

QUALITY OF LIFE ASSESSMENT IN PATIENTS WITH MALOCCLUSION UNDERGOING ORTHODONTIC AND ORTHOGNATHIC TREATMENT

OCENA KAKOVOSTI ŽIVLJENJA PRI PACIENTIH Z MALOKLUZIJO, PRI KATERIH SE IZVAJA ORTODONTSKO IN ORTOGNATSKO ZDRAVLJENJE

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ABSTRACT

Introduction: The objective of this study was to assess pre-treatment quality of life and the relevant clinical variables in adult patients with malocclusion in order to improve orthodontic treatment strategies.

Keywords:
malocclusions,
quality of life,
orthodontic therapy,
orthognathic therapy

Methods: The study was conducted in 240 consecutive adult patients with malocclusions divided into two groups: patients for whom an orthodontic treatment plan was considered, and patients for whom an orthognathic treatment plan was selected. Patients were examined between December 2015 and February 2017, at the School of Dental Medicine, University of Belgrade. Malocclusion severity was recorded using the Peer Assessment Rating index pre-treatment score. Skeletal malocclusion parameters were measured using lateral cephalometric radiographs. Quality of life was assessed by means of a generic questionnaire (Medical Outcomes Study Short Form-36 (SF-36)), and the disease-specific Orthognathic Quality of Life Questionnaire (OQLQ).

Results: There were significant differences in the mean values of the OQLQ domain scores between orthodontic and orthognathic patients. Patients for whom orthodontic treatment was planned had statistically significantly lower scores in comparison to those for whom orthognathic treatment was planned. This was the case in all OQLQ domains except for "Awareness of facial deformity". Statistically significant correlations ($p < 0.05$) were presented between OQLQ scores and following demographic and clinical variables: gender, age, malocclusion severity, maxillary and mandibular sagittal, maxillary vertical, and lower incisor positions, intermaxillary angle, and the Beck Depression Inventory and Beck Anxiety Inventory levels. The independent predictors for the planning of orthodontic and orthognathic treatment in patients with malocclusion were two OQLQ domains, "Facial aesthetics" and "Awareness of facial deformity", as well as total OQLQ score, after adjustment for demographic characteristics, skeletal parameters, anxiety and depression.

Conclusions: Our findings suggest that patients for whom orthodontic treatment was planned demonstrated better quality of life according to the OQLQ scores in comparison to those for whom orthognathic therapy was planned.

IZVLEČEK

Uvod: Cilj te študije je bil oceniti kakovost življenja pred zdravljenjem in zadevne klinične spremenljivke pri odraslih pacientih z malokluzijo, da bi lahko izboljšali strategije zdravljenja.

Ključne besede:
malokluzije, kakovost življenja, ortodontsko zdravljenje, ortognatsko zdravljenje

Metode: V študijo smo vključili 240 zaporednih odraslih pacientov z malokluzijo, ki smo jih razdelili na dve skupini: v prvi so bili pacienti, pri katerih je bil predviden načrt ortodontskega zdravljenja, pri drugi pa je bil izbran načrt ortognatskega zdravljenja. Bolnike smo pregledovali med decembrom 2015 in februarjem 2017 na Stomatološki fakulteti Univerze v Beogradu. Resnost malokluzije smo evidentirali z rezultatom pred zdravljenjem po indeksu PAR (Peer Assessment Rating). Parametre skeletne malokluzije smo izmerili na lateralnih cefalometričnih radiogramih. Kakovost življenja smo ocenili s splošnim vprašalnikom v kratki obliki s 36 izjavami glede medicinskih izidov (SF-36), in za bolezen specifičnim vprašalnikom o ortognatski kakovosti življenja (OQLQ).

