

## EFFECTS OF THREE ORAL ANALGESICS ON POSTOPERATIVE PAIN FOLLOWING ROOT CANAL PREPARATION: A CONTROLLED CLINICAL TRIAL

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### ABSTRACT

**Objective:** To compare the effect of single dose of three analgesics on postoperative endodontic pain following pulpectomy in teeth with irreversible pulpitis.

**Study Design:** A quasi-experimental study.

**Place and Duration of Study:** Endodontics department, Fatima Jinnah Dental College Hospital Karachi, from Jan to Oct 2018.

**Methodology:** In this Double Blind placebo controlled study, 120 subjects coming with the complaint of irreversible pulpitis in any one tooth were randomly allocated into 4 groups. Each group took either naproxen sodium (550mg), ibuprofen (400mg), tramadol (100mg) or placebo medication (multivitamin tablet) immediately after the pulpectomy appointment. A questionnaire was designed to assess the experienced pain based on VAS scale at 6, 12 and 24 hours postoperatively. Kruskal-Wallis test was applied followed by post-hoc analysis to compare the VAS scores by taking  $p$ -value  $\leq 0.05$  as significant.

**Results:** Pain levels were significantly lower in experimental groups as compared to placebo ( $p < 0.001$ ) but there was no statistically significant difference between the effectiveness of naproxen, ibuprofen and tramadol at 6, 12 and 24 hours postoperatively.

**Conclusion:** Naproxen, Ibuprofen and Tramadol were found to be equally effective in reducing pain after instrumentation in teeth with irreversible pulpitis.

**Keywords:** Analgesics, Endodontics, Irreversible pulpitis, NSAIDs, Pain management, Pulpectomy.

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### INTRODUCTION

Pain is the most common reason for a visit to the dentist<sup>1</sup>, and one of the most important objectives of root canal treatment is to alleviate this pain. Root canal treatment in itself is not a painful procedure if carried out under proper local anesthesia, ensuing postoperative pain is a concern for both the patient and the clinician. Post endodontic pain is intense during the first 24-48 hours after the procedure, reducing in intensity with the passage of time<sup>2</sup>. This pain can be related to the amount of extruded debris from the canal into the periradicular tissues during the procedure. It can also be due to over-instrumentation or restoration in hyperocclusion<sup>3</sup>. There is also a positive correlation between post-endodontic pain and presence of preoperative pain and apprehension<sup>4</sup>.

Commonly used methods to relieve post-operative endodontic pain are administration of long acting local anesthetic agents and use of analgesic drugs. Some of these drugs act by preventing the production of inflammatory mediators called prostaglandins, thus decreasing pulpal and corresponding peri-radicular changes. Increased prostaglandin levels are linked with increased levels of inflammation and pain<sup>5</sup>.

Others have central and peripheral nervous system effects. Whether NSAIDs, Acetaminophen or opioids, all can be used to reduce pulpal and peri-radicular pain levels. Ibuprofen is the most commonly used analgesic with the safest profile<sup>6</sup>. Naproxen has longer duration of action as compared to ibuprofen but takes more time to reach similar plasma levels<sup>7</sup>. Tramadol is a non-narcotic opioid that acts on central nervous system to produce analgesia<sup>8</sup>.

Knowing an effective pharmacologic regimen to control post-operative endodontic pain has been the objective of many previously conducted studies<sup>9-11</sup>, yet no definitive analgesic and anti-inflammatory protocol have been established. The present study compared the effects of Ibuprofen, Naproxen and Tramadol in controlling post-operative pain following pulpectomy in teeth with signs and symptoms of irreversible pulpitis.

### METHODOLOGY

This quasi-experimental study was carried out from January to October 2018 in the Department of Endodontics, Fatima Jinnah Dental College and Hospital, Karachi. After approval from the Institutional Ethics Review board via certificate no. MAR-2018-OPR01, data was collected from randomly selected 120 subjects coming to the Department of Endodontics with the complaint of irreversible pulpitis. Previously

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reported means of  $5.8 \pm 2.24$  (baseline),  $0.7 \pm 0.99$  (after 24 hours) for group 1 and  $5.8 \pm 2.69$  (baseline),  $0.4 \pm 0.97$  (after 24 hours) for group 2 were used to calculate sample size by WHO calculator at 95% confidence interval. After explanation and comprehensive medical history, written consent was taken before the start of the procedure. Subjects were divided randomly into four groups of 30 each by using software Microsoft Excel 2013. A control group received a multivitamin medication as placebo and three test groups received a single dose of either tablet (400 mg of Ibuprofen), tablet (100 mg of Tramadol HCL or tablet (550 mg of Naproxen Sodium; ICI, Pakistan) immediately after the pulpectomy appointment.

