

Fixed Orthodontic Appliance Therapy and Its Impact on Oral Health-Related Quality of Life in Chinese Patients

Mu Chen^a; Da-Wei Wang^b; Li-Ping Wu^c

ABSTRACT

Objective: To determine changes in oral health-related quality of life (OHRQoL) during fixed orthodontic appliance therapy in Chinese patients.

Materials and Methods: Two-hundred fifty Chinese orthodontic patients completed six distinct intervals of the 14-item Oral Health Impact Profile (OHIP-14, Chinese version): before treatment (T0); after the placement of the fixed appliance at 1 week (T1), 1 month (T2), 3 months (T3), and 6 months (T4); and posttreatment (T5).

Results: The overall response rate was 88.8% (222 of 250). Significant differences of overall OHIP-14 scores could be found between any two time points ($P < .001$), except for between T0 and T2 ($P > .05$) and between T3 and T4 ($P > .05$). Overall scores at T1 were significantly higher than the scores at the other intervals ($P < .001$), with a significant change in the scores on physical pain ($P < .001$), psychological discomfort ($P < .001$), and physical disability ($P < .001$). Scores at T5 were lowest among the six time points ($P < .001$).

Conclusions: Fixed orthodontic appliance therapy did affect Chinese patients' OHRQoL. Patients were considerably compromised in terms of their overall OHRQoL until approximately 1 month after insertion. The severity of the compromised condition in terms of overall OHRQoL was greatest at 1 week with the reported impact on physical pain, psychological discomfort, and physical disability. Patients' OHRQoL was better after they completed the orthodontic treatment than before or during treatment. (*Angle Orthod* 2010;80:49–53.)

KEY WORDS: Quality of life; Orthodontic treatment; Patient assessment

INTRODUCTION

The oral health-related quality of life (OHRQoL) index provides an insight into how individual oral health status affects overall quality of life (QoL) and how oral health care brings about improvements to patients' overall QoL.^{1,2} It may serve as a foundation for assessing,

planning, implementing, and evaluating outcomes of dental hygiene care.¹ Recently, performing a QoL evaluation as it relates to the dental field has attracted more and more clinical doctors and researchers.

Orthodontic treatment is different from most other medical interventions in that it aims to correct variations from an arbitrary norm.³ The reason why people frequently undertake orthodontic treatment is to effectuate an improvement in esthetics and a subsequent enhancement of psychosocial well-being, which contributes to QoL. OHRQoL assessments are recommended in orthodontics for a number of reasons: to study treatment needs and outcomes, to study a therapy's efficiency and impact during said period of treatment, and as part of clinical trials, which have the potential to improve the quality of care. Furthermore, understanding patients' expectations of treatment can help detail the parameters for informed consent as well as help patients develop coping methods to deal with treatment sequelae.⁴ Increasingly, patient-centered measures are used to assess these subjective attributes in determining the outcomes of orthodontic care. However, few studies have explored the phys-

^a Graduate MS Student in Orthodontics, Guanghua College of Stomatology, and Lab of Stomatology, Sun Yat-sen University, Guangzhou, China.

^b Associate Professor, Department of Orthodontic, Affiliated Stomatology Hospital, Guanghua College of Stomatology, Sun Yat-sen University, Guangzhou, China.

^c Deputy Chief Dentist in Department of Orthodontic, Affiliated Stomatology Hospital, Guanghua College of Stomatology, Sun Yat-sen University, Guangzhou, China.

Corresponding author: Dr Da-Wei Wang, Department of Orthodontic, Affiliated Stomatology Hospital, Guanghua College of Stomatology, Sun Yat-sen University, Lingyuan Xilu No. 56, Guangzhou, 510055, PR China (e-mail: 0wangdawei0@gmail.com)

Accepted: April 2009. Submitted: January 2009.

© 2010 by The EH Angle Education and Research Foundation, Inc.

ical, social, or psychological effects of treatment or how discomfort and pain affect these aspects of QoL.⁵

This prospective cohort study, using the Chinese version of the Oral Health Impact Profile (OHIP-14), which is a good instrument used in the assessment of OHRQoL, investigated the realities experienced during and after fixed orthodontic appliance therapy and determined the baseline OHRQoL pretreatment in Chinese orthodontic patients. The objective was to assess whether orthodontic treatment affected the levels of OHRQoL outcomes in Chinese patients and to determine the extent and parameters of the impact as well as to study whether any difference in terms of impact exists among different groups of patients according to their overall health profiles and oral clinical condition.