Rezultati: Pri povprečnih vrednostih rezultatov vprašalnika OQLQ je med ortodontskimi in ortognatskimi pacienti prišlo do pomembnih razlik. Pacienti, predvideni za ortodontsko zdravljenje, so imeli v primerjavi s pacienti, predvidenimi za ortognatsko zdravljenje, statistično pomembno nižje rezultate pri vseh elementih vprašalnika OQLQ, razen pri zavedanju obrazne deformacije. Pokazale so se statistično pomembne korelacije ($p < 0,05$) med rezultati OQLQ ter naslednjimi demografskimi in kliničnimi spremenljivkami: spol, starost, resnost malokluzije, sagitalni položaj maksile in mandibule, vertikalni položaj maksile, položaj spodnjih sekalcev, intermaksilarni kot, rezultati po Beckovi lestvici depresivnosti in Beckovi lestvici tesnobe. Neodvisni prediktorji za načrtovanje ortodontskega in ortognatskega zdravljenja pri pacientih z malokluzijo so bili dva elementa vprašalnika OQLQ - obrazna estetika in zavedanje obrazne deformacije, ter skupni rezultat OQLQ, in sicer po prilagoditvi glede na demografske značilnosti, skeletne parametre, tesnobo in depresijo.

Sklep: Naše ugotovitve kažejo, da je bila kakovost življenja pri pacientih, predvidenih za ortodontsko zdravljenje, glede na rezultate OQLQ boljše kot pri pacientih, predvidenih za ortognatsko zdravljenje.

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1 INTRODUCTION

Malocclusion is a multifactorial dentofacial disorder which occurs in the majority of persons in population (1). Although it is not considered a disease, malocclusion can significantly affect orofacial aesthetics, oral functions and oral health (2). Disturbed aesthetics and function in this region can lead to psychological and social problems and, particularly in the domain of psychosocial adaptation, may potentially have an adverse effect on quality of life (3). Despite Angle's widely accepted qualitative classification of malocclusion (4), quantitative occlusal indices such as the Index of Orthodontic Treatment Need (IOTN) (5) and the Peer Assessment Rating Index (PAR index) (6) were created in order to provide easy, uniform and reproducible malocclusion recordings. Those qualitative and quantitative objective measures are important for malocclusion diagnostic procedures, therapeutic decisions and malocclusion epidemiology. However, when considering the necessity of orthodontic treatment and patient treatment outcome satisfaction, Patient-Centred Measures (PCM) are also recommended (7). Additionally, Health-Related Quality of Life (HRQoL) and Oral Health-Related Quality of Life (OHRQoL) measures can give great insight into the impact of health, disease, care and treatment (8). Specific instruments sensitive enough to detect changes in the quality of life in persons with malocclusion have therefore been created; these include the Orthognathic Quality of Life Questionnaire (OQLQ) (9, 10) and the Malocclusion Impact Questionnaire (MIQ) (11-13).

Studies related to malocclusion and quality of life have played a significant role in scientific literature in recent years (14-17). It has been consistently demonstrated that malocclusions have harmful effects on OHRQoL, predominantly in the domains of emotional and social well-being. Additionally, the routine clinical application of quality of life measures in orthodontics is still limited. However, findings from studies on quality of life may have a potentially significant role in improving the quality of orthodontic care (3, 18). Since the quality of life concept is multidimensional and dynamic, many factors influence malocclusion-related quality of life, such as: the demographic, cultural and social characteristics of the observed population, the timing and frequency of measurement, and the appropriate choice of measuring instruments (19). Finally, additional factors that also influence malocclusion-related quality of life are anxiety, depression and self-esteem (20-22).

The objective of this study was to assess pre-treatment quality of life and the relevant clinical variables in adult patients with malocclusion in order to potentially improve orthodontic treatment strategies.

2 METHODS

2.1 Study Design

This is a cross-sectional study comprising all consecutive patients from the Department of Orthodontics, School of Dental Medicine, University of Belgrade, from December 2015 to February 2017.

2.2. Observed Population

In this study, the group consisted of 240 participants, all young adults who presented consecutively at the Department of Orthodontics, School of Dental Medicine, University of Belgrade and expressed a personal desire to have their malocclusion corrected.

The inclusion criteria were the presence of malocclusion, a personal desire for orthodontic treatment, age 17+ years and signed informed consent form. Patients who had already had orthodontic treatment, and patients with craniofacial deformities (e.g. cleft lip, cleft palate and syndromes) were excluded. Before enrolment, all the subjects provided signed informed consent. The study was approved by the Ethics Committee of the School of Dental Medicine, University of Belgrade (No 1/2016).

