

Original article

The impact of orthodontic treatment on quality of life and self-esteem in adult patients

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Summary

Objectives: To assess the impact of fixed orthodontic treatment on oral health related quality of life (OHRQoL) and self-esteem in adults.**Subjects and methods:** A prospective study design was applied, within private practice. Sample size estimation revealed a minimum of 52 subjects, allowing for drop outs. All participants completed a set of validated questionnaires at baseline (T0), 1- (T1), 3- (T2), and 6-months (T3) and post-treatment (T4). These included the Rosenberg Self-esteem scale, the Oral Health Impact Profile (OHIP-14) and a socioeconomic status questionnaire. The Dental Health Component of the Index of Orthodontic Treatment Need (IOTN) was used to assess malocclusion severity.**Results:** Sixty-one subjects were recruited, with only one subject lost to follow-up. A statistically significant difference in OHRQoL scores was seen between: T0 and T1 ($P = 0.001$); T0 and T2 ($P = 0.020$). There was no statistical difference between T0 and T3 ($P = 0.078$) or T4 ($P = 0.565$), where OHRQoL improved to pre-treatment scores. A significant difference in self-esteem scores was observed between baseline and end of treatment ($P = 0.002$).**Conclusions:** Undergoing fixed orthodontic therapy had a negative impact on the overall OHRQoL, during the first 3 months of treatment, which then improved to pre-treatment scores, whilst a significant increase was observed in self-esteem as a result of treatment.

Introduction

Patient-centred care is a concept that has been introduced recently in healthcare systems. Among the main elements are a need to understand the patient's treatment needs, experiences, satisfaction and the perceived overall quality of healthcare system (1). With an increasing number of adult patients now seeking orthodontic treatment, there is a growing need for such research in orthodontics. To date, very little work has been published evaluating patient experiences during treatment in relation to the type of appliance being received.

Malocclusion is often conspicuous, so it might lead to adverse social reactions and a deficient self-concept. Correction of the malocclusion has been shown to improve body image of dental and facial features (2). In addition, because social and psychological effects are the key motives for seeking orthodontic treatment, oral health related quality of life (OHRQoL) can be considered a useful supplementary

measurement for orthodontic treatment need and outcome (3). The concept of 'OHRQoL' has been defined as either 'a standard of health of oral and related tissues which enables an individual to eat, speak and socialize without active disease, discomfort, or embarrassment' (4) or 'the absence of negative impacts of oral conditions on social life and a positive sense of dentofacial self-confidence' (5).

The term self-esteem is used to describe a person's overall sense of self-worth or personal value. Self-esteem can involve a variety of beliefs about the self, such as the appraisal of one's own appearance, beliefs, emotions, and behaviours. There has been a growing acceptance of the positive relationship between improvement in aesthetics and psychological profile. Studies with longitudinal prospective designs have been performed on patients undergoing orthognathic surgery, which suggest an improvement in self-esteem, body image, and ability to mix socially, secondary to facial surgery (6). Positive

psychological benefit following orthognathic surgery is expected due to the fact that orthognathic surgery is typically planned to improve facial profile and appearance. However, very little research has been undertaken to investigate changes in OHRQoL and self-esteem in adults undergoing orthodontic treatment alone in the absence of a severe skeletal discrepancy. It is important to take into account what patients will experience during orthodontic treatment to provide insight into the true benefits and health gains associated with orthodontic therapy.

