

Review Article

Incidence of Post-operative Pain after Single Visit Root Canal Treatment using Rotary and Reciprocating Single File Systems—A Systematic Review

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ABSTRACT:

Background: Aim of this systematic review was to evaluate the incidence of post-operative pain after single visit root canal treatment using single file rotary and reciprocating file systems. Objective of this article is to compare the difference between single and multiple file systems on the incidence of postoperative pain after single visit root canal treatment.

Data Source: Two internet sources of evidence were used in the search of appropriate papers satisfying the study purpose: the National Library of Medicine (MEDLINE PubMed) and Google Scholar.

Study Eligibility Criteria: The following criteria was used to select the studies:

1. The inclusion criteria were articles in English having detailed summary were searched, and studies published between 1st January 2000 to 31st October 2017 were selected, in-vivo studies which included single and multiple file systems using greater taper instruments in endodontically treated teeth were searched.
2. The exclusion criteria were review, abstracts, letters to editors, In-vitro studies and studies assessing postoperative pain in endodontically treated teeth with parameters other than instrumentation.

Intervention: Single visit root canal treatment using single file system.

Results: Total of 26 articles were searched out of which 23 articles were selected. The papers were screened, as a second step. Titles, abstract and full text were screened; 2 articles were excluded while screening the titles, one article was excluded while screening the abstract and 7 were duplicates. Papers were obtained when they fulfilled the criteria of the study aim. However, only articles where single visit root canal treatment, with instrumentation using single file systems having different kinematics such as rotary or reciprocating motions of endodontic file systems on post operative pain was assessed and selected. Finally, a total of 13 articles were included which were selected for this review.

Conclusion: Irrespective of the number of appointments, that is single visit or multiple visit root canal treatment, reciprocating single file systems proved to be better than continuous rotary single file and multiple file systems with respect to post-operative pain. Reciprocating instrument systems create less debris extrusion during instrumentation, which may be the cause of reduced post-operative pain.

Future Implications: This systematic review should be recorded in future studies and the outcome measure should be reported in relation to improvement or deterioration rather than mere prevalence of postoperative pain. Sample size selection and power of a study are fundamental and should be addressed at the design stage of any clinical study. However, despite the shortcomings among the studies included, there is a need for conducting further studies with standardized protocols in root canal treatment.

Key words: Single visit root canal treatment, Rotary instruments, Reciprocating file systems, Multiple file systems, Post-operative pain.

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INTRODUCTION:

RATIONALE:-

The goal of root canal treatment is to provide an environment in the periapical tissues that irradiates

infection and encourages the reestablishment of normal tissues. Endodontic treatment is the choice of treatment for irreversible pulpitis with or without periapical lesion, with up to 98% success rates.¹

Postoperative pain can be attributed to the different factors such as instrumentation method, improper irrigation, perforations during the treatment or obturation.²

“Endodontic flare up is defined as pain with or without swelling of the facial tissues and the oral mucosa in the area of the endodontically treated teeth that can occur within few hours or a few days following the root canal treatment, when clinical symptoms are strongly expressed and the patient visits a health care institute sooner than scheduled.”³

American Association of Endodontics has defined as “A flare up is an acute exacerbation of an asymptomatic and/or periapical pathosis after the initiation or continuation of the root canal treatment.”⁴

Over the years with continuous advances in technology, there are new endodontic armamentarium being introduced. There is a change in kinematics. Common method of instrumentation in bio-mechanical preparation of the root canal is rotation, but a new method of reciprocating motion is developed to reduce the risks associated with rotary movement of instrument. Reciprocating method uses clockwise and counterclockwise motion of the files mimicking manual instrumentation, hence reducing the risk of file separation in the canal.⁵

It minimizes various other risks associated with continuous rotating file systems including debris being pushed periapically, one of the factors influencing post-operative pain.⁶

Root canal treatment is traditionally done in multiple visits, but concept of single visit root canal treatment is gaining popularity.

