Original Article

Dental esthetics and quality of life in adults with severe malocclusion before and after treatment

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ABSTRACT

Objective: To investigate the association between satisfaction with dental esthetics and quality of life, and esthetics satisfaction in relation to esthetic evaluations of three panel groups.

Materials and Methods: Fifty-two patients (36 women, 16 men; age 18–61 years) with severe malocclusion were treated in Oulu University Hospital. Of these, 38 and 14 patients underwent orthodontic/surgical treatment and orthodontic treatment, respectively. A questionnaire and dental photographs were collected before and after treatment. The 14-item Oral Health Impact Profile (OHIP-14) was used to measure oral health-related quality of life. Satisfaction with dental esthetics was evaluated using the Visual Analogue Scale. Dental photographs were presented to three panel groups: 30 laypersons, 30 dental students, and 10 orthodontists, who rated the photographs using the Aesthetic Component of the Index of Orthodontic Treatment Need.

Results: Oral health–related quality of life (OHIP-14 severity score) and esthetic satisfaction (according to the Visual Analogue Scale) improved after the treatment ($P < .001$). The most unsatisfied patients reported oral effects more often both before and after treatment. Changes in oral health–related quality of life components of severity, psychological discomfort, and psychological disability correlated positively with the changes in esthetic satisfaction. Orthodontists graded the situation before treatment as worse and the outcome as better than the laypersons; the level of grading by dental students fell between these two groups.

Conclusion: Improvement in esthetic satisfaction due to the treatment of severe malocclusion improves oral health–related quality of life, particularly by decreasing psychological discomfort and psychological disability. (*Angle Orthod.* 2014;84:594–599.)

KEY WORDS: Orthodontics; Orthognathic surgery; Malocclusion; Quality of life; Dental esthetics

INTRODUCTION

Oral conditions can have a strong impact on patients' psychological, social, and functional health. These psychological, social, and functional aspects are referred to as oral health–related quality of life. The term ''quality of life'' has been defined as ''a person's sense of well-being that stems from satisfaction or dissatisfaction with the areas of life that are important to him/her.''[1] Locker's conceptual model of oral health describes the seven dimensions of oral health–related quality of life: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and social handicap.[2] The 14-item Oral Health Impact Profile (OHIP-14), based on Locker's conceptual model, is one of the most commonly used indexes to measure oral health–related quality of life.

Among functional reasons or reasons related to self-esteem and self-confidence, esthetic concerns are

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Accepted: October 2013. Submitted: June 2013.
Published Online: December 5, 2013

Table 1. Sample Characteristics

	Men (n = 16)	Women (n = 36)	All
Surgical treatment (n)	13	25	38
Orthodontic treatment (n)	3	11	14
Mean age (y)	35.7	38.1	37.4
Age range (y)	18.2–55.2	20.0–61.9	18.2–61.9
Mean active treatment time (y)	2.2	1.9	2.0
Mean follow-up period (y)	5.2	5.1	5.1

commonly reported as motivation factors for patients to seek treatment, although the percentages of patients reporting these motives show great variation in different studies.[3–5] Earlier studies have shown that dental esthetics are firmly related to body image, self-esteem and self-concept, and improvement of self-esteem or body image after surgical-orthodontic treatment has been reported.[6–9] In a recent study among patients who had combined orthodontic-surgical treatment, patients who thought the esthetic and functional outcome was incomplete also reported compromised psychological status and social interaction.[10]

We have monitored patients with severe malocclusion or dentofacial deformities who underwent orthodontic or orthodontic-surgical treatment. Previously, we have shown that patients with severe malocclusion have significantly more oral health effects compared with general population, and severe malocclusions impair patients' quality of life more than many other oral conditions.[11–13] After the treatment, occlusion and oral effects were correlated, those with more insufficient occlusion reported more oral effects. Nevertheless, occlusal indexes measure occlusal characteristics that are likely associated with functional limitations while dental esthetics can have an equal influence on a person's quality of life. Consequently, we wanted to consider how much esthetics and quality of life interrelate and whether they change simultaneously during treatment.

