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Pain during various stages of orthodontic treatment and its management: A review

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Abstract

Orthodontic pain, which is accompanied as a result of applying orthodontic forces, is an important matter of concern for clinicians and patients/parents as it has a direct impact on their amenability during the course of the treatment. Long treatment periods along with recurrent pain due to the orthodontic appliances, many a times, leads to stress and exhaustion to the patient and has been associated with cessation of orthodontic treatment. Clinicians must be able to recognize and control the pain experienced by their patients. Every orthodontist is obligated to satisfy the questions emerging 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 shed an explanation for the various possible causes of orthodontic pain and to describe the various management options for the orthodontic pain.

Keywords: Orthodontic pain, debonding pain, periodontal inflammation, TENS

1. Introduction

International association for the study of pain (1994) defines pain as an 'unpleasant sensory and emotional experience associated with actual or potential tissue damage'. It is a subjective feeling that shows large individual fluctuations, as it depends upon various factors such as age, gender, emotional state, culture and previous pain experience and is one of the major deterrents for patient compliance for orthodontic treatment [1-5].

Various investigations have shown that, with the commencement till completion of orthodontic procedures such as the use of elastic separators, arch wire placement, orthodontic implant placement, banding and activations and applying forces on teeth for movement, may cause pain and discomfort in patients [3].

Of all the parameters in any dental procedure, one of the most important one to determine its acceptability to the patient is that which is performed with lack of pain and least amount of or no discomfort [6]. Amongst all patients undergoing orthodontic treatment, almost 70-95% of them have reported varying degrees of pain during orthodontic treatment which has been the reason for them to discontinue treatment [3, 7-12].

With all patients undergoing orthodontic therapy, pain ranked first amongst least liked parameters during treatment and fourth amongst all fears and anxiety prior to orthodontic treatment as per a Survey conducted in 2000 [13, 14].

The forces applied on teeth to cause its movement, initiate an inflammatory response which involves factors like pain and bone resorption, which form the basis of tooth movement [17, 23].

After appliance placement during orthodontic therapy, patients experience various discomforts which are often expressed by them as feelings of pressure, tension, soreness of the teeth, and pain as such [3]. These perceptions may be due to changes in blood flow in the periodontal ligament and might be correlated with the presence of prostaglandins, neuropeptides like substance P, cytokines and other inflammatory mediators [15, 16].

The methods which are used for controlling pain during the orthodontic treatment include stress relieve method, elastomeric wafer bite, finger pressure method, pain relieving medications, use of low-level laser therapy, Transcutaneous Electrical Nerve Stimulation (TENS), and vibratory stimulation of the periodontal ligament and many more. All these methods have been successfully implied to a certain extent, however, Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) has emerged as the most preferred method [3, 17].

The purpose of this review article is to shed an explanation for the various possible causes of orthodontic pain and to describe the various management options for the orthodontic pain.

2. Pain during various stages of orthodontic treatment

2.1 During initial stage of treatment

Earliest episodes of pain start with the placement of elastomeric separators or metallic separators and according to a study conducted by Asiry *et al* to evaluate the effect of elastomeric separators on pain perceived by patients came to the conclusion that pain associated with orthodontic separation starts and peaks within 4-48 hours after the placement and gradually declines to reach the lowest level by 5-6th day [18].

According to Campos *et al*, pain was experienced by both children and adults pain after bonding and placement of initial wires. Patients show a wide range of pain response varying from mild soreness or discomfort to severe pain for different sequences of alignment wires irrespective of the material of the wire used [19]. Although Cioffi *et al*. found that pain was of less magnitude in the patients while commencing wire placement in which activated thermal nickel-titanium (Niti) was used as compared to superelastic Niti [18]. Patients experienced a greater intensity of pain when placement of conventional NiTi was compared to Super-elastic NiTi for initial levelling and aligning [20].

2.2 Space closure

Disturbance of the periodontal ligament fibres is caused by applying orthodontic forces which in turn creates zones of pressure and tension followed by release of inflammatory products which are responsible for pain and discomfort. An increase in pain intensity was observed after 20-24 hours of appliance activation [21].

Luppanapornlarp *et al* concluded that the intensity of pain and amount of tooth movement are related to the magnitude of force application it has been seen that lower forces produce lesser pain as compared to higher forces with equally effective tooth movement [22]. It was also found by Ogura *et al* that greater biting pain is caused by heavy forces, a few hours after the force application [23].

2.3 Debonding of orthodontic appliances

After a multicentre clinical trial Mangnall *et al* [1] suggested that while undergoing debonding procedure patients experience mild to moderate pain, pain intensity varies in depending upon the region of tooth, lower anteriors were found to be most painful during debonding. Maxillary and mandibular anterior teeth are more vulnerable to pain than posterior teeth during debonding as found by Nehir *et al*. [4], Normando *et al*. conducted a study to compare two methods of debonding that is, a lift-off method and ligature cutting pliers and came to the conclusion that lift-off method caused pain but of a lower magnitude during debonding [24].

