

Comparative Evaluation of Efficacy of Preoperative Administration of Piroxicam and Ibuprofen on Pain after Placement of Separators in Orthodontic Treatment

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ABSTRACT

Background: Pain has been reported to be the most common reason for patient to dislike or discontinue the treatment. The aim of the present study is to compare the effects of administration of pre-operative piroxicam and ibuprofen on pain after placement of separators in orthodontic treatment.

Materials and methods: For the study, we selected 22 patients scheduled to receive fixed orthodontic treatment. Subjects included in the study belonged to the age group of 18-30 years with mean age of 23.43 years, scheduled for orthodontic treatment for the first time or re-treatment requiring the placement of atleast two separators in each of the four quadrants. The subjects were asked to rate their expectation of pain consequent to separator placement using a 10 cm VAS. Anchors of "no pain at all" (0 cm) and "worst pain imaginable" (10 cm) were used.

Results: After the placement of separators, repeated comparisons at 2 h, 6 h, Bedtime, Awakening and 24 h between two groups were done. It was observed that Piroxicam group experienced less "pain on chewing" compared with patients in the ibuprofen group ($P < .05$). After the placement of separators, repeated comparisons at 2 h, 6 h, Bedtime, Awakening and 24 h between two groups were done. It was observed that significant differences are present between two groups at the 2-hour and 6-hour intervals ($P < 0.05$). Comparison of mean pain scores at Bedtime and 24- hour after placement of separator did not show significant difference between the both groups.

Conclusion: There is no significant difference in the discomfort perceived by the subjects during initial separator placement among two groups and Piroxicam 20 mg is significantly more effective as an analgesic in orthodontic treatment compared to Ibuprofen 400 mg.

Keywords: Ibuprofen, piroxicam, orthodontic treatment, separators, pain.

INTRODUCTION

Pain can be defined as an unpleasant sensation caused due to same changes in the

surrounding tissues. These tissue changes in orthodontic treatment are caused by the compression of periodontal ligament and alteration of blood flow to the tooth, resulting in releasing

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chemical mediators like prostaglandins.^{1, 2} In orthodontic therapy, approximately 95% of patients report varying degrees of pain and discomfort during different stages of therapy, such as placement of separators or arch wire placement.^{3, 4} Also, pain has been reported to be the most common reason for patient to dislike or discontinue the treatment.^{5, 6} It has been claimed that degree of pain experienced by patient varies based on gender, age, patient anxiety level, and emotional stress.^{7, 8}

Non-steroidal anti-inflammatory drugs (NSAIDs) act by inhibiting cyclooxygenase enzymes, thereby blocking the formation of prostaglandins and preventing inflammation and the sensitization of peripheral nerve receptors.⁹ If NSAIDs are given before a procedure, the body can absorb and distribute the medication before tissue injury occurs. This result in an analgesic effect by reducing nerve sensitivity to certain inflammatory mediators and could allow for lower production of prostaglandins and thus decreasing inflammatory response.¹⁰

With regard to preoperative administration of analgesics for pain control in orthodontic therapy, the efficacy of only aspirin, ibuprofen, and naproxen sodium has been studied to date.^{11, 12} Piroxicam is an oxicam, a non-selective COX inhibitor. It exhibits a long mean half-life of 50–60 hours, which permits once daily dosing. The recommended dosage of piroxicam is 20–30 mg once daily. The advantage of piroxicam is the significantly lower gastrointestinal irritation it causes, as is commonly observed with administration of aspirin, ibuprofen, or naproxen sodium.¹³

The aim of the present study is to compare the effects of administration of pre-operative piroxicam and ibuprofen on pain after placement of separators in orthodontic treatment.

MATERIALS AND METHOD

The study was conducted in the Department of Orthodontics in the institution. For the study, we selected 22 patients scheduled to receive fixed orthodontic treatment. The ethical approval for the study was obtained from the Ethical committee of the institute. Subjects included in the study belonged to the age group of 18-30

years with mean age of 23.43 years, scheduled for orthodontic treatment for the first time or re-treatment requiring the placement of atleast two separators in each of the four quadrants. A written consent was obtained from the patients after informing them about the aim and procedure of the study.

