

Local Interventions for the Management of Pain Associated with Orthodontic Treatment in Saudi Arabia

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Abstract

Objectives: The systematic review objective was designed to assess the effects of local interventions used for the prevention and treatment of pain associated with orthodontic treatments. **Methods:** A digital literature search was carried out between 2000 and 2022 in the following databases, Scopus, Google Scholar, PubMed, and the Cochrane Library of Systematic Reviews. **Results:** Orthodontic patients' quality of life was significantly impacted negatively by the discomfort associated with fixed orthodontic equipment. There were poor dental hygiene, slurred speech, difficulty chewing, movable teeth, decreased taste, halitosis, and gingival bleeding which were frequently the main indicators of pain. **Conclusion:** Patients might, to some extent, prevent pain and suffering with the support of effective orthodontist-patient dialogue and targeted dietary guidance. However, analgesics continue to be a trusted and widely used method for subsiding painful sensations.

Keywords: Orthodontic pain management, orthodontic treatment, orthodontists, awareness, cognition, Saudi Arabia.

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INTRODUCTION

The pain and sensitivity associated with orthodontic treatment are always felt in the affected teeth as a dull ache. Orthodontic discomfort is a serious issue for both patients and orthodontists since it is the main reason that orthodontic therapy is stopped. It is also the negative effect and difficult experience that occurs after orthodontic therapy that is most frequently mentioned. The preponderance of patients' orthodontic pain impacts their health in a variety of ways, making it difficult for them to effectively chew and talk, among other issues. Up to now, a range of methods have been used in clinical research to relieve orthodontic discomfort, comprising medication, laser irradiation treatment, physical, and cognitive methods. Pain is defined as an unpleasant sensory and emotional experience brought on by real or potential tissue injury. Orthodontic discomfort is always experienced as a dull ache and hypersensitivity in the afflicted teeth [1]. The biggest cause of halting orthodontic treatment is orthodontic pain, which is why it is a major concern for both patients and orthodontists. It is also the most

commonly cited adverse impact and challenging experience that follows orthodontic therapy. Any uncomfortable feeling brought on by orthodontic devices, such as a gingival lesion, a mucosal ulcer, or soreness in the tongue, may be referred to as orthodontic pain. It is often defined as dental discomfort brought on by tooth movement caused by orthodontic treatment and experienced as soreness, pressure, and tension in the impacted teeth. Most patients can bear orthodontic discomfort since they are aware that it is a common, unpleasant side effect of tooth movement [2].

Features of Orthodontic Pain

Few hours following the application of orthodontic force, orthodontic discomfort often begins. It increases after one day, then steadily declines and returns to zero after three to seven days and one month, respectively. For the majority of patients, orthodontic discomfort goes beyond just being uncomfortable; it also affects their health in many ways, impairs their ability to eat and speak properly, among other things. When orthodontic forces are exerted on the teeth,

inflammatory responses that trigger the secretion of various bio-chemical messengers in the periodontium and dental pulp, which cause the feeling of pain, along with coordinated responses from the vascular, cellular, neural, and immune systems, ultimately lead to pain and tooth movement [3].

Orthodontic discomfort and tooth movements are two biological events that are linked and rely on local inflammatory response as their method of action. Products like prostaglandin and bradykinin work on sensory terminals during inflammatory responses to increase unpleasant feelings. Periodontal inflammation induced by orthodontic stresses and including a matrix of interacting vascular, cellular, and chemical processes is where the basic causes of orthodontic discomfort are identified [4]. Orthodontic pain has been reduced in clinical practice using a variety of techniques up to this point, including pharmaceutical treatments, laser irradiation therapy, mechanical, and behavioral approaches. Additionally, gene therapy is gaining acceptance as a method for treating pain, so it's possible that in the future orthodontic patients will benefit from it as well [5].

Since many years ago, non-steroidal anti-inflammatory medications (NSAIDs) have been the most popular way to manage discomfort during orthodontic treatment. NSAIDs come in a variety of forms, including Acetaminophen, Ibuprofen, Celecoxib, Misoprostol, and Naproxen sodium. Different studies have shown NSAID usage to be less effective at preventing tooth movement obstruction [6]. There is a need for verification of the effectiveness of chewing gum and nibbling since there is a dearth of evidence. Although acupuncture has been shown to be useful in treating orthodontic discomfort, its exact methods of action are yet unclear [7].

Both medical and dentistry practices have employed low-level laser treatment extensively to treat pain. Using it has allowed those undergoing orthodontic treatment to get pain reduction. Divergent behavioral strategies are applied to lessen orthodontic discomfort. Exercise, cognitive behavioral therapy (CBT), and relaxation techniques are some of them [8-10].

