Effect of Orthodontic Pain on Quality of Life of Patients Undergoing Orthodontic Treatment

Abstract

Introduction: Pain is an important aspect of oral health-related quality of life (OHRQOL). Understanding how patients’ pain experiences during their treatment affect their quality of life (QOL) is important and the absence of pain/discomfort is important for achieving a high QOL.

Aim and Objective: The objective of this study was to assess the relationship between pain and OHRQOL among patients wearing fixed orthodontic appliances and to evaluate whether patient motivation and counseling had an effect on the pain and discomfort. Materials and Methods: The McGill-Short-Form with visual analog scale and present pain intensity and Oral Health Impact Profile-14 indices were used to determine the intensity and severity of pain and to evaluate the QOL of 200 adolescents undergoing fixed orthodontic treatment during different phases of treatment. Results: There was a significant correlation found between pain and the QOL of patients undergoing orthodontic treatment. Overall score of OHRQOL increased significantly (mean 43.5 ± 10.9) in the initial phase of treatment where the incidence of severe to moderate pain was reported in 80% patients. Ninety-five percent patients felt pain or discomfort. After 1 day of appliance placement, more than 85% of patients experienced severe to mild pain whereas 9% of patients suffered very severe pain. Pain reduced over a week, and at the end of a month, 10.5% patients had moderate pain whereas majority, i.e., 58% of patients complained of only mild pain (P < 0.05). Conclusion: Pain is important sequelae of orthodontic treatment and has a significant effect on the QOL of orthodontic patients, especially during the initial phases of treatment. Patient motivation and counseling by the orthodontist have a profounding effect in reducing the pain and discomfort, improving the QOL, and an overall improvement in the patient compliance affecting the successful outcome of the treatment.

Keywords: McGill Pain Questionnaire, orthodontic treatment, pain, quality of life

Introduction

Fixed orthodontic appliance therapy may cause functional restrictions, discomfort, and pain.[1] Discomfort is expressed as unpleasant tactile sensations, feeling of constraint in the oral cavity, stretching of the soft tissues, pressure on the mucosa, displacement of the tongue, and soreness of teeth and pain.[2,3] All orthodontic procedures such as separator placement, archwire placement and activations, application of orthopedic forces, and debonding produce pain in patients. Pain, induced by orthodontic treatment, generally could be categorized as mild- and short-lasting.[3] However, some patients do experience severe pain, even to the extent that mastication of food and tooth brushing might be impaired. Pain is a subjective response and shows large individual variations.[4,5] Patients’ self-confidence might be affected by visibility of the appliance and speech impairment, especially during social interactions when attention is focused on the face, eyes, and mouth. Poor oral health can affect physical, psychological, and social conditions, which in turn affect patients’ quality of life (QOL). In orthodontics, researchers have assessed health-related quality of life (OHRQOL) in connection with orthodontic treatment outcomes; however, research on orthodontic patients QOL during their treatment is scarce. Orthodontic pain, the most cited negative effect arising from orthodontic force application, is a major concern for parents, patients, and clinicians. Studies have reported this reaction to be a major deterrent to orthodontic treatment and an important reason for discontinuing treatment.[7] OHRQOL is defined as “the absence of negative impacts of oral conditions on social life and a positive sense of dentofacial self-confidence.”

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Thus, since Cohen and Jago\textsuperscript{[8]} advocated development of “social-dental” indicators, there has been considerable subjective patient-based measurement results leading to further understanding about psychosocial well-being and/or dental health. With regard to fixed orthodontic appliance therapy, understanding the consequences and discomforts during orthodontic procedures affords patients more realistic expectations regarding orthodontic treatment and may increase adherence to treatments. The aim of the study was to evaluate type and degree of pain during orthodontic treatment and whether pain has an effect on QOL and patient’s compliance and cooperation during orthodontic treatment affecting the final outcome of treatment.\textsuperscript{[7]}

**Materials and Methods**

A total of 200 patients which included 110 female and 90 male patients in the adolescent age group of 13–18 years undergoing orthodontic treatment from January 2014 chosen by random selection were included for the study. Approval for the study was obtained from the Institutional Ethics Committee. The inclusion criteria\textsuperscript{[9]} were age between 11 and 18 years, skeletal pattern Class I, Class II, or Class III, moderate crowding or spacing in upper and lower arches (4–8 mm), and no therapeutic intervention planned with any extraoral or intraoral appliances other than fixed appliances (e.g., quad-helix, transpalatal arch, or nance button) within the first 6 months of orthodontic treatment. Mean age of selected patients was 15.0 years (standard deviation = 5.1). The exclusion criteria were patients with severe skeletal pattern (Class II or Class III) who required orthognathic surgery and syndromic patients (cleft lips or palate or both). The McGill-Short-Form\textsuperscript{[10]} with visual analog scale (VAS) scale and present pain intensity (PPI) and Oral Health Impact Profile (OHIP)-14 indices\textsuperscript{[11]} were used to determine the intensity and severity of pain and to evaluate the QOL. Patients were asked to complete questionnaires and to answer questions about pain and discomfort they had experienced during 1 month after the appliance insertion. The questions about the intensity of pain contained three series of horizontal visual analog scales (17) on which the patient marked the intensity of pain after 1 day, 1 week, and 1 month. It was possible to choose answers to the questions on a 0–4 score scale as follows: 0 - No pain/discomfort, 1 - mild pain/discomfort, 2 - moderate pain/discomfort, 3 - severe pain/discomfort, 4 - very severe pain/discomfort.

