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Quality of Life Changes in Taiwanese Patients with Dentofacial Deformities Undergoing Orthognathic Surgery

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Quality of Life Changes in Taiwanese Patients with Dentofacial Deformities Undergoing Orthognathic Surgery

Abstract

Objectives: The evaluation of orthognathic surgery (OgS) is shifting towards a coherent approach for patient care that balances objective clinician-defined measures with patient-centred outcome assessments, including health-related quality of life (QoL). This aim of this study adds to the pool of literature in East Asian subjects by studying the longitudinal QoL changes in Taiwanese patients with dentofacial deformities (DFD) undergoing OgS, using two standardized questionnaires at three different treatment stages. **Materials and Methods:** This prospective cohort study comprised 113 consecutive Taiwanese OgS patients who underwent surgical-orthodontic treatment between 2015 and 2018. The subjects completed SF-36 and OHIP-14 standardized questionnaires with one additional aesthetics question at one month before OGS (T1), 3 months (T2) and at debond (T3). All responses were screened, and 90 valid questionnaires included for analysis. Additional subgroup comparisons were made between Class II and Class III patients, symmetric and asymmetric patients, surgery-first approach and orthodontics-first approach, presence or absence of genioplasty, genders, and younger and older patients. **Results:** The cohort was comprised largely of skeletal Class III patients (84.4%) and showed significant improvements in OHIP-14 and Aesthetic score from T1 to T3. Pre-surgical orthodontic decompensation leads to a decrease in QoL. Patients who have undergone genioplasty have better generic health QoL than those without genioplasty at T3. Male DFD patients have better generic oral health and aesthetics QoL than female DFD patients. Age does not appear to affect generic health, generic oral health and aesthetics QoL at any time during OgS treatment. **Conclusion:** OgS has positive effects on generic health, generic oral health and aesthetics QoL in DFD patients. The effect of asymmetry on QoL in OgS patients remains an area that requires further research in order to clarify conflicting results in the literature. Future studies should explore the long-term stability of QoL effects.

Keywords

Orthognathic surgery (OgS); Dentofacial deformities (DFD); Health-related quality of life (HRQoL); Patient-reported outcomes; Questionnaire

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Quality of Life Changes in Taiwanese Patients with Dentofacial Deformities Undergoing Orthognathic Surgery

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ABSTRACT

Objectives: The evaluation of orthognathic surgery (OgS) is shifting towards a coherent approach for patient care that balances objective clinician-defined measures with patient-centred outcome assessments, including health-related quality of life (QoL). This aim of this study adds to the pool of literature in East Asian subjects by studying the longitudinal QoL changes in Taiwanese patients with dentofacial deformities (DFD) undergoing OgS, using two standardized questionnaires at three different treatment stages.

Materials and methods: This prospective cohort study comprised 113 consecutive Taiwanese OgS patients who underwent surgical-orthodontic treatment between 2015 and 2018. The subjects completed SF-36 and OHIP-14 standardized questionnaires with one additional aesthetics question at one month before OGS (T1), 3 months (T2) and at debond (T3). All responses were screened, and 90 valid questionnaires included for analysis. Additional subgroup comparisons were made between Class II and Class III patients, symmetric and asymmetric patients, surgery-first approach and orthodontics-first approach, presence or absence of genioplasty, genders, and younger and older patients.

Results: The cohort was comprised largely of skeletal Class III patients (84.4%). From T1 to T3, the cohort showed significant improvement in the Social Functioning ($p < 0.001$) domain of SF-36, significant improvement in all OHIP-14 scores, and significant improvement in Aesthetic score ($p < 0.001$). OgS patients with chin deviation had better QoL on multiple components on SF-36, OHIP-14 and the Aesthetic score throughout all three time points.

Conclusion: OgS has positive effects on generic health, generic oral health and aesthetics QoL in DFD patients. OgS patients with chin deviation greater than 4 mm had significantly better QoL before and after OgS than patients with chin deviation 4 mm or less. Male DFD patients have better generic oral health and aesthetics QoL than female DFD patients before surgery, with these differences resolved after OgS. *Taiwanese Journal of Orthodontics* 2022;34(4):190–204

Keywords: Orthognathic surgery (OgS); Dentofacial deformities (DFD); Health-related quality of life (HRQoL); Patient-reported outcomes; Questionnaire

INTRODUCTION

Orthognathic surgery (OgS) outcomes are traditionally evaluated using objective clinician-defined metrics such as anthropometry, cephalometry and post-treatment occlusions.¹ However, success of treatment determined by

clinicians does not necessarily equate to patient satisfaction,² as the factors that motivate individuals to undergo orthodontic treatment and OgS are oral health improvement, functional demands, and dentofacial aesthetics,³ which may not correlate well to the objective measures used by clinicians.⁴

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Following Engel's biopsychosocial model of health,⁵ there has been a shift towards a coherent approach for patient care that balances objective clinician-driven measures with patient-centred outcome assessments, including health-related quality of life (QoL) assessments. The current research shows that OgS significantly improves QoL of dentofacial deformity (DFD) patients⁶ with Class III patients benefiting the most from OgS.⁷ Soh and Narayanan⁶ further recommended the use of three questionnaires to evaluate patients' QoL: the generic health-related Short Form Health Survey (SF-36),^{8–10} the generic oral health-related Oral Health Impact Profile (OHIP-14),^{11,12} and the condition-specific Orthognathic Quality of Life Questionnaire (OQLQ).^{13,14}

Combined surgical-orthodontic treatment has the potential to worsen patients' oral function and aesthetics¹⁵ before definitive correction. A patient who is seeking orthognathic treatment for facial correction would face a temporary impairment in occlusion with both conventional orthodontics-first approach (OFA) and surgery-first approach (SFA)¹⁶ before definitive facial and occlusal improvement. Patients are hence subject to fluctuating levels of oral function and aesthetics, which can improve or worsen QoL levels throughout the surgical-orthodontic treatment process. Cross-sectional QoL studies in OgS patients^{17–19} or studies that require patients to retrospectively recall their pre-treatment conditions after completion of OgS treatment²⁰ may not accurately reflect the multi-stage treatment process and the associated changes in oral function and QoL. Prospective studies with contemporaneous surveys at appropriate time points would better reflect the patient's QoL throughout the treatment process.

For DFD patients undergoing OgS, QoL studies may not be immediately applicable across races and geographic regions. Craniofacial form,²¹ the nature of orthodontic and orthognathic treatment²² and cultural norms of beauty²³ typically vary across races and geographic regions. In East Asian populations, 68% of DFD patients undergoing OgS have been reported to be skeletal Class III.²⁴ Race has also been shown to affect psychological resilience²⁵ and Health-Related QoL.²⁶

To date, there have been a number of longitudinal prospective studies evaluating the impact of OgS on QoL over time in East Asian patients with DFD.^{7,27–31} This study aims to add to the burgeoning pool of literature in East Asian subjects by studying the longitudinal QoL changes in Taiwanese DFD patients undergoing OgS, using two standardized questionnaires at three different treatment stages.

MATERIALS AND METHODS

Subjects

This prospective cohort study comprised 113 consecutive Taiwanese patients who underwent surgical-orthodontic treatment at Chang Gung Craniofacial Center between 2015 and 2018. All participants signed an informed consent agreement. The inclusion criteria were Taiwanese DFD patients aged 20 years and older who were undergoing orthodontic treatment with OgS. Patients who had a history of facial trauma, congenital craniofacial anomalies, temporomandibular joint disorders and who were undergoing retreatment OgS were excluded.

This study followed the guidelines of the Declaration of Helsinki.³² The research protocol was approved by the Institutional Review Board and medical ethics committee of Chang Gung Memorial Hospital.

Data collection

The data collection consisted of two parts: Physician assessment and patient-reported assessment.

Physician assessment

Physician assessment was done at the pre-treatment stage by one expert orthodontist (E.W.C.K), and comprised examination, orthodontic records, diagnosis, and treatment planning, including the assessed need for OgS and whether SFA or OFA was used.

