



Frequency and distribution of maxillary teeth treated by a single visit and multiple visit endodontics in an Indian population – A retrospective study

Krishna Doshi, Raghu Sandhya*, Delphine Priscilla Antony S

Department of Conservative Dentistry and Endodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 600 077, Tamil Nadu, India

Article History:

Received on: 23 Jul 2020
Revised on: 25 Aug 2020
Accepted on: 28 Sep 2020

Keywords:

Single-visit endodontics,
Multi visit endodontics,
Root canal treatment,
Maxillary teeth,
Frequency and
distribution

ABSTRACT

Controversy exists as to the completion of endodontic procedures in a single visit or in multiple visits. Analyzing the frequency and distribution of single and multiple visit endodontics carried out based on demographic data can give us an insight towards the success of the treatment. This retrospective study aimed to analyse the frequency and distribution of maxillary teeth treated by single or multiple visit endodontics in an Indian population. Data for the study were collected retrospectively. Patient records of 86000 patients that reported to the institution between June 2019 and March 2020 were reviewed. Excel sheet tabulations were made involving age, gender, tooth number and number of visits. Descriptive statistics were applied using SPSS software. Association between each demographic data and the number of visits was analyzed by Chi-Square Test. A total of 4493 RCT procedures were done, of which 48.6% were single visit procedures and 51.4% were multi-visit procedures. The age group of 18-30 years (31.7%) and 31-40 years (29.3%) underwent the highest number of procedures, followed by 41-50 years (21%) and >50 years (18%). 51% of the procedures were done in males and 49% in females. Statistically, a significant association was observed between age, gender and tooth with a type of treatment (single or multiple visit endodontics), $p < 0.05$. A statistically significant association between age, gender and tooth was observed with the type of treatment (single and multiple visit endodontics). Younger age group, males and maxillary central incisors showed the highest predilection to multi-visit endodontics. In general, more multi-visit procedures than single visit procedures were done in maxillary teeth.



*Corresponding Author

Name: Raghu Sandhya
Phone: 9884610410
Email: sandhya.sdc@saveetha.com

ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11iSPL3.3356>

Production and Hosted by

IJRPS | <https://ijrps.com>

© 2020 | All rights reserved.

INTRODUCTION

The main objective of endodontic therapy is the complete debridement of necrotic and infectious tissue and disinfection of the root canal system (Gutmann, 1992), followed by a three-dimensional seal to prevent re-entry of microorganisms. Contemporary endodontics must adhere to the certain principles which are based on the previous principles formulated in the past (Grossman, 1967). These include: 1) use of the aseptic technique (Rani et al., 2016); 2) cleaning the canals thoroughly and mechanically with the aid of chemical agents; 3) shaping the root canals for ease of obturation; 4)

obturation to achieve a tight seal of the root canals; and 5) proper restoration of the tooth to prevent coronal leakage, which can induce future bacterial reinfection.

Today, endodontics aims at cleaning and disinfecting more than mechanical shaping of the canals (Teja and Ramesh, 2019). The fifth objective, which is the maintenance of a good coronal seal followed by an appropriate post endodontic restoration, is often neglected. Nowadays, composite materials are very commonly used for this purpose. Various studies have been done to assess the bond strength and fracture resistance of these materials for the evaluation of long term success (Hussainy, 2018).

Nowadays, the concept of prevention of extension has led to a more conservative approach to post endodontic restorations. Veneers and laminates can be used in anterior teeth in place of full-coverage crowns. Recent advances in these techniques improve esthetics and efficiency of the operator (Ravinthar and Jayalakshmi, 2018). Endodontic treatment, in the past, took multiple visits to complete, with one of the main reasons for this being the lack of technology which necessitated a considerable amount of time to complete every step throughout the treatment (Mohammadi et al., 2006).

