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Preference Of Intracanal Medicaments Placed During Management Of Non-Vital Opex Apex

Research Article

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Abstract

Dental agony commonly requires interdisciplinary treatment planning for good prognosis. In order to prevent reinfection of the pulp canal space and medicaments for regenerative purposes, the coronal seal should have a perfect marginal adaptation. Calcium hydroxide (CH), Triple Antibiotic paste (TAP) and chlorhexidine (CHX), Mineral trioxide aggregate (MTA) and Biodentine are among the most popular sealing materials. These are commonly used in combination with antibiotic medicaments, to ensure disinfection. Thus, the aim of the study was to review the intracanal medicaments placed during the management of non-vital open apex. A retrospective study was carried out using digital records of 105 patients who reported to the Department of Paediatric and Preventive Dentistry and the Department of Endodontics from June 2019 to March 2020. A total of 55 patients were finally included for the study evaluation. The placement of intracanal medicaments during management of non-vital open apex were observed from the digital records and tabulated on a spreadsheet. The collected data was analysed by computer software SPSS version 21using chi-square test with the level of significance set at 5%. CH is placed as an intracanal medicament in the majority of the teeth treated by the dentists flowed by TAP and CHX. CH is the most preferred intracanal medicaments placed during management of non-vital open apex.

Keywords: Apexification; Calcium Hydroxide; Tooth Injuries; Open Apices.

Introduction

Dental agony may be considered a multifactorial health problem globally that periodically requires multidisciplinary treatment outlining [45, 11]. It arises most frequently in young patients, who commonly present with immature teeth (with open apex) [38]. Proper cleaning and shaping aids the irrigant to reach the apical third of the root during the irrigation process resulting in sterile root canal for obturation [25, 16, 43, 18, 19] Bacteria exhibits a dominant role in the commencement and breakthrough of pulp and periapical diseases, as conferred by many authors [29, 36, 8, 10] Bacteria also exhibits an extensive role in the advancement of apical periodontitis associated with root-filled teeth, despite studies have shown that the microflora alter in these teeth from that present when there has been pulp necrosis with infection [35, 62, 26]. In order to get rid of as many bacteria as possible from the integrated root canal system, a combination of mechanical instrumentation and irrigating solutions is used to eliminate or dissolve organic and inorganic debris, to destroy bacteria, to remove the smear layer and to retain dentine permeability [1] To assure complete eradication of root canal bacteria, an active antimicrobial agent in the root canal is needed for a predetermined time period to annihilate or destroy any halting bacteria [50, 60] Consequently, antimicrobial agents used as interappointment medicaments must be able to pass through the dental tissues in the existence of microbes to reach a sufficiently great concentration in order to eradicate the disease-causing bacteria in an anticipated manner [57, 46, 41] Medicaments are used as an aid to advance the predictability

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and prognosis of endodontic treatment. They are used in endodontic management [8, 10, 35, 6] in order to:

• Expulsion of apical exudate if it is present
• Avert or arrest inflammatory root resorption if it is present
• If the temporary or interim restoration breaks down, avert re-infection of the root canal system by acting as both a chemical and a physical barrier.

The residence of bacteria inside a root canal may not naturally lead to breakdown of treatment, but their absence will positively favour healing [32] Antimicrobial substances that have been used as root canal medicaments are CH, TAP and CHX. The conventional access to handle cases with open apex is the multi-visit apexification management with the use of CH as intracanal medicament [54]. The frequency of changes of CH from the root canal establishes a contentious topic as there are debates that recommend a single placement of this medicament is enough to accomplish anticipated outcomes [5], although others claim that multiple replacements of CH could edge to a more accelerated formation of a calcified tissue barrier [2]. The time needed for the calcified tissue barrier to form differs from 5 to 20 months [55] and seems to be altered by numerous factors such as opening of the apex, frequency of intracanal medication replacement, age of the patient and the presence of periapical radiolucency [34, 12, 31]. The antimicrobial action of CH is due to the release and diffusion of hydroxyl ions (OH-) resulting in a highly alkaline environment which is not conducive to the endurance of microorganisms. The rate of diffusion of hydroxyl ions is quiet slow due to the inherent buffering capacity of the dentine [35, 63, 49, 63]. Limitations of CH are the complications associated with eliminating it from the root canal walls and its effect on decreasing the setting times of zinc oxide-based root canal cements. Some cements have brittle consistencies when set and are granular in structure on contact with CH [3] Bacteria may exist within the areas of the root canal system that are not accessible to irrigants and to the mechanical cleaning processes within the canal. Hence, an antibiotic enclosed within an intracanal medicament must be able to diffuse into these areas to lower the number of viable bacteria. If such a reduction is achieved, an improved periapical healing response would be expected [36] TAP has shown promising antibacterial activity when used as intracanal medicament. Its initial composition was suggested by Hoshino et al, 1996 and it was produced by mixing minocycline, metronidazole and ciprofloxacin in combination with saline [24]. It has shown successful clinical results in regenerative treatments and canals with persistent and treatment-resistant infections. Clinicians have used this antibacterial paste for seven to 28 days [22, 56, 4, 56, 27] Although TAP is successful in elimination of microorganisms when used in a paste like consistency, coronal discoloration after its application has been commonly reported following regenerative treatments using TAP. This drawback negatively affects the success of these treatments particularly in the aesthetic zone despite the presence of other success criteria [40, 39, 28, 30]. Therefore, determining the accurate consistency seems to be clinically valuable.