In light of a patient's susceptibility assessment, orthodontists should include pain management and prevention in the treatment plans, and patients should be informed as part of informed consent. In this study; a review of all the articles related to the pain management during the orthodontic therapy among orthodontists of Saudi Arabia is to be studied.

METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement [PRISMA Checklist 2009] was followed in the preparation of the

current review. An Information Specialist searched four bibliographic databases up to 28 October 2022 and used additional search methods to identify published, unpublished, and ongoing studies. (((orthodontic pain)) AND (management)) AND (orthodontists)) AND (awareness)) AND (cognition)) AND (Saudi Arabia)) were among the keywords that were utilized to find the pertinent articles. Inclusion requirements for this study contained studies covered the topics of the awareness of orthodontists and orthodontic pain management, pain and discomfort during orthodontic treatment, *vitro* and *in-vivo* research. However, exclusion criteria were all the studies with surgical involvements or participation of animals. Selection of Studies: In order to find any pertinent research, references for the textbook and a few papers were checked. The researcher participated independently in this study's procedure and gathered the essential data. The relevancy of each title and abstract to the study was recognized, scanned, and evaluated. The reviewer carefully examined full-text articles whenever the title and abstract's material left questions about the paper's relevancy. In order to find possibly pertinent later primary research, papers that have cited these works were also found using Science Citation Index.

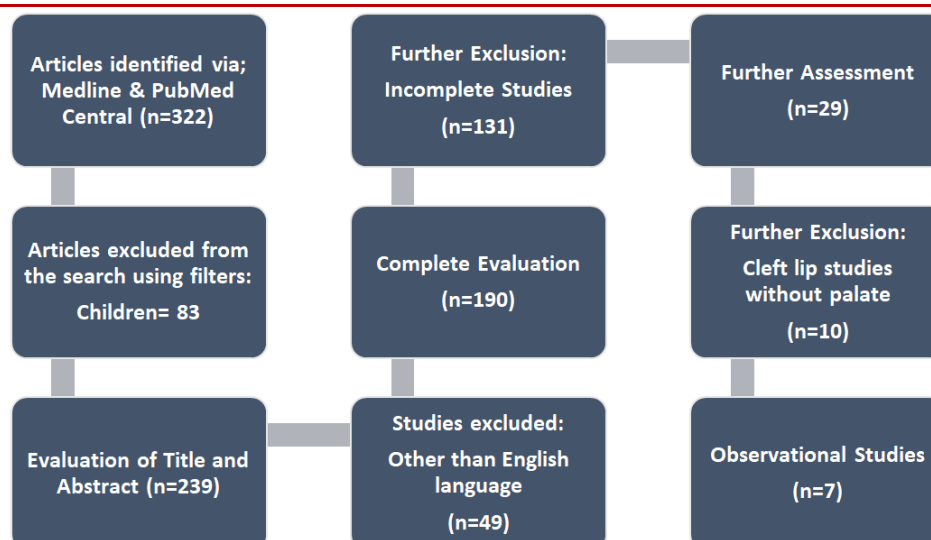
RESULTS

By using fixed appliances for active orthodontic therapy, pain and discomfort were frequent side effects. After initial bonding and separator installation, pain often begins within four hours, develops over the following 24 hours, and then reduces within seven days. In orthodontic therapy, pressure, ischemia, inflammation, and edema caused by tooth movement are the major causes of pain and discomfort.

Additionally, the discomfort related to fixed orthodontic equipment frequently has a significant negative influence on the quality of life for orthodontic patients. The primary characteristics that determine discomforts are often poor oral hygiene, slurred speech, trouble eating, mobile teeth, impaired taste, halitosis, and gingival bleeding.

The kind of appliance can also affect how painful something is. Patients with permanent appliances report far more acute pain compared to those with removable devices. Along with other purported benefits, it has been proven that envisaging aligners were more comfortable than fixed orthodontic appliances throughout the early stages of treatment.

However, underlying orofacial pain issues may exist in certain patients. Orofacial pain issues must be managed using a comprehensive approach. Therefore, while treating these patients in their practice, orthodontists must work in conjunction with the orofacial experts.



Graph Showing Process of evaluation of articles to assess the effects of local interventions used for the prevention and treatment of pain associated with orthodontic treatments.

Data Selection

Following details were gathered: author, year, purpose, findings, summary, and conclusion.