Patient reported assessment

Patients completed self-assessment questionnaires that gathered information about gender and age. In addition, they completed the SF-36 and OHIP-14 questionnaires at three different time points: T1, one month before OgS; T2, 3 months after OgS; T3, debond.

The traditional Chinese version of SF-36³³ and OHIP-14³⁴ was used in this study.

Because neither questionnaire included a specific aesthetic domain, an additional question on aesthetics was included in the patient survey in the manner of Rustemeyer and Lehmann.³⁵ The question: "Have you been dissatisfied with your facial aesthetics because of problems with your teeth, mouth or denture?" was added for aesthetics QoL evaluation in the study, with the score ranging from 0 (never) to 4 (fairly often) on a five-point Likert scale. This question was drawn from the original OHIP-49.¹¹

Questionnaires with identical answers for ten or more consecutive questions and similar questions with extreme variation in answers were excluded.³⁴ 113 responses were screened for validity and 90 valid questionnaires included for analysis.

Comparisons and statistical analysis

Changes in the combined and component scores for SF-36, OHIP-14 and the additional aesthetic question were measured from T1-T2-T3. Paired t-tests were used for T1 vs T2, T2 vs T3 and T1 vs T3 comparisons.

In addition, the following subgroup comparisons were made using independent t-tests at the three different time points:

Deformity features

- 1) Antero-posterior (A-P): skeletal Class II (CL II) versus skeletal Class III (CL III).
- 2) Transverse: Chin deviation versus no chin deviation. The presence of a significant and perceptible chin deviation was defined as a horizontal deviation greater than 4 mm as assessed on a frontal cephalogram.^{36,37}

Treatment Features

- 3) SFA versus OFA.
 - 4) Genioplasty versus no genioplasty.
- Demographic Features
- 5) Female versus male.
 - 6) Under 30 years old versus 30 years old and above.

The level of significance was set at 5% and considered significant when $p < 0.05$. The Statistical Package for Social Sciences (SPSS version 22.0; SPSS Inc., Chicago, IL) was used to perform the analysis.

RESULTS

Sample distribution and characteristics are presented in Table 1. The majority of patients were Class III OgS patients (84.4%) under 30 years old (86.7%).

Overall cohort

From T1 to T2, General Health ($p = 0.015$), Social Functioning ($p = 0.039$), Mental Health ($p = 0.003$) domains and Mental Component Summary (MCS) ($p = 0.025$) in SF-36 showed significant improvement. However, there were no significant changes in the Physical Component Summary (PCS) nor the overall score of SF-36 (Table 2). OHIP-14 showed

significant improvement in Psychological Discomfort ($p < 0.001$), Psychological Disability ($p < 0.001$), Social Disability ($p = 0.001$) and Handicap ($p < 0.001$) dimensions, with the overall score ($p = 0.001$) improving significantly. Aesthetic score ($p < 0.001$) also showed significant improvement at T2 over T1.

From T2 to T3, only the physical functioning ($p = 0.026$) domain of SF-36 improved significantly from T2 to T3. There was significant improvement in OHIP-14 overall score ($p < 0.001$) from T2 to T3, with all individual dimension scores except Social Disability and Handicap showing significant improvement at T3 over T2. Aesthetic score ($p = 0.003$) continued to improve significantly from T2 to T3.

From T1 to T3, there was significant improvement only in the Social Functioning ($p < 0.001$) domain of SF-36. OHIP-14 showed significant improvement in all scores from T1 to T3. Aesthetic score ($p < 0.001$) improved significantly from T1 to T3.

Longitudinal changes in Class III patients

From T1 to T2, only the General Health ($p = 0.041$) and Mental Health ($p = 0.025$) domains in SF-36 showed significant improvement. OHIP-14 showed significant improvement in Psychological Discomfort ($p < 0.001$), Psychological Disability ($p < 0.001$), Social Disability ($p = 0.006$) and Handicap ($p = 0.001$), with the overall OHIP-14 score ($p = 0.003$) significantly improving from T1 to T2. The Aesthetic score ($p < 0.001$) showed significant improvement from T1 to T2 (Table 3).

From T2 to T3, only the Social Functioning ($p = 0.004$) domain of SF-36 improved significantly. OHIP-14 showed significant improvement in all

Table 1. Sample characteristics in this study.

Comparator	Category	Number	%
A-P SKELETAL	CL I	4	4.4%
	CL II	10	11.1%
	CL III	76	84.4%
ASYMMETRY	No Chin Deviation (= <4 mm)	51	56.7%
	Chin Deviation (>4 mm)	39	43.3%
SFA/OFA	SFA	43	47.8%
	OFA	47	52.2%
GENIOPLASTY	No Genioplasty	30	33.3%
	Genioplasty	60	66.7%
GENDER	Female	56	62.2%
	Male	34	37.8%
AGE	≥30 years old	12	13.3%
	<30 years old	78	86.7%

Table 2. Longitudinal changes of SF-36, OHIP-14 and Aesthetic score in overall cohort.

Overall Cohort	T1 vs T2					T2 vs T3					T1 vs T3				
	T1	SD	T2	SD	p-value	T2	SD	T3	SD	p-value	T1	SD	T3	SD	p-value
SF-36 Total (0–100) (Lower Score is Worse)	79.10	11.08	80.26	11.77	0.051	80.26	11.77	80.25	12.25	0.990	79.10	11.08	80.25	12.25	0.088
PCS ^b	84.23	5.28	84.56	5.17	0.541	84.56	5.17	84.92	5.43	0.537	84.23	5.28	84.92	5.43	0.309
MCS ^c	73.61	7.30	75.63	7.72	0.025 ^a	75.63	7.72	75.24	7.72	0.658	73.61	7.30	75.24	7.72	0.080
Physical Functioning	97.30	1.66	96.40	1.70	0.112	96.40	1.70	97.90	1.59	0.026 ^a	97.30	1.66	97.90	1.59	0.340
Role Physical	71.13	0.74	71.38	0.75	0.783	71.38	0.75	72.13	0.64	0.487	71.13	0.74	72.13	0.64	0.310
Bodily Pain	83.92	1.25	82.33	1.24	0.257	82.33	1.24	81.92	1.48	0.766	83.92	1.25	81.92	1.48	0.249
General Health	72.88	3.37	75.64	3.19	0.015 ^a	75.64	3.19	74.88	3.20	0.508	72.88	3.37	74.88	3.20	0.101
Vitality	68.63	3.00	68.88	3.39	0.830	68.88	3.39	69.00	3.22	0.945	68.63	3.00	69.00	3.22	0.777
Social Functioning	84.20	1.22	86.80	1.15	0.039 ^a	86.80	1.15	89.10	1.12	0.052	84.20	1.22	89.10	1.12	<0.001 ^a
Role Emotional	91.33	0.99	95.00	0.80	0.065	95.00	0.80	93.33	0.92	0.314	91.33	0.99	93.33	0.92	0.212
Mental Health	70.57	3.74	73.43	3.71	0.003 ^a	73.43	3.71	72.00	3.69	0.166	70.57	3.74	72.00	3.69	0.164
OHIP 14 Total (0–56) (Higher Score is Worse)	19.88	9.64	16.09	9.40	0.001 ^a	16.09	9.40	11.86	10.49	<0.001 ^a	19.88	9.64	11.86	10.49	<0.001 ^a
Functional Limitation (0–8)	2.61	1.61	2.87	1.93	0.283	2.87	1.93	1.91	1.63	<0.001 ^a	2.61	1.61	1.91	1.63	0.002 ^a
Physical Pain (0–8)	3.57	1.81	3.46	2.08	0.629	3.46	2.08	2.72	1.91	0.001 ^a	3.57	1.81	2.72	1.91	<0.001 ^a
Psychological Discomfort (0–8)	3.70	2.26	2.28	1.68	<0.001 ^a	2.28	1.68	1.70	1.58	0.003 ^a	3.70	2.26	1.70	1.58	<0.001 ^a
Physical Disability (0–8)	2.92	2.01	2.96	1.99	0.882	2.96	1.99	1.80	1.65	<0.001 ^a	2.92	2.01	1.80	1.65	<0.001 ^a
Psychological Disability (0–8)	3.34	2.11	2.22	1.76	<0.001 ^a	2.22	1.76	1.74	1.81	0.030 ^a	3.34	2.11	1.74	1.81	<0.001 ^a
Social Disability (0–8)	1.92	1.73	1.24	1.27	0.001 ^a	1.24	1.27	0.98	2.10	0.245	1.92	1.73	0.98	2.10	<0.001 ^a
Handicap (0–8)	1.81	1.44	1.07	1.21	<0.001 ^a	1.07	1.21	1.00	2.19	0.780	1.81	1.44	1.00	2.19	0.005 ^a
Aesthetic Score (0–4)	2.56	1.21	1.23	1.16	<0.001 ^a	1.23	1.16	0.78	1.21	0.003*	2.56	1.21	0.78	1.21	<0.001 ^a

^a Statistically significant with $p < 0.05$.

