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A Study on Efficacy of NSAIDs in Control of Pains Caused by Orthodontic

[1]Parviz Padisar, [1]Roya Nasseh, [2]Mansour Khorasani and [3]Marjan Nassiri Assl
[1]Department of Orthodontics, [2]Department of Maxillofacial and Dental Surgery,
Dental School, Qazvin University of Medical Sciences, Qazvin, Iran
[3]Department of Pharmacology, Qazvin University of Medical Sciences, Qazvin, Iran

Abstract: Since, pain is one of the most important reason that patient do not come for orthodontic treatments, pain control is important for both clinicians and patients. This double-blind prospective clinical trial was carried-out with the aim of determining the efficacy of common used Non-Steroidal Anti Inflammatory Drugs (NSAIDs). For pain control after orthodontic procedures. This study was carried-out in 2 stages. In the 1st stage, separators were placed on both sides of the 1st superior molar, in 43 patients (22 females and 21 males) to obtain their pattern of pain plotted on a 100 mm horizontal line (VAS). In the 2nd stage, 75 patients, after placement of initial arch wire, were randomly divided into 5 groups receiving 5 different treatments (Ibuprofen 400 mg, Naproxen 250 mg, Mefenamic Acid 250 mg, Aspirin 325 mg and placebo (Starch). After receiving 2 doses of drug (1 h before and 6 h after bonding), they indicated the severity of their pain during mastication, biting, fitting on anterior teeth and fitting on posterior teeth in different specified times. Statistical analyses were carried out based on ANOVA and t-test. The pain increased soon after placement of the arch wire and reached its peak in 24 h. In all cases, the least pain was reported following consumption of Ibuprofen and the most after taking placebo. There was no difference between molars and females in the reported severity of pain. The pattern of pain had no relation with gender and the pain began immediately after bonding and reached its peak in 24 h, then gradually decreased during a period of 7 days. Although, all NSAIDs were more or less effective in pain control ibuprofen was relatively more Effie in decreasing the pain.

Key words: Pain, NSAIDs, separator, bonding, orthodontic, VAS

INTRODUCTION

Dental procedures are often painful and orthodontic ones are not an exception. Nearly 95% of patients report some degree of pain during the course of treatment (Scheurer *et al*., 1996) and indeed, pain is one of the most important causes that patients refrain from seeking orthodontic care (Oliver and Knapman, 1985).

While the cause of orthodontic pain is not fully known, it is believed that such a pain may be due to alterations in PDL's blood flow and secretion of prostaglandins (White, 1984).

Prostaglandins cause hyperalgesia, increased permeability and dilatation of blood vessels as well as increased effects of histamine, bradykinin, acetylcholine and serotonin (Aslihan *et al*., 2004). In fact, pain is a multi-factorial phenomenon that has been related to factors such as sex, age, mental status, race, etc. (Scheurer *et al*., 1996). However, various investigations carried-out in different circumstances have revealed no significant difference in the felling of pain in different ages or on the basis of patients gender (Bird *et al*., 2007). Possible sex differences in pain response are thought to be related to culture rather than physiological factors (Burjuis *et al*., 2000).

Different methods are suggested for controlling such a pain, including there using LPL (Low-Power-Laser) in periodontal tissues (Lim *et al*., 1995), transcutaneous electrical never stimulation (Roth and Thrash, 1986) and vibratory stimulation of the periodontal ligament (Marie *et al*., 2003) that have been partially useful. Profile has suggested chewing gum or biting a plastic water to increase the blood flow in those areas of the ligament that are under pressure and block the transfer of impulses to never end (Proffit, 2000). Of course, the preferred method is using NSAIDs which can relieve the pain due to orthodontic procedures by inhibiting inflammatory reactions in these areas (Polat and Karaman, 2005).

