

## Review Article:

# Causes of Orthodontic Pain & its treatment: an overview

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### Abstract

Orthodontic pain, the most cited negative effect arising as a result of orthodontic force application, is a major matter of distress for clinicians and patients/parents and directly influences their compliance during the treatment. The lengthy duration of treatment along with frequent pain due to the orthodontic appliances often leads to patient burn out and has been associated with discontinuation of orthodontic treatment. It is imperative for the clinicians to identify and manage the pain experienced by their patients. It becomes duty of an orthodontist to satisfy the questions arising in the mind of patients, parents and clinicians. Various modalities for the management of orthodontic pain have been proposed over the years. The purpose of this review article is to throw a light on the various possible causes of orthodontic pain and to discuss the various management options for the orthodontic pain.

### Key words:

Negative effect, Frequent pain, lengthy duration, various modalities, Various management.

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### Introduction

Pain, which is a subjective feeling that shows large individual fluctuations, is one of the major deterrents for patient compliance for orthodontic treatment<sup>1,2</sup>. Surveys of orthodontic patients have revealed that pain is among the most cited negative effect of orthodontic therapy and even when compared with the pain of invasive procedures such as extractions, patients perceived orthodontic pain to be greater in both incidence and severity<sup>3</sup>. Patients undergoing orthodontic treatment

experience varying degrees of discomfort which may be as a result of tension, functional restrictions or psychological aversion to wear the appliance in the public. Patient's compliance during the orthodontic treatment is directly associated with the discomfort experienced by the patient during orthodontic therapy<sup>4,5</sup>.

Patient's often associate pain as the most discouraging factor related to their treatment. Patients undergoing fixed orthodontic treatment have reported greater pain and discomfort than the patients with removable plates<sup>4</sup>. According to Kavaliauskienet *al.* 72% of patients complained of pain and discomfort 1st day after the initiation of orthodontic treatment although the frequency decreased following 1-month of the follow-up period<sup>6</sup>. Among various age groups, children report pain lesser as compared to adults. In the same age group, females report greater pain experiences as compared to the males<sup>7,8</sup>. It is dependent upon various factors including sex, age, pain threshold, magnitude of force, and emotional status. The forces which are applied on teeth trigger an inflammatory response which involve factors which form the basis of tooth movement i.e. pain and quantum of bone resorption<sup>2,9</sup>.

A study which was done in India revealed that 8 per cent of a study population discontinued the orthodontic treatment because of pain<sup>2,10</sup>. Although the pain reported after the placement of self-ligating bracket system was found to be less continuous as compared to conventional bracket system<sup>11</sup>. Pain is a subjective response, which shows large individual variations<sup>12</sup>. The methods which are used for controlling pain during the orthodontic treatment include pain relieving medications, use of low-level laser therapy,

Transcutaneous Electrical Nerve Stimulation (TENS), and vibratory stimulation of the periodontal ligament and many more that discuss later. All these methods have been successful to a certain degree, however, Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) has emerged as the most preferred method<sup>2,12</sup>.

The purpose of this review article is to throw a light on the various possible causes of orthodontic pain and to discuss the various management options for the orthodontic pain. patients experienced greater discomfort during the manipulation of self-ligating brackets than conventional brackets.

### **Common causes of orthodontic pain**

Orthodontic pain is the result of compression of the periodontal ligament by the tooth resulting in an inflammatory response mediated by cytokines and prostaglandin<sup>13</sup>.

#### ***Initial stages of treatment***

Pain experience has been a common problem faced by patients right from the beginning of orthodontic treatment that is, placement of separators. Asiryet *al.* conducted a study to evaluate the effect of elastomeric separators on pain experienced by patients and concluded that pain associated with orthodontic separation starts and peaks within 4–48 h from the placement of separators and starts to decline to reach the lowest level on 5th day<sup>14</sup>. Most of the orthodontic patients routinely report pain, due to alterations in the periodontal ligament and surrounding soft tissues, with intensity and prevalence varying according to age. According to Campos *et al.* both children and adults complain of pain after bonding and initial wire placement. Various alignment wire sequences were found to have variable pain response in patients irrespective of the material of the wire used.

Although, Cioffiet *al.* found reduced pain response in their patients during initial wire placement when they used heat activated thermal nickel-titanium (Niti) as compared to superelastic Niti<sup>15</sup>.

Fernandeset *al.* compared the discomfort caused by the initial placement of superelasticNiti wires and conventional Niti wires. They found greater pain experience among patients as a result of nitinol wires<sup>16</sup>.

Johalet *al.* conducted a longitudinal study over a 3-month period, on pain experience and quality-of-life changes during fixed orthodontic treatment and concluded that initial stages of treatment results in subjective pain experience<sup>17</sup>.

