The Comparison of The Quality of Life Between Conventional Orthognathic Surgery and Surgery-first Orthognathic Surgery in Skeletal Class III Deformity Patients

Chalalai Wongmaneerung[1], Yuthakran Aschaitrakool[1]

[1]*Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Chiang Mai University, Thailand*

Abstract

Objectives: This prospective cohort study aimed to compare the quality of life (QoL) of patients with skeletal Class III deformities undergoing either conventional orthognathic surgery (CS) or surgery-first orthognathic surgery (SF) using the Orthognathic Quality of Life Questionnaire (OQLQ) and the Oral health Impact (OHIP-14) tools.

Methods: The OQLQ was translated into Thai. Thirty-four patients were enrolled, with 17 in each group according to their orthodontic treatment plans. Patients completed the OQLQ and OHIP-14 assessments on the day before surgery (T1) and at 1 month (T2), 3 months (T3), and 6 months (T4) post-surgery. Data collection occurred from October 2021 to April 2022. Independent sample T-tests and one-way repeated measures ANOVA were used for statistical analysis ($p<0.05$).

Results: At T1, the QoL was significantly lower in the CS group compared to the SF group. The CS group exhibited significant QoL improvements at T2 (OQLQ) and T3 (OHIP-14) compared to T1. The SF group had a lower QoL at T2 but showed significant improvement at T4 (OQLQ and OHIP-14).

Conclusions: There was no significant difference in QoL between the two groups after surgery. Both surgical approaches led to improvements in patients' QoL. Thus, the choice of surgical method should be based on appropriate indications and patient-doctor agreement.

Keywords: conventional orthognathic surgery, OHIP-14, OQLQ, quality of life, surgery-first orthognathic surgery

Introduction

Skeletal deformity is defined as deformities caused by the malformed anatomy of the jawbones, midface, and lower face, together with irregular tooth position.[1] Individuals with skeletal deformities often encounter difficulties in social interaction, affecting their self-confidence, societal acceptance, and overall quality of life (QoL), which are significant factors motivating patients to decide to undergo orthodontic treatment with orthognathic surgery.[2,3]

In conventional orthognathic surgery, there is a pre-surgical orthodontic treatment phase, which worsens facial abnormalities and reduces chewing efficiency.[4-6] The pre-surgical orthodontic phase normally takes 12-24 months.[5,7,8] The emergence of the surgery-first approach (SFA) in orthognathic surgery aims to shorten or eliminate the pre-surgical orthodontic phase, providing patients with immediate post-surgical facial changes, consequently reducing the overall treatment duration.[5,7,8]

To evaluate the QoL of patients with oral health problems, many tools have been developed, such as the Orthognathic Quality of Life Questionnaire (OQLQ)[9] and the Oral Health Impact Profile-14 (OHIP-14).[10] The OQLQ is specifically used to investigate the impact of orthognathic surgery on the patients' QoL and comprises 22 items from four domains: facial esthetics, oral function, awareness of facial deformities, and social aspects of deformity. The total score of the OQLQ is from 0 to 88 points. The OHIP-14 is a global oral health assessment instrument that assesses patients' oral health-related QoL, which comprises 14 questions from seven domains, including functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. The total score of the OHIP-14 is from 0 to 56. Higher scores on both tools indicate a greater impact on the patient's QoL.