MATERIALS AND METHODS

Subject Selection

Two-hundred fifty patients who had registered for orthodontic treatment at the Department of Orthodontics at the Stomatology Affiliated Hospital of Sun Yat-sen University were enrolled in the study. The inclusion criteria stipulated that these were patients who could understand and use Chinese without difficulty, those who had a perceived need for orthodontic treatment and were about to undergo fixed orthodontic appliance therapy, and who had finished other dental therapy before, such as endodontic or periodontal treatments. Exclusion criteria included patients with cognitive disorders or chronic medical conditions, those who had previously received any type of orthodontic treatment, and those with craniofacial anomalies such as cleft lip and palate, untreated dental caries, or poor periodontal health status. Where necessary, a letter was sent to the parents/guardians of the participants to seek consent for their cooperation in the study.

Instruments and Measures

A questionnaire of general conditions (Q1) was filled out by patients to determine their demographic data, such as gender, age, race, and marital status. The Chinese Version of the OHIP-14 (Q2) consists of 14 items covering seven domains: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and any handicaps. Each item was scored on a 5-point scale to rate the impact of overall oral health status as it relates to the particulars of QoL, whereby responses were coded ranging from *never* (score 0) to *very often* (score 4).

Subjects received a clinical and radiologic examination and model measurement before treatment. The first investigation for baseline data (T0) was finished

before any tooth extraction, which might have been a necessary procedure in some cases. Q1 and Q2 were given to the subjects, with the complete requirements spelled out in detail. All of the questionnaires were filled out within a 10-minute time frame and collected on the spot. After appliance insertion, a plan was put in place as to how test subjects' data were to be monitored and collected. Ultimately, Q2s were presented to subjects for a retrospective evaluation of OHRQoL at 1 week (T1); 1 month (T2), 3 months (T3), and 6 months (T4) after appliance placement; and after treatment (T5).

Data Analysis

OHIP-14 domain scores were derived by collating responses to items in each domain, and overall scores were derived by collating said domain scores. Possible overall OHIP-14 scores ranged from 0 to 56. A high overall or domain score would represent a poor baseline OHRQoL.

Data analysis was carried out on a personal computer using the Statistical Package for Social Sciences (SPSS) software (Chicago, Ill) for Windows. Because the data followed a normal distribution, parametric tests were used in the data analysis. Data satisfy the Huynh-Feldt condition by applying Mauchly's Test of Sphericity ($P = .598$), so the univariate tests for within-subject effects and interactions involving these effects can be used to test whether there is a difference in scores over time. When the differences of average levels among several groups are statistically significant, multiple comparisons should be carried out. Finally, the Bonferroni method was used to determine at which intervals the most significant differences occurred. Mean overall and domain OHIP-14 scores at the six intervals are presented in Table 1.

RESULTS

Descriptive Data

Twenty-eight patients had to be excluded because of their incomplete questionnaires. Thus, the overall response rate was 88.8% (222 of 250). The sample consisted of 148 females (66.6%) and 74 males (33.3%). The mean age of the patients was 15.7 years, and they were all of Chinese ethnicity.

After using analysis of variance of the repeated measurement data (the tests of within-subjects effects), there were significant changes in overall OHIP-14 scores at the six intervals ($F = 64.532$, $P < .001$). In strict accordance with the Bonferroni method, the overall score at one point in time was compared with that at the other interval time points. Significant differences could be observed between any two time

Table 1. Means of Overall and Domain Scores During Orthodontic Treatment at Six Times (n = 222)

	Overall Scores	Domain 1 Scores	Domain 2 Scores	Domain 3 Scores	Domain 4 Scores	Domain 5 Scores	Domain 6 Scores	Domain 7 Scores
T0	8.65	1.13	1.55	1.84	0.94	1.38	0.78	1.04
T1	11.74	1.12	2.99	2.5	2.18	1.81	0.5	0.64
T2	8.54	1.2	2.12	1.55	1.52	1.09	0.57	0.49
T3	5.4	0.72	1.25	1.04	0.86	0.84	0.36	0.33
T4	5.07	0.87	1.16	0.97	0.69	0.77	0.42	0.18
T5	2.65	0.41	0.46	0.84	0.35	0.44	0.08	0.08

points ($P < .001$) except for T0 and T2, T3 and T4 ($P > .05$). Overall scores were highest at T1 (Table 1), whereas there was a significant reduction between scores from T1 to T2 ($P < .001$), T2 to T3 ($P < .001$), and T4 to T5 ($P < .001$). Finally, overall scores were lowest at the sixth point ($P < .001$). In other words, the scores indicate that the worst total experience of patients appeared at the first week. Then, as treatment progressed, a generalized mild decline occurred, and overall scores at T2 were similar to the scores at T0 ($P < .001$). At 1 month after appliance insertion, the OHRQoL was similar to pretreatment. Finally, the lowest scores after treatment indicated that orthodontic treatment might indeed improve patients' OHRQoL. The time frame for the mean overall OHIP-14 score is given in Figure 1.

