

Effect of Preoperative Ibuprofen and Acetaminophen on Orthodontic Pain

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ABSTRACT

Objectives: Pain in dentistry is a common problem which dentists think about it. Controlling the pain in dentistry is crucial. Nonsteroidal anti-inflammatory drugs (NSAIDs) and acetaminophen are used worldwide for suppressing pain and inflammation. The aim of the present study was to compare the effect of preoperative ibuprofen and acetaminophen therapy on orthodontic pain with a different method.

Materials and methods: Samples were divided into two groups: Group I (they received placebo in first level, acetaminophen at second level, and ibuprofen at third level), group II (they received placebo in first level, ibuprofen at second level, and acetaminophen at third level). All drugs were administered single dose before treatment and the researcher put 1 month gap between levels. After using each drugs in each level, the amount of pain was measured by using a questionnaire based on several activities (chewing, in time of contacting teeth, and noncontacting) with visual analog scale (VAS) in multiple times.

Results: Placebo, ibuprofen, and acetaminophen have significant effect on suppressing pain before starting treatment, during chewing, in time of contacting teeth, and noncontacting ($p=0.000$). Although the pain process in this study was ascendant, ibuprofen and acetaminophen were unable to reduce pain significantly in comparison to placebo.

Conclusion: Pain process was ascendant and the mentioned drugs were unable to reduce the pain by passing time. We could not reduce the pain process gradient by this drug dose. So, by increasing the dose, we wish to reduce orthodontic pain.

Keywords: Acetaminophen, Ibuprofen, Orthodontic, Pain.

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INTRODUCTION

Controlling the pain during orthodontic treatment is important for patient and dentists.¹ Past studies have shown that imagination of pain in patients mind is the worst aspect of orthodontic treatment and is the first reason for not continuing the orthodontic treatment.^{1,2} Orthodontic pain by having more severity is the worst pain in comparison with other pains, such as tooth extraction.³

Pain has a multifactorial nature and depends on the patient's previous experience of pain, age, sex, appliance type, stress, current emotional state of the patient, and cultural differences. It is thought that a gender-dependent response to pain is related to the culture of the society and is not due to physiologic factors.^{4,5} Pain might have a negative effect on patient compliance and even in some cases will stop brushing painful teeth.⁶ Pressure on the teeth by orthodontic appliance will lead to ischemia, inflammation, and quick edema.⁷ Followed by compression of periodontal dithering ligament (PDL), algogens, such as histamine, prostaglandins, serotonin, and substance P are secreted and start inflammation reactions.⁸ Pain would occur after 2 hours from starting of pressure and reach to its maximum point in 24 hours and would decrease in 5 days.^{7,8}

For controlling pain in dentistry, some ways are suggested, such as use of low-intensity laser on periodontal tissue, transcutaneous electrical nerve stimulation, stimulating PDL, and using nonsteroidal anti-inflammatory drugs (NSAIDs).⁹⁻¹¹

The NSAIDs, such as ibuprofen and naproxen are used due to antinociception, anti-inflammatory, and febrifuge effects, but because of their negative gastrointestinal effects acetaminophen might be prescribed, which is a nonopioid analgesic with no anti-inflammatory effects.¹²⁻¹⁴ Inhibitory effect of NSAIDs on the activity of cyclooxygenase for the production of prostaglandins is the main issue in using NSAIDs for controlling orthodontic pain.¹⁵ In some studies the role of prostaglandins in teeth movements has been proved.^{16,17} It was found that prostaglandin E (PGE) causes bone resorption in rats. Also, topical application of PGE in monkeys has two-fold effects in controlling tooth movements than rats and effect of PGE in human is the same as in rats.^{16,17} Because of the important role of PG in tooth movements, it is recommended not to use ibuprofen for pain control

