MANAGEMENT OF PAIN IN ORTHODONTICS

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INTRODUCTION

Orthodontic Tooth Movement and Pain

- Teeth are moved by applied mechanical forces of pressure and tension. The initial movement of the tooth root causes PDL tissue damage that triggers an innate inflammatory reaction within the periodontium surrounding the tooth.
- Orthodontic pain is a symptom of inflammation created in the PDL and alveolar bone.
- Hyperalgesia is due to increased concentration of prostaglandins making the PDL more sensitive to mediators of inflammation.[1]
- Upon orthodontic force application, pro-inflammatory mediators IL-1β and TNF-α are elevated within 1 hour. Orthodontic pain is correlated with increased IL-1β levels.[1, 2]

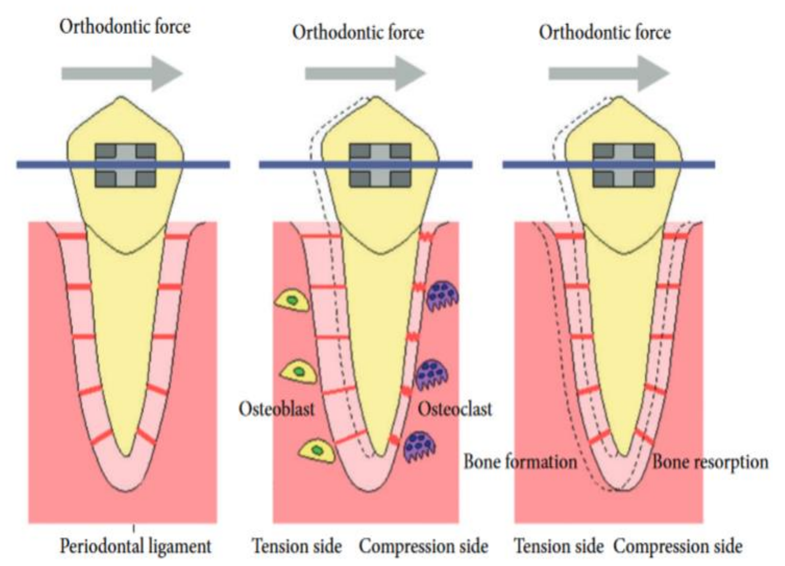


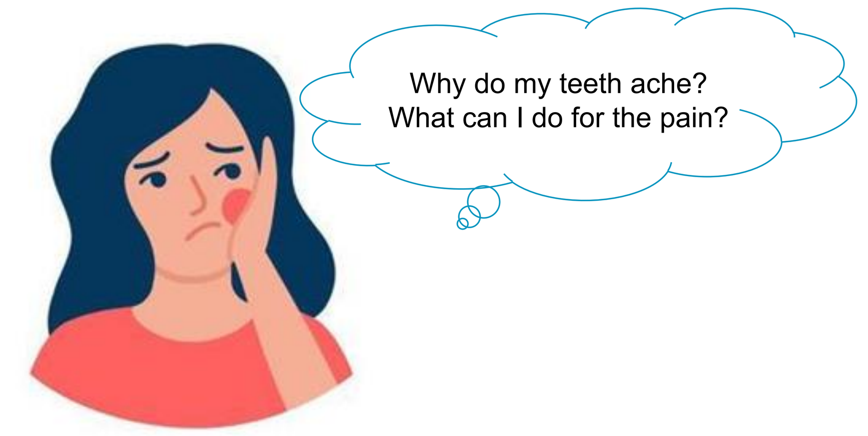
Fig. 1 – Schematic diagram of tooth movement. Applying orthodontic force to the tooth causes compression and tension on opposite sides of the PDL. Osteoclasts appear on the compressed side of the PDL and osteoblasts on the tension side. The tooth moves as osteoclasts resorb bone while osteoblasts form new bone.