A questionnaire was designed to record the VAS score before and after 6, 12 and 24 hours of treatment. The questionnaire contained 4 lines of 10 cm each drawn at some distance to allow patients to draw lines parallel to them according to their pain levels at specified time intervals.

Inclusion criteria was cooperative patients of both genders and age group of 18-60 years with spontaneous pain of moderate to severe nature associated with irreversible pulpitis and no signs or symptoms of apical periodontitis. Patients having no other tooth with symptoms of irreversible pulpitis in the same quadrant was also a criterion for inclusion.

Exclusion criteria was patients who had taken analgesics in the previous 6-12 hours, patients with previous bad dental experience, history of allergy to the experimental drugs, pregnant or lactating women, periodontally compromised tooth and significant medical history.

On the day of the appointment, Local anesthesia was administered using 1.8 ml cartridge of Lidocaine 1; 100,000 (Medicaine) and 27-gauge needle. Isolation was obtained by using rubber dam and access was gained into the pulp chamber. Electronic apex locator (Dentaport ZX; J. Morita, Japan) was used to determine working length and patency was achieved using K-file # 10. Further instrumentation was carried out with K-files # 15, 20 and 25 to achieve pulpectomy. Irrigation was done between instrumentation using 2.5% sodium hypochlorite. After pulpectomy had been carried out, access was sealed with cotton pellet and temporarily restored with Cavit (3M ESPE, St Paul, USA).

A coded sealed pack containing a randomly allocated tablet was given to the patient after the appointment and was instructed to take it immediately. A questionnaire containing biodata, VAS and secret code

of the medicine was handed over to the patient and was instructed to record the pain levels at specified intervals. Filled questionnaires were collected from the patients at the next appointment.

Data analysis was done using SPSS-23 (SPSS inc., IL, USA). Normality testing was done using the Shapiro-Wilk test. The Kruskal-Wallis test was applied followed by Dunn's test for Post-hoc analysis to compare the VAS scores of test groups considering  $p$ -value of  $\leq 0.05$  as significant.

## RESULTS

All patients included in the study sample ( $n=120$ ) reported back to the department with the filled questionnaire at follow-up appointment and loss to follow-up was avoided by keeping in contact with the patients throughout the study. Only two forms had no score marked at 6-hour interval which was replaced using Last Observation Carried Forward (LOCF).

Table-I showed the demographic characteristics of each group. All patients experienced post-procedural pain at the 6, 12 and 24 hours postoperatively. Table-II showed mean VAS scores and their standard deviation before and 6, 12 and 24 hours after the administration of drug. Among all the studied factors, three factors (gender, type of medication and pre-operative pain) were found to be statistically significant in determining post-procedural pain.

There were significantly lower pain levels in experimental groups as compared to placebo at 6, 12 and 24 hours ( $p < 0.001$ ). No significant difference was found between the analgesic effects of Naproxen, Tramadol and Ibuprofen ( $p > 0.05$ ). Patients taking Naproxen had lower VAS scores at all intervals as compared to other groups, but it was not statistically significant.

A significant correlation was found between Gender and VAS scores after intervention as females reported more severe pain levels as compared to males ( $p < 0.014$ ). No significant association was found between the tooth being treated and the VAS score ( $p > 0.438$ ).

Also, there was a significantly positive correlation between the intensity of pre and postoperative pain ( $p < 0.001$ ). Chances of more postoperative pain were associated with the intensity of pre-operative pain.

## DISCUSSION

Post-endodontic pain can lead to patient dissatisfaction with the process, evoking fear towards dental treatment<sup>11,12</sup>. This can act as a barrier to continued subsequent treatment causing a disservice to the patient. This post-operative pain is mainly due to the irri-

tation of periodontium and trauma of severing the pulp which leads to the formation of chemical mediators and cytokines, most important of which are prostaglandins<sup>3</sup>.

Effective pain management strategy involves pharmacological and non-pharmacological approaches<sup>13</sup>. Preoperative pain control includes proper diagnosis and anxiety reduction protocol. This is followed by intra-operative pain control which involves effective local anesthesia and careful operative techniques. Lastly, postoperative pain can be managed by different analgesic medications.

post-instrumentation pain in the first 24 hours after instrumentation.

Raouf *et al*, also found naproxen to be effective for pain relief as compared to placebo after endodontic therapy<sup>10</sup>. This is in line with the results of the present study. Elzaki *et al*, in a double-blind clinical trial compared the effect of acetaminophen alone and combined with 3 different NSAIDs taken immediately after root canal preparation and found Ibuprofen/Acetaminophen combination to be more effective as compared to others<sup>11</sup>.