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because NSAIDs inhibit cyclooxygenase pathway, which will inhibit PGE production. Also, they might inhibit osteoclastic activities and cause slow bone resorption.¹⁸ Although there is no evidence on inhibition of human tooth movements by PG inhibitors in these days,^{19,20} ibuprofen significantly inhibits the production of PG in PDL and consequently will decrease teeth movement speed. On the contrary, although ibuprofen has inhibitory effects on PGE production in PDL, no significant difference in teeth movement speed was observed.²¹

Recent researches in medicine and dentistry are focused on the subject of analgesic prescription before treatment due to reduction of pain after the treatment. It is thought that analgesics are resolving peripheral sensitivity and prevent central sensitivity.²² The aim of using analgesics before treatment is blocking the afferent nerve impulses before they reach to the central nervous system, which is obtained by using narcotics, local anesthesia, or NSAIDs.²³ When NSAIDs are prescribed before treatment, body has enough time to absorb and distribute the drug before tissue damage and PG sequence production, and consequently will reduce inflammation reactions.^{23,24} The aim of this study was to compare the effect of pre-operative ibuprofen and acetaminophen therapy on orthodontic pain with a different method.

MATERIALS AND METHODS

This crossover clinical trial study was double-blinded, which was conducted on people who had inclusion criteria for this study (no specific systemic disease, no digestive and coagulation diseases, due to drug tolerance no history of frequent use of the drugs used in this study, not to receive any other drugs during the study, lack of pain in other teeth and other parts of oral cavity, selected teeth must be vital with no endodontic and periodontal problems) and had been referred to Ahvaz Jundishapur Dentistry Faculty. Software NCSS with 95% power and 95% confidence level was used to calculate the sample size. Fifty-four people in the 18 to 25 years age range were randomly selected. Informed consent was obtained from the participants.

For conducting crossover trial study, the samples were divided into two groups: Groups I and II. The sample size for a clinical trial in each I and II groups was 27 people, but due to the use of randomization table, 25 people in group I and 29 people in group II were acceptable. Randomization table includes 54 random numbers from 0 to 9, where numbers 0 to 4 were related to the group I and numbers 5 to 9 were related to the group II. The obtained numbers from randomization table are as follows:

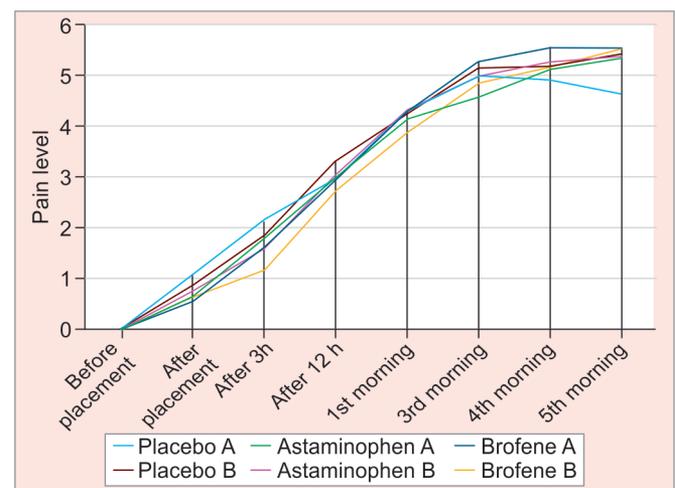
1-8-6-6-9-7-6-7-4-6-5-4-6-6-9-5-0-1-4-7-5-4-5-1-4-2-3-0-1-5-7-9-2-5-0-1-8-6-7-1-9-4-9-2-0-6-4-8-1-4-9-5-1-0-

Samples in group I received placebo (starch) in first level, acetaminophen 650 mg (Kharazmi Pharmaceutical Company, Tehran, Iran) at second level, and ibuprofen 400 mg (Kharazmi Pharmaceutical Company, Tehran, Iran) at third level. Samples in group II received placebo in first level, ibuprofen 400 mg at second level, and acetaminophen 650 mg at third level. At each stage, two sets of 6.4 mm separator [imports/exports Net Tehran Company (NT Co.), USA] were placed between teeth numbers 5, 6, and 7 at right lower quadrant. All three drugs were offered to samples in the form of same capsules. The time interval between each stage was a month.