^b PCS: Physical Component Summary.

^c MCS: Mental Component Summary.

dimensions ($p < 0.05$) and overall score ($p < 0.001$) from T2 to T3. Aesthetic score ($p < 0.001$) continued to improve significantly from T2 to T3.

From T1 to T3, SF-36 showed significant improvement only in the Social Functioning ($p < 0.001$) domain and MCS ($p = 0.034$), with no significant changes in PCS nor SF-36 overall. OHIP-14 showed significant improvement in all dimensions ($p < 0.001$) and overall score ($p < 0.001$) from T2 to T3. Aesthetic score ($p < 0.001$) improved significantly from T1 to T3.

CROSS-SECTIONAL COMPARISONS BETWEEN GROUPS

Class III versus Class II

At T1, the Class II group had a significantly worse score only on the Bodily Pain ($p = 0.026$) domain of SF-36 than the Class III group. There were no significant differences on the remaining SF-36 domains, on OHIP-14 and the Aesthetic score (Table 4).

At T2 and T3, there were no significant differences between Class II and Class III groups.

No chin deviation versus chin deviation

At T1, the Chin Deviation group had significantly better QoL on SF-36 on the overall score ($p = 0.001$), PCS ($p = 0.011$), MCS ($p = 0.001$), and the General Health ($p = 0.012$), Vitality ($p = 0.002$), Social Functioning ($p = 0.006$), Role Emotional ($p = 0.009$) and Mental Health ($p = 0.022$) domains of SF-36. The Chin Deviation group also had significantly better scores on OHIP-14 total score ($p = 0.009$) and Functional Limitation ($p = 0.001$), Physical Pain ($p = 0.032$), Psychological Discomfort ($p = 0.009$) and Psychological Disability ($p = 0.029$) dimensions of OHIP-14. There were no significant differences between the two groups on the Aesthetic score (Table 5).

At T2, the Chin Deviation group had significantly better scores on SF-36 overall ($p = 0.017$), PCS ($p = 0.007$), and the Physical Functioning ($p = 0.045$), General Health ($p = 0.021$) and Role Emotional ($p = 0.024$) domains on SF-36. There were no significant differences between the two groups on OHIP-14 and Aesthetic score.

At T3, the Chin Deviation group had significantly better QoL on SF-36 overall ($p = 0.002$), PCS

Table 3. Longitudinal changes of SF-36, OHIP-14 and Aesthetic score in Class III patients.

Class III	T1 vs T2					T2 vs T3					T1 vs T3				
	T1	SD	T2	SD	p-value	T2	SD	T3	SD	p-value	T1	SD	T3	SD	p-value
SF-36 Total (0–100) (Lower Score is Worse)	79.19	11.32	79.94	11.91	0.204	79.94	11.91	80.43	12.45	0.452	79.19	11.32	80.43	12.45	0.096
PCS ^b	84.48	5.33	84.77	5.14	0.641	84.77	5.14	85.00	5.40	0.713	84.48	5.33	85.00	5.40	0.501
MCS ^c	73.51	7.33	74.77	7.73	0.152	74.77	7.73	75.53	7.86	0.414	73.51	7.33	75.53	7.86	0.034 ^a
Physical Functioning	97.67	1.50	96.77	1.63	0.136	96.77	1.63	97.90	1.65	0.096	97.67	1.50	97.90	1.65	0.737
Role Physical	70.75	0.78	71.38	0.76	0.567	71.38	0.76	72.25	0.60	0.460	70.75	0.78	72.25	0.60	0.181
Bodily Pain	84.50	1.17	82.92	1.21	0.257	82.92	1.21	82.33	1.29	0.674	84.50	1.17	82.33	1.29	0.169
General Health	73.00	3.52	75.56	3.25	0.041 ^a	75.56	3.25	74.88	3.30	0.603	73.00	3.52	74.88	3.30	0.180
Vitality	68.38	3.05	67.92	3.46	0.757	67.92	3.46	69.13	3.25	0.401	68.38	3.05	69.13	3.25	0.584
Social Functioning	85.00	1.13	86.10	1.16	0.349	86.10	1.16	89.70	1.03	0.004 ^a	85.00	1.13	89.70	1.03	<0.001 ^a
Role Emotional	91.67	1.00	95.00	0.80	0.116	95.00	0.80	94.67	0.82	0.897	91.67	1.00	94.67	0.82	0.070
Mental Health	70.17	3.80	72.47	3.73	0.025 ^a	72.47	3.73	72.07	3.85	0.719	70.17	3.80	72.07	3.85	0.083
OHIP 14 Total (0–56) (Higher Score is Worse)	19.86	9.88	16.20	9.49	0.003 ^a	16.20	9.49	11.24	8.13	<0.001 ^a	19.86	9.88	11.24	8.13	<0.001 ^a
Functional Limitation (0–8)	2.59	1.56	2.76	1.70	0.479	2.76	1.70	1.79	1.29	<0.001 ^a	2.59	1.56	1.79	1.29	<0.001 ^a
Physical Pain (0–8)	3.54	1.81	3.41	2.10	0.592	3.41	2.10	2.62	1.67	<0.001 ^a	3.54	1.81	2.62	1.67	<0.001 ^a
Psychological Discomfort (0–8)	3.74	2.22	2.24	1.61	<0.001 ^a	2.24	1.61	1.76	1.59	0.02 ^a	3.74	2.22	1.76	1.59	<0.001 ^a
Physical Disability (0–8)	3.00	2.07	3.07	1.94	0.774	3.07	1.94	1.83	1.72	<0.001 ^a	3.00	2.07	1.83	1.72	<0.001 ^a
Psychological Disability (0–8)	3.28	2.10	2.32	1.78	<0.001 ^a	2.32	1.78	1.66	1.47	0.001 ^a	3.28	2.10	1.66	1.47	<0.001 ^a
Social Disability (0–8)	1.87	1.68	1.28	1.31	0.006 ^a	1.28	1.31	0.79	1.09	0.002 ^a	1.87	1.68	0.79	1.09	<0.001 ^a
Handicap (0–8)	1.84	1.48	1.13	1.26	0.001 ^a	1.13	1.26	0.79	1.24	0.017 ^a	1.84	1.48	0.79	1.24	<0.001 ^a
Aesthetic Score (0–4)	2.57	1.18	1.18	1.15	<0.001 ^a	1.18	1.15	0.63	0.81	<0.001 ^a	2.57	1.18	0.63	0.81	<0.001 ^a

^a Statistically significant with $p < 0.05$.

^b PCS: Physical Component Summary.

^c MCS: Mental Component Summary.

($p = 0.013$) and MCS ($p = 0.002$), and on the Bodily Pain ($p = 0.036$), General Health ($p = 0.033$), Vitality ($p = 0.005$), Social Functioning ($p = 0.001$), Role Emotional ($p = 0.008$) and Mental Health ($p = 0.013$) domains of SF-36. The Chin Deviation group also had significantly better scores on the Physical Pain ($p = 0.032$), Physical Disability ($p = 0.008$), Psychological Disability ($p = 0.002$) dimensions and total score ($p = 0.021$) of OHIP-14. The Chin Deviation group also had significantly better Aesthetic scores ($p = 0.018$).

