Patient's Satisfaction with Facial Appearance and Psycho-Social Wellness after Orthognathic Surgery among Hong Kong Chinese using the FACE-Q

Running title: Post-orthognathic facial appearance satisfaction

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Abstract

Purpose: To assess and compare the changes in satisfaction with facial appearance and psycho-social well-being in dento-skeletal class II and III patients after orthognathic surgery **with the FACE-Q among Hong Kong Chinese**.

Methods: The **into Cantonese** translated and validated questionnaires of thirteen orthognathic-relevant FACE-Q scales were administered to **Hong Kong Chinese** patients before and after orthognathic surgery in the short- and long-term review respectively. The assessed scales were categorized into four main domains: satisfaction with facial appearance, quality of life, patient's experience of care, and adverse effects.

Results: Generally, the highly significant ($p<0.001$) improved FACE-Q scores were found in long-term in the scales investigating the satisfaction with overall facial appearance, lower face and jawline, and chin. Although dento-skeletal class III patients demonstrated significantly improved satisfaction with their post-surgical nostril appearance ($p=0.003$), this was not evident in dento-skeletal class II patients ($p=0.231$). Nonetheless, both class II and class III subjects have also revealed significantly improved psychological well-being (0.003; <0.001) and social function (0.001; <0.001) in the long-term. Age was not found to be correlated with all scales for satisfaction of facial appearance.

Conclusion: Previously validated Face-Q scales are valuable instruments to measure clinical outcomes, psychological well-being and social function in Cantonese speaking patients. Both Class II and Class III patients showed significantly improved satisfaction with facial

appearance, psychological well-being and social function after orthognathic surgery regardless of skeletal pattern and gender, **confirming findings in other ethnicities.**

Keywords: Orthognathic surgery; quality of life; aesthetic outcome; patient satisfaction; self-reported questionnaire

Background

An attractive face is often correlated with intelligence, effectiveness, better interpersonal relationships and higher social status.(Alanko et al., 2010; Al-Asfour et al., 2018) Facial aesthetics is one of the main motive(Miguel et al., 2014; Baherimoghaddam et al., 2016) and has been reported in as high as 30-96% of the patients(Alanko et al., 2010) for seeking orthognathic surgery. **As the** surgeon's beauty perception, however, might well differ from the patient, as the aesthetic perception is known to vary among individuals based on many factors, e.g. social and geographic background(Kavin et al., 2012)**, a study on the patient's post-orthognathic satisfaction with facial appearance among Hong Kong Chinese was considered appropriate.**

Most previous studies in orthognathic patients have focused on functional and psychosocial outcomes. It has been reported that up to 20% of patients were disappointed by the post-surgical facial appearance that was below their level of expectation.(Alanko et al., 2010) Hence, the post-surgical aesthetic satisfaction in orthognathic patients is an important area to be explored. Patients' self-perceived satisfaction with their post-surgical facial appearance needs to be considered as an important criterion for a successful orthognathic surgery.

A discordant facial appearance caused by dento-skeletal discrepancy may significantly affect a person's health-related quality of life (QoL).(Gava et al., 2013) Furthermore, psychological well-being together with social function are considered the main components of one's QoL(Al-Asfour et al., 2018). Many previous studies reported an improved aesthetic satisfaction(Kavin et al., 2012; Emadian Razvadi et al., 2017; Ghorbani et al., 2018), psychosocial well-being(Alves e Silva et al., 2013; Ghorbani et al., 2018) and QoL(Kavin et al., 2012; Alves e Silva et al., 2013; Baherimoghaddam et al., 2016; Emadian Razvadi et al., 2017; Al-Asfour et al., 2018) in patients who underwent orthognathic surgery.

A recently developed patient-reported outcome instrument, the FACE-Q, comprises more than 40 independently functioning scales and checklists each assessing the concepts and symptoms of specific facial areas.(Klassen et al., 2015) The FACE-Q questionnaire covers 4 main domains, namely appearance appraisal, quality of life, adverse effect and patient's experience of care.(Klassen et al., 2015) Each appearance appraisal scale assesses different facial area specifically, e.g. nostril, chin and lower jaw. The uniqueness consists in that each scale works autonomously.

This study aimed to assess and correlate the changes in satisfaction with facial appearance and psycho-social well-being in dento-skeletal class II and III **Hong Kong Chinese** patients after orthognathic surgery **using translated and validated Cantonese version of FACE-Q scales**.