	Compression	Tension
Increase	Cox2 → PGE_2 → RANKL, M-CSF TNFα MMPs eNOS → NO IL-1β	IL-10 → OPG TGFβ TIMPs iNOS → NO
Decrease	OPG	RANKL
Outcome	↑ Osteoclasts ↑ Resorption ↓ Apposition	↓ Osteoclasts ↓ Resorption ↑ Apposition

Fig. 2. – Signaling pathways associated with compression and tension due to orthodontic loading. Distinct signaling factors are upregulated and downregulated associated with compressive and tensile strain with the net outcome of resorption in compression side and bone apposition in tension side. (Li et al. 2018)[8]

OBJECTIVES

1. Explore the current studies on orthodontic pain management amongst various orthodontic treatment modalities (fixed appliances, clear aligner therapy, expansions, temporary skeletal anchorage devices, etc.)
2. Compare the efficacy of pain-mitigating techniques and interventions for patients experiencing orthodontic pain



METHODS

Search engines, including PubMed and Google Scholar, were employed, using keywords of ***orthodontic pain***, ***orthodontic pain management***, ***orthodontics AND pain***, with NCBI filters of Free Full Text, Clinical Trial, Meta-Analysis, Randomized Controlled Trial, and Systematic Review. The time restriction from 2007-2024 and English language were applied.

RESULTS

The total of 23 articles were included and reviewed. We organized the retrieved information in three specific subtopics: (1) Mechanism of pain sensation during orthodontic treatment, (2) Orthodontic treatment modalities and pain, and (3) Orthodontic pain management techniques and interventions. In each of these subtopics, we summarized the most important aspects, conclusions, and recommendations.

Mechanism of Pain Sensation During Orthodontic Treatment

Nociception refers to the central nervous system (CNS) and peripheral nervous system (PNS) processing of noxious stimuli, such as tissue injury and temperature extremes, which activate nociceptors and their nerve pathways.
Pain is the subjective experience one feels as a result of activation of these pathways.

