Quality of life in patients with severe malocclusion before treatment

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SUMMARY The aim of this study was to determine the occurrence of oral health impacts among patients with severe malocclusions and dentofacial deformities before treatment. A further aim was to evaluate the effect of gender or the type of malocclusion on the oral impacts.

The study comprised 151 adult patients who were referred for orthodontic or surgical-orthodontic treatment to the Oral and Maxillofacial Department, Oulu University Hospital, Finland during the years 2001–2004. The study group consisted of 92 females and 59 males with a mean age of 35.5 years [standard deviation (SD) 11.5 years, range 16–64 years]. A self-completed Oral Health Impact Profile (OHIP)-14 questionnaire was used to measure oral impacts during a 1 month reference period. The prevalence, extent, and severity scores were calculated from the OHIP-14. Malocclusions were registered at clinical examination. The prevalence and mean extent and severity scores were compared among malocclusion groups and between genders. Statistical significance was evaluated with Mann–Whitney, Kruskall–Wallis, Chi-squared, and Fisher's exact tests.

The prevalence of oral impacts perceived fairly or very often was 70.2 per cent. The mean severity and extent scores were 17.2 (SD 10.5, range 0–45) and 2.5 (SD 2.6, range 0–10), respectively. Physical pain as well as psychological discomfort and disability were the most commonly perceived oral impacts. Being self-conscious, feeling tense, having difficulties in relaxing, and being somewhat irritable with other people were more common in females than in males. No differences were observed in oral impacts among the malocclusion groups.

Compared with a 'normal' population, patients with severe malocclusions report high levels of oral impacts. Females reported oral impacts more often than males.

Introduction

In dental research, more emphasis has traditionally been placed on clinician-driven outcome measures than on subjective patient-based measures, such as perceived functional status or psychological and social well-being (de Oliveira and Sheiham, 2003). The presence of malocclusion among other oral conditions represents only one dimension of the complex nature of oral health, and its clinical assessments have shown only a weak relationship with the perceived oral health of an individual (Locker 1988, 1992; Dini et al., 2003). While clinician-driven assessment is in some respects relevant, patient-based assessment provides more substantive information concerning the impacts of oral disorders because patients are considered to be the best persons to judge their own oral health-related quality of life (OHROoL; Cunningham and Hunt, 2001; de Oliveira and Sheiham, 2003).

Patients with severe malocclusions or dentofacial deformities may report various oral health impacts that affect their well-being in many ways. A combination of orthodontics and orthognathic surgery is, in many cases, a contemporary modality to treat these patients (Mayo *et al.*, 1991). Patients who seek orthognathic surgery often hope for a remarkable improvement in their physical well-being

and quality of life. Problems in the facial region in general, such as those of chewing, speaking, and periodontal disease, are common physical complaints in patients with severe malocclusions (Scott *et al.*, 1999). Improvement in aesthetics is a significant motivating factor to undergo orthodontic or orthognathic treatment, and some of these patients report concerns with body image and a low self-esteem or self-concept (Scott *et al.*, 1999). Temporomandibular joint problems and external motivation (such as the need to please others) are also common reasons to seek orthognathic treatment as well as a need to gain aesthetic or functional improvement (Cunningham *et al.*, 1995).

According to the review by Cunningham and Hunt (2001), only limited data are available on orthodontic patients' OHRQoL, and changes in quality of life have more often been studied in relation to orthognathic surgery than orthodontic treatment. One reason for this might be that patients undergoing orthognathic surgery have more severe problems and are thus more likely to benefit psychologically from improved facial and dental appearance and have a possible increase in self-confidence compared with patients treated only by orthodontics (Kiyak *et al.*, 1982, 1984; Cunningham *et al.*, 2000). O'Brien *et al.* (1998) stated that the majority of oral health measures developed in dentistry

are not applicable to orthodontic patients because most indications for orthodontic treatment are asymptomatic and related to aesthetics, as opposed to features such as pain or discomfort. For this reason, it is important to use self-report instruments to determine the patients' own views and feelings along with clinical outcome indicators (Cunningham and Hunt, 2001). These instruments should measure several dimensions of oral health as described by Locker (1988). Of the several measures of OHRQoL (Locker and Allen, 2007), one of the most commonly used is the Oral Health Impact Profile (OHIP) or its short form OHIP-14. The measure was based on the International Classification of Impairments, Disabilities, and Handicaps model of disease and its consequences (Locker, 1988). OHIP intends to assess the social impact of oral disorders, i.e. the dysfunction, discomfort, and disability caused by these conditions (Locker and Allen, 2007). It includes seven sub-scales: functional limitation, physical pain, physiological discomfort, physical disability, psychological disability, social disability, and handicap (Slade and Spencer, 1994). These aspects represent the hierarchy of impacts that can affect a patients' daily life and motivate them to seek orthodontic or orthognathic treatment.

