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ORIGINAL RESEARCH

Comparative Evaluation of Efficacy of Calcium Hydroxide, 2 % Chlorhexidine Gel, Propolis and Triple Antibiotic Paste as Intracanal Medicaments in Treatment of Apical Periodontitis: An In – Vivo Study

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ABSTRACT:

Introduction- In this study teeth with apical periodontitis underwent non surgical endodontic treatment. **Method-** Forty patients with permanent maxillary and mandibular anterior teeth with primary apical periodontitis with periapical index of 4 or 5 were selected. The patients were divided into four groups, depending on the type of intracanal medicament that is calcium hydroxide, TAP, Chlorhexidine gel and Propolis. Each case was treated in four weekly appointments with change of intracanal medicament. The patients were called for follow-up at 3, 6, 9, and 12 months. Radiographs were taken and observed and healing was judged by the periapical index (PAI). **Results-** At the end of 6 months teeth treated with TAP showed significantly enhanced healing, followed by calcium hydroxide. At end of 9 months triple antibiotic paste showed statistically significant difference in healing than with chlorhexidine and propolis. **Conclusion-** All inflammatory periapical lesions should be initially treated non surgically to eradicate the root canal microbes.

Key words- Primary apical periodontitis, periapical index, intracanal medicament.

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INTRODUCTION

Apical periodontitis is a sequel to endodontic infection and manifests itself as the host defense response to microbial challenge emanating from the root canal system that results in local inflammation, resorption of hard tissues, destruction of other periapical tissues, and eventual formation of various histopathological categories of apical periodontitis, commonly referred to as periapical lesions. There is a clear consensus on the essential etiological role of intraradicular micro-organisms in apical periodontitis.¹

All inflammatory periapical lesions should be initially treated with conservative nonsurgical procedures.² Surgical intervention is recommended only after nonsurgical techniques have failed. A high percentage of 94.4% of complete and partial healing of periapical

lesions following nonsurgical endodontic therapy has also been reported.³

The treatment of the disease consists of eradicating the root canal microbes or substantially reducing the microbial load and preventing re-infection by root canal filling to treat apical periodontitis. Mechanical instrumentation plays an important role in removing microorganism from root canal system. Mechanical cleaning of root canal aided by chemical disinfection technique are two key elements that help in reducing bacterial load of root canal. Intracanal medicaments are useful for elimination of micro-organisms, rendering canal contents inert, controlling persistent periapical abscesses, preventing or controlling post-treatment pain and enhancing anaesthesia.⁴

The ideal root canal medicament should have the following properties: Anti-bacterial, anti-inflammatory,

ability to stimulate hard tissue repair, ability to prevent or reduce pain, non-irritant to the periapical and periodontal tissue, ability to diffuse through dentine, quick acting initially, long lasting, effective in the presence of pus and organic tissue, water soluble, practical to use, non-staining to the tooth and soft tissues, inexpensive, a long shelf-life.⁵

This study compared healing of periapical lesions with evident bone loss associated with primary apical periodontitis in anterior maxillary and mandibular teeth using four different intracanal medicaments (Calcium hydroxide, Chlorhexidine gel 2%, Propolis and Triple antibiotic paste) treated non-surgically.

MATERIAL AND METHOD

Patient Selection

Patients presenting to the Department of Conservative Dentistry and Endodontics, Himachal Pradesh Government dental College and Hospital, Shimla diagnosed with primary periapical periodontitis between January 2017 and December 2017 were included in the study.

Inclusion Criteria- Permanent maxillary and mandibular anterior teeth with necrotic pulp as determined by electric pulp test and with periapical lesion of at least 5 mm (primary apical periodontitis).

Exclusion criteria: Presence of any kind of pathosis associated with vertical root fracture; perforation, inflammatory root resorption, moderate to severe periodontal bone loss, diameter of bone defect more than 30mm and teeth with post treatment disease.

These patients were treated non-surgically in multiple visits using different intracanal medicaments.

All periapical radiographs were exposed to 70kvp voltage using film holder and exposed for 0.7 mA for 1.2 seconds and processed in an automated processor.

Each radiograph was observed and PAI (Peri Apical Index) score was recorded.

40 patients with primary apical periodontitis were included in this study. They were randomly divided into 4 groups. Randomization during subject selection was performed by the "block method." Each group contained 10 patients depending on the type of intracanal medicament used.

Group 1 Triple antibiotic paste (TAP)

Group 2 Calcium hydroxide (Prevestdenpro)

Group 3 Chlorhexidine gel (2%) (Cerkamed)

Group 4 Propolis

TAP was prepared by removing the coating and crushing the tablets of ciprofloxacin, metronidazole, and minocycline separately using a mortar and pestle to obtain a fine powder. The powders obtained were weighed separately and mixed in a 1:1:1 proportion to obtain triple antibiotic mixture.

A total of 100 mg of this triple antibiotic mixture was dispensed and mixed with one drop of propylene glycol to get a thick paste-like consistency to prepare TAP.