While single visit root canal treatment is defined as “the conservative and nonsurgical root canal treatment of an involved tooth consisting of complete chemo-mechanical preparation and obturation of root canal system in one visit”.⁷ There are many advantages of single visit root canal treatment over multiple visit root canal treatment, one being that single visit root canal treatment is less time consuming as it is performed in one visit and there is a myth that single visit endodontic treatment causes more postoperative pain, discomfort and flare up to the patients. One documented survey reported that almost 70% of endodontists would treat teeth with a necrotic pulp and chronic apical abscess in one visit. Another survey showed that around 70% of undergraduate teaching institutions in the USA encourage single-visit root canal treatment.⁸ However; the fact that various practices are widely adopted does not indicate that the practices are biologically sound and/or appropriate. The argument for single visit treatment relies heavily on convenience, patient acceptance and reduced post-operative pain.

On the other hand, bacterial eradication cannot be predictably maximized without calcium hydroxide dressing between appointments; thus, the potential for healing may be compromised.

Single visit endodontic treatment performed in cases with vital pulp have given good results but in cases with

necrotic pulp the incidence of post operative pain, discomfort and flare up’s is high with single visit endodontic treatment as compared to multiple visit endodontic treatment.⁹ The issue is very controversial, and opinions vary greatly as to the relative risks and benefits of single- vs multiple-visit root canal treatment. “Postoperative pain is unwanted but is not an uncommon occurrence irrespective of the method adopted i.e single visit or multiple visit, armamentarium used that is single file or multiple file systems and type of motion whether rotary or reciprocating”. Hence the purpose of this systematic review is to access the “Incidence of post-operative pain after single visit root canal treatment using single file systems”

FOCUSED QUESTION:

Does single file systems have an effect on postoperative pain after performing single visit endodontic treatment?

OBJECTIVE:

To assess the literature comparing the incidence of post-operative pain after single visit root canal treatment using single file rotary and reciprocating systems.

ELIGIBILITY CRITERIA

Inclusion Criteria:

- 1) Articles in English or those having detailed summary in English
- 2) Studies published between 1st January 1990 and October 2017
- 3) In-vivo studies.
- 4) Studies showing the evidence of pain in endodontically treated teeth using greater taper instruments.
- 5) Articles providing information on post-operative pain in single visit root canal treatment
- 6) Articles providing information about different file systems (rotary, reciprocating, single file and multiple file systems)

Exclusion Criteria:

- 1) Review, abstracts, letters to editors, editorials.
- 2) In vitro studies.
- 3) Studies showing instrumentation in teeth with single and multiple roots and canals.
- 4) Studies assessing parameters other than instrumentation.

The PICOS guidelines selected are:

P comprised of patients. I as the Intervention single visit root canal treatment. C as comparison and this review aimed to compare between various single and multiple file systems. O as the outcome where it assessed the Post-operative pain rotary Vs reciprocating endodontic file systems. And hence the PICOS are mentioned below:

P - (POPULATION) - Participant / patient

I- INTERVENTION)- Single visit root canal treatment

C- (COMPARISON) - Between various single and multiple file systems

O - (OUTCOME) - Post-operative pain

INFORMATION SOURCES

The comprehensive data search was done on PubMed and Google scholar. While carrying out the search filters were put for the dates of publication from January 1st 2000 to October 31st 2017. Language restriction was put to English articles only. No filters for full text and for study

design were kept. The keywords for search were decided by the review of literature. The search strategy using primary keywords for searching articles in PubMed was Single visit root canal treatment and Single file system and Post operative pain

SEARCH

Keywords

1) Instrumentation	Single file systems OR Rotary instruments OR Reciprocating file systems.
2) Postoperative pain	Single visit treatment or multiple visit treatment

SR. NO.	SEARCH STRATEGIES	NUMBER OF ARTICLES	SELECTED	AFTER DUPLICATES REMOVAL
1.	Single visit root canal treatment AND single file system rotary AND reciprocating AND post operative pain.	5	5	2
2.	Single visit endodontic treatment AND single file system rotary AND reciprocating AND post operative pain	4	4	2
3.	Single visit endodontic treatment AND using single file system OneShape OR WaveOne system AND post operative pain	3	1	1
4.	Post obturation pain AND single visit root canal treatment OR single file systems	4	4	1
5.	Root canal treatment AND post obturation pain AND single file rotary AND reciprocating system	2	2	1
6.	Single file rotary Oneshape single file rotary AND WaveOne single file reciprocating system	1	2	1
7.	Single visit endodontics	2	2	2
8.	Single sitting endodontic treatment	2	1	1
9.	Single file rotary OneShape OR single file rotary system	1	1	1
10.	Single file WaveOne AND single file reciprocating system	2	1	1

STUDY SELECTION

Preliminary screening consisted total of 26 articles out of which 16 articles were selected. The papers were screened independently by two reviewers. At first the papers were screened by title and abstract. As a second step, full text papers were obtained when they fulfilled the criteria of the study aim. Any disagreement between the two reviewers was resolved after consensus. For full-text screening, the following criteria were taken into consideration: In vivo studies were selected; however, only articles where the influence of different kinematics such as rotary or reciprocating motions of endodontic file systems on post operative pain after single visit endodontic treatment was assessed. Finally a total of 13 articles were included.