Corresponding Author: Roya Nasseh, Department of Orthodontics, Dental School, Qazvin University of Medical Sciences, Shahid Bahonar Ave., P.O. Box: 34197-59811, Qazvin, Iran

There have been few clinical studies to evaluate the efficacy of various analgesics in decreasing the pain caused by orthodontic procedures. White found that 63% of patients report less pain after chewing analgesic gums (White, 1984). Ngan *et al.* (1994) showed that those patients who receive Ibuprofen (400 mg) after placement of separator or arch-wire report significantly less pain, compared to those who receive Aspirin (650 mg) or placebo. It is also reported recently that prescription of Ibuprofen (400 mg) prior to placement of separators in adolescent patients make them feel less pain than those who receive placebo (Law *et al.*, 2000; Bernhardt *et al.*, 2001).

Polat and Karaman (2005) have reported that fad ministration of Naproxen sodium (550 mg) and Aspirin (300 mg) is most effective in relieving pain during fixed appliance therapy. Bird *et al.* (2007) have recently concluded in a study that Acetaminophen is as effective as Ibuprofen in decreasing the pain due to separator placement.

The aims of this study is to determine the characteristics of pain due to orthodontic procedures; evaluate the Efficacy of commonly used NSAIDs in pain control; determine the effect of gender in perception of pain in patients and whether preoperative administration of those NSAIDs decreases orthodontic pain.

MATERIALS AND METHODS

In this prospcctive double-blind clinical trial, 150 patients in the age group of 17±5 years, who had been referred to a specialized clinic in Qazvin for under going fixed orthodontic produces, were enrolled on a serial sampling basis after explaining the process of the study to and obtaining informed consent from them. None of these patients had chronic systemic problems or active caries and did not need prophylactic antibiotic therapy and had no contraindication. For taking NSAIDs. However, in cases who needed extraction the shortest time interval between tooth extraction and beginning of the study on them was 2 weeks. The patients who were excluded consisted of those:

- Whose separators were removed for any reason?
- Who had used analgesics other than those prescribed for this study?
- Who had not filled the VAS form completely?

With the above mentioned consideration, in the first phase of this research, 43 patients (22 females and 21 males) were studied. For these patients 2 separators (Dentaurum) were placed in both sides of the upper first molars.

Asked to record the severity of pain during each of four activities (biting, chewing, fitting or another tooth) in certain determined time intervals (immediately after placement of separators, 2, 6 and 24 h, 2, 3 and 7 days there after). On a 100 mm horizontal line (VAS) by putting a vertical line crossing the horizontal one.

In the 2nd phase 74 patients entered the bonding stage and for each of them 0.022" slot brackets along with 0.016" NiTi wires were placed on all existing maxillary teeth. These patients were randomly divided into 5 groups and for each group one of the predetermined types of medication (Naproxen 250 mg, Ibuprofen 400 mg, Mefenamic Acid 250 mg, Aspirin 325 mg and placebo (starch)), put in identical capsules of the same color, were prescribed in 2 doses (1 h before and 6 h after bonding) and they were asked to completed the VAS form. Finally, the rate of efficacy of the used medications were assessed by measuring the distance between the beginning of the horizontal line from the left and the vertical line put by the patient in each case and the results were analyzed using ANOVA and t-test.

RESULTS

A review of the first phase results showed no significant difference in the severity of reported pain after placement of separator between males and females ($p>0.05$)

The pattern of pain: The peak of pain in the placebo group occurred 6 h after placement of arch wire with respect to fitting anterior and posterior teeth and at 24 h with respect to biting and chewing. Pain levels started to decrease gradually from the peak until the 7th day. The mean and standard deviation of pain level in different conditions are shown in Table 1.

Also, unite 2 h after bonding the severity of pain reported by all groups in biting chewing and fitting on anterior and posterior teeth was less than that reported by the placebo group ($p<0.05$).

The nature of pain caused by orthodontic procedures is not completely known. Dustman suggested that such a pain is caused by a combination of pressure, ischemia, inflammation and edema (Furstman and Bernick, 1972). Burrstone in a study on the pain caused by orthodontic procedures noted an immediate and a delayed pain response and called it hyperalgesia of the periodontal ligament (Ngan *et al.*, 1994).

