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What's new for the clinician – summaries of recently published papers (August 2024)

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1. Comparative effectiveness of preemptive administration of ibuprofen and ibuprofen arginine on the anaesthetic success of inferior alveolar nerve block in teeth with symptomatic irreversible pulpitis: a double-blind randomised clinical trial

Millions of patients each year suffer from episodes of acute pain, ranging from mild to severe, as a result of numerous conditions in the fields of trauma, surgery and dental procedures.[1] Acute pain usually lasts for less than 7 days but often extends up to 30 days and, for some conditions, acute pain episodes may recur periodically.[1]

Despite the availability of effective pharmacological and non-pharmacological approaches, the management of pain remains inadequate across different treatment settings, with a substantial proportion of patients continuing to experience pain of mild to moderate intensity.[1]

Ibuprofen is an NSAID with analgesic, anti-inflammatory and antipyretic properties that has proven to be safe and effective for treating many different types of pain. Currently available in the market are preparations in which bioavailability of ibuprofen is increased by salification with various salts, in particular, L-arginine (ibuprofen arginate).

Managing pain during endodontic treatment for teeth with symptomatic irreversible pulpitis poses challenges – obtaining effective anaesthesia in this condition, especially in lower posterior teeth, is notably more difficult than for healthy pulps due to various factors, including altered resting potentials, heightened excitability thresholds of inflamed fibres, increased sodium channel expression, the presence of anaesthetics-resistant sodium channels, and patient psychological factors.[1]

Assessing pain is intricate, as it involves subjective sensations influenced by behavioural, cultural, psychological and environmental factors, along with expectations, fear, anxiety and depression. Changes in dental anxiety from moderate to very severe has been shown to increase the risk of difficult or failed anaesthesia by more than 30 times.[1] Therefore, the level of anxiety is one of the most important predictors of success in dental anaesthesia. De Oliveira and colleagues (2024)[1] reported on a randomised clinical trial (RCT) that sought to assess the pre-emptive use of ibuprofen arginine, considering the influence of anxiety and preoperative pain on inferior alveolar nerve block (IANB) effectiveness in symptomatic irreversible pulpitis-affected teeth.

MATERIAL AND METHODS

This was a randomised, double-blind, placebo-controlled clinical trial conducted at a dental school in Brazil. Patients aged 18 years or older who had a clinical diagnosis of symptomatic irreversible pulpitis in their lower posterior teeth were selected. The diagnosis was established based on anamnesis and both clinical and radiographic assessments. Inclusion criteria required participants to report spontaneous pain, a positive response to the cold test, and the absence of radiographic evidence of pulp cavity exposure. Patients excluded comprised pregnant women, patients who could not take ibuprofen due to previous sensitivity, allergies or other reasons, who were allergic to local anaesthetics or sulfites, had a significant history of health problems, were sensitive to the post anaesthesia test, absence of reported lower lip numbness following inferior alveolar nerve block (IANB), ingested analgesics or anti-inflammatory drugs 8h prior to treatment, and were unable to give informed consent or to comprehend the anxiety level questionnaire or the pain rating scale. Sample size calculations showed that for an 80% study power, at least 50 patients were needed.

The participants were randomly divided into three groups (n = 50) with the following premedication alternative: Group 1. Ibuprofen 600mg; Group 2. Ibuprofen arginine 1155mg (equivalent to 600mg of ibuprofen and 555mg of arginine); Group 3. Placebo. All the medications and anaesthetics used in the IANB belonged to the same manufacturing batch.

In the waiting room, the patient's level of anxiety toward dental treatment was measured by application of the Modified Dental Anxiety Scale (MDAS) questionnaire. The completed questionnaire was kept in a sealed envelope, together with the patient's medical record, and filed as such until the end of the study. The data collection instrument consisted of the anamnesis, the radiographic examination and intraoral physical examination, comprising the palpation, pulp sensitivity and percussion test, as well as the evaluation of periodontal health (absence of mobility, and recession or loss of periodontal insertion). The cold test was performed with refrigerant gas under relative isolation, and applied with a cotton ball at the centre of the buccal surface of the tooth. Preoperative pain intensity (patient's self-reported pain level) was recorded using the Heft-Parker visual analogue scale.