DATA COLLECTION PROCESS

A standardized data extraction form was prepared in Microsoft Excel with the help of an expert. Initially 3-4 entries were made in the Excel and it was reviewed by an expert. Any disagreement between the authors was

resolved by discussion. The following criteria were predetermined for extracting the data:-

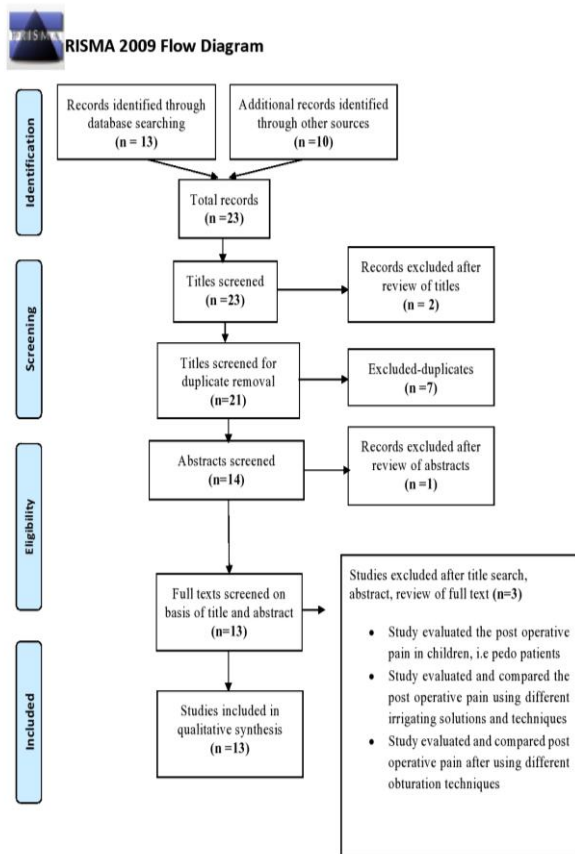
- ❖ The major interest was to obtain the incidence of post-operative pain.
- ❖ Follow up period from the time root canal treatment was completed.

To evaluate post obturation pain after a single visit endodontic treatment.

DATA ITEMS

Data items included for the data extraction were :-

1. Author’s name:- name of the author
2. Year of publication:- year in which the study was published.
3. Intervention and comparison incidence percentage:- different parameters (files, instrumentation i.e single file and multiple files systems, treatment protocol i.e single visit and multiple visit treatment) before, during and after the procedure.
4. Remarks:- results of the individual study.



DISCUSSION:

SUMMARY OF EVIDENCE:-

Traditionally root canal treatment is a multiple visit treatment, but single visit treatment is also carried out in certain clinical situations. Endodontic protocol remains the same in both the methods, but all the steps are completed at one time in single sitting root canal treatment; whilst multiple visits are indicated for eradication of infection and treatment is completed in more than one visit.

Postoperative pain is a sequel and may be experienced by some patients during and after endodontic treatment. There is no particular timings or pattern of initiation of post-operative pain. It can start just after few hours or few days, varying in different patients.

There are various means to measure and document postoperative pain, eg. Visual Analogue Scale, Visual Rating Scale or using questionnaire, etc.

STRENGTH AND RELEVANCE OF EVIDENCE:-

Albashaireh ZSM & Alnegrish AS (2000)¹⁰ conducted a study to evaluate the difference in post-operative pain after single sitting root canal treatment and multiple visit root canal treatment. Three hundred patients were included in the study, who were randomly allocated to two groups (single visit and multiple visit) root canal treatment. All the patients were treated using step back technique and obturated using lateral compaction. Post-operative pain was evaluated after 24 hours, which showed the higher incidence in multiple visits root canal treatment group (38%) as compared to single visit group (27%).