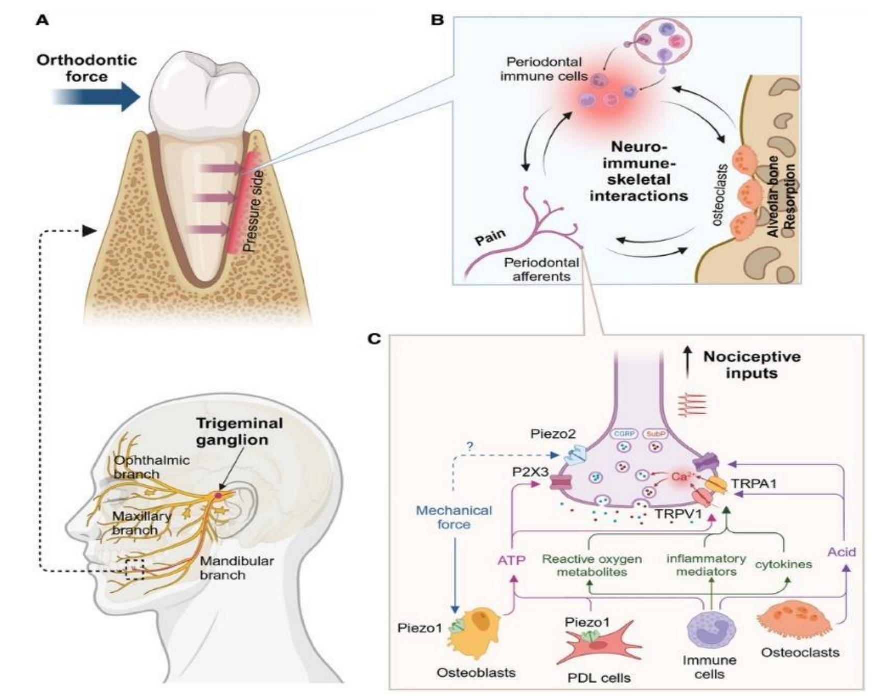


Fig. 3 – Primary afferent mechanisms of orthodontic pain. (A) Anatomy of trigeminal afferents (bottom) and mandibular premolar under orthodontic pressure (top). The alveolar bone in the pressure side undergoes resorption. (B) Hypothetical neural-immune-skeletal interactions at the site of orthodontic pressure. Primary afferent terminals and immune cells within periodontal ligaments can regulate alveolar bone through the modulation of osteoclasts, which can also affect both neural and immune system. (C) Proinflammatory cytokines (e.g., interleukin 1β, tumor necrosis factor), inflammatory mediators (e.g., prostaglandin E2, bradykinin), reactive oxygen metabolites (e.g., hydrogen peroxide, 8-hydroxy-2'-deoxyguanosine) can activate and sensitize transient receptor potential vanilloid subtype 1 (TRPV1) and transient receptor potential ankyrin subtype 1 (TRPA1). Their activation induces calcium influx into nerve terminals and triggers exocytosis of the vesicles containing calcitonin gene-related peptide (CGRP) and substance P (SubP). Mechanical forces can activate Piezo1 ion channel in periodontal ligament (PDL) cells and osteoblasts, which induces ATP release likely activating P2X3 receptor. Immune cells or osteoclasts can increase acids to activate acid-sensing ion channels 3 (ASIC3). Concerted activation of these cationic ion channels in the terminal can generate action potential, which is transmitted into brain and leads to nociception. (Wang et al. 2024)[9]

Orthodontic Treatment Modalities and Pain

Most studies assessing orthodontic pain utilize the visual analogue scale (VAS) to quantify pain level using a line with word descriptors of "least pain" and "severe pain" on each end.

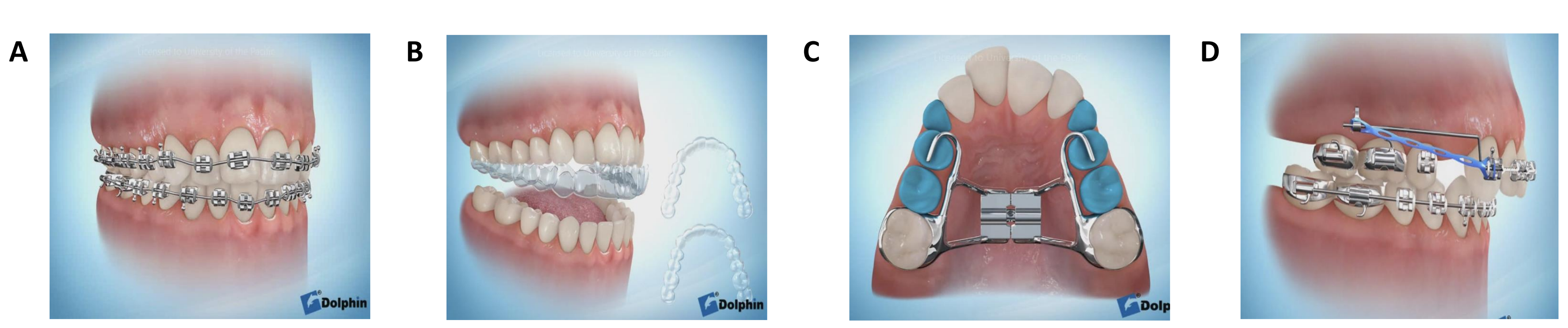


Fig. 4 – Orthodontic treatment modalities discussed in this literature review. Adopted from Dolphin Aquarium 3.5.

A. Leveling & Aligning with light archwire: patients reported pain onset 4.1 hours after archwire insertion with peak pain at day one.[3]
B. Clear aligners vs. self ligating Damon & MBT systems: clear aligners had the lowest VAS, experiencing significantly less discomfort and pain.[4]
C. Palatal expanders: highest pain levels were reported 24 hours after initial expander placement and declined over a 7-day period.[5]
D. Temporary skeletal anchorage devices (TADs): "*mild-to-moderate*" pain day 1 after insertion that decreased after day 5.[6]

Orthodontic Pain Management and Interventions

Pharmacological Interventions
NSAIDs block COX-1 and COX-2 to decrease prostaglandin, the primary inflammatory mediator produced by orthodontic forces.

Low-level Laser Therapy (LLLT)
Anti-inflammatory and neuroregenerative effects within the periodontal ligament.

Light Emitting Diodes (LEDs)
Stimulate vasodilation and the release of growth factors to guide in wound healing by controlling inflammation and decreasing pain in patients.

Transcutaneous Electrical Nerve Stimulation (TENS)
Electrical stimulation to block nerve depolarization which prevents neuropeptide release of substance P.

Low-intensity Pulsed Ultrasound (LIPUS)
High-frequency acoustic pressure waves initiate functional movements around the cell membrane which improve bone remodeling and accelerate orthodontic tooth movement.