In a recent cross-sectional study, Palomares *et al.* (7) compared the OHRQoL of young Brazilian adults, aged 18–30 years, who had completed orthodontic treatment to untreated subjects waiting for treatment. One hundred patients in the retention phase of orthodontic treatment for more than 6 months (treated group) and 100 subjects who were seeking orthodontic treatment and were still on a waiting list (non-treated group) were compared using the Brazilian version of the OHIP-14 and Index of Orthodontic Treatment Need (IOTN) (8). The results found that non-treated young adults had mean Oral Health Impact Profile (OHIP) scores 5.3 times higher than the treated subjects. The authors concluded that young Brazilian adults who received orthodontic treatment had significantly better OHRQoL scores in the retention phase, after treatment completion, than non-treated subjects. This study was cross-sectional, compared the OHRQoL at the end of treatment only with no pre-treatment score, which could have affected the results. The study did not evaluate self-esteem. Earlier research has predominately focused on the pain and discomfort experiences of patients in relation to labial fixed appliances. These studies have evaluated only the short-term (0–14 days) effects and demonstrate pain commences 2 h after placement of the appliance, peaks at 24 h, with discomfort dissipating over the next 5–7 days (9–11).

Thus, despite the increased uptake of adult orthodontics, currently there is little evidence to evaluate the impact of fixed orthodontic treatment on this group. This study aimed to assess the impact of fixed orthodontic treatment on OHRQoL and self-esteem in adult orthodontic patients.

Subjects and methods

Subjects

This study utilized a prospective design, for which ethical approval and written informed consent was obtained, in which adult patients undergoing treatment were observed during the course of treatment for changes in quality of life and self-esteem. All subjects, aged 18 years and above, who fulfilled the selection criteria were recruited from four specialist practices across the southeast of England: literate and fluent in English and adult patients who were due to receive active fixed labial orthodontic treatment alone to correct their malocclusion. Subjects were excluded on the basis of: a history of or concomitant organic or psychiatric disease; previous orthodontic treatment or orthognathic surgery; presence of caries, periodontal disease, or recent dental treatment; the presence of a craniofacial deformity.

A sample size calculation was carried out using data of a study investigating the effects of orthodontic treatment on quality of life (12). Prior data indicated that patients undergoing treatment suffered deterioration in OHRQoL at 6 months into treatment, with an observed increase in summary score from 23.0 to 29.3. Therefore, it was estimated that a sample size of 48 subjects was needed to demonstrate a significant change in OHRQoL, with an 80 per cent probability power at the 5% level of significance. The sample size was inflated by a 10% margin to allow for loss to follow-up and drop outs; thus, the total sample size was a minimum of 52.

Methods

Subjects were assessed in relation to following criteria at baseline (T0). Presenting occlusion using the Dental Health Component (DHC) of the IOTN (8) was assessed by calibrated examiners. This was to identify the need for orthodontic treatment thresholds in relation to the severity of malocclusion, from no need (grades 1 and 2), borderline need (grade 3), and definite need (grades 4 and 5) (8).

Socioeconomic status. A validated questionnaire in which demographic data and occupational and educational status of subjects is gathered as an indicator of socioeconomic status was used (13). The registrar general's classification of occupations was used to allocate social class (groups I–V) based on the subject's occupation: I. Professional occupations, e.g. doctors, lawyers. II. Managerial and lower professional occupations, e.g. managers, teachers. III. Non-manual skilled occupations, e.g. office workers. IV. Manual skilled occupations, e.g. bricklayers, coal miners. V. Semi-skilled occupations, e.g. postal workers. VI. Unskilled occupations—e.g. porters, dustmen.

The Rosenberg Self-esteem scale (14) assessed the psychological influences of malocclusion and orthodontic treatment. This scale has proven reliability and validity for the general population and orthodontic patients (15). The scale consists of 10 questions: 5 positive and 5 negative and uses a Likert scale, in which the responses for positive and negative questions are weighted differently, by a four-point scale, ranging from 'strongly agree; agree; disagree and strongly disagree'. The scale ranges from 0 to 30, with scores of 15–25 indicating a normal self-esteem and scores of less than 15 indicating a low self-esteem.

