

**Ministry Of Higher Education And Scientific Research**

**University of Baghdad**

**College of Dentistry**

**Orthodontic pain**

**Graduation Project Submitted To Department Of Orthodontics**

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introduction

Pain, which includes sensations evoked by, and reactions to, noxious stimuli, is a complex experience and often accompanies orthodontic appointments. This, among the most cited negative effects of orthodontic treatment, is of major concern to patients as well as clinicians (Oliver and Knapman, 1985; Kluemper *et al.*, 2002) . Surveys performed to determine the experience of orthodontic pain have rated it as a key deterrent to orthodontic therapy and a major reason for discontinuing treatment . One survey rated pain as the greatest dislike during treatment and fourth among major fears and apprehensions prior to orthodontic treatment (O'Connor, 2000). Pain is a subjective response, which shows large individual variations. It is dependent upon factors such as age, gender, individual pain threshold, the magnitude of the force applied, present emotional state and stress, cultural differences, and previous pain experiences (Ngan *et al.*, 1989; Brown and Moerenhout, 1991; Scheurer *et al.*, 1996; Firestone *et al.*, 1999; Bergius *et al.*, 2000). Surveys regarding the percentage of patients experiencing pain have reported values ranging from 70 (Caucasian population) to 95 (Asian population) percent (Oliver and Knapman, 1985). One report has even stated that 8 per cent of a study population discontinued treatment because of pain (Patel, 1989). Surprisingly, this important area, in clinical practice as well as research, is ignored, as evidenced by the scarcity of publications. This review is an attempt to organize the existing literature regarding pain, which appears as part of orthodontic mechanotherapy, and attempts to address questions that might arise in a clinical setting from the viewpoint of clinicians and patients/parents. It also provides an overview of current management strategies employed for alleviating orthodontic pain.

(Otasevic M 2006) found that Communicating with patients about pain and pain management should therefore be part of patient-orthodontist interactions. Patients' pain is one aspect of oral health-related quality of life (OHRQOL), a relatively new concept in the oral health sciences, Poor oral health can affect physical, psychological, and social conditions, which in turn affect patient's quality of life (QOL).( J Orthod. 2001 ,2004) Researchers have therefore suggested that OHRQOL be included when assessing a patient's treatment needs and outcomes. they have assessed OHRQOL in connection with orthodontic treatment outcomes, such as in studies of how patients' QOL is affected by improvements in appearance and functioning after treatment is concluded. It is well accepted that orthodontic treatment affects patients' appearance, speech, ability to take in nutrition, and their social interactions. Understanding how patients' pain experiences during their treatment affect their QOL is important because pain/discomfort is one main component of patients' QOL and the absence of pain/discomfort is important for achieving a high QOL (Quintessence; 2002) For patients, pain might even be the most significant side effect of orthodontic treatment and one of the primary reasons for noncompliance. Pain from orthodontic treatment has been shown to have negative effects on oral hygiene efforts and to be a major reason for missing appointments ; in addition, almost all orthodontic patients reported pain when chewing and biting food, causing them to change their diet. Finally, pain and discomfort during orthodontic treatment has been shown to affect a patient's overall satisfaction with their orthodontic treatment outcomes. Given that pain affects patients' QOL and treatment cooperation, discussing pain management should be part of the communication between patients and orthodontists. If orthodontists are able to support their patients' efforts to prevent or manage pain, their patients would have a better QOL and might be more willing to cooperate with treatment recommendations. However, research suggests that pain management has been largely neglected and that orthodontic education lacks pain management training.

There seems to be a consensus that pain management merely requires common sense and the ability to follow basic medication procedures. Other researchers have shown that it is difficult for health professionals to communicate effectively about pain and for orthodontists to predict patients' pain responses to treatment.( Ngan et al 1989). This situation is unfortunate because patients' pain can be decreased when the patient is well informed about how much pain to expect, and patients' expectations are greatly influenced by information from providers and memories of past experiences. When patients receive information about the level of pain they might experience, they gain an increased sense of control, and as a result, pain can be reduced.