Standard orthodontic diagnostic procedures were performed and diagnosis established for all participants. The diagnostic procedure included: interview, medical and dental history, clinical evaluations of oral health, jaw and occlusal function, facial and dental appearance, and an analysis of diagnostic records.

2.3. Study Instrument

Malocclusion severity was measured using the pre-treatment Peer Assessment Rating index (PAR index). This index was created for assessing the outcome of orthodontic treatment, and has also been used for assessing and recording malocclusion severity (6). More severe malocclusion was given a higher single PAR pre-treatment score. In this study, the PAR index was assessed by one senior dentist (specialist in orthodontics) trained in PAR index measurement. The components of PAR index have to be weighted. In this study, the British weighting values were used.

Skeletal malocclusion components were assessed by tracing and measuring angular and linear skeletal relations using lateral cephalometric radiographs. The manual measuring method was performed by a senior dentist/ specialist in orthodontics. In order to analyse the jaw anteroposterior relationship, the jaw vertical relationship, the rotation of the jaw bases, incisor position, type of facial growth and the dimension of the jaw bases, angles and linear parameters (anterior face height N-Me, posterior face height S-Go, anterior cranial base length Se-N, upper and lower jaw base length, mandibular corpus length and

mandibular ramus length) were measured and recorded. The cephalometric measurements were interpreted and the values of all skeletal measures defined in accordance with the average values of the corresponding parameters (23) (Table 1).

Prior to discussing treatment options, participants completed five self-reporting Serbian versions of the following questionnaires: Medical Outcomes Study Short Form-36 (SF-36) (24), Orthognathic Quality Of Life (OQLQ) (9, 10, 25), Beck Depression Inventory (BDI) (26), Beck Anxiety Inventory (BAI) (27), and Rosenberg Self-Esteem Scale (RSES) (28). Demographic and clinical data was collected by the investigator.

2.4 Observed Outcome

After diagnostic procedures and detailed discussion with patients had been performed, all participants were divided in two groups in accordance with the treatment options: patients for whom an orthodontic treatment plan was considered, and patients for whom an orthognathic treatment plan was selected.

2.5 Explanatory Factors

The variables that were analysed as potential explanatory factors responsible for the variability of observed outcomes were the different domains of the OQLQ ("Social aspects of deformity", "Facial aesthetics", "Oral function", "Awareness of facial deformity") and the total OQLQ.

Table 1. List of malocclusion skeletal parameters analysed in the study of quality of life assessment in patients with malocclusion undergoing orthodontic and orthognathic treatment in Serbia.

Parameters*	Author*	<	= Average value	>
ANB (2-4)°	Stainer	skeletal class III	skeletal class I	skeletal class II
SNA 82°	Stainer	maxillary retrognathism	average sagittal position	maxillary prognathism
SNB 80°	Stainer	mandibular retrognathism	average sagittal position	mandibular prognathism
SN/SpP 12°	Stainer	maxillary ante inclination	maxillary normal inclination	maxillary retro inclination
SN/MP 32°	Stainer	mandibular forward rotation	mandibular neutral rotation	mandibular backward rotation
SpP/MP 20°	Szwarc	skeletal deep bite	normal bite	skeletal open bite
Bjork 396°	Bjork	horizontal face growth	neutral face growth	vertical face growth
Jarebach (62-65)%	Jarebach	vertical face growth	neutral face growth	horizontal face growth
I/SpP (65-75)°	Szwarc	↑incisors labial inclination	↑incisors normal inclination	↑incisors oral inclination
i/MP (87-93)°	Szwarc	↓incisors lab. inclination	↓incisors normal inclination	↓incisor oral inclination
C max (7/10 NSe)	Szwarc	short maxillary corpus	average maxillary corpus	long maxillary corpus
C mand (21/20 NSe)	Szwarc	short mandibular corpus	average mandibular corpus	long mandibular corpus
C ram (5/7 Cmnd)	Szwarc	short mandibular ramus	average mandibular ramus	long mandibular ramus

