Review Article

Orthodontic Pain Management- A Literature Review

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Abstract:
Introduction: Pain is experienced by the patient during the orthodontic treatment. Pain is a subjective response to the noxious stimuli. It varies from patient to patient depending on the various factors such as age, sex, gender, past dental history, anxiety, stress, past medical history or type of appliance used.

Objective: The objective of this literature review is to discuss conventional versus recently introduced modalities in pain management of orthodontic patients.

Conclusion: There are non-pharmacological and pharmacological methods to control pain management in orthodontic patients. Orthodontist must decide which method is best suited for the particular patient depending on the threshold level of individual patient. Further investigations are required in this field.

Keywords: orthodontic treatment, pain management, discomfort

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INTRODUCTION

The most frequent side effects of orthodontic therapy with fixed appliances are pain and discomfort. Separator placement, within an hour, during the following 24 hours, causes pain during the course of the treatment. Within seven days of initial bonding, initial installation of the wire, or initially placement of the separators, pain lessens. Inflammation, pressure, ischemia, and edema related to tooth movement are some of the causes that contribute to discomfort or pain experienced during treatment. The numeric scale of rating or visual analog scale is the most typical tool for assessing pain intensity.1 Orthodontic pain and discomfort can be managed using both pharmaceutical and non-pharmacological techniques. Additionally, the discomfort brought on by orthodontic treatment causes the patient's lifestyle to change and can cause gingival bleeding, speech impairment, lack of oral hygiene, tooth movement, halitosis, and difficulties eating.2

Patients using fixed appliances experience higher discomfort and pain than those who use removable appliances, according to a number of studies, which demonstrate that aligners give less discomfort and pain than fixed appliances.3

An easy and non-invasive cold pressor test may be done to assess the likelihood that patients receiving orthodontic treatment would experience pain.4,5 There are many techniques that can be used, including anesthesia, painkillers, transcutaneous nerve stimulation (TENS), vibration stimulating of the periodontal ligament, and low-level laser therapy.6 However, taking NSAIDs is the most effective way to manage discomfort during orthodontic treatment. In addition, some patients may experience orofacial pain while undergoing

treatment; in these cases, orthodontists must work with orofacial experts to manage the patient.
The objective of this review is to discuss various methods used to relieve pain during orthodontic treatment.

Classification of orthodontic pain management

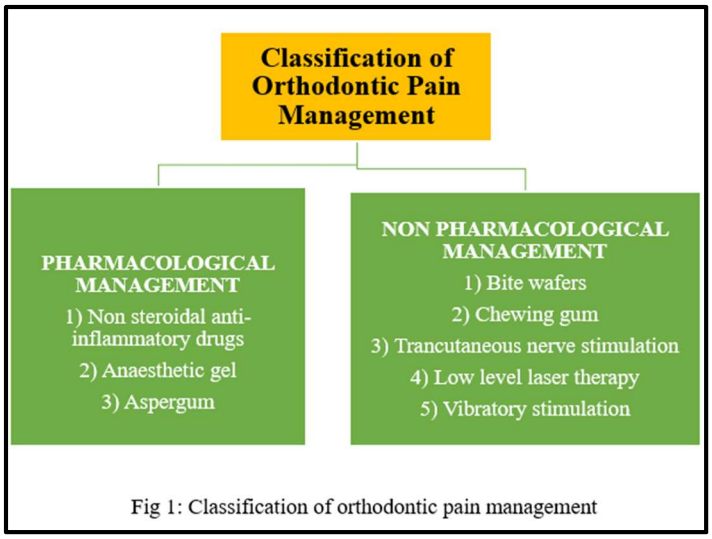

Fig 1: Classification of orthodontic pain management

PHARMACOLOGICAL MANAGEMENT
Analgesics:
Analgesics are mostly used to ease the discomfort brought on by orthodontic treatment. Narcotics (such opiates) and non-narcotics (NSAIDs) make up the majority of the medications for relieving pain. The most popular orthodontic medication is offered as over-the-counter drugs including aspirin, paracetamol, and ibuprofen. To determine whether non-steroidal anti-inflammatory medicines are effective at reducing pain, Angelopoulou et al. carried out a meta-analysis. 7 Seven research out of 1,127 investigations were included. Ibuprofen and acetaminophen had no statistically significant variation in their ability to reduce discomfort during orthodontic treatment. Ibuprofen did, however, appear to lessen the severity of the patient pain within the first two to six hours following the intervention, but not throughout the first 24 hours of treatment, when pain is severe. Therefore, it was determined that ibuprofen reduced discomfort in the early stages of treatment.8

