

REVIEW ARTICLE

Beyond Analgesics: Modern Approaches to Orthodontic Pain Control

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ABSTRACT

Pain is a perception which experienced when damage occurs for example in case of ulcer in the oral cavity, taste sensation is not altered but the discomfort is felt as pain or in case of burn, the sensation is felt like pain. It basically lets us realise about the damage that has occurred and alerts us to remove the stimulus for the healing to take place. Sometimes pain may arise in the absence of any detectable stimulus, damage or disease. Thorough understanding of the physiology of pain will help to select and combine the most effective methods for its treatment. Not all pain is the same, not all patients are the same. Minimally invasive procedures should be carried out to minimize discomfort and for good patient compliance. Effective measures should be taken to motivate the patient. There are various methods to relieve pain like gels, wafers, tens, lasers and vibrations but the most commonly used ones are NSAIDS. However, it is seen that NSAIDS interfere with the process of tooth movement as they interfere with the process of inflammation which occurs in response to the force that is applied on the tooth surface but if given in low dosage for 1-2 days will not have affect the tooth movement. Nowadays, pre-operative analgesics are given at least one hour before the procedure. This review article puts light on the ways in which we can reduce patient discomfort and motivate the patient towards the treatment.
Keywords: pain management, minimally invasive procedures, NSAIDS, dental pain eraser, cold laser, muscle relaxants.

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INTRODUCTION

Pain and the associated discomfort are the most common symptoms encountered by patients undergoing fixed orthodontic treatment [1]. While diagnosis, pain is referred as a symptom of an underlying condition. It makes the individual conscious so that he can withdraw from the situation to prevent any further damage to the system and also makes the individual aware to avoid any further experiences in the future.[2] Most of the times pain resolves once the stimulus is removed and the body has healed, but at times it may persist even after the body has healed. It can vary from individual to individual depending on the pain threshold and is certain influencing such as age, gender, type or procedure the patient is undergoing etc. The various procedure that causes pain in orthodontic patients are: orthodontic separation, arch wire placement and activation, level of force and initial position of tooth, orthopaedic forces and sutural strain and thus, they are a major concern factor for guardian, patient and orthodontist as it gives negative feedback regarding the treatment. Patients in present days want to undergo treatment as they are more aesthetically conscious and demand for less painful and invasive procedures [3]. So it is the duty of the orthodontist to convince and ensure the patient about the treatment and council the patient beforehand regarding slight discomfort that will occur. Patient should be made aware about the fact that the pain usually starts within first four hours, increases over a period of next 24 hours, and decreases gradually in 3-7 days after applying orthodontic force and the cause of such pain is pressure, etc in the periodontal space [4]. On applying orthodontic force on a tooth, two zones are created on the root surface namely compression zone (the surface where the periodontal ligaments are compressed) and the tension zone (the surface where the periodontal ligaments are stretched) [5].

PROCEDURES

The following are the various procedures carried out in patients who undergo orthodontic tooth movement: -

Placement of Separator- This is the initial step in orthodontic procedure which is carried out for creating space on the proximal surfaces of the tooth to facilitate banding. Various types of separators are commercially available like wire made of brass, spring type steel separators, and elastics made of latex. According to various studies, it is clear that separator placement reduces the pain threshold of the masticatory muscles thus lowering the motor output. This is also considered as a protective mechanism against any further injury [6].

Archwire placement and activation- Various studies have shown arch wire activation and placement has its effect on masseter activity which is produced by the noxious stimuli produced from the periodontium or paradental fibres which trigger a reflex mechanism [7].

Appliance type-Orthodontic patients can be given two types of appliances depending on the needs of the patient i.e. removable and fixed appliances. A number of studies carried out in past have shown that fixed appliance causes more discomfort, pain to the patient compared with removable type of appliance [8].

Force level and initial tooth position- There exist two schools of thought when considering amount of force level, initial tooth position and pain experienced by the patient. It is concluded that whether the force level is high or low, it is going to cause discomfort and pain to the patient [9].

Orthopaedic forces- Orthopaedic forces apply high magnitude force which are applied and transmitted to the craniofacial complexes [10].

Debonding-According to study done by Williams and Bishara where they evaluated the pain threshold level concluded that mobility of tooth and amount of force applied were the influencing factors. It was found that when force is applied in intrusive direction produces less pain. They also suggested to apply finger pressure or asked the patient to bite on a piece of cotton roll to minimize pain while debonding [11]. In 1994, Rinchuse proposed an occlusal rim wax for pain-free debonding [12].