The use of contemporary endodontic techniques and equipment, beginning with advanced diagnostic techniques (Janani et al., 2020) such as the use of rubber dam, magnifying devices, electronic apex locators, engine-driven rotary nickel-titanium files (Ramanathan and Solete, 2015), and so forth, not only increases the success rate of endodontic treatment but also, shortens the time needed for the treatment. This led to the current concept of 'single visit endodontics' which is routinely practised today. Our team has performed various researches on various materials and instruments used in endodontics (Manohar and Sharma, 2018; Nasim and Nandakumar, 2018; Ramesh et al., 2018). (Siddique, 2019) We have also done various in vitro, in vivo experiments as well as clinical trials on other topics in restorative dentistry and endodontics (Ramamoorthi et al., 2015; Noor and Pradeep, 2016).

The concept of a single-visit root canal treatment was described as early as the 1880s. The treatment techniques used at that time were very primitive, and the success rate of single-visit root canal treatment was low, which led to a decline in the use of this approach. The single-visit treatment was brought back in the 1950s by Ferranti et al. (Ferranti, 1959), who advocated the use of diathermy for pulpal disinfection and hydrogen peroxide for irri-

gation. Although today the techniques of practice are significantly different, the basic principles are the same as used by Ferranti. Nowadays, root canal therapy has become increasingly automated and can be performed more quickly, so some clinicians are incorporating single-visit endodontics into their own clinic routine as the main component of contemporary practice. On the other hand, some dentists believe that the traditional multiple-visit protocol has a long history and a high clinical success rate, preferring to provide multiple-visit endodontic treatment to their patients.

Considerable controversy exists regarding whether it is preferable to complete endodontic therapy in one or multiple appointments. The factors to be considered in the choice of the type of treatment are operator ability and clinical experience, tooth conditions (vitality, presence of symptoms, swelling), adequate treatment time, patient's time constraints, medical history, as well as anatomic considerations (Figini et al., 2008).

Maxillary bone is known to be porous in nature as compared to the dense mandibular bone (Abrahams et al., 1995). This may be one of the reasons why the spread of infection in the maxilla is faster as compared to the mandible. This makes the need for a more prompt diagnosis and treatment for diseased maxillary teeth. The decision of treating maxillary teeth in a single visit or multiple visits must be taken carefully.

Studying the frequency and distribution of teeth treated by these two approaches will give us an insight into the success of the respective treatment modalities. Hence, the aim of this study was to analyze the distribution and frequency of maxillary teeth treated with single and multiple visit endodontics in an Indian population.

MATERIALS AND METHODS

The study was conducted in an institution online setting. One researcher, one guide and one mentor, were involved in conducting the study. Approval was obtained from the Institutional Review Board, Saveetha Dental College, Chennai. Data were collected retrospectively from patients reporting to the institute. Patient records of 86000 patients that reported to the institute from June 2019 to March 2020 were reviewed. Data of adult patients whose maxillary teeth were treated endodontically were included in the study.

Excel sheet tabulations were constructed for Age, Gender, Tooth Number and Type of treatment (single and multiple visit endodontics). Treatments are

done on primary teeth and patients below 18 years of age were excluded in order to generalize the study to adult patients only.

RESULTS AND DISCUSSION

The data was imported to SPSS Software (Version 23.0) and descriptive statistics were done to analyze the distribution and frequency of single and multiple visit endodontics. A total of 4493 RCT procedures were done, of which 2183 were single visit and 2310 were multiple visit procedures [Table 1, Figure 1]. A higher number of multi-visit procedures were done as compared to single-visit procedures. The age group of 18-30 years (1421) and 31-40 years (1317) showed the highest number of procedures done. The 41-50 years age group showed 943 procedures done and >50 years age group showed 809 procedures done [Table 2, Figure 2]. Age group 18-30 years and 31-40 years showed the highest prevalence. A total of 2292 procedures were done in males and 2201 in females [Table 3, Figure 3]. An approximately, equal number of males and females were treated. Maximum procedures were done in maxillary first molars (997 RCT procedures) followed by central incisors (821 RCT procedures) and least was done in maxillary 3rd molars (98 RCT procedures) followed by canines (365 RCT procedures) [Table 4, Figure 4]. The highest number of root canal treatments were done in maxillary first molars.