Mechanism of action:
Prostaglandins are typical mediators of pain and inflammation that are generated during the breakdown of an arachidonic acid derivative.9 COX isoenzymes controls the process of synthesis. While COX-2 levels alter during the treatment, COX-1 does not show any alterations. While COX-2 (an inducible isoenzyme) is claimed to arise in response to certain stimuli, COX-1 is reported to release at general equilibrium in a variety of tissues.10,11 According to the premise that selective COX-2 inhibitors, also called "coxibs," will have an anti-inflammatory action without influencing the stomach levels of COX-1 inhibitors.12,13 Coxibs exhibit anti-inflammatory characteristics as a result, but by blocking COX-2, they preserve the COX-1 pathway and the natural synthesis of prostaglandins needed to maintain a healthy gastrointestinal flora.14
NSAIDs are known to inhibit the movement of teeth and increasing the risk of root resorption, according to literature review research.15 Acetaminophen has been demonstrated to be an effective painkiller during orthodontic treatment with no adverse effects on tooth movement, root resorption risk, or oral cavity flora. However, a lot of the information that has been published is still debatable on this subject.
The prophylactic administration of the oxicam derivative meloxicam and the traditional NSAIDs acetaminophen and ibuprofen were compared in a study.16, 17 to reduce the discomfort associated with orthodontic treatment, the patients were given 7.5 mg of meloxicam, 650 mg of acetaminophen, and 400 mg of ibuprofen. According to the study's findings, acetaminophen is a drug of choice for reducing orthodontic therapy pain without influencing the movement of teeth or causing gastrointestinal toxicity. Meloxicam can still be used as a substitute in people for those NSAIDs that are contraindicated because it has the lowest GIT toxicity.
In a study by M. Abu Al-Melh and Anderson, the effectiveness of lidocaine/prilocaine topical anaesthesia was assessed to control the discomfort and pain brought on by the placement of elastomeric separators.1 In comparison to the placebo group, they discovered that there was a reduction in the total discomfort and pain caused on by the placement of separators. Therefore, this may be a useful

technique for patients with low pain thresholds. The explanation of mode of action of NSAIDs in Fig.2:

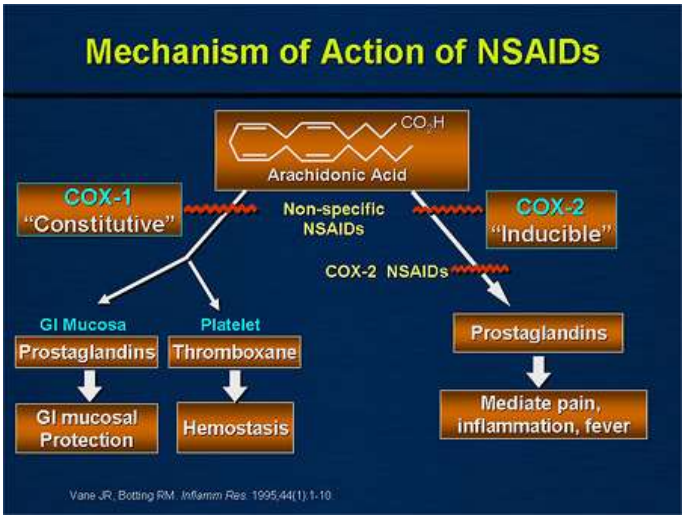

Fig 2: Mechanism of action of NSAIDs19

NON-PHARMACOLOGICAL MANAGEMENT:

One common objective of research in every field of medical science is to obtain efficient relief from pain without the usage of medicines. Because of this, patients undergoing orthodontic treatment may use lasers to manage their pain.20, 21

Patients who have pain can benefit from a single dosage of helium-neon laser therapy. It is one of the most efficient ways to manage discomfort during orthodontic treatment. Compared to the placebo group, the laser therapy patients reported to have less discomfort. However, the study has limitations of its own, and no prior research has been done to compare the efficacy of helium-neon laser treatment to that of other laser types.22

Chewing gum or biting on wafers:

The pain caused by orthodontic treatment can be reduced by chewing gum or wafers. 57 Orthodontic patients participated in a study to determine whether use of chewing gum affects or reduces discomfort for patients receiving orthodontic treatment. The average overall effect score is 16 at 24 hours, whereas the median VAS was 25 mm different between the two groups.23, 24

An investigation into the impact of ibuprofen and sugar-free chewing gum on orthodontic patient discomfort recently was conducted. Patients were split into two groups: the control group, who were only allowed to take ibuprofen, and the experimental group, who were also allowed to chew gum. They concluded that patient using sugar free gum may experience lesser pain without affecting the bond failure rate.