Oral Health Impact Profile. Several instruments of measure have been designed to assess dental outcomes, in terms of the impact on quality of life of changes in oral health (16). The OHIP and its short form (OHIP-14) are widely used. The OHIP-14 has seven conceptualized domains (two items per domain): functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. In which, respondents are asked to rate how frequently they experienced an oral health impact (as described by each item). In turn, the response to each item is scored on a five-point Likert scale: 0, never; 1, hardly ever; 2, occasionally; 3, fairly often; and 4, very often or every day. Thus, summary OHIP-14 scores can range from 0 to 56, and domain scores can range from 0 to 8 (16, 17). A high total value indicates a high negative impact on the OHRQoL.

Patients were invited to complete both the Rosenberg Self-esteem scale and OHIP-14 questionnaires at their 1- (T1), 3- (T2) and 6-months (T3) and post-treatment (T4) follow-up appointments:

Statistical analysis

Data analysis was performed using the Statistical Package for the Social Science software (SPSS), version 17.0 (New York, USA), with statistical significance set at $P < 0.05$. A summary of baseline characteristics of participants in the study was performed. Non-parametric tests, including the Pearson chi-squared test and the Wilcoxon signed rank test were applied to assess the level of significance of change during the course of treatment.

Results

Baseline characteristics

Table 1 summarizes the sociodemographic characteristics. In total, 61 adult patients, from four specialist orthodontic practices, were recruited to the study. A higher ratio of females was observed, with a mean age of 41.2 years. The majority of patients were White British (86.9%), single (31.1%), in their first marriage (39.3%) and with secondary school education, with O levels or above. Most patients were in full-time employment (54.1%). All subjects demonstrated either borderline ($n = 36$) or definite treatment need ($n = 25$), as evaluated by the DHC of the IOTN (8).

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Table 2 shows the descriptive statistics of the summary OHIP-14 scores at T0, T1, T2, T3, and post-treatment (T4). The Wilcoxon signed rank test was used to evaluate the change in OHRQoL as assessed by OHIP-14 scores between T0 and follow-up (T1–T4). The results show a statistically significant difference in quality of life scores between T0 and T1, with an increase in the overall OHIP score to 16.0 ($P = 0.001$); T0 and T2, with an increase in the overall OHIP score to 12.5 ($P = 0.020$). Statistically significant changes were observed among five of the seven domain scores (except for the handicap and physical disability domains). Thus, functional limitation, physical pain, psychological discomfort, psychological disability, and social disability demonstrated a significant ($P < 0.05$)

Table 1. Sociodemographic characteristics of subjects ($n = 61$). IOTN, Index of Orthodontic Treatment Need

Gender, n	Male	13
	Female	48
Age (years)	Mean	41.2
	Minimum	18
	Maximum	71
Ethnicity, n	Asian British	2
	Asian Pakistani	1
	Asian Middle East	2
	White British	53
	White West European	1
	Other	2
Family structure, n	Single	19
	Married (first marriage)	24
	Remarried	2
	Cohabiting	8
	Divorced	7
	Widowed	1
Level of education, n	Elementary/primary	1
	Secondary (no O'levels)	1
	Secondary (with O'levels)	15
	Teaching qualification	8
	A/AS/S levels	14
	University	17
Occupation, n	Post-graduate	5
	In training/student	5
	Full-time employed	33
	Part-time employed	13
	Self-employed	1
	Looking after home/family	6
IOTN grade, n	Retired	3
	3	36
	4	22
	5	3

negative impact. Whilst a deterioration in summary score (12.5) remained at 6 months, this was no longer significant ($P = 0.078$). This trend in overall OHIP-14 improvement continued with a return to the pre-treatment (T0) score at the end of treatment (T4; $P = 0.565$). Hence, there appeared to be a negative impact of fixed orthodontic therapy during the first 3 months on the overall OHRQoL with a gradual observed return at 6 months and complete return at the end of treatment where OHRQoL improved to pre-treatment scores.

Table 3 shows the descriptive statistics of the overall self-esteem scores at baseline and follow-up (T1–T3). The Wilcoxon signed rank test was used to evaluate the change in self-esteem scores between T0 and T4. No statistical difference was observed between T0 and T3, but a significant difference in self-esteem scores was detected between baseline (T0) and end of treatment (T4; $P = 0.002$).