In addition to exploring whether orthodontists can accurately assess their patients' pain, it is also interesting whether they engage in effective communication about pain management. Research showed that nonsteroidal anti-inflammatory drugs (NSAIDs) are the preferred over-the-counter medications for orthodontic pain.While high doses of NSAIDs have been reported to disrupt tooth movement, over-the-counter doses have not been shown to affect tooth movement. Some studies reported similar levels of pain relief with NSAIDs and acetaminophen.(bird. 2007),Other pain medications studied include aspirin, which was found to be less effective than other NSAIDs and should not be used by children, and valdecoxib, a COX-2 inhibitor that has been removed from the US market due to adverse cardiovascular effects. Other more nontraditional methods of pain relief include low-level laser therapy, transcutaneous electrical nerve stimulation, vibratory stimulation, and analgesic gum. Premedication with an NSAID such as ibuprofen or naproxen sodium has been found to be effective in managing orthodontic pain. research showed that these medications delayed the onset of pain and decreased initial pain experiences if taken 1 hour before certain orthodontic procedures and that preprocedural and postprocedural pain medication gave the most effective and long-lasting pain relief.( Angle Orthod. 2006)

Despite these research findings, there is no standard of care for analgesic use in the pain management of orthodontic patients. It is more common for orthodontists to simply tell their patients to take analgesics as needed, leaving pain management decisions up to their mostly adolescent patients and their parents.(bird 2007) In fact, despite the known effectiveness of various analgesics, there is surprisingly little use of these medications among patients.

 Orthodontic causes of pain — what are they?

 It is clear from the existing literature that all orthodontic procedures such as separator placement, archwire placement and activations, application of orthopaedic forces and debonding produce pain in patients. It is also clear that ﬁxed appliances produce more pain than removable or functional appliances and there exists little correlation between applied force magnitude and pain experienced. The various discomforts experienced by patients after appliance placement are often described by them as feelings of pressure, tension, soreness of the teeth, and pain as such ( Ngan et al.1989) . Clinicians usually respond to the most frequently asked question ‘ W ill it hurt?’ with the answer ‘ There may be some discomfort associated with all orthodontic procedures such as placement of separators, archwire placement and activations, elastic wear and debonding ’ . The two most important parts of orthodontic pain— i ts duration and intensity are often ignored. It is known that the above-mentioned procedures will cause pain but what is not known is ‘ why they cause pain? ’ It is reported that orthodontic procedures will reduce the proprioceptive and discriminating abilities of the patients for up to 4 days, which result in lowering of the pain threshold and disruption of normal mechanisms associated with proprioception input from nerve endings in the periodontal ligament (Soltis et al.1971) . At the same time, there will be pressure, ischaemia, inﬂammation, and oedema in the PDL space . Burstone (1962) reported an immediate and delayed painful response after orthodontic force application. He attributed the initial response to compression and the delayed response to hyperalgaesia of the PDL. This hyperalgaesia has been related to prostaglandins (PGEs), which make the PDL sensitive to released algogens such as histamine, bradykinin, PGEs, serotonin, and substance P (Polat et al. 2005) . It is clear that all orthodontic procedures will create tension and compression zones in the PDL space resulting in a painful experience for the patients.

 Orthodontic separation and pain

 Creating space mesially and distally to teeth, which are to be banded, forms the initial step in ﬁxed orthodontic mechanotherapy. It is well-known that placement of orthodontic separators (brass wire, elastomerics, spring type steel separators, and latex elastics) results in a painful experience for almost all patients (Ngan et al. 1989). Two controlled clinical trials performed by (Ngan et al. 1989) concluded that there was discomfort associated with separator placement, which usually starts within 4 hours of insertion. The level of discomfort increases over the next 24 hours and decreases to pre-placement level within 7 days. A recent report ( Bondemark et al. 2004 ) has also addressed this issue. They evaluated and compared the separation effect and patient perception of pain and discomfort to two types of orthodontic separators (elastomeric and spring type) but found no statistically signiﬁcant difference between the discomfort caused by the two types of separators. They reported that the worst pain was experienced at day 2 and subsided almost completely by day 5