The aims of this study were, first, to investigate the relationship between satisfaction with dental esthetics and oral health–related quality of life in adults who have undergone orthodontic or orthodontic-surgical treatment, and second, to longitudinally compare esthetic satisfaction and quality of life with the esthetic evaluation performed by laypersons, orthodontists, and dental students.

MATERIAL AND METHODS

This was a secondary analysis of data collected for a longitudinal study. The study was approved by the Ethics Committee of the Northern Ostrobothnia Hospital District in Finland. The original study group comprised 249 adult patients who were in queue for orthodontic or orthodontic-surgical treatment at the Oral and Maxillofacial Department at Oulu University Hospital. Of these, 169 patients agreed to participate in the study, and 99 patients met the inclusion criteria: severe skeletal malocclusion, diagnosed by cephalometry, and functional disorders like pain, traumatic occlusion, or difficulty in mastication. Patients were treated in the Oral and Maxillofacial Department at Oulu University Hospital during 2002–2006. Patients with full pretreatment and follow-up questionnaires and dental photographs were included in the final study group. Two patients were excluded because of edentulous maxilla. The dropout analysis of the current sample was reported previously.[12]

The final study group contained 52 patients (36 women, 16 men) with a mean age of 37.4 years (range = 18–61 years). Of the patients, 14 underwent orthodontic treatment and 38 underwent combined surgery and orthodontic treatment. The surgical techniques were either a sagittal ramus osteotomy and/or a Le Fort I osteotomy. Mean active treatment time was 2.0 years (range = 1.3–3.7 years). The severity of malocclusion was analyzed before and after the treatment using the Peer Assessment Rating Index; the mean values were 25.8 (range = 6–47) before treatment and 6.7 (range = 1–23) after treatment.[14] The study group is described in more detail in Table 1.

The questionnaire was administered before treatment and an average of 3.1 years (SD = 1.22) after active treatment. Oral health–related quality of life and satisfaction with dental appearance were surveyed via the questionnaire. Oral health–related quality of life was measured using a Finnish translation of the OHIP-14, which has been found to be valid and reliable.[15,16] The OHIP-14 includes seven conceptual dimensions of oral health–related quality of life, two items measuring each dimension. The dimensions are functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and social handicap. Response alternatives were coded as follows: "never" = 0; "hardly ever" = 1; "occasionally" = 2; "fairly often" = 3; and "very often" = 4. The OHIP-14 severity score (potential range = 0–56) was calculated by summing the ordinal values for 14 items. The mean scores for the seven dimensions were calculated (range = 0–4). For patients with one or two missing OHIP-14 items, values were imputed using the item's sample mean for their group.

Patients' satisfaction with their dental appearance was estimated by the 100-mm Visual Analogue Scale. The question was: "How satisfied are you with your current dental appearance?" A response of 0 mm meant "very satisfied" and a response of 100 mm meant "very unsatisfied."

Standardized dental photographs were taken of the patients before treatment and an average of 3.0 years (SD = 1.07) after active treatment. All the photographs were taken in frontal view with the teeth in intercuspal position using lip retractors. A series of dental photographs comprising study group's pretreatment and follow-up photographs were set in random order. Each photograph was numbered and shown for 10 seconds.

The photograph series was presented to three panel groups: 10 orthodontists (2 men, 8 women; mean age = 46.1 years; range = 36–56 years), a convenience sample of 30 laypersons (16 men, 14 women; mean age = 34.7 years; range = 21–62 years), and 30 fourth-year dental students from the University of Oulu, Oulu, Finland (9 men, 21 women; mean age = 25.5 years; range = 22–32 years). The orthodontists were staff working at the Department of Orthodontics, University of Oulu, and the dental students were the full class of fourth-year students. The socioeconomic background of the nondental judges varied greatly, but they were not connected to dentistry. The judges rated the photographs using the Aesthetic Component (AC) of the Index of Orthodontic Treatment Need.[17,18] The AC is used to prioritize cosmetic treatment need; as an aid in patient counseling; and as an independent research variable in studies of stereotyping, compliance, or treatment effectiveness.[18,19] The AC consists of 10 dental color photographs illustrating attractiveness of occlusion (grade 1 is the most attractive and grade 10 the least attractive). Before judging the series of photographs, similar instructions were presented to the panel groups. Participants were instructed to judge dental esthetics only and to not pay any attention to possible plaque or staining.