After 30min of administering the medication, the patients were seen by the operating researcher, a specialist in endodontics with six years of experience. All patients received injections of 1.8ml of anaesthetic comprising 2% lidocaine with 1:100,000 epinephrine applied by using the direct technique for IANB. After 15min of anaesthesia application, the patient was asked if his lip was numb. If lip numbness was not achieved, the block was considered unsuccessful and the patient was excluded from the study. If the block was successful, the patient was submitted to the cold test, and the coronal access cavity preparation

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was initiated in those with a negative response. Excluded patients received a new anaesthesia protocol, and their treatments continued separate from the study.

The patients were instructed to notify the operator if they felt any pain during the endodontic intervention. After treatment completion, the patients were monitored by telephone every 24h for 2 days for possible side effects or painful symptomatology. In the case of postoperative symptoms or intercurrences, medication was prescribed and/or the patient was scheduled to return to resolve the situation.
According to the score obtained in the MDAS questionnaire, the patient's anxiety level was classified as: relaxed (+1); kind of uncomfortable (+2); tense (+3); anxious (+4); so anxious that I break out in a sweat or start to feel sick (+5). The final score was obtained by adding the scores corresponding to the answers to the five questions, and yielded a variation that ranged from 5 to 25 points.

The intensity of preoperative pain was indicated by the patient on a 170mm line, and classified according to the Heft-Parker visual analogue scale as absent (point 0mm), mild (from point 1mm to 54mm), moderate (between 55mm and 113mm) and severe (above 113mm). If the patient felt any pain during the treatment, the procedure was interrupted and the patient indicated the intensity of the pain felt using the Heft-Parker visual analogue scale. If access to and preparation of the root canal were performed without pain, or if only mild pain was reported, the anaesthetic blockade was considered efficient; however, if the report was moderate or severe pain, it was considered anaesthetic failure.

RESULTS

Out of a total of 167 potential patients that were screened, 13 were excluded before the experimental procedures because they had ingested other pain relief medication less than 8h before the pre-emptive treatments. Therefore, 154 patients that remained were randomised into experimental (n=51) and placebo (n=52) groups.
A total of 4 patients were excluded from the statistical analysis because they did not experience lip numbness following IANB, which indicated a failure in the anaesthetic.
The participants' preoperative pain intensity was scored according to the Heft-Parker scale, and classified as mild (≤54mm) by one patient, moderate (≥55mm≤113mm) by 46, and severe (≥14mm) by 103. The level of anxiety regarding dental treatment, determined by the MDAS scale, ranged from 6 to 21 points. When comparing the mean scores for preoperative pain, there was no significant difference for pain intensity among the participants in the three groups. When comparing the median values of the anxiety score, no statistical difference was found among the anxiety levels of the participants in the three groups. The IANB was considered efficient for 62% of the patients in the ibuprofen group, 78% in the ibuprofen arginine group, and 34% in the placebo group, pointing out the significant difference observed for the placebo group ($p<0.001$).

Patients who received the pre-emptive ibuprofen medication had a 1.82 risk ratio (RR) of having an effective IANB over placebo (95% confidence interval of 1.17 to 2.84), and those who received pre-emptive ibuprofen arginine had a 2.29 RR (95% confidence interval of 1.52 to 3.47).

Analysing the patients who had efficient alveolar nerve block compared to those who experienced block failure, it was observed that the average preoperative pain in the group with efficient alveolar nerve block (n=70) was 118.3, whereas in the group of those who had anaesthetic block failure, it was 132.1 (n=30), with a statistically significant difference between them (p=0.025). It was also observed that the median on the MDAS anxiety scale for patients who had efficient inferior alveolar nerve block was 8 (6-10), while for those who did not have a successful block, it was 15 (8-20). Thus, there was a significant difference in anxiety levels between participants with and without efficient block ($p<0.001$).

