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ASSOCIATION BETWEEN ENDODONTIC MISHAPS AND FOLLOW UP - A RETROSPECTIVE STUDY

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ABSTRACT

Endodontic mishaps play a critical role in guiding the final endodontic outcome of therapy. It not only delays the treatment outcome but also causes poor patient satisfaction and also leads to operator frustration. Most common endodontic mishaps include ledge formation, file separation and perforation. The aim of the study is to assess the association between endodontic mishaps and follow up rate of patients. This university based study involved collection of data from the database from which cases of endodontic mishaps were selected and cross verified. All the data was compiled and tabulated in Microsoft Excel and exported to IBM SPSS 20. Data was represented through frequency distribution tables and Chi square tests performed for the comparison between the endodontic mishaps and the follow up rates. A total of 64 endodontic mishap based cases were undertaken in the study, which revealed that the highest number of endodontic mishaps occurred in age group of 31- 40 years followed by age group of 41 - 50 years, the cases of endodontic perforation were more in frequency compared to instrument retrieval cases. Within the limitations of this study, it was found that endodontic instrument separation and perforation repair cases had good follow up.

Keywords: Endodontic mishaps; Instrument separation; Perforation; Root Canal Treatment

INTRODUCTION

Endodontic mishaps often impede the process of endodontic therapy which causes poor follow up of the patient. Successful endodontic therapy should not have procedural errors or if they have such procedural errors they must be managed by skilled operators to reduce the treatment time and prognosis of tooth [1]. Some of the examples of the procedural errors in the field of endodontics are as follows - Missed canal, ledge formation, perforation, and instrument separation [2].

Perforation is pathologic or iatrogenic communication between root canal space and the attachment apparatus [2]. Perforations can occur during access cavity preparation, post space preparation or due to the extension of internal resorption into the periradicular tissues [3]. The effect of perforation depends on the size of the perforation, time of repair, level, and location of the perforation [3].

MTA and Biodentine is the most commonly used material for repair of perforation. MTA has a good sealing ability, induces osteogenesis, and cementogenesis, and it is highly biocompatible [4]. Biodentine (Septodont, Saint-Maur des Fosses, France), a contemporary tricalcium silicate-based dentin replacement material like MTA, has been evaluated for various physical and

biologic properties. It offers much more advantages than MTA like a faster setting time and higher push-out bond strength at 24 hour [5].

The role of separated instruments are very important in deciding the endodontic treatment outcome. Separated instruments in the root canal wall impede the process of obturation and doesn't allow the operator to clean the canal and shape it beyond the point of separation of instrumentation [6]. Separation of instruments occurs due to improper examination of the files before instrumentation for the wear and tear and nicks on the files.

Separation of instruments also occurs due to lack of usage of lubricant like EDTA gel or EDTA liquid which acts as a chelating agent and simultaneously reduces the friction between the canal wall and the instrument [7]. Improper force and improper filing sequence and motion described against the manufacturers instruction [7], overzealous preparation of calcified [8] and lack of the proper precurving of the file before the start of the instrumentation after assessing the canal curvature on the radiographs can cause instrument separation.

Understanding such a relation or an association between these types of cases

where the procedural errors were encountered would help the researchers formulate a better set of guidelines so that such kinds of challenges during the endodontic treatment were reduced to its minimalist levels if not completely avoided [7].

Previously our team had conducted numerous studies which include in vitro studies [9–14], review [15–18], survey [19,20], clinical trial [21–23]. Now we are focussing on retrospective studies, the aim of the study is to assess the association between endodontic mishaps and follow up rate of the patients.

MATERIALS AND METHODS

Study design

Single centered retrospective study

Ethical approval

Approval for the project was obtained from the Institutional Review Board of Saveetha Institute of Medical and Technical Sciences, Chennai, India on Date 20/04/2020

Inclusion Criteria

Patients aged 18- 81 years who underwent perforation repair and instrument separation treatment based procedures.

Exclusion Criteria

Patients who have undergone other endodontic mishaps management apart from perforation repair and retrieval of separated instruments.

Data Extraction

Data was evaluated of 86000 patients among which 64 patient's records were undergone treatment for perforation repair and retrieval of separated instruments from June 2019 to March 2020. The final data was exported to excel sheet and saved on a secure server for analysis. The case selection and data extraction is shown in (Table 1).

Sample size

Based on inclusion and exclusion criteria 64 patients were selected of which 47 patients underwent treatment for perforation repair and 17 patients for retrieval of separated instruments.