Statistical Analysis

Mean values and their changes were calculated for patient's esthetic satisfaction; OHIP-14 severity and its dimensions; and AC as evaluated by laypersons, dental students, and orthodontists before and after treatment, separately for both treatment groups and genders. Changes occurring during follow-up were normally distributed, so statistical significances of the changes were evaluated with paired samples *t*-tests. Because no statistically significant differences were found between orthodontic and orthodontic-surgical groups or between genders in OHIP-14 severity scores, mean values for different dimensions or esthetic satisfaction before treatment, after follow-up, or in the changes during the follow-up, further analyses were done for the entire study population together. To investigate the relationship between esthetic satisfaction and oral health–related quality of life, the study group was divided into subgroups according to esthetic satisfaction quartiles before and after treatment; between these groups, OHIP-14 scores were evaluated using univariate general linear modeling. Associations between changes in OHIP-14 scores and patients' esthetic satisfaction and esthetic components evaluated by laypersons, dental students, and orthodontists were evaluated with Pearson correlation coefficients. The Statistical Package for Social Sciences version 19.0 (SPSS Inc, Chicago, Ill) was used in statistical analysis.

RESULTS

Oral health–related quality of life and its dimensions as well as esthetic satisfaction improved after treatment regardless of gender (Table 2) or treatment type (Table 3) were determined. The esthetic evaluations of all panel groups were significantly better after treatment than before treatment. The orthodontists graded the situation before treatment as worse and the outcome as better than the laypersons, and the evaluation scores of the dental students fell between the two groups; these differences were statistically significant (paired samples *t*-test).

When the patients were divided into quartile groups according to dental esthetics satisfaction, those who were least satisfied with their dental esthetics tended to report oral effects more often, both before treatment and after follow-up, but most of these differences were not statistically significant (Table 4). A similar trend was seen in panel groups' evaluations about dental esthetics.

Changes in OHIP-14 severity and four dimensions were statistically significantly correlated with patient's esthetic satisfaction (Table 5). The changes in esthetic evaluations of laypersons, dental students, and orthodontists correlated strongly with each other but had only little correlation with patient's esthetic satisfaction or OHIP-14 dimensions.

DISCUSSION

Improvement in esthetics satisfaction due to orthodontic or orthodontic-surgical treatment seems to lead to improvement in oral health–related quality of life. Our finding of the positive change in oral health–related quality of life during the follow-up is in line with findings of earlier studies, which have also shown improvements in oral health–related and health-related quality of life after combined orthodontic-surgical treatment in adults.[20–24] However, studies have not yet provided much evidence showing the effect of conventional orthodontic treatment on quality of life in adults. Recently, a cross-sectional study reported that young Brazilian adults who had completed orthodontic treatment had significantly better oral health–related

Table 2. Satisfaction with Dental Esthetics According to the Visual Analogue Scale,[a] OHIP-14 severity score, OHIP-14 dimensions, and AC of the Panel Groups Before Treatment (T1) and at Follow-up (T2),[b] According to Gender [c]

	Men (n = 16)			Women (n = 36)			All (n = 52)		
	T1	T2	T2–T1	T1	T2	T2–T1	T1	T2	T2–T1
Esthetic satisfaction	57.7	21.3	−36.4	67.2	17.8	−49.4	64.3	18.9	−45.4
OHIP-14 severity	14.7	4.8	−9.9	19.9	4.7	−15.2	18.4	4.7	−13.7
Functional limitation	1.8	0.4	−1.4	1.8	0.9	−0.9	1.9	0.8	−1.1
Physical pain	4.4	2.2	−2.2	4.8	1.6	−3.2	4.6	1.8	−2.8
Psychological discomfort	2.9	0.8	−2.1	4.1	1.1	−3.0	3.8	1.0	−2.8
Physical disability	1.1	0.3	−0.8	2.0	0.3	−1.7	1.8	0.3	−1.5
Psychological disability	1.8	0.4	−1.4	3.1	0.6	−2.5	2.7	0.6	−2.2
Social disability	1.5	0.4	−1.1	2.2	0.2	−2.0	2.0	0.3	−1.7
Handicap	1.2	0.4	−0.8	1.9	0.3	−1.6	1.7	0.3	−1.4
AC rated by laypersons	5.9	3.4	−2.5	5.5	3.2	−2.3	5.6	3.2	−2.4
AC rated by dental students	5.9	2.9	−3.0	5.7	2.6	−3.1	5.8	2.7	−3.1
AC rated by orthodontists	6.6	2.7	−3.9	5.8	2.1	−3.7	6.0	2.3	−3.7

