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Original Research

Efficacy of Analgesics in Reducing Post Endodontic Pain: A Comparative Study

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***ABSTRACT*:**

Introduction: The purpose of this study was to determine the efficacy of taking ibuprofen and acetaminophen at the same time versus alternating the same medications in patients with a diagnosis of symptomatic irreversible pulpitis. **Objective:** The aim of this study will be to investigate whether there is a difference in the pain relief following root canal therapy on teeth exhibiting symptomatic irreversible pulpitis between administering ibuprofen 600 mg and APAP 1000 mg at the same time every six hours and alternating the same medications every three hours. **Materials and Methods:** Ten patients who presented for root canal therapy with a diagnosis of symptomatic irreversible pulpitis were included in this study. The patients were randomly assigned to 2 groups. Following root canal therapy, the patients in group A were instructed to take ibuprofen 600 mg and acetaminophen 1000 mg every six hours. Patients in group B were instructed to take ibuprofen 600 mg, wait three hours, take acetaminophen 1000 mg, wait three hours, and repeat the cycle. Patients evaluated their pain levels using a numeric rating scale (NRS) at 2, 4, 6, 8, 12, and 24 hours post-operatively. **Results:** The average preoperative pain level was 4.0 ± 2.0 for group A and 4.4 ± 3.05 for group B. The pain levels for group A were 3.4 ± 2.61 at 2 hours, 2.8 ± 1.79 at 4 hours, 2.6 ± 1.52 at 6 hours, 3.0 ± 2.0 at 8 hours, 2.4 ± 2.61 at 12 hours, and 2.2 ± 2.68 at 24 hours. The pain levels for group B were 2.2 ± 0.84 at 2 hours, 2.0 ± 0.71 at 4 hours, 1.8 ± 0.84 at 6 hours, 2.0 ± 1.22 at 8 hours, 1.6 ± 0.55 at 12 hours, and 1.4 ± 0.55 at 24 hours. **Conclusion:** The data shows a trend toward having no significant difference between the two test groups.

Key words: Analgesics, endodontic pain, pulpitis.

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INTRODUCTION:

Pulpitis, as the name implies, is inflammation of the pulp due to caries or the restorative process, such as a deep restoration or a crown preparation. The process of pulpal inflammation has been described in detail[1]. Trauma to the pulp causes the release of vascular mediators including histamine and serotonin. These mediators then cause an increase in vasodilation and vascular permeability, leading to an initial increase in pulpal blood flow followed by a decrease in blood flow.

Also among the mediators released following noxious stimuli are prostaglandins. Prostaglandins, especially PGE2, can cause hyperalgesia, vasodilation, and increased vascular permeability. Due to the pulp being a low compliance system, this immune response can lead to an increase in pulpal tissue pressure, hypoxia, and pulpal necrosis, all of which can produce significant pain. Root canal therapy aims to remove the pulp, thereby eliminating the source of pain. However, inflammatory mediators (i.e. prostaglandins) may still be present in the periapical tissues.[2]

One of the most commonly used pain medications is ibuprofen. A survey published by Mickel, et al. (2006)[3] showed that endodontists recommend ibuprofen 600-800 mg significantly more than any other pain medication. Due to the mechanism of action, ibuprofen is able to treat both pain and inflammation at the site of injury. Ibuprofen is a non-steroidal anti-inflammatory drug (NSAID). This class of drugs, which includes aspirin, works by blocking the conversion of arachidonic acid to prostaglandins via the cyclooxygenase (COX) -1 and -2 pathways. By preventing the production of prostaglandins, inflammation can be reduced and pain managed. It has been shown in numerous studies that ibuprofen 400-800 mg is more effective than almost all other pain medications, including acetaminophen (APAP), narcotics, and combinations of narcotics and APAP.[4-9]

Acetaminophen is another commonly used over-the-counter pain medication.