CONCLUSION

In cases of symptomatic irreversible pulpitis the pre-emptive medication with ibuprofen arginine effectively increased the efficacy of the inferior alveolar nerve block The inferior alveolar nerve block efficacy was influenced by preoperative anxiety levels and the intensity of pain.

IMPLICATIONS FOR PRACTICE

This research underscores the potential benefits of oral premedication with ibuprofen and ibuprofen arginine in improving anaesthesia outcomes in cases of symptomatic irreversible pulpitis.

REFERENCE

1. Comparative effectiveness of preemptive administration of ibuprofen and ibuprofen arginine on the anaesthetic success of inferior alveolar nerve block in teeth with symptomatic irreversible pulpitis: a double-blind randomised clinical trial

2. The incidence and intensity of postoperative pain and flare-up following the use of three different intracanal medicaments in teeth with posttreatment apical periodontitis: a randomised clinical trial

Research

Success in endodontic treatment was originally based on the triad of debridement, thorough disinfection, and obturation of root canal system, with each and every procedure equally important. At present, successful root canal treatment is based on much broader principles. This includes diagnosis and treatment planning; knowledge of anatomy and morphology; the traditional concepts of debridement, thorough disinfection and obturation; and the coronal restoration.

There is overwhelming evidence in the literature that most of the root canals contain viable microorganisms even after the completion of the chemo-mechanical preparation; thus, intracanal medicaments have been recommended as an essential step in killing the bacteria in root canals, especially when treatment cannot be completed in one appointment.[1]

Calcium hydroxide has been the most used root canal dressing in endodontic practice since the early 1930s.[1] Although it is the most preferred medication, it does not show an equal effect against all the bacterial species in the root canal system. Chlorhexidine, which has been widely used in dentistry since the 1970s, has also been recommended as an intra-canal disinfectant in endodontics. However, chlorhexidine alone cannot form a physical barrier and cannot provide radiopacity, thus its use combined with calcium hydroxide may offer such features.

The synergistic effect of chlorhexidine and calcium hydroxide mixture increases the antimicrobial activity of calcium hydroxide while preserving its barrier function. There is limited knowledge about the effectiveness of this combination on postoperative pain and flare-up incidence in retreatment cases. Angin et al (2024)[1] reported on a trial that sought to evaluate the effect of chlorhexidine, calcium hydroxide, chlorhexidine and calcium hydroxide mixture as intra-canal medicaments on postoperative pain and flare-up incidence and the frequency of analgesic use in teeth with posttreatment apical periodontitis (PTAP). The null hypothesis tested in this study is that the type of intra-canal medicaments used would not affect the incidence and the intensity of post-treatment endodontic pain and flare-up incidence.

MATERIALS AND METHODS

One hundred and twenty systematically healthy patients aged between 20 and 65 years met the criteria and agreed to participate in the study. Patients who had root canal-treated single-rooted incisor or mandibular premolar teeth with a single root canal at least or equal three years ago but still had posttreatment apical periodontitis (PTAP) were included in this study. Failure of the previous root canal treatment was determined by clinical and radiographic examinations. Teeth with clinal signs and symptoms for the requirement of retreatment, except for cases with preoperative swelling, spontaneous pain, severe percussion and palpation, were included in this trial. The volunteers were randomly assigned to three different medicament groups. The allocation was performed according to Consolidated Standards of Reporting Trials (CONSORT, 2010). Stratified randomisation was performed for each group according to gender and age. After patients were divided based on gender and age groups, they were randomly placed in the medicament groups to make an equal distribution of the type of medicament used.