Gum, Finger Pressure, Stress Relief
Temporary displacement of teeth to allow for blood flow in PDL to prevent a buildup of inflammatory mediators and ischemic areas, reducing pain.

Fig. 5 – Mechanisms of action of various orthodontic pain management interventions explored in this literature review.

CONCLUSIONS

- Pain is a powerful psychological and systemic stressor; therefore, it is a concern for patients and clinicians alike.
- Pain of different severity and different presentation is commonly experienced by patients undergoing various phases of orthodontic treatment.
- Patient's compliance that is crucial for successful orthodontic treatment, may be negatively affected by appliance discomfort.
- Knowledgeable and adequate pain management during orthodontic treatment is important for good treatment outcome and patient satisfaction.

ACKNOWLEDGMENTS

I would like to give a special thank you to Dr. Marie M. Tolarová and Dr. Mirek Tolar for their guidance in writing this literature review. I would also like to acknowledge the University of the Pacific for providing access to databases and faculty which allowed me to write this literature review. Additionally, I would like to recognize all the authors of cited articles.

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Abstract

Research Problem and Objectives

While there have been extensive advancements in research on temporomandibular joint pain management, the application of technological advancements in the management of pain in orthodontics is understudied. Although studies on the correlation between orthodontic tooth movement (OTM) and pain have increased over the last twenty years, research remains limited by the wide variety of orthodontic treatment modalities and pain management strategies. The objective of this literature review is to explore the current studies on orthodontic pain management amongst various orthodontic treatment approaches (fixed appliances, clear aligner therapy, expansions, temporary skeletal anchorage devices, etc.), and to analyze the efficacy of existing and new interventions for patients experiencing orthodontic pain.

Methods

Search engines, including PubMed and Google Scholar, were employed, using keywords of *orthodontic pain, orthodontic pain management, orthodontics AND pain*, with NCBI filters of Free Full Text, Clinical Trial, Meta-Analysis, Randomized Controlled Trial, and Systematic Review. The time restriction from 2007-2024 and English language were applied.

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Keywords: Orthodontic Pain, Orthodontic Pain Management, Orthodontics, Pain

Acknowledgments

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Introduction

Pain is commonly experienced by patients undergoing various phases of orthodontic treatment and can have different presentations. Such pain can be a concern for patients and clinicians alike as patient compliance, which is crucial for successful orthodontic treatment, may be negatively affected by appliance discomfort. Furthermore, pain has been cited as the most common reason for patients wanting to discontinue orthodontic treatment.[1] Since pain may vary depending on the type of appliance used, understanding the causes of orthodontic pain and collectively analyzing pain across orthodontic treatment modalities is necessary for comprehensive patient care. Most importantly, examining current orthodontic pain management interventions can help guide practitioners in properly alleviating patient pain in order to achieve better treatment outcomes.

Mechanism of Pain Sensation During Orthodontic Treatment

Pain is a subjective experience that can vary based on an individual's age, gender, culture, emotional state, and individual pain threshold.[2] As will be thoroughly discussed in this review, all orthodontic procedures produce pain in patients, from type of tooth movement to orthodontic appliance. While this pain may present as pressure, soreness, or tension of the teeth, the fundamentals of orthodontic tooth movement rely on the mechanical forces of pressure and tension to trigger reactions within the surrounding periodontium.[2, 3] These tissue reactions within the periodontal ligament and alveolar bone allow for tooth movement through a coordinated balance of bone resorption and bone deposition.[3] Orthodontic pain is a symptom of the inflammation created during this dynamic process of bone remodeling.[2]

Understanding the mechanisms behind the duration and intensity of orthodontic pain are also important to establish effective treatment strategies. Orthodontic procedures reduce proprioception from nerve endings in the periodontal ligament for up to 4 days, which lowers a patient's pain threshold.[2] As a delayed response to orthodontic force, hyperalgesia of the PDL occurs due to an increase in prostaglandins making the PDL more sensitive to modulators of inflammation and pain such as histamine, cytokines bradykinin, and substance P.[2, 4] Substance P is a sensory neuropeptide release from sensory peripheral nerve endings in the PDL to transmit pain signals from OTM to the central nervous system.[2] Kapoor *et al.* (2014) found that upon orthodontic force application inflammatory bone-resorptive mediators in the gingival crevicular fluid increased immediately with IL-1β increasing 1 minute to 1 hour after force application and TNF-α increasing in 1 hour to 1 day. The reported patient experience of pressure, soreness, and discomfort can be attributed to the changes in blood flow and increased levels of pain mediators in the area subsequent to inflammation.[2] Furthermore, the intensity of orthodontic pain has been correlated with increased IL-1β levels.[4] Nociceptors, or pain receptors, in the periodontal ligament are sensitized by the inflammation of bone remodeling in orthodontic tooth movement which can cause an increased pain response to normal stimuli such as chewing or biting.[2, 6]