Author	Year of publication	Objective of the experiment	Analysis of Findings	Conclusion
Sharawi NA, Somaili AMH, Arishi SA, Somaili RM, Ghazwani LY, Sumayli AH, Sumayli MA, Jafer MA, Ghoussoub MS, Patil S. [15]	2021	To assess the effectiveness of adjuvant analgesics/anesthetics in pain control after separator placement compared with no medication	The results revealed that virtually all time intervals had decreased reported pain ratings when analgesics were used. NSAIDs significantly reduced pain compared to the control group statistically.	The literature that is currently available indicates that the use of analgesics is useful in reducing orthodontic discomfort brought on by separators. Ibuprofen and acetaminophen provide a consistent analgesic effect.
Lal A, Alam MK, Ahmed N, Maqsood A, Al-Qaisi RK, Shrivastava D, Alkhalaf ZA, Alanazi AM, Alshubrmi HR, Sghaireen MG, Srivastava KC. [16]	2021	In recent years, liposomes, polymeric particles, and core shells have been created to identify the nanoparticle drug delivery systems based on metals.	Nano-drug delivery systems, such as silver and copper-based nanoparticles, are utilized in the treatment of periodontitis, numerous phases in root canal therapy, and dental cavities as antibacterial dental treatments. Treatment for oral fungal infections, such as candida albicans in denture users, has included the use of nanoparticles in conjunction with antifungals.	Combination agents based on nanoparticles enable improved drug release in a regulated way in addition to effective delivery at the site of action.
Al Shayea EI. [17]	2020	The purpose of this study was to compare the usage of chewing gum and biting wafers to ibuprofen in terms of how well they worked to relieve pain in Saudi orthodontic patients following the activation of the first archwire.	There were no statistically significant variations between the three groups' perceptions of pain at any point in time. The pain perception finding at various time intervals within each pain management technique was statistically significant ($p = 0.000$, $p 0.05$), and it was observed that the pain experienced at bedtime and 24 hours after wire implantation across different groups was somewhat greater with maximum intensity. Additionally, the ANOVA findings show no variations in	Following the initial activation of fixed orthodontic equipment, biting wafers and chewing gum were equally efficient as ibuprofen for relieving pain in Saudi orthodontic patients. Furthermore, the research revealed no statistically or clinically significant variations in bracket detachment across the groups.

Author	Year of publication	Objective of the experiment	Analysis of Findings	Conclusion
			bracket detachment across the groups that are statistically significant ($p = 0.20$, $p 0.05$).	
AlShahrani I, Togoo RA, Hosmani J, Alhaizaey A. [18]	2019	In order to resolve this discrepancy, the aim is to conduct a systematic review, quantifying the literature studies that suggested a connection between photobiomodulation and the acceleration of tooth movement, and determining whether photobiomodulation therapy is associated with the acceleration of tooth movement.	In terms of the acceleration of tooth movement, it was found as a statistically significant difference between the photobiomodulation treatment group and the non-laser group (Mean difference 0.59 (95%CI-0.24 to 0.95) I2 95%). Because of the significant variability among the studies, it is important to use caution when extrapolating these findings to clinical practice.	The current systematic review's findings point to a potential advantage for photobiomodulation treatment and tooth mobility in orthodontics. However, in order to unify the methodological design that can be applied in ordinary clinical practice; these findings need to be further confirmed in bigger studies employing certain standardized features of laser settings.
Prasad SMV, Prasanna TR, Kumaran V, Venkatachalam N, Ramees M, Abraham EA [19]	2019	This study sought to determine if low-level laser treatment (LLLT) may successfully reduce orthodontic discomfort following activation.	According to the study's findings, the experimental group's level of discomfort at time zero compared to the placebo groups was higher for the individuals following orthodontic activation. In comparison to the placebo group, the patients in the experimental group reported decreased discomfort at time points T1, T2, T4, and T5. The experimental group's participants at T3 reported much less pain than the placebo group's participants.	After activation, the discomfort associated with orthodontics can be effectively reduced with a single dose of LLLT at 980nm, 2.5 W/cm2, and 600 J.
Al-Harthy M, List T, Ohrbach R, Michelotti A. [20]	2018	Women with temporomandibular disorder (TMD) discomfort from three different cultures had their basic disease beliefs and type of therapy they had received evaluated.	The study didn't find any conclusive links between cultures and the kinds of practitioners consulted in the past. Treatments varied depending on the culture: behavioral therapy, acupuncture, and an occlusal appliance were most frequently used by Swedes, Islamic medicine was most frequently used by Saudis, and antidepressants were most frequently used by Italians. Swedes were substantially more likely than Saudis and Italians to think that behavioural aspects should be taken into account while treating TMD pain.	Culture had no impact on the type of healthcare provider sought out before seeing a TMD specialist or the patients' perceptions of the causes and exacerbating aspects of their pain among Saudi, Italian, or Swedish women with persistent TMD pain. The sorts of therapies available locally or wider cultural attitudes may also have an impact on the treatments TMD patients choose to get, since there are cultural differences in both therapy types and ideas about the processes behind the pain.
Al-Naoum F, Hajeer MY, Al-Jundi A. [21]	2014	To compare the effectiveness of alveolar corticotomy with the usual approach for orthodontic tooth movement while retracting upper canines and to gauge the amount of pain and discomfort experienced by patients following the procedure.	At one and three days after surgery, respectively, 50% and 30% of patients reported experiencing significant discomfort when eating. On the experimental side, there were no discernible changes in the tooth movement velocity between the male and female patients.	Alveolar corticotomy caused moderate levels of pain and suffering while accelerating orthodontic tooth movement.

