ISSN: 2091-2889 (online)
2091-2412 (print)

Received: 12 Dec 2024
Accepted: 15 Jan 2024
Published: 28 Feb 2024

DOI: 10.54530/jcmc.1616

OPEN ACCESS

Disposition and distribution of root canal treatment among patients visiting a tertiary care centre

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Peer reviewed

Abstract

Introduction: Pulp infection is a common sequel of dental caries leading to pulp necrosis and peri-radicular diseases. Patients present with pain, sensitivity, swelling or fracture of the tooth structure disturbing daily activities. With increasing awareness, more people wish to preserve their teeth. Root canal treatment (RCT) can save teeth by retaining aesthetics and function. This study was conducted to find out the pattern and indication of RCT.

Method: This descriptive cross-sectional study included patients who underwent RCT from 15 Jan 2024 to 15 Jul 2024 at Patan Hospital, Patan Academy of Health Sciences, Nepal. Ethical approval was obtained. Two endodontists took a detailed history, clinical examination, sensibility tests and interpreted radiographs for endodontic diagnosis and treatment plan. Patients with retained deciduous teeth, and grossly decayed root stumps were excluded. The demographic and clinical data were descriptively analysed using Excel and SPSS 22.

Result: Out of 427 patients who had RCT, females were 249(58.3%). The age group of 16-40 years, 186(43.6%) was the predominant population undergoing RCT. The indication of maxillary teeth, 219(51.3%) and mandibular teeth 208(48.7%) for RCT were quite comparable. The first molars were the commonly treated tooth with the right mandibular first molar having the highest frequency, 57(13.3%). The most common endodontic diagnosis was symptomatic irreversible pulpitis; symptomatic apical periodontitis 176(41.2%).

Conclusion: Commonly younger population of the age group 16-40 years and females underwent root canal treatment for symptomatic irreversible pulpitis and symptomatic apical periodontitis.

How to cite

Thapa S, Maharjan A, KC N, Joshi NP. Disposition and distribution of root canal treatment among patients visiting a tertiary care centre. Journal of Chitwan Medical College. 2025;15(51):113-9.

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Introduction

Root canal treatment (RCT), also known as endodontic treatment is a dental procedure used to reduce pathologies such as periapical infections and irreversible pulpitis, through adequate instrumentation and modelling, cleaning, effective disinfection and precise root canal filling.[1] The purpose of RCT is to either maintain asepsis of the root canal system or to disinfect it adequately.[2] It is an effective therapeutic strategy for those teeth that are functionally or aesthetically important and have a reasonable prognosis. With the success of preventive and conservative dentistry, people are opting for RCT to save their teeth in preference to extraction.

Pain occurring due to diseases of the pulp and periradicular tissues is the prime reason for patients seeking dental treatment.[3,4] Understanding the progressive nature of pulp and periradicular diseases, diagnostic procedures and tests help to establish an accurate diagnosis thereby determining the most appropriate treatment strategy.[5] To render a proper root canal treatment, a complete endodontic diagnosis including both a pulpal and periapical diagnosis must be made.[6] However, the conditions for which RCT is performed in tertiary care centres in Nepal are not well appreciated. It is prescribed more often without proper diagnosis leading to ambiguous prognosis and often failure of endodontic treatment.[7]

Hence our study is aimed to assess the indications of teeth requiring endodontic intervention and find out the clinic-demographic parameters associated with the treatment. Monitoring the pattern of RCT done in hospitals is a much-needed approach to provide evidence-based information to support decision-making at different levels of the health system.

Method

The descriptive cross-sectional study was carried out from 15 January 2024 to 15 July 2024 among the patients visiting the dental department of Patan Hospital after approval from the Institutional Review Committee, Patan Academy of Health Sciences (drs2401121835). Written informed consent was taken from each participant after the purpose and methodology were explained in full.

All patients who met the inclusion criteria for age 16 years or above, provided written consent and underwent RCT during the study period were included. The exclusion criteria were patients with retained deciduous teeth, grossly decayed root stumps, and patients undergoing treatment other than RCT.

The calculation of sample size was based on CI 95%, assumed prevalence 50%, a margin of error 5%, $n= z^2*p*q/e^2=(1.96)^2*0.5*(1-0.5)/0.05^2$

The minimum sample size was 384. All patients undergoing RCT during the designated study period were included in the study.