There have been several studies comparing the QoL between patients undergoing conventional orthognathic surgery and surgery-first orthognathic surgery. Huang et al.,[6] conducted a study on 50 patients with class III dentofacial deformity who underwent bilateral sagittal split osteotomy (BSSRO), divided into 25 patients in each group. This study used the Dental Impact on Daily Living (DILD) and the OHIP-14 before surgery and at 1, 6, 12, and 18 months after the start of orthodontic treatment, and at the end of orthodontic treatment. The surgery-first group had better QoL than the conventional group at all time intervals, but the difference was not statistically significant. Park et al.,[11] studied 26 class III patients, divided into conventional group (N=15) and surgery-first (N=11) groups. Patients retrospectively rated the OQLQ at initial presentation, just before surgery, 3 months after surgery, and at debonding. There were no significant differences in each domain and at each stage between the two groups. Pelo et al.,[12] used both the OHIP-14 and OQLQ. The subjects consisted of 30 patients with class II and class III dentofacial deformity who underwent two-jaw surgery. Each group included 15 patients. The questionnaires were completed before bracket placement, 1 month before surgery, and 1 month after surgery. There was no significant difference in the QoL between the two groups at 1 month after surgery. Saghafi et al.,[13] studied 32 patients who underwent orthognathic surgery, divided into two groups (surgery-first: N=18, orthodontic-first group: N=14). This study assessed the QoL using the OQLQ, the Generalized Anxiety Disorder (GAD-7) questionnaire, and the Patient Health Questionnaire (PHQ-9) at 1 week preoperatively, and 6 weeks and 6 months postoperatively. QoL was significantly better in the surgery-first group preoperatively. Both approaches resulted in an improvement in the QoL at 6 weeks postoperatively. A variety of assessment tools were used to evaluate the QoL across different phases of treatment in systematic reviews by Zamboni et al.,[14] and Cremona et al.,[15] including the OQLQ, OHIP-14, and the Short Form Health Survey (SF-36). The results indicated high rates of patient satisfaction and improved oral health-related QoL following orthognathic surgery. A systematic review and meta-analysis by Zheng et al.,[16] explored the effects of the surgery-first approach(SFA) on QoL and mental health of patients compared to the conventional three-stage approach (CTA). Eight studies were included, using the OHIP-14, OQLQ, the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) and the Beck Depression Inventory (BDI-II) to examine QoL and mental health. This study found that orthognathic treatment with SFA can immediately enhance the QoL at the end of the first-stage treatment. In terms of overall treatment, both SFA and CTA have similar effects on the QoL.

This study was initiated due to an increasing number of patients undergoing surgery-first orthognathic surgery at the Faculty of Dentistry, Chiang Mai University,

Thailand. The QoL of the patient is an important factor to consider when providing treatment. The study was performed in skeletal class III deformity patients undergoing orthognathic surgery. The primary outcome of this study was to compare the QoL between patients undergoing conventional orthognathic surgery and surgery-first orthognathic surgery using the OQLQ and OHIP-14.

Materials and Methods

This prospective cohort study compared the QoL of individuals with skeletal class III deformities who had orthognathic surgery at the Oral and Maxillofacial Surgery Clinic, Faculty of Dentistry, Chiang Mai University, Thailand, from October 2021 to April 2022. The study received ethical approval from the Human Experimental Committee of the Faculty of Dentistry, Chiang Mai University, Thailand (No.47/2021). Prior to participation, patients provided informed consent for the release of their responses to the questionnaires to the researchers.

Participants

The sample size was calculated using Gpower version 3.1 software, with reference to the study by Pelo *et al.*,[12] The calculation showed that 32 samples were needed. The total sample size increased from 32 to 34, accounting for a 5% drop out rate. The 34 participants were separated into two groups based on the treatment plan agreed upon between the patient and the orthodontist. The first group consisted of 17 patients who underwent conventional orthognathic surgery (CS) group to serve as the control. The other group included 17 participants who underwent surgery-first orthognathic surgery (SF) group and served as the experimental group.

The inclusion criteria were patients with a skeletal Class III facial appearance, an ANB value of less than 0.5 on a lateral cephalometric radiograph, and a normal SN value.[17] The patients had an orthodontic treatment plan involving either CS or SF orthognathic surgery.

The exclusion criteria included the following: patients with skeletal class III deformity who were undergoing camouflage orthodontic treatment; patients with other abnormalities of the jaw and face, such as cleft lip and/or cleft palate or craniofacial anomalies; patients

who had previously undergone orthognathic surgery; patients with psychological disorders; patients who could not read and understand the Thai language; patients who were unable to comply with postoperative treatment follow-up for 6 months; patients with a history of maxillofacial trauma; and patients who had undergone cosmetic surgery including injectable filler that may affect facial contours.

Orthognathic quality of life questionnaire translation and validation

The Orthognathic Quality of Life Questionnaire (OQLQ) was translated from English to Thai following the cross-cultural translation process outlined by Beaton *et al.*[18] The steps involved initial translation, synthesis of translations, and back translation from Thai to English. Subsequently, the expert committee review process involved comparing the original version with the back-translated version. After all questions were revised, the Thai version of the OQLQ was obtained. Then, the reliability of the Thai version of the OQLQ was assessed by administering it to a group of 30 patients who had undergone orthognathic surgery for at least one year. The scores were analyzed to determine the questionnaire's reliability using Cronbach's α-coefficient computed through SPSS software. The Cronbach's α-coefficient of this questionnaire is 0.913, exceeding the minimum acceptable value of 0.70.[19]

Questionnaire administration

All participants in both the CS group and the SF group were asked to complete QoL assessments using the Thai version of the OQLQ and the Thai version of OHIP-14.[10] Participants were asked to read and complete the questionnaires one day before the surgery, marked as the preoperative period (T1), and during follow-up periods at 1 month (T2), 3 months (T3), and 6 months (T4) after surgery.

