

# EVALUATION OF THE CAUSES OF ROOT CANAL FAILURE TREATED BY DIFFERENT OPERATOR GROUPS

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## ABSTRACT

**Objective:** The aim of this study was to assess various causes of failure of root canal treatment performed by various groups of operator.

**Materials and Methods:** 200 patients were evaluated, detailed relevant history; Periapical radiograph and clinical examination were recorded. Sample size was calculated through WHO scale. Patients presenting with post treatment symptoms such as pain, tenderness, swelling and sinus formation, were included in this study from June 2017 till May 2018. Teeth which had poor prognosis such as having class 3 mobility, furcation defects were excluded. The mean age group of the included patients was 15-55 years. Statistical analysis was done using IBM SPSS Statistics for windows IBM Corp. Armonk, NY. The Fisher exact test and Chi square test was applied where applicable to know the significance. ( $P$  value  $\leq 0.05$  was considered significant).

**Results:** Out of 200 patient evaluated, 105(64.0%) were under obturated, 78 (92.9%) canals were missed, 18(9%) had separated instrument, 54(62.1%) improper coronal restorations.

**Conclusion:** The common causes of failure of root canal treatment were under-obturation, untreated canals and improper coronal restoration. This was found in the patients treated by quacks and fresh graduates.

**Keywords:** Endodontically treated teeth, Failure, Re-endodontics, Root canal treatment,

## INTRODUCTION

The aim of root canal treatment is combating/reversal of the per apical pathosis, eradicating the non-favorable bacterial activity and conservation of the natural tooth in an arch for its normal function.<sup>1</sup> It is done by complete extirpation of pulp, cleaning and debridement of the pulp chamber and root canal, shaping and eventually sealing of the entire root canal system.<sup>2</sup>

The success rate of endodontic treatment is stated up to 86-98%.<sup>3</sup> The prognosis is reported better in patients with satisfactory general medical

condition. The success is evaluated over time in the follow up visits. While failure is mostly interpreted as no relieve or aggress of pain and the residual Periapical radiolucency.<sup>1,4,5</sup> In terms of dentist, the success is the reduction or completely relieving of pain, reduction or disappearance of radiolucency on radiograph, proper restoration and normal function of the tooth. The patient calls it successful, if he is feeling no discomfort.

According to Hayes et al. the causes of root canal failure were Re-infection by the bacteria and residual dentine chips in canals, apical transposition, existence of the isthmus, and accumulation of bacteria on root surface, missed canals, and over obturation of root canal. The failure mostly occurs because of compromised clinical protocol,<sup>10</sup> aseptic technique, limited opening of access cavity, limited availability

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of instruments, complication, perforations or broken instrument, under obturation or non-homogeneous compaction or micro-leakage and percolation of coronal restoration. The non odontogenic reasons for endodontic failure are extra-radicular infection, true cysts, foreign bodies, the presence of cholesterol crystals or scar healing of the tissue.<sup>11</sup>

The aim of this study was to assess common causes of failure of root canal treatment performed by various operator groups in patients presenting to Khyber College of Dentistry, Peshawar, Pakistan.

## MATERIALS AND METHODS

This cross sectional study was conducted at Department of Operative dentistry and Endodontics, Khyber College of dentistry, Peshawar, Pakistan during academic year from June 2017 till May 2018. A total of 200 patients were included in this study, regardless of gender. Informed consent was taken from the participants

A detailed history and clinical examination of 200 patients was done in age group 15-55 years. Post treatment Periapical x-rays (conventional and/or digital) were taken for all the patients. Patients presenting with complaint of pain, tenderness, swelling and sinus formation were included in the study. Teeth which had poor prognosis such as periodontally compromised teeth, un-restorable and un-strategic teeth were excluded.

The radiographs/patients were thoroughly examined by two endodontists for the confirmation of failure and potential factors responsible for root canal treatment failure, including quality of obturation, missed canals, separated instruments and Periapical radiolucencies.

Overfilling was seen as the obturating material was extending beyond the radiographic apex. Under filling was seen as the obturation was 2mm or more short of the radiographic apex. Instrument separation was seen as a radio-opaque object detected in canal space, at root apex or beyond the root apex in Periapical area. Un-treated main canal was seen as radiolucent line running along the obturated canal while untreated accessory canal were found clinically in expected teeth.

Statistical analysis was done by using IBM SPSS Statistics for windows IBM Corp. Armont, NY. The Fisher exact test and Chi square test was applied

where applicable to find out the relationship between failed root canal treatment and different groups of operators. Statistical significance was set at  $P \leq 0.05$ .

## RESULTS

The most common cause of root canal failure seen was under obturation followed by missed canals and coronal leakage. These errors were reported mostly from quacks & fresh graduates (P-value 0.012). The associated causes, their frequency and percentages are given in table 1 and table 2.

A total of 200 patients with failed root canal treatment were documented. These failed root canal treatment were performed mostly by quacks in their private practices, followed by fresh graduates, dentist with endodontic training and specialist endodontist. The percentage of failed root canal treatments by different operators is given in figure 1

Among different causes of failure, most common were under obturation followed by missed canals, separated instruments and faulty coronal restoration. Failure associated with faulty coronal restoration was mostly due to temporary restoration followed by composite restoration and glass ionomer cement. Frequency and percentage of each cause is given in table 1.

