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Evaluation of Root Canal Treatment in Human Molar Teeth By Single Or Multiple Visits: A Clinical Study

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Abstract:
The study was conducted to evaluate the endodontic treatment in human molar teeth by single or multiple visit using various intracanal medicaments.The patients will be divided into two groups, i.e. (Group1) single visit group, (Group 2) multiple visit with intacanal medicament. Group 2 was again sub divided into 4 sub groups according to the use of different intracanal medicaments– calcium hydroxide, calcium hydroxide + chlorhexidine 2%, triple antibiotic paste(1part ciprofloxacin, 3parts of metronidazole and minocycline), turmeric (200gm dried turmeric powder in 500ml distilled water to make paste). The subjects were followed up in recall appointments for clinical signs and symptoms including pain, tenderness to percussion, sinus tract, mobility, abscess, swelling, apical healing, clinical attatchment & radiographic evaluation. The statistical analysis was done by one way anova test. The result showed single visit endodontics is better than multiple visit endodontics. Triple antibiotic paste and turmeric is better than calcium hydroxide only and calcium hydroxide & chlorhexidine combination. How ever calcium hydroxide & chlorhexidine combination showed better results than calcium hydroxide only

Key words: *Root canal treatment, Single visit, Multiple visit, Intracanal medicaments, Triple endodontic paste, Calcium hydroxide, Turmeric*

Clinical Significance: Turmeric and triple antibiotic paste can be used as intracanal medicament in root canal treatment

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I. Introduction

Root canal treatment or endodontic treatment, is a common procedure in dentistry. The main indications for root canal treatment are irreversible pulpitis and necrosis of the dental pulp caused by carious processes, cracked or chipped tooth or dental trauma. The main goal of root canal treatment is to avoid apical periodontitis, inflammation in the periradicular tissues and to obtain success in terms of prevention and healing of endodontic diseases, leading to the preservation of natural tooth.[1] Root canal treatment is a procedure performed to remove organic tissue and pathologic bacteria from the root canal system by means of mechanical instrumentation associated with irrigation. After cleaning and drying, the space in the root canal is filled with gutta percha which is a rubber based material. Different procedure can be employed, depending upon the biological condition of the tooth being treated, its pathological conditions, clinician expertise, instrument availability and patient preference. Root canal treatment can be done using two approaches: single visit or multiple visits. A one visit root canal treatment is attractive to a patient because it saves time and would probably reduce the cost of the procedure. Furthermore, the problems of inter visit leakage, loss of temporary seal, or any of the accidents that can occur between the visits are solved. Perhaps the most important advantage is the prevention of root canal contamination and/or bacterial regrowth that can occur when the treatment is prolonged over an extended period. In single sitting the entire procedure is completed, the access opening, cleaning, shaping and obturation is done in one visit.[2] In multiple visit, the treatment is performed with intracanal medicaments between the root canal preparation and obturation, which mainly aims to reduce or eliminate micro-organisms and their by-products from the root canal system before obturation.[3] Multiple visit root canal treatment is well accepted as a safe and common therapy. Bacteria and their products are considered

to be the primary etiological agents of pulpal necrosis and periapical lesions.[4] The main aim of root canal treatment is to eliminate the bacteria from an infected root canal and prevent reinfection. The remaining bacteria may multiply between appointments often reaching the same level that was observed at the beginning of treatment, in cases where the canal is not dressed with an antimicrobial agent between visits. Thus, the use of an effective intracanal medication may assist in the disinfection of the root canal system. . After all the infected and necrotic pulp tissue is removed, the root canal is disinfected, enlarged and shaped to allow optimal root canal filling.[5] However, with the use of conventional chemomechanical technique of root canal treatment preparation, neither the removal of soft tissue is complete nor does the elimination of bacteria seem to be sufficient. Hence, the use of intracanal medicaments has been advocated to further reduce the number of microorganisms. Intracanal medicament has almost became a panacea in multibacterial infections of root canals.

II. Materials And Methods

The aim of the study was to compare the outcome of single visit root canal and multiple visit root canal using different intra canal medicaments. The patients requiring root canal treatment were selected.
The patients were divided into groups, i.e.single visit group (Group 1), multiple visit with intacanal medicament (Group2).