Those patients were excluded from the study that had any medical condition preventing them to participate in the study such as pregnancy. Also, subjects undergoing any oral surgical procedure before separator placement were excluded from the study. A brief medical history was obtained from each patient especially hypersensitivity to NSAIDS and vitals were recorded.

Administration of drugs to the patients was done randomly and the investigator who dispensed the drugs to patients was blinded to the drug because standard white opaque papers were used for both the drugs. Prior to separator placement, subjects completed a Visual Analog Scale (VAS) for expected pain. Pain upon placement was recorded on a VAS. The subjects were asked to rate their expectation of pain consequent to separator placement using a 10 cm VAS. Anchors of "no pain at all" (0 cm) and "worst pain imaginable" (10 cm) were used. Pain scores were recorded in the pain diary at: 2 hours post-separator placement (T1), 6 hours post-separator placement (T2), at bedtime (T3), at time of awakening (T4) and at 24 hours post-separator placement (T5).

Statistical Analysis

The analysis of the data was done using SPSS software for windows. Student's t-test was used for comparison of pain perception among first and second group. Statistical significance was determined at $p < 0.05$.

RESULTS

For the study, we selected total 22 patients. Patients were randomly grouped into two groups, Group 1 and Group 2, with 11 patients in each group. The mean age of all three groups were within the same range and was not statistically significant. The Visual Analogue Scale (VAS scale) was used for the measurement of pain because it has been shown

to be the most reliable and accurate tool in the evaluation of subjective experiences such as pain. The summary for the statistic of both the groups are given in Table 1, Figure 1 and Figure 2. After studying the profile of each patient for discomfort at each medication, it was observed that there was a decrease in the pain perceived with respect to time period.

Differences in Pain Experienced between Experimental Groups in "Pain on chewing"

After the placement of separators, repeated comparisons at 2 h, 6 h, Bedtime, Awakening and 24 h between two groups were done. It was observed that Piroxicam group experienced less "pain on chewing" compared with patients in the ibuprofen group ($P < .05$). The mean pain scores for "Pain on chewing" by Piroxicam group at 2 h, 6 h, Bedtime, Awakening and 24 h were 1.68+2.71 cm, 4.24+6.02 cm, 3.87+2.98 cm, 4.91+4.12 cm and 5.71+4.89 cm respectively. The mean pain scores for "Pain on chewing" by Ibuprofen group at 2 h, 6 h, Bedtime, Awakening and 24 h were 3.26+1.98 cm; 7.78+5.37 cm; 6.22+4.11 cm; 7.48+4.22 cm; and 8.18+4.86 cm respectively (Table 1, figure 1).

Differences in Pain Experienced between Experimental Groups in "Pain on Biting"

After the placement of separators, repeated comparisons at 2 h, 6 h, Bedtime, Awakening and 24 h between two groups were done. It was observed that significant differences are present between two groups at the 2-hour and 6-hour intervals ($P < 0.05$). Comparison of mean pain scores at Bedtime and 24-hour after placement of separator did not show significant difference between the both groups. The mean pain scores for "Pain on biting" by Piroxicam group at 2 h, 6 h, Bedtime, Awakening and 24 h were 1.71+2.98 cm; 3.23+3.11 cm; 4.22+3.24 cm; 4.98+3.91 cm; and 5.34+3.64 cm respectively. The mean pain scores for "Pain on biting" by Ibuprofen group at 2 h, 6 h, Bedtime, Awakening and 24 h were 3.20+2.39 cm; 6.66+5.44 cm; 6.20+3.91 cm; 7.21+4.21 cm; and 7.86+5.04 cm respectively (Table 2, figure 2).

Table 1: Comparison of Visual Analogue Scale score for various determinants.