Specific enzymes, cyclooxygenase-1 and cyclooxygenase-2 (COX-1 and COX-2), are responsible for catalyzing the conversion of arachidonic acid to the primary inflammatory and pain mediator prostaglandin.[5] COX-1 is involved in general homeostasis and is found in most organ systems, while COX-2 is only selectively stimulated and is not present in the tissues.[5] Pharmacological interventions for pain management inhibit these enzymes to decrease the production of prostaglandin and thus the sequelae of pain and inflammation. However due to the systemic involvement of COX-1, selective inhibition of COX-2 leads to fewer side effects while still producing anti-inflammatory effects.[5] While drug therapy for orthodontic pain management will be discussed further in this review, it is important to outline the role of cyclooxygenase enzymes in the synthesis of prostaglandins and inflammatory process.

Orthodontic Treatment Modalities and Pain

Assessing pain intensity across various phases and appliance types in orthodontic treatment helps to contextualize specific pain management approaches. While some interventions have been studied in specific orthodontic treatment modalities or stages, others warrant more research.

Leveling and aligning is typically the first phase of orthodontic treatment. For fixed appliances, this step is achieved with the placement of a light archwire to allow for predictable and efficient tooth movement. Orthodontic pain associated with leveling and aligning has been well documented and may negatively impact a patient’s motivation to cooperate with treatment, patient satisfaction, and quality of life after appliance placement and activation.[6] A meta-analysis by Inauen *et al.* (2023) on randomized controlled trials assessing patient’s self-reported pain during the leveling and aligning phase of orthodontic treatment utilized a visual analogue scale (VAS) on a 100-mm scale to quantify pain level using a line with word descriptors of “least pain” and “severe pain” on each end.[6, 7] On average, patients reported pain onset 4.1 hours after archwire insertion with an average VAS of 12.9mm post-insertion.[6] Pain continued to increase in the first few hours after treatment, peaking at 1 day with an average VAS of 42.4mm, and gradually declining within the first week.[6] 54% of the patients in this study reported taking analgesics for pain management during the first week of wire placement with peak use at 6 hours post-insertion.[6]

The emergence of clear aligner therapy over the last 2 decades has eliminated the need for brackets and archwire placement, allowing clear aligners to become the most preferred treatment option by patients.[7] Comparing the pain levels during the initial phase of orthodontic treatment between patients with fixed appliances and clear aligners, a randomized control trial found that pain levels peaked at 24 hours after treatment and decreased during the first week for both groups.[7] However patients with clear aligners had the lowest VAS, experiencing significantly less discomfort and pain compared to the 2 fixed appliance groups (self ligating Damon appliances and conventional MBT appliances).[7] A meta-analysis studying pain and its impacts on the oral health-related quality of life (OHRQoL) between orthodontic patients treated with clear aligners and fixed appliances similarly found that patients treated with clear aligners experienced less pain during treatment.[9] Assessing a patient’s OHRQoL is a useful clinical tool as it describes “the patient-perceived impact of orofacial conditions and dental interventions” allowing for care to be more patient-centered in order to improve treatment experience and outcomes.[9] OHRQoL is measured using the total oral health impact profile, OHIP-14, which factors in functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap.[9] Patients treated with clear aligner therapy report lower OHIP-14 scores, specifically lower levels of psychological discomfort, psychological disability, and physical disability when compared to their fixed appliance counterparts, thus yielding a higher oral health-related quality of life.[9] Despite more long-term prospective clinical studies being needed to produce stronger evidence for these claims, this meta-analysis of pain amongst patients undergoing clear aligner therapy and conventional braces highlighted the importance of considering the impact of orthodontic pain on a patient's oral health-related quality of life.