[a] Visual Analogue Scale = 0–100, in which 0 is the most satisfied.

[b] All changes in T2–T1 were statistically significant (paired samples *t*-test) with $P < .001$ among all patients and $P < .05$ among genders separately, except for change in physical disability among men ($P = .074$).

[c] OHIP-14 indicates 14-item Oral Health Impact Profile; AC, Aesthetic Component.

quality of life than subjects waiting for orthodontic treatment.[25] In the present study, there was no significant difference in oral health–related quality of life in orthodontic patients compared with orthodontic-surgical patients. This suggest that severe malocclusion with functional and esthetic disadvantages that is treatable with conventional orthodontics can be as harmful for patients as malocclusion requiring orthognathic surgery.

In the present study, the positive change in esthetic satisfaction was especially associated with the changes in psychological discomfort and psychological disability dimensions of the OHIP-14. The negative effect of esthetic impairment on the oral health–related quality of life measured with OHIP-14 has recently been found in adults in a cross-sectional study.[25] The association between OHIP-14 and self-perceived esthetic impairment was also found in an earlier cross-sectional study where severely compromised esthetics in adolescents was a better predictor of worse oral health–related quality of life than it was in orthodontic treatment–seeking adolescents.[9] The findings of these studies and the present study suggest that patients' experience of dental esthetics is actually in line with the OHIP-14 score, although there is no esthetic dimension as such in the instrument.

In this study, changes in the esthetic evaluations of the different panel groups were concordant, but the orthodontists evaluated esthetics before treatment as worse and after treatment as better than did the laypersons. Similarly, previous studies have discovered

Table 3. Satisfaction with Dental Esthetics According to the Visual Analogue Scale,[a] OHIP-14 Severity Score, OHIP-14 Dimensions, and AC of the Panel Groups Before Treatment (T1) and at Follow-up (T2),[b] According to Treatment[c]

	Orthodontic Treatment (n = 14)			Orthodontic-Surgical Treatment (n = 38)		
	T1	T2	T2–T1	T1	T2	T2–T1
Esthetic satisfaction	71.9	19.8	−52.1	61.4	18.5	−42.9
OHIP-14 severity	18.7	5.5	−13.2	18.3	4.4	−13.9
Functional limitation	2.4	0.7	−1.7	1.7	0.8	−0.9
Physical pain	4.6	1.9	−2.7	4.6	1.8	−2.9
Psychological discomfort	3.9	1.2	−2.7	3.7	0.9	−2.8
Physical disability	1.7	0.3	−1.4	1.8	0.3	−1.5
Psychological disability	2.4	0.7	−1.7	2.8	0.5	−2.3
Social disability	2.1	0.3	−1.8	1.9	0.2	−1.7
Handicap	1.6	0.3	−1.3	1.7	0.3	−1.4
AC rated by laypersons	5.4	3.5	−2.0	5.7	3.2	−2.5
AC rated by dental students	5.6	2.8	−2.8	5.8	2.7	−3.2
AC rated by orthodontists	5.6	2.3	−3.3	6.2	2.3	−3.8

[a] Visual Analogue Scale = 0–100, in which 0 is the most satisfied.

[b] All changes in T2–T1 among both groups were statistically significant (paired samples *t*-test) with $P < .05$.