Group 1: Single visit treatment

Single visit treatment is an approach where in access opening, cleaning and shaping with intermittent irrigation and obturation is done in a single visit. Inclusion criteria was : Positive patient acceptance, sufficient time to complete procedure, Absence of acute symptoms requiring drainage, absence of anatomic obstacles and procedural difficulties. Exclusion criteria was : Teeth with anatomic anomalies e.g. calcified and curved canals, Patients with allergies, Acute alveolar abscess cases with pus discharge, Patients who were unable to keep mouth open for long duration e,g TMJ disorders, Systemic diseases, Immune-compromised, Tooth antibiotics or corticosteroids within the previous three months

Group 2: Multiple visit treatment

Multiple visit treatment is a safer and more commonly accepted method of root canal treatment. Multiple visit endodontic treatment was performed in the same sequence of events as that of single visit but were carried out in 3-4 appointments to help reduce chances of error and infection. Instrumentation was completed at the first appointment. Intra canal medicaments was placed. At the second appointment the medicament was removed and irrigation was done. The canal were dried with sterile paper points and obturation was done followed by post endodontic restoration. Selection criteria for multiple visit treatment**:**Allow time for lessening of symptoms such as pain, Tooth with doubtful prognosis can be easily assessed, Positive effects if the intra canal medicaments were used during appointments, Patient or doctor time constrains.
Patients were divided into 4 sub groups according to the use of different intra canal medicaments in multiple visits. The groups were further sub divided into:
SubGroup 1 – calcium hydroxide
SubGroup 2 – calcium hydroxide + chlorhexidine 2%
SubGroup 3 – triple antibiotic paste (1part ciprofloxacin, 3parts of metronidazole and minocycline)
SubGroup 4 – turmeric (200gm dried turmeric powder in 500ml distilled water to make paste).
The subjects were followed in recall appointments for clinical signs and symptoms including pain, tenderness to percussion, sinus tract, mobility and abscess.
Evaluation were made of the radiographic findings.
Finally, coronal portion was sealed with intermediate restorative material and subjected to a radiographic examination to confirm the adequate obturation. Patients were recalled for clinical evaluation of pain, tenderness and swelling. The radiographic parameters were studied for follow- up visits for any change in periapical area.
The subjects i,e (groups) were asked about their experience of post – operative pain and to rate it as:-
Pain was recorded as none, slight, moderate or severe:

- No pain: the treated tooth felt normal. Patients don't have any pain.
- Mild pain: recognizable, but not discomforting, pain which does not required analgesics.
- Moderate pain: discomforting, but bearable, pain were relieving if analgesics is used.
- Severe pain: difficult to bear, pain have or not effect in relieving on analgesics.

Tenderness was recorded as mild, moderate and severe.

Tenderness (subjective) graded as follows	
No tenderness	Normal response for even heavy blow
Mild	Painful for heavy blow from metal instrument handle
Moderate	Painful for a light blow with a metal instrument handle

Severe	Painful even on light finger pressure

Mobility

Mobility was recorded as grade I, grade II, grade III.

Grade I	Distinguishable sign of tooth movement more than normal
Grade II	Horizontal tooth movement not more than 1mm
Grade III	Movement of tooth more than 1mm or when tooth can be depressed.

Evaluation parameters

Baseline parameters were recorded before the initiation of endodontic treatment. Clinical attachment level (CAL), probing depth (PD), and bleeding on probing (BOP) were noted at 6 sites per tooth (mesiobuccal, midbuccal, distobuccal, mesiolingual, mid-lingual and distolingual sites of the tooth) using a calibrated 15 -mm periodontal probe.

Radiographic assessment

Radiographic evaluation was done using the PAI scoring system taken by Orstavik in 1986. This is a 5- point scale radiographic interpretation design to determine the absence, presence, or transformation of a disease state. The table below represent the description of PAI score.

PAI score	Description of radiographic findings
1	Normal periapical structures
2	Small changes in bone structures
3	Change in bone structure with mineral loss
4	Periodontitis with well-defined radiolucent area
5	Severe periodontitis with exacerbating features

The periapical status was assessed using the periapical index (PAI) score and the level of alveolar bone at the proximal root surface was measured with the Image software. Using the software, a parallel straight line to the root surface was drawn over the digital image to measure the distance between cementoenamel junction and the most coronal bone level, at which the width of the periodontal ligament space was considered normal at both mesial and distal surfaces of the tooth. Alveolar bone level and the PAI score were assessed at baseline and at 6-month follow-up.

CRITERIA OF RESULT:

The criteria regarding the endodontic treatment results was the following:

1) At least 1year completion of endodontic treatment success was presented by:
a) Total absence of specific clinical symptoms (pain, swelling, fistula)
b) Tooth was functional
c) Radiological image lacks any pathological elements
2) Failure was represented by occurrence of periapical lesions or preexisting one increased in volume.

STATISTICAL ANALYSIS

The data for the present study was entered in the Microsoft Excel 2007 and analyzed using the SPSS statistical software 19.0 Version. The descriptive statistics included mean, standard deviation. The level of the significance for the present study was fixed at 5%.

The intergroup comparison for the difference of scores between independent groups was done using the unpaired/independent t test, One Way ANOVA and Chi Square test.