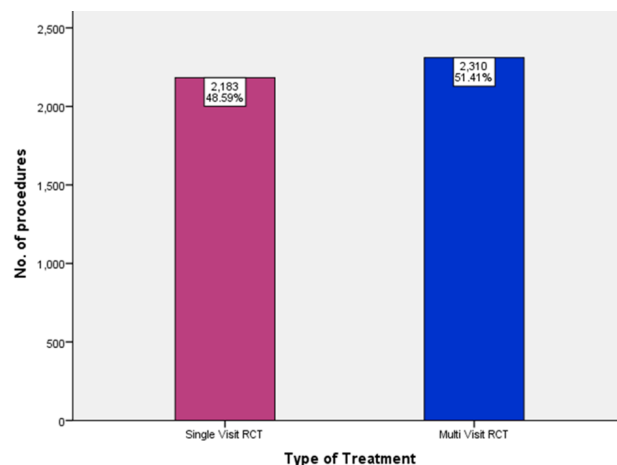


Figure 1: Frequency and percentage distribution of single and multi-visit root canal treatment procedures done in the institution.

The association between each parameter (age, gender and tooth) with the type of treatment (single or multiple visit endodontics) was analyzed by performing the Chi-Square Test. A significant association was observed between all three parameters and the type of treatment (p<0.05). Age group 18-30 years and 31-40 years showed a maximum number

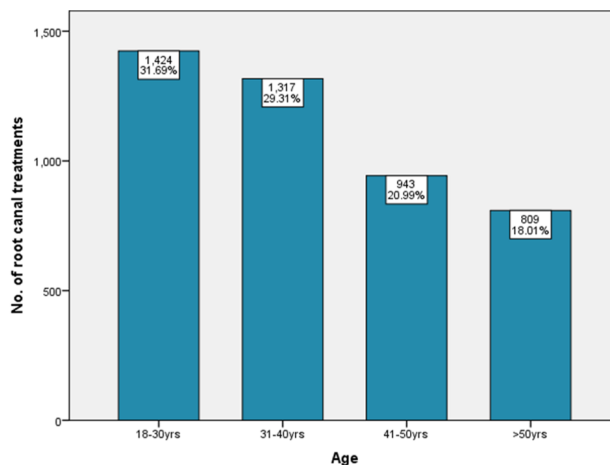


Figure 2: Frequency and percentage distribution of age of the patients treated with root canal treatment.

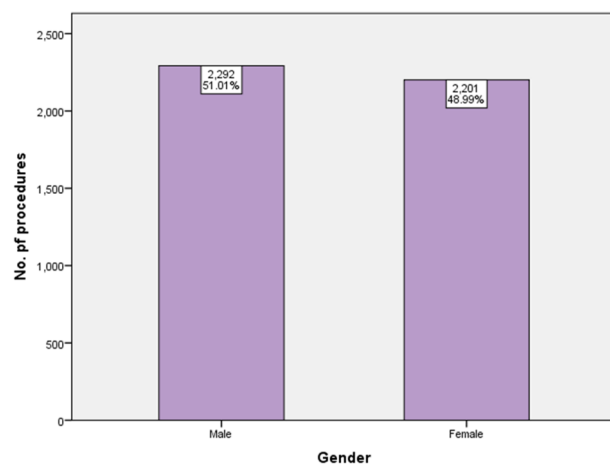


Figure 3: Distribution of gender of the patients treated for root canal treatment.

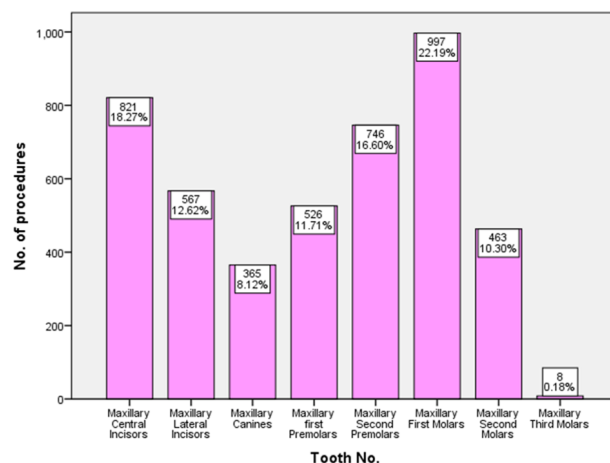


Figure 4: Percentage distribution of root canal treatments done in each maxillary tooth.