While the method of action is not fully understood, it is thought that it generally affects pain perception centrally rather than peripherally as ibuprofen and other NSAIDs do. Recent work has found that the metabolite AM404 is responsible for all or part of the analgesic effects of acetaminophen.[10]

This study is a further investigation into how the timing of doses of two commonly used over-the-counter pain medications, ibuprofen and acetaminophen, might alleviate post-operative pain.

MATERIALS & METHODS:

Ten adult patients participated in this study. All patients were determined to be in good health following a review of the health history and oral questioning. The following exclusion criteria were applied: age less than 18 years, pregnancy, ibuprofen or acetaminophen use within the last 12 hours, allergy to ibuprofen or acetaminophen, diagnosis of a bleeding disorder (i.e. hemophilia or Von Willebrand's disease), liver or kidney disease, peptic ulcer disease, long-term corticosteroid use, diagnosis of Inflammatory Bowel Disease (i.e. Ulcerative Colitis or Crohn's Disease). All patients gave written informed consent.

The patients in this study all had a diagnosis of symptomatic irreversible pulpitis. The diagnosis was determined by testing with an electric pulp tester, and, as necessary, heat using gutta percha on a System B tip. If there were any indication of advanced pulpal pathosis with periapical involvement, such as a periradicular radiolucency or draining sinus tract, the patient was not included in the study. Patients rated their pre-operative pain levels using a numeric rating scale (NRS) on a scale from 1 (no pain) to 10 (severe pain).

All endodontic procedures were completed in a single visit. Teeth were anesthetized and after successful anesthesia, a rubber dam was placed, and access into the pulp chamber was achieved. If purulence or lack of vital tissue was found in any canals at this time, the patient was excluded from the study. Working length was determined using an apex locator. The canals were then prepared using rotary instrumentation. Obturation was completed and the pulp chamber was temporized using sterile sponge or cotton pellet and Cavit. Following treatment, the patients given two bottles of medications labeled A and B. Bottle A contained 12 liquigel capsules of ibuprofen 200 mg. Bottle B contained 8 capsules of quick release acetaminophen 500 mg. Patients were randomly assigned to one of two groups. Patients in group A were instructed to take three capsules (600 mg) of bottle A and two capsules (1000 mg) of bottle B every six hours. Patients in group B were instructed to take three capsules (600 mg) of bottle A, wait three hours, then take two capsules (1000 mg) of bottle B, wait three hours and repeat the cycle.

Patients were given an instruction sheet and an NRS and were instructed to record their pain levels at 2, 4, 6, 8, 12, and 24 hours post-operatively. If the study medications were not sufficient in relieving pain, the patients were instructed to call a pre-paid cell phone carried by the lead investigator (E.D.D.). Patients would then be prescribed tramadol and instructed to continue the study medications as needed. If the patient developed severe pain or swelling, he or she would be seen clinically and evaluated for the need for additional treatment and/or medications, including antibiotics. The patients were contacted the following day and their data recorded.

RESULTS:

Ten patients participated in the study with 5 patients in each group. The mean pain levels can be found in **Table 1** and **Figure 1.** The patients in group A (mean age, 40.2; range, 25-62) consisted of 1 male and 4 females. The responses from the individual patients in group A can be seen in **Figure 2**. The patients in group B (mean age, 35.0; range, 26-51) consisted of 5 females. The responses from the individual patients in group B can be seen in **Figure 3**. The average preoperative pain for group A was 4.0 ± 2.0. The pain levels for group A were 3.4 ± 2.61 at 2 hours, 2.8 ± 1.79 at 4 hours, 2.6 ± 1.52 at 6 hours, 3.0 ± 2.0 at 8 hours,

2.4 ± 2.61 at 12 hours, and 2.2 ± 2.68 at 24 hours. The average preoperative pain for group B was 4.4 ± 3.05. The pain levels for group A were 2.2 ± 0.84 at 2 hours, 2.0 ± 0.71 at 4 hours, 1.8 ± 0.84 at 6 hours, 2.0 ± 1.22 at 8 hours, 1.6 ± 0.55 at 12 hours, and 1.4 ± 0.55 at 24 hours.