Normality and homogeneity tests were performed using the Shapiro–Wilk test and Levene's test, respectively. The independent sample t-test was used to evaluate the QoL scores between the 2 groups at T1, T2, T3, and T4, with a 95% confidence level ($p<0.05$). One-way repeated

Table 1: Demographic findings. Statistical analysis by the Chi-square test.

	Conventional group	Surgery-first group	*p*-value
Gender			
Female (%)	12 (70.59)	12 (70.59)	1.000
Male (%)	5 (29.41)	5 (29.41)	
Age (years)			
Range	20 to 34	17 to 54	0.900
Mean±SD	25.35±7.93	25.70±10.64	
Type of surgery			
Le Fort I osteotomy and BSSRO (%)	5 (29.41)	7 (41.18)	0.714
BSSRO (%)	12 (70.59)	10 (58.82)	
ANB (°)			
Range	-8 to -0.6	-8 to -0.8	0.975
Mean±SD	-4.18±2.43	-4.2±1.98	

BSSRO refers to bilateral sagittal split osteotomy.

measures ANOVA was used to assess the QoL scores for each group at different treatment intervals, with a 95% confidence level ($p<0.05$).

Results

The demographic data for the study participants are presented in Table 1. There were no significant differences between two groups.

Comparison of quality of life between conventional and surgery-first orthognathic surgery groups

There were statistically significant differences in the awareness and social domains and the total scores of the OQLQ between the CS and SF groups at T1. Postoperatively, statistically significant differences were observed in the domain of function at T2 and T3, as shown in Table 2. Table 3 shows statistically significant differences in all domains and total scores of OHIP-14 between the two groups at T1.

Comparison of the quality of life of patients undergoing orthognathic surgery at various intervals using the Orthognathic Quality of Life Questionnaire (OQLQ)

A comparison of the two groups' overall OQLQ scores is displayed in Figure 1. Patients in the CS group experienced noticeable enhancements in their QoL beginning at 1 month after surgery (T2). There were statistically significant ($p<0.05$) differences at T2, T3, and T4 compared to T1. In the SF group, a worse QoL was observed at T2, followed by improvements at T3 and T4. Significant

changes ($p<0.05$) were seen at T2 and T4 compared to T1.

Comparison of the quality of life of patients undergoing orthognathic surgery at each interval using the Oral Health Impact Profile (OHIP-14)

The overall average OHIP-14 scores in the CS group showed a statistically significant ($p<0.05$) improvement in QoL at T3 and T4 compared with T1 (Figure 2). In the SF group, there was a decrease in QoL at T2 ($p<0.05$), followed by an improvement at T3 and T4 ($p<0.05$) compared to T1.

Discussion

Previous studies[20-27] that examined the QoL among patients with skeletal deformity undergoing orthognathic surgery primarily focused on those treated with CS. Several studies used only the OHIP-14[20-23] or the OQLQ[24-27] to assess QoL, depending on the objective of the assessment. The OHIP-14 is used to assess the impact of oral health on the QoL of patients in general across three dimensions (social, psychological, and physical) rather than focusing solely on effects attributable to specific oral disorders. OHIP-14 includes seven domains: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap domains. The OQLQ is specifically used to investigate the impact of orthognathic surgery on QoL and comprises four domains: facial esthetics, oral function, awareness of facial deformities, and social aspects of deformity. Here, however, we

Table 2: Comparison of the quality of life between patients treated with conventional orthognathic surgery (CS) and surgery-first orthognathic surgery (SF) during the preoperative period (T1) and at 1 (T2), 3 (T3), and 6 months after surgery (T4) using the Orthognathic Quality of Life questionnaire (OQLQ). Statistical analysis by independent sample t-test.