Tarik M& Al-Jabreen (2002)¹¹ carried out a research to find the incidence of post-operative pain after single visit root canal treatment using three different instrumentation techniques. Ninety one patients in the age range of 18-55 years, having necrotic pulp in maxillary central incisors were selected. All the participants were divided into three groups on the basis of instrumentation. Group 1 was treated using step back technique, Group 2 was treated using 0.04 taper 29 series files and Group 3 was treated using Profile GT files. All the teeth were obturated using lateral condensation technique. Post-operative pain after 48 hours and 1 week was evaluated. Group 1 showed the highest incidence of post-operative pain after 48 hours, where 27 participants did not suffer from any pain, 4 complained of mild post-operative pain, 3 of moderate and 1 participant complained of severe pain. This reduced to 4 participants complaining of post-operative pain after 1 week. Group 2 showed the least incidence of post-operative pain after 48 hours where only 1 patient complained of moderate pain and it reduced to 0 after 1 week. Group 3 also showed very less incidence of pain after 48 hours, with only 1 participant having postoperative pain, reducing to 0 after 1 week. The use of the Profile 0.04 and GT systems in preparing single rooted teeth contributed to lower the incidence of post-operative pain reported by patients.

Abdalla A H Elmubarak (2008)² conducted a study to evaluate the post-operative pain following root canal treatment associated with various clinical factors. 234 patients with age range of 18-70 years were included in the study. Of these, 202 of the patients were treated with multiple visit root canal treatment and 32 with single visit root canal treatment. Post-operative pain was evaluated using Visual Analogue Scale after 12 and 24 hours. After 12 hours 88.9% of patients did not experience pain, 1.7% experienced mild pain, 0.4% participants experienced moderate pain, 9.0% experienced severe pain. After 24 hours 88.9% of patients did not experience pain, 1.3% experienced mild pain, 0.9% participants experienced moderate pain, 9.0% experienced moderate pain to severe pain.

Various factors were evaluated, namely history of pre-operative pain which showed incidence of 15.9% patients with preoperative pain. Only 7.1 % participants had post-operative pain who did not have pre-operative pain.

Patients with vital teeth showed incidence of 7.8% post-operative pain, while non vital teeth showed incidence of 13.7% incidence.

Nineteen Patients in the age group of 18-33 years showed the highest post-operative pain. Whereas, in 34-49 years age group only 5 patients complained of post-operative pain, followed by 2 in the age group of 50-65 years.

Malhotra N et al(2010)¹² evaluated post-operative pain after single visit root canal treatment in single rooted and multiple rooted teeth. 110 teeth with or without periapical radiolucency were included, which were divided into four groups. Group I was single rooted teeth with periapical radiolucency, Group II was single rooted teeth without

periapical radiolucency, Group III was multiple rooted teeth with periapical radiolucency and Group IV was multiple rooted teeth without periapical radiolucency. Post-operative pain was evaluated after 24 hours, 3 days and 1 week using self-report questionnaire. Group I showed incidence of pain, where 2 patients complained of pain after 24 hours, 6 patients after 3 days and 3 patients complained up of post-operative pain after 1 week. Group II showed incidence of 4 patients complaining of pain after 24 hours, 6 patients after 3 days and none after 1 week. Group III showed incidence of 5 patients complaining of post-operative pain after 24 hours, 8 after 3 days and none after 1 week. In Group IV, 5 participants complained of post-operative pain after 24 hours, 1 patient after 3 days and reduced to 1 patient after 1 week.

Laurindo F V et al (2011)¹³ et al conducted a comparative evaluation to check the incidence of post-operative pain after single and multiple sessions. 117 patients who were treated using root canal treatment with single session and multiple sessions were included. Teeth with and without periapical lesions were considered in the study. Post-operative pain was evaluated after 24 hours, 48 hours and 1 month. 80% patients without lesion reported pain after 24 hours, while 53% of patients with lesion complained of post-operative pain after 1 day; it reduced to 57% and 47% respectively after 2 days and in both groups after 1 month in the patients who were treated in single session. In multiple session, 100% patients with no lesion complained of post-operative pain after 1 day and 71% who had with lesion. It was reduced to 62% in with lesion group but remained same 100% in no lesion group after 2 days. After 1 month only 50% patients in no lesion group complained of post-operative pain and 14% in with lesion group.