Clinical outcome

The primary clinical outcome of this procedure was to evaluate the follow up rate of patients undergoing management of perforation and instrument separation. Success rate is assessed based on Patients follow up.

Statistical Analysis

Chi square test was done to assess the association between endodontic mishap cases and follow up rates. The results were depicted in the form of tables and graphs.

RESULTS AND DISCUSSION

A total of 64 endodontic mishap based cases were undertaken in the study, which revealed that the maximum number of cases were seen

in the age group of 31 - 40 yrs and least was 61-81 years [Table 1, Figure 1].

When the endodontic mishap based cases were analysed separately for instrument retrieval cases and perforation repair cases, it was found that the cases of instrument retrieval were 17 (26.6%) and perforation repair cases were 47(73.4 %) [Table 2].

The gender wise distribution of endodontic mishap based cases revealed that the total number of males reported were 31 (48.4%) and females 33 (51.6%) [Table 3].

Out of 17 instrument retrieval cases, 8 were males and 9 were females at a percentage of (12.50 and 14.06). In perforation repair cases, 23 were males and 24 were females at a percentage of (35.94% and 37.50%) [Table 4] [Figure 3].

Endodontic mishaps are often caused due to clinical negligence of the operator [6]. Endodontic mishaps can be an unpleasant experience for the patient as well as the operator. In clinical scenarios the separated instrument at the apical third of the canal can be the source of continuous pain, which if not treated in due time would lead to formation of abscess [24] In this retrospective study it was found that, there was a highly significant association between the endodontic procedural errors and the follow up rate of the patient. (*p value- 0.000* Chi square test)

[Figure 2].

There has been a conflict of opinion among researchers regarding the clinical significance of retained fractured instruments. Two studies reported that the retained fragment delays the healing, particularly when there is a presence of preexisting periapical radiolucency [25] whereas another two studies stated that it had no influence on healing [26]. Removal of fragment is very critical if the fractured fragment is located in the coronal third, middle third or before the canal curvature. Mostly in such cases success is achieved by bypassing the fragment and by the enlargement of canal or/and simple use of ultrasonic tips, even without surgical microscope for the file retrieval [27].

Perforation being a significant endodontic challenge which leads to poor prognosis, commonly seen in the patients of old age groups, mostly in an attempt to negotiate the calcified canal [28]. Perforation leads to communication of the root canal with the adjacent periodontal tissue .Perforation is caused by the iatrogenic cause, due to root resorption based mechanism, or due to spread of dental caries. Accessibility of the root canal is an important factor in perforation repair, the prognosis of perforation is also affected by the duration of the perforation,

which prolongs the bacterial contamination. Our study results correlate with this finding that the perforation cases were seen maximum in the age group of 41 - 50 yrs, and the major reason behind these cases was the inability of the operator to be careful while negotiating the calcified canal. Also the calcified teeth are most commonly seen in the elderly patients who had undergone a

lot of dental restoration based procedures, or had a periodontally compromised teeth [29]. The use of magnification, ultrasonics, instrument retrieval techniques, operator skill, biocompatible materials plays an important role in the success rate of patients undergoing endodontic mishaps based treatment.

Table 1: Depicting the age wise distribution of cases of endodontic mishaps. The maximum number of cases were seen in the age group of 31 - 40 yrs followed by the age group of 41 - 50 yrs and 51-60 years .The age group 61 - 81 yrs revealed the least frequency count of cases

Age distribution of cases					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-30 years	12	18.8	18.8	18.8
	31-40 years	21	32.8	32.8	51.6
	41-50 years	20	31.3	31.3	82.8
	51-60 years	7	10.9	10.9	93.8
	61-81 years	4	6.3	6.3	100.0
Total		64	100.0	100.0	

Table 2: Depicting the cases of instrument retrieval and perforation repair separately out of total cases studied. The cases of instrument retrieval were at a percentage of 26.6% , followed by perforation repair cases at a percentage of 73.4 %.. Majority of cases were perforation repair cases.

