



Prevalence and perception of pain among Yemeni adolescents during orthodontic treatment

Ghamdan Alharazi¹ and Yasser Ali Ahmed² Thabet Husam.A.Al.eryani³

¹Head of Orthodontic, ²Head of orthodontics Department, ³Prevention Department

Abstract

The aims of this study were to investigate the intensity and duration of patients' discomfort following insertion of orthodontic appliances, and to examine for interactions between patient age, gender, appliance type and the perception of pain. No such investigation have been conducted for the country of Yemen previously. After insertion of orthodontic appliances, 150 patients received five questionnaires, one they completed and returned after 4 h, then one daily for 7 days. The respondents' ages ranged from 8-18 years (median age 12 years 2 months); 25 per cent were male and 75 per cent female. Of the patients, 69 per cent reported pain after 4 h and 93 per cent after 24 h. After 7 days, 24 per cent of the patients still reported discomfort. On day 1, 18 per cent took analgesics and 15 per cent reported being awakened the first night. Comparing a 2 x 4 appliance, a full appliance in one arch and in both arches, no statistical differences were found for reported pain frequency, general intensity of pain, pain at the teeth, discomfort when biting and chewing and analgesic consumption. The perception of general pain intensity, analgesic consumption, pain when eating and the influence of discomfort on daily life were all significantly greater in girls than in boys. Patients younger than 14 years reported pain significantly less frequently than the older patients. The highest frequency of pain was found in the group of 11-14 year olds. The pain intensity did not differ among the age groups.

Introduction:

Orthodontists must be able to address the concerns of the patient about their treatment. Pain and discomfort are frequent side-effects of orthodontic therapy with fixed appliances. The orthodontist should be able to inform the patient about this common side-effect of treatment, especially before inserting an appliance that will cause discomfort. In most cases, the level of pre-treatment explanations seems to be generally satisfactory, but many people report not having been well-informed (Bos et al, 2005; Oliver and Knapman, 1985).

The mechanisms whereby the application of orthodontic forces cause pain are not yet fully understood, but there are indications that these perceptions are due to changes in blood flow in the periodontal ligament (Burstone, 1964; Kvam et al, 1987) and correlated with the presence of

prostaglandins, substance P and other substances (Burstone, 1964; Kvam et al, 1987).

The subjective perception of pain is difficult to measure and there is a wide range of individual response even when similar forces are applied to teeth (Burstone, 1964). Several studies have described patients' responses to fixed orthodontic appliances. These studies report that pain begins a few hours after application of an orthodontic force and lasts approximately 5 days (Sjorgen et al 2010; Feldmanna et al, 2007; Polata et al, 2005; Sinclair et al, 1986; Feinmann et al, 1987; Kvam et al, 1987, 1989; Ngan et al, 1989; Jones and Chan, 1992). There is less unanimity about the question of how fast pain starts and whether or not the force magnitude, the sex and the age of the patient influence the outcome of pain reports.

This may be due to differences in the experimental design,

*Corresponding author: Ghamdan Alharazi, University of Sanaa Head of Orthodontic, Peadodntic, Prevention Department
Phone: 777422337, email:drghamdan@yahoo.com

e.g. reporting methods, the number and schedule of questionnaires and the size of the sample groups and subgroups.

The aim of the present study was to investigate the intensity and duration of patients' pain following the insertion of orthodontic appliances. Further aims were to examine for interactions between the age and gender of the patient and the perception of pain and between the kind of appliance and the perception of pain. It was also an aim of this study to investigate the effect that pain, as a consequence of orthodontic treatment, had on the subject's daily life. No such study has been conducted in Yemen previously.

Subjects and Methods

This study describes the response of patients who were at the beginning of their active treatment. After insertion of a fixed appliance, 150 patients received a series of five questionnaires. They were requested to complete one and return it after 4 h, 24 h, 2, 3, 4, 5, 6 and 7 days. The mean age of the respondents was 14 years 2 months with a median value of 12 years 2 months (range 8-18 years). Of the participants, 50 (25 per cent) were male and 100 (75 per cent) females. All the subjects came from the area around Sanaa, Yemen. They were patients of the Department of Orthodontics at the School of Dentistry, University of Sanaa. The patients were not pre-selected but were a convenience sample of consecutive cases.