The changes in physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicaps reported from T0 to T5 were shown with a similar and corresponding change pattern as overall scores. In addition, scores from domain 1 to domain 5, especially domains 2, 3, and 4 (physical pain, psychological discomfort, and physical disability), contributed most significantly to patients' overall scores. Domain 2, 3, and 4 scores at T1 were significantly higher than those domain scores at any other time ($P < .001$), whereas there was no

significant difference between T3 and T4 ($P > .05$). Statistically significance declines across these domain scores starting at T2.

The frequency distribution of reported impacts on the 14 activities of the OHIP was measured at six intervals and is detailed in Table 2. It is evident that the most common complaint of the negative effect in all instances was that it was in fact "uncomfortable to eat any food" (51.80%) and "have felt self-conscious" (51.35%), which appeared at T1. This suggests that complaints about eating and psychological discomfort contributed most significantly to the impact on orthodontic patients in the first week after appliance placement.

DISCUSSION

The assessment of OHRQoL has an important role to play in clinical practice.⁶ The treatment of malocclusion, which has a large psychosocial component, calls for the use of OHRQoL measures.⁷ One of the most commonly used generic OHRQoL measures is the two versions of OHIP, with 49 or 14 items, respectively.⁸ It is important to carry out a rigorous translation and validation process before an instrument developed in one culture is used in another population group with a different culture. The translated Chinese version of the OHIP-14 demonstrated good reliability and validity, providing us with the theoretical founda-

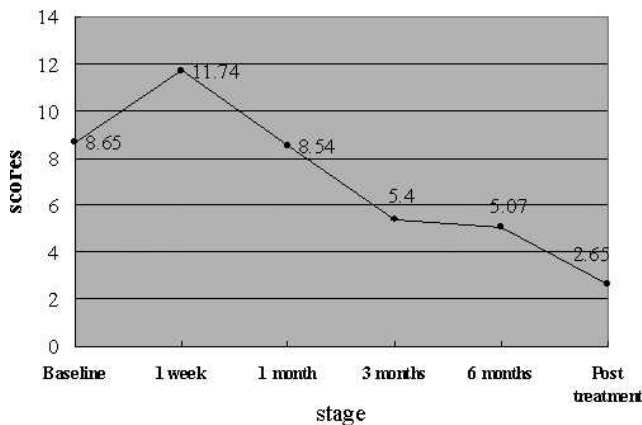


Figure 1. Means of overall scores during orthodontic treatment at six times (baseline [T0], 1 week [T1], 1 month [T2], 3 months [T3], 6 months [T4], posttreatment [T5]).

Table 2. Frequency (%) Distribution of Reported Impacts on the 14 Items of the Oral Health Impact Profile Measure (OHIP-14) at Six Times (n = 222)

	T0	T1	T2	T3	T4	T5
Item 1	22.52	19.82	23.87	12.61	12.61	2.70
Item 2	9.91	9.46	8.11	1.80	9.01	1.35
Item 3	23.87	42.79	27.48	12.16	15.32	7.21
Item 4	17.57	51.35	36.04	12.16	9.91	4.05
Item 5	36.94	51.80	32.43	14.86	5.41	9.91
Item 6	21.62	28.38	14.41	9.91	10.81	4.05
Item 7	10.36	33.78	21.62	6.76	9.91	1.80
Item 8	12.16	31.98	21.17	8.56	6.31	1.35
Item 9	8.11	22.07	8.11	2.70	0.45	0.45
Item 10	31.53	31.98	19.37	14.86	9.01	4.50
Item 11	12.16	4.50	5.86	5.41	0.45	0
Item 12	8.11	4.96	2.70	1.80	0	0.45
Item 13	17.12	10.36	6.31	7.66	0.45	0.45
Item 14	1.35	2.70	1.80	0.90	0	0

tion for further use in the Chinese population.⁹ Indeed, that was the basis for this study.