Methodology

The ethical approval for this study was granted by the Institutional Review Board of The University of Hong Kong (IRB no: UW 12-066). The study was conducted at the Discipline of Oral and Maxillofacial Surgery, The University of Hong Kong. All orthognathic patients seen in the clinic from June 2016 to October 2017 were recruited for this cross-sectional study. Patients with craniofacial syndromes or cleft lip and palate were excluded.

The orthognathic-relevant FACE-Q scales and checklists were administered to patients consecutively attending the clinic. These scales and checklists included four main domains: 1) satisfaction with appearance, 2) quality of life, 3) patient's experience with care, and 4) adverse effects. These patient self-reported outcome instruments were translated and validated into Hong Kong Chinese earlier.(Tan et al., 2017) The scores for each scale/checklist is based on 3- or 4-point Likert scale. The sum of the raw score cannot be used for accurate comparison as these are non-linear data(Boone, 2016). Therefore, the total score for each scale was converted

into Rasch-transformed scores ranging from 0 to 100, except for the recovery early symptoms (scores range: 12 to 48) and late-negative sequelae for lower jaw and chin (scores range: 15 to 45) checklists. While higher Rasch-transformed scores do point at greater satisfaction within the tested scales, high non-converted scores of the two adverse effect checklists stand for more symptoms or sequelae.

Orthognathic patients were allocated into three groups: pre-surgical (T0), short-term post-surgical (T1 = first post-surgical review in the outpatient clinic) and long-term post-surgical (T2 = late post-surgical review) in the outpatient review clinic. Only questionnaires including relevant scales and checklists related to the particular clinical status were administered to the patients at each timeline (Table 1).

Statistical Analysis

Descriptive statistics were used to analyze the demographic parameters of the study subjects. The patients were matched based on gender, age and skeletal pattern for statistical analysis, as different patients have filled up the questionnaire at various stages. The statistical analysis was performed on dento-skeletal class II and III patients.

The normality of the data was checked using the Shapiro-Wilk Test. The paired t-test has been used for the comparison of changes in scores over time. The possible effect of the adjunctive genioplasty procedure was tested with the independent t-test for three scales, i.e. 1) satisfaction with overall facial appearance, 2) lower face, and 3) jawline and chin. The possible effect of gender and dento-skeletal pattern on the scores was tested with the independent t-test.

The correlation between age and the scales was tested with Pearson correlation test. Besides, the same test was also applied to assess the correlations between psychological well-being and social function with each satisfaction with facial appearance scale.

A p-value of <0.05 was considered significant for all statistical tests performed. All data were analyzed using the SPSS Statistics software version 23.0 (Armonk, NY: IBM Corp, USA).

Results

A total of 533 orthognathic patients have completed the questionnaires either pre-surgically at T0, or post-surgically during T1 or T2. After matching the patient's age, gender and skeletal pattern for further analysis, there were 134 pairs of patients available for T0 versus T2 analysis, and 108 pairs of patients available for T1 versus T2 analysis (Table 2).

Pre-surgical (T0) versus long-term (T2) changes

Satisfaction with overall facial appearance, lower face and jawline, chin and psychological well-being as well as social function scales of both dento-skeletal class II and III subjects have improved significantly ($p<0.01$) in long-term (Table 3). However, despite class III subjects have demonstrated significant improvement in their long-term post-surgical satisfaction with nostril ($p=0.003$), the same finding was not seen in class II subjects ($p=0.231$). Class II subjects have shown psychological well-being and satisfaction with lower face and jawline scale results much lower than class III subjects pre-surgically, however, those differences were not significant statistically ($p>0.05$).

66 class III and 20 class II patients have undergone genioplasty as part of their orthognathic treatment. There were no significant differences between male and female ($p>0.05$); with or without genioplasty respondents for class III ($p>0.05$) in the tested FACE-Q scales. There was also no significant difference scores between gender for class II subjects ($p>0.20$). Based on the limited amount of subjects without genioplasty (n=3) in dento-skeletal class II patients, no statistical test was performed to assess the difference between subjects with

and without genioplasty. Furthermore, no statistical difference was discovered when comparing dento-skeletal class II versus III subjects regarding all FACE-Q scales (p>0.05).

No statistically significant correlation was found between age and the changes in all the 6 assessed scales (p>0.10). However, significant correlations (p<0.05) were found between changes in all scales related to satisfaction with facial appearance with psychological well-being and social function in both dento-skeletal class II and III patients (Table 4). All satisfaction with appearance scales were found correlated with each other (p<0.05), except the satisfaction with nostril scale in dento-skeletal class II patients (p=0.389).