Davidovitch and Shanfield (1986), proposed the theory that the first phase of the orthodontic movement involves an acute inflammatory response characterized by vase dilatation of PDL and felling of pain.

Table 1: Mean pain index values

Pain index values	0 h	2 h	6 h	24 h	48 h	72 h	7 days
Biting							
Mefenamic acid	1.8	2.8333	4.7	2.1667	1.9	2.1333	1.5667
Placebo	6.8214	6.4643	5.7143	6.3571	1.7857	1	0.9286
Aspirin	1.25	1.4786	1.8571	2.6786	2.0714	1.2857	0.3571
Ibuprofen	0.5	0.6154	1.1538	1	0.7308	0.3077	0
Naproxen	1.4063	1.9375	2	3.3625	2.8625	3.2	1.8438
Chewing							
Mefenamic acid	2.1333	3.3	4.7333	4.2333	4.9333	3.5333	1.8333
Placebo	6.8571	6.5357	5.5714	6.8214	4.6429	1.9286	0.9286
Aspirin	0.5357	1.6071	2.0357	4.5	3.0714	2.25	0.6071
Ibuprofen	0.5	0.6154	1.1538	1	0.7308	0.3077	0
Naproxen	1.4063	1.9375	2	3.3625	2.8625	3.2	1.8438
Fitting Ant. teeth							
Mefenamic acid	2.1333	3.3	4.7333	4.2333	4.9333	3.5333	1.8333
Placebo	6.8571	6.5357	5.5714	6.8214	4.6429	1.9286	0.9286
Aspirin	0.5357	1.6071	2.0357	4.5	3.0714	2.25	0.6071
Ibuprofen	0.1538	0.0769	0.6923	0.6923	0.3077	0.2308	0
Naproxen	0.6875	1.125	1.6875	2	2.3125	1.8125	1.125
Fitting Post. teeth							
Mefenamic acid	1.5333	1.9	2.6333	1.4667	2	1.2333	0.9667
Placebo	6.8571	7.3929	6.1429	4.9286	3.8929	3.2857	1.6429
Aspirin	0.9286	0.9643	1.25	1.7143	1.6786	1.1071	0.0357
Ibuprofen	0.3077	0.3846	0.7692	0.6923	0.7308	0.3077	0
Naproxen	0.7813	1.6875	2	2.425	2.8625	3.45	2

This inflammatory nature of pain is the reason why NSAIDs are an appropriate choice for pain control in orthodontics.

Recent studies have reported on the control of the inflammatory response using preoperative analgesics.

If NSAIDs are taken before the orthodontic procedure, they will be absorbed before prostaglandin production and this causes a decrease in inflammatory responses (Law *et al*., 2000).

According to this study, the pain reported by all groups 2 h after placement of arch wire in cases of biting and filling on another and posterior teeth, was significantly less than that reported by the placebo group. The least pain was reported by the group taking Ibuprofen in this study. Indeed, prescription of all NSAIDs before commencement of orthodontic procedures has caused a significant decrease in pain 2 h after the procedure.

The majority of studies on effects of preoperative consumption of these drugs are related to those of Ibuprofen. Law *et al*. (2000) found that taking Ibuprofen prior to treatment will significantly decrease the pain caused by chewing 2 h after treatment compared to those who have taken placebo.

Bernhardt *et al*. (2001) too, have noted a decrease in pain reported by those who had taken Ibuprofen before treatment compared to those who had taken it only after treatment. Furthermore, Jackson *et al*. (1989) and Dionne *et al*. (1983) concluded that using NSAIDs prior to tooth extraction will result in a delay onset of pain and decreased level of pain intensity after 3rd molar extr-actions. All these studies are consistent with our results.

Comparison of pain severity after drug consumption on chewing. Differences in pain severity in chewing were significant in different groups up to 48 h ($p<0.05$) and after 48 h no significant difference was observed ($p>0.05$).

The most sever pain from the moment of bonding until 2 days later was reported by the placebo group and the least until the 7th day was reported by the Ibuprofen group.

