

Symptoms in the masticatory system and related quality of life in  
prospective orthognathic patients

Short title: Effect of symptoms on quality of life

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## **Abstract**

**Objective** The aim of this study was to investigate the relation between orthognathic patients' self-reported symptoms in the head and neck region on their quality of life (QoL). **Material and methods** Participants included consecutive patients (n=50) referred to assessment of orthognathic treatment need and voluntary first-year university students (n=29). All participants filled in the Orthognathic Quality of Life Questionnaire (OQLQ) and a structured diary created by the authors. The median values of Orthognathic Quality of Life (OQOL) sum and subscores, satisfaction with oral function and number of awakenings were compared between patients and controls. Further, correlations between the OQOL sum and subscores, satisfaction with oral function, and number of awakenings were analyzed. **Results** Patients reported significantly more symptoms ( $p=0.013$ ) and woke up significantly more often than controls ( $p=0.032$ ). Their OQOL sum scores were significantly higher (indicating a lower OQOL) ( $p=0.001$ ), and they were significantly less satisfied with their oral function than controls ( $p<0.001$ ). Among the awakened and not-rested patients, the most commonly reported symptoms were pain in the head and/or neck region and fatigue and/or stiffness in the jaws. **Conclusions** Experiences of pain and discomfort have a significant impact on patients' OQOL and well-being.

*Key words: Dentofacial deformity, orthognathic treatment, orthognathic quality of life*

## **Introduction**

In previous studies, 28–70% of patients with severe dentofacial deformities have pretreatment-reported symptoms in the head and neck region. These symptoms have included, e.g., pain, joint sounds and limitation in mouth opening [1-4]. It has also been found that temporomandibular dysfunction occurs more commonly in patients with dentofacial deformities than in their matched controls [5]; this finding could be related to the observation that a majority of orthognathic patients with pre- and postnormal occlusion use a unilateral chewing pattern [6,7]. However, self-reported symptoms are not directly associated with the severity of malocclusion [3].

In adults, severe dentofacial deformities often require combined orthodontic and surgical treatment [8]. In addition to social and appearance-related factors [9,10], these patients seek treatment for improvements in concrete functional problems, e.g., in eating and chewing and for pain relief [9,11]. In the literature, dentofacial deformities have also been suggested to cause severe consequences to patients' lives due to their impact on quality of life (QoL) [12-14]. Recent findings by Silvola et al. [15] have indeed indicated that QoL improves after treatment of severe malocclusion. The authors concluded that this improvement was due to the decrease in facial pain.

The aim of this study was to investigate the relation between orthognathic patients' self-reported symptoms and their quality of life.

## Subjects and Methods

Study subjects comprised consecutive patients (n=50, 13 males, 37 females, age range 18–61 years) referred to two university clinics for assessment of orthognathic treatment need. Among them, the most frequent preliminary diagnosis was mandibular retrognathia (74%); of these, 65% had a deep bite and 19% an open bite. Maxillary retrognathia was diagnosed in 14% of patients. Patients with cleft lip or palate, or syndromes affecting craniofacial anatomy, and those whose Finnish language skills did not allow them to complete the questionnaires were excluded from the study. The control group consisted of voluntary first-year university students (n=29, 28 females, 1 male, age range 19–49 years), with no or borderline need for orthodontic treatment.

Participants' quality of life (QoL) was assessed using the condition-specific Orthognathic Quality of Life Questionnaire (OQLQ). The questionnaire is developed especially for patients with severe dentofacial deformity and it consists of 22 items [16]. These items form four subscales: oral function, facial aesthetics, awareness of facial aesthetics, and social aspects of dentofacial deformity. Higher scores indicate lower OQOL. The questionnaire was completed with a semi-structured diary created by the authors. According to the instructions, it was filled in after waking up or at 8 a.m. [17].

The questions in the diary focus on respondents' satisfaction with oral function and on various self-perceived symptoms. In Question 1.a, respondents assess satisfaction with oral function (scale 1–7, from

extremely dissatisfied to extremely satisfied). If the patient selects one of the alternatives 1–3 (indicating dissatisfaction), Question 1.b further elucidates the reasons for dissatisfaction. In Question 2, the respondent is asked whether he/she had a good night's sleep, and in Question 3, whether he/she feels himself/herself rested in the morning. The questions with their response alternatives are presented in Table 1.

The study protocol was approved by the Ethics Review Committee of the Hospital District of South-West Finland and the Joint Municipal Authority of the Pirkanmaa Hospital District. Before the study, all participants signed an informed consent form.

### **Statistical Analyses**

Comparison of symptoms between patients and controls was done using the Chi square test. Differences between patients and controls according to the number of awakenings per night, the OQOL sum and subscores, and satisfaction with oral function were evaluated using median values, interquartile range ( $Q_1$ – $Q_3$ ), and the independent samples Mann-Whitney U test. P-values of less than 0.05 were interpreted as statistically significant. Associations between satisfaction with oral function, number of awakenings per night, and OQOL sum and subscores were evaluated using Spearman's correlation coefficients, separately among patients and controls. Values  $r$  of less than 0.3 were interpreted as weak, 0.3–0.5 as moderate, and  $r$  over 0.5 as strong correlations between the variables. All analyses were conducted using SPSS 23.0 (IBM SPSS Statistics, V22.0, Armonk, NY).