Table 1: Average pain levels reported at each time interval per group.

Time Post-Op (h)	Pain Level*	
	Group A	Group B
Pre-Op	4.0 ± 2.0	4.4 ± 3.0
2	3.4 ± 2.6	2.2 ± 0.8
4	2.8 ± 1.8	2.0 ± 0.7
6	2.6 ± 1.5	1.8 ± 0.8
8	3.0 ± 2.0	2.0 ± 1.2
12	2.4 ± 2.6	1.6 ± 0.5
24	2.2 ± 2.7	1.4 ± 0.5

* Mean ± Standard Deviation

Figure 1: The mean pain levels and standard deviations reported for each group.

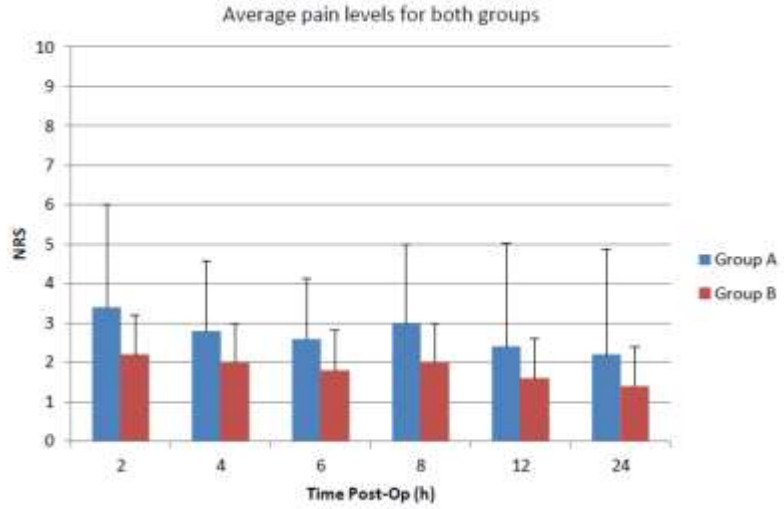


Figure 2: Responses from each individual patient in group A.

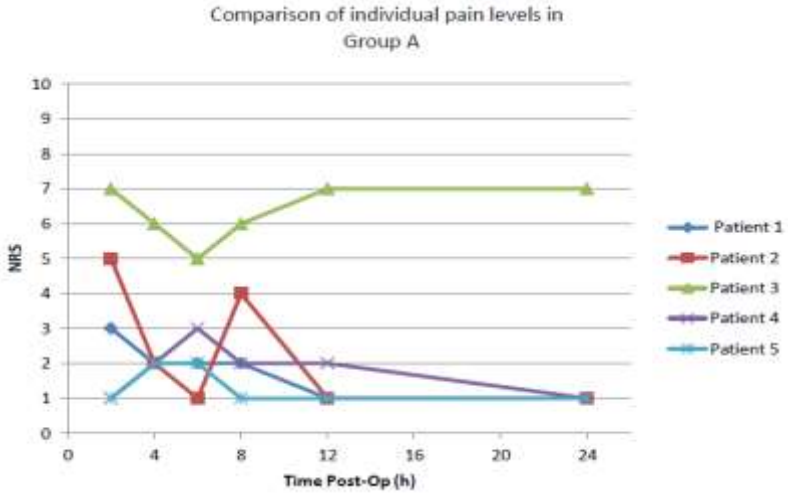
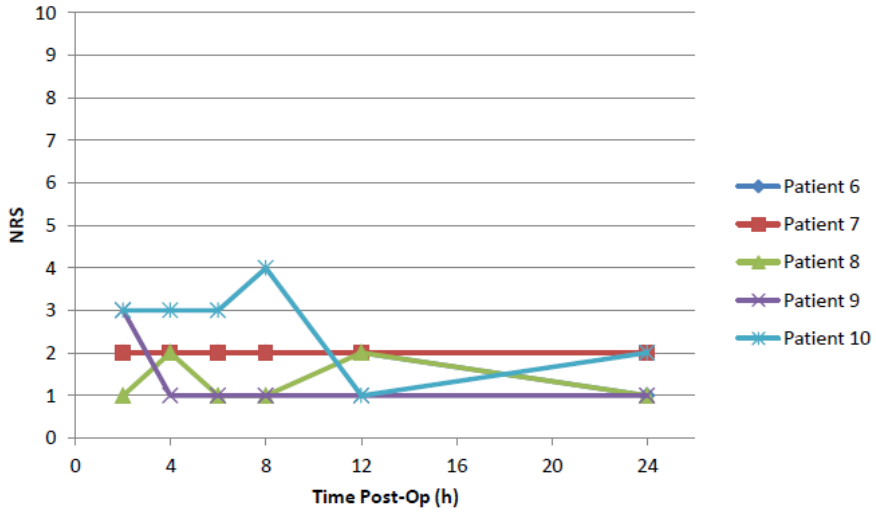