SFA versus OFA

At T1, the OFA group had significantly worse QoL on the Bodily Pain ($p = 0.025$) domain of SF-36 and the Functional Limitation ($p = 0.002$) and Physical Pain ($p = 0.001$) of OHIP-14. There were no significant differences in the Aesthetic score, and no significant differences in the remaining components and the overall scores of SF-36 and OHIP-14 (Table 6). There were no significant differences between the groups in any measure at T2 and T3.

No genioplasty versus genioplasty

At T1, the Genioplasty group had significantly better QoL score on Mental Health ($p = 0.048$) of SF-36 and Functional Limitation ($p = 0.013$) on OHIP-14. There were no other significant differences at T1 (Table 7).

At T2, there was no significant difference in QoL scores between the two groups.

At T3, the Genioplasty groups had significantly better QoL score on General Health ($p = 0.037$), Vitality ($p = 0.027$), Mental Health ($p = 0.020$) and MCS ($p = 0.045$) on SF-36. There were no significant differences in OHIP-14 and Aesthetic score at T3.

Female versus male

At T1, there was no significant difference in SF-36 scores between Females and Males. However, Males scored significantly better on OHIP-14 Psychological Discomfort ($p = 0.044$) and Aesthetic score ($p = 0.007$) at T1 (Table 8).

At T2, Males scored significantly better on the Physical Functioning ($p = 0.021$) score of SF-36.

Table 4. Comparison of SF-36, OHIP-14 and Aesthetic score between Class III and Class II patients at T1, T2, T3.

A-P Skeletal (Class III/ Class II)	T1					T2					T3				
	CL III	SD	CL II	SD	p value	CL III	SD	CL II	SD	p value	CL III	SD	CL II	SD	p value
	Mean		Mean			Mean		Mean			Mean		Mean		
SF-36 Total (0–100) (Lower Score is Worse)	79.18	11.32	77.72	8.65	0.571	79.95	11.91	79.93	10.93	0.996	80.43	12.45	78.07	12.86	0.418
PCS ^b	84.47	5.33	80.80	4.97	0.126	84.77	5.14	81.20	5.36	0.127	85.00	5.40	83.60	6.62	0.575
MCS ^c	73.52	7.33	74.43	6.24	0.793	74.77	7.73	78.57	7.45	0.308	75.53	7.86	72.14	8.07	0.374
Physical Functioning	97.68	1.50	94.00	2.62	0.222	96.75	1.63	93.00	2.18	0.052	97.89	1.65	98.33	0.97	0.806
Role Physical	70.72	0.78	72.50	0.63	0.581	71.38	0.76	70.00	0.84	0.671	72.20	0.60	70.00	0.97	0.423
Bodily Pain	84.54	1.17	76.67	1.69	0.026 ^a	82.90	1.21	76.67	1.55	0.079	82.35	1.29	78.33	2.72	0.344
General Health	73.00	3.52	69.60	2.27	0.461	75.58	3.25	72.80	2.74	0.520	74.89	3.30	72.80	3.01	0.635
Vitality	68.37	3.05	67.92	2.26	0.914	67.93	3.46	72.08	2.71	0.384	69.13	3.25	65.00	3.47	0.370
Social Functioning	85.00	1.13	84.00	1.26	0.795	86.05	1.16	91.00	1.20	0.208	89.74	1.03	84.00	1.71	9.879
Role Emotional	91.67	1.00	91.67	0.71	1.000	94.96	0.80	93.33	0.97	0.725	94.74	0.82	85.00	1.29	9.984
Mental Health	70.18	3.80	73.00	3.57	0.506	72.46	3.73	76.67	3.50	0.314	72.06	3.85	71.33	3.17	0.864
OHIP 14 Total (0–56) (Higher Score is Worse)	19.86	9.88	20.60	9.52	0.823	16.20	9.49	16.90	9.62	0.827	11.24	8.13	18.60	21.58	9.339
Functional Limitation (0–8)	2.59	1.56	3.20	1.93	0.263	2.76	1.70	4.00	3.20	0.058	1.79	1.29	3.20	3.08	9.418
Physical Pain (0–8)	3.54	1.81	4.30	1.57	0.210	3.41	2.10	4.00	1.89	0.399	2.62	1.67	3.60	3.06	0.123
Psychological Discomfort (0–8)	3.74	2.22	3.40	2.76	0.663	2.24	1.61	2.90	2.23	0.245	1.76	1.59	1.70	1.57	0.906
Physical Disability (0–8)	3.00	2.07	2.70	1.70	0.662	3.07	1.94	2.50	2.37	0.401	1.83	1.72	1.70	1.42	0.821
Psychological Disability (0–8)	3.28	2.10	3.50	2.27	0.754	2.32	1.78	1.70	1.70	0.303	1.66	1.47	3.10	3.31	9.468
Social Disability (0–8)	1.87	1.68	2.10	2.42	0.699	1.28	1.31	1.00	1.05	0.525	0.79	1.09	2.60	5.50	9.093
Handicap (0–8)	1.84	1.48	1.40	1.35	0.373	1.13	1.26	0.80	0.92	0.424	0.79	1.24	2.70	5.56	9.117
Aesthetic Score (0–4)	2.57	1.18	2.50	1.65	0.905	1.18	1.15	1.70	1.34	0.195	0.63	0.81	1.90	2.69	9.219

^a Statistically significant with $p < 0.05$.

^b PCS: Physical Component Summary.

^c MCS: Mental Component Summary.

There were no other significant differences between Males and Females for the remaining SF-36 domains and on OHIP-14 and Aesthetic score.

At T3, Males scored significantly better on the Bodily Pain domain ($p = 0.010$) and overall SF-36 score ($p = 0.043$). However, there were no significant differences on OHIP-14 and the Aesthetic score.

30-and-over versus under-30

There was no significant difference in QoL scores between the two age groups at T1, T2 or T3 (Table 9).

DISCUSSION

Sampling was done on a consecutive basis, which reduced the risk of bias. To the best of the authors' knowledge, this is one of the largest longitudinal QoL studies performed on East Asian OGS patients.

SF-36, OHIP-14 and OQLQ were recommended by Soh and Narayanan⁶ to cover generic health, generic oral health and condition-specific QoL in OGS patients. This study used only generic QoL instruments and did not include the condition-specific OQLQ because it was a continuation of an

earlier study³⁴ that compared multiple treatment groups including non-OGS patients. In retrospect, a condition-specific QoL such as OQLQ would have been ideal due to the additional sensitivity that might reveal changes in QoL that would otherwise remain undetected by generic tools.³⁸

The literature shows that OHIP-14 and SF-36 may still be sufficiently sensitive QoL instruments for DFD and OGS patients. A study in Chinese DFD patients found a significant correlation between OHIP-14 and OQLQ scores ($r = 0.693$), with OHIP-14 deemed useful to describe the impact of DFD on QoL.³⁹ Similarly, significant correlations between OQLQ and OHIP-14 scores ($r = 0.70$) were reported in Brazilian DFD patients.⁴⁰ This is suggestive of moderate to strong correlation⁴¹ between OHIP-14 and OQLQ and attests to the utility of OHIP-14 in OGS patients. Similarly, although SF-36 is largely considered less sensitive for DFD patients,³⁹ SF-36's mental health scale has significant moderate correlations with OQLQ domains.¹⁴

Aesthetics is a major concern in orthodontic treatment and OGS,^{3,18,27,42,43} with the greatest difference in pre-operative and post-operative OQLQ scores in the facial aesthetics domain.^{42,43} However,

Table 5. Comparison of SF-36, OHIP-14 and Aesthetic score between patients with and without chin deviation before surgery at T1, T2, T3.