 Archwire placement and activation

 Pain associated with initial archwire placement has been previously researched. Jones (1984) reported that pain is experienced by the majority of patients 4 hours after archwire placement, which will peak at 24 hours and then decline . Jones and Chan (1992b) stated that pain from archwire placement can be worse in some patients and could even be more than that experienced after tooth extraction. They observed a diurnal variation in pain experienced by patients — with evening and nights showing the highestscores. The pain will usually last for 2 – 3 days and will gradually decrease in its intensity by ﬁfth or sixth day. Comparing various archwires to determine differences in pain perception showed no statistically signiﬁcant results. No difference in the intensity, prevalence, or duration of pain between different archwires was found . patients reported more pain experience in anterior than in posterior teeth because of the differences in root surface area, increased involvement of anterior teeth during levelling, and greater use of anterior teeth for biting. Fernandes et al. (1998) reported that after 11 hours of force application, a higher pain perception was experienced in the lower than in the upper arch. (smith et al .1984 and Goldreich et al. 1994), through different experiments, evaluated the effect of orthodontic archwire activation on the masseter muscle through EMG activity. They observed a reduction in masseter muscle activity and attributed this to the noxious stimuli emulating from the periodontal membrane or paradental receptors triggering a reﬂ ex mechanism, which caused inhibition of jaw-closing muscles (EMG activity during induced pain has been shown to increase when jawclosing muscles act as antagonists). In brief, both archwire placement as well as activation will cause pain and might affect dietary habits as well as the daily life activities of patients.

 Appliance type

 The effect of different appliances (ﬁxed and removable) on pain experience has been evaluated. Oliver and Knapmann (1985) found no difference in the level of discomfort produced by ﬁxed or removable appliances. Sergl et al. (1998) contradicted this ﬁnding and stated that ﬁxed and functional appliances produced a higher intensity of discomfort than removable appliances. Patients wearing ﬁxed appliances reported higher values for intensities of pressure, tension, pain, and sensitivity to teeth.

 Initial tooth positions and force levels

 The concept of light forces producing more physiological and less painful tooth movement is a matter of debate. Hixon et al. (1969), who favoured application of heavier forces for canine retraction, stated that higher forces per unit area increased the rate of biological response. Gianelly and Goldman (1971) argued that large forces caused greater periodontal compression and thus more pain. They stated that some pain accompanies every orthodontic appointment. J ones and Richmond (1985) evaluated the relationship between initial tooth positions, applied force levels, and experienced pain but observed no statistically signiﬁcant correlation among the three parameters. Those authors suggested that the degree of displacement of the tooth from the archwire to indicate the level of applied force and thereby discomfort experienced by the patient should not be considered. All these assumptions and ﬁndings point to the fact that malocclusions, however severe, when undergoing orthodontic treatment will elicit a painful response, and little correlation exists between the degree of pain response and applied force magnitude.

 Orthopaedic forces and sutural strain

 Craniofacial orthopaedics utilizes mechanical forces of a high magnitude, which when applied are absorbed and transmitted to the craniofacial complex. These forces will produce a series of reactions characterized by tissue displacement, deformation, and development of internal stress .Ten Cate et al. (1977) , after exerting a sagittal expansion force in rats, observed traumatic tears, exudates, death of ﬁbroblasts, disruption of collagen ﬁbres, and acute inﬂammation. As part of the inﬂammatory process, the patient perceives a painful sensation, which is often expressed in the whole craniofacial region. they demonstrate painful experiences after application of expansive force with rapid palatal expanders. Needleman et al. (2000) concluded that vast majority of children undergoing rapid palatal expansion experience pain, which occurs during the initial phase and diminishes thereafter. Egolf et al. (1990) found that approximately 28 per cent of patients reported pain as the factor which prevented them from wearing headgear or elastics. Patients often experience discomfort after 24 hours of headgear wear and there is a sharp decline in pain after 3 days . Cureton (1994) evaluated the discomfort levels associated with combination therapy, headgear, and a transpalatal arch (TPA). They suggested that wearing of a headgear and a TPA should never be started together and that headgear wear should precede TPA wear by at least 1 week. Ngan et al. (1997) , who evaluated levels of masticatory muscle pain and EMG activity in patients treated with protraction headgear, concluded that protraction headgear does not induce muscle pain or produce an increase in muscle activity. It is clear that the pain associated with orthopaedic devices is not of amuscular nature but a part of the acute inﬂammatory reaction occurring at the sutural regions.