DISCUSSION

The results of this study showed that orthodontist-patient dialogue and targeted dietary guidance and analgesics are very effective for reducing pain and discomfort associated with orthodontic treatments. Study by Sharawi *et al.*, reported that pain scores dropped dramatically by using analgesic drugs. Acetaminophen and ibuprofen both have a constant analgesic effect [15].

Moreover, Lal *et al.*, reported that various stages of root canal therapy, and dental cavities are all treated using nano-drug delivery systems, such as silver and copper-based nanoparticles, as antibacterial dental procedures. Nanoparticles have been used in concert with antifungals to treat oral fungal infections, such as candida albicans in denture wearers. Combination medications based on nanoparticles allow for effective drug delivery at the site of action in addition to better drug release in a controlled manner [16].

As studied by Al Shayea *et al.*, at any point in time, there were no statistically significant differences in the judgments of pain across the three groups. The pain perception results for each pain management approach at different time points were statistically significant ($p = 0.000$, $p 0.05$), and it was found that the pain felt at night and 24 hours following wire insertion varied somewhat across groups in terms of maximum severity. Furthermore, the ANOVA results do not reveal any statistically significant differences in bracket detachment across groups ($p = 0.20$, $p 0.05$). Biting wafers and chewing gum were just as effective as ibuprofen for Saudi orthodontic patients in reducing discomfort after the initial activation of fixed orthodontic equipment. Additionally, the study found no clinically or statistically significant differences in bracket detachment across the groups [17].

It was shown that there was a statistically significant difference between the photobiomodulation treatment group and the control group in terms of the acceleration of tooth movement (Mean difference 0.59 (95%CI- 0.24 to 0.95) I2 95%). It reported when applying these findings to clinical practice, it is crucial to exercise caution due to the large variation among the research. The results of the systematic study by Alsharani *et al.*, suggest that photobiomodulation therapy and tooth mobility may be advantageous in orthodontics. These results must be further supported in larger research using certain standardized laser setting elements in order to unify the methodological design that can be used in routine clinical practice [18].

According to the study by Prasad *et al.*, found that after orthodontic activation, the experimental group's level of pain was greater at time zero compared to the placebo groups. At time periods T1, T2, T4, and T5, patients in the experimental group reported less discomfort than those in the placebo group. Participants

in the experimental group at T3 reported significantly less pain than those in the placebo group. After activation, a single dosage of LLLT at 980nm, 2.5 W/cm², and 600 J can significantly lessen the pain connected with orthodontics [19].

No clear correlations were reported by Harty A *et al.*, between cultures and the kind of practitioners consulted in the past were discovered by the investigation. The most popular forms of treatment differed by culture: behavioral therapy, acupuncture, and an occlusal appliance were most popular in Sweden, Islamic medicine was most popular in Saudi Arabia, and antidepressants were most popular in Italy. Swedish people were significantly more likely than Saudis or Italians to believe that behavioral factors should be included while treating TMD discomfort. The culture had no effect on the kind of healthcare provider sought after consulting a TMD specialist or the patients' opinions of the origins and aggravating factors of their pain. The types of treatments that is accessible locally or across cultures [20].

According to Al Naoum *et al.*, 50% and 30% of patients, respectively, reported having substantial discomfort when eating one and three days following surgery. Between the male and female patients in the trial, there were no appreciable differences in the tooth movement velocity. Alveolar corticotomy accelerated orthodontic tooth movement while causing mild to severe pain and suffering [21].

According to a study, both male and female patients' pain levels can be decreased by trained specialists using systemic acupuncture prior to surgery. Consequently, it was viewed as a secure way of pain management [22].

CONCLUSION

Effective orthodontist-patient communication and focused dietary advice may, to some extent, help patients avoid pain and suffering. Analgesics are still considered the best choice for subsiding painful sensation associated with orthodontic treatments. Orthodontists must have a deep knowledge about the mechanism of action analgesic used in dentistry. Patients with trigeminal neuralgia or psychological discomfort, they might need special care. However, pain management is a complicated condition. Therefore, more research combining various orthodontic techniques might be required.

ETHICAL CONSIDERATIONS

Compliance with Ethical Standards

Ethical Approval

This proposal contains survey studies with human participants performed by any of the authors.

Conflict of Interest

The authors do not have any commercial associations that might pose or create a conflict of interest with information presented in this communication. No intramural or extramural funding supported any aspect of this work.

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