Discussion

This study adopted a prospective cohort design aimed to investigate the impact of fixed orthodontic treatment on their OHRQoL and self-esteem.

Baseline characteristics

The present study sample revealed that the majority of the participants were female (78%). Shaw (18) demonstrated that females were more dissatisfied with the appearance of their dentition and perceived a need for braces more often than males. The subjects demonstrated either borderline or definite treatment need, as evaluated by the DHC of the IOTN (8). No statistically significant differences were detected between the IOTN and social class. Shaw *et al.* (15) in a comparative study of 150 subjects that received orthodontic treatment and a control group of 181 subjects demonstrated there was no difference in social class between the groups.

Table 2. Descriptive and comparative statistics of summary Oral Health Impact Profile (OHIP-14) scores at baseline (T0), 1- (T1), 3- (T2), and 6-months (T3) and post-treatment (T4; $n = 61$)

Variable	Median	Minimum	Maximum	P value
T0	10	0	26	—
T1	16	0	30	0.001
T2	12.5	0	39	0.020
T3	12.5	0	34	0.078
T4	10	0	24	0.565

Wilcoxon signed rank test was used to evaluate the change (P value) in OHIP-14 scores between T0 and follow-up (T1–T4).

Table 3. Descriptive and comparative statistics of the overall self-esteem scores in the test group at baseline (T0), 1- (T1), 3- (T2), and 6-months (T3) and post-treatment (T4; $n = 61$)

Variable	Median	Minimum	Maximum	P value
T0	23	8	30	—
T1	22	8	30	0.892
T2	21	8	30	0.727
T3	23	16	30	0.841
T4	26	18	30	0.002

Wilcoxon signed rank test was used to evaluate the change (P value) in self-esteem scores between T0 and follow-up (T1–T4).

Impact of orthodontic treatment on quality of life and self-esteem

It is worth noting that malocclusion perception differs between professionals and patients and that self-perceived OHRQoL is not always a reflection of malocclusion severity (12). Subjects with severe malocclusions may not report a negative impact on quality of life, whereas others with minor irregularity report high negative impacts on quality of life (6, 12, 19). Therefore, the application of patient-centred measures such as OHRQoL and self-esteem assessments in orthodontics are imperative to the study of treatment needs, outcome, and managing patient expectations. Previous research supports the finding of an association between malocclusion and psychological discomfort (3, 19, 20). Quality of life is a multidimensional concept that includes subjectively perceived physical, psychological, and social functions, as well as a sense of subjective well-being. The current findings may reflect the fact that these patients were actively seeking orthodontic treatment for malocclusion of sufficient severity, as confirmed by the clinician's evaluation of their DHC of IOTN, which as a consequence resulted in a poorer OHRQoL. The results from the current study showed that there appeared to be a significant negative impact of fixed orthodontic therapy on the overall OHRQoL during the first 3 months of treatment, with OHRQoL returning to pre-treatment scores at the end of treatment. Fixed orthodontic treatment initially worsened the patient's overall OHRQoL, which was emphasized by the statistically significant deterioration of the overall OHIP score at T1 (16.0) and T2 (12.5) compared with baseline (T0; 10.0) scores. Certain aspects of a patient's daily activities appeared to be affected by the treatment that had a negative impact on the overall OHRQoL. Most notably, during these first 6 months, statistically significant changes were observed among five of the seven domain scores (except for the handicap and physical disability domains). Thus, functional limitation, physical pain, psychological discomfort, psychological disability, and social disability all demonstrated a significant negative impact. This information could be useful to further inform patients of the likely impact of orthodontic treatment to their lives and in particular during the first 3 months and thus helping to not only manage their expectations but also adaptation. This is important to enable them to provide informed consent. Similar results were reported by Liu *et al.* (12), who found in the early phase of fixed orthodontic treatment, the greatest deterioration in OHRQoL occurred, but with ongoing treatment, the detrimental effects in OHRQoL were reduced. In comparison, Chen *et al.* (21) and Palomares *et al.* (7) found patients' OHRQoL was better after orthodontic treatment than before or during treatment. Adults who had completed orthodontic treatment and were in the retention phase of treatment were found to have better OHRQoL than the non-treated subjects who were waiting for treatment (7).