Facial Asymmetry	T1					T2					T3				
	No Chin Deviation (= <4 mm)	SD	Chin Deviation (>4 mm)	SD	p value	No Chin Deviation (= <4 mm)	SD	Chin Deviation (>4 mm)	SD	p value	No Chin Deviation (= <4 mm)	SD	Chin Deviation (>4 mm)	SD	p value
SF-36 Total (0–100) (Lower Score is Worse)	76.78	10.80	82.14	9.94	0.001 ^a	78.49	12.32	82.56	10.22	0.017 ^a	77.88	12.56	83.34	10.37	0.002 ^a
PCS ^b	82.59	5.34	86.36	4.80	0.011 ^a	82.88	5.22	86.77	4.68	0.007 ^a	83.27	5.89	87.08	4.32	0.013 ^a
MCS ^c	70.56	7.30	77.62	6.36	0.001 ^a	73.78	8.23	78.06	6.74	0.068	72.10	7.70	79.34	6.84	0.002 ^a
Physical Functioning	96.47	1.70	98.38	1.55	0.105	95.36	1.84	97.78	1.42	0.045 ^a	97.06	1.98	98.97	0.77	0.062
Role Physical	70.34	0.75	72.12	0.74	0.373	70.10	0.87	73.08	0.54	0.115	71.08	0.68	73.40	0.57	0.163
Bodily Pain	82.68	1.37	85.47	1.07	0.211	80.88	1.35	84.19	1.07	0.135	79.58	1.65	85.04	1.13	0.036 ^a
General Health	69.80	3.40	76.92	3.07	0.012 ^a	72.94	3.06	79.18	3.17	0.021 ^a	72.39	3.06	78.15	3.23	0.033 ^a
Vitality	65.03	2.85	73.29	2.84	0.002 ^a	66.34	3.52	72.22	3.08	0.050	65.52	3.04	73.50	3.17	0.005 ^a
Social Functioning	81.18	1.14	88.21	1.21	0.006 ^a	85.49	1.15	88.46	1.14	0.226	85.88	1.19	93.33	0.87	0.001 ^a
Role Emotional	87.58	1.09	96.15	0.74	0.009 ^a	92.48	0.99	98.29	0.38	0.024 ^a	89.87	1.08	97.86	0.57	0.008 ^a
Mental Health	68.04	4.12	73.85	2.94	0.022 ^a	72.09	4.05	75.21	3.19	0.238	69.22	3.74	75.64	3.36	0.013 ^a
OHIP 14 Total (0–56) (Higher Score is Worse)	22.18	9.63	16.87	8.90	0.009 ^a	16.33	9.06	15.77	9.93	0.780	14.08	11.43	8.95	8.39	0.021 ^a
Functional Limitation (0–8)	3.08	1.64	2.00	1.36	0.001 ^a	3.00	2.05	2.69	1.76	0.456	2.10	1.80	1.67	1.34	0.214
Physical Pain (0–8)	3.92	1.86	3.10	1.64	0.032 ^a	3.55	1.99	3.33	2.20	0.628	3.10	1.96	2.23	1.74	0.032 ^a
Psychological Discomfort (0–8)	4.24	2.27	3.00	2.06	0.009 ^a	2.16	1.59	2.44	1.79	0.437	1.96	1.61	1.36	1.48	0.072
Physical Disability (0–8)	3.06	2.04	2.74	1.97	0.463	3.10	2.07	2.77	1.90	0.441	2.20	1.51	1.28	1.70	0.008 ^a
Psychological Disability (0–8)	3.76	2.18	2.79	1.89	0.029 ^a	2.18	1.77	2.28	1.76	0.780	2.25	1.98	1.08	1.31	0.002 ^a
Social Disability (0–8)	2.14	1.81	1.64	1.60	0.179	1.22	1.17	1.28	1.39	0.811	1.27	2.62	0.59	1.02	0.127
Handicap (0–8)	1.98	1.48	1.59	1.37	0.203	1.14	1.17	0.97	1.27	0.529	1.20	2.61	0.74	1.46	0.334
Aesthetic Score (0–4)	2.73	1.23	2.33	1.16	0.128	1.18	1.16	1.31	1.17	0.598	1.04	1.41	0.44	0.75	0.018 ^a

^a Statistically significant with p < 0.05.

^b PCS: Physical Component Summary.

^c MCS: Mental Component Summary.

Table 6. Comparison of SF-36, OHIP-14 and Aesthetic score between two treatment modalities (SFA or OFA) at T1, T2, T3.

SFA/OFA	T1					T2					T3				
	SFA	SD	OFA	SD	p value	SFA	SD	OFA	SD	p value	SFA	SD	OFA	SD	p value
SF-36 Total (0–100) (Lower Score is Worse)	80.45	10.77	77.87	11.17	0.110	80.74	11.51	79.81	12.10	0.591	81.44	10.63	79.15	13.48	0.200
PCS ^b	85.40	5.06	83.15	5.40	0.131	84.99	5.29	84.17	5.10	0.575	85.71	4.04	84.20	6.44	0.317
MCS ^c	75.15	7.25	72.22	7.29	0.184	76.18	7.18	75.14	8.25	0.657	76.88	7.42	73.74	7.92	0.179
Physical Functioning	98.22	1.01	96.45	2.06	0.121	96.74	1.68	96.10	1.74	0.593	99.07	0.50	96.81	2.11	0.037
Role Physical	72.68	0.59	69.68	0.85	0.122	71.22	0.80	71.54	0.71	0.872	71.80	0.66	72.34	0.62	0.751
Bodily Pain	86.43	1.07	81.56	1.35	0.025 ^a	83.53	1.24	81.21	1.24	0.291	83.33	1.15	80.67	1.72	0.309
General Health	73.58	3.56	72.26	3.21	0.643	76.00	3.34	75.32	3.07	0.802	75.26	2.95	74.55	3.44	0.796
Vitality	70.54	3.15	66.84	2.81	0.161	69.38	3.16	68.44	3.62	0.755	70.93	3.20	67.20	3.22	0.189
Social Functioning	85.12	1.20	83.40	1.24	0.508	86.74	1.15	86.81	1.16	0.979	90.47	0.92	87.87	1.27	0.274
Role Emotional	93.41	0.93	89.36	1.03	0.245	96.90	0.55	93.26	0.97	0.198	95.35	0.80	91.49	1.02	0.236
Mental Health	71.86	3.81	69.36	3.68	0.345	73.95	3.64	72.98	3.81	0.711	73.41	3.71	70.71	3.66	0.300
OHIP 14 Total (0–56) (Higher Score is Worse)	18.30	9.46	21.32	9.67	0.139	16.02	9.93	16.15	8.99	0.950	10.12	7.79	13.45	12.33	0.133
Functional Limitation (0–8)	2.07	1.52	3.11	1.54	0.002 ^a	2.72	1.92	3.00	1.94	0.496	1.56	1.14	2.23	1.92	0.048
Physical Pain (0–8)	2.91	1.57	4.17	1.81	0.001 ^a	3.21	2.11	3.68	2.04	0.285	2.58	1.85	2.85	1.97	0.506
Psychological Discomfort (0–8)	3.63	2.13	3.77	2.39	0.774	2.37	1.62	2.19	1.74	0.612	1.56	1.44	1.83	1.70	0.417
Physical Disability (0–8)	2.84	2.19	3.00	1.84	0.703	2.88	2.11	3.02	1.91	0.746	1.70	1.68	1.89	1.63	0.577
Psychological Disability (0–8)	3.21	2.14	3.47	2.08	0.563	2.42	1.82	2.04	1.71	0.314	1.42	1.52	2.04	2.01	0.102
Social Disability (0–8)	1.81	1.74	2.02	1.74	0.573	1.37	1.40	1.13	1.13	0.363	0.65	1.07	1.28	2.71	0.160
Handicap (0–8)	1.84	1.45	1.79	1.44	0.870	1.05	1.36	1.09	1.06	0.881	0.65	0.97	1.32	2.86	0.149
Aesthetic Score (0–4)	2.65	1.00	2.47	1.38	0.470	1.26	1.16	1.21	1.18	0.862	0.58	0.85	0.96	1.44	0.141

^a Statistically significant with $p < 0.05$.