Mean $\pm$ SD)					
Group s	2 h	6 h	Bedtime	Awakening	24 h
Piroxicam	1.68 $\pm$ 2.71	4.24 $\pm$ 6.02	3.87 $\pm$ 2.98	4.91 $\pm$ 4.12	5.71 $\pm$ 4.89
Ibuprofen	3.26 $\pm$ 1.98	7.78 $\pm$ 5.37	6.22 $\pm$ 4.11	7.48 $\pm$ 4.22	8.18 $\pm$ 4.86
Mean pain scores for biting in study groups (Mean $\pm$ SD)					
Group s	2 h	6 h	Bedtime	Awakening	24 h
Piroxicam	1.71 $\pm$ 2.98	3.23 $\pm$ 3.11	4.22 $\pm$ 3.24	4.98 $\pm$ 3.91	5.34 $\pm$ 3.64
Ibuprofen	3.20 $\pm$ 2.39	6.66 $\pm$ 5.44	6.20 $\pm$ 3.91	7.21 $\pm$ 4.21	7.86 $\pm$ 5.04

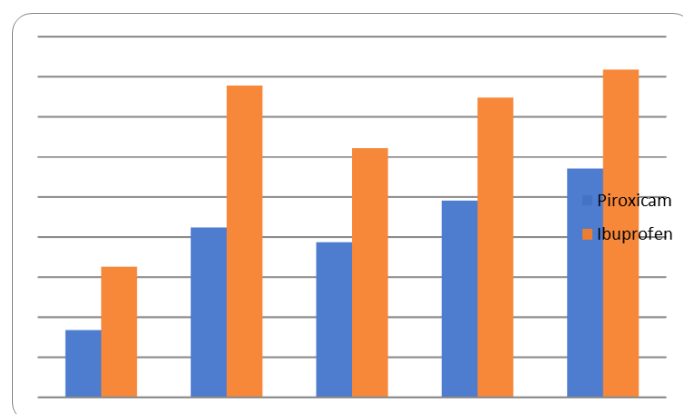


Fig 1: Comparison of Mean pain scores for chewing in study groups

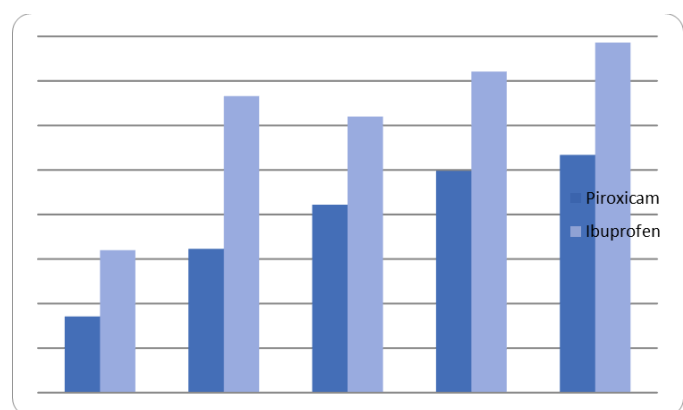


Fig 2: comparison of Mean pain scores for biting in study groups

DISCUSSION

Mean pain scores for chewing in study groups (

Pain relief in dentistry has been fairly well studied in the literature but the management of pain associated with orthodontic treatment is less well known. As clinicians we are often asked whether it will be necessary for the patients to take analgesics during orthodontic treatment and if so, which is likely to be the most effective. Some studies have shown that pretreatment doses of NSAIDs may help to reduce the amount of pain experienced immediately after treatment.¹⁴ This study was done with the aim to compare the efficacy of two analgesics, Piroxicam and Ibuprofen in their standard doses in the management of orthodontic pain as a pre-emptive analgesic one hour before the procedure.

Piroxicam was the analgesic chosen for this study because it has been in use for a long time and its dosage is very convenient. It only needs to be used once a day because of its long elimination half-life with good results in controlling acute pain of mild or moderate intensity, such as the pain triggered by orthodontic activation, without presenting any significant adverse effects. Although single preoperative doses of 20 mg of piroxicam and 400 mg of ibuprofen were similar in terms of onset of action, piroxicam provided pain relief for a longer duration, until the 24 hours; this allows for a single preoperative dose, without the need for an additional postoperative dose.