Debonding of fixed appliances at the end of orthodontic treatment also elicits pain in patients. During bracket removal, intrusive forces produce the least amount of pain compared to mesial, distal, facial, lingual, or extrusive forces.[2, 8] A study by Gupta *et. al* (2022) specifically analyzed pain management techniques during orthodontic debonding in 140 patients.[8] Utilizing the visual analogue scale (VAS) to measure pain intensity, researchers recorded patient pain levels during debonding across 4 groups: a control group, a stress relief group, a finger pressure group, and a medication group. The control group received no advice or treatment methods. The stress relief group received instructions that the debonding procedure would not cause harm or serious pain as a method of cognitive behavioral therapy. The finger pressure group had finger pressure applied in the occlusal-gingival direction with an operator's thumb during the debonding of each bracket. The medication group received 1 dose of 500 mg Paracetamol tablet 1 hour before the debonding procedure. The median VAS was highest in the control group (16.67), 13.33 in the stress relief group, 10 in the finger pressure group, and 8.33 in the medication group.[8] Patient's reported more pain in the anterior teeth compared to the posterior.[7] Although repeated studies are needed to confirm the efficacy of these pain management strategies, a major finding in this study is that finger pressure can be a useful inexpensive tool in making the debonding process more comfortable for patients.[8]

Other forms of appliances are also utilized in orthodontics to control or expand the growth of facial bones through craniofacial orthopedics. Fixed or removable palatal expanders are often used to address posterior crossbite malocclusion.[10] A randomized controlled trial in children age 9-10 analyzed perceived pain intensity and discomfort during posterior crossbite treatment across 2 expander types: quad helix (QH) and rapid maxillary expansion—hyrax type (RME).[10] 42% of study participants reported low to moderate pain upon appliance insertion with no difference between the 2 expander groups.[10] Similar to other orthodontic appliances discussed previously, highest pain levels were reported 24 hours after initial expander placement and declined over a 7 day period as determined by VAS.[10] 11% of patients with the QH expanders reported pain affecting their daily activities on the first day of orthodontic treatment, compared to 15% of patients with the RME expanders.[10]

Temporary skeletal anchorage devices (TADs) or “mini-implants” can be coupled with fixed orthodontic appliances to provide maximum anchorage and minimize the need for patient cooperation with headgear or elastics. Mousa *et. al* (2023) identified patient pain levels to be “mild-to-moderate” on the first day after mini-implant insertion which decreased to a mild pain level after the fifth day.[11] Discomfort from swelling after TAD placement was reported as “moderate-to-severe” during the first week of treatment, decreasing or subsiding completely within 1 month.[11] Additionally, functional activities of speaking, chewing, and oral hygiene care were impaired for patients with TADs compared to other anchorage methods.[11] These higher pain levels for patients treated with TADs is likely due to the installation process involving elevation and suturing of flaps which cause more tissue trauma, edema, and subsequent inflammation.[11]

Examining the existing literature on orthodontic pain across various treatment methods not only establishes context for the common experience of pain, but also identifies the need for effective pain management approaches in orthodontics. A 2009 study from the American Journal of Orthodontics and Dentofacial Orthopedics characterized the success of orthodontic treatment to one that is free of pain complications or functional impairment.[12] Thus, ensuring that patients have as comfortable of an experience as possible when undergoing orthodontic treatment improves overall treatment quality and patient satisfaction.

Orthodontic Pain Management Interventions

Interventions for management of orthodontic pain are a continuously growing field of clinical research. Pharmacological interventions of analgesics have historically been the primary treatment modality in reducing orthodontic pain and still remain the most effective pain management strategy.[13] As discussed previously, the enzymes cyclooxygenase-1 and cyclooxygenase-2 (COX-1 and COX-2), are responsible for catalyzing the conversion of arachidonic acid to the primary inflammatory and pain mediator prostaglandin.[5] Non-steroidal anti-inflammatory drugs (NSAIDs) function by blocking COX-1 and COX-2 to inhibit the synthesis of arachidonic acid and decrease prostaglandin production.[14] With prostaglandin being the primary inflammatory mediator produced by orthodontic forces, decreasing their production allows a patient to experience less inflammation and therefore less pain from orthodontic tooth movement.[14] Comparing the efficacy of ibuprofen to placebo in initial archwire placement, ibuprofen was most effective at 6 hours and 24 hours after treatment.[13] A systematic review of specific analgesic types in controlling orthodontic pain found that, out of 19 randomized controlled trials, analgesics decreased VAS by 15 on average.[14] Ibuprofen and naproxen provided the best analgesia at 6 hours after treatment lowering VAS by 1.63 and 2.11 respectively.[14] Acetaminophen's analgesic effect for orthodontic pain management steadily increased after 24 hours to lower VAS by 1.91.[14]