Singh S & Garg A(2012)⁵ conducted a study among 200 patients who required root canal treatment in permanent single rooted teeth. Vital and non-vital teeth were included in the study. Patients were divided into two groups, Group 1 was obturated on day 1 and Group 2 was obturated in second visit i.e. Day 7. Post-operative pain was evaluated using Visual Analogue Scale at 6, 12, 24 and 48 hours. Group 2 showed the higher incidence of post-operative pain at 6 hour (15.77 ± 17.03) as compared to Group 1 (13.46 ± 15.46). The incidence was further reduced in both the groups after 48 hours, where in Group 2 it was slightly higher (5.55 ± 9.73), than in Group 1 (4.51 ± 7.53).

Jabeen S & Khurshiduzzaman (2013)¹⁴ evaluated 60 patients with asymptomatic non-vital single rooted teeth indicated for root canal treatment. Out these 60 patients, 32(53.3%) were males and females were 28(46.7%). All the patients were treated in single visit root canal treatment and were evaluated for post-operative pain after 1 day and 7 days. The pain evaluation was graded into four categories. The age of the patients was ranges from 15-40 years (mean age 22.9 ± 6.68 years). In clinical evaluation, 31(51.7%) patients had history of trauma, 31(51.7%) had discolouration of tooth and 29(48.3%) had

caries in tooth. The periodontal condition was average in 59(98.3%) patients. By occupation, most of the patients were students ($n=34$, 56.7%) followed by housewife ($n=14$, 23.3%). Teeth in maxillary arch were 39(65%) and 21(35%) were in mandibular arch.

Out of 60 patients, 37(61.6%) experienced no pain, 12(20%) slight pain and 11(18.4%) moderate pain i.e. 23(38.4%) experienced pain at the day 1 after post-obturation; whereas 50(83.3%) patients had no pain, 8(13.3%) had slight pain and 2(3.3%) showed moderate pain at the day 7 after post obturation. No one experienced severe pain in both follow-up days.

Females were found to record more pain than males and older patients (25years) perceived more pain than younger patients at both day 1 and 7 after post obturation. When considering arch type and type of teeth, pain was experienced more in mandibular group and molar teeth than maxillary and anterior teeth at both days 1 and 7 post-obturation days. Statistically significant differences were found in the incidence and degree of pain between two follow up days. Incidence of pain was more on day 1 post-obturation and later decreased thereafter.

Krishanaprasada L & Nambiar J M (2013)¹⁵ conducted a study to evaluate the effect of two single dose of two oral medication after single visit root canal treatment in teeth with irreversible pulpitis. Thirty patients having anterior and premolar teeth with irreversible pulpitis were included in the study. Patients were divided randomly in three groups. Group 1 was given E-90, Group 2 was administered Movon -p and Group 3 was control. To control post operative pain two drugs i.e. E-90 and Movon-p were administered immediately after root canal treatment. Post operative pain was evaluated using Visual Analogue Scale (VAS) at 6 hour, 12 hour and 48 hour respectively. Results showed that E-90 Etoricoxib-90 (Group 1) was clinically significant at 10% more compared to the other two groups in the reduction of post operative pain. Movon-p (Group 2) was more effective compared to the control group where no medication was given. A single dose of E-90 considerably reduced the post operative pain compared to the other two groups taken immediately after the RCT in teeth with irreversible pulpitis.

Ali S G, Mulay S et al (2013)¹⁶ evaluated postoperative pain after single visit root canal treatment and various factors influencing it. 1328 participants were included in this multicenter study. Post operative pain was evaluated using Visual Analogue Scale at 12, 24 and 48 hours. Overall prevalence of post operative pain was low (4%, $n=52$), but it was influenced by different factors such as age, gender, maxillary or mandibular teeth and presence of pre operative pain.

Post-operative pain related to age: Differences were found between both the age groups. Incidence of post-operative pain was high in 41-65 years age group at all the three-time intervals, which was statistically significant ($P < 0.0$).

Post-operative pain related to gender: More number of women experienced severe pain as compared to men, at

all the three-time intervals. Statistically significant ($P < 0.0$) difference was present between both the genders.

Post-operative pain related to the arch: In lower teeth post-operative pain was significantly higher ($P < 0.001$) at all the three time intervals.

Post-operative pain related to the vitality status of the tooth: There was no statistically significant difference ($P = 0.338$) in post-operative pain at all the three time intervals, between both the groups i.e. vital and non-vital.