The appliances inserted were either complete banded/bonded appliances in one arch ($w = 52$) or in both arches ($w = 98$), or partial banded/ bonded appliances, i.e., 2x4 ($n = 10$) in one arch, or a Goshgarian transpalatal appliance ($n = 10$). Jones et al. (1985, 1992) could find no difference in discomfort following the insertion of different aligning arch wires, and we did not include the type of archwire as a parameter in the study. Two different dentists performed the treatment but they all had the same materials available and in most of the cases the first wire was a 0.016 in nitinol.

The initial space-analysis or anterior crowding were not recorded: Jones and Richmond (1985) concluded that there was no relationship between pain experience and initial crowding.

The patients were given oral and written instructions together with an explanation on how to complete the questionnaires. The questionnaires consisted of 25 questions. Three questions had to be answered by choosing 'yes' or 'no'. All the other questions used a visual analogue scale (VAS). The VAS method is widely used for measuring pain and has been described by other investigators as being sensitive and reliable and having certain advantages over verbal scales (Seymour et al, 1985; Krishnan 2007).

Moreover, even small children manage it very well (Seymour et al, 1985).

The data were analyzed by a commercial software program (SAS; SAS-Institute, Cary, NC, USA). Cross tabulations were worked out and the significance of the dependence between parameters was calculated. The chi-square test, Wilcoxon test and Fisher's exact test were applied where appropriate. The level of significance was set at $P < 0.01$

Results

Pain course

The response rate was excellent: 95 per cent for day 5 and earlier, 80 per cent for the last questionnaire (day 7) and 87 per cent overall for all questionnaires. The pain course during the observation time of 7 days was established by counting the number of patients who reported 'yes' when asked: 'Did it hurt within the last 24 h (4 h for the first questionnaire)?' (yes/no) and measuring the response to the question 'How much does it hurt NOW?' (VAS) Table 1 and Figure 1 show the number of answers 'yes' as well as the pain score for those who responded 'yes' (100 being the maximum pain response and 0 no pain). Within 4 h after insertion of the appliance, almost two-thirds of the patients reported experiencing discomfort, almost every patient (93 per cent) reported pain from the appliance

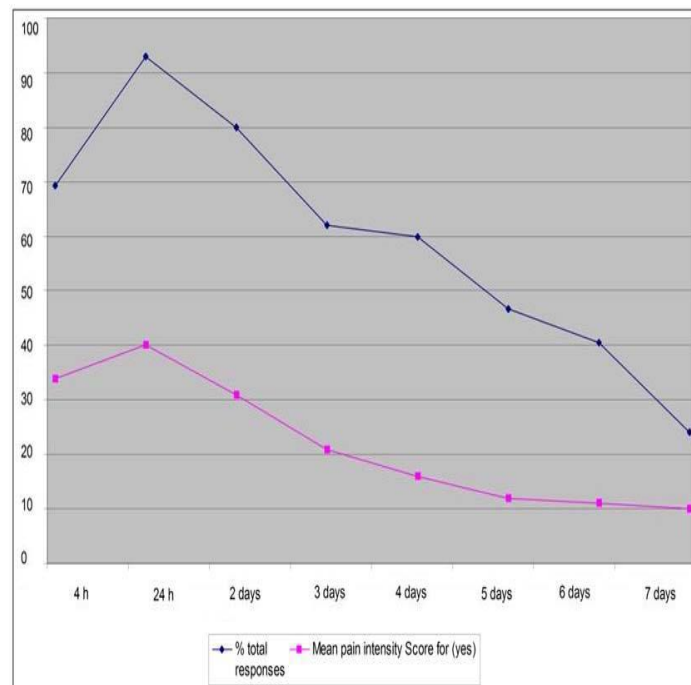
within the first 24 h. After this peak, the number of patients reporting pain decreased steadily. The percentage of patients who experienced pain was still very high on the second day (80 per cent) and even on the last day (7) one out of four patients reported having had discomfort from the appliance.

For pain intensity scores, the peak occurred at 24 h. Several patients reported the pain as being unbearably strong (score 100), but the mean score of 40 was relatively moderate. Pain intensity score was at about the same level after 4h and at day 2. Until day 4, the range of responses was from 0 up to 100 and the mean score was higher than 14. After 5 days, the mean pain score was below 14 and the highest response was only 53.