Due to the negative side effects of analgesics, researchers have studied alternative orthodontic pain management strategies to analgesics such as low-level laser therapy (LLLT). LLLT involves laser treatment with low energy that produces biostimulatory effects without changing the temperature of gingival tissue[13] This treatment approach mitigates orthodontic pain through its anti-inflammatory and neuroregenerative effects within the periodontal ligament, while also enhancing tooth movement by promoting bone remodeling.[13, 15] A study on the application of LLLT during archwire placement found that LLLT significantly decreased patient's perceived pain with VAS scores of 3.30 in the LLLT group compared to 8.55 in the placebo group treated with a simulated laser and 7.25 in the control group with no treatment.[16] Pain also stopped on the third day for the LLLT group in this study rather than the fifth day for patients in the placebo and control group.[16] This highlights the potential for low-level laser therapy to decrease both orthodontic pain intensity and duration. When compared to ibuprofen, LLLT reduces orthodontic pain from 2 hours up to 7 days after treatment while ibuprofen appears to be most effective at 6 hours and 24 hours after treatment.[17] High levels of evidence support ibuprofen's short term pain reducing effects within the first day of treatment, while more studies are needed to support LLLT reducing long term orthodontic pain.[17]

The advancement of technology has enabled the principles of low-level laser therapy to be utilized in other devices including light emitting diodes (LEDs), transcutaneous electrical nerve stimulation (TENS), and low-intensity pulsed ultrasound (LIPUS).[15] LEDs used on human tissues have been shown stimulate vasodilation and the release of growth factors to guide in wound healing by controlling inflammation and decreasing pain in patients.[15] A preliminary study on LED-mediated-photobiomodulation therapy in rats undergoing orthodontic tooth movement also found that LEDs can accelerate tooth movement by increasing osteoblasts in areas on tension and osteoclasts in areas of compression, thus guiding bone remodeling.[18]

Despite multiple studies being conducted on the efficacy of transcutaneous electrical nerve stimulation in managing orofacial pain and temporomandibular joint dysfunction (TMD), the research on the application of TENS in orthodontic pain management is extremely limited. The mechanism of action of TENS relies on electrical stimulation to block nerve depolarization which prevents neuropeptide release of substance P, described previously in this paper on being responsible for sending pain signals to the brain.[2, 15] One study evaluated the use of TENS in controlling orthodontic pain in 65 patients undergoing leveling and aligning.[19] Patients treated with TENS reported significantly less pain after orthodontic treatment compared to the control group.[19] 55% of patients in the TENS group reported pain subsiding within 1 minute of TENS application and 29% felt pain diminish in 1 to 2 minutes.[19] Although more studies are needed on the application of transcutaneous electrical nerve stimulation in orthodontic pain management, this study demonstrates that TENS can be a very easy and effective method for reducing orthodontic pain and improving patient's orthodontic experience.[19]

Low-intensity pulsed ultrasound (LIPUS) is a noninvasive pain management technique that functions by transmitting mechanical energy transcutaneously through high-frequency acoustic pressure waves.[15, 20] These acoustic waves help to initiate functional movements around the cell membrane which improve bone remodeling and accelerate orthodontic tooth movement.[15, 21] Patients in one study undergoing orthodontic treatment with LIPUS had significantly decreased average pain scores compared to a control group, at 24 hours, 4 days, and 5 days after elastomeric separator placement.[20] LIPUS not only allows for a decrease in orthodontic pain, but also has been shown to reduce the intensity of orthodontically induced inflammatory root resorption (OIIRR), a harmful condition that causes permanent damage to root structure.[21] Similar to TENS, more research on the efficacy of LIPUS in orthodontic pain management is needed to understand its clinical usefulness for practitioners.