PAIN ASSESSMENT

Visual Analogue Scale

The visual analog scale (VAS), which Freyd first developed in 1923, illustrates a straight line with ends that reflect the extremes of pain, such as "no pain at all" and "pain as awful as it could be." A line is provided for the patient to indicate how painful they are. The subject's pain is then defined as the distance between "no discomfort at all" and the mark. As the distance between two different locations must be measured, the process takes longer and is more prone to measurement errors than a rating scale. Therefore, a physical VAS has been created where participants are requested to place a slider on a straight pain-scale in order to get around these drawbacks. As a result, the researcher can easily read the pain threshold on a millimetre scale on Computer based assessment of pain is the recent advancement in which the subject is given a palm top computer which enables pain levels to be assessed on the screen from 0 indicating no pain to 100 indicating worst possible pain. It was concluded that this is a valid and time-saving method for pain assessment [13].

Numerical Rating Scale:

Depending on their level of pain, patients are asked to circle a number between 0 -10, 0-20, or 0-100. The lower limit signifies "the worst suffering possible," while zero represents "no discomfort at all" [14].

Verbal Rating Scale:

In a Verbal Rating Scale (VRS), the participant uses several adjectives to describe the discomfort. The subject is asked to select the adjective that best describes the level of pain. Different descriptors expressing various pain-intensity levels are arranged in order of the severity of the pain between two extremes [15].

Pain drawing:

This method allows the patient to mark the areas where he/she experiences pain on figure of human body. Some different methods enable the patient to indicate different types of pain like electrifying, burning. Subjects indicating multiple areas of pain also have high psychological involvement but some authors didn't find this reliable to assess the pain condition. Also, the result of the surgical or non-surgical treatment cannot be assessed [16].

INSTRUMENTS TO MEASURE PAIN EFFECTS

There have been various methods in the past to assess pain like vs., vas, pain drawings etc but with the advancement in technology new measures have been introduced to measure pain like pain-o-meter, and Mc Gill questionnaire.

Pain-o-meter:

This instrument comprises of a mechanical VAS and two lists of phrases that describe the pain affect. Each phrase has a corresponding intensity value, which ranges from 1 to 5. The best term to express their suffering is chosen by the responders out of a possible [11]. The affective scale is then created by adding the intensity values together. When treating pain with analgesics or developing a differential diagnosis for chest pain, this scale is regarded as sensitive and reliable in various contexts [17].

McGill Pain Questionnaire:

It is used to measure index of pain rating, words describing pain, scale of intensity which measures from 1-5. It is effective tool for measuring pain [18].

MANAGEMENT OF PAIN IN ORTHODONTICS

The patients experience discomfort and pain due to various procedures carried in the course of orthodontic treatment and thus he/ she wants to undertake measure that will relieve the discomfort either by manipulation in the steps of the treatment or by taking certain medications. In dentistry, the local inflammatory conditions in and around the tooth like temporomandibular joint, and the muscle like masticatory muscles are the common sites of pain. The orthodontics should be able to diagnose the cause of pain and should be well aware of the medications that can be prescribed to the patient such the medication doesn't interfere with the tooth movement.¹⁹ Different conditions are treated using different measures. There are various types of therapies that are used to decrease pain like pharmacologic therapy including nsoids etc; physical therapy which includes thermal therapy, coolant therapy; acupuncture, psychologic therapy which includes counselling, behaviour modification training.

Pharmacological therapy:

This includes treating the pain using prescribed drugs. The orthodontist should take into consideration the indications, contraindications of the drug, half-life, dosage prescribed, side effects and the possible complications and the measures to be undertaken to overcome such problems [19].

Analgesic medications:

This group of drugs help in relieving pain by not only eliminating the pain but by increasing the pain threshold of the patient.