Post-operative pain related to the pre-operative pain: In cases with reported presence of pre-operative pain, the presence of post-operative pain was significantly more ($P < 0.0010.0$). Analysis of the influence of patient's age, gender, arch, vitality of the tooth, and presence of pre-operative pain, on prevalence of the post-operative pain showed that it is higher in the age group of 41-65 years, women, mandibular teeth, and with presence of pre-operative pain. The vital condition of the tooth does not affect the intensity and frequency of post-obturation pain.

Bhagwat S & Mehta D (2013)¹⁷ conducted a study to evaluate post-operative pain after single visit root canal treatment in vital and non-vital teeth. 60 patients were treated in single visit root canal treatment in anterior and premolar teeth, vital or non-vital, with and without periapical radiolucency. Post-operative pain was evaluated using self-administered questionnaire at interval of 1 day, 2 day, 3 day, 1 week and 2 week.

1st day after obturation, 48% of teeth did not have post-operative pain, 36% teeth had mild pain and 16% moderate pain. Severe pain was not reported in any case. In Group I - 40% did not have pain, 36% teeth had mild pain and 24% moderate pain Group II - 36% did not have pain, 48% teeth had mild pain and 16% moderate pain Group III - 68% did not have pain, 24% teeth had mild pain and 8% moderate pain.

2nd day after obturation 60% teeth did not have pain. 33.3% teeth had mild pain and 6.7% had moderate pain. Severe pain has not been reported in any of the cases. In Group I - 60% did not have pain, 28% teeth had mild pain and 12% moderate pain. 28% teeth showed a reduction in pain whereas in 32% teeth the pain was not reduced when compared with post-operative pain after 1 day. In Group II - 48% did not have pain, 44% teeth had mild pain and 8% moderate pain. In 20% teeth pain was reduced whereas in 44% teeth there was no reduction in pain compared with 1st day. In Group III - 72% did not have pain, 28% teeth had mild pain, 4% teeth showed a reduction in pain whereas 28% teeth showed no reduction in pain compared to 1st day. On 3rd day after obturation 76% teeth were reported free of pain. 18.7% teeth had mild pain and 5.3% teeth had moderate pain. In Group I - 76% did not have pain, 12% teeth had mild pain and 12% moderate pain. 16% teeth did not have a reduction in pain whereas pain was reduced in 28% teeth compared with 1st day. In Group II - 76% did not have pain, 20% teeth had mild pain and 4% moderate pain. 48% teeth showed a reduction in pain and 16% teeth showed no reduction in pain compared with the 1st day. In Group III - 76% did not have pain, 24% had mild pain. 12% teeth showed no reduction in pain, whereas 20% teeth did not show any

decrease in pain compared to 1st day.

One week post-obturation, 93.3% teeth were free of pain and 6.7% had mild pain (2 in Group I and 3 in Group III). In Group I - 92% did not have pain 8% had mild pain. 8% teeth showed a reduction in pain compared to 1st day. In Group II - None of the teeth had pain. In Group III - 88% did not have pain, 12% had mild pain. 12% did not show any reduction in pain 20% teeth the pain was reduced to score 0.

Two weeks post-obturation, 94.7% teeth had no pain and 5.3% teeth had mild pain. In Group I - None of the teeth had pain. Group II - None of the teeth had pain. Group III - 84% teeth did not have pain, 16% had mild pain 12% teeth did not show any reduction in pain when compared to 1st day mild pain developed in asymptomatic teeth.

There was no difference in pain amongst both males and females. Results showed that the patients with vital teeth had the highest incidence of post operative pain (60%), while in the patients with non vital teeth without radiolucency, incidence of post-operative pain was 68%. Patients who had non vital teeth with periapical radiolucency showed 32% incidence of post operative pain.

Waskiewicz A L et al (2014)¹⁸ conducted a study amongst 302 patients undergoing root canal treatment. Follow up was done for all the patients regarding pain after root canal treatment. If they responded yes, they were asked about the intensity of pain. Different parameters were considered for evaluating post operative pain. Results showed that 30.8% patients reported with post operative pain, while 69.20% did not feel any pain.

Edionwe JI et al (2014)¹ evaluated 45 patients for postoperative pain, who had the following presentation - pre operative pain, tenderness on percussion, periapical radiolucency, irreversible pulpitis etc. All the patients were treated with single sitting root canal treatment. Post operative pain was evaluated at 1 day, 1 week, 1 month, 3 months and 6 months. The incidence of pain was reported highest on Day 1 (51.1%), which reduced after 1 week (15.5%) and became 0 after 6 months.