Table 1: Number of single and multiple visit root canal treatment (RCT) procedures in maxillary teeth in the institute.

| Type of treatment | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------------|-----------|---------|---------------|--------------------|
| Single Visit RCT | 2183 | 48.6 | 48.6 | 48.6 |
| Multi Visit RCT | 2310 | 51.4 | 51.4 | 100.0 |
| Total | 4493 | 100.0 | 100.0 | |

More multi-visit RCT procedures done as compared to single visit RCT procedures.

Table 2: Number of root canal treatment procedures in various age groups.

| Age Groups | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------|-----------|---------|---------------|--------------------|
| 18-30yrs | 1424 | 31.7 | 31.7 | 31.7 |
| 31-40yrs | 1317 | 29.3 | 29.3 | 61.0 |
| 41-50yrs | 943 | 21.0 | 21.0 | 82.0 |
| >50yrs | 809 | 18.0 | 18.0 | 100.0 |
| Total | 4493 | 100.0 | 100.0 | |

The maximum number of procedures done in age groups 18-30 years and 31-40 years

Table 3: Number of root canal procedures in maxillary teeth in males and females.

| Gender | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------|-----------|---------|---------------|--------------------|
| Male | 2292 | 51.0 | 51.0 | 51.0 |
| Female | 2201 | 49.0 | 49.0 | 100.0 |
| Total | 4493 | 100.0 | 100.0 | |

A slightly higher number of procedures done in males as compared to females.

Table 4: Frequency and distribution of root canal procedures done in each maxillary tooth.

| Tooth | Frequency | Percent | Valid Percent | Cumulative Percent |
|----------------------------|-----------|---------|---------------|--------------------|
| Maxillary Central Incisors | 821 | 18.3 | 18.3 | 18.3 |
| Maxillary Lateral Incisors | 567 | 12.6 | 12.6 | 30.9 |
| Maxillary Canines | 365 | 8.1 | 8.1 | 39.0 |
| Maxillary first Premolars | 526 | 11.7 | 11.7 | 50.7 |
| Maxillary Second Premolars | 746 | 16.6 | 16.6 | 67.3 |
| Maxillary First Molars | 997 | 22.2 | 22.2 | 89.5 |
| Maxillary Second Molars | 463 | 10.3 | 10.3 | 99.8 |
| Maxillary Third Molars | 8 | 0.2 | 0.2 | 100.0 |
| Total | 4493 | 100.0 | 100.0 | |

Most number of procedures done in maxillary first molars.

Table 5: Association between single and multiple visit RCTs and age of the patient.

| Age | Type of Treatment | | Total | p-value |
|----------|-------------------|-----------------|-------|---------|
| | Single Visit RCT | Multi Visit RCT | | |
| 18-30yrs | 632 | 792 | 1424 | 0.000 |
| 31-40yrs | 590 | 727 | 1317 | |
| 41-50yrs | 468 | 475 | 943 | |
| >50yrs | 493 | 316 | 809 | |
| Total | 2183 | 2310 | 4493 | |

A significantly higher number of patients in the younger age group were treated in multiple visits.

Table 6: Association of single and multiple visit root canal treatment procedures done with the gender of the patient.

| Gender | Type of Treatment | | Total | p-value |
|--------|-------------------|-----------------|-------|---------|
| | Single Visit RCT | Multi Visit RCT | | |
| Male | 1071 | 1221 | 2292 | 0.006 |
| Female | 1112 | 1089 | 2201 | |
| Total | 2183 | 2310 | 4493 | |

The higher number of multi-visit RCT procedures in males than females.