Domain		Pre-op (T1)		Effect size	p	1 month (T2)		Effect size	p	3 months (T3)		Effect size	p	6 months (T4)		Effect size	p
		CS	SF			CS	SF			CS	SF			CS	SF		
Aesthetic	Mean±SD	12.29±3.85	9.94±4.91	0.53	0.130	7.64±5.57	10.29±4.63	0.52	0.142	4.82±4.85	7.52±5.00	0.54	0.119	3.58±3.72	5.52±3.71	0.52	0.138
(0-20)	95% CI	10.46–14.12	7.60–12.27			4.99–10.28	8.08–12.49			2.51–7.12	5.14–9.89			1.81–5.34	3.75–7.28		
Awareness	Mean±SD	8.94±3.24	5.58±2.15	1.22	0.001**	7.94±2.96	7.23±2.90	0.24	0.489	5.00±3.04	5.82±3.28	0.25	0.454	4.70±3.61	5.05±3.52	0.09	0.775
(0-16)	95% CI	7.40–10.48	4.55–6.60			6.53–9.34	5.85–8.60			3.55–6.44	4.26–7.37			2.98–6.41	3.37–6.72		
Social	Mean±SD	15.70±6.08	8.94±4.58	1.25	0.001**	12.11±5.88	10.82±6.84	0.20	0.559	6.82±5.64	6.64±5.18	0.03	0.935	4.70±4.74	5.11±4.56	0.08	0.798
(0-32)	95% CI	12.81–18.59	6.76–11.11			9.31–14.90	7.56–14.07			4.13–9.50	4.17–9.10			2.44–6.95	2.94–7.27		
Function	Mean±SD	11.29±3.83	8.76±3.76	0.66	0.061	9.17±3.45	13.70±4.52	1.12	0.002**	6.29±2.99	9.23±3.73	0.86	0.016*	3.82±3.82	5.17±3.66	0.36	0.300
(0-20)	95% CI	9.46–13.11	6.97–10.54			1.66–5.23	11.55–15.84			4.86–7.71	7.45–11.00			2.00–5.63	3.43–6.91		
Total score	Mean±SD	48.23±12.34	33.23±10.32	1.31	0.001**	36.88±14.46	42.05±15.45	0.34	0.321	22.94±14.32	29.23±14.04	0.44	0.205	16.82±12.88	20.88±13.05	0.31	0.368
(0-88)	95% CI	42.36–54.09	28.32–38.13			30.00–43.75	34.70–49.39			16.13–29.74	22.55–35.90			10.69–22.94	14.67–27.08		

Table 3: Comparison of the quality of life between patients treated with conventional orthognathic surgery (CS) and surgery-first orthognathic surgery (SF) at the preoperative period (T1), 1 month (T2), 3 months (T3), and 6 months after surgery (T4) using the Oral Health Impact Profile (OHIP-14). Statistical analysis by independent sample t-test.