^b PCS: Physical Component Summary.

^c MCS: Mental Component Summary.

SF-36 and OHIP-14 lack an aesthetic component. Similar to previous studies facing this limitation,³⁵ an aesthetic domain question from OHIP-49¹¹ was used for Aesthetic QoL scoring.

The study group showed continuous improvement in OHIP-14 overall score and the Aesthetic score from the pre-surgical to three-month and at least 12-month postsurgical stages (debond), and improvement in various domains, dimensions and components of SF-36 and OHIP-14. This is largely in agreement with previous studies in East Asians.^{7,28} The generic oral health instrument OHIP-14 appeared to be more sensitive than the generic health instrument SF-36, with the overall score and more dimensions in OHIP-14 showing improvement compared with fewer domains in SF-36. This is similar to the findings of Lee et al.³⁹ who found that OHIP-14 showed greater sensitivity than SF-36 in a group of East Asian DFD patients.

SUBGROUP COMPARISONS

Class III versus Class II

As it is possible for skeletal Class II patients to disguise their skeletal problems by protruding their

mandible, it was theorised that Class II OgS patients might have better QoL than Class III OgS patients.⁴⁴ There is no scientific consensus in the literature, with multiple studies showing evidence for both QoL differences and no QoL differences between Class III and Class II patients.^{20,45}

East Asian populations have consistently shown an aversion towards concave profiles and mandibular prognathism.^{23,46,47} Despite this cultural proclivity, studies in East Asian populations generally do not show significant QoL differences between Class III DFD and other facial deformity types. In a South Korean female population, Jung studied Class II and Class III patients undergoing two-jaw OgS and found no difference in the two groups' QoL on OQLQ.⁴⁸ In a Chinese study utilising both OQLQ and OHIP-14, Sun et al. showed no difference between Class I, II and III skeletal deformities at any stage of OgS treatment.⁷ Paradoxically, however, they also reported that Class III skeletal deformities patients had the greatest improvement in QoL after OgS when compared to the other two groups. Using both OQLQ and SF-36, Choi et al. reported no significant difference in QoL outcomes among skeletal Class II and Class III patients in Hong Kong at all time points of OgS treatment from pre-to post-

Table 7. Comparison of SF-36, OHIP-14 and Aesthetic score between two treatment modalities (no genioplasty or genioplasty) at T1, T2, T3.

No Genioplasty/ Genioplasty	T1					T2					T3				
	No Genioplasty	SD	Genioplasty	SD	p value	No Genioplasty	SD	Genioplasty	SD	p value	No Genioplasty	SD	Genioplasty	SD	p value
SF-36 Total (0–100) (Lower Score is Worse)	77.59	11.58	79.86	10.74	0.184	78.51	11.62	81.13	11.74	0.150	77.79	13.13	81.47	11.48	0.051
PCS ^b	83.33	5.46	84.67	5.20	0.400	84.09	4.65	84.80	5.44	0.647	83.24	6.11	85.76	4.99	0.121
MCS ^c	71.43	7.65	74.71	7.06	0.160	72.52	8.22	77.19	7.29	0.058	71.95	8.21	76.88	7.27	0.045 ^a
Physical Functioning	96.89	1.96	97.50	1.49	0.623	96.00	1.86	96.61	1.63	0.633	96.78	2.22	98.44	1.14	0.254
Role Physical	70.00	0.72	71.67	0.76	0.426	72.50	0.55	70.83	0.84	0.432	72.50	0.55	71.88	0.68	0.728
Bodily Pain	85.28	1.10	83.19	1.32	0.375	83.89	1.05	81.53	1.33	0.311	82.22	1.36	81.81	1.55	0.881
General Health	70.40	3.40	74.13	3.33	0.217	73.60	3.12	76.67	3.21	0.284	70.93	3.53	76.87	2.92	0.037 ^a
Vitality	66.53	3.11	69.65	2.93	0.265	65.00	3.39	70.83	3.32	0.065	64.58	3.44	71.18	3.00	0.027 ^a
Social Functioning	84.67	1.11	84.00	1.28	0.808	84.67	1.14	87.83	1.15	0.220	88.33	1.21	89.50	1.08	0.643
Role Emotional	91.67	0.94	91.11	1.02	0.881	93.89	0.89	95.56	0.76	0.579	95.00	0.75	92.50	1.00	0.470
Mental Health	66.89	3.89	72.39	3.58	0.048 ^a	70.22	3.96	75.06	3.52	0.081	67.78	3.86	74.11	3.46	0.020 ^a
OHIP 14 Total (0–56) (Higher Score is Worse)	21.87	10.89	18.88	8.88	0.168	15.67	8.51	16.30	9.87	0.765	11.50	7.23	12.03	11.83	0.822
Functional Limitation (0–8)	3.20	1.77	2.32	1.44	0.013 ^a	2.77	1.41	2.92	2.15	0.730	1.87	1.01	1.93	1.87	0.856
Physical Pain (0–8)	3.77	1.99	3.47	1.71	0.461	3.37	2.03	3.50	2.12	0.776	2.63	1.54	2.77	2.08	0.757
Psychological Discomfort (0–8)	3.90	2.31	3.60	2.24	0.555	2.10	1.58	2.37	1.73	0.480	1.67	1.40	1.72	1.67	0.888
Physical Disability (0–8)	3.27	2.15	2.75	1.93	0.252	2.93	1.74	2.97	2.12	0.941	1.93	1.62	1.73	1.68	0.591
Psychological Disability (0–8)	3.50	2.22	3.27	2.06	0.623	2.10	1.54	2.28	1.87	0.644	1.73	1.39	1.75	2.00	0.967
Social Disability (0–8)	2.03	1.67	1.87	1.77	0.669	1.33	1.24	1.20	1.29	0.640	0.87	0.97	1.03	2.49	0.725
Handicap (0–8)	2.20	1.67	1.62	1.28	0.069	1.07	1.05	1.07	1.29	1.000	0.80	1.30	1.10	2.52	0.543
Aesthetic Score (0–4)	2.57	1.28	2.55	1.19	0.951	1.00	1.15	1.35	1.16	0.179	0.60	0.72	0.87	1.38	0.326

^a Statistically significant with $p < 0.05$.

^b PCS: Physical Component Summary.

^c MCS: Mental Component Summary.

Table 8. Comparison of SF-36, OHIP-14 and Aesthetic score between female and male groups at T1, T2, T3.

