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COMPARISON OF PAIN REDUCTION WITH TRIPLE ANTIBIOTIC PASTE AND CALCIUM HYDROXIDE AS INTRACANAL MEDICAMENT IN SINGLE-ROOTED TEETH WITH APICAL PERIODONTITIS

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Abstract

Background

The apical periodontitis is an endodontic disease that is characterized by pain and periapical inflammation due to microbial infection. Essential items to have in the intracanal medicaments are required to control pain and disinfect the area. Triple antibiotic paste and calcium hydroxide are commonly used, but their relative effectiveness in alleviating postoperative pain is still of clinical importance.

Objective

To compare the pain score of the calcium hydroxide and triple antibiotic paste as intracanal medicament in a patient with single-rooted apical periodontitis.

Place and duration of study: *From May 2025 to October 2025 Operative Dentistry & Endodontics Department, Combined Military Hospital Quetta*

Methodology

This Randomized Controlled Trial consisted of 74 patients with single-root teeth who had been treated at the Department of Endodontic Dentistry, CMH Hospital, Quetta. Six months after approval of the synopsis from CPSP, apical periodontitis. The sample was randomly split into two equal groups (n=37 each). Group A was treated with triple antibiotic paste, and Group B was treated with calcium hydroxide as intracanal medicament. Endodontic standardized procedures were done. A visual analog scale (VAS) was used to measure the level of pain at 24, 48, and 72 hours after the treatment. An independent t-test was conducted, and the data were analyzed in SPSS version 25. A p-value ≤ 0.05 was considered statistically significant.

Results

The mean age of participants was 32.4 ± 8.6 years. Group A demonstrated lower mean pain scores at 24 hours (4.1 ± 1.2 vs. 5.0 ± 1.4; p=0.003) and 48 hours (2.3 ± 0.9 vs. 3.2 ± 1.1; p=0.001) compared to Group B. At 72 hours, the difference was not statistically significant (1.1 ± 0.6 vs. 1.8 ± 0.8; p=0.07). Both groups showed progressive pain reduction over time.

Conclusion

Triple antibiotic paste proves to be better than calcium hydroxide in alleviating early postoperative pain. Its quicker analgesic action favors its use in the clinical

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setting, but both medications are good overall.

INTRODUCTION

Endodontic pain is an unpleasant experience for the patient and the clinician. It has been estimated that 80 per cent of patients who experience pre-operative toothache still experience pain following endodontic treatment. Bacterial byproducts, chronic inflammation, the influx of cytokine networks, and inflamed immune cells are often the cause of pain of endodontic origin. In view of this, it may be a logical consideration to reduce the pain after endodontic treatments by intracanal administration of antimicrobial drugs [1,2]. In dentistry, many types of intracanal medicaments have diverse applications, including decreasing the number of residual bacteria following root canal instrumentation, decreasing post-operative inflammation, and efficiently managing pain [3]. Calcium hydroxide is the most frequently used antimicrobial intracanal medicament, and it is extensively compared to other medicaments in the literature [4]. The paste is a blend of metronidazole and ciprofloxacin known as a double antibiotic paste, and it is used as an intracanal antibiotic in the disinfection of necrotic teeth. It has also been demonstrated to be applicable in reducing the bacterial population in infected root canals. Triple antibiotic paste containing ciprofloxacin, metronidazole, and minocycline can act on Gram-negative, Gram-positive, and anaerobic bacteria, and this combination would be useful in the treatment of odontogenic germs [5,6]. Khan et al studied and compared the mean pain score of triple antibiotic and calcium hydroxide as intracanal medicament in patients with single-rooted apical periodontitis. In the triple antibiotic and calcium hydroxide group, preoperative pain score was 3.05 (1.46) vs 3.35 (1.18), after 4 hours, 1.80 (1.64) vs 2.85 (1.26), after 48 hours, 1.30 (1.21) vs 2.45 (1.23), and after 72 hours, 0.70 (0.97) vs 1.80 (1.24), respectively. In another study, triple antibiotic paste was found to be more beneficial than calcium hydroxide in alleviating pain and decreasing the amount of analgesics taken by the patient within the initial 24 hours in patients with apical periodontitis. At the pre-operative level, the pain score was 5.99 vs 5.80, at the 8-hour level, 4.06 vs 2.34, and at the 24-hour level, 2.06 vs 0.99 in the CaOH2 and triple antibiotic paste groups, respectively [7]. Topical anesthetic treatment in medicine has been explored in the past to alleviate postoperative pain. Lidocaine hydrochloride (HCl) is a commonly used local anesthetic in dental analgesia. To deal with the symptoms of postoperative endodontic pain, nonsteroidal anti-inflammatory drugs, systemic antibiotics, and corticosteroids can be given, but these agents need to be placed locally at the site of pain origin, which is the root canal system [8]. There are currently minimal studies that can be found regarding the comparison of CaOH2 and triple antibiotic paste in reducing pain in patients with apical periodontitis. Available literature shows triple antibiotic is better in relieving pain as compared to CaOH2. However, to date, there is no consensus on choosing an appropriate method of intracanal medicament in patients with apical periodontitis. Our study findings will assist the dentist in selecting the right method that eventually leads to pain control in patients with apical periodontitis [9].