Neelkantan P & Shama S (2015)⁶ conducted a study on 1248 patients who were diagnosed with symptomatic irreversible pulpitis with symptomatic apical periodontitis. Patients were treated using two different root canal instrumentation techniques (rotary and reciprocating). Patients were divided in two groups, Group 1 was treated using RECIPROC system and Group 2 with One Shape.

Post-operative pain was evaluated using self-administered questionnaire along with modified Visual Analogue Scale. There was significant difference in the incidence of *postoperative pain* between the two groups ($P = 0.001$). The number of patients who had no pain in the RECIPROC and OneShape group were 507 and 462, respectively. However, for patients who had pain (98 in the RECIPROC group and 143 in the One Shape group), the intensity showed significant difference, with patients in the OneShape group (40.5 % of the patients having

pain) reporting more values of “severe” pain on the VAS scale compared to the RECIPROC group ($P=0.001$). The same 40.5% patients (58 out of 143 patients) also reported having taken analgesics, and this was significantly higher than the percentage of patients in the RECIPROC group (19 out of 98 patients; 19.3%) ($P=0.001$). The percentage of patients having mild, moderate, and severe pain in the RECIPROC group was 71.4%, 19.3%, and 9.18%, respectively, whereas the intensity of pain in the One Shape group was 22.3% mild, 37.1% moderate, and 40.5% severe. There was significant difference in the number of patients who had mild ($P < 0.001$), moderate ($P < 0.002$), and severe ($P < 0.001$) pain between the two groups.

Disregarding the severity of pain, the mean duration of pain in the RECIPROC and OneShape group was 1.37 ± 0.85 and 1.61 ± 1.23 days, and hence, there was no significant difference between the two groups in duration of pain ($P = 0.074$). However, when duration was related to the severity of pain, there was no significant difference in the duration of postoperative pain between the two groups when the pain was mild ($P = 0.301$), but One Shape showed significantly longer duration of moderate ($P = 0.001$) and severe pain ($P = 0.002$). Of the 98 patients, only 6 patients reported severe pain longer than two days in the RECIPROC group.

The incidence of post operative pain with RECIPROC system was 71.4% (mild) while in Rotary system 40.5% patients reported with severe post-operative pain. The authors concluded that the use of RECIPROC instrumentation showed significantly less intensity and longer duration of moderate and severe post-treatment pain as compared to the single-file rotary system (One Shape) in patients with symptomatic irreversible pulpitis with apical periodontitis.

In this systematic review 13 studies from year 2000 to 2017 were included, which were evaluating the post operative pain. Out of the 13 studies, 5 studies evaluated post operative pain after single visit root canal treatment, 3 studies compared the single visit treatment with multiple visits, 1 study compared two drugs to control post operative pain, 1 study compared two different techniques used to prepare root canals, 1 study compared 3 different types of files used to prepare the root canals, and 1 study did not mention any criteria for evaluating post operative pain.

Post operative pain was mostly evaluated after 24 hours in studies included in this systematic review, either using self administered questionnaire, Visual analogue scale or both.

Most of the studies showed that incidence of post operative pain was more in multiple visit root canal treatment as compared to single visit root canal treatment. Factors such as gender, age and anatomy of teeth, periapical radiolucency and pre operative pain influences the incidence of post operative pain.

LIMITATIONS:

Compelling evidence indicating a significantly different prevalence of postoperative pain/flare-up of either single-

or multiple-visit root canal treatment is lacking. The low level of agreement among studies reflects the widely varying measures of pain severity, differences in treatment protocols and patient selection, as well as variability in treatment effects.

CONCLUSIONS :

1. From the results of this study and scientific literature, it is clearly evident that multi visit endodontics does not reduce the incidence of pain.
2. Both reciprocating single- file or rotary-file system generate apical extrusion of debris. The inflammatory reaction i.e. pain is not influenced by the number of files, but the type of movement and instrument design.
3. One should carefully evaluate the case before making the decision for single visit or multi visit root canal treatment.

FUTURE IMPLICATIONS :

Preoperative pain has been established as a major determinant (prognostic factor) of postoperative pain or flare-up (Torabinejad et al. 1988, Walton & Fouad 1992, Mattscheck et al. 2001).