*Source: Ozerovic, 1985 (23); ANB - sagittal angle between upper and lower jaw; SNA - sagittal angle between base of skull and upper jaw; SNB - sagittal angle between base of skull and lower jaw; SN/SpP - vertical angle between base of skull and upper jaw; SN/MP - vertical angle between base of skull and lower jaw; SpP/MP - vertical angle between upper and lower jaw; Bjork - type of face growth according to skeletal angles; Jarebach - type of face growth according to vertical face proportions; I/SpP - sagittal inclination of upper incisors; i/MP - sagittal inclination of lower incisors; C max - length of maxillary base; C mand - length of mandibular base; C ram - length of mandibular ramus

2.6 Confounding Factors

Confounding factors are variables that influence both the dependent variable and independent variable, causing a false association. In our investigation, demographic characteristics, skeletal parameters, anxiety and depression were considered as potential confounding factors.

2.7 Methods of Analysis

For the comparison of categorical variables, the χ^2 test was used. An analysis of variance (ANOVA) was performed for continuous variables. Correlation analysis examined the relationship between two variables, and Pearson's correlation test (for continuous variables) and Spearman's test (for categorical variables) were used, depending on the data distribution.

The predictive value of the baseline scores of the different domains of OQLQ (independent variables) for different treatment options (dependent variable: treatment - orthodontic or orthognathic), adjusted by demographic characteristics, skeletal parameters, anxiety and

depression, were assessed by using logistic regression analyses. In order to assess the reliability of the generic (SF-36) and specific (OQLQ) questionnaires, we performed additional logistic regression analyses in the same manner. We used odds ratio (OR) with corresponding 95% confidence intervals (CI) as a measure of effect, and a p-value of 0.05 was considered as statistically significant.

3 RESULTS

Out of 240 patients who met the inclusion criteria, 104 (43.3%) were male and 136 (56.7%) female, with an average age of 21 years (range 17-39).

The mean pre-treatment PAR index, as a measure of malocclusion severity, was 32.2 ± 11.68 (range 5-57). The majority of participants (132, 55%) had PAR index pre-treatment values of between 30 and 49. Table 2 shows the mean values of malocclusion severity measured using the PAR index in the groups with different treatment options.

Table 2. Clinical variables in the study of quality of life assessment in patients with malocclusion undergoing orthodontic and orthognathic treatment in Serbia.

Variables	n	Mean \pm SD / Median \pm SD	Range
Age	236	21.0 \pm 4.4	17-39
PAR index pre-treatment score			
All	240	32.2 \pm 11.7	5-57
Orthodontic treatment	82	22.3 \pm 9.1	5-50
Orthognathic treatment	92	39.4 \pm 9.3	12-57
Refused orthognathic treatment	66	34.5 \pm 8.7	17-55
Cephalometric parameters			
\angle ANB	230	1 $^\circ$ \pm 4.60	-11.0-13.0
\angle SpP/MP	230	25.52 $^\circ$ \pm 7.28	3.0-43.0
\angle SNA	230	80.45 $^\circ$ \pm 4.45	68.0-98.0
\angle SNB	230	79.61 $^\circ$ \pm 5.95	62.0-100.0
\angle SN/SpP	230	9.05 $^\circ$ \pm 3.40	0.0-20.0
\angle SN/MP	230	34.48 $^\circ$ \pm 7.67	11.5-56.0
\angle I/SpP	231	65.09 $^\circ$ \pm 8.53	39.0-90.0
\angle i/MP	231	95.6 $^\circ$ \pm 6.01	67.0-98.9
Bjork	229	394.0 $^\circ$ \pm 7.97	371.0-417.0
Jarebach	229	64.7 $\%$ \pm 6.08	45.0-85.0
Maxillary. Corpus Length. Discrepancy	230	0.0mm \pm 3.52	-12.0-14.0
Mandibular Corpus. Length. Discrepancy	230	2.9mm \pm 5.97	-35.0-18.6
Mandibular Ram. Length. Discrepancy.	230	5.8mm \pm 5.75	-15.0-25.5