Patients were screened for inclusion criteria by taking a detailed history and clinical examination. A thorough history of the patients fulfilling the inclusion criteria was taken by the investigator and co-investigator (endodontists) followed by extra-oral and intra-oral examination.[8] An intraoral radiograph was taken as a part of a routine diagnostic procedure.[2] A sensibility test using an Electric Pulp Tester (PacDent International, Inc.) was done for the assessment of pulpal neural responses.[9] The history, clinical and radiographic findings were assessed to come to an endodontic diagnosis as per American Association of Endodontics guidelines.[6] After the diagnosis, the treatment plan was made. Any discrepancies were resolved by mutual consensus among two clinicians/researchers. Only the cases of RCT and retreatment were included in our study.

The data collected was entered in Microsoft Office Excel and analysis of data was done using IBM SPSS 22. Descriptive statistical tools were applied to calculate the frequency and percentage of the data among the study population.

Result

Out of 427 patients who underwent RCT during the designated study period females accounted for 249(58.3%).

The patients were categorized into three age groups viz 16-40 years, 41-60 years and above 60 years. The highest number of patients indicated for root canal treatment belonged to the age group 16-40 years,186 (43.6%) followed by 41-60 years, 147(34.4%) and the least number of patients were above 60 years 94(22%). The youngest patient recorded was 16 years and the oldest was 83 years while the median age was 45, Table 1.

The teeth in the maxillary arch, 219(51.3%) were more frequently indicated for RCT than mandibular teeth 208(48.7%). In the maxillary arch, the frequency was 109(25.5%) for the right side and 110(25.8%) for the left side. In the mandibular arch, the frequency was 86(20.1%) for the left side and 122(28.6%) for the right side, Table 2.

First molars were the most frequently treated tooth with the right mandibular first molar having the highest frequency (13.3%). The most common pulpal diagnosis indicated for endodontic treatment was symptomatic irreversible pulpitis 208(48.7%) followed by pulp necrosis 76(17.8%) then asymptomatic irreversible pulpitis 60(14.1%), Table 3.

The most common periapical diagnosis indicated for endodontic treatment was symptomatic apical periodontitis 272(63.7%) followed by asymptomatic apical periodontitis 58(13.6%) and acute apical abscess 46(10.8%), Table 4.

The most common endodontic diagnosis was symptomatic irreversible pulpitis; symptomatic apical periodontitis 176(41.2%) followed by pulp necrosis; symptomatic apical periodontitis 66(15.4%), Table 5.

There were 347(81.3%) cases of RCT, and 47(11%) retreatments, and intentional RCT in 33(7.7%), Table 6.

Table 1. Age distribution of dental patients undergoing Root Canal Therapy (RCT), n=427

Age group, years	n	%
16-40	186	43.6
41-60	147	34.4
>60	94	22.0

Table 2. Distribution of treated teeth according to arch, n=427

Arch	n	%
First (maxillary right)	109	25.5
Second (maxillary left)	110	25.8
Third (mandibular left)	86	20.1
Fourth (mandibular right)	122	28.6

Table 3. Distribution of treated teeth according to pulpal diagnosis, n=427

Pulpal diagnosis	n	%
Normal pulp	30	7.0
Reversible pulpitis	3	0.7
Symptomatic irreversible pulpitis	208	48.7
Asymptomatic irreversible pulpitis	60	14.1
Pulp necrosis	76	17.8
Previously treated	33	7.7
Previously initiated	17	4.0

Table 4. Distribution of treated teeth according to periapical diagnosis, n=427

Periapical diagnosis	n	%
Normal apical tissues	33	7.7
Symptomatic apical periodontitis	272	63.7
Asymptomatic apical periodontitis	58	13.6
Acute apical abscess	46	10.8
Chronic apical abscess	18	4.2

Table 5. Distribution of treated teeth according to endodontic diagnosis, n=427

Endodontic diagnosis	n	%
Normal pulp; normal apical tissues	30	7.0
Reversible pulpitis; normal apical tissues	3	0.7
Symptomatic irreversible pulpitis; symptomatic apical periodontitis	176	41.2
Symptomatic irreversible pulpitis; asymptomatic apical periodontitis	4	1
Symptomatic irreversible pulpitis; acute apical abscess	28	6.6
Asymptomatic irreversible pulpitis; symptomatic apical periodontitis	6	1.4
Asymptomatic irreversible pulpitis; asymptomatic apical periodontitis	54	12.6
Pulp necrosis; symptomatic apical periodontitis	66	15.4
Pulp necrosis; chronic apical abscess	10	2.3
Previously treated; symptomatic apical periodontitis	18	4.2
Previously treated; acute apical abscess	11	2.6
Previously treated; chronic apical abscess	4	1
Previously initiated; symptomatic apical periodontitis	6	1.4
Previously initiated; acute apical abscess	7	1.6
Previously initiated; chronic apical abscess	4	1