A total of 100 mg of calcium hydroxide powder was dispensed and mixed with one drop of propylene glycol on a clean and dry glass slab to prepare a thick paste-like consistency.

Ethanollic extracts of commercially available propolis was used.

Treatment Procedure

First Appointment

Access to pulp chamber was made using high speed hand piece under copious irrigation after rubber dam isolation. Canal was negotiated with #10 file K- file. Working length was confirmed radiographically. Preparation of root canal was carried out using Protaper Gold rotary file system (Densply) upto F3 for maxillary anteriors and F2 for mandibular anteriors. Preparation was done under constant irrigation with sodium hypochlorite using side vented needles. Final rinse was done with 5ml of 17 % EDTA followed by normal saline. The canal was then dried with paper points before placement of intracanal medicament with lentulospirals. Access cavity was then restored with temporary filling material.

Second Appointment

After rubber dam isolation the temporary restoration was removed to gain access into the root canal. The intracanal medicament placed during the first appointment was removed with master apical file followed by irrigation with 20 ml sodium hypochlorite. Followed by final rinse the canal was then dried and intracanal medicament placed.

Third Appointment

Same as the second appointment

Fourth Appointment

The teeth were obturated. The access cavity was restored with composite and an immediate post operative radiograph would be taken.

The patients were recalled for follow-up at 3 months, 6 months, 9 months and 12 months for examination of the tooth both clinically and radiographically.

Healing of the periapical lesion was judged on the basis of clinical and radiographic findings recorded at the follow up visits by comparison of the PAI values.

Statistical Analysis

Data was entered in microsoft excel spread sheet, corrected for errors if any and analysed using epi-info software, version 7.0

Qualitative variables were presented as percentages and proportions chi-square test was used for comparison of outcome among experimental groups. A two sided p-value of less than 0.05 was taken as statistically significant

RESULTS

At the end of three months none of the peri-apical lesion treated with various intracanal medicaments showed signs of radiographic healing however they remained asymptomatic. The PAI values were recorded to be either four or three. At the end of 6 months teeth treated with TAP (60 % healing) showed significantly enhanced healing, followed by calcium hydroxide (50 % healing). Healing with, chlorhexidine and propolis was found to be less. Healing with TAP was statistically significant then chlorhexidine and propolis (p 0.303). Healing difference with TAP and calcium hydroxide as intracanal medicaments was found to be statistically insignificant. At end of 9 months triple antibiotic paste showed statistically significant difference in healing with both chlorhexidine (p .0301) and propolis (.010). There was no statistical difference in healing between TAP (90 %) and calcium hydroxide (80%) and between calcium hydroxide and chlorhexidine. At the end of 12 month there was no statistically significant difference in healing between the different intracanal medicaments.



Figure 1: Radiographs of patient treated with triple antibiotic as intracanal medicament



Figure 2: Radiographs of case treated with calcium hydroxide as intracanal medicament

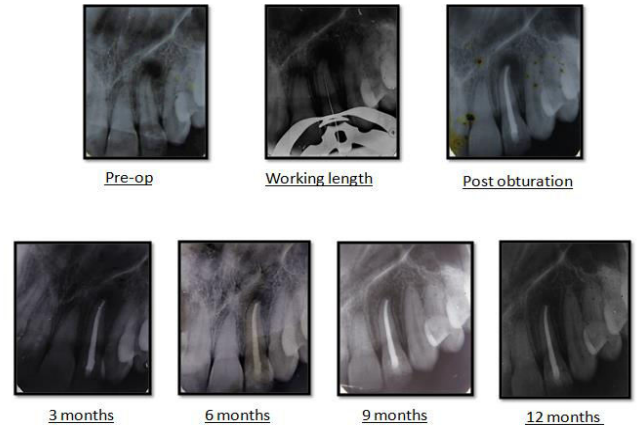


Figure 3: Radiographs of case treated with propolis as intracanal medicament

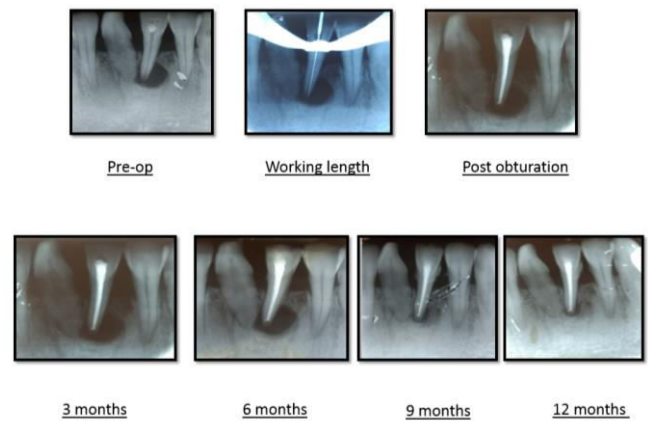


Figure 4: Radiographs of case treated with Chlorhexidine as intracanal medicament