The overall self-esteem appeared high among the group, and therefore its impact on malocclusion was unlikely to be detected. The present finding has been supported by a number of studies confirming the presence of a dentofacial deformity and does not necessarily result in lower self-esteem (22–24). This in turn, may reflect the fact that self-esteem, itself, is a complex area that may not be influenced by malocclusion alone. In contrast, Albino *et al.* (25) reported that subjects who were satisfied with their faces, as opposed to their teeth alone, appeared to be more self-confident and have higher self-esteem than those who were dissatisfied. The results from the current study found there was no statistically significant difference in self-esteem scores during orthodontic treatment. However, a significant difference was detected between the start and end of treatment. These results are in contrast to the findings from a longitudinal

study on adult orthodontic patients in which orthodontic treatment was not found to affect self-esteem (15), but in agreement with the findings of Pabari *et al.* (26). The latter study found there was a statistically significant difference between the stage of treatment and the self-esteem score, with the post-treatment patients having higher self-esteem than the pre-treatment and in-treatment groups. These results may be interpreted by the fact that self-esteem is not simply influenced by a single factor, and it is rather a very complex area that may fluctuate remarkably at different stages of life. Self-esteem is influenced by many factors such as body image, facial image, stage of anxiety and depression, and social acceptance; therefore, the interaction with orthodontic treatment may be variable. The findings of the present study suggest that orthodontic treatment might impart psychological benefits to adult patients.

Limitations of the study

Both OHRQoL and self-esteem are subjective evaluations of a patient's own experiences and perceptions. Nevertheless, there is an increasing acceptance of the importance of evaluating patient-centred measures as a means of improving our understanding of treatment effect and value. Despite the fact that statistically significant changes were observed in patients in relation to both the patient's presenting malocclusion and in response to treatment, the exact clinical level of importance of these findings remains to be determined. Within the field of dentistry and specifically orthodontics, this concept remains relatively 'new' and with the emergence of such evidence our interpretation and understanding will both improve and more importantly translate to better informed consent and potentially more successful treatment outcomes.

Conclusions

Undergoing fixed orthodontic therapy appeared to have a more negative impact on the overall OHRQoL during the first 3 months of treatment, which then improved to pre-treatment scores. In contrast, a significant improvement was detected in self-esteem.

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References

1. McGrath, C. and Bedi, R. (1999) The value and use of 'quality of life' measures in the primary dental care setting. *Primary Dental Care*, 6, 53–57.
2. Kiyak, H. and Reichmuth, M. (2002) Body image issues in dental medicine. In Cash, T.F. and Pruzinsky, T. (eds), *Body Image: A Handbook of Theory, Research, and Clinical Practice*. Guilford, New York, NY, pp. 342–350.
3. de Oliveira, C. and Sheiham, A. (2004) Orthodontic treatment and its impact on oral health-related quality of life in Brazilian adolescents. *Journal of Orthodontics*, 31, 20–27.
4. Department of Health (1994) *An Oral Health Strategy for England*. HMSO, London. <http://www.dh.gov.uk> (1 May 2011, date last accessed).
5. Inglehart, M. and Bagramian, R. (2002) *Oral Health-Related Quality of Life*. Quintessence Publishing, Chicago, IL.
6. Hunt, O., Johnston, C. and Hepper, P. (2001) The psychosocial impact of orthognathic surgery: a systematic review. *American Journal of Orthodontics and Dentofacial Orthopaedics*, 120, 490–501.
7. Palomares, N., Celeste, R., de Oliverira, B. and Miguel, J. (2012) How does orthodontic treatment affect young adults' oral health-related quality