Gender (Female/Male)	T1					T2					T3				
	Female	SD	Male	SD	p value	Female	SD	Male	SD	p value	Female	SD	Male	SD	p value
SF-36 Total (0–100) (Lower Score is Worse)	78.33	12.06	80.39	9.11	0.187	79.31	12.72	81.81	9.79	0.159	78.94	13.28	82.39	9.72	0.043 ^a
PCS ^b	83.52	5.57	85.37	4.72	0.229	83.60	5.57	86.16	4.25	0.088	83.76	5.96	86.82	4.10	0.051
MCS ^c	72.76	7.92	75.04	6.13	0.316	74.72	8.35	77.14	6.54	0.315	73.78	8.17	77.65	6.71	0.107
Physical Functioning	96.96	1.84	97.84	1.30	0.467	95.48	1.98	97.94	0.99	0.021 ^a	97.26	1.90	98.92	0.81	0.089
Role Physical	70.76	0.77	71.69	0.71	0.647	70.76	0.82	72.43	0.64	0.418	71.21	0.74	73.53	0.41	0.128
Bodily Pain	84.38	1.25	83.09	1.27	0.574	81.99	1.28	82.84	1.20	0.709	79.61	1.65	85.78	1.00	0.010 ^a
General Health	71.07	3.46	75.88	3.10	0.100	74.21	3.25	78.00	3.04	0.173	73.57	3.27	77.06	3.04	0.212
Vitality	68.38	2.92	69.00	3.15	0.822	68.97	3.58	68.75	3.11	0.943	67.63	3.40	71.20	2.87	0.224
Social Functioning	83.93	1.29	84.71	1.11	0.771	85.89	1.16	88.24	1.14	0.352	87.32	1.15	92.06	1.01	0.051
Role Emotional	89.88	1.06	93.63	0.85	0.297	93.16	0.93	98.04	0.48	0.052	91.07	1.01	97.06	0.72	0.052
Mental Health	69.11	4.14	72.94	2.90	0.126	71.90	3.95	75.98	3.20	0.112	70.71	3.75	74.12	3.54	0.204
OHIP 14 Total (0–56) (Higher Score is Worse)	21.21	10.56	17.68	7.52	0.068	15.57	9.15	16.94	9.86	0.506	12.86	11.34	10.21	8.81	0.247
Functional Limitation (0–8)	2.84	1.73	2.24	1.30	0.064	2.86	1.65	2.88	2.35	0.952	2.09	1.65	1.62	1.56	0.184
Physical Pain (0–8)	3.66	1.86	3.41	1.73	0.529	3.29	1.98	3.74	2.23	0.322	2.91	2.01	2.41	1.71	0.231
Psychological Discomfort (0–8)	4.07	2.29	3.09	2.09	0.044 ^a	2.13	1.61	2.53	1.78	0.270	1.77	1.41	1.59	1.83	0.603
Physical Disability (0–8)	2.91	2.07	2.94	1.94	0.945	2.80	2.05	3.21	1.90	0.356	1.89	1.72	1.65	1.54	0.496
Psychological Disability (0–8)	3.66	2.23	2.82	1.80	0.067	2.20	1.71	2.26	1.86	0.860	1.89	1.92	1.50	1.60	0.320
Social Disability (0–8)	2.14	1.86	1.56	1.44	0.121	1.25	1.30	1.24	1.23	0.958	1.20	2.54	0.62	0.99	0.208
Handicap (0–8)	1.93	1.64	1.62	1.02	0.269	1.05	1.24	1.09	1.16	0.896	1.11	2.57	0.82	1.36	0.554
Aesthetic Score (0–4)	2.82	1.22	2.12	1.07	0.007 ^a	1.27	1.24	1.18	1.03	0.720	0.91	1.42	0.56	0.71	0.181

^a Statistically significant with $p < 0.05$.

^b PCS: Physical Component Summary.

^c MCS: Mental Component Summary.

treatment.²⁸ In contrast, Takatsuji et al. found that Japanese Class III OgS patients had higher depression scores than both Class I and Class II OgS patients before surgery, and this score decreased significantly after surgery.⁴⁹

Reflective of the equivocal results of the prior literatures in both Asian and non-Asian populations, in the current study, the only significant difference between the skeletal Class II and Class III groups was at T1. At T1, the skeletal Class II group reported a worse score only on the Bodily Pain domain of SF-36. There was no other significant difference in QoL at T1, and no significant difference in QoL at T2 and T3.

Although the findings might be unexpected due to the stated aversion for skeletal Class III profiles in East Asian and Chinese patients, the higher proportion of skeletal Class III deformities in Chinese populations might also result in a smaller social burden to the individual.^{24,50,51}

No chin deviation versus chin deviation

The correction of facial asymmetry has been extensively studied and is one of the key goals of OgS.⁵² Many patients seek OgS for the

improvement of facial symmetry.^{39,52} However, to date, only a few studies have addressed the effect of asymmetry on psychological status or QoL.⁴⁹

Takatsuji et al. found that there was no significant difference in the psychological status of asymmetric and symmetric Japanese patients before and after OgS.⁴⁹ Jung studied female Korean Class II and Class III patients undergoing two-jaw OgS and found no influence of asymmetry on the QoL of Class II and Class III patients using OQLQ.⁴⁸

Contrary to previous studies, this study found that OgS patients with chin deviation had better QoL on multiple components on SF-36, OHIP-14 and the Aesthetic score throughout all three time points. This result is unexpected since asymmetry is commonly regarded as an aesthetic deficit.⁵² Due to the paucity of previous studies, the effect of asymmetry on QoL in OgS patients remains an area that requires further research in order to clarify the conflicting results in the current literature.

SFA versus OFA

Decompensation has been shown to intensify the patient's perception of their facial disharmony.⁵³

Table 9. Comparison of SF-36, OHIP-14 and Aesthetic score between patients aged ≥ 30 years and patients aged <30 years (at time of surgery) at T1, T2, T3.

Age (≥ 30 / <30)	T1					T2					T3				
	≥ 30	SD	<30	SD	p value	≥ 30	SD	<30	SD	p value	≥ 30	SD	<30	SD	p value
SF-36 Total (0–100) (Lower Score is Worse)	79.77	10.29	79.00	11.25	0.747	82.59	9.60	79.89	12.04	0.287	82.13	10.80	79.96	12.47	0.410
PCS ^a	83.67	6.17	84.31	5.17	0.771	85.44	6.05	84.43	5.06	0.637	85.56	6.64	84.82	5.26	0.745
MCS ^b	75.60	5.55	73.32	7.54	0.391	79.52	5.79	75.04	7.93	0.191	78.45	4.66	74.74	8.06	0.124
Physical Functioning	96.94	2.11	97.35	1.59	0.814	97.22	1.53	96.28	1.74	0.596	98.33	0.90	97.82	1.67	0.757
Role Physical	68.75	1.00	71.47	0.70	0.348	70.83	0.78	71.47	0.75	0.828	67.71	1.16	72.76	0.50	0.260
Bodily Pain	79.17	1.17	84.62	1.25	0.092	80.56	1.56	82.59	1.20	0.531	77.78	2.53	82.59	1.25	0.210
General Health	74.67	3.20	72.62	3.40	0.626	78.33	3.37	75.23	3.17	0.435	79.67	2.84	74.15	3.23	0.166
Vitality	72.22	1.92	68.06	3.12	0.143	72.92	2.65	68.27	3.48	0.292	72.92	2.58	68.38	3.30	0.278
Social Functioning	84.17	1.24	84.23	1.22	0.987	90.00	1.13	86.28	1.15	0.300	90.83	0.79	88.85	1.16	0.570
Role Emotional	93.06	0.90	91.03	1.00	0.693	97.22	0.39	94.66	0.85	0.538	94.45	0.78	93.16	0.95	0.790
Mental Health	71.94	3.15	70.34	3.84	0.681	77.78	2.81	72.78	3.81	0.194	75.56	1.92	71.45	3.87	0.093
OHIP 14 Total (0–56) (Higher Score is Worse)	20.58	7.42	19.77	9.97	0.787	14.67	6.31	16.31	9.80	0.576	15.92	19.38	11.23	8.39	0.151
Functional Limitation (0–8)	2.50	0.80	2.63	1.70	0.672	3.08	1.78	2.83	1.96	0.678	2.42	2.97	1.83	1.32	0.516
Physical Pain (0–8)	3.92	2.19	3.51	1.75	0.474	3.42	1.62	3.46	2.15	0.945	3.42	2.75	2.62	1.74	0.177
Psychological Discomfort (0–8)	3.33	1.50	3.76	2.35	0.414	1.67	0.98	2.37	1.74	0.053	1.58	1.62	1.72	1.58	0.785
Physical Disability (0–8)	3.25	1.82	2.87	2.04	0.546	2.42	1.78	3.04	2.02	0.317	2.17	1.53	1.74	1.67	0.411
Psychological Disability (0–8)	3.17	1.85	3.37	2.15	0.755	1.58	1.08	2.32	1.83	0.178	2.08	3.03	1.69	1.57	0.489
Social Disability (0–8)	2.75	1.86	1.79	1.69	0.075	1.50	1.17	1.21	1.28	0.456	2.00	5.10	0.82	1.10	0.441
Handicap (0–8)	1.67	1.30	1.83	1.46	0.711	1.00	0.85	1.08	1.26	0.838	2.25	5.05	0.81	1.27	0.345
Aesthetic Score (0–4)	2.33	0.89	2.59	1.25	0.497	0.92	0.52	1.28	1.23	0.081	1.33	2.50	0.69	0.86	0.397

*Statistically significant with $p < 0.05$.