**McGill Pain-Short-Form Questionnaire**

The McGill Pain-Short-Form Questionnaire [Figure 1],\textsuperscript{[10]} a shorter version of the MPQ, is a multidimensional measure of perceived pain in adults of 15 words (11 sensory and 4 affective) and takes just 2–5 min to complete. The Pain Rating Index is comprised of two subscales: (1) sensory subscale with 11 words or items and (2) affective subscale with four words or items, which are rated on intensity scale as 0 - none, 1 - mild, 2 - moderate, or 3 - severe. The Short-Form McGill Pain Questionnaire also includes for 1 item for a 10-cm VAS [Figure 2] and PPI [Figure 3] for average pain. For the Pain Rating Index, each selected word is scored from 0 (none) to 3 (severe). The total Pain Rating Index score is obtained by summing the item scores (range 0–45). Scores on the PPI range from 0 to 5 and on the VAS from 0 to 10. A higher score indicates worse pain.

**Oral health impact profile**

OHIP\textsuperscript{[11]} was developed and tested in Australia as an indicator of perceived need to enhance understanding of oral health-related behaviors by measuring the discomfort, dysfunction, and self-perceived impact of oral diseases on the daily activities of adults and seniors, thereby complementing traditional epidemiological indicators. Its 49 items are divided into seven subgroups or dimensions: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability,
social disability, and physically challenged in performing daily activities that collectively indicate the “social impact” of each disease. These subscales are in a hierarchical order of increasing impact on the individual’s life and are based on a concept suggested by Locker (2001),[12] which is derived from the classification of impairments, disabilities, and physically challenged of the World Health Organization.[12] The questions are rated using the five-level Likert scale (always [4], often [3], sometimes [2], rarely [1], and never [0]).

**Results**

The statistical significances of the differences between the groups were evaluated using the nonparametric Mann–Whitney (for two groups) and Kruskal–Wallis (for more than two groups) tests. The paired means in time period analysis were statistically compared using the Wilcoxon signed-rank test. Chi-squared statistics was used to evaluate the statistical significance of the differences in prevalence between groups. \( P \leq 0.05 \) was considered statistically significant. All statistical analyses were performed with SPSS for Windows version 15.0 (SPSS Inc., Chicago, IL, USA) statistical software package. Ninety-five percent patients felt pain or discomfort. After 1 day of appliance placement, more than 85% of patients experienced severe to mild pain whereas 9% of patients suffered very severe pain. Pain reduced over a week, and at the end of a month, 10.5% patients had moderate pain whereas majority, i.e., 58% of patients complained of only mild pain [Table 1].

During the 1 month of fixed orthodontic treatment, almost all domains in the OHRIQOL, i.e., functional limitation, physical pain, physical disability, psychological disability, and psychological discomfort, were significantly affected following insertion of fixed orthodontic appliances, except physically challenged domain and social disability [Table 2]. More than 85% of patients experienced problem in speech, more than 95% had problem in eating and experienced pain, 60%–65% of patients experienced anxiety, embarrassment, and difficulty to relax. There was a strong correlation between patients who indicated more pain (moderate to severe pain) during treatment with higher scores for the OHIP-14 impact profile (\( P < 0.05 \)).