| Domain		Pre-op (T1)		Effect size	p	1 month (T2)		Effect size	p	3 months (T3)		Effect size	p	6 months (T4)		Effect size	p
		CS	SF			CS	SF			CS	SF			CS	SF		
Functional limitation (0-8)	Mean±SD	2.88±1.49	1.64±1.27	0.89	0.014*	3.58±1.46	2.76±1.64	0.52	0.132	2.11±1.40	1.88±1.49	0.15	0.640	1.11±1.21	1.00±0.79	0.10	0.741
	95% CI	2.17–3.58	1.03–2.24			2.88–4.27	1.98–3.54			1.44–2.77	1.17–2.58			0.53–1.68	0.62–1.37		
Physical pain (0-8)	Mean±SD	4.05±1.369	2.52±0.87	1.31	0.001**	4.41±1.27	3.64±1.27	0.60	0.900	2.82±1.42	2.70±1.31	0.08	0.804	1.41±1.27	1.70±1.57	0.20	0.554
	95% CI	3.38–4.71	2.10–2.93			3.80–5.01	3.03–4.24			2.14–3.49	2.07–3.32			0.80–2.01	0.95–2.44		
Psychlogical discomfort (0-8)	Mean±SD	4.58±1.00	3.35±1.05	1.19	0.001**	3.41±1.62	3.41±1.27	0	1.000	2.35±1.80	2.70±1.72	0.19	0.563	1.47±1.77	1.88±1.40	0.25	0.459
	95% CI	4.10–5.05	2.85–3.84			2.64–4.18	2.80–4.01			1.49–3.20	1.88–3.51			0.62–2.31	1.21–2.54		
Physical disability (0-8)	Mean±SD	3.47±1.69	1.29±1.21	1.48	0.000**	3.35±1.27	2.64±1.76	0.46	0.190	2.00±1.32	1.52±1.46	0.34	0.333	1.29±1.49	0.58±0.87	0.58	0.101
	95% CI	2.66–4.27	0.71–1.86			2.74–3.95	1.80–3.47			1.37–2.62	0.82–2.21			0.58–1.99	0.16–0.99		
Psychological disability (0-8)	Mean±SD	4.00±1.11	2.29±1.21	1.47	0.000***	3.17±1.50	3.00±1.93	0.09	0.769	1.47±1.50	2.00±1.65	0.33	0.337	0.82±0.95	1.35±1.65	0.39	0.262
	95% CI	3.47–4.52	1.71–2.86			2.45–3.88	2.08–3.91			0.75–2.18	1.21–2.78			0.36–1.27	0.56–2.13		
Social disability (0-8)	Mean±SD	2.29±1.57	1.35±0.99	0.71	0.045*	2.05±1.14	2.00±1.36	0.03	0.893	1.23±1.39	1.11±1.21	0.09	0.795	0.82 ± 1.13	0.64±1.11	0.16	0.650
	95& CI	1.54–3.03	0.87–1.82			1.50–2.59	1.35–2.64			0.56–1.89	0.53–1.68			0.28 – 1.35	0.11–1.16		
Handicaps (0-8)	Mean±SD	1.64±1.36	0.58±0.71	0.97	0.008**	1.76±1.60	1.58±1.37	0.12	0.732	1.00±1.58	1.00±1.11	0	1.000	0.52±1.23	0.35±0.70	0.16	0.611
	95& CI	0.99–2.28	0.24–0.91			0.99–2.52	0.92–2.23			0.24–1.75	0.47–1.52			0.06–1.10	0.01–0.68		
Total score(0-56)	Mean±SD	22.94±5.89	13.05±4.73	1.85	0.001**	21.76±6.82	19.05±7.09	0.38	0.265	13.00±8.1	12.94±6.72	0.01	0.982	7.47±7.15	7.52±5.936	0.01	0.979
	95& CI	20.14–25.74	10.80–15.29			18.51–25.00	15.68–22.42			9.15–16.85	9.74–16.13			4.07–10.86	4.70–10.33		
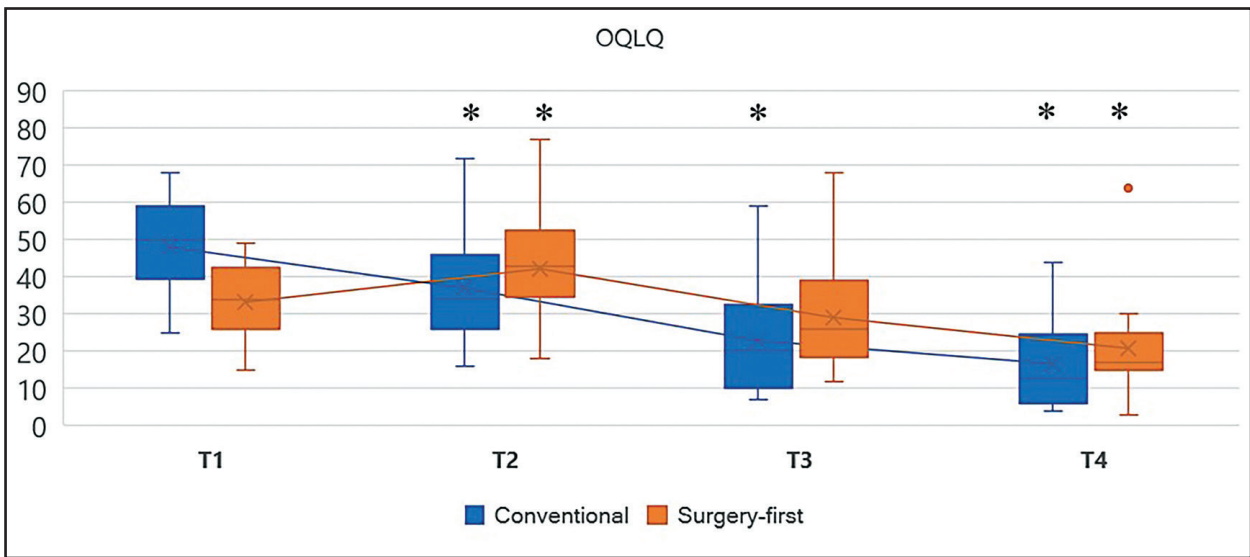
Figure 1: The average overall scores of the Orthognathic Quality of Life Questionnaire (OQLQ) in the preoperative period (T1) and at 1 month (T2), 3 months (T3), and 6 months after surgery (T4).
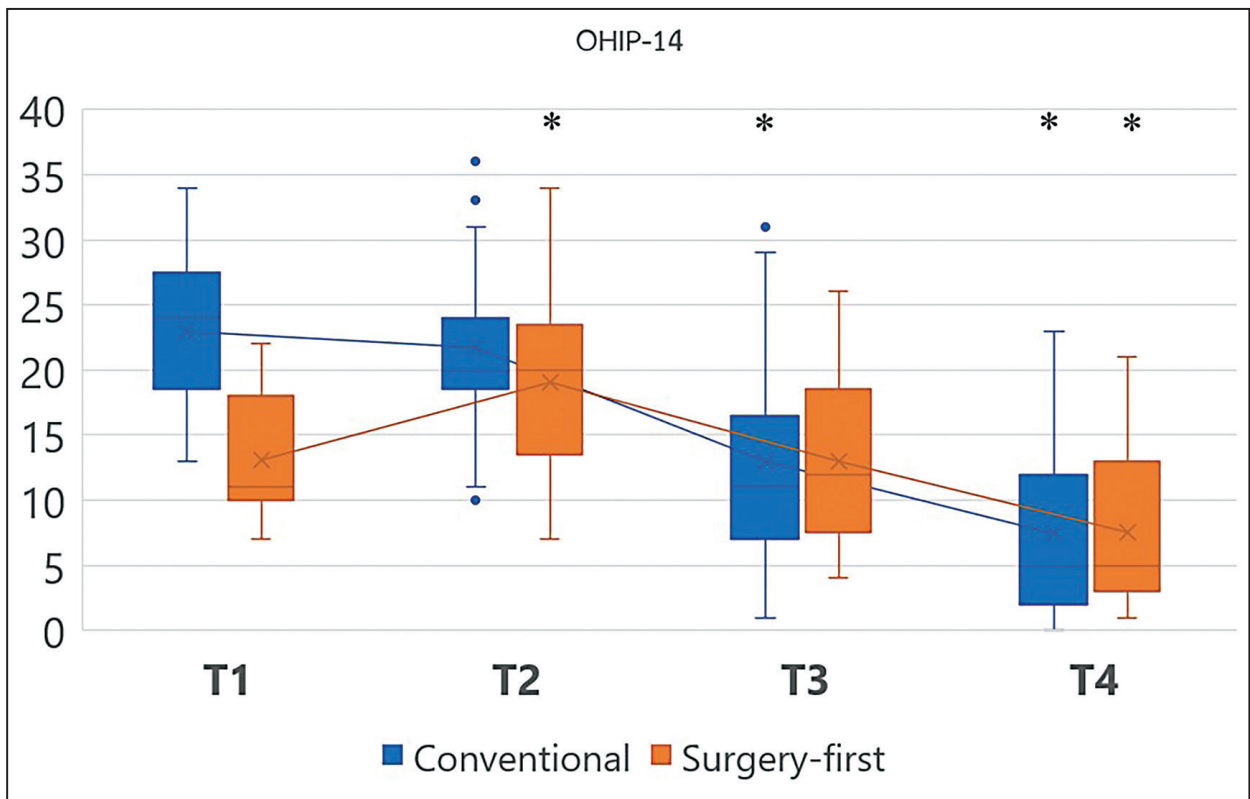*indicates a statistically significant difference (p<0.05) when compared with T1 within each group.*