 Debonding

 Williams and Bishara (1992) evaluated the threshold level for patient discomfort at debonding and concluded that tooth mobility and force application were the two important inﬂuencing factors. They found intrusive forces to produce less pain at debonding in comparison with forces applied in a mesial, distal, facial, lingual, or extrusive direction. They suggested applying ﬁnger pressure or asking the patient to bite on a piece of cotton roll to minimize pain while debonding. Rinchuse (1994) , in another report, described the use of an occlusal rim wax for pain-free debonding.

 What is the underlying mechanism for orthodontic pain?

 There is no doubt that the perception of orthodontic pain is part of an inﬂammatory reaction causing changes in blood ﬂow following orthodontic force application. This is known to result in the release of various chemical mediators eliciting a hyperalgaesic response. Recent research has started revealling the molecular basis of orthodontic pain with demonstration of the presence as well as elevation in levels of various neuropeptides released.

Orthodontic tooth movement is known to cause inﬂammatory reactions in the periodontium and dental pulp, which will stimulate release of various biochemical mediators causing the sensation of pain. The perception of orthodontic pain is due to changes in blood ﬂow caused by the appliances and has been correlated with the release and presence of various substances, such as substance P, histamine , dopamine, serotonin , leukotriens, and cytokines. Processing of complex information arising from mechanical force application induces recruitment of neurons, which act by the way of chemical mediators as modulators of the effector response to the stimulus ( Vandevska-Radunovic, 1999 ). Apart from the classic constituents mentioned above, peripheral nerve ﬁbres also participate in the inﬂammatory process associated with tooth movement (neurogenic inﬂammation). This involves release of neuropeptides after stimulation of afferent nerve endings and initiation of an inﬂammatory reaction. These neuropeptides released are known to elicit a painful response .

 Are there any factors that inﬂuence a painful response to orthodontic force?

 There exists a non-linear relationship between age, gender, psychological state and cultural background in pain perception following placement of an orthodontic appliance. The relationship between the psychological well being of patients and orthodontic pain perception is proven beyond doubt. It is clear from the published literature that females express more pain than males, and adolescents report higher levels of pain than pre-adolescents and adults. I t is well-known that an individual’s ‘ physiological and psychological susceptibility ’ can become a signiﬁcant factor in the intensity of tissue discomfort caused by the physical effects of appliances. It has been reported that the pain experienced by patients does not seem to be directly related to the magnitude of force exerted but relies heavily on the psychological well-being of the individual . Sergl et al. (1998) conﬁrmed these ﬁndings and reported a very distinct correlation between a patient’s attitude towards treatment and discomfort felt after appliance insertion. Traditionally, it is believed that females are ‘ fragile’ and sensitive to pain, while males can tolerate more pain (Bergius et al. , 2000 ). Others reported that there is no differences between males and females in reporting the feeling of pain with respect to threshold .

The ‘ effect of age ’ on pain perception is difﬁcult to compare as far as orthodontic treatment is concerned. This is mainly because of the different treatment approaches followed for patients of different ages. However, studies reporting this issue reveal conﬂicting results. Most favour the opinion that adult subjects perceive more pain than young patients (Fernandes et al. , 1998 ).