CHX has a reasonably wide range of activity against aerobic and anaerobic organisms as well as Candida species. It is more effective at alkaline than at acid pH, and its action is inhibited by the presence of soaps and organic matter [13, 15] CHX at low concentrations will result in a bacteriostatic effect but at higher concentrations, it is bactericidal due to precipitation and/or coagulation of the cytoplasm which is probably caused by protein cross-linking [15]. The beneficial effect of CHX is due to its antibacterial, substantive properties and its ability to inhibit adherence of certain bacteria [20] When used as an intracanal medicament, CHX was more effective than calcium hydroxide in eliminating E. faecalis from inside dentinal tubules [23].

To our knowledge, no previous studies have investigated the intracanal medicaments with respect to pulpal pathology. Therefore, the present study was focused on intracanal medicaments with respect to pulpal pathosis such as pain, swelling and abscess for the management of immature teeth with non-vital open apex.

Materials And Methods

Study Design

In this retrospective study, data from 105 patients within Saveetha Dental College were collected from dental records. At data extraction, all information was anonymized and tabulated onto a spreadsheet. The study was commenced after approval from the Institutional Review Board.

To fulfil the inclusion criteria, patients between the age group of 12-20 years should have been provided with intracanal medicament, the medicament being placed on a mandibular first molar. Only one tooth per patient was included. Teeth managed for vital teeth with closed apex were excluded from the study.

Subjects and Procedures:

Data were collected from June 2019 to March 2020 for 55 patients provided altogether with 45 - CH, 6-TAP, 3 - CHX. The following data were retrieved from the dental records: patient age, gender, type of intracanal dressing and the endodontic status of the tooth (Vital or non-vital). The records were examined for the type of intracanal medicament placed by the post graduates.

Statistical Analysis

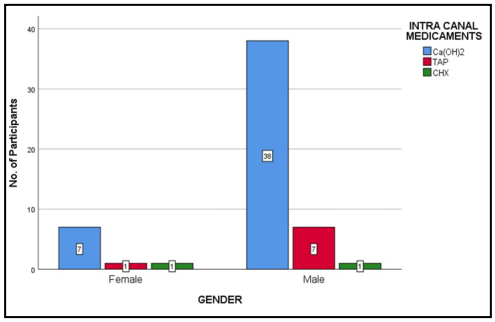
The statistical analysis was done using SPSS software version 21.0 (SPSS Inc., Chicago, IL, USA). Chi-square test was done between the three groups. The significance level was set at 5% for the present study.

Results And Discussion

A total of 55 patients with a mean age of 17.52 years were included in the present study. Gender showed an unequal distribution of participants [Graph-1] CH was highly preferred by the dentist during pain, swelling and abscess followed by TAP and CHX [Graph-2; Table-1] Chi-square test, $P > 0.05$, which is statistically not significant.

Oral health plays a pivotal role in the general well-being of individuals, and parents' behavior and attitudes influence the oral health of their children [21] Dental caries is a complex process that has been shown to have a multifactorial etiology which leads to the initiation and progression of the lesion [61]. Fluoride is one of the direct ways in decreasing the prevalence of caries and its progression. It has been recommended for more than 50 years

Graph 1. Bar chart showing distribution of participants in each group. X-axis shows gender labelled as female and male. Y-axis shows the number of participants in each group. Bar chart shows an unequal distribution of participants.



Graph 2. Bar chart showing distribution of intracanal medicaments in respect to pulp pathology where blue colour denotes pain, red denotes swelling, green denotes abscess. X-axis shows the intracanal medicaments. Y-axis shows the number of participants on a scale of 0-20 (count). CH was highly preferred by the dentist during pain, swelling and abscess. Chi-square test, p value = 0.50 (>0.05) Hence, statistically not significant.