Figure 2: The mean scores of the overall outcome of the Oral Health Impact Profile (OHIP-14) in the preoperative period (T1) and at 1 month (T2), 3 months (T3), and 6 months after surgery (T4).
indicates a statistically significant difference (p<0.05) when compared with T1 within each group.

integrated both OHIP-14 and OQLQ to comprehensively evaluate the QoL of patients. Using this method, comprehensive and specific information is provided on individuals undergoing orthognathic surgery for skeletal deformities.

This study translated the OQLQ into a Thai version using the cross-cultural adaptation method.[18] This version aligns with the research conducted by Patchenee and Chaiprakit.[28] This approach was used in the study conducted by Nammontri[29], who translate the OHIP-14 into Thai. Likewise, Saensutthawijit et al.,[30] employed this method to create the Thai version of the Dental Health Impact Profile.

No changes in QoL were observed between the CS and SF groups after surgery using the OHIP-14. This finding is consistent with previous studies.[6]

This study found a significant improvement in QoL, as indicated by the OQLQ scores, from 1 to 3 months following surgery in participants undergoing CS. This finding is consistent with those of Park et al.[11]

When the average OHIP-14 scores were used to compare the QoL of patients treated with CS, a significant increase in QoL was observed 6 months after surgery. This observation is consistent with Baherimoghaddam et al.[23]

At 6 months after surgery, the total scores of OQLQ and OHIP-14 in both groups improved significantly, consistent with previous studies.[11,13,31]

According to the absence of a pre-surgical orthodontic phase in the SF orthognathic surgery, the surgery procedure may cause instability of the bite following surgery.[5] Excessive overjet and a deep Curve of Spee, which affect bite stability and the patient's QoL, were found to produce more mandibular displacement in SF than in CS.[5,32] Consequently, this study found that patients in the SF group had lower QoL on both the OQLQ and OHIP-14 at 1 month following surgery compared to the CS group. At 1 month after surgery, the SF group experienced changes in their occlusion. Changes in occlusion affect individuals physically and psychologically, resulting in decreased QoL across all domains with no statistical significance.