Moreover, this study assessed the effects of drugs

**Table-I: Demographic data of each group.**

Age (Years ± SD)		Naproxen	Ibuprofen	Tramadol	Placebo
		33.20 ± 9.4	32.0 ± 9.1	32.07 ± 8.9	34.47 ± 10.8
Gender	Male (%)	13 (43.3)	19 (63.3)	15 (50.0)	12 (40.0)
	Female (%)	17 (56.7)	11 (36.7)	15 (50.0)	18 (60.0)
Tooth	Maxillary Anterior (%)	5 (16.6)	11 (36.6)	8 (26.6)	6 (20.0)
	Maxillary Posterior (%)	7 (23.3)	8 (26.6)	7 (23.3)	9 (30.0)
	Mandibular Anterior (%)	11 (36.6)	7 (23.3)	8 (26.6)	9 (30.3)
	Mandibular Posterior (%)	7 (23.3)	4 (13.3)	7 (23.3)	6 (20.0)

**Table-II: The means ± standard deviation of visual analog score (VAS) before and after administration of analgesic drugs and placebo.**

Name of Drug	VAS ± SD Before drUg	VAS ± SD 6 hours After Drug	VAS ± SD 12 hours After Drug	VAS ± SD 24 hours After Drug
Naproxen	5.0 ± 2.0	2.8 ± 1.4	1.8 ± 1.2	0.8 ± 0.8
Ibuprofen	5.2 ± 1.8	3.4 ± 1.4	2.2 ± 1.0	1.5 ± 1.1
Tramadol	5.2 ± 1.9	3.3 ± 1.2	2.4 ± 1.2	1.6 ± 1.2
Placebo	5.1 ± 1.1	4.4 ± 0.9	3.9 ± 1.0	3.6 ± 1.1

This double-blind study compared the efficacy of three different analgesic drugs in controlling post-operative pain after endodontic instrumentation. Inclusion criteria involved subjects with moderate to severe spontaneous pain as these are the patients most difficult to manage. Also, severity of pre-operative pain is one of the most important indicators of postoperative pain intensity<sup>4</sup>. The teeth with periapical inflammation were excluded from the study as this severely inflamed tissue needs more time to heal. Such patients may require additional pain killers and thus might have resulted in bias in the results.

Mehrvarzfar *et al*, compared the analgesic effect of single doses of Novafen, Naproxen and Tramadol on post-endodontic pain following instrumentation in teeth with symptoms of irreversible pulpitis<sup>9</sup>. Tramadol and placebo groups were significantly less effective in controlling pain levels after 24 hours of root canal instrumentation as compared to novafen and naproxen that were similar to each other in achieving effective pain relief. Whereas in present study, Naproxen, Ibuprofen and Tramadol were equally effective in reducing

for 24 hours since most patients experience maximum post-operative endodontic pain during this period<sup>2,14</sup>. The administration of naproxen, ibuprofen and tramadol is likely to result in relief from pain caused due to inflammation subject to their anti-inflammatory effects. Patients who had taken any analgesic drugs during the 12 hours before the procedure were excluded from the study since this might have led to interfering of effects of multiple analgesic drugs.

The female patients in this study reported significantly higher pain scores as compared to males ( $p < 0.014$ ). This finding is in accordance with previous studies by Madani and Sadaf that also reported more pain experience in females as compared to males after endodontic treatment<sup>15,16</sup>. This may validate the sex-dependent manner of pain relief over the study period. It is assumed that sex hormones mainly estrogen may interact with some neuromediators and neuroactive agents involved in the inflammatory process. Brain response to such stimulants is different in male and female individuals<sup>17</sup>.

This study found a statistically significant correlation between pre and postoperative pain ( $p < 0.001$ ). This was in line with the study by Sadaf and Ahmad<sup>16</sup>, who also found significant association between the severity of pre and post-operative endodontic pain.

NSAIDs act by inhibiting the inflammatory mediators, thus reducing pain<sup>67</sup>. On the other hand, Opioids act by increasing the pain threshold and perception<sup>18</sup>. This study found no significant difference in pain relief from three different drugs belonging to these groups, though patients taking naproxen had comparatively lower VAS scores at all intervals.

### LIMITATIONS

However, there were certain limitations to this study. After taking the first dose in front of the operator, it could not be ensured that the patients had taken all subsequent doses at their specified time. Secondly pain perception varies between individuals<sup>18</sup>. This can be attributed to emotional status, psychological factors and difference in pain threshold levels. Furthermore considering the side effect profile of the prescribed drugs, risk to benefit ratio of these drugs has not been assessed. Further studies need to be carried out to overcome these limitations.

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### CONCLUSION

This study concludes that Naproxen, Ibuprofen and Tramadol were equally effective in reducing post-instrumentation pain in the first 24 hours after root canal treatment in teeth with irreversible pulpitis.

### CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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