The time course for the number of respondents reporting pain and the mean pain intensity score are given in Figure 1. Both the number of patients experiencing pain and the pain intensity peaked at 24 h and diminished steadily over the remainder of the reporting period.

Table 1 Number of patients with pain within the last 24h (yes) and pain score of (yes) responders

Time after insertion	N total responses	N-responses (yes)	% total responses	Mean pain intensity Score for (yes)	Range of Pain score (pain now)
4 h	150	106	69.3	34	0 - 100
24 h	147	138	93	40	0 - 100
2 days	146	120	80	31	0 - 100
3 days	148	105	62	21	0 - 100
4 days	145	93	60	16	0 - 100
5 days	142	70	46.6	12	0 - 53
6 days	133	61	40.6	11	0 - 46
7 days	120	36	24	10	0 - 45



Analgesic consumption

Neither prescriptions for pain medication nor analgesics were dispensed to the patients. Every patient was free to take any medication he or she felt necessary. Patients were asked to respond whether or not they had taken any analgesics within the last 24 h. The percentage of 'yes' answers increased from 8.2 per cent after 4 h to 18.4 per cent after 24 h and fell to 11 per cent after 48 h and 5.2 per cent or less after day 3. On the seventh day, no patient reported taking medication for pain relief.

Type of treatment

To measure whether or not the type of appliance had an influence on the discomfort level, the complete banded/bonded appliance in both arches served as a reference.

Goshgarian Patients having a Goshgarian transpalatal arch inserted, which was activated to rotate maxillary molars, reported pain with a significantly lower frequency than patients who were fully banded/bonded, but the mean pain intensity score did not differ between the two groups.

Anterior teeth hurt less, but posterior teeth hurt more compared with complete appliances; both findings were statistically significant.

Complete appliance in one arch and 2x4 Patients with brackets only on the incisors (2 x 4) reported less influence on diet i.e. avoiding hard things to eat, restricting meals to eggs, soup etc. than patients with appliances in both arches. For both appliances there was no statistical difference, compared with a complete appliance, for pain frequency, reported intensity of pain or for activities such as chewing, biting and leisure activities (with the exception of wind instrument playing). Also the frequency of analgesic consumption did not differ among the appliances.

Sex

For three parameters: frequency of pain, pain intensity for the anterior teeth and influence on leisure activities, there was no difference between the sexes. For all the other variables, statistically significant differences were found, with females reporting a greater perception of discomfort for pain intensity, for pain in posterior teeth and TMJ, for chewing and biting as well as for reported interference with daily life. In accordance with these reports of greater discomfort, female subjects also reported a significantly higher analgesic consumption frequency ($P < 0.001$).

Age

The patients were separated according to age into three groups: 8-11 years ($n = 55$), 11-14 years ($n = 71$) and > 14 years ($n = 36$). These were mainly patients with Goshgarian or 2 x 4 appliances. The frequency of pain reports (yes/no) from the youngest patients was significantly lower than from the other two groups. The middle and the older patients groups did not differ in the reports of pain frequency, but the tendency was for the patients > 14 years to report pain less frequently than the middle group

($P < 0.03$). The mean pain intensity value or time course of pain scores did not differ among the three groups.

However, our data showed that the patients in the youngest age group consumed more analgesics, although not at a statistically significant level, than the older patients.

Discussion

This study consisted of 150 patients who, after the insertion of a fixed appliance, were requested to complete a visual analogue scale (VAS). The co-operation of the patients was extremely good. The overall response rate was 87.3 per cent (131 out of 150) and the data can be considered as representative during the whole time of observation. The system of measuring discomfort by visual analogue scale (VAS) was found to be very appropriate. As has been reported by other authors (Seymour et al, 1985; Oliver and Knapman, 1985;), even young children quickly grasped the concept and were able to respond to the questions.

Pain intensity and course

Pain began quickly after insertion of appliances. Kvam et al. (1987) reported that 95 per cent of all patients experienced pain from orthodontic appliances which is in agreement to our findings of 93 per cent of all patients complaining of discomfort within the first 24 h. Similar observations have been made by others (Ngan et al, 1989, 1994; Jones and Chan, 1992). Out of 30 patients, 23 suffered moderate or severe discomfort in a study reported by Jones (1984), however pain intensity in our material cannot be compared directly. The mean overall or general pain intensity score never passed half of the length of the VAS in this study.