ANB - sagittal angle between upper and lower jaw; SNA - sagittal angle between base of skull and upper jaw; SNB - sagittal angle between base of skull and lower jaw; SN/SpP - vertical angle between base of skull and upper jaw; SN/MP - vertical angle between base of skull and lower jaw; SpP/MP - vertical angle between upper and lower jaw; Bjork - type of face growth according to skeletal angles; Jarebach - type of face growth according to vertical face proportions; I/SpP - sagittal inclination of upper incisors; i/MP - sagittal inclination of lower incisors;

The mean values of all cephalometric variables are presented in Table 2 and the frequencies of various malocclusion skeletal variables in Table 3. Of the group

in total, orthodontic treatment was planned for 82 participants (34.2%) and orthognathic treatment for 158 participants (65.8%).

Table 3. Distribution of patients according to the pre-treatment values of various clinical and cephalometric parameters in the study of quality of life assessment in patients with malocclusion undergoing orthodontic and orthognathic treatment in Serbia.

		n	%
PAR n=240	(0-9)	7	2.9%
	(10-29)	90	37.5%
	(30-49)	132	55.0%
	(>50)	11	4.6%
∠ ANB n=230	class III skeletal malocclusion	126	54.8%
	class I skeletal malocclusion	51	22.2%
	class II skeletal malocclusion	53	23.0%
∠ pP/MP n=230	low intermaxillary angle	42	17.5%
	average intermaxillary angle	68	29.6%
	high intermaxillary angle	120	52.2%
∠ SNA n=230	maxillary retrognathism	124	53.9%
	maxillary orthognathism	23	10.0%
	maxillary prognathism	83	36.1%
∠ SNB n=230	mandibular retrognathism	114	49.5%
	mandibular orthognathism	19	8.3%
	mandibular prognathism	97	42.2%
∠ SN/SpP n=230	maxillary anteinclination	176	76.5%
	maxillary normal inclination	26	11.3%
	maxillary retroinclination	28	12.2%
∠ SN/MP n=230	mandibular forward rotation	81	35.2%
	mandibular neutral rotation	16	7.0%
	mandibular backward rotation	133	57.8%
∠ I/SpP n=230	upper incisors labial inclination	129	55.8%
	upper incisors normal inclination	77	33.4%
	upper incisors oral inclination	25	10.8%
∠ i/MP n=230	lower incisors labial inclination	89	38.5%
	lower incisors normal inclination	34	14.7%
	lower incisors oral inclination	108	46.8%
Maxillary corpus length	short	87	37.9%
	normal	78	34.3%
	long	64	27.8%
Mandibular corpus length	short	47	20.5%
	normal	40	17.8%
	long	142	61.7%
Mandibular ramus length	short	26	11.3%
	normal	20	8.7%
	long	184	80.0%
Facial growth	vertical facial growth	88	38.5%
	neutral facial growth	39	17.0%
	horizontal facial growth	102	44.5%

PAR - Peer Assessment Rating Index; ANB - sagittal angle between upper and lower jaw; SNA - sagittal angle between base of skull and upper jaw; SNB - sagittal angle between base of skull and lower jaw; SN/SpP - vertical angle between base of skull and upper jaw; SN/MP - vertical angle between base of skull and lower jaw; SpP/MP - vertical angle between upper and lower jaw; Bjork - type of face growth according to skeletal angles; Jarebach - type of face growth according to vertical face proportions; I/SpP - sagittal inclination of upper incisors; i/MP - sagittal inclination of lower incisors;

An analysis of SF-36 scores showed that the Composite Score of Physical Functioning (85.9 ± 16.5) was higher than the Composite Score of Mental Functioning (75.7 ± 21.8). The two composite scores, physical and mental functioning, are derived from a weighted combination of the scale scores. Physical Health Composite includes Physical Functioning, Role Physical, Bodily Pain and General Health scale scores. Mental Health Composite comprises Vitality, Social Functioning, Role Emotional, and Mental Health scale scores. The worst score was for the domain of Vitality (66.5 ± 21.1), and the highest score and the best quality of life was noticed in the domain of Physical Functioning (94.8 ± 15.5) (Figure 1). Quality of life was subsequently assessed using OQLQ, which showed the highest mean score in the domain of the “Social aspects of deformity”, and the lowest score in the domain of “Awareness of deformity” (Figure 2).