Transcutaneous electric nerve stimulation:

It is one of the non-invasive, nonpharmacological method to reduce the discomfort associated with orthodontic treatment. TENS works primarily by preventing nerve depolarization.25,26 TENS generates an electrical stimulus that moves more quickly than a pain impulse. It enters the dorsal horn and shuts the gate for pain impulses, resulting in a decrease in pain intensity.27

Lasers in orthodontic pain management:

According to the power of the radiation they emit, which might have high, medium, or low intensities, lasers vary according to the radiations. Low level lasers (LLL), also known as soft lasers, therapeutic, or cold lasers, have analgesic, anti-inflammatory, and tissue-stimulating properties, but they do not cause treated tissue to get damage to a temperature of 36.5 degrees Celsius over normal body temperature.28,29

A study by Manoel Brito et al. had 54 participants who were randomly assigned to the laser group or the control group. The laser in question was a gallium-aluminum-arsenide infrared laser with a cross area of 2 mm and a 40-mW power setting. They came to the conclusion that the laser therapy patients reported less pain as compared to the control group at 6, 24, and 48 hours into treatment.30

Low level laser therapy (LLLT):

The introduction of LLLT helps to reduce orthodontic discomfort. Low intensity laser therapy also has analgesic properties and speeds up tooth movement. A metanalysis was performed, and only 14 RCTs (randomized control trials) with a total of 659 participants were included out of 186 results. According to the findings of the study, patients who used an LLLT diode had less pain than those who used a placebo. Studies, however, did not yield sufficient results to support the use of laser treatment to treat pain.31

Behavioural approach:

Physical activity, cognitive behavioral therapy, and music therapy are effective ways to manage pain during orthodontic treatment. Orthodontic patients who experience discomfort can benefit from a psychological perspective and behavioral management. The goal of the study was to improve the patient-doctor connection during the course of treatment. If an orthodontist guides and educates about the discomfort that is expected at the beginning of the treatment, pain can be avoided.

Patients who have higher internal control orientation and personal pain control perception feel less pain than those who do not. By interviewing the patients about their impression of pain prior to the placement of the archwire, a study was conducted to determine the impact of pain. They found that people who anticipated that pain will be more experienced greater intensity of pain and had negative impact of pain in their life style.

Gene therapy:

In order to alter the biological functioning of the target cells, this process involves transporting sequences of DNA or genes to the target cells. Pain reduces when endogenous opioids genes are inserted into the neurons. Gene therapy was utilized to treat cancer in a human clinical trial, and it assisted in reducing discomfort. Herpes simplex virus is used to deliver endogenous opioid genes or RNA interference sequences to the trigeminal ganglia against pro-inflammatory genes like calcitonin gene-associated peptide (CGRP). Due to biosafety concerns, this approach is not, however, routinely used to treat pain. If the biosafety issue is resolved, this approach may also be beneficial in reducing pain.

Dietary modifications:

Dietary changes are most important during orthodontic treatment. Patients need to be inspired to begin healthy eating practices. 180 participants were enrolled in a study to examine the dietary intake of orthodontic patients as well as control subjects. According to the authors, compared to the control group, orthodontic patients consumed much less fibre, chromium, and beta-carotene and significantly more calories in general, proteins, and carbohydrates. Riordan documented how orthodontic treatment affected nutritional consumption. 10 adolescents in total were enrolled in the trial. The comparison of nutritional consumption prior to and following orthodontic treatment was the goal. Using a t-test with two samples having an alpha level of 0.05, recorded diets were analysed. After orthodontic corrections, the data indicated a decrease in magnesium and copper consumption.

Communication:

Nutritional guidance and proper oral hygiene instructions should be given to the patients undergoing fixed orthodontic treatment. A study conducted by Cozzani et all stated that telephone follow-up after the orthodontic treatment is effective in reducing the pain threshold level of the patients. However, it is not possible to take follow up of the patients in this busy schedule post orthodontic follow-up.

CONCLUSION

Orthodontists must evaluate each patient's pain threshold separately using their best clinical judgment. A certain amount of pain and discomfort experienced by patients may be prevented with effective orthodontist-patient communication and dietary recommendations. However, according to the material that is now accessible, analgesics continue to be a reliable and common approach of pain management. Additionally, orthodontists must understand pharmacological activity of each medication as well as the benefits and drawbacks before administering it as an analgesic. For each patient, a maximum advised dose must be taken into consideration. Advanced care management and collaboration with patients' specialists are frequently necessary for those with specific diseases like trigeminal neuralgia or psychological discomfort. However, managing pain is a complicated affair. Nevertheless, pain management is a complex phenomenon. Therefore, further investigations combining different methods of orthodontic pain control with appropriate study designs and large sample sizes are required.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE
Not applicable.

CONSENT FOR PUBLICATION
Not applicable.

CONFLICT OF INTEREST
The authors declare no conflict of interest, financial or otherwise.

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