The purpose of this study was to determine the occurrence of oral health impacts among patients with severe skeletal malocclusions who required orthodontic and/or orthognathic surgery. A further aim was to determine the effect of gender or type of malocclusion on oral impacts.

Subjects and methods

The study was approved by the Ethics Committee of the Northern Ostrobothnia Hospital District.

This was a secondary analysis of a data collected for a longitudinal study. The original study group comprised 249 adult patients, all of whom had severe, diagnosed skeletal malocclusions with considerable functional disorders and who were awaiting orthodontic or surgical-orthodontic treatment at the Oral and Maxillofacial Department at Oulu University Hospital. From these, 170 patients agreed to participate in this study, which included a questionnaire survey and clinical examination. The study was performed during the years 2001—2004, and the final study group comprised 92 (61 per cent) females and 59 (39 per cent) males. The mean age of the participants was 35.5 years (SD 11.5 years, range 16–64 years).

Data were collected using a standardized, self-completed questionnaire that included a Finnish translation of the OHIP-14 measure with a 1 month reference period and questions on age and gender. In the OHIP questionnaire, subjects were asked, for example, the following: 'Have you found it uncomfortable to eat any foods because of problems with your teeth, mouth, or dentures?' Five ordinal response categories were coded with the following values: 0, 'never'; 1, 'hardly ever'; 2, 'occasionally'; 3, 'fairly often'; and 4, 'very often'. The Finnish OHIP-14 has been found to be valid and reliable (Sutinen *et al.*, 2007; Lahti *et al.*, 2008).

The subjects were invited to a clinical examination and the questionnaire was given to them to fill in at home. A self-addressed envelope was provided for return of the questionnaire. The clinical examinations were conducted by one author (JR) who had undergone training in stomatognathic examinations before measurements. Overbite was defined as a vertical overlap of the right central incisor (mm) and overjet as a horizontal overlap of the right central incisor (mm). The bite was considered to be open when there was no occlusal contact (less than 0 mm), and a deep bite was diagnosed when the overbite was 4 mm or more. A reverse overjet was registered when the overjet was less than 0 mm (negative) and an increased overjet when the overjet was 4 mm or more. A posterior crossbite was registered when a canine or one or more upper premolars or molars occluded more palatally than the lower teeth (transverse discrepancy) and a scissor bite when a canine, premolar, or molar occluded entirely buccal to the lower arch teeth. A lateral open bite was registered when there was no occlusal contact of one or more upper and lower premolars or molars unilaterally or bilaterally. Sagittal (antero-posterior) molar relationship was graded using Angle's classification of the first permanent molars bilaterally. When the molar relationship was cusp to cusp, it was classified as an Angle Class II malocclusion. The oral measurements were performed using articulating paper (lateral scissor bite, crossbite, and open bite) and a periodontal probe (overjet and overbite).

Three variables were calculated from the OHIP-14. 'Prevalence' described the percentage of the participants reporting one or more items 'fairly often' or 'very often'. The 'severity' score (potential range 0-56) was calculated by summing ordinal values for the 14 items. Higher scores indicated poorer oral health and disability. The 'extent' score (potential range 0-14) was calculated by summing the number of items reported 'fairly often' or 'very often'. Those participants who had three or more missing OHIP items or three 'don't know' responses were omitted from analysis, and for participants with one or two missing OHIP items, the values were replaced with the sample mean for the group. Adequate clinical and questionnaire data were available for 151 subjects who were included in the analyses.

Distribution of the prevalence scores and the mean levels of the extent and severity scores between malocclusion groups and between genders were calculated. As the distributions of the extent and severity scores were not normally distributed, the statistical significances of the differences between the groups were evaluated using the non-parametric Mann–Whitney and Kruskall–Wallis tests. Chi-squared and Fisher's exact tests were used to evaluate the statistical significance of the differences in prevalence between the groups. Statistical analyses were performed using the Statistical Package for Social Sciences for Windows version 16.0 (SPSS Inc., Chicago, Illinois, USA).

Results

The prevalence of oral impacts in this study was 70.2 per cent. The mean severity score was 17.2 (SD 10.5, range 0-45) and the mean extent score 2.5 (SD 2.6, range 0-10). Distribution of the patients according to their malocclusions is presented in Table 1. Of the patients, 3.3 per cent (five) were using removable dentures.

The percentage distributions of OHIP-14 items reported occasionally, fairly often, or very often among participants are shown in Figure 1. Because of problems with their teeth,

 Table 1
 Distribution of the patients according to their malocclusions.