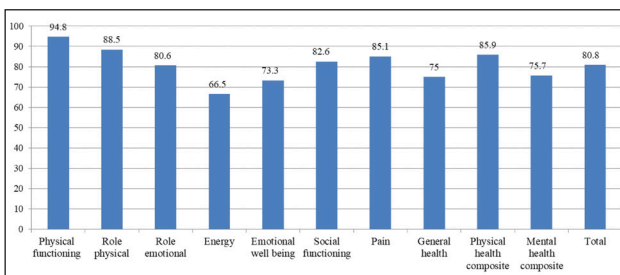


Figure 1. Domain, composite and total scores of SF-36 questionnaire.

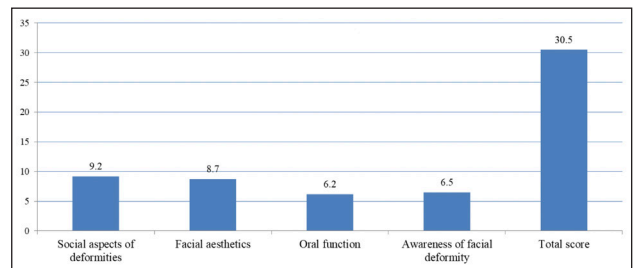


Figure 2. Domain and total scores of OQLQ questionnaire.

BDI scores showed that of the 240 participants, eight (3.3%) had moderate symptoms of depression and only two (0.8%) had severe depression. The mean BDI score in our group was 5.0 ± 6.9 (range 0-63). The BAI scores showed that 75% participants did not have symptoms of anxiety. Moderate and severe anxiety was detected in the same proportion of patients (12.5%). The mean value of the BAI score in the cohort was 6.2 ± 7.7 (range 0-41). The level of self-esteem as measured by the Rosenberg scale showed a mean value of 28.3 ± 6.3 (range 0-39).

Table 4 presents the results of the correlation analyses between the OQLQ domain score and the different demographic and clinical variables. Statistically significant positive correlations were demonstrated between all OQLQ domains scores and total score and gender and malocclusion severity. Additionally, a statistically significant positive correlation ($p < 0.01$) was detected between all OQLQ domains and total scores and BDI and BAI, and OQLQ.

Table 4. Correlation analyses between OQLQ scores and clinical variables in the study of quality of life assessment in patients with malocclusion undergoing orthodontic and orthognathic treatment in Serbia.

OQLQ domains	Gender	Sagittal maxillary position	Sagittal mandibular position	Maxillary rotation	B angle	Lower incisor inclination	Therapeutic option	PAR score	Age	BDI score	BAI score	
Social aspects of deformity	ρ	0.135	-0.142	-0.142	-0.144	-0.168	0.028	0.174	r 0.235	-0.083	0.401	0.305
	p	0.037	0.105	0.032	0.029	0.011	0.668	0.007	p 0.001	0.204	0.001	0.001
Facial aesthetics	ρ	0.232	-0.14	-0.116	-0.069	-0.084	0.029	0.251	r 0.142	-0.026	0.371	0.288
	p	0.001	10.033	0.078	0.301	0.205	0.028	0.001	P 0.028	0.688	0.001	0.001
Oral function	ρ	0.189	-0.009	-0.080	-0.059	-0.039	0.138	0.218	r 0.142	0.158	0.238	0.207
	p	0.003	0.898	0.226	0.377	0.554	0.037	0.001	p 0.028	0.015	0.001	0.001
Awareness of facial deformity	ρ	0.236	-0.226	-0.083	-0.104	-0.127	-0.123	0.100	r -0.006	-0.063	0.376	0.391
	p	0.001	0.001	0.211	0.115	0.055	0.062	0.122	p 0.925	0.335	0.001	0.001
Total	ρ	0.236	-0.146	-0.129	-0.124	-0.142	0.023	0.125	r 0.179	-0.22	0.434	0.363
	p	0.001	0.027	0.050	0.061	0.031	0.723	0.001	P 0.005	0.739	0.001	0.001