Table 7: Association of single and multiple visit root canal treatment procedures performed, with a type of maxillary tooth.

| Tooth | Type of Treatment | | Total | p-value |
|----------------------------|-------------------|-----------------|-------|---------|
| | Single Visit RCT | Multi Visit RCT | | |
| Maxillary Central Incisors | 323 | 498 | 821 | 0.000 |
| Maxillary Lateral Incisors | 278 | 289 | 567 | |
| Maxillary Canines | 209 | 156 | 365 | |
| Maxillary first Premolars | 244 | 282 | 526 | |
| Maxillary Second Premolars | 392 | 354 | 746 | |
| Maxillary First Molars | 486 | 511 | 997 | |
| Maxillary Second Molars | 245 | 218 | 463 | |
| Maxillary Third Molars | 6 | 2 | 8 | |
| Total | 2183 | 2310 | 4493 | |

Maximum multi-visit procedures were performed on maxillary molars and central incisors.

of multi-visit RCT procedures. A higher number of multi-visit procedures were performed in younger age groups [Table 5, Figure 5]. Males showed a higher number of multi-visit RCTs performed. A higher number of multi-visit RCT procedures were done in males [Table 6, Figure 6]. Maxillary central incisors showed a significantly higher number of multi-visit root canal procedures as compared to a single visit. Maximum procedures were done in maxillary first molars, followed by central incisors

and second premolars [Table 7, Figure 7].

Single-visit endodontics is defined as a conservative nonsurgical treatment of an endodontically involved tooth consisting of complete biomechanical cleansing, shaping, and obturation of the root canal system during one visit (Ashkenaz, 1984). Teeth indicated to be treated in single-visit include vital teeth with pulp exposures caused by trauma, caries, or mechanical reasons; teeth with subgingival break-

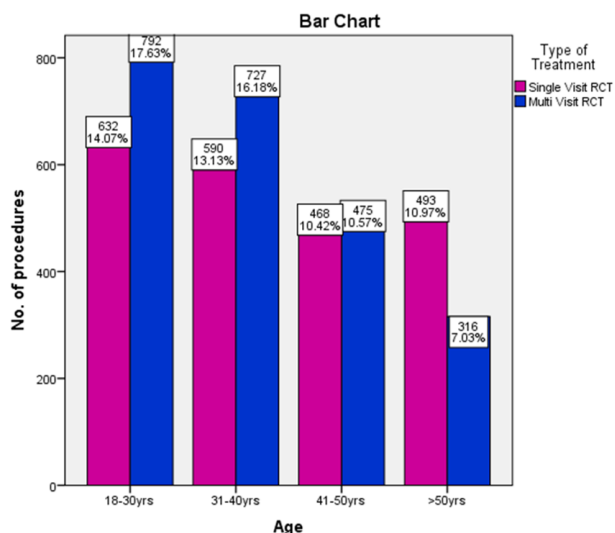


Figure 5: Association between single and multi-visit root canal treatment procedures with the age of the patient.

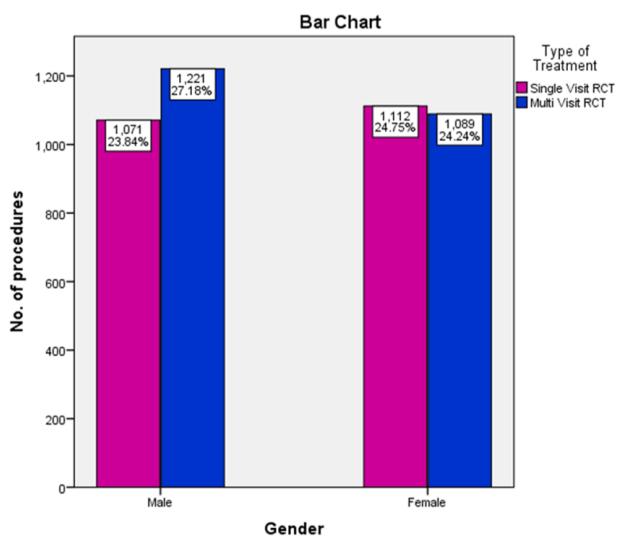


Figure 6: Association of single and multiple visit root canal treatment procedures done with the gender of the patient.