Single non-narcotic analgesic medication: They are prescribed to treat mild to moderate musculoskeletal pain and the drug of choice is acetaminophen which has minimal side effect but has no anti- platelet or anti- inflammatory action so this is the safest drug to be taken while carrying out treatment as there are no chances of root resorption, no influence on tooth movement or any other side effects. Asalicylate drugs (aspirin, diflunisal) are anti-pyretic, analgesic and anti- inflammatory drugs and in case of allergy magnesium trisalicylate is effective. Ibuprofen which is a propionic acid derivative has excellent relief for musculoskeletal pain with minimum side effects and are inexpensive and over the counterdrugs. The only drawback of this drug is gastric esophageal reflux disorder and when prescribed a proton pump inhibitor like omeprazole should be added. According to some studies it is clear that ibuprofen decreases the pain in the first 2 hours of administration but not at 24 hrs when the pain reaches the peak levels. So, it is advised to take ibuprofen prior to the procedure reduces pain [20].

Combination non-narcotic analgesic medication: These are prescribed so that the combination of drugs will be more effective in relieving musculoskeletal pain for eg Excedrin, ultracet etc. The factors like absorption metabolism and its excretion varies from patient to patient and in case to some side effect, the medication should be changed [21].

Anti inflammatory medication: these drugs are prescribed in conditions of tissue inflammation and these reduce the overall response to irritation. NSAIDS are the group of drugs that inhibit both the pain pathways ie COX 1 and COX 2 but also decrease the rate of gastric secretion thus causing gastric irritation. Celecoxib is a COX 2 inhibitor which has less effect on the gastric secretion and has an advantage to being taken once or twice a day.²¹ Ketorolac can be prescribed for the treatment of moderate to severe pain and when given in patients its dosage should not exceed more than 5 tablets a day [22].

Muscle relaxants: These medications mostly have central effect on the patient i.e. sedative effect. It should be kept in mind that in order to achieve effect on masticatory muscles, the blood level should be raised to such a level that it doesn't allow the patient to perform normal activity. Cyclobenzaprine is a muscle relaxant that has additive effect on a muscle pain and pain in muscles of mastication [23].

Anesthetic medication: This includes injectable and local anesthesia.

Thermal therapy: The concept behind heat application is that it will increase blood circulation of the area thus helping in relieving pain as decreased blood flow causes muscle soreness and it should be applied for about 10-15 minutes and not exceeding 30 minutes. Electric heating pad can be used but it is advisable that it should not be left unattended [24].

Coolant therapy- When ice is applied to a surface the patient initially feels uncomfortable followed by burning sensation, mild aching and numbness. The ice is removed after 5-7 minutes. Most commonly used coolant sprays are ethyl chloride and fluoromethane [25].

RECENT ADVANCES

Dental pain eraser- It is a portable tens device found very effective in for pain relief during orthodontic wire activation, traction of impacted teeth, separator placement etc [26].

Cold lasers: They help by increasing the collagen synthesis, vascularity of inflamed tissue decreasing the no. of microorganism and decrease pain.

Behavioural approach: Various methods have been opted to decrease pain of orthodontic origin like CBT, physical activity, musical therapy. These modalities help by increasing the pain threshold of the patient [26].

Gene therapy: It is a method of delivering gene to target cell in order to bring about changes in the DNA sequence to alter biological function of the cells [26].

NON-PHARMACOLOGICAL MANAGEMENT

According to various studies carried out in past, it was concluded that chewing gums and bite wafers have been found to reduce the intensity of orthodontic pain [27]. Low level laser has been found to relieve pain and it also helps in recovery of tissue and accelerates tooth movement. According to a study done on canine retraction it was found that single dose helium neon laser therapy was effective in relieving pain. Some authors have evaluated the effect of low power red infrared laser for pain management and found that it is very effective [28, 29]. Moreover, dietary modification play a very important role for patient undergoing orthodontic treatment.

MEASURES TO BE UNDERTAKEN FOR LESS PAINFUL PROCEDURE

1. Nowadays, bonding of molar tubes is recommended over banding so pain caused due to separator placement should be eliminated.
2. For maxillary expansion, NiTi expanders are preferred because they cause less amount of pain and apply low force over a period of 3-6 months.
3. CuNiTi or NiTi wire are preferred as initial wires for levelling and alignment due to their low stress deflection rate [27].

CONCLUSION

To conclude, there are no procedure carried out in orthodontics in which patient will not feel any type of discomfort, thus, the orthodontist must put in efforts to minimise this discomfort and the pain experienced by the patient and this is only possible when the clinician has thorough understanding about the cause of pain and measures that can be undertaken to prevent it. Also, the patient should be told beforehand about the procedure that is going to be done and what are the outcomes of the procedure.

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