Table 6. Distribution of Root Canal Treatment in the Root Canal Therapy (RCT), n=427

Treatment	n	%
Root canal treatment	347	81.3
Retreatment	47	11.0
Intentional root canal treatment	33	7.7

Discussion

The result of this study showed that the endodontic treatment was more common in females than in males. This might be because females account for 51.13% compared to males 48.87% according to the National Population and Housing Census, 2021 Central Bureau of Statistics Nepal.[10] Similar female predominance was seen in other studies attributing to the fact that females are more concerned about their oral health than males.[11,12] Contrary to our study, more male demand was seen in a study by Khan et al.[13] Age-wise distribution of our study showed that the age group 16-40 years (43.6%) had a maximum number of RCT followed 41-60 years (34.4%) and the least number of patients was above 60 years (22%). The higher demand for RCT in the younger population is similar to the findings of other studies.[7,12] The adult age group has a higher prevalence of dental caries along with easier access to health care compared to the young (<20) and older (>60/) population.[14] The age group 56 and above have a higher prevalence of partial edentulism to the loss of teeth due to periodontal reasons.[15]

The indication of RCT in the maxillary arch (51.3%) and mandibular arch (48.7%) was comparable. Usually, a higher prevalence of caries is found in the maxillary arch than in the mandibular arch.[13,16,17] However, the mandibular arch was more affected by caries in another.[4] First molars were the most frequently treated tooth with the right mandibular first molar having the highest frequency (13.3%).

Our findings are similar to other studies.[4,11] First molars are often cited to be most susceptible to caries perhaps due to their early exposure in the oral environment and morphologic features being pitted and fissured attracting plaque formation and caries.[18] On the other hand, some studies have reported that the most treated teeth were maxillary central incisors, and premolars were prone to RCT.[19,20]

The most common pulpal diagnosis indicated for endodontic treatment was Symptomatic Irreversible Pulpitis (48.7%) followed by Pulp Necrosis (17.8%) then Asymptomatic Irreversible Pulpitis (14.1%). The most common periapical diagnosis indicated for endodontic treatment was Symptomatic Apical Periodontitis (63.7%) followed by Asymptomatic Apical Periodontitis (13.6%) and Acute Apical Abscess (10.8%) thereafter. The most common endodontic diagnosis was Symptomatic Irreversible Pulpitis; Symptomatic Apical Periodontitis. This trend is most likely due to the reason that patients often seek dental treatment only after symptoms manifest. In Nepal, a routine dental checkup is rare and root canal treatment is habitually done because of sequelae of dental caries manifesting as pain and swelling. The finding is similar to other studies.[11,4,21] Other studies have reported pulp necrosis to be the major indication for endodontic treatment.[20,22]

There is a notable number of previously treated (7.7%) and previously initiated (4%) cases where retreatment (11%) is done. Cases were referred to our tertiary centre due to procedural errors, the persistence of pain and infection, coronal leakage, struggle in the negotiation of canals and high-difficulty index cases. With an increasing number of endodontic treatments being done, it has become imperative to avoid or minimize the fundamental reasons leading to endodontic failure.[23] Fair count of teeth had elective devitalization (7.7%) to provide post space, prior to construction of overdenture, doubtful pulp health prior to restorative procedures and the likelihood of pulpal exposure when restoring a misaligned tooth.[2]

Thus, the prevention of endodontic pathologies through proper diagnosis and prophylactic interventions such as early caries diagnosis and adequate management may represent a decisive step during health promotion, perhaps minimizing the need of endodontic treatment.

This study has a few limitations. The study was done at a single tertiary care centre in Nepal. The patient-specific characteristics may be different from other healthcare organizations which may limit the generalizability of findings. Further multicentre studies with diverse populations and extended periods of study can help in broader conclusions.

Conclusion

Symptomatic irreversible pulpitis and apical periodontitis were the predominant indications for root canal treatment. The call for endodontic treatment was higher for the female population and 16-40 years of age category. The most frequently treated teeth were the first molars.

Author contribution

Concept Design: ST; Literature Search: ST, AM, NKC, NPJ; Data Collection: ST, AM, NKC; Data Analysis: NPJ; Draft Manuscript: All; Final Manuscript and Accountability: All.

Acknowledgment

We would like to express our sincere gratitude towards all the participants of the study. We also acknowledge the dental department for providing a supportive environment in conducting the research.

Conflict of interest

None

Funding

None

Supplementary material

The data and supplementary material that support the findings of this study are available from the corresponding author upon reasonable request.

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