- of life? *American Journal of Orthodontics and Dentofacial Orthopaedics*, 141, 751–758.
8. Brooke, P. and Shaw, W. (1989) Development of an index of orthodontic treatment priority. *European Journal of Orthodontics*, 11, 309–320.
 9. Jones, M. and Chan, C. (1992) The pain and discomfort experienced during orthodontic treatment: a randomized controlled clinical trial of two initial aligning wires. *American Journal of Orthodontics and Dentofacial Orthopaedics*, 102, 373–381.
 10. Serogl, H.G., Klages, U. and Zentner, A. (1998) Pain and discomfort during orthodontic treatment: causative factors and effects on compliance. *American Journal of Orthodontics and Dentofacial Orthopaedics*, 114, 684–691.
 11. Erdinç, A.M. and Dinçer, B. (2004) Perception of pain during orthodontic treatment with fixed appliances. *European Journal of Orthodontics*, 26, 79–85.
 12. Liu, Z., McGrath, C. and Hagg, U. (2011) Changes in oral health-related quality of life during fixed appliance therapy: an 18-month prospective longitudinal study. *American Journal of Orthodontics and Dentofacial Orthopaedics*, 139, 214–219.
 13. Adult Dental Health Survey (1998) *Oral Health in the United Kingdom*. Office for National Statistics, The Stationary Office, London.
 14. Rosenberg, M. (1965) *Society and the Adolescent Self-Image*. Wesleyan University Press, Middletown, CT.
 15. Shaw, W., Richmond, S., Kenealy, P., Kingdon, A. and Worthington, H. (2007) A 20-year cohort study of health gain from orthodontic treatment: psychological outcome. *American Journal of Orthodontics and Dentofacial Orthopaedics*, 132, 146–157.
 16. Slade, G. (1997) Derivation and validation of a short-form oral health impact profile. *Community Dental and Oral Epidemiology*, 25, 284–290.
 17. Slade, G.D. and Spencer, A.J. (1994) Development and evaluation of the Oral Health Impact Profile. *Community Dental Health*, 11, 3–11.
 18. Shaw, W.C. (1981) Factors influencing the desire for orthodontic treatment. *European Journal of Orthodontics*, 3, 151–162.
 19. Klages, U., Bruckner, A., Guld, Y. and Zentner, A. (2005) Dental esthetics, orthodontic treatment, and oral-health attitudes in young adults. *American Journal of Orthodontics and Dentofacial Orthopaedics*, 128, 442–449.
 20. Helm, S., Kreiborg, S. and Solow, B. (1985) Psychosocial implications of malocclusion: a 15-year follow-up study in 30-year-old Danes. *American Journal of Orthodontics*, 87, 110–118.
 21. Chen, M., Wang, D., and Wu, L. (2010) Fixed orthodontic appliance therapy and its impact on oral health-related quality of life in Chinese patients. *Angle Orthodontist*, 80, 49–53.
 22. Hassan, A. and Amin, H. (2002) Association of orthodontic treatment needs and oral health-related quality of life in young adults. *American Journal of Orthodontics and Dentofacial Orthopaedics*, 137, 42–47.
 23. O'Regan, J., Dewey, M., Slade, P. and Lovious, B. (1991) Self-esteem and aesthetics. *British Journal of Orthodontics*, 18, 111–118.
 24. Varela, M. and Garcia-Camba, J. (1995) Impact of orthodontics on the psychologic profile of adult patients: a prospective study. *American Journal of Orthodontics and Dentofacial Orthopaedics*, 108, 142–148.
 25. Albino, J.E., Lawrence, S.D. and Tedesco, L.A. (1994) Psychological and social effects of orthodontic treatment. *Journal of Behavioral Medicine*, 17, 81–98.
 26. Pabari, S., Moles, D. and Cunningham, S. (2011) Assessment of motivation and psychological characteristics of adult orthodontic patients. *American Journal of Orthodontics and Dentofacial Orthopaedics*, 140, e263–e272.