth to undergo root canal retreatment is maxillary right second molar. (Figure 3)

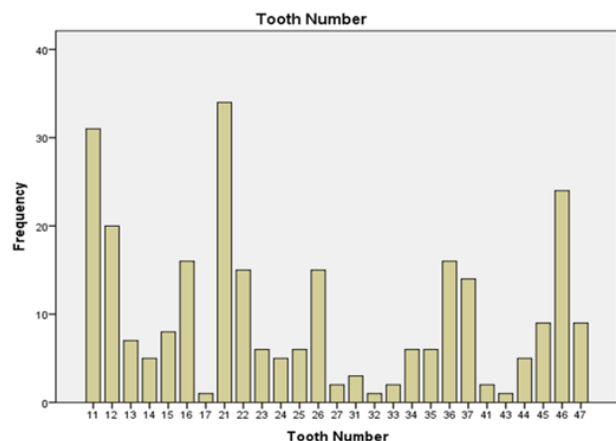
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There was a statistically significant correlation (chi-

square test,  $P= 0.002$ ) observed between age and the reason for retreatment (Figure 4) which can be attributed to state of pulp and periradicular tissue with ageing. The graph shows incomplete obturation in blue colour, a lesion in green colour, missed canal in brown colour and symptomatic Root canal treatment in purple colour with age in the x-axis and number of patients in the y-axis. Incomplete obturation is most common in a younger age group. Chi-square test  $p=0.002$  ( $p<0.05$ -Statistically Significant).

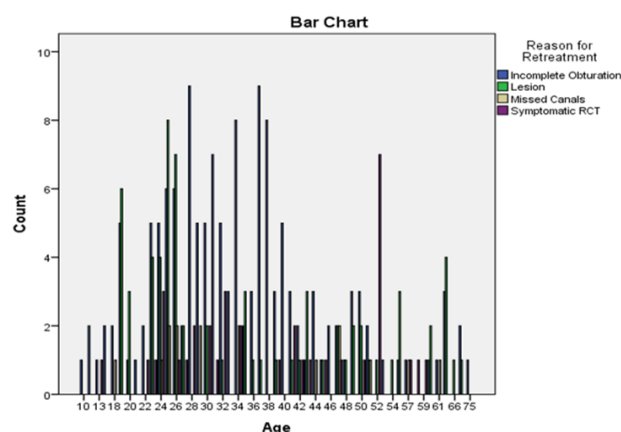
With the advent of age, the root canals can get receded and narrowed due to the formation and deposition of tertiary dentin (Bjørndal and Darvann, 1999). There can be a decreased healing potential due to various vascular changes that occur in the pulp (Bennett *et al.*, 1965). Conventional root canal procedures have a success rate due to increased

knowledge of the root canal system (Vertucci, 1984, 2005) alongside technological advancements that have occurred through the years (Schilder, 2006) invariably the most common underlying reason for the failure of endodontic treatment is a bacterial infection.



**Figure 3: Bar Graph shows the distribution of Different teeth to undergo root canal retreatment with the tooth number in the x-axis and the number of teeth in they axis**

According to the present study, the most common cause for endodontic failure to report for retreatment was incomplete obturation. (Schilder, 2006) described the overextension or the under extension of a root canal filling as being solely a matter of its vertical dimension. The underfilled root canal fails to seal the circumference of the apical foramen in one or more dimensions, leaving a reservoir for the stagnation of fluids, recontamination and persistence of infection.



**Figure 4: Bar Graph shows association between different reasons for retreatment with different ages.**

When further investigated the reason for incomplete obturation, the inapparent reason was the presence of curved canals. There can be various reasons

for difficulties with curved canals such as operator inexperience, inadequate attention to preoperative radiograph and errors in radiographs (Patel, 1979).

With the advent of more sensitive radiographs, the same can be incorporated into clinical practice (Ramanathan and Solete, 2015). The determination of working length appropriately is very important to prevent incomplete obturation. Meticulous length determination, proper cleaning and shaping (Teja and Ramesh, 2019) with an appropriate irrigants (Noor and Pradeep, 2016; Siddique, 2019) and an adequate condensation technique, usage of appropriate medicaments (Manohar and Sharma, 2018) are crucial factors in the determination of success and failure of the root canal treatment.

Another most common reason for root canal failure or the necessity to report for retreatment was pain after root canal treatment or in other terms, symptomatic patients. In a study conducted by (Levin et al., 2006), most patients reported with pain after root canal treatment. Single visit root canal treatments have shown (Oginni and Udoye, 2004; Al-Negrish and Hababbeh, 2006; Levin et al., 2006) to cause more post endodontic pain. Few authors (Calhoun and Landers, 1982; Marshall and Liesinger, 1993) reported that post-treatment pain is more common is a treatment involving vital teeth. The possible reason is an injury to the periapical tissue during the endodontic treatment (Gotler et al., 2012). Hence, it is important to maintain the integrity of the periapical tissue during endodontic treatment. The second most common reason would be the development of a lesion after root canal treatment. This can also be attributed to disturbances in the periapical tissue either due to instrumentation or over obturation.

Through various evidence in the literature, it was acceptable that the inability to recognize the presence of and to adequately treat all canals of the root canal system may be a major cause for the failure of root canal treatment (Wolcott, 2002; Wolcott et al., 2005) however, it was the least common reason in the present study, but still a reason, This frequently may be due to persistent microorganism in uncleaned canal system which in due time will lead to failure.

The clinical impact of missed canal anatomy can be demonstrated with a large number of cases reported in the literature; in a majority of these reports, failure is due to untreated canal space. (Cantatore et al., 2006). Two angled radiographs help clinicians to appropriately locate extra canals if it is present.

The next aspect of the study considered is the

prevalence of retreatment among the various teeth present in the oral cavity. According to the present study, the most common teeth are maxillary central incisors. These can be attributed to the fact that they are the most common teeth to undergo traumatic injury (Hecova *et al.*, 2010) although there are modalities for the management of same (Rajakeerthi and Nivedhitha, 2019).

In a study performed in an adult Belarusian population (Kabak and Abbott, 2005; Hecova *et al.*, 2010) a majority of the cases had apical periodontitis post root canal treatment, However, in the present study, incomplete obturation is a more prevalent factor. The study had also reported an increased presence of apical periodontitis in molar teeth, this could explain the reason for lower molars to be the second most common type of tooth to undergo root canal retreatment. In a study conducted in Nepali Population by (Gautam *et al.*, 2012) it is found that the most common reason is inadequate obturation which is in line with the findings of the present study.

The limitations of the present study include the small sample size, the samples are from a geographically isolated location and specialists can also be added to improve the knowledge of etiology for retreatment.

## CONCLUSIONS

From the present study, it is evident that incomplete obturation is the most common reason for retreatment, Further studies and programs are to be carried out to ensure quality treatment and prevent the occurrence of such causes for failure which would help the community as a whole.

## Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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