### ***Intermaxillary elastics***

Intermaxillary elastics have been found to cause pain in patients similar to wire placement, but the pain due to elastics was not found to last as long as the pain found after initial bonding<sup>18</sup>.

### ***Appliance activation***

Appliance activation causes disruption in the periodontal ligament creating areas of pressure and tension leading to discomfort to the patient.

An increase in pain 24 h after activation of appliance was observed by Treinet *al.* in their patients<sup>19</sup>.

Luppanapornlarpet *al.* evaluated the effect of force levels on the pain intensity and tooth movement and thus concluded that lower forces produced less pain as compared to higher forces with equally effective tooth movement<sup>20</sup>.

Ogura *et al.* compared the pain intensity among subjects with light and heavy force application and found that heavy forces cause greater biting pain few hours after the force application<sup>21</sup>.

### ***Debonding of orthodontic appliances***

Mangnallet *al.* conducted a multicenter trial and suggested that debonding of fixed appliances leads to pain experience in the patients. Furthermore, lower anteriors were reported to be most painful after debonding<sup>22</sup>. Normandoet *al.* compared two methods of debonding that is, a lift-off method and ligature cutting pliers and confirmed that lift-off method caused lesser pain to the patients during debonding<sup>23</sup>.

### ***Insertion of temporary anchorage devices***

The study was conducted by Chen *et al.* to evaluate the pain experienced by the patients during placement of interdental implants and was compared to the baseline value of discomfort during premolar extractions. They concluded that the placement of interdental implants did not cause pain greater than that during traditional orthodontic treatment<sup>24</sup>.

## **DISCUSSION**

Usually patients perceive orthodontic treatment as a very painful treatment procedure. For the lay person the array of complex brackets, bands, wires, springs as well as elastics seem to be very complicated. Many patients do not want to carry orthodontic treatment because of the fear of pain. It is reported in the study of Kvam that 95% of the patients experience pain after orthodontic treatment out of which very few only experience severe pain<sup>25</sup>. treatment among which only 11% of the patients received severe pain VAS score 8-10<sup>25</sup>. The anxiety always plays a vital role on the experience of pain. We should always try to reduce the anxiety level of the patients by proper counseling and explanation of the procedure we are going to deliver. The level of pain is different among male and female patients. The anticipated pain seems to be

slightly higher in females compared to male which is not significant statistically. The study of Ngan et al has found no difference on pain perception between two sexes<sup>26</sup>. Administering analgesics 2 hours before extraction reduces the post-extraction pain. It is important to know that psychological pain associated with orthodontic treatment can be reduced by proper explanation and counseling where as real pain experienced by patients can be reduced by administering analgesics before major orthodontic procedures like separator placement, banding, as well as arch wire placement. The study of Bernhardt et al has found that pain perceived after orthodontic treatment is greater than that of following extraction<sup>27</sup>.

## Management

### *Analgesics*

Nonsteroidal anti-inflammatory drugs (NSAIDs) are often recommended by orthodontists to their patients to alleviate the pain caused during orthodontic tooth movement. Usually, analgesics are advised after the procedure is performed, but preemptive administration of analgesics has been found to be useful before procedures like separator placement<sup>28</sup>.

Ashkenazi and Levin reported in their study that 59% of the patients informed their orthodontist of pain, but only 21% were prescribed analgesics<sup>29</sup>.

Bradley *et al.* conducted a randomized control trial comparing the efficacy of paracetamol and ibuprofen in relieving pain due to separator placement. They suggested that patients taking ibuprofen reported discomfort on orthodontic separation<sup>30</sup>.

Patel *et al.* evaluated the effectiveness of ibuprofen, naproxen sodium, and acetaminophen. They concluded that

ibuprofen was superior to the placebo in relieving postseparator pain as measured by the visual analog scale pain summary scores, whereas acetaminophen and naproxen sodium did not significantly differ from the placebo<sup>31</sup>.

Nonsteroidal anti-inflammatory drugs have been found to reduce the rate of orthodontic tooth movement when consumed for an increased period. A number of studies have been conducted by researchers comparing the efficacy and side effects of various NSAIDs.

Paracetamol, explicitly indicated by most authors as the safest NSAID, seems to be the drug of choice in view of no influence on the range of tooth movement, the risk of root resorption or other adverse effects within oral cavity. According to Shetty *et al.* acetaminophen showed no significant effect on prostaglandin synthesis and may be a safe choice compared to ibuprofen for relieving pain associated with orthodontic tooth movement<sup>32</sup>.

Arantes *et al.* evaluated an alternative drug tenoxicam in 36 patients and showed that it proved to be an effective drug during orthodontic treatment without affecting the tooth movement<sup>33</sup>.

Young *et al.* showed another drug valecoxib to be administered before the procedure to relieve pain due to initial wire placement<sup>34</sup>.