This systematic review should be recorded in future studies and the outcome measure should be reported in relation to improvement or deterioration rather than mere prevalence of postoperative pain. Sample size selection and power of a study are fundamental and should be addressed at the design stage of any clinical study. However, despite the shortcomings among the studies included, there is a need for conducting further studies with standardized protocols in root canal treatment.

REFERENCES:-

1. Edionwe JI, Shaba OP, Umesi DC. Single visit root canal treatment: a prospective study. Niger J Clin Pract. 2014 May-Jun;17(3):276-81.
2. Abdalla AH H Elmubarak. Post operative pain in Single and Multiple-visits root canal treatment. J Endod. 2010 Jan;36(1):36-9.
3. Sipavičiūtė E, Manelienė R. Pain and flare-up after endodontic treatment procedures. Stomatologija. 2014;16(1):25-30.
4. Tsesis I, Faivishevsky V, Fuss Z, Zukerman O. Flare-ups after endodontic treatment: a meta-analysis of literature. J Endod. 2008 Oct;34(10):1177-81.
5. Singh S, Garg A. Incidence of post-operative pain after single visit and multiple visit root canal treatment: A randomized controlled trial. J Conserv Dent. 2012 Oct;15(4):323-7.
6. Neelakantan P, Sharma S. Pain after single-visit root canal treatment with two single-file systems based on different kinematics--a prospective randomized multicenter clinical study. Clin Oral Investig. 2015 Dec;19(9):2211-7.
7. Chan D. single visit endodontic treatment in the management of pulpal disease. J Dent Res Rev 2016; 3:2
8. Sathorn, C. Effectiveness and efficiency: systematic reflections on single- and multiple-visit root canal treatment. PhD thesis, Faculty of Medicine, Dentistry & Health

- Sciences, Dental Science, The University of Melbourne. 2008: 1- 229
9. Netto de souza M, Saavedra F, Júnior JS, Machdo R, Silva E J N L, Vansan LP. Endodontists perceptions of single and multiple visit root canal treatment : a survey in Florianópolis- Brazil. RSBO. 2014. Jan- Mar;11(1): 13-8
 10. Albashaireh ZSM, Alnegrish AS. Postobturation pain after single- and multiple-visit endodontic therapy. A prospective study. J Dentistry 1998; 26: 227-232
 11. Tarik M, Al-Jabreen. Single visit endodontics: In cadence of post-operative pain after instrumentation with three different techniques:An objective evaluation study. Saudi Dent J. 2002 Sept-Dec; 14(3) : 136- 139
 12. Malhotra N, Mala K, Reddy S, Singh P, Acharya S, Shenoy R. Incidence of post-operative pain following single visit endodontic therapy in single- and multiple rooted teeth. Malays Dent J. 2010. July- Dec; 31 (2): 71-77.
 13. Laurindo, F.V. & Matos Neto, M & Villela, A.M. & Pithon, MM.. (2011). Incidence of flare-ups in endodontic treatments performed in necrotic teeth in a single and in multiple sessions. Dental Press Endodontics;1: 57-63.
 14. Jabeen S, Khurshiduzzaman M. A Study of Post Obturation Pain Following Single Visit Root Canal Treatment. Chattagram Maa-O-Shishu Hospi Med Col J. 2013 Sept; 12(3): 16-19.
 15. Krishnaprasada L,Nambiar JM. A Comparative evaluation of the Efficacy of two oral medication on post operative pain following single visit root canal therapy – An in vivo study. IOSR-JDMS.2013 Mar - Apr; 5(2): 01-04.
 16. Ali SG, Mulay S, Palekar A, Sejjal D, Joshi A, Gufran H. Prevalence of and factors affecting post-obturation pain following single visit root canal treatment in Indian population: A prospective, randomized clinical trial. Contemp Clin Dent. 2012 Oct;3(4):459-63
 17. Bhagwat S, Mehta D. Incidence of post-operative pain following single visit endodontics in vital and non-vital teeth: An in vivo study. Contemp Clin Dent. 2013 Jul;4(3):295-302
 18. Waskiewicz A L, Baldissarelli F, Solda C, Hartmann M S M< Fornar V J. evaluation of postoperative pain in endodontically treated teeth. RSBO. 2014 Jul-Sep; 11(3): 265-9

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