Malocclusion	Gender							
	All		Female		Male			
	n	%	п	%	п	%		
Class II	67	44	47	51	20	34		
Class III	25	17	11	12	14	24		
Lateral crossbite	53	35	30	33	23	39		
Lateral scissor bite	41	27	26	28	15	24		
Lateral open bite	35	23	18	20	17	29		
Open bite	15	10	11	12	4	7		
Deep bite (>4 mm)	81	54	47	51	34	58		

mouth, or dentures during the previous month, 67.6 per cent of the participants had felt pain or discomfort occasionally 36.4 per cent, fairly often 19.9 per cent, or very often 11.3 per cent. Over two-thirds (69.5 per cent) had found it uncomfortable to eat. Being self-conscious with their teeth, mouth, or dentures was reported by 69.5 per cent of the participants and more than a half (57.6 per cent) had occasionally (27.8 per cent), fairly often (15.2 per cent), or very often (14.6 per cent) felt tense. Nearly half of the participants (49 per cent) had felt that life in general was less satisfying, and 47 per cent had found it difficult to relax. Despite very severe impacts on their oral health, only 5.3 per cent of the subjects with a severe malocclusion or dentofacial deformity had been totally unable to function.

Females tended to report oral impacts (fairly often and very often responses) related to the teeth, mouth, or dentures more often than males (Table 2). The differences were statistically significant in the psychological and social dimensions of OHIP-14, i.e. females reported being self-conscious, feeling tense, difficulties in relaxing, and being a bit irritable with other people significantly more often than males.

When comparing prevalence rates among participants with different malocclusions, statistically significant differences were found in the lateral crossbite, open bite, reverse overjet, and Class II malocclusion groups. Participants with a lateral crossbite had more often been a bit embarrassed because of problems related to their teeth, mouth, or dentures (P = 0.039) when compared with patients with transverse normal dimensions of the lateral teeth. Subjects with an open bite reported discomfort more often



Figure 1 Percentage distribution of occasionally, fairly often, or very often responses to each Oral Health Impact Profile-14 items among patients with severe malocclusions before orthodontic or orthognathic treatment.

Table 2 Percentage of 'fairly often' or 'very often' Oral HealthImpact Profile-14 responses and the mean extent and severityscores among males and females.

DHIP items	Gender					
	All	Males	Females	Р		
Trouble pronouncing words	12	10	13	0.595		
Worsened sense of taste	5	3	7	0.483		
Painful aching	31	22	37	0.053		
Uncomfortable eating any foods	45	39	49	0.231		
Being self-conscious	40	25	50	0.003		
Felt tense	30	10	42	0.000		
Unsatisfactory diet	8	3	11	0.128		
Interrupting meals	4	0	7	0.082		
Difficult to relax	19	5	28	0.000		
Been a bit embarrassed	15	9	19	0.089		
Been a bit irritable	9	0	14	0.003		
Difficulty doing usual jobs	9	5	11	0.216		
Life in general less satisfying	23	19	25	0.362		
Totally unable to function	1	0	1	1.000		
Extent score	2.5	1.5	3.1	< 0.001		
Severity score	17.2	13.5	19.6	< 0.001		

P values between males and females for the item-wise values from chi-square tests and for the mean extent and severity scores from Mann–Whitney tests.

when eating any foods (P = 0.020) than those with a normal vertical overlap or deep bite. Patients with a reverse overjet reported being slightly more embarrassed (P = 0.022) and irritable with other people (P = 0.025) more often when compared with those with a positive overjet. Class II malocclusion subjects were less self-conscious in relation to their teeth, mouth, or dentures (P = 0.043) and had an unsatisfactory diet less often (P = 0.044) compared with those with a Class III or other malocclusion. There were no statistically significant differences in the OHIP-14 severity and extent scores between different malocclusion groups.

Discussion

Patients with skeletal malocclusions were found to have high levels of subjective oral impacts in all malocclusion groups. The total prevalence of reported oral impacts was greater than 70 per cent. This prevalence is seven times higher when compared with the results of the National Health 2000 survey among adult Finns aged 30 years and older (Lahti et al., 2008), and even higher when compared with 30 to 44 year olds. Differences in the severity and extent scores were also greater when compared with those reported in a nationally representative study among Finns (Lahti et al., 2008). The the severity score was four times higher and the extent score eight times higher in the present study. The severity scores were over two to four times higher and the extent scores five to seven times higher compared with those of dentate adults in the United Kingdom and Australia (Slade et al., 2005). Of the patients in this study, 3.3 per cent were using removable dentures. Among adults Finns, the difference in the severity scores between subjects wearing and not wearing removable dentures was 6.43 and 2.83, respectively (Lahti *et al.*, 2008). Thus, the use of dentures did not have a major contribution to the high severity reported by the patients in this investigation. In a recent study (Lee *et al.*, 2007), the mean severity OHIP-14 score of 152 Chinese patients with dentofacial deformities was 15.0, which is in agreement with the scores found in the present investigation. Despite the different reference periods used in Finland (1 month) and in the United Kingdom and Australia (12 months; Slade *et al.*, 2005), the mean severity and extent scores of OHIP-14 may be compared with a reasonable degree of confidence (Sutinen *et al.*, 2007).