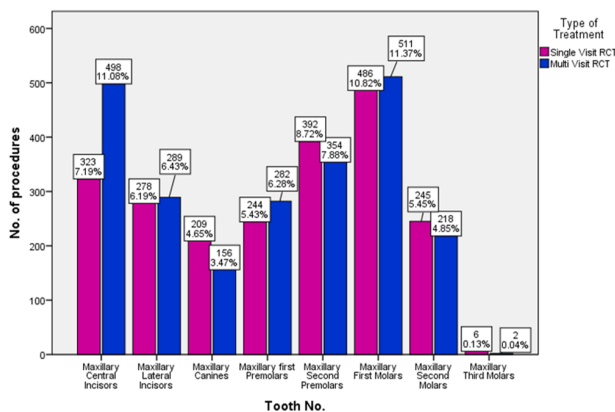


Figure 7: Association of single and multiple visit root canal treatment procedures done on each maxillary tooth.

down; teeth with multiple coronal walls missing; full coverage restorations with carious margins; fractured anterior or bicuspids requiring temporary restorations; teeth to be used as overdenture abutments, full veneer crowns on mandibular anterior; physically disabled patients or patients who require sedation (Mohammadi *et al.*, 2006). The main contraindications are the presence of anatomic anomalies (receded pulp chambers, calcified canals, sharply curved canals, bifurcated canals, and dilacerations) or procedural difficulties (broken instruments, perforations, ledge formation) that extend treatment time, patients suffering from physical (muscular dystrophy) or mental disability (neuromuscular disorders) that require good patient cooperation. Also, teeth with severe inflammation or large periapical infections are avoided. Researchers have studied and analyzed different techniques to overcome these difficulties, most of which involve the use of multiple visits (Kumar and Antony, 2018).

In this study, out of a total of 4493 root canal procedures done, 48.6% (2183) were single visit while 51.4% (2310) were multi-visit procedures. This shows that approximately an equal number of single and multiple visit procedures are done in the institution. This finding is supported by a previous survey (Inamoto *et al.*, 2002) which stated that root canal obturation during a first visit was carried out by 55.8% of the endodontists. Although, in infected root canal cases, the percentage was decreased to 34.4%. The distribution of multi-visit RCT procedures being done was significantly higher in younger age groups, in males, and in central incisors ($p < 0.05$). Single-visit RCT was most commonly carried out in maxillary canines.

The highest numbers of RCT procedures were carried out in the 18-30years age group (1424) with 632 single visit and 792 multi-visit RCTs and the 31-40years group (1317) with 590 single visit and 727 multi-visit procedures. This may be due to the fact that the younger age groups are more conscious about their oral health and esthetics due to which they acquire dental treatment more often than older age groups. This is supported by a previous study done by Eckerbom *et al.* in 1987 (Eckerbom *et al.*, 1989) which stated that the distribution of patients' age skewed towards younger age groups and can probably be explained by the fact that these age groups seek dental treatment more often than older age groups.

A higher number of multi-visit RCT procedures were carried out in males (1221 multi-visit and 1071 single visit), while a higher number of single visit RCT procedures were carried out in females (1112 sin-

gle visit and 1089 multi-visit procedures). This finding is contradictory to a previous study (Lorduy *et al.*, 2018) which stated that female sex was more prevalent in endodontic procedures (68% females in undergraduate group and 70.1% females in the graduate group were treated). This may be due to the fact that smoking, which is a predisposing factor for persistent apical periodontitis (Kirkevang *et al.*, 2007) as well as delayed wound healing (Balaji, 2008), is more prevalent in males. This may compel the clinician to opt for multi-visit procedures in these patients.