After the peak at 24 h, the curve of pain intensity showed a steady decrease, with only a small number of patients reporting high levels of pain over a long period of time. After the 5th day, the mean pain intensity score was < 15 which can be considered as very mild discomfort on a scale from 0-100. For biting (incising) and chewing, pain intensity remained elevated for a longer period (Table 1).

Even after 7 days, 25 per cent of patients reported having felt pain as a result of the appliances, though with a low mean intensity score (score 10). We share the opinion that pain after insertion of fixed appliances subsides to negligible levels by days 5 to 7 (Erdinc et al, 2004; Zhanga et al, 2007; Soltis et al, 1971; Jones, 1984; Sinclair et al, 1986; Kvam et al, 1989; Ngan et al, 1989, 1994; Brown and Moerenhout, 1991; Jones and Chan, 1992). This phenomenon may be the result of a significant loss of proprioceptive ability 4 days after insertion of fixed appliances (Soltis et al, 1971).

Analgesic consumption

In contrast to the findings of Feinmann et al (1987) who found no correlation between pain experience and analgesic consumption, our data show parallels between pain intensity score and the use of analgesics. As pain intensity peaks on the first and second day, 18 per cent and 11 per cent respectively of the patients reported the need for pain relief. These results are in agreement with Dzipunova et al (2002) who reported analgesic consumption for 19% of patients within 24 hrs. By the third day only 5 per cent consumed analgesics. These results are in agreement with those of Jones (1984) who also reported a correlation between perceived discomfort and analgesic consumption with the demand for analgesics largely finished by day 3. In the present study, approximately 20 per cent of patients reported consuming analgesics, and probably many of them on a preventive basis (Jones and Chan, 1992). Feinmann et al. (1987) found a correlation between the use of analgesics and anxiety.

We hypothesize that by providing sufficient information to reduce anxiety it may be possible to reduce the perceived intensity of pain and/or the consumption of analgesics.

Sex

Other authors have reported no difference in the perception of pain from orthodontic appliances between males and females (Jones, 1984; Ngan et al, 1989; Padiyar et al 2009). Feinmann et al. (1987) in a sample of adults

after oral surgery also reported that women did not report more pain or require more analgesics than men. Our data from 100

female and 50 male patients, however, indicate significant differences in the response to fixed appliances. These apparently contradictory findings may be due to several reasons. Some may be cultural; our sample was drawn from the Sanaa region of Yemen. The analysis of mean pain intensity scores revealed that girls reported significantly greater pain intensity and consumed significantly more analgesics than males. In line with the finding of Kvam et al. (1987) that truancy was much higher in girls, was our observation that girls reported a higher impact on daily life from orthodontic appliances than boys. When informing patients about the side-effects of fixed appliances, it should be borne in mind that the perception of general pain intensity, pain when eating and the influence of discomfort on daily life can, under some circumstances, differ in girls and boys.

Age

The question whether or not age has an influence on perceived pain during orthodontic therapy remains open. Here too, a critical comparison of the various studies is impossible due to differences in experimental design. In the present study, the data show that the youngest age group (8—11 years) reported pain significantly less frequently than the older groups. This result may have been influenced by the fact that the question 'Did it hurt within the last 24 h?' might be more difficult to answer by younger children when there was no pain at that moment. The group of patients older than 14 years reported a lower pain frequency than the middle group (11-14 years) although not at a significant level ($P = 0.027$). Therefore, the middle age group had the highest pain frequency. This is in agreement with the report of Brown and Moerenhout (1991) who found that adolescents (14-17 years) were more vulnerable to the undesirable psychological effects of treatment and had higher levels of pain than younger or older patients. However, the mean reported pain intensity

did not differ between the age groups nor did reported pain intensity for biting, chewing and analgesic consumption.

Conclusions

This investigation of reports of perceived pain after the insertion of orthodontic appliances revealed significant differences based on sex and age. It confirms previous reports that pain intensity peaks within 2 days after appliance insertion and decreases to minor levels after 5 days. Although several patients reported unbearable pain, a maximum of only 18.4 per cent of patients consumed analgesics during the initial 24 h, at the peak of pain intensity. Pain during mastication was the most intense pain reported by our patients and it remained at elevated levels during most of the observation period. There were only minor differences in reported pain intensity regardless of the type of appliance. Except for a marked influence on the consistency of food consumed, the insertion of fixed appliances was reported to have only a transient and minor effect on the patients' daily lives.