However, there are some oral conditions that seem to have almost equally high oral impacts as severe malocclusions. For example, patients' OHRQoL is significantly aggravated by a dry mouth and xerostomia (Locker 2003; Thomson et al., 2006). In a study by Ikebe et al. (2007), elderly Japanese dry mouth and xerostomia patients had an almost similar severity score (16.8, SD 8.3) as the malocclusion patients in this study. It seems that a severe malocclusion usually impairs a patient's quality of life more than other oral conditions in the general population. For example, it was found that patients' quality of life was impaired by removable and full dentures but not to the same extent as by malocclusions (Lahti et al., 2008). Interestingly, malocclusion patients felt uncomfortable eating at least twice as often compared with those with dentures, and they suffered psychological disability related to their oral conditions nearly four times more often (Lahti et al., 2008). Painful biting was also more than three times more common in malocclusion patients compared with those with dentures.

All 14 OHIP items showed higher scores in malocclusion patients, and the profile of the item-wise responses was different from adult Finns (Lahti *et al.*, 2008). Reported physical pain and psychological discomfort occurred four times more often among patients with a severe malocclusion than among adult Finns. Psychological disability, such as difficulty relaxing, was reported nearly 10 times more often and being a bit embarrassed over seven times more often in malocclusion patients compared with Finnish adults. The participants of this study reported social disability, such as being a bit irritable or having difficulty doing their usual work, eight times more often and felt life in general to be less satisfying seven times more often than adult Finns. This may be a consequence of the multifactorial nature of the malocclusions and may possibly be the reason to seek treatment.

All participants in this study had been diagnosed with severe skeletal malocclusions with considerable functional disorders. Among the malocclusion groups, differences in oral health impacts were found in the lateral crossbite, open bite, reverse overjet, and Class II malocclusion groups. For example, patients with an open bite reported more often that they found it uncomfortable to eat, which could be explained by difficulty in biting. Patients with a reverse overjet felt more often a bit embarrassed and being a bit irritable with other people, possibly due to their facial appearance. Interestingly, participants with a Class II malocclusion were, in this study, found to be less often self-conscious in relation to their teeth, mouth, or dentures and had less often had an unsatisfactory diet compared with those with a Class III or other malocclusion. In this study, a number of subjects had combinations of different malocclusions. It is not always clear to resolve which of those malocclusions caused subjective oral impacts.

Females reported severe oral impacts more often when compared with males. This is in agreement with the study of McGrath and Bedi (2000) on gender variations in the social and psychological impacts of oral health. They found that compared with males, oral health had a greater impact on the quality of life of females, both positively and negatively. Those authors also stated that females perceived oral health as enhancing their quality of life, in particular their appearance, moods, and general well-being. On the other hand, in the Finnish National Health 2000 survey (Lahti *et al.*, 2008), there were only minor differences between females and males, a finding that differs from the results of the present study. The severity score of males was slightly higher (4.2 versus 13.5) than that of females (3.9 versus 19.6).

There are many reasons to seek orthodontic treatment. Aesthetic improvement of appearance is a significant motivating factor to undergo orthodontic or orthognathic treatment and is often related to the social well-being of the patient (Heldt et al., 1982). de Oliveira and Sheiham (2003) estimated that 80 per cent of orthodontic patients seek orthodontic treatment due to aesthetic rather than healthrelated or functional concerns, and Mayo et al. (1991) estimated that dental function was as significant as aesthetics, while temporomandibular disorders was an additional reason. Scott et al. (1999) stated that disorders such as severe pain and psychological, physiological, or social disabilities are compelling reasons to seek treatment. In this study, physical pain as well as psychological discomfort and disability were the most common oral impacts in malocclusion patients before treatment. In most cases, there was more than one reason to seek orthodontic treatment. However, the main aim when seeking treatment is to restore physiological, physical, social health, and well-being.

As this was a secondary analysis of a data collected for a longitudinal study, no power calculations were performed. Some significances in the differences between malocclusions may have been higher if the study group was larger. The OHIP-14 measure used was previously found to be reliable and valid (Sutinen *et al.*, 2007), but intra-examiner reliability was not assessed. However, all clinical measurements were performed by one trained author using same instrumentation.

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Conclusions

Patients with severe malocclusion or dentofacial deformities reported significantly higher levels of oral health impacts than the general population, and it seems that severe malocclusion impairs patients' quality of life more than many other oral conditions. Females tend to suffer more from oral impacts than males, but there were no specific malocclusions that caused discomfort or pain affecting a patient's well-being more often compared with others.

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