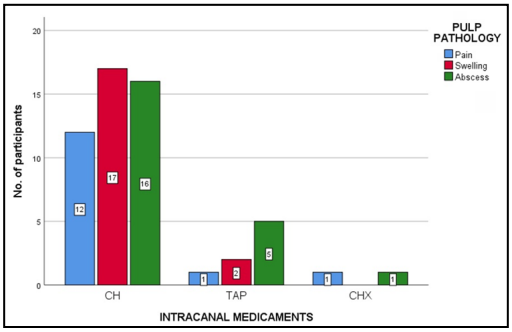


Table 1. Comparison of intracanal medicaments with respect to pulpal pathology such as pain, swelling and abscess respectively*Chi-square test, p value obtained (p > 0.05).

Intracanal Medicaments	Pulp Pathology			Overall P value
	Pain	Swelling	Abscess	
CH	12	17	16	0.50
TAP	1	2	5	
CHX	1	0	1	

to prevent and control dental caries and it is a naturally occurring substance which is present in water [47, 59]. Ranula is a cystic lesion that appears in the floor of the mouth. It can interfere with the endodontic management [42]. Hence it should be surgically removed to gain proper access.

In young children, the frenum is usually wide and thick which later on becomes thin and small during growth. Thick labial frenum makes cleaning in that area onerous causing plaque accumulation which in sequence may lead to caries in primary and permanent teeth [7]. Efficient plaque control is necessary for maintaining good gingival and periodontal health, prevention of dental caries and to perpetuate the oral health [17]. Accomplishment in endodontic management was basically based on the triad of debridement, thorough disinfection, and obturation of the root canal system, with each and every condition being important. Root canal shaping aims to eliminate microorganism, remove infected and necrotic dentin and shape the root canal system [16, 37]. Root canal instrumentation is usually succeeded by the use of endodontic instruments and irrigating solutions under aseptic conditions. Intracanal medicament is generally endorsed when treatment cannot be finished in one appointment; there are odds that remaining intracanal bacteria often breed between appointments [44]. Grossman first quoted about the utilization of polyantibiotic paste as an intracanal medicament in weeping canals or where there was continuous seepage from the pulp space [53]. CH was popularized into dentistry by Hermann in 1920. Later on, it was extensively used for root canal treatment during the 1970s and is now noted as one of the first choices as a multiple-visit root canal medication. Bystrom and Sundqvist proposed its antimicrobial efficacy, and later, this property was used for the disinfection of root canals [9, 33]. Numerous advantages are such that they are bactericidal and then bacteriostatic, promotes healing and repair, high pH stimulates fibroblasts, neutralizes low pH of acids, stops internal resorption, Inexpensive and easy to use. These advantages might be the reasons in the present study that CH was observed to be the most preferred choice by the dentists for the management of non-vital open apex. In spite of various advantages, it does have some limitations. There are some concerns in regard to the handling of CH and proper placement of CH, which presents a great challenge to the average clinician and desires skill.

CH has been the prototype of any intracanal medicament used nowadays; but, with advancement in the field of endodontics, newer materials have emerged. This has led to widespread study in endodontics looking for a substitute in intracanal medicament. Some of them are even providing more promising results as

compared to the CH. CHX gluconate (2%) has been favored as a potential substitute to CH. Many studies have been organized regarding the effectiveness of CH and CHX mixture and its antibacterial property with the notion that their antimicrobial properties interact in a synergistic fashion that enhances their efficacy. Recent studies have assessed the tissue reactions to the mixture of CH/CHX, showing that the combination exerts good antimicrobial properties and improves healing of the periapical tissues [58]. However, CHX do have some disadvantages in clinical application. A suggested clinical protocol for treating dentin before root canal obturation consists of irrigation with NaOCl to dissolve the organic components, irrigation with EDTA to eliminate the smear layer, and irrigation with CHX to increase the antimicrobial spectrum of activity and impart substantivity [52]. CHX was preferred only in 2 cases in the present study. The reason might be due to the limitations mentioned above.

Other medicaments such as TAP, was first tried for its effectiveness against Escherichia coli-infected dentin *in vitro* [14]. Only in very few cases, TAP was favored by the dentist as intracanal medicament for management of teeth with non-vital open apex. The possible reason could be intracanal use of minocycline that could cause tooth discoloration, creating potential cosmetic complications. To overcome this disadvantage, double antibiotic paste eliminating minocycline can be advocated. There is a need to create awareness and education regarding treatment protocols and the risk of developing complications if the tooth is left untreated. This may help the clinician to determine an appropriate treatment protocol and prognosis of traumatized permanent teeth [48].

Limitations of the study are, the study is restricted to a single ethnic group and the treatment plan is not decided by a single operator. Further research and long term follow up of cases with different intracanal dressing should be studied more in detail.

Conclusion

CH was the most ideal intracanal medicament preferred by the dentist in case of pain, swelling and abscess followed by TAP and CHX. Success of the endodontic treatment relies upon the elimination of bacteria from the root canal. Microorganisms in the periapical region can cause reinfection and failure.

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