In general, the maximum number of endodontic procedures were carried out in the maxillary first molars followed by incisors, premolars and least in canines. This is in concurrence with an article by L.L Kirkevang *et al.* which stated that molars have a higher risk of developing apical periodontitis than incisors and premolars (Kirkevang *et al.*, 2007). The maxillary central incisors were reported to have a maximum number of multi-visit endodontic procedures (323 single visit and 493 multi-visit procedures). The higher number of multi-visit procedures in these teeth can be attributed to the fact that these teeth are most likely to undergo dental trauma (Andersson, 2013). Even in severely traumatized teeth like avulsed teeth, endodontics can be performed, if extraoral dry time is reduced. For this purpose, several storage media are recommended (Rajakeerthi and Nivedhitha, 2019). Traumatized teeth generally present with numerous complications like non-vitality, internal resorption, external root resorption, periapical lesions, etc. which makes it mandatory for the clinician to complete the procedure in multiple visits using intracanal medicaments such as calcium hydroxide. Simpler fractures like Ellis' Class 1 and 2 fractures usually do not require the need for endodontic treatment. A survey was conducted to assess the practice of such teeth by dentists (Jose *et al.*, 2020).

The limitations of this study were that it was limited to a single population in a confined geographical area. Hence, long term clinical research on this topic is required in larger geographical areas covering larger populations. A more detailed analysis of the treatment outcomes and success must be studied, especially based on the tooth and age group in order to provide appropriate guidelines for practising single and multiple visit endodontics.

CONCLUSION

Within the limitations of this study, it can be concluded that a higher number of multi-visit procedures as compared to single-visit procedures were

done in maxillary teeth. There was a significant association between age, gender and tooth with single and multi-visit endodontics. Younger age groups, male gender, and maxillary central incisors showed the highest predilection for multi-visit root canal treatments as compared to single visit root canal treatments.

ACKNOWLEDGEMENT

The authors would like to acknowledge the institution and all the staff members of the Department of Conservative Dentistry and Endodontics for their support towards completion of this research.

Funding Support

The authors declare that they have no funding support for this study.

Conflict of Interest

The authors deny any conflicts of interest related to this study.

REFERENCES

- Abrahams, J. J., Frisoli, J. K., Dembner, J. 1995. Anatomy of the jaw, dentition, and related regions. *Seminars in Ultrasound, CT and MRI*, 16(6):453-467.
- Andersson, L. 2013. Epidemiology of traumatic dental injuries. *Journal of endodontia*, 39(3):2-5.
- Ashkenaz, P. J. 1984. One-visit endodontics. *Dental clinics of North America*, 28(4):853-863.
- Balaji, S. M. 2008. Tobacco smoking and surgical healing of oral tissues: a review. *Indian journal of dental research: official publication of Indian Society for Dental Research*, 19(4):344-348.
- Eckerbom, M., Andersson, J.-E., Magnusson, T. 1989. A longitudinal study of changes in frequency and technical standard of endodontic treatment in a Swedish population. *Dental Traumatology*, 5(1):27-31.
- Ferranti, P. 1959. Treatment of the root canal of an infected tooth in one appointment: a report of 340 cases. *Dental Digest*, 65(11):490-494.
- Figini, L., Lodi, G., Gorni, F., Gagliani, M. 2008. Single Versus Multiple Visits for Endodontic Treatment of Permanent Teeth: A Cochrane Systematic Review. *Journal of Endodontics*, 34(9):1041-1047.
- Grossman, L. I. 1967. Rationale of endodontic treatment. *Dental Clinics of North America*, pages 483-490.
- Gutmann, J. L. 1992. Clinical, radiographic, and histologic perspectives on success and failure in