According to the findings presented in Table 5, a statistically significant difference between the different treatment options was detected for the total OQLQ score and all its domains, except for the “Awareness of facial deformity” domain. Patients for whom orthodontic treatment was planned had statistically significantly lower scores in comparison to those for whom orthognathic treatment was planned. This was the case in all OQLQ domains except for “Awareness of facial deformity”. There was no statistically significant difference in mean OQLQ domains and total score between the orthognathic group and those who had been refused orthognathic treatment (data not shown).

Table 5. OQLQ scores according to the various treatment options in the study of quality of life assessment in patients with malocclusion undergoing orthodontic and orthognathic treatment in Serbia.

OQLQ domains	Orthodontic treatment	Orthognathic treatment	p
	mean value ± SD	mean value ± SD	
Social aspects of deformity	6.5±7.7	10.6±9.8	0.001
Facial aesthetics	6.6±5.1	9.7±6.1	<0.001
Oral function	4.7±4.7	6.2±4.9	0.003
Awareness of facial deformity	6.1±4.8	6.7±4.8	0.360
Total	23.9±18.0	33.9±21.3	<0.001

According to the results presented in Table 6, the independent predictors for the planning of orthodontic and orthognathic treatment in patients with malocclusion were two OQLQ domains, “Facial aesthetics” and “Awareness of facial deformity”, as well as total OQLQ score, after adjustment for demographic characteristics, skeletal parameters, anxiety and depression. The same analyses were performed for the SF-36 domains. None was found to be predictive (data not shown).

Table 6. Predictive value of OQLQ domains for two different treatment options in the study of quality of life assessment in patients with malocclusion undergoing orthodontic and orthognathic treatment in Serbia.

OQLQ domains	OR*	95%CI	p
Social aspects of deformity	1.07	1.00-1.14	0.051
Facial aesthetics	1.15	1.03-1.28	0.013
Oral function	1.08	0.97-1.21	0.160
Awareness of facial deformity	1.14	1.03-1.32	0.046
Total OQLQ	1.04	1.00-1.07	0.020

*Adjusted for demographic characteristics, skeletal parameters, anxiety and depression

4 DISCUSSION

This study demonstrates the existence of significant differences in the mean values of all OQLQ domain scores between orthodontic and orthognathic patients, except in the domain of “Awareness for facial deformity”. Patients for whom orthodontic treatment was planned had statistically significantly lower baseline OQLQ scores in comparison to those for whom orthognathic treatment was planned, suggesting that they enjoyed a better quality of life. On the other hand, there was no significant difference in mean OQLQ domain scores and total score between the orthognathic group of patients and those who had been refused orthognathic treatment. Additionally, independent predictors for the planning of orthodontic and orthognathic treatment in patients with malocclusion were two OQLQ domains, “Facial aesthetics” and “Awareness of facial deformity”, as well as total OQLQ score.

The mean values for all OQLQ domains in the total cohort of our patients with malocclusion were lower than in previously published studies (10, 29-31). The data varies because of differences in study protocols and settings. Our findings are otherwise similar to those obtained in Cunningham’s study (10), but different to those in the study conducted by Bock et al. (30). While German patients’ complaints focused heavily on “Functional impairment” (30), those of Serbian patients focused on “Facial aesthetics”. Tajima et al. showed OQLQ domain scores for three different groups in a Japanese population (orthodontic group, orthognathic group, control group with normal occlusion). All those people focused their complaints on facial aesthetics in first place and on the social aspects of deformity in second place (29). These authors also showed similar results to ours in relation to the comparison between surgically treated and non-treated patients, namely a significant difference in OQLQ domain scores between these two groups (29).

Results comparing quality of life before orthodontic and orthognathic treatment in patients with malocclusion are inconsistent (31-33). In the two recent studies referred to above (32, 33), quality of life was better or the same in the orthodontic treatment first group in comparison with the surgery first group. More recently, however, the contrary has been shown: in a group of 32 patients, those patients planned for surgery first had a lower total OQLQ score and social domain score than those planned for orthodontics first (31).