After using each drugs in each level, the amount of pain was measured by using a questionnaire based on several activities (chewing, in time of contacting teeth, and noncontacting) with visual analog scale (VAS) for multiple times: 1 hour before setting separator, after in time of setting separator, 2 to 3 hours after setting separator, 12 hours after setting separator, and in time of waking up by the next morning and time of waking up in 3rd, 4th, and 5th day. Six days after setting separator, the samples were referred to dentistry faculty for removing the separator. In each level, questionnaires were collected and the effects of three drugs were compared. Also, the effects of three drugs were compared between sexes. Statistical analysis was done using t test and analysis of variance (ANOVA) were used by Statistical Package for Social Sciences (SPSS) software version 22. $p \leq 0.05$ was considered significant.

RESULTS

The results showed that using placebo, ibuprofen, and acetaminophen had significant effect on suppressing pain before starting treatment, during chewing, in time of contacting teeth, and noncontacting ($p = 0.000$). Total pain process is shown in Graph 1. In males, it had been



Graph 1: Pain process during received drugs

Table 1: The effect of received drugs in groups I and II

Groups	Frequency	Received drugs				
		First level	p*	Second level	p†	Third level
I	25	Placebo	0.96	Acetaminophen	0.71	Ibuprofen
II	29	Placebo	0.07	Ibuprofen	0.15	Acetaminophen

*The comparison between first and second levels in both groups.

†The comparison between second and third levels in both groups.

declared that using placebo had significant effect on suppressing pain in time of contacting teeth ($p=0.047$). Acetaminophen had significant effect during chewing, in time of contacting teeth ($p=0.04$), and ibuprofen has significant effect in time of contacting teeth ($p=0.024$). In females, it was shown that using placebo, ibuprofen, and acetaminophen had significant effect on suppressing pain before starting treatment, during chewing, in time of contacting teeth, and noncontacting ($p\leq 0.05$).

To determine the effect of choice, in groups I and II, it was found that there is no significant difference for choosing the drug in group A ($p\geq 0.05$), because in group I, acetaminophen has no significant different with placebo in reducing the pain ($p=0.962$). Also, acetaminophen and ibuprofen were unable to create significant difference in reducing the pain ($p=0.713$). In group II, ibuprofen has no significant difference with placebo in reducing the pain ($p=0.077$) and also ibuprofen and acetaminophen were unable to create significant difference in reducing the pain ($p=0.150$) (Table 1).

To determine ibuprofen and acetaminophen interaction in groups I and II by t test, no significant difference was found ($p=0.589$ and $p=0.868$ respectively). These drugs in each groups could not reduce the pain in comparison with placebo significantly during chewing ($p=0.639$), in time of contacting teeth ($p=0.543$), and noncontacting ($p=0.325$).

Evaluation of pain changes in samples at the time of its creation to its absence showed that there are significant differences between male and female for placebo during chewing immediately after placement ($p=0.003$), in the morning of the 4th day ($p=0.05$). For acetaminophen and ibuprofen, immediately after placement, $p=0.006$ and $p=0.005$ respectively. There were significant differences between male and female in time of contacting teeth for placebo immediately after placement ($p=0.0001$), 3 hours after placement ($p=0.024$), in the morning of the 3rd day ($p=0.05$), and on the morning of the 4th day ($p=0.048$). For acetaminophen and ibuprofen, immediately after placement, the difference was significant ($p=0.004$ and $p=0.009$ respectively). There were significant differences between male and female for placebo in time of noncontacting teeth immediately after placement ($p=0.002$).

In comparison of the effect of the initial dose for placebo, acetaminophen, and ibuprofen in reducing orthodontic pain in groups I and II, it had been shown that there were no significant differences during chewing, in time of contacting teeth, and noncontacting ($p\geq 0.05$).