- endodontics. *Dental Clinics of North America*, 36(2):379-392.
- Hussainy, S. N. 2018. Clinical performance of resin-modified glass ionomer cement, flowable composite, and polyacid-modified resin composite in non-carious cervical lesions: One-year follow-up. *Journal of Conservative Dentistry*, 21(5):510-515.
- Inamoto, K., Kojima, K., Nagamatsu, K., Hamaguchi, A., Nakata, K., Nakamura, H. 2002. A Survey of the Incidence of Single-Visit Endodontics. *Journal of Endodontics*, 28(5):371-374.
- Janani, K., Palanivelu, A., Sandhya, R. 2020. Diagnostic accuracy of dental pulse oximeter with customized sensor holder, thermal test and electric pulp test for the evaluation of pulp vitality: an in vivo study. *Brazilian Dental Science*, 23(1):1-8.
- Jose, J., P., A., Subbaiyan, H. 2020. Different Treatment Modalities followed by Dental Practitioners for Ellis Class 2 Fracture – A Questionnaire-based Survey. *The Open Dentistry Journal*, 14(1):59-65.
- Kirkevang, L. L., Væth, M., Hörsted-Bindslev, P., Bahrami, G., Wenzel, A. 2007. Risk factors for developing apical periodontitis in a general population. *International Endodontic Journal*, 40(4):290-299.
- Kumar, D., Antony, S. D. P. 2018. Calcified Canal and Negotiation-A Review. *Research Journal of Pharmacy and Technology*, 11(8):3727-3730.
- Lorduy, M. C., Marrugo, S. P., Aguilar, K. H., Ariza, L. G. 2018. Epidemiology and prevalence of pulp and periapical pathologies. *Salud Uninorte*, 34(2):294-301.
- Manohar, M. P., Sharma, S. 2018. A survey of the knowledge, attitude, and awareness about the principal choice of intracanal medicaments among the general dental practitioners and nonendodontic specialists. *Indian Journal of Dental Research*, 29(6):716-720.
- Mohammadi, Z., Farhad, A., Tabrizizadeh, M. 2006. One-visit versus multiple-visit endodontic therapy - a review. *International Dental Journal*, 56(5):289-293.
- Nasim, I., Nandakumar, M. 2018. Comparative evaluation of grape seed and cranberry extracts in preventing enamel erosion: An optical emission spectrometric analysis. *Journal of Conservative Dentistry*, 21(5):516-520.
- Noor, S. S. S. E., Pradeep 2016. Chlorhexidine: Its properties and effects. *Research Journal of Pharmacy and Technology*, 9(10):1755.
- Rajakeerthi, R., Nivedhitha, M. S. 2019. Natural Product as the Storage medium for an avulsed tooth – A Systematic Review. *Cumhuriyet Dental Journal*, 22(2):249-256.
- Ramamoorthi, S., Nivedhitha, M. S., Divyanand, M. J. 2015. Comparative evaluation of postoperative pain after using endodontic needle and EndoActivator during root canal irrigation: A randomised controlled trial. *Australian Endodontic Journal*, 41(2):78-87.
- Ramanathan, S., Solete, P. 2015. Cone-beam Computed Tomography Evaluation of Root Canal Preparation using Various Rotary Instruments: An in vitro Study. *The Journal of Contemporary Dental Practice*, 16(11):869-872.
- Ramesh, S., Teja, K., Priya, V. 2018. Regulation of matrix metalloproteinase-3 gene expression in inflammation: A molecular study. *Journal of Conservative Dentistry*, 21(6):592-596.
- Rani, L., et al. 2016. Sterilization protocols in dentistry-A review', Research Journal of pharmaceutical, biological and chemical sciences. *Journal of Pharmaceutical Sciences and Research*, 8(6):558-564.
- Ravinthar, K., Jayalakshmi 2018. Recent Advancements in Laminates and Veneers in Dentistry. *Research Journal of Pharmacy and Technology*, 11(2):785-787.
- Siddique, R. 2019. Qualitative and quantitative analysis of precipitate formation following interaction of chlorhexidine with sodium hypochlorite, neem, and tulsi. *Journal of Conservative Dentistry: JCD*, 22(1):40-47.
- Teja, K. V., Ramesh, S. 2019. Shape optimal and clean more. *Saudi Endodontic Journal. Medknow Publications and Media Pvt. Ltd*, 9(3):235-236.