^a PCS: Physical Component Summary.

^b MCS: Mental Component Summary.

SFA avoids the need for pre-surgical orthodontic decompensation, reducing the risk of any QoL deterioration associated with it.^{15,54} Additionally, SFA has also been reported to have the benefits of early correction of skeletal discrepancy and shortened treatment duration owing to the regional acceleratory phenomenon effect.^{16,55} These factors would suggest that OFA patients in this study would have a lower QoL at T1 compared to SFA patients, and these differences would resolve after surgery.

Studies comparing the impact of pre-surgical orthodontic decompensation against pre-treatment baseline are relatively novel as the modern surgery-first approach is very much newer compared to the traditional approach and most previous QoL studies included only one pre-surgical time point.^{27,28,42,56,57}

Cunningham et al. studied two pre-surgical time points found no significant difference in QoL between pre-treatment and pre-surgery stages in the conventional OgS workflow.⁵⁸ In a cross-sectional study on OFA patients, Esperao et al. found that decompensated pre-surgical orthodontics patients had a similar QoL as pre-treatment patients when

measured with OHIP-14, with significant improvements in QoL seen only with the post-surgery group.¹⁷ These studies suggest that decompensation does not worsen QoL. In contrast, a meta-analysis by Yi et al. found that QoL measured with OQLQ decreased from orthodontic decompensation in the conventional OgS approach, especially on facial aesthetics and oral function domains, whereas there were no significant changes in OHIP-14 from decompensation.⁵⁹ They concluded that the decrease in QoL was due to the temporarily deteriorated occlusion and facial profile during orthodontic decompensation in the conventional orthognathic surgery approach.

In recent years, with increasing use of SFA, a number of newer studies have started to compare SFA with OFA as a measure of the effects of decompensation and overall treatment time on QoL.^{54,60,61} A meta-analysis by Huang et al. found that SFA patients had better oral health QoL outcomes than OFA patients, and this persisted over a 2-year follow-up period after bonding.⁶²

In East Asian populations, Wang et al. found a significant early improvement in OHIP-14 and

component scores in SFA patients compared to OFA patients, with differences reducing after surgery and resolving at the end of treatment.²⁹ The different rates of QoL improvement was attributed to the lack of decompensation and significantly shorter treatment times in the SFA group. Tachiki et al. studied 20 Japanese Class III patients with mandibular prognathism treated using OFA. They reported that orthodontic decompensation resulted in a worsening in QoL, significantly correlated with changes in relative lip positions and reverse overjet.³⁰ Ni et al. found that pre-surgical orthodontics resulted in a temporary negative impact on QoL in young Chinese adults with Class III malocclusion.³¹

The results from the current study reflect both perspectives in the literature. At pre-surgical stage T1, which corresponds to pre-treatment in the SFA group and the post-decompensation, pre-surgical stage in the OFA group, OFA patients reported having worse QoL on Functional Limitation and Physical Pain domains on OHIP-14 and a worse QoL on the Bodily Pain score on SF-36. However, the remaining five components and overall score of OHIP-14, the Aesthetic score, and the remaining domains on the SF-36 did not show any significant difference. The results would suggest that there are limited deleterious effects of orthodontic decompensation.

It is important to note that the pre-surgical orthodontic treatment duration for OFA patients in this study was relatively brief, ranging from 2.7 months to 15.1 months, with a mean of 6.4 months. This contrasts with the reported durations of pre-surgical orthodontic decompensation in the literature, which have ranged from 15.4 months⁶³ to 17.0 months⁶⁴ to 25.0 months.⁶⁵

This shortened pre-surgical orthodontics phase benefits oral function and QoL in two ways. Firstly, the presurgical orthodontics serves only to grossly align teeth and remove occlusal interferences rather than achieve full decompensation and arch coordination. Patients' functional deficits are reduced because some dental compensation remains, moderating the QoL degradation associated with greater reverse overjet and upper to lower lip discrepancy.³⁰ Secondly, a shorter presurgical orthodontic phase means that patients experience a shorter period of functional and facial deficits before definitive surgical correction.

No genioplasty versus genioplasty

Rustemeyer and Lehmann found that the addition of genioplasty in prognathic Caucasian females undergoing bimaxillary OGS significantly altered

the lower facial profile and produced more facial convexity, greater reduction of lower lip length and greater narrowing of the labiomental angle than OGS without genioplasty.³⁵ Using OHIP-14 modified with an added Aesthetic component, both genioplasty and non-genio-plasty patients showed improved QoL from OGS, but the post-surgical scores for Psychological Discomfort and Aesthetics showed significantly better QoL for genioplasty patients over the non-genio-plasty group. In contrast, Schwitzer et al. found that a mixed group of Caucasian and non-Caucasian OGS patients had significant improvements in satisfaction with facial appearance with or without genioplasty.⁶⁶

This study found that at 3 months after surgery, there were initially no differences in QoL scores between the two groups. However, at 12 months post-surgery, the results are similar to those of Rustemeyer and Lehmann with the genioplasty group having better QoL scores on the Vitality and Mental Health domains and the MCS of SF-36.³⁵ However, similar to Schwitzer et al. there were no significant differences in the Aesthetic score.⁶⁶

Female versus male

Although there have been studies that found no difference in QoL between males and females with dentofacial deformities undergoing OGS,^{49,57} the bulk of the literature suggests that females tend to experience worse QoL than males from facial deformities, with some QoL differences resolving after OGS.^{17,20,45,67}

In a Chinese population, Sun et al. showed no differences in OHIP-14 between males and females at all stages of the OGS process.⁷ However, when using the condition-specific OQLQ, they found that female individuals had significantly poorer QoL than males both before and after OGS.

Similar to the bulk of the existing literature, this study found that males had a better QoL than females on a number of domains and dimensions throughout all three stages of treatment. Male patients had a better Aesthetics QoL at T1, with surgical correction resolving this difference between males and females at T2 and T3. In addition, unlike study of Sun et al.,⁷ this study was able to detect these differences using generic QoL measures OHIP-14 and SF-36.

30-and-over versus under-30

Age was theorised to be a factor in QoL levels for DFD patients undergoing OGS. Espeland et al.⁴⁵ found that older patients had a higher risk of

sensory impairment from OgS when compared to younger patients. It was hypothesised that the younger age groups might be more psychologically resilient compared to older age groups.

This was supported by studies which found that older DFD patients experience a poorer QoL compared to younger patients.^{20,58,67} In contrast, the older patient has also been reported to experience better QoL than the younger patient.^{45,68} However, previous studies have used arbitrary age cut-offs to define older and younger age groups, with 23 years,⁷ 27 years²⁰ and 30 years⁶⁸ being used as cut-offs for “old” and “young” patient groups.

In a Chinese population, Sun et al. using OQLQ, found that older individuals (>23 years old) had significantly poorer QoL than younger individuals after OgS.⁷ Reflecting the conflicting literature, this study found that there were no differences in QoL between the 30-and-over and under-30 age group undergoing OgS at any time points. This result is similar to the finding by Emadian Razvadi who reported that the patient's age was not correlated to satisfaction rates as measured by OQLQ.⁵⁷

CONCLUSIONS

OgS has positive effects on generic health, generic oral health and aesthetics QoL in DFD patients. OgS patients with chin deviation greater than 4 mm had significantly better QoL before and after OgS than patients with chin deviation 4 mm or less. In at least 12-months after OgS, patients who have undergone genioplasty have better generic health QoL than those without genioplasty. Male DFD patients have better generic oral health and aesthetics QoL than female DFD patients before surgery. With these differences resolved after OgS, males still have better generic health QoL after OgS.

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ETHICAL APPROVAL

This study was approved by the Institutional Review Board of Chang Gung Memorial Hospital (No. 103–7642A3).

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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