## Results

According to the OQLQ, patients' QoL was lower than that of controls; the difference was statistically significant in all other subscales except in social aspects of dentofacial deformity. Patients woke up more frequently and were less satisfied with their oral function than controls (Table 2).

Of patients, 48% and of controls, 24% reported various symptoms ( $p=0.013$ ). Those with symptoms had lower OQOL, reported more awakenings, and were less satisfied with oral function than those without symptoms (Table 3).

A total of 64% of patients and 55% of controls reported awakening during the night. Thirty-seven respondents (46% of patients and 48% of controls) reported that they did not feel rested in the morning. Those who reported feeling rested did not wake up as many times per night as those who felt not-rested in the morning. Rested participants had significantly lower OQOL sum score and social subscore than the not-rested subjects (Table 4).

The most frequently reported symptoms among the 'awakened and not-awakened' and 'rested and not-rested' were pain in the head and/or neck region, pain in the area of the jaw joint, jaws feeling tired or stiff and difficulties chewing (Table 5).

Among patients, there were significant correlations between satisfaction with oral function and OQOL sum and subscores (Table 6).

Among controls, satisfaction with oral function correlated significantly with OQOL sum score and function subscore (Table 7).

## **Discussion**

In this study, prospective orthognathic patients with dentofacial deformities reported significantly more symptoms from the head and neck region than controls, were less satisfied with their oral function, and had a significantly lower QoL than controls. These results are in line with earlier findings that orthognathic patients have a lower QoL than asymptomatic controls with a normal occlusion [13,14,18]. According to several studies, this inferiority can be improved through orthognathic treatment, possibly by reducing signs and symptoms of temporomandibular disorders [14,15,17-20].

In Finland, patients are referred for assessment of orthognathic treatment need mainly due to functional problems; esthetic reasons are not prioritized in publicly funded university clinics [15,20]. Thus, it was not surprising that the OQOL function subscore differed significantly from that of controls. However, although among patients this subscore and satisfaction with oral function correlated significantly, these variables correlated also among controls although the correlation was not as strong.

The current results indicate that patients woke up much more frequently than controls and did not feel as rested in the morning as controls. Similar symptoms have been reported in patients diagnosed with obstructive sleep apnea syndrome (OSAS) and mandibular retrognathia [21]. Since orthognathic surgery has been recommended as one of the

treatment options for OSAS, it is likely that some of the patients in the current study had been referred for assessment of orthognathic treatment need because of OSAS. However, it is worth noting that more than half of controls also reported awakening during the night. Interestingly, their share was eightfold in comparison with the results of a national survey among university students [22]. In this survey, only 5% of males and 7% of females reported nocturnal wake-ups and difficulties falling asleep.

Although among all respondents awakenings were associated with self-perceived symptoms, it is obvious that there were also other reasons. For example, results by Exelmans and Van der Bulck [23] indicated that 38–52% of adults receive text messages or phone calls in the night-time. Recent results by Levenson et al. [24] also revealed that frequent and long-lasting use of social media is strongly associated with increase in sleep disturbances. In their study, the researchers used the PROMIS® Sleep Disturbance assessment consisting of 27 statements, e.g., ‘I had a problem with my sleep’; ‘I had difficulty falling asleep’ and ‘I had trouble staying asleep’ [25].

The OQLQ is a valid, condition-specific questionnaire that has been used widely in analyses of orthognathic patients’ QoL [26]. It can also be assumed that data considering various self-perceived symptoms were reported reliably, because the diary was filled in immediately after awakening in the morning. However, as in other studies [27,28], the majority of respondents were females, which limits the generalizability of the results. Further studies are needed to elucidate the situation in larger samples that include both genders.



Another limitation in this study comes from the difference in both age and gender distribution between patients and controls. This article is part of an ongoing prospective study analyzing orthognathic patients' psychosocial well-being during the course of treatment. When planning the study, two prerequisites were set to the controls: First, they should have a normal occlusion with no or borderline need for orthodontic treatment. Secondly, they should be available in all data gathering points. In Finland, dental treatment including orthodontics, is offered free of charge to children and adolescents up to 18 years of age. Therefore, it was plausible that among first year students there should not be considerable unmet need for orthodontic treatment. Furthermore, because the completion of many university studies ideally takes approximately 5 years, first year university students were expected to also meet the requirement of availability. However, the results shall be interpreted with caution.

To conclude: In light of current results, experiences of pain and discomfort have a significant impact on patients' QoL, satisfaction with oral function and well-being.

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**Table 1.** The questions and their response alternatives in the diary filled in after waking up or at 8 a.m.