This study analyzed perceived discomfort after initial placement of separators and measured the pain perceived using 10 cm Visual Analogue Scale over a period of 2 hours, 6 hours, bedtime, and awakening and at 24 hours. Discomfort was measured using a VAS, which is one of the most commonly used tools in the measurement of perceived discomfort during orthodontic treatment.

The results of this investigation reveal that patients who had been administered 20 mg of piroxicam 1 hour preoperatively exhibited significantly lower pain scores than did patient in the other groups until 24 hours after separator placement. This finding could be attributed to the absorption of the NSAIDs and the high bioavailability of the drug, which blocks the synthesis of prostaglandins and consequently decreases the inflammatory response.

Zarif Najafi et al conducted the study to evaluate and compare the effect of pre-procedural administration of acetaminophen, ibuprofen, and meloxicam in reducing pain after separator placement. Three hundred twenty-one patients who needed orthodontic treatment and aged above 15 were randomly assigned to one of the three study groups: group A: 650 mg acetaminophen, group B: 400 mg ibuprofen, and group C: 7.5 mg meloxicam. All subjects received a single dose of medication 1 h prior to separator placement. Using visual analog scale, patients recorded their pain perception during rest, fitting posterior teeth together, and chewing at time intervals of immediately, 2, 6, 24, and 48 h after separator placement. There was no significant difference between acetaminophen, ibuprofen, and meloxicam in post-separator placement pain control when administered 1 h before the procedure. In all the groups, at rest, pain level elevated after separator placement and reached its peak at 24 h and then subsided until 48 h. But during chewing and fitting of the posterior teeth, some of the groups reached a peak in pain at 48 h. No significant difference was found in pain experience between males and females. It was concluded by the authors that Meloxicam can be used as an effective analgesic in orthodontic pain control considering it has less gastric side effects compared to the conventional non-steroidal anti-inflammatory drugs.¹⁵

Study conducted by Kohli et al. to compare the effectiveness of preoperative administration of ibuprofen and piroxicam on orthodontic pain experienced after separator placement. Ninety patients aged between 13 years 9 months and 18 years 2 months who were to undergo fixed appliance orthodontic treatment were enrolled in this double-blind, parallel-arm, prospective study. Patients were evenly and randomly distributed to any of three experimental groups, as follows: (1) administration of placebo, (2) administration of 400 mg ibuprofen, and (3) administration of 20 mg piroxicam; medications were administered 1 hour before separator placement. The pain perceived was recorded by the patients on a linear and graded Visual Analogue Scale at time intervals of 2 hours; 6 hours; nighttimes on the day of appointment; 24 hours after the appointment; and 2 days, 3 days, and 7 days after separator placement during each of the four activities (viz, chewing, biting, fitting front

teeth, and fitting back teeth). The results revealed that preoperative administration of 20 mg of piroxicam 1 hour prior to separator placement resulted in a significant decrease in pain levels at 2 hours, 6 hours, nighttimes, and 24 hours and on the second and third days after separator placement, compared to patients on a placebo or ibuprofen. It was concluded by the authors that premedication with 20 mg of piroxicam results in significantly decreased pain experienced, compared to premedication with 400 mg of ibuprofen or placebo.¹⁶

A study conducted by Bird et al. compared the pain control effectiveness of acetaminophen (650 mg) with ibuprofen (400 mg) taken 1 hour before separator placement in adolescents. The patients recorded their discomfort on a 100-mm visual analog scale during several activities (teeth not touching, chewing, and fitting back teeth together) and by selecting words adapted from the McGill Pain Questionnaire at 5 time intervals: immediately before separator placement, immediately after separator placement, 2 to 3 hours later, at bedtime, and on awakening the next morning. The patients (n = 33) were randomly assigned to the ibuprofen group or the acetaminophen group.