In order to assess the reliability of the generic (SF-36) and specific (OQLQ) instruments in detecting differences in quality of life and when planning different therapeutic strategies for patients with malocclusion, we performed two independent logistic regression analyses. None of the SF-36 domains were found to be predictive. On the other hand, we demonstrated that OQLQ was more reliable and sensitive for the detection of differences in quality of life between different treatment options. Furthermore, it has to be mentioned that statistically significant correlations between SF-36 and PAR pre-treatment scores were not found, suggesting that malocclusion presence and severity did not influence general health-related QoL in our cohort. However, the correlation of OQLQ and PAR pre-treatment scores indicated that participants with more severe malocclusion had worse specific QoL, which accords with the notions presented by Sun et al. (34). In our survey, there was no statistically significant correlation with malocclusion severity, except with the domain of "Awareness of facial deformity". Similar results are shown in the study by Struggle et al. (35).

A statistically significant correlation between sagittal type of malocclusion and OQLQ scores was not found in our patients. Regarding intermaxillary angle, patients with low angle malocclusion presented with the most significantly impaired specific QoL, especially in "Social aspects of deformity". Finally, in our cohort malocclusion severity had greater impact on malocclusion-specific QoL than the skeletal type of malocclusion, which is similar to the results obtained by Rusnan et al. in the Finnish population (36). We have also demonstrated that the domain of "Awareness of facial deformity" correlated significantly with maxillary retrognathism. Likewise, the domain of "Facial aesthetics" score correlated with both maxillary and mandibular retrognathism, suggesting that middle face concavity or a possible bird-like profile might be less acceptable in our population.

Some limitations of the present study need to be kept in mind when interpreting the results. First, the choice of the questionnaire could be discussed. The Oral Health Impact Profile (OHIP) instrument is a widely used generic questionnaire for oral health quality of life (37). However, this questionnaire has unfortunately not yet been validated for Serbian cultural settlements. Another

limitation is related to the design of the study, which was cross-sectional. A longitudinal study capable of following the evolution of quality of life after treatment would have been preferable. Quality of life has therefore recently been assessed using OQLQ in two groups of patients with dentofacial deformities after the orthodontic-first and orthognathic-first approach in 32 patients. It was shown that the mean OQLQ score and the individual domain scores showed significant improvements at six weeks and six months post-operatively (31). The strength of our study might be in the rather high number of study participants treated and followed-up at the national referral centre.

We should emphasise that the number of adult patients seeking orthodontic care today is on the rise and that clinicians frequently face difficulties in achieving adequate therapeutic strategies, since in the majority of these cases both surgical and non-surgical treatment plans can be considered. In cases of significant skeletal malocclusion, the chance that orthodontic treatment alone (i.e. without surgery) will produce beneficial effects is small. However, especially in borderline cases, it would be crucial to define whether the difference in quality of life after intervention between surgical and non-surgical treatment is expected to be significant. Moreover, future studies that deal with quality of life changes after surgical or non-surgical treatment first could potentially provide data on predictive factors of treatment outcome. Finally, such quality of life data might be of interest to public oral health systems, as well as to health insurance companies and national health services, as one of the outcome measures.

In conclusion, our patients for whom orthodontic treatment was planned demonstrated better quality of life according to their OQLQ scores than those planned for whom an orthognathic strategy was planned. The independent predictors for the planning of orthodontic and orthognathic treatment in patients with malocclusion were two OQLQ domains, "Facial aesthetics" and "Awareness of facial deformity". All patients with malocclusion should be involved in the shared decision-making process related to the choice of treatment, after a detailed diagnostic procedure followed by a quality of life assessment using specific instruments. This could have a significant impact on the treatment strategy, at least in certain cases.

CONFLICT OF INTEREST

The authors declare that no conflicts of interest exist.

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ETHICAL APPROVAL

Received from the Ethical Committee of the Faculty of Dental Medicine of the University of Belgrade.

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