**Discussion**

The most common and problematic sequela of orthodontic treatment is pain and discomfort.[1‑8] The intensity of orthodontic pain is comparable to the greatest intensity of general pain felt with a wasp sting or an ankle sprain. Between 87% and 95% of adolescents experience pain during fixed orthodontic treatment, especially during the first 24 h.[15‑15] Moreover, 39%–49% experience pain during every step of the treatment or after appliance removal.[16‑18] Therefore, pain is a major deterrent to orthodontic treatment, a factor that reduces patient compliance during treatment, and a reason that patients discontinue treatment or miss appointments According to 90% of patients, orthodontic treatment is painful, and 30% might prematurely cease treatment because of the pain.[2,19] Despite its substantial clinical value, this area has been surprisingly neglected in the literature, educational programs, and practice. Orthodontists usually underestimate the degree of pain caused by treatment and are not well equipped to assess if and when their patients might need painkillers.[22] Pain has been assessed in only a handful of studies. According to the literature, 70%–95% of orthodontic patients experience pain during treatment.[20,21] About 11% of patients maintain that treatment is constantly painful.[20] As stated by Krukemeyer et al.,[23] 59% of patients indicated that they had experienced pain for a few days after their appointment. In our study, 18% of the patients experienced severe pain, and more than 60% of patients experienced moderate to mild pain after 1 day of fixed appliance placement. The occurrence of pain considerably decreased after 1 week, and only 31.5% of patients did not complain of any pain whereas 58% patients only had mild pain at the end of 1 month. It has been suggested that psychological factors may influence patients’ adaptation to pain and discomfort during orthodontic treatment.[22] Recent research data indicate that patients may adapt to continuous pain with the progression of treatment as the sensations cease or at least disappear from their focus of attention. A clinician must precisely know and explain to patient how much time is needed for such adaptation to occur.[22]

Although all studies agree that pain occurs during orthodontic treatment, there are large variations between reported prevalence rates, intensities, and durations of pain.[23‑28] Sergl et al.[29] pointed out that patients, who were aware of the severity of their orthodontic irregularities, perceived lower intense feeling of discomfort. Unfortunately, motivation for orthodontic treatment usually is very weak, especially in young children. It has been found that parents reported greater motivation for their children

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**Table 1: Pain intensity mean score at different time periods after the appliance insertion**

| Score | Pain intensity | After 1 day, \( n(\% ) \) | After 1 week, \( n(\% ) \) | After 1 month, \( n(\% ) \) |
|-------|----------------|-----------------------------|-----------------------------|-----------------------------|
| 0     | No pain        | 11 (5.5)                    | 40 (20)                     | 63 (31.5)                   |
| 1     | Mild pain      | 38 (19)                     | 60 (30)                     | 116 (58)                    |
| 2     | Moderate pain  | 46 (23)                     | 87 (43.5)                   | 20 (10)                     |
| 3     | Severe pain    | 87 (43.5)                   | 11 (5.5)                    | 1 (0.5)                     |
| 4     | Very severe pain | 18 (9)                     | 2 (1)                       | 0                           |

Chi-squared test to compare with pain intensity distribution after 1 day

\( \chi^2=6.033; df=4; P=0.197; \chi^2=32.92; df=4; P<0.001 \)
to have orthodontic treatment than did the children.\(^{[29]}\)
Consequently, the second aim of our study was to elucidate roles of patients’ motivation for orthodontic treatment and awareness of negative perceptions to the intensity of pain during orthodontic treatment. In agreement with previous studies, we found that pain perception was significantly associated with patients’ motivation for treatment and their awareness of probable discomfort. Patients who were positively motivated for treatment or were aware of potential pain and discomfort after 1 week complained of significantly less acute pain than patients from alternative group. Insufficient information about orthodontic treatment and lack of communication between the orthodontist and patient were the basis for premature termination of orthodontic treatment.\(^{[30]}\)

Lighter forces are less traumatic and painful and are thought to be ideal for orthodontic treatment,\(^{[31]}\) but this recommendation is controversial.\(^{[32]}\)

Crowded teeth will be actively engaged with the archwire, which results in substantial forces depending on the level of crowding. Therefore, extreme forces are likely unavoidable at the beginning of treatment and will produce pain that peaks around 24 h after treatment and reduces slightly after the 2\(^{nd}\) or 3\(^{rd}\) day.\(^{[32,33]}\)

Within the field of orthodontics, there is a long-standing recognition that malocclusion and dentofacial anomalies can produce immense physical, social, and psychological upset.\(^{[34]}\)

Greater understanding of patients’ expectations of the orthodontic treatment process and how it affects their day-to-day living or QOL is important in many ways. Their expectations of treatment, unrealistic understanding of orthodontic treatment processes, and sequelae can influence compliance with treatment. This study was carried out to assess any change in OHIPQOL among patients wearing fixed orthodontic appliances. The findings of the study support that orthodontic treatments will have impact on patients’ lives, especially during the initial phase as more than 85% patients believed that their QOL was altered after initiation of fixed orthodontic treatment. Pain experienced by this study population was mostly moderate to severe, mild pain and discomfort experienced while brushing teeth, and severe pain and discomfort during mastication. A systematic review of the literature on the use and performance of OHIP concluded that the instrument is sensitive enough to capture changes in the impact of oral conditions. The short form of the OHIP-49 questionnaire (OHIP-14) was developed using epidemiological data from a sample of 1217 South Australians with a mean age of 60 years. Liu et al.\(^{[1]}\) concluded that fourteen questions were effective in determining the same patterns of variation in clinical and sociodemographic factors that were observed using the 49 questions, in addition to comprising the seven subgroups, neatly and hierarchically distributed every couple of questions, suggesting that the reduced version of the instrument is useful to quantify the levels of impact with good reliability, validity, and accuracy.\(^{[30]}\)

Broder et al.\(^{[35]}\) spearheaded the use of the OHIP in adolescents aged 12–17 years. Sergl et al., Gift and Atchison\(^{[34,35]}\) concluded that OHIP-14 may be an important, sensitive screening tool to identify people with high levels of oral health impacts in a given community, even in younger individuals.