Lastly, there are also low cost orthodontic pain management approaches that are more accessible to both patients and providers including chewing gum, finger pressure techniques, and stress relief tools. Chewing gum is a noninvasive affordable alternative for orthodontic pain management that can have equal pain relief to analgesics and significantly reduced pain compared to control groups.[22] Based on the physiology of orthodontic pain, it is thought that any treatment modality that can temporarily displace teeth enough to allow for blood flow through compressed areas from orthodontic forces in the PDL can prevent a buildup of inflammatory mediators and ischemic areas, reducing pain.[2, 22] Therefore chewing gum increases blood flow in the PDL in order to relieve inflammation and the discomfort caused by such inflammation.[22] As previously highlighted in this paper's discussion of pain during debonding, finger pressure can effectively reduce orthodontic pain.[8] While the application of finger pressure for pain management may be limited to debonding procedures, another study found that this technique can reduce patients' pain levels by 47%.[23] Stress relief techniques were also employed in the debonding study referenced previous in this review, receiving instructions that the debonding procedure would not cause harm or serious pain.[8] Although this pain management technique had the weakest reduction of debonding pain compared to the other methods in the study, the psychological aspect of pain can be difficult to control.[8] A study examining the psychological side of orthodontic pain tested the effectiveness of alpha binaural beat music on pain reduction during archwire placement.[24] Total pain scores in patients in the binaural beat music group were significantly lower than the control group from days 3 to 7 but had no difference from the placebo group, outlining the potential positive effects that auditory alpha range stimulation may have on anxiety and pain yet the need for more reliable studies.[24]

Conclusions

Pain of different severity and different presentation is commonly experienced by patients undergoing various phases of orthodontic treatment. Such pain can be a concern for patients and clinicians alike. Patient's compliance that is crucial for successful orthodontic treatment, may be negatively affected by appliance discomfort. Thus, knowledgeable pain management during orthodontic treatment is important for good treatment outcome and patient's satisfaction.

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OKU Sutro Excellence Day Project Cover Sheet

Project Title

Management of Pain in Orthodontics

Full name(s) and class year(s) of all project collaborators

Example: Jane Smith, DDS 2022; John Smith, DDS 2022

Brianna Wolfe, DDS 2025; Gregory Pavlos, DDS, Ortho2025; Miroslav Tolar, MD, PhD, faculty; Marie M. Tolarova, MD, PhD, DSc, faculty

Project Category

DDS/IDS/DH - PIP Awards: Bench or Clinical Research

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Objectives: The objective of this literature review is to explore the current studies on orthodontic pain management amongst various orthodontic treatment approaches (fixed appliances, clear aligner therapy, expansions, temporary skeletal anchorage devices, etc.), and to analyze the efficacy of existing and new interventions for patients experiencing orthodontic pain.

Methods: Search engines, including PubMed and Google Scholar, were employed, using keywords of orthodontic pain, orthodontic pain management, orthodontics AND pain, with NCBI filters of Free Full Text, Clinical Trial, Meta-Analysis, Randomized Controlled Trial, and Systematic Review. A time restriction from 2007-2024 and English language were applied.

Results: After rigorous restrictions a total of twenty-three articles were included and reviewed. In order to retrieve the most valuable information and experiences from selected articles, we chose three specific subtopics (1) Mechanism of pain sensation during orthodontic treatment, (2) Orthodontic treatment modalities and pain, and (3) Orthodontic pain management and interventions. In each of these subtopics, we summarized the most important aspects, conclusions, and recommendations.

Conclusion: Pain of different severity and different presentation is commonly experienced by patients undergoing various phases of orthodontic treatment. Such pain can be a concern for patients and clinicians alike. Patient's compliance that is crucial for successful orthodontic treatment, may be negatively affected by appliance discomfort. Thus, knowledgeable pain management during orthodontic treatment is important for good treatment outcome and patient satisfaction.

Acknowledgements: I would like to give a special thank you to Dr. Marie M. Tolarová and Dr. Mirek Tolar for their guidance in writing this literature review. I would also like to acknowledge the University of the Pacific for providing access to databases and faculty which allowed me to write this literature review. Additionally, I would like to recognize all the authors of cited articles.