DISCUSSION

Pain in dentistry is one of the most common complications that dentists think about it. Controlling the pain in dentistry is a wish for patient and dentist.^{22,25} Sedative and nonsteroid drugs are used worldwide for emotional stress, chronic stress, high blood pressure, seizure control, suppressing pain and inflammation, and joint pains.²²

In the present study, it had been declared that ibuprofen and acetaminophen as well as placebo were useful to reduce pain before starting treatment, during chewing, in time of contacting teeth, and noncontacting which these results were close to the results of Patel et al,¹² Bird et al,²⁶ Mehlisch et al,¹³ Polat and Karaman,⁹ Steen Law et al²⁷ studies.

Patel et al¹² showed significant effect of ibuprofen after separator placement. Significant decrease in pain was observed for ibuprofen in comparison with placebo before and after separator placement. Results from Bird et al²⁶ showed that the pain increases after placing separator, then decreases and reaches to its maximum amount in the 1st morning. In Polat and Karaman⁹ study, all analgesics compared to placebo showed reduction in pain. Melissa et al showed that using ibuprofen before starting treatment would significantly decrease the pain in 2 hours after placing separator and in bed time. It had been cleared in Steen Law et al²⁷ study that patients who received edible ibuprofen 1 hour before placing separator showed significant decrease in pain during chewing than patients who received placebo.

The pain process in this study was ascendant and ibuprofen and acetaminophen were unable to reduce pain significantly in comparison to placebo. This result is close to the obtained results from Patel et al¹², Bird et al²⁶ studies and in contradiction with Minor et al²⁸ study. In Patel et al¹² study, acetaminophen and sodium naproxen did not have significant difference with placebo and reduction in the effect of analgesics resulted in high pain in 2nd day. Bird et al²⁶ did not observe any significant difference between acetaminophen and ibuprofen, but

Minor et al²⁸ showed significant decrease in pain 6 hours after separator placement, during bed time, and 1st morning after separator placement.

In this study, it was shown that ibuprofen and acetaminophen were effective for reducing the pain significantly in comparison to placebo. Significant differences were seen at three stages between genders, but pain process got ascendant and the mentioned drugs were unable to reduce the pain by passing time. Thus, we were not able to reduce the pain process gradient by this drug doses and number of tablets. So, by increasing the number of tablets and increasing daily ibuprofen and acetaminophen dose, we wish to reduce orthodontic pain.