DISCUSSION

Endodontic infection is essential to the progression and perpetuation of apical periodontitis. Law and Messer,⁶ stated that cleaning, shaping and irrigation are not capable of eliminating all the bacteria, the same conclusion was achieved in a meta-analysis by Sathorn et al.⁷ Therefore, intracanal medicaments are used to act against pathogens that resist and survive the biomechanical preparation of the main canals and especially microorganisms lodged inside dentinal tubules, secondary canals and accessory canals. The “block method.” Of randomisation created a balance in sample size and ensured equal treatment allocation within each block. Moreover to eliminate the “patient bias” the subjects were kept blinded. Lesion of the anterior segment of either jaw exhibits accelerated healing due to the proximity of the buccal and lingual plates so only anterior teeth were selected.⁸ Although age and gender have not been significantly associated with the potential for healing after nonsurgical endodontic treatment,⁹ the enrolled subjects were between 15 and 45 years of age with equal gender distribution (5 males and 5 females) in each group. Bio mechanical preparation in all the cases was performed with rotary Protaper Gold Rotary File System.

Barato-Filho (2009),¹⁰ observed that the cleaning ability of the apical instruments of the ProTaper™ system (F1, F2, and F3) was directly proportional to their diameter. So, to keep mechanical preparation standardized maxillary teeth were prepared to size F3 and mandibular teeth were prepared to F2 as the master apical files.

The number of appointments necessary to treat infected root canals is one of the most controversial issues in endodontics.¹¹ In order to reduce bias and predictably eliminate microorganisms from infected root canals and consequently to achieve a better outcome of the endodontic therapy, each case was treated in four weekly appointments with change of intracanal medicament every week followed by obturation and restoration in the final appointment.

On the basis of the average healing rate of approximately 3 mm²/month, a 30 mm² lesion will require 10 months for complete resolution.¹¹ Lesions upto 5 cm in size were chosen.

Azim et al,¹² in their study found the average healing time of 11.78 month is required this is similar to previous findings (Ørstavik 1996, Imura et al. 2007)^{13, 14} indicating that 1 year is perhaps the minimal time required for most cases before concluding a treatment outcome. Therefore in the present study a follow up period of one year was kept to evaluate healing.

The PAI scoring system is accepted as a valid tool to determine treatment outcome and to reveal changes in the extent and severity of periapical inflammation after root canal treatment.¹¹

In this study, the postoperative PAI scores were converted into a nominal scale by considering teeth with PAI score <3 i.e. 1 and 2 as healed and PAI score ≥3 i.e. 3, 4 and 5 as not healed.

In order to reach complex canal morphologies enhanced penetration is attained by means of intracanal medicaments used along with carriers or vehicles, for example, propylene glycol.¹⁵

In the present study at 3 month follow up period none of the patient in all the four treatment groups showed radiographic signs of healing. This lack of apparent healing as visible on conventional radiograph, is due to the fact the bone mineralization should be at least 40 percent before it can be detected in conventional radiograph.¹⁶

This difference in healing of tooth treated with Triple antibiotic paste and Calcium hydroxide over Chlorhexidine and Propolis may be explained on the basis of endodontic microbiology in primary apical periodontitis.

Conditions inside root canal are different in primary endodontic infection. Endogenous proteins and glycoprotein are the main nutrients in the root canal system of primary endodontic cases. Whereas facultative anaerobes (found in persistent infection that is post endodontic disease) have, their primary energy source from carbohydrates.

Hence the microbiota against which the intracanal medicaments were tested was generally of obligate anaerobe.

The high rate of healing with triple antibiotic paste can be explained due to metronidazole which has a wide bactericidal spectrum especially against obligate anaerobes. Certain bacteria are resistant to metronidazole; hence, ciprofloxacin and minocycline are added with it to achieve higher antimicrobial effect.

Since the infection of the root canal system is considered to be polymicrobial, a combination of drugs would be needed to treat the diverse flora. Thus, the recommended protocol combines the use of metronidazole, ciprofloxacin, and minocycline.

Madhubala MM et al.¹⁷ showed triple antibiotic paste having higher antibacterial effects than Chlorhexidine.

Yamaguchi et al,¹⁸ revealed that treatment with Chlorhexidine gluconate does not destroy the biofilms rather biofilms become more resistant to removal when they were treated with Chlorhexidine. Chlorhexidine binds to lipopolysaccharide in the Extracellular polymeric substances in the residual biofilms and increases their mechanical stability.

Thus lower healing with Chlorhexidine as compared to Triple antibiotic paste.

Victorino et al,¹⁹ observed that propolis showed good activity against aerobic bacteria, proving more effective than calcium hydroxide. This may account for lower antibacterial of propolis against pathogens responsible for primary apical periodontitis.

The selective activity of propolis mainly against gram positive bacteria explains the least number of healed cases.^{20, 21, 22, 23}

CONCLUSION

All inflammatory periapical lesions should be initially treated nonsurgically to eradicate the root canal microbes and intracanal medicaments play an important role in root canal disinfection.

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