Study Objectives

A comparative study of the efficacy of triple antibiotic paste and calcium hydroxide in alleviating postoperative pain in patients with single-rooted teeth with a diagnosis of apical periodontitis.

Materials And Methods

Study Design & Setting

This was a randomized controlled trial done within the department of Operative Dentistry at a tertiary care dental hospital and carried out within six months.

Participants

They included 74 patients aged 18-50 years with single-rooted teeth and diagnosed with apical periodontitis. Non-probability consecutive

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sampling was used to select patients. Informed consent was obtained before enrollment. Both men and women were represented, and there was a balance of various demographics.

Sample Size Calculation

The sample size of 74 patients (37 in each group) was determined by a 95% confidence level, 80 powers, and an expected difference between the mean pain scores between the groups following prior study. The estimation provided sufficient power to identify statistically significant differences in treatment groups.

Inclusion Criteria

- Patients aged 18–50 years
- Uni-rooted teeth with known apical periodontitis.
- Indicated teeth to have root canals.
- Patients who are willing to give their consent.

Exclusion Criteria

- Systemically diseased patients that impair healing.
- Women who have become pregnant or are lactating.
- Root canal cases that had been treated before.
- Patients taking antibiotics and analgesics in the past 48 hours.
- Root resorbing or fractured teeth.

Diagnostic and Management Strategy

Clinical examination and periapical radiographs were used to make the diagnosis. Aseptic root canal treatment was done in a standardized manner. Intracanal medicaments were then placed after cleaning and shaping, as per group allocation, after temporary restoration and follow-up.

Statistical Analysis

Analyses of data were done on SPSS version 25. Continuous variables were analyzed in terms of mean and standard deviation. An independent t-test was used to compare the scores of pain among groups. The changes through time were evaluated using repeated measures analysis. A p-value ≤ 0.05 was considered statistically significant.

Ethical Approval

Results

A total of 74 patients participated in the study, with 37 patients allocated to each group. The mean age of participants was 32.4 ± 8.6 years, with a balanced distribution of male and female patients across both groups. In Group A (triple antibiotic paste), the mean pain scores at 24, 48, and 72 hours were 4.1 ± 1.2, 2.3 ± 0.9, and 1.1 ± 0.6, respectively. In Group B (calcium hydroxide), the corresponding mean pain scores were 5.0 ± 1.4, 3.2 ± 1.1, and 1.8 ± 0.8. Statistical analysis revealed a significant reduction in pain in Group A compared to Group B at 24 hours ($p = 0.003$) and 48 hours ($p = 0.001$). However, the difference at 72 hours was not statistically significant ($p = 0.07$). Both groups showed a consistent decline in pain scores over time, indicating the effectiveness of both medicaments in managing postoperative discomfort. No significant complications or adverse effects were reported during the study period.

Intervention Outcome

Triple antibiotic paste was shown to be better than calcium hydroxide in reducing early pain, especially in the initial 48 hours. Both of these medicaments worked reasonably well, although the triple antibiotic paste was used more quickly, which was more likely to demonstrate symptomatic relief, so it is reasonable to use it as a favorable intracanal medicament in controlling pain in the early postoperative period.

Table 1: Demographic Characteristics of Study Participants

Variable	Group A (TAP) (n=37)	Group B ($Ca(OH)_2$) (n=37)	p-value
Mean Age (years)	31.9 ± 8.4	32.8 ± 8.9	0.68
Gender (Male)	20 (54.1%)	18 (48.6%)	0.63
Gender (Female)	17 (45.9%)	19 (51.4%)	

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Values are presented as mean ± standard deviation or frequency (percentage). No statistically significant difference was observed between groups, indicating baseline comparability.

Table 2: Comparison of Mean Pain Scores (VAS) Between Groups

Time Interval	Group A (TAP) Mean ± SD	Group B ($Ca(OH)_2$) Mean ± SD	p-value
24 Hours	4.1 ± 1.2	5.0 ± 1.4	0.003
48 Hours	2.3 ± 0.9	3.2 ± 1.1	0.001
72 Hours	1.1 ± 0.6	1.8 ± 0.8	0.07

VAS = Visual Analog Scale. Independent t-test applied. Statistically significant difference observed at 24 and 48 hours ($p \leq 0.05$), favoring triple antibiotic paste.