All root canal treatments were performed by the same clinician. During the diagnostic examination, periapical radiographs were obtained using a phosphor plate and using the long-cone paralleling technique under standard exposure conditions and recorded. After the clinical and radiographic evaluations of relevant teeth, the findings – including spontaneous pain, swelling, fistula, restoration type and condition, caries and fractures – were recorded on the case report forms. Tests such as percussion, palpation, mobility and periodontal probing were performed to determine the presence of preoperative pain. All patients received two-visit root canal retreatments.

After administration of local anaesthesia (2ml, 4% articaine hydrochloride containing 1:100 000 adrenalin), a rubber dam was applied for the isolation. No additional local anaesthesia was given since patient comfort was provided with the delivered amount. Following the preparation of the access cavity, ProTaper Universal Retreatment files were used at 500rpm and 3Ncm torque to remove the root canal filling. The working length was determined to be 1mm shorter than the value (0.0) indicated by the electronic apex locator and confirmed radiographically. Apical patency was established with a size 10K file. Next, the shaping procedure was completed at the working length using ProTaper Next rotary files. A 27-gauge notched type irrigation needle (Endo Eze) was placed loosely 2mm shorter of working length while performing 2ml, 5.25% NaOCl irrigation between each file. After the last used file, shaping for retreatment was considered complete when there was no residual canal filling observed under 2.5x magnification and the irrigation solution was clear from debris. Then, a periapical radiograph was taken to verify the complete removal of the filing materials. After that, final irrigation was done under activation (endoactivator) using 2ml of 17% EDTA followed by 4ml of 5.25% NaOCl. The endoactivator was run for 20sec between 1ml 5.25% NaOCl irrigation. The root canal was rinsed with sterile distilled water and dried with sterile paper points. Finally, to minimise technical variations in medicament placement which could affect postoperative pain, all medicaments applied with a lentulo spiral was used (Dentsply Maillefer) 2mm minus the root canal length as follows:

Group 1: Calcium hydroxide paste (Ultracal XS).
Group 2: 2% chlorhexidine gel.
Group 3: Equal amounts of calcium hydroxide and chlorhexidine gel were placed on a sterile mixing pad. A sterile spatula was then used to stir until a homogeneous mixture was obtained.

After the visual observation of the canals filled with medicament, sterile Teflon tape was placed in the canal orifice and the access cavity was sealed with glass ionomer cement (Kavitan™ Plus).

Postoperative pain levels were evaluated for seven days using a VAS scale. Postoperative pain scores were recorded at 6 and 12 hours and at 1, 2, 3, 4, 5, 6 and 7 days after the medicaments were placed. In the VAS scale given to the patient two opposite limits of the parameter are marked on both ends of a line prepared as 0-100mm. According to the scale, while “no pain” is marked with zero, “unbearable pain” is marked with 100 on the line. The patients were asked to evaluate their own pain status by marking the line on the specified days and times. Patients who could not communicate to submit the evaluation forms were excluded from the study. The patients were prescribed 400mg ibuprofen (Brufen) and instructed to use it only for severe pain. Frequency and time of use of analgesics were recorded. In addition to the documentation, oral examinations were performed on the 48th hour and at 7 days. Sensitivity on percussion, spontaneous pain, swelling of surrounding tissues and antibiotic requirement were also examined and recorded.

Evaluation of the status of primary root canal fillings was performed by two independent endodontists, who were not included in the study and had at least three years of experience, clinically and on the periapical radiographs. Canal fillings terminating at the radiological apex and 2mm within are “acceptable”; canal fillings shorter than 2mm of apex are “short” and gutta-percha seen beyond the radiological apex are considered “overfilled”.

RESULTS

Three patients left the study on their own accord after the first visit. Additionally, a total of nine patients, three per group, were excluded from the study due to various reasons such as apical restriction, anxiety and perforations due to the previous root canal treatment. Thus they were excluded from the final analysis, which included a total of 108 retreatment cases performed on 108 patients. Forty-one of the treated teeth were maxillary incisors, 26 of the

treated teeth were maxillary premolars, 6 were mandibular incisors and 35 were mandibular premolars. All the root canals have a single root canal. There were no statistically significant differences between the distribution of the types of teeth in medicament groups (p>0.05).