2.4 Placement of mini-implants

Another study conducted by Amir Hossein Mirhashemi *et al*. showed that the pain experience after miniscrew insertion is significantly low. Maximum level of the pain and discomfort was recorded 12 hours after insertion, following which there was a decline in the pain intensity [25].

3. Management

3.1 Analgesics

Nonsteroidal anti-inflammatory drugs (NSAIDs) are most commonly prescribed drugs to alleviate the pain caused during initial stages of orthodontic treatment. Usually, NSAIDs are advised after the procedure, but pre-operative administration of analgesics 1-2 hour before procedures like separator placement has been found to be more efficacious. [26]

A study conducted by Ashkenazi and Levin reported that only 59% of all the patients undergoing fixed orthodontic treatment informed their orthodontist of pain, but only 21% were prescribed analgesics [27].

Although NSAIDs have been found to affect the rate of orthodontic tooth movement it has been suggested by Vinod krishnan that low doses of NSAIDs administered for one or two days in the initial stages will not affect the tooth movement process as such [3].

Patel *et al* compared the efficacy of ibuprofen, naproxen sodium, and acetaminophen and concluded that ibuprofen was superior to the placebo in relieving post separator pain when visual analog scale was utilized as a measure, whereas there was no significant difference between acetaminophen, naproxen sodium and the placebo [28].

The drug of choice which seems to have no influence on the range of tooth movement or any other adverse effects within oral cavity is Acetaminophen which is also one of the most commonly prescribed NSAIDs. In accordance with a study by Shetty *et al* prostaglandin synthesis was not significantly influenced by acetaminophen and might be regarded a safe choice compared to ibuprofen for relieving pain associated with orthodontic tooth movement [29].

3.2 Low level laser therapy

Another therapy which has been used to relieve pain in patients during various stages of orthodontic treatment is the Low Level Laser Therapy. A study conducted by Tortamano *et al* concluded that a low-level laser therapy reduced the pain caused after the placement of initial archwires [30]. Local application of carbon dioxide laser has also been found to reduce pain during orthodontic debonding without affecting the rate of orthodontic tooth movement [31].

3.3 Pain control methods used during debonding of orthodontic brackets

Pain perceived is reduced by biting on a soft acrylic wafer during debonding of the posterior teeth. The lower anterior teeth are the most painful during debonding. Greater intensity pain is perceived by patients during the fixed appliances orthodontic therapy while debonding as shown by Mangnall *et al* in 2013 [1].

Nehir *et al* compared the effects of elastomeric wafer bite, finger pressure method and stress relief method and found that elastomeric wafer method was less efficacious than the finger pressure method with respect to pain experienced during debonding, especially for the lower jaw, but neither was superior to stress relief method [4]. Use of therabite wafers in relieving pain after orthodontic procedures has also been suggested by Hwang *et al* in 1994 [32].

Squeezing the bracket wings mesiodistally and lifting the bracket off with a peel force is a gentler technique of painless bracket removal as given by Bora *et al*. [33]

3.4 Psychological Management

Pain can be managed by psychological means by being honest and making the patient aware about the procedure before treatment and it is important because a trusting relationship between patient and doctor can reduce pain perception and anxiety. Polat *et al.* [19].

CBT (cognitive behaviour management therapy) consists mainly of instructions to alter patients' pain-related thinking and acts on the psychological mechanism of pain, since it has been demonstrated that personality, mood, perception, cognition, etc. is responsible for influencing pain intensity, threshold, and tolerance as shown in a study conducted by Wang *et al.* [34]

3.5 Vibratory forces

Use of vibratory apparatus by the patients to reduce the pain caused during orthodontic treatment has been proven effective to certain limit. Marie *et al* demonstrated that vibratory forces act by re-establishing the blood supply in the pain-causing ischemic areas [35].

3.6 Transcutaneous Electrical Nerve Stimulation (TENS)

A non-pharmacological method known as Transcutaneous electric nerve stimulation (TENS) is widely used by medical and paramedical professionals for the handling and coping of acute as well as chronic pain in several conditions and can be employed for the management of pain during a variety of dental procedures as well as pain due to numerous varied disorders that affect the maxillofacial region.

Roth and Thrash evaluated the effect of TENS in decreasing periodontal pain perception after placing the separators. The effective range for decreasing pain was intraoral delivery of current at a frequency of 0.5 Hz with an intensity of 500 mA for 6 seconds [36].

3.7 Other methods

Anesthetic gels such as Oraqix containing lidocaine and prilocaine in 1:1 ratio by weight can be used during routine orthodontic procedures to relieve the patient's discomfort [37] and chewing gums maintain the proper blood supply in the areas of compressed periodontal ligament and doesn't allow the pain substance P and other inflammatory products to accumulate.

4. Conclusion

As it is known that pain ranks first amongst least liked parameters during any treatment procedure and its absence during any procedure is considered as one of the most important parameter to determine the acceptability of that treatment procedure, therefore it is pertinent to understand the possible situations which may evoke pain during orthodontic treatment and their management as well. This review provides an insight to the same.

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