Although there was no statistically significant difference in postoperative QoL between patients undergoing CS and those undergoing SF, the QoL improved in both groups after surgery. Both orthognathic surgery approaches contribute to improving the QoL of patients with skeletal deformities.[33] Therefore, the selection of the surgical approach relies on the agreement between the patient and doctor.

A key limitation of this study is the absence of pre treatment quality of life (QoL) assessments for the CS group, which has resulted in an unequal baseline QoL between the two groups.

Conclusions

There was no significant difference in QoL between the patients treated with CS or SF approaches at 1, 3, and 6 months after surgery. In the CS group, there was an improvement in QOL, with statistically significant differences observed at 1 month (OQLQ) and 3 months (OHIP-14) post-surgery compared to the preoperative period.

In the SF group, there was a significant decline in QoL at 1 month after surgery, followed by a significant improvement at 6 months after surgery (OQLQ and OHIP-14), compared to the preoperative period.

Both surgical approaches resulted in noticeable improvements in the patients' QoL. Therefore, the selection of the surgical approach relies on the agreement between the patient and doctor.

References

1. Ong MA. Spectrum of dentofacial deformities: a retrospective survey. Ann Acad Med Singap. 2004;33(2):239-42.
2. Marques LS, Ramos-Jorge ML, Paiva SM, Pordeus IA. Malocclusion: esthetic impact and quality of life among Brazilian schoolchildren. Am J Orthod Dentofacial Orthop. 2006;129(3):424-7.
3. Stagles C, Popat H, Rogers S. Factors influencing patient-reported quality of life in pretreatment orthognathic surgery patients. Angle Orthod. 2016;86(2):331-6.
4. Jacobs JD, Sinclair PM. Principles of orthodontic mechanics in orthognathic surgery cases. Am J Orthod. 1983;84(5): 399-407.
5. Baek SH, Ahn HW, Kwon YH, Choi JY. Surgery-first approach in skeletal class III malocclusion treated with 2-jaw surgery: evaluation of surgical movement and postoperative orthodontic treatment. J Craniofac Surg. 2010;21(2):332-8.
6. Huang S, Chen W, Ni Z, Zhou Y. The changes of oral health-related quality of life and satisfaction after surgery-first orthognathic approach: a longitudinal prospective study. Head Face Med. 2016;12:2.
7. Peiro-Guijarro MA, Guijarro-Martinez R, Hernandez-Alfaro F. Surgery first in orthognathic surgery: a systematic review of the literature. Am J Orthod Dentofacial Orthop.

2016;149(4):448-62.

8. Liou EJ, Chen PH, Wang YC, Yu CC, Huang C, Chen YR. Surgery-first accelerated orthognathic surgery: orthodontic guidelines and setup for model surgery. J Oral Maxillofac Surg. 2011;69(3):771-80.

9. Cunningham SJ, Garratt AM, Hunt NP. Development of a condition-specific quality of life measure for patients with dentofacial deformity: II. validity and responsiveness testing. Community Dent Oral Epidemiol. 2002;30(2):81-90.

10. Chatalongkorn S. Psychometric properties of Thai version of the oral health impact profile (OHIP-14 Thai). J Prapokklao Hosp Clin Med Educat Center. 2017;34(3):158-70.

11. Park JK, Choi JY, Yang IH, Baek SH. Patient's satisfaction in skeletal class III cases treated with two-jaw surgery using orthognathic quality of life questionnaire: conventional three-stage method versus surgery-first approach. J Craniofac Surg. 2015;26(7):2086-93.

12. Pelo S, Gasparini G, Garagiola U, Cordaro M, Di Nardo F, Staderini E, et al. Surgery-first orthognathic approach vs traditional orthognathic approach: oral health-related quality of life assessed with 2 questionnaires. Am J Orthod Dentofacial Orthop. 2017;152(2):250-4.

13. Saghafi H, Benington P, Ayoub A. Impact of orthognathic surgery on quality of life: a comparison between orthodontics-first and surgery-first approaches. Br J Oral Maxillofac Surg. 2020;58(3):341-7.