III. Results

There was no statistically difference in group I and group II. There was no statistically difference in group III and group IV. There was statistically significant difference in group I and group III. There was statistically significant difference in group I and group IV. There was statistically significant difference in group II and group III. There was statistically significant difference in group II and group IV. There was statistically significant difference in between single visit endodontics and multiple visit endodontics.

This result showed single visit endodontics was better than multiple visit endodontics. Triple antibiotic paste and turmeric was better than calcium hydroxide only and calcium hydroxide & chlorhexidine combination. However calcium hydroxide and chlorhexidine combination showed better results than calcium hydroxide only.

IV. Discussion

The primary goal of endodontic treatment is to relieve acute pain and get rid of infection. The criterias are following in treatment evaluation to achieve success:

a) The affected tooth is asymptomatic, functional and firm in its alveolus.
b) Soft tissue appears normal and responds normal and responds normally to manual examination.
c) Radiographs reveal a normal lamina dura.

For failure

a) Affected tooth is symptomatic or has an abnormal appearance
b) Soft tissue responds abnormally to manual examination
c) Radiographs reveal that a lesion has not resolved, a lesion appears subsequent to endodontic treatment or pre existing lesion increases in size.

Hence, this study was done to compare the success rate between single-visit and multiple- visit endodontics in human molars using clinical and radiographic parameters like pain, tenderness, swelling, mobility, clinical attachment, apical healing and radiographic assessment. Out come and complications are the most important factors to be considered when making treatment plans.[6] Numerous studies evaluating the effectiveness and post treatment of pain of single verses multiple appointment root canal treatment have been done, which reported no significant differences in effectiveness.[7,8]

The single visit endodontic treatment has started to become popular because of convenience of patients, inadequate time, difficulty with negotiation, difficulty to continue in other visit. Some published studies reported single visit to be as successful as multiple visits and show no difference in treatment complications and no difference in pain perception of individuals, whether treated in single visit or in multiple visits. However some studies in the past concluded that the number of treatment visits also has a significant effect in post-operative pain due to the high risk of inter- appointment microbial leakage through temporary restorations. The post obturation pain in single visit treatment group was more significant that in multiple visit treatment group.[9,10]

Elimination of bacteria from the root canal is the most important factor for the success of periapical lesions. The role of intracanal medicament cannot be underestimated in the eradication of bacteria associated with persistent infections. Intra canal medicaments helps in reducing the remaining bacteria from the root canal and prevent re-infection.

The success rate and prevalence of postoperative pain of single visit or multiple visit had no significant difference. The chair side time for single visit was shorter than multiple visit treatment.The single visit RCT was as successful as multiple visit RCT in teeth with vital as well as in teeth with nonvital pulp associated with or without periapical radiolucencies.[7] Based on the current best available evidence single visit RCT appeared to be slightly more effective than multiple visits.

The use of intacanal medications becomes mandatory in endodontics as many non-vital and abscessed teeth lack blood circulation. As a result of this, systemic antibiotics fail to reach the site of infection and hence such infections cannot be treated. To date, calcium hydroxide has been considered as a gold standard for optimal disinfection of root canals. Calcium hydroxide is known for its efficiency in eliminating both aerobic and anaerobic bacteria by its ionic dissociation into Ca^{+} and OH^{-} ions and for its cytotoxic effect by consequent change in the organic component and in nutrient transport.

Chlorhexidine in combination with calcium hydroxide showed antibacterial properties similar to that of chlorhexideine alone. This might be due to the high ph, suggesting an increase of the ionized capacity of chlorhexidine molecule. In cases of resistant bacteria and their by products are likely to cause lack of healing. Healing rate is increase when intracanal medicament calcium hydroxide was used, combination of chlorhexidine and calcium hydroxide showed higher antibacterial efficacy in comparision to that of calcium hydroxide alone. Periodontal healing, reduction in pocket depth, bleeding on probing sites with gain attatchment level were observed. Chorhexidine is a cationic bisbiguanide, which is active against gram positive and gram negative bacteria, bacterial spores, lipophilic virus, yeast, and dermatophytes, being bacteriostatic at low concentrations and bactericidal at high concentrations, CHX crosses the cell wall, presumably by passive diffusion, and subsequently attacks the cytoplasmic membrane. It is found to be a potent antimicrobial agent that is particularly effective against E.facalis. The property of substantivity exhibited by CHX is what imparts its long term antimicrobial effect.

Triple antibiotic paste consists of ciprofloxacin, metronidazole, and minocycline. It has been shown that this combination of drugs can kill any bacteria in the carious lesions, necrotic pulp, infected root dentin, and periapical lesions. Even in the present case, there was a remarkable reduction in the symptoms after the use of triple antibiotic paste. The swelling did not recur and no pus discharge was observed.