Figure 3: Responses from each individual patient in group B.



DISCUSSION:

The data exhibits a trend towards being not significantly different between the two treatment groups. While the data seems to conclude that patients in group B experienced greater pain relief than those in group A, it should be noted that the standard deviation for group A is much greater than that of group B. Because of the variability in the small sample size, it cannot be concluded that the difference will be significant. The larger standard deviation is likely due to one patient in group A who reported pain levels that were much greater than any other participant (Figure 1). It is possible that the patient reacted more severely to treatment than the other patients. This patient, however, did not feel the need to contact the investigator for prescription medication. Although using the NRS should normalize variances, patients perceive pain differently. While some patients may report a certain level of pain as 2, others may perceive that same pain as 4. This subjective variance may be negated with an increase in the number of participants. Additionally, it is not known how the slight difference in gender makeup between the two groups contributed to the findings.

Many previous studies investigating pain medications evaluated pain after cleaning and shaping but before obturation.[11, 12,13] Root canal therapy consists also of obturation which can be a source of post-operative pain.[14] This study was aiming to be more complete in terms of pain relief following a root canal since all treatment was performed in a single visit. There have also been several studies that investigated the pain following single- or multiple-step root canals. [15,16,17] Most investigators found there was no difference between single and multiple visit non-surgical root canal therapy in terms of the level of pain experienced by the patient. Because there is relatively little difference in pain between single and multiple visit root canals, this study is applicable for most practitioners.

The duration of evaluation of pain in this study was 24 hours. While some studies have investigated duration of pain for longer[14], Harrison et al. (1983)[13] found that the highest incidence and degree of pain following obturation was in the first 24 hours. While post-operative pain is not limited to only 24 hours, the level of pain should decrease significantly after the first day. To treat pain after this initial period, patients can be advised to continue medication for 2-3 days following the procedure.[18]

Several recent studies have shown the efficacy of liquigel ibuprofen.[19,20,21] Hersh et al.[19] demonstrated that liquigel ibuprofen had a faster onset of pain relief and greater peak pain relief. The theory may also apply to quick release acetaminophen. These capsules are designed to break open quickly in the stomach, allowing for faster delivery of the drug. While faster delivery leads to faster onset of pain relief, there have been no studies investigating whether the duration of pain relief is affected.

As the results of the study are showing a trend towards a non-significant difference, it would be reasonable to suggest that patients take both medications at the same time. These schedules would likely increase patient compliance and reduce postoperative complications. Patients are more likely to miss a dose if they need to remember to take one every three hours as opposed to every six hours. If a patient forgets to take the medication at a certain time, there could be an increase in the pain, which could lead a patient to schedule an emergency visit or request stronger (i.e. narcotic) pain medications.

CONCLUSION:

The results of this study indicate that there is trend toward there being no difference in pain relief between taking ibuprofen 600 mg and acetaminophen 1000 mg together or alternating the same medications. Further studies with an increased number of subjects are needed to either validate or refute these findings.

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