14. Zamboni R, de Moura FRR, Brew MC, Rivaldo EG, Braz MA, Grossmann E, et al. Impacts of orthognathic surgery on patient satisfaction, overall quality of life, and oral health-related quality of life: a systematic literature review. Int J Dent. 2019;2019:2864216.

15. Cremona M, Bister D, Sheriff M, Abela S. Quality-of-life improvement, psychosocial benefits, and patient satisfaction of patients undergoing orthognathic surgery: a summary of systematic reviews. Eur J Orthod. 2022;44(6):603-13.

16. Zheng Y, Liao N, Mo S, Huang X, Zhou N. Effect of surgery-first approach on quality of life and mental health of orthognathic patients: a systematic review and meta-analysis. Heliyon. 2024;10(1):e23285.

17. Sutthiprapapron P, Manosudprasit A, Pisek A, Manosudprasit M, Pisek P, Phaoseree N, et al. Establishing esthetic lateral cephalometric values for thai adults after orthodontic treatment. Khon Kaen Dent J. 2020;23(2):31-41.

18. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine (Phila Pa 1976). 2000;25(24):3186-91.

19. Robert MT. Book Review : Psychometric Theory (3rd ed.) by Jum Nunnally and Ira Bernstein New York: McGraw-Hill, 1994, xxiv + 752 pp. Applied Psychological Measurement. 1995;19(3):303-5.

20. Chadda D, Majumdar SK, Shome A, Das RK. Evaluation of cephalometric changes and its relation to changes in patients' quality of life after mandibular setback surgery. J Maxillofac Oral Surg. 2022;21(4):1279-85.

21. Geramy A, Nazarifar AM, Shahroudi AS, Sheikhzadeh S. Oral health-related quality of life following orthognathic surgery for class III correction its relationship with cephalometric changes. Int J Oral Maxillofac Surg. 2019;48(11):1434-9.

22. Rustemeyer J, Gregersen J. Quality of life in orthognathic surgery patients: post-surgical improvements in aesthetics and self-confidence. J Craniomaxillofac Surg. 2012;40(5):400-4.

23. Baherimoghaddam T, Tabrizi R, Naseri N, Pouzesh A, Oshagh M, Torkan S. Assessment of the changes in quality of life of patients with class II and III deformities during and after orthodontic–surgical treatment. Int J Oral Maxillofac Surg. 2016;45(4):476-85.

24. Eslamipour F, Najimi A, Tadayonfard A, Azamian Z. Impact of orthognathic surgery on quality of life in patients with dentofacial deformities. Int J Dent. 2017;2017:4103905.

25. Tuk JG, Lindeboom JA, Tan ML, de Lange J. Impact of orthognathic surgery on quality of life in patients with different dentofacial deformities: longitudinal study of the Oral Health Impact Profile (OHIP-14) with at least 1 year of follow-up. Oral Maxillofac Surg. 2022;26(2):281-9.

26. Ni J, Song S, Zhou N. Impact of surgical orthodontic treatment on quality of life in Chinese young adults with class III malocclusion: a longitudinal study. BMC Oral Health. 2019;19(1):1-7.

27. Tachiki C, Nishii Y, Takaki T, Sueishi K. Condition-specific quality of life assessment at each stage of class III surgical orthodontic treatment—a prospective study—. Bull Tokyo Dent Coll. 2018;59(1):1-14.

28. Chaiprakit N, Patchanee S. Reliability and validity of orthognathic quality of life questionnaire (OQLQ): Thai version. Thai J Oral Maxillofac Surg. 2022;36(2):141-9.

29. Nammontri O. Validation of the Thai version of the 14-Item oral health impactprofile (Thai OHIP-14) amongst the general Thai adult population in a community setting. J Health Res. 2017;31(6):481-6.

30. Saensutthawijit P, Chatiketu P, Wanichsaithong P. Development and use of the Thai version of the dental impact profile to assess Thai older adults under royal dental prosthesis project. Khon Kaen Dent J. 2022;25(3):25-43.

31. Thitiyuk C, Patchanee S, Klaisiri A, Chaiprakit N. Comparison of "orthodontic first" and "surgery first" approaches to quality of life in orthognathic surgery patients: a prospective cohort study. Appl Sci. 2022;12(23):12137.

32. Sharma VK, Yadav K, Tandon P. An overview of surgery-first approach: recent advances in orthognathic surgery. J Orthod Sci. 2015;4(1):9-12.

33. Cunningham SJ, Hunt NP, Feinmann C. Perceptions of outcome following orthognathic surgery. Br J Oral Maxillofac Surg. 1996;34(3):210-3.