[c] OHIP-14 indicates 14-item Oral Health Impact Profile; AC, Aesthetic Component.

Table 4. Mean Values of OHIP-14 Severity and Dimensions and AC According to Self-reported Esthetic Satisfaction (Visual Analogue Scale) Quartiles Before Treatment (T1) and at Follow-up (T2)[a]

	Esthetic Satisfaction T1			Esthetic Satisfaction T2		
	Q1	Q2, Q3	Q4	Q1	Q2, Q3	Q4
OHIP-14 severity	15.92*	16.27*	25.15*	3.38	3.92	7.54
Functional limitation	1.77	1.69	2.38	0.42	0.60	1.38
Physical pain	4.23	4.73	4.85	1.38	1.77	2.31
Psychological discomfort	2.85*	3.46*	5.31*	0.62	0.65	2.00
Physical disability	1.77	1.50	2.23	0.15	0.27	0.46
Psychological disability	1.85*	2.12*	4.77*	0.54	0.15	1.38
Social disability	1.85	1.54	3.00	0.15*	0.31*	0.23*
Handicap	1.62	1.23	2.62	0.08	0.31	0.54
AC rated by laypersons	4.87	5.70	6.10	2.89	3.04	3.94
AC rated by dental students	5.02	5.90	6.24	2.17	2.66	3.32
AC rated by orthodontists	4.94*	6.24*	6.62*	1.75	2.40	2.74

* Statistically significant differences between esthetic satisfaction quartiles (univariate general linear modeling).
[a] OHIP-14 indicates 14-item Oral Health Impact Profile; AC, Aesthetic Component.

that orthodontists' opinion of dental esthetics is more critical than that of laypersons.[19,26,27]

All panel groups graded the dental esthetics of the least satisfied patients worse than the dental appearance of the most satisfied patients before and after follow-up. Interestingly, the change in the grading of the laypersons and the orthodontists were positively correlated with oral health–related quality of life and esthetic satisfaction, whereas the grading of the students was not. These findings suggest that laypersons and orthodontists are able to estimate the kind of esthetic impairments that have the greatest effect on patients' psychological and social well-being. The reason why the change in students' evaluations did not correlate with the change in dental esthetics or oral health–related quality of life may be that students pay more attention to functional features and posterior occlusion and that patient-orientated understanding grows with clinical experience. According to the literature, age does not affect esthetic ratings, whereas the profession of the raters may play a role.[27–29]

The strength of this study is the long follow-up period, particularly as most studies in the field are cross-sectional. On the other hand, the size of the study group was not very large. The results of this study emphasize the concept that dental esthetics influence patients' oral health–related quality of life. Considering the things that are associated with quality of life, successful treatment outcome can be reached.

Table 5. Statistically Significant Correlations ($P < .05$) Between Changes in OHIP-14 Severity and its Dimensions and Esthetic Satisfaction (Visual Analogue Scale) and Aesthetic AC During the Follow-up Period[a]

	Esthetic Satisfaction	AC Rated by Laypersons	AC Rated by Orthodontists
OHIP-14 severity	.427		
Functional limitation			
Physical pain	.278		
Psychological discomfort	.482		
Physical disability			
Psychological disability	.461	.274	
Social disability	.325	.330	.289
Handicap			
AC rated by laypersons	.328		
AC rated by dental students		.832	.786
AC rated by orthodontists	.278	.797	

[a] OHIP-14 indicates 14-item Oral Health Impact Profile; AC, Aesthetic Component.

CONCLUSIONS

- Patients who were unsatisfied with dental esthetics were more likely to report more oral effects than those who were more satisfied.
- Improvement in esthetic satisfaction because of treatment of severe malocclusion improved the oral health–related quality of life and its dimensions of psychological discomfort and psychological disability.
- The change in dental esthetics evaluated by orthodontists and laypersons was associated with the change in social disability, and in the case of laypersons, was also associated with the change in psychological disability.

ACKNOWLEDGMENTS

The authors would like to thank Heli Liuski for statistical assistance. The study was supported by the Finnish Doctoral Program in Oral Sciences (FINDOS) and PlanmecaGroup.

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