In a study utilizing a visual analogue scale (VAS),( is a simple and frequently used method for the assessment of variations in intensity of pain), Ngan et al. (1989) found no statistically signiﬁcant difference in pain perception between adolescents and adults. An extensive report by Brown and Moerenhout (1991), comparing pain perception with a pain rating index in pre-adolescents, adolescents, and adults, found that adolescents reported a higher level of pain than pre-adolescents and adults. This phenomenon was noted after all phases of treatment such as separator placement, banding, archwire placement, and activations. They rationalized this phenomenon by a statement that ‘ reported pain could be somatization of either anxiety or depression ’ . This might help the patient to translate feelings of anxiety or depression into a psychological problem. There is strong evidence that some experiences of pain are universal, while others are ‘ culture’ speciﬁc. Some ethnic groups encourage social attitude and behaviour and persons in these groups are often expected to openly express his/her responses. These patterns are learned and transmitted largely in families (Bergius et al., 2000) . Thus, the family as well as surroundings should be considered as an important source of early learning with no exception with respect to pain perception and its response. It can be stated that there exists a non-linear relationship between age, gender, psychological state, and cultural background in pain perception following placement of orthodontic appliances and these factors should be considered before beginning treatment.

 How to evaluate pain?

 There is a well-deﬁned classiﬁcation system for orthodontic pain proposed by Burstone (1962). It appears to be valid even now and to have stood the test of time. In order to study or evaluate pain, patient interview/questionnaire and ratings with VAS, McGill pain questionnaire (MPQ), Verbal Rating Scales (VRS) and algometers (an instrument for measuring the smallest pressure upon the skin that will arouse a sensation of pain) can be effectively used.



 Classifying pain

 Burstone (1962) classiﬁed a painful response to orthodontic mechanics in two ways: one depends on the relationship of force application with pain and the other according to the time of onset. According to that author, the degree of pain perceived in response to the amount of force application can be divided into three:

 1. First degree: the patient is not aware of pain unless the orthodontist manipulates the teeth to be moved by the appliance, e.g. using instruments such as a band pusher or force gauge.

 2. Second degree: pain or discomfort caused during clenching or heavy biting— usually occurs within the ﬁrst week of appliance placement. The patient will be able to masticate a normal diet with this type of pain.

 3. Third degree: if this type of pain appears, the patient might be unable to masticate food of normal consistency.

 Based on time of onset, Burstone (1962) further classiﬁed pain as follows:

 1. Immediate: which is associated with sudden placement of heavy forces on the tooth, e.g. hard ﬁgure of eight tie between the central incisors to close a midline diastema.

 2. Delayed: produced by variety of force values from light to heavy and representing hyperalgaesia of the periodontal membrane. This type of pain response decreases with time i.e. the pain reaction might start as third degree but become second or a ﬁrst degree with the passage of time.

 Studying pain

 It is well-known that correct measurement of pain is an essential part of its evaluation, and adaptation of methods to control it. Various approaches have been used to measure and evaluate pain perception in orthodontic patients. The methods adopted vary from traditional surveys with pretested questionnaires, rating with VAS ( Linacre, 1998 ), MPQ ( Melzack, 1975 ), VRS ( Jones and Chan, 1992a , b ), and algometers ( Simmons, 1994 ). Most of the studies have utilized a VAS, which is designed to present the respondent with a rating scale with minimum constraints . The respondent is expected to mark a location on the line corresponding to the amount of experienced pain. This has been claimed to have two advantages:

 1. It provides freedom to choose the exact intensity of pain.

 2. It gives maximum opportunity for expression in an individual personal response style.

 Another common method used in medical research, but less explored in orthodontics, is the MPQ ( Melzack, 1975 ). This consists of three major classes of word descriptors— sensory, affective, and evaluative — that are used by patients to specify subjective pain experience. It also contains an intensity scale and other items to determine the properties of pain experience. The main advantage of the MPQ is the provision to identify quantitative measures of clinical pain. The pain rating index is a short form of MPQ, which can be used in routine clinical practice because of its user-friendly nature.