A repeated-measures ANOVA was performed as a function of time and treatment group. Pain increased immediately after separator placement, lessened, and then increased to a peak the next morning. The most commonly selected words to describe pain were "annoying," "sore," and "tight." There was no significant difference in pain at any time after separator placement regardless of the medication taken. It was concluded that Acetaminophen and ibuprofen produced no significant differences in pain after separator placement.¹⁷

CONCLUSION

It was concluded by the authors that there is no significant difference in the discomfort perceived by the subjects during initial separator placement among two groups and Piroxicam 20 mg is significantly more effective as an analgesic in orthodontic treatment compared to Ibuprofen 400 mg.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Krishnan V. Orthodontic pain: from cause to management—a review. *Eur J Orthod.* 2007;29:170–79.
2. Furstman L, Bernik S. Clinical considerations of the periodontium. *Am J Orthod.* 1972;61:138–55.
3. Lew KK. Attitudes and perceptions of adults towards orthodontic treatment in an Asian community. *Community Dent Oral Epidemiol.* 1993;21:31–5.
4. Scheuer PA, Firestone AR, Burgin WB. Perception of pain as a result of orthodontic treatment with fixed appliances. *Eur J Orthod.* 1996;18:349–57.
5. Oliver RG, Knapman YM. Attitudes to orthodontic treatment. *Br J Orthod.* 1985;12:179–88.
6. Fujiyama K, Honjo T, Suzuki M, Matsuoka S, Deguchi T. Analysis of pain level in cases treated with Invisalign aligner: comparison with fixed edgewise appliance therapy. *Prog Orthod.* 2014;15:64.
7. Ngan P, Kess B, Wilson S. Perception of discomfort by patients undergoing orthodontic treatment. *Am J Orthod Dentofacial Orthop.* 1989;96:47–53. doi: 10.1016/0889-5406(89)90228-X.
8. Brown DF, Moerenhout RG. The pain experience and psychological adjustment to orthodontic treatment of preadolescents, adolescents, and adults. *Am J Orthod Dentofacial Orthop.* 1991;100:394–56.
9. Jackson DL, Moore PA, Hargreaves KM. Preoperative nonsteroidal anti-inflammatory medication for the prevention of postoperative dental pain. *J Am Dent Assoc.* 1989;119:641–7.
10. Bernhardt MK, Southard KA, Batterson KD, Logan HL, Baker KA, Jakobsen JR. The effect of

preemptive and/or postoperative ibuprofen therapy for orthodontic pain. *Am J Orthod Dentofacial Orthop.* 2001;120:20-27.

11. Polat O, Karaman AI, Durmus E. Effects of preoperative ibuprofen and naproxen sodium on orthodontic pain. *Angle Orthod.* 2005;75:791-796.
12. Polat O, Karaman AI. Pain control during fixed orthodontic appliance therapy. *Angle Orthod.* 2005;75:214-219.
13. Furst DE, Munster T. Nonsteroidal anti-inflammatory drugs, disease modifying antirheumatic drugs, non-opioid analgesics & drugs used in gout. In: Katzung BG, ed. *Basic & Clinical Pharmacology*, 8th ed. New York, NY: LangeMcGraw Hill; 2001:596-624.
14. Shetty S, Shenoy N, Shenoy K A, Unnikrishnan B, Mogra S. Comparison of effects of preoperative piroxicam and ibuprofen on pain

after separator placement: A randomized controlled trial. *J Orthod Res* 2013;1:57-61

15. Zarif Najafi H, Oshagh M, Salehi P, Babanouri N, Torkan S. Comparison of the effects of preemptive acetaminophen, ibuprofen, and meloxicam on pain after separator placement: a randomized clinical trial. *Progress in Orthodontics.* 2015;16:34. doi:10.1186/s40510-015-0104-y.
16. Kohli SS, Kohli VS. Effectiveness of piroxicam and ibuprofen premedication on orthodontic patients' pain experiences A randomized control trial. *Angle Orthod.* 2011;81:1097-1102.)
17. Bird SE, Williams K, Kula K. Preoperative acetaminophen vs ibuprofen for control of pain after orthodontic separator placement. *Am J Orthod Dentofacial Orthop.* 2007 Oct;132(4):504-10.