### *Low level laser therapy*

Low-level laser therapy has been used to relieve pain in patients during various stages of orthodontic treatment. Tortamano *et al.* conducted a study in on 60 patients and confirmed that a low-level laser therapy reduced the pain caused after the placement of initial archwires<sup>35</sup>.

Fujiyama *et al.* evaluated the effect of carbon dioxide laser on pain reduction in 60 patients and showed that local carbon

dioxide laser irradiation reduced pain without affecting the orthodontic tooth movement<sup>36</sup>.

Domínguez and Velásquez reported reduction in pain symptoms on application of low-level laser therapy after activation of final archwires<sup>37</sup>.

### ***Vibratory forces***

Based on their clinical study, Marie *et al.* have advised the use a vibratory apparatus by the patients to ameliorate the pain caused by orthodontic treatment. Vibratory forces are effective when used before the development of pain as they improve and re-establish the blood supply in the pain-causing ischemic areas<sup>38</sup>.

### ***Bite wafers***

Mangnallet *al.* conducted a randomized clinical trial the results of which showed a reduction in pain during debonding procedures when the patients were made to bite on soft acrylic wafers<sup>22</sup>. Hwang *et al.* suggested the use of thera bite wafers in relieving pain after orthodontic procedures<sup>39</sup>.

### ***Anesthetic gels***

Keim described an anesthetic gel “oraqix” containing a combination of lidocaine and prilocaine in 1:1 ratio by weight. Such gels can be used when performing routine orthodontic procedures to relieve the patient’s discomfort<sup>40</sup>. Kwonget *al.* described the use of two anesthetic gels oraqix and TAC alternate for easy placement of temporary anchorage devices and showed that TAC alternate was more effective in reducing the local discomfort<sup>41</sup>.

### ***Chewing gums***

Farzaneganet *al.* conducted a randomized clinical trial on 50 patients to evaluate the efficacy of various measures to reduce pain after placement of initial archwires. They suggested that efficacy of chewing gums as

a method to relieve pain caused due to such orthodontic procedures was comparable to that of analgesics<sup>42</sup>. Benson *et al.* conducted a randomized clinical trial on 57 patients and reported that the use of chewing gum significantly decreased both the impact and pain from the fixed appliances<sup>43</sup>.

Chewing gums can be recommended as a suitable alternative to analgesics for pain reduction in orthodontic patients.

### ***Medicated wax***

Kluemperet *al.* conducted a comparative study on subjects using wax to relieve the discomfort caused by fixed orthodontic appliances with those using wax containing slow releasing benzocaine. The patients using medicated wax reported of less pain as compared to the other group showing the analgesic properties of benzocaine containing wax<sup>44</sup>.

### ***Behavioral therapy***

Wang *et al.* provided cognitive behavioral therapy to 150 patients and compared the effects with the use of analgesics. They concluded that the behavioral therapy was effective in pain control during initial stages of orthodontic treatment<sup>45</sup>.

### ***Transcutaneous electrical nerve stimulation (TENS)***

Roth and Thrash evaluated the effect of TENS in reducing periodontal pain after separator placement. Although it was able to reduce pain within a relatively short span of time of electrode placement, there is dearth of literature published on its use<sup>12,46</sup>.

### ***vibrating needle (Vibraject™)***

In orthodontic treatment sometimes we have to remove teeth for gaining space and other surgical procedure and that definitely need administration of local anesthesia. Various advancements have been made in anesthetic

agents and techniques to get a pain free and comfortable anesthesia. Newer vibrotactile devices for pain control have been introduced such as Vibraject and Accupal<sup>47</sup>. This is a newer concept used in dentistry for pain control. Vibraject is a battery operated detachable device based on vibration and can be easily applied in routine local anesthesia procedures. Vibration provides interference stimulation and relieves pain. The concept is based on the gate-control theory<sup>48</sup>.

### T SCAN SYSTEM

Assessing the occlusion at the beginning and at the end of orthodontic treatment by a superficial clinical inspection associated with the Angle classification may lead to errors in the orthodontic treatment. Angle classification indicates the existing relation between maxillary and mandibular teeth, without assessing the occlusal contacts in vertical plane. Not only the number and contact area are important but also the distribution of contacts along the arches statically and during function<sup>49</sup>, easy to observe with T-Scan. That increase the stability after orthodontic treatment, reduce chances of TMD and as well as reduce chances of Pain.

### Conclusion

Orthodontic treatment is associated with a number of side effects most common being pain. Orthodontists must be aware of the various factors that might cause discomfort to the patients and should be able to manage such episodes to improve the compliance of patients with the orthodontic therapy. The present article has highlighted the various measures that can be undertaken to manage the pain experienced by the patients during therapy. By far, the most commonly used method is administration of analgesics,

Beside most common management I express the latest technology like Vibraject, TENS, Laser therapy, T-Scan etc and it stays to be the most effective modality in controlling orthodontic pain.

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