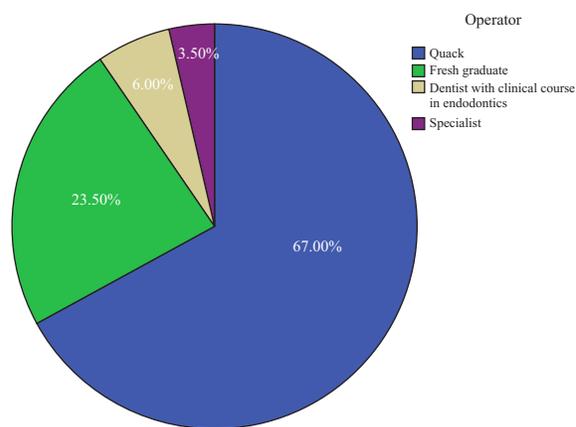


Fig 1: Percentage of RCT failure done by four different operators

**Table: 1** Frequency and Percentage of failure factors among different operators RCT

Name of Variable	Levels	Operator			
		Quack	Fresh graduate	Dentist with clinical course in endodontics	Specialist
Missed canal		78(92.9%)	6(7.1%)	0(0.0%)	0(0.0%)
Separated instrument		18(100.0%)	0(0.0%)	0(0.0%)	0(0.0%)
Quality of Obturation	Standard	12(80.0%)	0(0.0%)	0(0.0%)	3(20.0%)
	Under-obturation	105(64.0%)	41(25.0%)	9(5.5%)	9(5.5%)
	Over-obturation	6(40.0%)	9(60.0%)	0(0.0%)	0(0.0%)
	No Obturation	3(50.0%)	3(50.0%)	0(0.0%)	0(0.0%)
Coronal restoration	Temporary filling	15(50.0%)	9(30.0%)	0(0.0%)	6(20.0%)
	Glass Ionomer filling	54(62.1%)	21(24.1%)	9(10.3%)	3(3.4%)
	Composite filling	6(35.3%)	8(47.1%)	0(0.0%)	3(17.6%)
	Amalgam filling	45(75.0%)	15(25.0%)	0(0.0%)	0(0.0%)
	No filling	6(100.0%)	0(0.0%)	0(0.0%)	0(0.0%)

## DISCUSSION

This study was done to assess common causes of root canal failure in different operator groups (assessed clinically and/or Radiographically) over a year in Khyber College of Dentistry, Peshawar.

Inappropriate Shaping and cleaning, persistence of bacteria in the canals and apex, non-standard obturation features and coronal leakage are some of the common potential causes of root canal failure.<sup>3</sup> According to Al Rahabi et al, the highest potential factor seen was under obturation,<sup>12</sup> followed by missed canals.<sup>3</sup> This is also the findings of our study. However, in present study we involved four groups of operators. Among these operators quacks and undergraduates were found responsible for most of the failure due to missed canal, under obturation and separated instruments in the canal. In our set up the patients fails to differentiate between qualified dentist and quick either due to illiteracy or socio-economic conditions. Yavari et al evaluated root canal fillings among undergraduates achieved the same results as in present study. According to him, lack of knowledge/ skill, not following the protocol properly such as inadequate length determination, inadequate filling technique and use of inflexible files.<sup>13</sup> Inadequate root canal obturation causes root canal failure mainly due to the presence of bacteria in the root canal.<sup>14</sup> Studies associated with under obturation in its censure and shows failure when obturation was 2mm or more short of the radiographic apex.<sup>13,16,17</sup> The same

were our findings in under-obtured cases where the root canal filling were shorter by 3mm or more. This is due to poor knowledge of the root canal anatomy and lack of instruments/devices to achieve correct working length. This usually happened in curved canals where the operator ignored or do not know the protocols of curved root canal management. Proper training in endodontics is essential regarding every step of treatment to avoid these errors such as missed canals. This may happened due to anatomical difficulties such as presence of pulp stones, calcified canals and variations in canal morphology.<sup>18</sup> With the advancement of technology and metallurgy, the separation of endodontic instrument is not often happen, however if it does happen it will affect the prognostic value because it becomes difficult to disinfect and completely seal the rest of that canal. It depends upon the preoperative status of the root canal, size and location of the separated instrument. Failure occurs if any preoperative infection is there. According to Tabassum et al, the separated rotary instrument has no effect on prognosis until there is a pre-operative infection and intra radicular infection.<sup>3</sup> The larger the size of separated instrument, the better is the prognosis.

Previous studies have concluded that coronal restoration has an important function in the survival rate of endodontically treated teeth.<sup>19</sup> In these studies, a complete coronal coverage of endodontically treated teeth was recommended. In our study teeth

reported with failure mostly had temporary or fractured coronal fillings with glass ionomer, zonaline temporary filling and broken amalgam filling. The same results were achieved by Zadik, Toure and Rotstein<sup>20,10,9</sup> respectively.

## CONCLUSION

The responsible factors for the failure of root canal treatment are under-obturation, untreated canals and improper coronal restoration made mostly by quacks due to lack of knowledge, skills and not following proper clinical protocol.

## RECOMMENDATION

Adequate community awareness program about dental health may initiate to avoid hazards of quackery. Health professionals, governing bodies and law enforcement agencies may abolish the quackery to avoid mal practice of endodontics to improve quality and success of root canal treatment.

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