Eighteen male (50%) and 18 female (50%) patients between the ages of 20-65 were included per group. Patient age groups were divided into three age groups: 20-34, 35-49 and 50-65; and a stratified randomisation was performed. When the correlation between age and postoperative pain is evaluated; at 12h, patients between the ages of 35-49 had significantly greater pain compared to the patients of 20-34 (p=0.033) and 50-65 age range (p=0.017). There was no statistically significant difference at 3, 4 and 7 days except for patients of 35-49 age group who had significantly more pain compared to patients between the ages of 20-34 (p<0.05).

No significant differences were observed in any of the following parameters: gender (exact chi-square test, p>0.05), presence of a periapical lesion (exact chi-square test, p>0.05), quality of obturation (exact chi-square test, p>0.05), type of the coronal restoration (exact chi-square test, p>0.05), location of the teeth (exact chi-square test, p>0.05) and presence of fistula (exact chi-square test, p>0.05).

There were no significant differences among the tested medicament groups at any of the assessed time intervals based on VAS scores (p>0.05). Additionally, no statistically significant difference was observed in the tested medicament groups when a periapical lesion was present (p>0.05); while patients with no fistula had significantly greater pain values after 24h compared to patients with fistula (p<0.05).

When correlation was tested between the presence of coronal restoration and pain, only patients with coronal restoration had more pain postoperatively at 6h (p<0.05).

No significant difference was found between the apical extension of the previous canal fillings in different medicament groups (p>0.05). When the correlation between the apical extension of the primary root canal fillings and pain was evaluated, significantly greater pain was observed in the short and overextended groups at 24h and 48h compared to the cases with acceptable root canal filling levels (p<0.05). There was no statistically significant difference between the groups in terms of percussion, spontaneous pain and swelling when the level of postoperative pain was compared at 48h and 7 days of clinical examinations (p>0.05).

The $Ca(OH)_2$ group had the lowest VAS scores postoperatively for the first 24h compared to the other medicament groups. After the first 24h, $Ca(OH)_2$ group VAS scores reflect a fluctuating postoperative pain until day 7 (scores were increased after 24h, started to decrease at the 48th hour, but started to increase again after the third day. The increase was continued until the fifth day and then a decrease occurred). While the Ca(OH)2 + CHX gel group had a high VAS score at the first 12h, it showed a continuous declining trend with the lowest VAS score after 48h compared to the other groups. The VAS score of the CHX gel group was greater compared to the scores of the other groups.

When all the time pain levels observed were evaluated, no statistically significant difference was found between the groups in terms of VAS scores (p>0.05).
There was a correlation between frequency of drug use and VAS scores, indicating that VAS score increased when the drug use increased.

CONCLUSIONS

Postoperative pain and flare-ups do not seem to differ when calcium hydroxide, chlorhexidine or their mixture is used as an intracanal medicament. A similar degree of pain relief indicates that calcium hydroxide or chlorhexidine-based medicaments are clinically preferable in retreatment cases to limit post endodontic pain and flare-up incidence.
A greater postoperative pain was associated with elderly patients, patients without fistula and patients with coronal restoration present at time of endodontic access cavity preparation. In addition, patients with short and overextending previous root canal fillings experienced greater postoperative pain when compared to the patients with acceptable root canal filling levels.

IMPLICATIONS FOR PRACTICE

All 3 intracanal medicaments were effective for the outcomes investigated.

REFERENCE

1. Angın AE, Özkan HD, Saral IP, Aydın B. The incidence and intensity of postoperative pain and flare-up following the use of three different intracanal medicaments in teeth with posttreatment apical periodontitis: a randomized clinical trial. Clinical Oral Investigations. 2024 Jul;28(7):1-0

CPD questionnaire on page 400

The Continuing Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.