 VRS is another method to evaluate orthodontic pain (Jones and Chan, 1992a , b ) . This consists of a list of adjectives to describe different intensities of pain. The method requires patients to read a list of adjectives and select the word or phrase that best describes their level of pain. An adequate VRS scale should include adjectives that reﬂect extremes such as ‘ no pain ’ and ‘ excruciating/extremely intense pain ’ .

 Simmons (1994) proposed use of an algometer to evaluate pain in patients sitting in dental chair. A data acquisition system was utilized to record the measurement of forces applied to teeth as ﬁxed orthodontic appliances were adjusted. The device contains two input systems— one is a metal strip attached to the orthodontic brackets and the other, a 5V signal from a remote control television unit that the patient activates when they begin to feel pain. More research is needed in to this electronic system of pain assessment before clinical application, so that accurate and reliable results other than subjective evaluation from patients can be obtained.

 Does orthodontic pain have any effect on patient compliance and daily activities?

 The literature supports the fact that orthodontic pain has a deﬁnite inﬂuence on compliance and daily activities of patients. The major reasons affecting patient compliance are the functional and aesthetic impairment produced by the appliance. Almost all patients undergoing orthodontic treatment have moderate to extreme difﬁculty in chewing and biting foods of ﬁrm to hard consistency, which causes them to change the consistency of their food.

 Patient compliance

 Discomfort from orthodontic appliances can be a signiﬁcant factor affecting patient compliance (Patel, 1989; Brown and Moerenhout, 1991 ; Sergl et al. , 1998 ; O’Connor, 2000 ). The primary causes for poor co-operation have been attributed to pain, functional, and aesthetic impairment caused by the appliances. This has even resulted in a discontinuation of treatment or its early termination. Sergl et al. (1998) conﬁrmed these ﬁndings and reported a signiﬁ cant correlation between patient co-operation and complaints during the 6-month period after appliance placement. Many patients as well as parents consider initial lack of information about possible discomfort during treatment to be a major cause of the poor compliance exhibited. The patients’ initial attitude towards orthodontics should be understood during the diagnostic phase itself and should be discussed with the patients in all its reality. This procedure, termed as ‘ rational restructuring’ in psychology ( Todesco et al., 1992) will prepare the patients to encounter discomfort during treatment through their own methods and also with the help of a specialist.

 Daily activities

 Brown and Moerenhout (1991) reported that pain from orthodontic treatment has a deﬁnite inﬂuence on daily activities of patients. The pain appearing within the ﬁrst 48 hours is considered to be so disturbing that it causes wakeful nights and consumption of medication. Almost all patients from various studies reported moderate to extreme difﬁculty in chewing and biting foods of a ﬁrm to hard consistency, which caused them to change the consistency of their diet ( Brown and Moerenhout, 1991 ; Bergius et al. , 2000 ). Erdinç and Dinçer (2004) evaluated this problem but observed no statistically signiﬁcant results. Even though the results were statistically insigniﬁcant, they reported that approximately 50 per cent of their patients had problems with their daily activities at 6 hours and on days 1 and 2. There was a decrease in the severity of discomfort and the number of patients experiencing it from day 3 onwards.

 How can orthodontic pain be managed?

 The existing literature supports the use of non-steroidal anti-inﬂammatory drugs (NSAIDs) for pain control, even though other methods (such as anaesthetic gel, bite wafers, transcutaneous electrical nerve stimulation, low level laser use and vibratory stimulation) have been suggested. The major concern regarding NSAIDs is the interference produced on inﬂammation associated with tooth movement process. Low doses administered for one or two days in the initial stages will not affect the tooth movement process as such. The current trend is directed towards use of preemptive or pre-opertaive analgesics, which are administered at least one hour before every orthodontic procedure. I t is imperative that pain control during orthodontic treatment should be considered an important aspect of orthodontic mechanotherapy and NSAIDs remain the most preferred method for pain control during orthodontics. Lack of an appropriate protocol for their administration after orthodontic appointments is considered to be a major drawback requiring attention.