Interestingly, the OHIP-14 scores at pretreatment were low, suggesting that despite having a perceived orthodontic treatment need, the effect of malocclusion on OHRQoL was modest in Chinese individuals. This result approximated those of studies involving other patient groups with malocclusion.¹⁰⁻¹³

Significant differences could be observed between any two intervals ($P < .001$), except for T0 and T2, T3 and T4. Patients undergoing orthodontic treatment were more likely to report an oral health impact, which may suggest that the process of treatment causes oral health impacts and affects the patients' QoL. This supports findings that orthodontic treatment affects patients' lives.^{14,15} Patients who were currently under fixed orthodontic therapy, especially at the first week, would exhibit a compromised OHRQoL compared with any other time, but the OHRQoL might improve gradually during therapy and would exhibit no obvious difference from pretreatment to the interval at 1 month after the fixed orthodontic appliance was bonded. When patients finished orthodontic treatment and debonded appliances, the OHRQoL seemed to be much better than at pretreatment. It is generally recognized that patients benefit psychologically from orthodontic treatment through improved facial and dental appearance and the associated increased self-confidence that accompanies those changes. The results of this study further indicate the value in informing patients that they may experience a temporary compromised OHRQoL in the beginning of fixed orthodontic therapy and a better OHRQoL once therapy has run its course.

One week after the insertion of fixed appliances, the overall OHIP-14 scores and domain scores were the highest of all six different intervals. Evaluation of the results showed that pain and discomfort occurred during the first week after placement of the appliance. The common reported impacts were characterized along the lines that the patient "had a painful aching in the mouth" (42.79%), "found it uncomfortable to eat any food" (51.35%), "have been self-conscious" (51.80%), and "had an unsatisfactory diet" (33.78%). The realities experienced in the domain of physical pain, psychological discomfort, and physical disability were significantly felt. Our findings suggest that orthodontic treatment affects patients' daily activities, particularly relating to eating, speaking, and smiling.

These findings were consistent with the known facts that pain and diet restrictions were chief complaints in patients' clinical follow-up visits.¹⁶ And these were our key anticipated concerns of patients with respect to orthodontic treatment.¹⁰ In point of fact, similar observations have been made by others.^{10,17,18} Sergl

et al¹⁵ reported that the most frequent complaints were impaired speech, impaired swallowing, feeling of oral constraint, and lack of confidence in public after undergoing different appliance treatments. Nor were a generalized feeling of oral constraint and lack of confidence related to the type of appliance worn. This indicates that these problems are caused by the presence of a foreign appliance in the oral cavity. However, the type of appliance did have an effect on impaired speech and swallowing.¹⁹ Miller et al²⁰ carried out a comparison of treatment impacts between Invisalign[™] aligners and fixed appliance therapy during the first week of treatment and found that adults treated with Invisalign[™] aligners experienced less pain and fewer negative impacts on their lives during the first week of orthodontic treatment than did those treated with fixed appliances.²⁰ Thus, the type of appliance might affect some aspects of OHRQoL, but the relationship is not as yet clear.

At 1 month, a significant reduction in the number of complaints occurred, and the level of OHRQoL at this time was similar with pretreatment. As treatment progressed, the total score had declined despite physical pain, psychological discomfort, physical disability, and social disability being still somewhat compromised. This indicates either actual decreases felt and experienced, adaptation to treatment, or learned experience of treatment.¹⁰ The fact that self-consciousness and embarrassment were still significantly reported feelings might be evidence of the long-term psychosocial impact of orthodontic treatment while patients adapted to the short-term physical impact of treatment. Although the self-conscious and embarrassed emotional notes were reported, treatment ultimately resulted in an increase in self-concept and a reduction of negative social experiences as the scores of those domains declined slowly.^{21,22}

Patients expected that while undergoing fixed orthodontic therapy their QoL would be markedly compromised compared with pretreatment.¹⁰ It is indeed important to pay close attention to the patients' self-perception and changes in their social behaviors over the course of treatment. Our findings indicate the wide-ranging implications of informing and reassuring patients that they may have a temporarily compromised OHRQoL in the beginning of fixed orthodontic therapy, particularly as it relates to eating, speaking, and smiling. It further suggests that doctors need to provide more guidelines to patients at week 1 about the daily impact. That will in turn be beneficial in helping patients overcome the negative effect of therapy and enhance their belief and confidence in their doctor. Doctors, for their part, should also actively comfort patients and relay that the OHRQoL might improve gradually during therapy and that there will be

no obvious difference between pretreatment and the end of the 1-month interval; in addition, doctors should impart that when the patient finishes orthodontic treatment, the OHRQoL will be significantly better than at pretreatment. This will be indicative of either actual decreases in negative factors experienced, adaptation to treatment, or learned experience that will occur along with treatment. These clinical visit parameters will help doctors to get their patients' cooperation during therapy and achieve a more acceptable and positive treatment result for both.