QUESTION	RESPONSE ALTERNATIVES
<b>1. a</b> How satisfied are you right now with your oral function?	(1) extremely dissatisfied (2) dissatisfied (3) rather dissatisfied (4) neither dissatisfied nor satisfied (5) rather satisfied (6) satisfied (7) extremely satisfied
<b>If you are dissatisfied with the function</b> (i.e. you selected one of the response alternatives 1–3), please assess,	
<b>1. b</b> which of the reasons are responsible for your dissatisfaction	(1) I have pain in my head and/or neck region (2) I have pain in the area of my jaw joint (3) I hear sounds like clicking or crepitation from my jaw joint (4) My jaws feel tired or stiff (5) I have difficulties in opening my mouth (6) I suffer from teeth clenching or grinding (7) I have difficulties in chewing (8) Some other problem, please explain
<b>2.</b> Did you wake up last night	(1) No, I did not (2) Yes, I woke up ____ times
<b>3.</b> Did you feel yourself rested in the morning	(1) Yes, I did (2) No, I did not

**Table 2.** Median ( $Q_1$ – $Q_3$ ) and p-values for OQOL sum and subscores, number of awakenings per night and satisfaction with oral function, separately for patients (n=50) and controls (n=29).

Variable	Patients	Controls	p
OQOL Sum	29 (16–47)	13 (9–22)	<b>0.001</b>
OQOL Social	7 (1–13)	4 (2–6)	0.396
OQOL Facial	8 (5–14)	5 (2–10)	<b>0.014</b>
OQOL Function	10 (6–15)	3 (1–4)	< <b>0.001</b>
OQOL Dentofacial	5 (2–8)	3 (0–6)	<b>0.020</b>
Number of Awakenings	2 (0–3)	1 (0–2)	<b>0.032</b>
Satisfaction with Function	3 (2–4)	6 (4–6)	< <b>0.001</b>

For OQOL, higher scores indicate lower quality of life.

P-values of less than 0.05 bold.

**Table 3.** Median (Q<sub>1</sub>–Q<sub>3</sub>) and p-values for number of OQOL sum scores, awakenings per night and satisfaction with oral function according to respondents with symptoms (n=31, 24 patients, 7 controls) and without symptoms (n=43, 21 patients, 22 controls).

Variable	Symptoms	No symptoms	p-values
OQOL Sum	38 (22–57)	14 (9–29)	< <b>0.001</b>
Number of Awakenings	2 (1–3)	1 (0–2)	<b>0.006</b>
Satisfaction with Function	3 (2–3)	6 (4–6)	< <b>0.001</b>

For OQOL, higher scores indicate lower quality of life.

P-values of less than 0.05 bold.

**Table 4.** Median (Q<sub>1</sub>–Q<sub>3</sub>) and p-values OQOL sum and subscores, number of awakenings and satisfaction with oral function among the not-rested (n=37, 23 patients, 14 controls) and rested (n=36, 21 patients, 15 controls).

Variable	Not Rested	Rested	p
OQOL Sum	28 (14–53)	17 (8–35)	<b>0.033</b>
OQOL Social	6 (3–16)	4 (0–8)	<b>0.038</b>
OQOL Facial	9 (5–14)	6 (3–9)	0.058
OQOL Function	8 (4–14)	5 (2–10)	0.053
OQOL Dentofacial	5 (1–8)	4 (1–6)	0.142
Number of Awakenings	2 (1–3)	1 (0–2)	<b>0.003</b>
Satisfaction with Function	3 (2–6)	5 (4–6)	<b>0.011</b>

For OQOL, higher scores indicate lower quality of life.

P-values of less than 0.05 bold.

**Table 5.** Main symptoms reported by patients and controls (%) separately among the awakened and not-awakened and the rested and not-rested.

		Pain in the head and/or neck region	Pain in the area of jaw joint	Jaws feel tired or stiff	Difficulties chewing
Awakened	Patients (n=32)	50	28	41	38
	Controls (n=16)	6	6	25	0
Not-awakened	Patients (n=32)	17	8	17	8
	Controls (n=16)	0	0	0	0
Not-rested	Patients (n=32)	63	33	50	42
	Controls (n=16)	7	7	21	0
Rested	Patients (n=32)	15	10	15	15
	Controls (n=16)	0	0	7	0

**Table 6.** Correlation table (Spearman's correlation values) for patients

(n=50) regarding OQOL sum and subscores, satisfaction with oral function, and number of awakenings.

Variable	Satisfaction with Function	Number of Awakenings
OQOL Sum	-0.538***	0.122
OQOL Social	-0.331*	0.109
OQOL Facial	-0.507***	-0.040
OQOL Function	-0.624***	0.231
OQOL Dentofacial	-0.502***	0.144
Satisfaction with Function		-0.221

\*, p<0.05; \*\*\*, p<0.001

**Table 7.** Correlation table (Spearman's correlation values) for controls

(n=29) regarding OQOL sum and subscores, satisfaction with occlusal

function, and number of awakenings.

Variable	Satisfaction with Function	Number of Awakenings
OQOL Sum	-0.455*	0.375
OQOL Social	-0.146	0.104
OQOL Facial	-0.350	0.206
OQOL Function	-0.418*	0.327
OQOL Dentofacial	-0.341	0.231
Satisfaction with Function		-0.345

\*, p<0.05