Second visit(follow up)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	instrument retrieval	17	26.6	26.6	26.6
	perforation repair	47	73.4	73.4	100.0
	Total	64	100.0	100.0	

Table 3: Depicting the gender wise distribution of cases. The total number of males reported for the management of endodontic mishap cases were 31 and at a percentage of 48.4 .The total number of females reported for the management of endodontic mishap cases were at a frequency of 33 and at a percentage of 51.6%

Gender wise distribution of cases					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	31	48.4	48.4	48.4
	female	33	51.6	51.6	100.0
	Total	64	100.0	100.0	

Table 4: Gender wise distribution of endodontic mishap cases. Total of 8 males and 9 females reported for retrieval of a separated instrument and 23 males and 24 females reported for perforation repair cases

Gender wise distribution of cases(detailed)				
		gender		Total
		male	female	
second visit	instrument retrieval	8	9	17
	perforation repair	23	24	47
Total		31	33	64

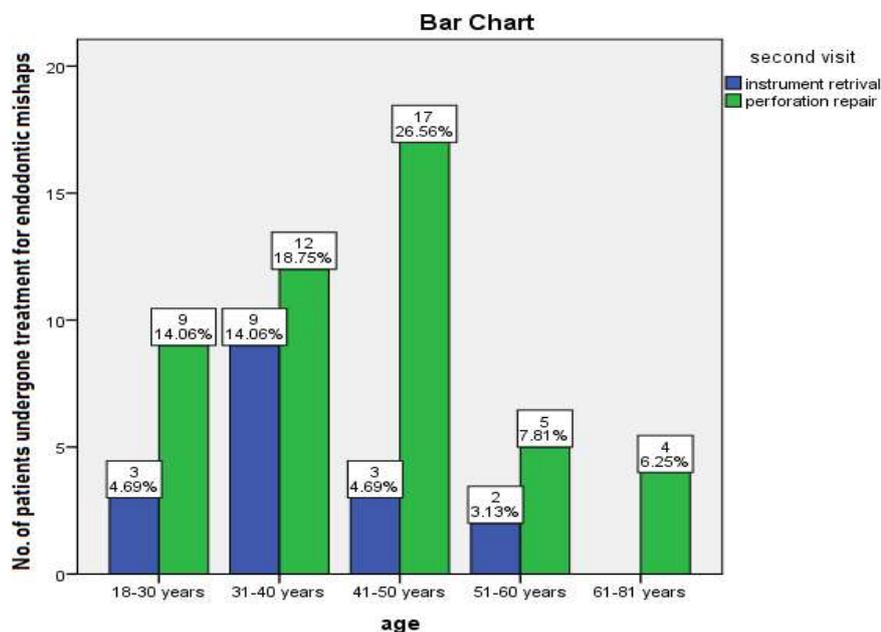


Figure 1: Bar graph depicting the association between the age and the total number of patients underwent management of endodontic mishap. The X axis represents the age and Y axis represents the total number of patients who had undergone management of endodontic mishap. The statistical analysis, Pearson Chi Square = 5.705 , Df = 4 , P value = 0.222 (p value > 0.05) indicating not significant. Maximum cases of instrument retrieval(blue) were seen in the age group of 31-40 yrs whereas for perforation repair(green) was in the age group of 41- 50 yrs.