Awareness of pain by health-care providers and attention to a patient’s psychological well-being can improve pain tolerance and decrease perceived pain.\(^{[36]}\) Thus, communication between the clinician and patient regarding the pain could improve felt pain and compliance, especially as many patients are not well informed. Medications, such as nonsteroidal anti-inflammatory drugs (NSAIDs), especially pre- and post-procedural doses and low-level laser therapy, might also be useful to reduce pain. However, over-the-counter doses of many NSAIDs cannot necessarily relieve pain and at the same time might potentially disrupt tooth movement due to prostaglandin antagonism.\(^{[1]}\)

### Table 2: Frequency distribution of reported impacts on the 14 activities of the Oral Health Impact Profile-14 measure and orthodontic treatment status

| Impact questions                                      | Always (%) | Often (%) | Sometimes (%) | Seldom (%) | Never (%) |
|-------------------------------------------------------|------------|-----------|---------------|------------|-----------|
| Had problem pronouncing words                         | Score 4    | Score 3   | Score 2       | Score 1    | Score 0   |
| Felt the sense of taste has worsened                  | 8 (4.0)    | 1 (0.5)   | 170 (85.0)    | 1 (0.5)    | 20 (10.0) |
| Had a painful aching in the mouth                     | 9 (4.5)    | 0         | 160 (80.0)    | 10 (5.0)   | 21 (10.5) |
| Found it uncomfortable to eat any food                | 180 (90.0) | 4 (2.0)   | 2 (1.0)       | 4 (2.0)    | 10 (5.0)  |
| Have been self-conscious                              | 187 (93.5) | 2 (1.0)   | 3 (1.5)       | 0          | 8 (4.0)   |
| Felt tense                                             | 125 (62.5) | 1 (0.5)   | 30 (15)       | 25 (12.5)  | 8 (4.0)   |
| Had an unsatisfactory diet                            | 5 (2.5)    | 119 (59.5)| 91 (45.5)     | 14 (7.0)   | 84 (42.0) |
| Had to interrupt meals                                | 12 (6.0)   | 6 (3.0)   | 91 (45.5)     | 14 (7.0)   | 84 (42.0) |
| Found it difficult to relax                           | 5 (2.5)    | 0         | 160 (80.0)    | 10 (5.0)   | 21 (10.5) |
| Have been a bit embarrassed                           | 3 (1.5)    | 0         | 8 (4.0)       | 11 (5.5)   | 178 (89.0) |
| Have been irritable with other people                 | 5 (2.5)    | 0         | 184 (92.0)    | 2 (1.0)    | 9 (4.5)   |
| Had difficulty doing usual jobs                       | 2 (1.0)    | 3 (1.5)   | 180 (90.0)    | 9 (4.5)    | 6 (3.0)   |
| Felt life in general less satisfying                   | 7 (3.5)    | 2 (1.0)   | 11 (5.5)      | 9 (4.5)    | 171 (85.5) |
| Have been totally unable to function                  | 3 (1.5)    | 0         | 8 (4.0)       | 11 (5.5)   | 178 (89.0) |
The study was limited in some aspects as pain is subjective by nature, it is extremely difficult to measure especially because it varies considerably from case to case and depends on several interindividually varying factors. The relatively high frequency of pain in this sample was consistent with other studies. Apart from the alveolar pain, soft-tissue lesions and wounds caused by orthodontic appliances might as well induce pain. Another limitation was the differences between treatment plans of the patients as the treatment plan depended on the amount and type of malocclusion.

Conclusion

Pain is one of the primary reasons for patients’ noncompliance and is a major reason for missing appointments, which affects the quality of treatment and a significant factor affecting the OHQoL of orthodontic patients. The perception of pain and discomfort among orthodontic patients was variable during the 1st month after the appliance insertion also depending on the patients’ motivation for treatment and their awareness of probable discomfort. Patients who were positively motivated for the treatment or were aware of probable pain and discomfort reported significantly decreasing pain. To solve these problems, cooperation between orthodontist and patient is essential. Sufficient time should be spared to explain the possible discomfort during treatment, and the treatment need should be used as a motivating stimulus. A standard care for pain management with analgesics should be established for orthodontic patients. Increased patient-orthodontist communication about pain management can improve patients’ QOL during orthodontic treatment and ultimately their treatment cooperation and satisfaction.

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Conflicts of interest

There are no conflicts of interest.

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