From 2 h after commencement of the procedure on, there was no difference between the effect of Mefenamic Acid and placebo in this case ($p>0.05$).

Comparison of pain severity after drug consumption in other cases (biting, filling on anterior and posterior teeth). In contrast with chewing, where there were significant differences until 48 h after bonding, in other conditions these differences were observed only until 24 h after bonding ($p<0.05$). Of course, in all these conditions the least pain was reported by the Ibuprofen group.

Two hours after bonding, all groups had a significant difference with the placebo group ($p<0.05$), but in the 6th h, there was no significant difference in none of the conditions between Mefenamic Acid and placebo. Twenty four hours after placement of arch wire, the mean of pain severity with respect to filling on anterior teeth in Ibuprofen and Aspirin groups was similar to the placebo group ($p>0.05$).

Also, with respect to filling on posterior teeth there was a significant difference only between the Naproxen group and the placebo group ($p<0.05$).

DISCUSSION

In this study, the pain began from the moment of bonding and reached its peak in 24 h. Most of similar studies, such as those of Law *et al.* (2000), Bernhardt *et al.* (2001), Wilson *et al.* (1989), Polat and Karaman (2005), Aslihan *et al.* (2004) and Ngan *et al.* (1994). Have observed the peak of pain at 24 h after the procedure that gradually decreases until the 7th day.

In our study, the pain's onset was simultaneous with bonding, which is consistent with Bird *et al.* (2007), while in Polat and Karaman (2005) and Aslihan *et al.* (2004) studies the pain's onset was reported to occur 2 h after bonding, which may be due to the higher age range of subjects in our study compared to their (13-14 years olds).

Our results revealed that the patient's taking Ibuprofen reported the least severity of pain in various conditions and different times, which is significant until 48 h later with respect to chewing and until 6 h later in other conditions, compared to the placebo group. Also, the most severe pain was reported by the placebo group in all cases at least for 24 h after bonding. According to Ngan *et al.* (1994). Too, those patients who had taken Ibuprofen had significantly less pain than those who had taken Aspirin and placebo. While the placebo group had reported the most severe pain. Similarity of our results with the above mentioned study's results may be due to closeness of age ranges of our subjects (17±5 years) and theirs (16±6.8 years) and the stage of therapeutic intervention in both studies. Also, both studies used VAS as the method of scaling the patient's pain. Also in the study by Bird *et al.* (2007). It was shown that Ibuprofen was more effective than paracetamol in pain relief.

However, Polat and Karaman (2005) said that those patients who had taken Aspirin had less pain that those who had taken Ibuprofen, which may be due to the fast that dosage form was different in our study (capsule) and theirs (tablet).

In our study the most severe pain was felt on chewing and the least was felt on fitting posterior teeth on. According to the results of Polat and Karaman (2005). In their study, the most severe pain was felt on chewing, that shows chewing puts more pressure on teeth and tissues response to these forces is more severe.

Finally, there was no significant relation between gender and severity of pain, which is consistent with the results of studies (Polat and Karaman, 2005; Ngan *et al.*, 1994; Aslihan *et al.*, 2004).

Therefore, it is shown that pain during orthodontic procedures is real and cannot be considered solely due to psychological factors and Ibuprofen can be used as an appropriate NSAID for relief of paint due to orthodontic procedures, especially during the 1 h.

CONCLUSION

- There is no relation between gender and pain's pattern and severity
- The pain begging at the moment of bonding and reaches its peak in 24 h and then, gradually decreases until the 7th day
- The most severe pain was reported by patients during chewing and the least on fitting on posterior teeth
- Ibuprofen is the most effective NSAID in decreasing the patient's pain after bonding
- Preoperative prescription of NSAIDs can cause significant decrease in pain 2 h after placement of arch wire

SUGGESTIONS

- Since all NSAIDs used in this study were effective in decreasing the patient's pain, it is recommended to prescribe these drugs according to each patient's conditions and the drug's side effects
- It is recommended to use other analgesics like Aataminophen or other NSAIDs for next studies in this regard

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