CONCLUSIONS

- Fixed orthodontic appliance therapy does affect Chinese patients' OHRQoL.
- Subjects' OHRQoL was worse during treatment compared with pretreatment until 1 month after insertion of appliances; OHRQoL was significantly improved posttreatment.
- At 1 week after the insertion of fixed appliances, the QoL was at the worst point because the combination of physical pain, psychological discomfort, and physical disability was at its highest level.

REFERENCES

1. Williams KB, Gadbury-Amyot CC, Bray KK, et al. Oral health-related quality of life: a model for dental hygiene. *J Dent Hyg.* 1998;72:19–26.
2. Cunningham SJ, Hunt NP. Quality of life and its importance in orthodontics. *J Orthod.* 2001;28:152–158.
3. O'Brien K, Kay L, Fox D, Mandall N. Assessing oral health outcomes for orthodontics—measuring health status and quality of life. *Community Dent Health.* 1998;15:22–26.
4. Mortensen MG, Kiyak HA, Omnell L. Patient and parent understanding of informed consent in orthodontics. *Am J Orthod Dentofacial Orthop.* 2003;124:541–550.
5. Zhang M, McGrath C, Hagg U. Changes in oral health-related quality of life during fixed orthodontic appliance therapy. *Am J Orthod Dentofacial Orthop.* 2008;133:25–29.
6. Locker D, Matear D, Stephens M, et al. Comparison of the GOHAI and OHIP-14 as measures of the oral health-related quality of life of the elderly. *Community Dent Oral Epidemiol.* 2001;29:373–381.
7. de Oliveira CM, Sheiham A. Orthodontic treatment and its impact on oral health-related quality of life in Brazilian adolescents. *J Orthod.* 2004;31:20–27.
8. Bernabe E, de Oliveira CM, Sheiham A. Comparison of the discriminative ability of a generic and a condition-specific OHRQoL measure in adolescents with and without normative need for orthodontic treatment. *Health Qual Life Outcomes.* 2008;21:64.
9. Wong MC, Lo EC, McMillan AS. Validation of a Chinese version of the Oral Health Impact Profile (OHIP). *Community Dent Oral Epidemiol.* 2002;30:423–430.
10. Zhang M, McGrath C, Hagg U. Patients' expectations and experiences of fixed orthodontic appliance therapy impact on quality of life. *Angle Orthod.* 2007;77:318–322.
11. Kok YV, Magneson P, Harradine NW, et al. Comparing a quality of life measure and the Aesthetic Component of the Index of Orthodontic Treatment Need (IOTN) in assessing orthodontic treatment need and concern. *J Orthod.* 2004;31:312–318.
12. Jokovic A, Locker D, Stephens M, et al. Validity and reliability of a questionnaire for measuring child oral-health-related quality of life. *J Dent Res.* 2002;81:459–463.
13. Foster Page LA, Thomson WM, Jokovic A, et al. Validation of the Child Perceptions Questionnaire (CPQ 11–14). *J Dent Res.* 2005;84:649–652.
14. Erdinc AM, Dincer B. Perception of pain during orthodontic treatment with fixed appliances. *Eur J Orthod.* 2004;26:79–85.
15. Serjl HG, Klages U, Zentner A. Pain and discomfort during orthodontic treatment: causative factors and effects on compliance. *Am J Orthod Dentofacial Orthop.* 1998;114:684–691.
16. O'Connor PJ. Patients' perceptions before, during, and after orthodontic treatment. *J Clin Orthod.* 2000;34:591–592.
17. Mandall NA, Vine S, Hulland R, et al. The impact of fixed orthodontic appliances on daily life. *Community Dent Health.* 2006;23:69–74.
18. Lew KK. Attitudes and perceptions of adults towards orthodontic treatment in an Asian community. *Community Dent Oral Epidemiol.* 1993;21:31–35.
19. Serjl HG, Klages U, Zentner A. Functional and social discomfort during orthodontic treatment—effects on compliance and prediction of patients' adaptation by personality variables. *Eur J Orthod.* 2000;22:307–315.
20. Miller KB, McGorray SP, Womack R, et al. A comparison of treatment impacts between Invisalign aligner and fixed appliance therapy during the first week of treatment. *Am J Orthod Dentofacial Orthop.* 2007;131:302.e1–9.
21. O'Brien K, Wright J, Conboy F, et al. Effectiveness of early orthodontic treatment with the Twin-block appliance: a multicenter, randomized, controlled trial. Part 2: psychosocial effects. *Am J Orthod Dentofacial Orthop.* 2003;124:488–494.
22. Hunt OT, Johnston CD, Hepper PG, et al. The psychosocial impact of orthognathic surgery: a systematic review. *Am J Orthod Dentofacial Orthop.* 2001;120:490–497.