Various authors have shown the anti-microbial activity of C. longa against an array of pathogens. In some study, it was found that C. longa – turmeric (T2-20%) with a wide range of therapeutic action being anti-inflammatory, antibacterial, and antifungal showed highest zones of microbial inhibition ranging from 21 mm to 23 mm. The mechanism of action was predominantly on the cell membrane by disrupting its structure, blocking

membrane synthesis, and inhibition of cellular respiration thereby causing cell leakage and cell death. Various studies depicting the results of using intracanal medicaments in single and multiple visit root canal treatment are following.

The success rate and the amount of post-operative complications depend on the selection criteria and the patients condition. They depend on the skill set of the clinician and the preparation techniques. The success rate and prevalence of post-operative pain of single visit or multiple visit treatment had no significant difference.

Sharma S et al concluded that there was no difference in the incidence of postoperative pain between vital and non-vital teeth. Majority of the patient reported no or only mild pain and the no of visit doesn't have any impact on the amount of pain. However it is suggested that the number of visit should be less, it minimize the patient discomfort.[6]

Gill GS et al concluded that after 1 year evaluation, no difference in periapical healing was found between single visit treatment and multiple visit treatment groups with the given sample size.[4]

Prashanth MB et al observed on strict adherence to biological principles and proper case selection, no significant difference in the success, post-operative pain and tenderness exist when treated with either single visit or multiple visit therapy.[1]

Baghdadi WA et al concluded that post-operative pain is likely to occur in the first 24hrs and it further reduces as time passes. The intensity of post-operative pain experience following in single visit or multiple visits RCT were not significantly different.[8]

Dorasani G et al concluded that within the limitations of the study, there was no statistically significant difference in radiographic evidence of periapical healing between one visit and two visit group at 12 months follow up. Both groups exhibited a statistically decrease in PAI scores from baseline to 12 months evaluation. Both groups showed improved healing in almost similar percentage of teeth at the end of 12 months.[2]

Al – Manei KK concluded that within the limitations of the study, multiple visit was not associated with a better quality of root canal treatment compared to multiple visit treatment.[9]

Patil AA et al concluded that the incidence of pain after endodontic treatment being performed in one visit or two visit in not significantly different.[5]

Gill GS et al concluded that after 1 year evaluation, no difference in periapical healing was found between single visit treatment and multiple visit treatment gropus.[4]

Uyan HM et al concluded that the present findings revealed that using an antimicrobial intra canal dressing remains a recommended method for eliminating post-operative pain after retreatment cases. The used of TAP and Ca(OH)2 are effective for reducing post-operative pain after retreatment.[10]

Chlorhexidine and its prepartions are more potent antibacterial agents against E. faecalis in comparison to calcium hydroxide[8]. 2% CHX gel showed substantial antimicrobial activity against E. faecalis. The combination of calcium hydroxide and 2% CHX gel also showed good antimicrobial activity. Hence, the efficacy of 2% CHX gel was greater than its combination with calcium hydroxide. The least effective drug against the microbes was metronidazole.

The chlorhexidine gel showed the maximum antimicrobial activity against E. faecalis, whereas calcium hydroxide showed the least. Among the natural intracanal medicaments, M. citrifolia gel consistently exhibited good inhibition up to the 5th day followed by aloe vera gel and papain gel. The endontic treatment before periodontal therapy results in attachment gain. Intracanal medicaments may not affect the healing of concurrent endodontic- periodontal lesions without communication. When the most commonly used medicament fail to eliminate the symptoms, then a triple antibiotic paste can be used as an alternative material. The peri radicular lesion in all three cases was large but showed progressive healing after using a triple antibiotic paste in the canal. Every effort should be made to treat such lesions irrespective of size by a nonsurgical endodontic treatment method.

The major advantages of using natural alternatives are easy availability, cost- effectiveness, increased shelf life, low toxicity and lack of microbial resistance reported so far. Herbal agents have been used in dentistry for reducing inflammation, as antimicrobial plaque agents, antiseptics, antioxidants, antimicrobials, antifungals, antibacterials, antivirals, and analgesics. They also aid in healing and are effective in controlling microbial plaque in gingivitis and periodontitis and thereby improving immunity. Though the in vitro results appear promising, many clinical trials are warranted to evaluate biocompatibility and safety factor before they can be recommended for clinical use conclusively.The herbal medicines seemed to be effective against E. faecalis compared to 2% chlorhexidine gluconate. Kumar H study concluded that C. longa can be used as intracanal medicament in endodontic failure cases.[3]

V. Conclusion

The result show single visit endodontics was better than multiple visit endodontics. Triple antibiotic paste and turmeric was better than calcium hydroxide only and calcium hydroxide & chlorhexidine combination. However calcium hydroxide and chlorhexidine combination showed better results than calcium hydroxide only.

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