References

- 1-Bos A , Hoogstraten J, Prahl-Andersen B 2005 Attitudes towards orthodontic treatment: a comparison of treated and untreated subjects. *European Journal of Orthodontics* 27:148-154
- 2-Brown D, Moerenhout R 1991 The pain experience and psychological adjustment to orthodontic treatment of preadolescents, adolescents, and adults. *American Journal of Orthodontics and Dentofacial Orthopedics* 100: 349-356
- 3-Burstone C 1964 Biomechanics of tooth movement. In:
- 4-Krause B S, Riedel R A (eds.) *Vistas in orthodontics*. Lea and Febiger, Philadelphia, pp 197-213
- 5-Dzipunova B, Gjorgova J 2002 Perception of pain as a result of orthodontic treatment with fixed appliances. *Balkan Journal of Stomatology* 6:107-109
- Erdinc A, Dincer B 2004 Perception of pain during orthodontic treatment with fixed appliances. *European Journal of Orthodontics* 26: 79-85
- 6-Feinmann C, Ong M, Harvey W, Harris M 1987 Psychological factors influencing post-operative pain and analgesic consumption. *British Journal of Oral and Maxillo-Facial Surgery* 25: 285-292
- 7-Feldmanna I, Listb T, Feldmannc H, Bondemarkd L 2007 Pain Intensity and Discomfort Following Surgical Placement of Orthodontic Anchoring Units and Premolar Extraction. *Angle Orthodontist* 77:578-585.
- 8- Jones M 1984 An investigation into the initial discomfort caused by placement of an archwire. *European Journal of Orthodontics* 6: 48-54
- Jones 9 - M, Richmond S 1985 Initial tooth movement: force application and pain—a relationship? *American Journal of Orthodontics* 88: 111-116
- 10- Jones M, Chan C 1992 The pain and discomfort experienced during orthodontic treatment. A randomised controlled clinical trial of two initial aligning arch wires. *American Journal of Orthodontics and Dentofacial Orthopedics* 102: 373-381
- Krishnan V 2007 Orthodontic pain: from causes to management—a review. *European Journal of Orthodontics* 29: 170-179
- Kvam E, 11- Gjerdet N, Bondevik O 1987 Traumatic ulcers and pain during orthodontic treatment. *Community Dentistry and Oral Epidemiology* 15: 104-107
- 12- Kvam E, Bondevik O, Gjerdet N 1989 Traumatic ulcers and pain in adults during orthodontic treatment. *Community Dentistry and Oral Epidemiology* 17:154-157
- Ngan P, Kess B, Wilson S 1989 Perception of discomfort by patients undergoing orthodontic treatment. *American Journal of Orthodontics and Dentofacial Orthopedics* 96: 47-53
- 14- Oliver R, Knapman Y 1985 Attitudes to orthodontic treatment. *British Journal of Orthodontics* 12: 179-88
- Padisar P, Nasseh R,
- 15- Khorasani M, Assl M 2009 A Study on Efficacy of NSAIDs in Control of Pains Caused by Orthodontic. *Research Journal of Biological Sciences* 4: 404-408
- 16- Polata O;, Karamanb A, Durmusc E 2005 Effects of Preoperative Ibuprofen and Naproxen Sodium on Orthodontic Pain. *Angle Orthodontist* 75:791–796.

- 17- Seymour R, Simpson J, Chariton J, Phillips M 1985 An evaluation of length and end-phrase of visual analogue scales in dental pain. *Pain* 21: 177-185
- 18- Sinclair P, Cannito M, Goates L, Solomos L, Alexander C 1986 Patient responses to lingual appliances. *Journal of Clinical Orthodontics* 20: 396-404 Sjorgen A, Arnrup K, Jensen C, Knutsson I, Huggare J 2010 Pain and fear in connection to orthodontic extractions of deciduous canines. *International Journal of Paediatric Dentistry* 20:193–200 Soltis J, Nakfoor P, Bowman D 1971 Changes in ability of patients to differentiate intensity of forces applied to maxillary central incisors during orthodontic treatment.
- 19 .*Journal of Dental Research* 50: 590-596 Zhanga M; McGrathb C; Haggc U 2007 Patients' Expectations and Experiences of Fixed Orthodontic Appliance Therapy. *Angle Orthodontist* 77: 318-322.