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REFERENCES

- Bernhardt MK, Southard KA, Batterson KD, Logan HL, Baker KA, Jakobsen JR. The effect of preemptive and/or post-operative ibuprofen therapy for orthodontic pain. *AM J Orthod Dentofacial Orthop* 2001 Jul;120(1):20-27.
- Oliver RG, Knapman YM. Attitudes to orthodontic treatment. *Br J Orthod* 1985 Oct;12(4):179-188.
- Jones ML, Chan C. Pain in the early stages of orthodontic treatment. *J Clin Orthod* 1992 May;26(5):311-313.
- Polat O, Karaman AI, Durmus E. Effects of preoperative ibuprofen and naproxen sodium on orthodontic pain. *Angle Orthod* 2005 Sep;75(5):791-796.
- Bergius M, Kiliaridis S, Berggren U. Pain in orthodontics. *J Orofac Orthop* 2000 Mar;61(2):125-137.
- Lew KK. Attitudes and perceptions of adults towards orthodontic treatment in an Asian community. *Community Dent Oral Epidemiol* 1993 Feb;21(1):31-35.
- Furstman L, Bernik S. Clinical considerations of the periodontium. *Am J Orthod* 1972 Feb;61(2):138-155.
- Skjelberd P, Lokken P. Pain and other sequelae after surgery-mechanisms and management. In: Anderasen JO, Peterson JK, Laskin DM, editors. *Textbook and color atlas of tooth impactions*. Copenhagen: Munksgaard; 1997. p. 369-437.
- Polat O, Karaman AI. Pain control during fixed orthodontic appliance therapy. *Angle Orthod* 2005 Mar;75(2):214-219.
- Marie SS, Powers M, Sheridan JJ. Vibratory stimulation as a method of reducing pain after orthodontic appliance adjustment. *J Clin Orthod* 2003 Apr;37(4):205-208.
- Proffit, WR. *Contemporary orthodontics*. 3rd ed. St. Louis, MO: Mosby; 2000. p. 280-281.
- Patel S, McGorray SP, Yeziarski R, Fillingim R, Logan H, Wheeler TT. Effect of analgesic on orthodontic pain. *Am J Orthod Dentofacial Orthop* 2011 Jan;139(1):e53-e58.
- Mehlich DR, Sollecito WA, Helfrick JF, Leibold DG, Markowitz R, Schow CE Jr, Shultz R, Waite DE. Multicenter clinical trial of ibuprofen and acetaminophen in the treatment of postoperative dental pain. *J Am Dent Assoc* 1990 Aug;121(2):257-263.
- Dionne RA, Cooper SA. Evaluation of preoperative ibuprofen for postoperative pain after removal of third molar. *Oral Surg Oral Med Oral Pathol* 1978 Jun;45(6):851-856.
- Jaelyn G, Kamdi I, Zara K, Peter K. *Orthodontic pain management*. University of Toronto, Faculty of Dentistry; 2009.
- Yamasaki K, Miura F, Suda T. Prostaglandin as a mediator of bone resorption induced by experimental tooth movement in rats. *J Dent Res* 1980 Oct;56(10):1635-1642.
- Yamasaki K, Shibata Y, Fukuhara T. The effect of prostaglandins on experimental tooth movement in monkeys (*Macaca fuscata*). *J Dent Res* 1982 Dec;61(12):1444-1446.
- Yamasaki K, Shibata Y, Imai S, Tani Y, Shibasaki Y, Fukuhara T. Clinical application of prostaglandin E1 (PGE1) upon orthodontic tooth movement. *Am J Orthod* 1984 Jun;85(6):508-518.
- Williams RC, Jeffcoat MK, Howell TH, Rolla A, Stubbs D, Teoh KW, Reddy MS, Goldhaber P. Altering the progression of human alveolar bone loss with the non-steroidal anti-inflammatory drug flurbiprofen. *J Periodontol* 1989 Sep;60(9):485-490.
- Sandy JR, Harris M. Prostaglandins and tooth movement. *Eur J Orthod* 1984 Jan;6(1):175-182.
- Proffit WR. The biologic basis of orthodontic therapy. In: Proffit WR, Fields HW, editors. *Contemporary orthodontics*. 3rd ed. St. Louis: Mosby; 2000. p. 296-325.
- Kehoe MJ, Cohen SM, Zarrinnia K, Cowan A. The effect of acetaminophen, ibuprofen, and misoprostol on prostaglandin E2 synthesis and the degree and rate of orthodontic tooth movement. *Angle Orthod* 1996 Oct;66(5):339-349.
- Woolf CJ. Generation of acute pain: central mechanism. *Br Med Bull* 1991 Jul;47(3):523-533.
- Golinski MA, Fill DM. Preemptive analgesia. *CRNA* 1995 Feb;6(1):16-20.
- Walker JB, Buring SM. NSAID impairment of orthodontic tooth movement. *Ann Pharmacother* 2001 Jan;35(1):113-115.
- 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):504-510.
- Steen Law SL, Southard KA, Law AS, Logan HL, Jakobsen JR. An evaluation of preoperative ibuprofen for treatment of pain associated with orthodontic separator placement. *Am J Orthod Dentofacial Orthop* 2000 Dec;118(6):629-635.
- Minor V, Marris CK, McGorray SF, Yeziarski R, Fillingim R, Logan H, Wheeler TT. Effects of preoperative ibuprofen on pain after separator placement. *Am J Orthod Dentofacial Orthop* 2009 Oct;136(4):510-517.