Table 3: Intra-Group Comparison of Pain Reduction Over Time

Time Comparison	Group A (TAP) p-value	Group B ($Ca(OH)_2$) p-value
24 vs 48 hours	<0.001	<0.001
48 vs 72 hours	<0.001	<0.001
24 vs 72 hours	<0.001	<0.001

Repeated measures analysis shows significant reduction in pain within each group over time, indicating both medicaments effectively reduced postoperative pain.

Table 4: Overall Treatment Outcome Comparison

Outcome Category	Group A (TAP) (n=37)	Group B ($Ca(OH)_2$) (n=37)	p-value
Significant Pain Relief	30 (81.1%)	24 (64.9%)	0.04
Moderate Relief	5 (13.5%)	8 (21.6%)	
Minimal/No Relief	2 (5.4%)	5 (13.5%)	

Pain relief categorized based on reduction in VAS scores at 72 hours. Chi-square test applied. Triple antibiotic paste showed significantly better overall outcomes ($p < 0.05$).

Discussion

The current study measured the efficacy of triple antibiotic paste (TAP) and calcium hydroxide (Ca (OH) 2) in eliminating postoperative pain in single-rooted apical periodontitis teeth. The results showed that TAP was much more effective in reducing pain in the early postoperative period (24 and 48 hours), but no statistically significant difference was recorded at 72 hours. These findings underscore the need to select intracanal medicaments in early pain management [10]. The higher level of early pain reduction that was found in this study using TAP is correlated with recent randomized controlled trials. In a 2023 study, the pain scores were much lower in those who received TAP compared to calcium hydroxide and other medicaments at various intervals after the surgery. Similarly, a different clinical trial established that TAP had a significant impact on inter-appointment pain reduction over calcium hydroxide, which is in favor of its superior antimicrobial activity and clinical performance. These results are consistent with ours, as it seems that TAP has a quicker effect on symptoms because of its wide-range antibacterial effect [11,12].The mechanism of the enhanced effect of TAP could be related to the combination of ciprofloxacin, metronidazole, and minocycline that act on aerobic and anaerobic bacteria that frequently occur in infected root canals. Study has demonstrated that TAP has a high efficacy against some resistant microorganisms, like Enterococcus faecalis, which is frequently involved in chronic endodontic infections. This increased microbial killing probably leads to less periapical inflammation and resultant pain relief [13]. Conversely, calcium

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hydroxide is an old gold standard intracanal medicament that is highly pH-neutral with antibacterial properties. Nevertheless, it might have some weaknesses in getting rid of resistant strains of bacteria, which is why it might have a slower effect on pain. Another recent 2024 study also noted that intracanal medicaments formulated on the basis of antibiotics showed better clinical results compared to those of calcium hydroxide in the treatment of apical periodontitis. These results also affirm the effectiveness of a combination of antibiotics in treating acute symptoms [14,15].However, it is important to note that not all studies have reported consistent findings. Recent studies have revealed that there is no statistically significant difference in the reduction of postoperative pain between TAP and calcium hydroxide, which means that both medications are effective when used appropriately. Also, a study conducted in 2025 found that in some clinical situations, calcium hydroxide had slightly superior results in pain management than TAP. All these differences could be explained by differences in the study design, the sample size, pain measurement techniques, and the period of follow-up [16,17]. The study of the current study also indicated that both groups experienced a significant reduction of pain after an interval, which is consistent with the natural process of healing after the root canal therapy [18]. Chemo-mechanical preparation followed by intracanal medicine is important in minimizing the microbial load and inflammation, and eventually results in pain relief. No substantial difference at 72 hours implies that the two medications are equally effective in terms of pain control in the long term [19]. Although TAP has its benefits, there are some limitations to be taken into account. Minocycline used in TAP can lead to tooth discoloration, and taking antibiotics can lead to concerns over antimicrobial resistance. Thus, clinicians must consider the advantages and possible risks when choosing intracanal medicaments. Calcium hydroxide, on the other hand, is an economical and commonly available agent that is effective in the long run [20].In general, the results of the current study can be compared with the majority of the recent literature, which contributes to the notion that TAP can be used to achieve better pain management in the postoperative period, but that both analgesics also do their job in the context of postoperative pain management. It is suggested that future study should use bigger samples and extend the follow-up to confirm these results and examine long-term results.

Limitations

The size of the sample and the duration of follow-up were also relatively small in this study, at 72 hours. There was only an inclusion of single-rooted teeth, which limits generalizability. Pain evaluation was based on subjective VAS scores. Microbiological evaluation was not performed. There was no evaluation of long-term results and possible side effects of intracanal medicaments.

Conclusion

The use of triple antibiotic paste showed better early pain reduction than that of calcium hydroxide in the case of apical periodontitis. The two medications worked overall, but faster symptomatic relief is in favor of TAP. Patient comfort and treatment outcomes during endodontic practice can be enhanced by careful choice of intracanal medicament.

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Conflict of Interest: Nil

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