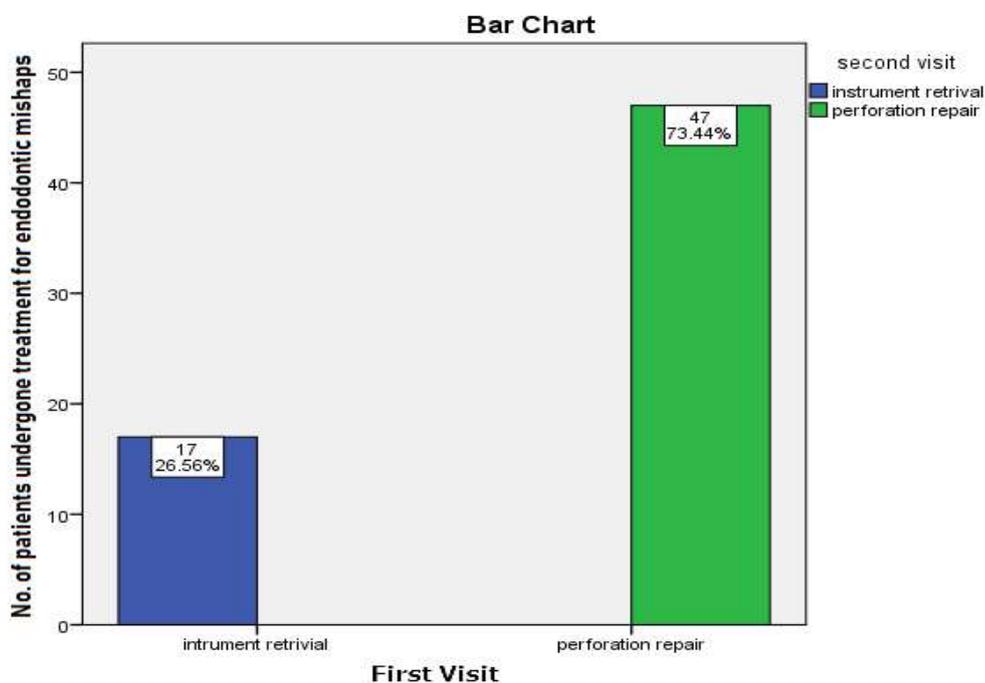


Figure 2 - Bar graph depicting the association between the endodontic mishaps and the follow up (second visit). The X axis represents the distribution of instrument retrieval (blue) and perforation repair (green) cases and Y axis represents the number of patients who had undergone management for endodontic mishap. The statistical analysis revealed that the association between the variables was statistically highly significant , Pearson Chi Square = 64.0 , Df = 1 , P value = 0.000

(p value = 0.000). All the patients had followed up after mishap.

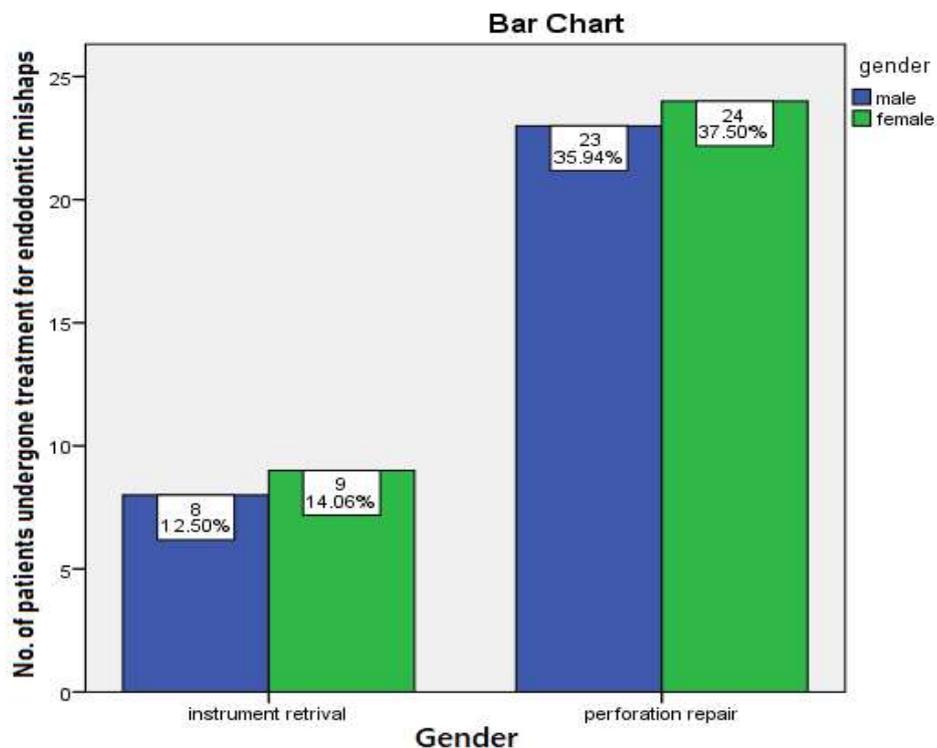


Figure 3: Bar graph depicting the association between the endodontic mishaps and the gender distribution. The X axis represents the distribution of instrument retrieval (blue) and perforation repair (green) cases and Y axis represents the number of patients. The statistical analysis revealed that the association between the variables was statistically not significant, Pearson Chi Square = 0.018, Df = 1, P value = 0.894 (p value > 0.05). There is no association between gender and endodontic mishaps.

Limitations of study

The sample size used in the study process was small which required close monitoring of the follow up cases. In this study only two types of endodontic mishaps were evaluated and other factors for followup were not considered.

Future Scope

More types of endodontic mishaps to be included. A well differentiated randomised control trial with larger sample size is needed to further validate the results of the current

study

CONCLUSION

Within the limitations of this study, it was found that endodontic instrument separation and perforation repair cases had good follow up. Thorough knowledge about root canal anatomy, training, development in technology, advanced armamentarium, and clinician skill enable successful management of endodontic mishaps.

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