 Efforts to compare various drugs in managing orthodontic pain were performed by Ngan et al. (1994). They compared ibuprofen, aspirin, and a placebo and concluded that ibuprofen was the most effective analgesic in orthodontic pain management. . these drugs effectively reduce the discomfort and pain caused by appliances by inhibiting or at least reducing the inﬂammatory response caused by the applied force. It is clear that, release of PGE, the primary mediators of inﬂ ammatory response following force application, will be inhibited by NSAIDs causing a reduction in tooth movement (Walker and Buring, 2001) . Kyrkanides et al. (2000) evaluated the molecular level mechanisms behind this process of inhibition. They reported an increase in the levels of MMP-9 and MMP-2 along with collagenase activity followed by reduction in procollagen synthesis after NSAID administration. The whole process is the result of inhibition of cyclooxygeanse activity and results in altered vascular and extracellular collagen remodelling, effecting a reduction in the rate of tooth movement. A recent development in this area of pain management is the introduction of rofecoxib, the cox-2 inhibitor. It has been reported that this drug has no effect on PGE 1 levels and can be safely used for pain control during orthodontic mechanotherapy ( Sari et al. , 2004 ). However, in light of ﬁndings regarding safety on administration of cox-2 inhibitors , more studies need to be carried out before it is administered in routine clinical practice.

Steen Law et al. (2000) demonstrated that pre-emptive ibuprofen administered at a dose of 400 mg 1 hour before separator placement results in a signiﬁcant decrease in pain on chewing at 2 hours after the procedure, in addition to the preoperative dose, at least one or two post-operative doses should be administered for complete pain control after orthodontic appointments. Apart from analgesics, other approaches have been tested to reduce pain from orthodontic procedures. Keim (2004) described an anaesthetic gel ‘ oraqix ’ , which is a combination of lidocaine and prilocaine in 1:1 ratio by weight. The ﬁndings suggest that it may be useful when performing orthodontic procedures such as band placement and cementation, archwire ligation, and band/bracket removal. The advantage of this system is its delivery method, which simply introduces the gel into the gingival crevice. The procedure is reported to be entirely painless. Chewing gum or a plastic wafer during ﬁrst few hours of appliance activation in order to reduce pain has been suggested (Profﬁ t, 2000) . This will temporarily displace the teeth sufﬁciently to allow blood to ﬂow through compressed areas preventing a buildup of metabolic products. White (1984) found that approximately 63 per cent of patients reported less discomfort after chewing Aspergum— a weak analgesic chewing gum with aspirin, after orthodontic mechanotherapy.

other techniques found in the literature for management of orthodontic pain include vibratory stimulation ( Marie et al. , 2003 ), transcutaneous electrical nerve stimulation (TENS),(Roth and Thrash, 1986 ) and low-level laser application (Lim et al. , 1995 ). The use of vibratory stimulation to reduce orthodontic pain was ﬁrst reported by Marie et al. (2003) , but on detailed analysis, it was found that most of the patients were not able to tolerate the vibrations, once the discomfort sets in. This led to the recommendation that, if employed, it should be used prior to the onset of pain (Marie et al. , 2003 ). Roth and Thrash (1986) evaluated the effect of TENS in reducing periodontal pain after separator placement. Although it was effective in reducing pain within 6 seconds of electrode placement, and the technique was used by others, no additional reports have been published. Lim et al. (1995) in a clinical investigation on the efﬁcacy of low-level laser therapy in reducing orthodontic pain found discouraging results and it was not found to produce immediate pain relief in orthodontic patients. The overall ﬁndings indicate that analgesics are still the main treatment modality to reduce orthodontic pain. Recent research towards its pre-emptive use as well as concentration on those agents not involving PGE synthesis and release is promising. However, the pharmacological actions as well as their side-effects should be identiﬁed before prescribing these medications in routine clinical practice.

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