Early- (T1) versus long-term (T2) post-surgical changes

The recovery of early symptoms and life impact scales have significantly (p<0.001) improved in the long-term (Table 5).

No significant gender difference related to scores was found in dento-skeletal class III subjects (p>0.05). Due to rather small sample size (4 class II female sample), this test was not performed in dento-skeletal class II subjects. Additionally, no statistical difference prevailed when comparing dento-skeletal class II versus class III subjects related to any FACE-Q scale.

Patient experience of care and late adverse effect (Table 6)

These FACE-Q scales/ checklists were tested in post-surgical long-term review patients. All subjects have disclosed low scores in the late negative sequelae checklist for lower face and neck. Generally, the patients were satisfied with the outcomes, their decision and the care they have received from surgeons and the medical team. No significant difference was detected between the two groups of patients regarding these five scales and checklists (p>0.10).

Discussion

This study revealed significantly improved scores in all FACE-Q scales within the domains satisfaction with facial appearance and quality of life in **Hong Kong Chinese** orthognathic patients during long-term follow-up, except for the satisfaction with nostril scale in dento-skeletal class II patients.

In orthognathic surgery, a maxillary impaction and/or setback usually is entailed with post-surgical widened nostrils. Although intra-operative alar cinch suturing is a routinely performed procedure as an effort to overcome this shortcoming, widened nostrils probably might be the cause for improved scores but not significantly in this scale in dento-skeletal class II patients. A recent study(Ghorbani et al., 2018) recorded that one-fourth of their previously dento-skeletal class II patients was dissatisfied with their post-surgical nasal appearance. All satisfaction with appearance scales were found correlated with each other, except the satisfaction with nostril scale in dento-skeletal class II subjects. This interesting finding indicated that when the patients in this group satisfied with the post-surgical overall appearance enhancement, they might not happy with their post-surgical nostril. Nevertheless, this result shall be interpreted with caution due to the small sample size of class II patients. To avoid post-surgical disappointment in the patients, the surgeons shall be alerted by this finding and warn dento-skeletal class II patients about the potential nostril widening effect before the surgery.

Overall, it was noted, that the different skeletal pattern did not have a significant effect on the results of this study. Unlike others(Gerzanic et al., 2002; Baherimoghaddam et al., 2016), the dento-skeletal class II and III patients here did not show statistically significant differences in scores related to psychological well-being or social function both pre- and post-surgically. Supported by findings of others (Choi et al., 2010; Baherimoghaddam et al., 2016; Emadian Razvadi et al., 2017; Ghorbani et al., 2018), no gender differences were discovered in this study. Similar to the results of Schwitzer et al.(Schwitzer et al., 2015) who reported significantly improved satisfaction with the facial appearance in their patients with and without

genioplasty, additional genioplasty did not increase the satisfaction with overall facial, lower jaw or chin appearance in the dento-skeletal class III patients of the here presented study.

As mentioned above, post-surgical FACE-Q scores for satisfaction with facial appearance and the quality of life domains were significantly ($p<0.003$) improved, except for the satisfaction with nostril appearance in dento-skeletal class II patients. The scores for satisfaction with lower face and jawline have increased two-fold, and the scores for satisfaction with overall facial appearance and chin have also increased more than 50% in the long-term. All these results showed that orthognathic patients are very satisfied with the improvement of their facial appearance after the surgery. Furthermore, their psychological well-being and social life function enhanced drastically (33-44%). These findings may be anticipated as patients with dento-skeletal malformations somehow are expected to improve psycho-socially as they might become more confident with their improved facial aesthetics. Similar to others(Baherimoghaddam et al., 2016; Ghorbani et al., 2018), these dento-skeletal class III subjects showed better social function compared to class II subjects, though not significantly in the present study. Positive changes in all facial aesthetic satisfaction scales were found correlating with improved psychological well-being and social function moderately to highly, therefore nurturing the assumption that an enhanced facial appearance due to orthognathic surgery can improve one's psychological well-being and social function. Besides, in accordance with the results of others(Emadian Razvadi et al., 2017; Ghorbani et al., 2018), this study has found no correlation between age and psycho-social function of the subjects.

As an elective surgery, orthognathic surgery is expected to cause minimal adverse effect to patients. This study disclosed very low scores in the late negative sequelae for lower jaw and chin checklist, both in dento-skeletal class II and III subjects. The effect of orthognathic surgery on recovery early life impact and on recovery early symptoms did not persist but improved significantly in both patient groups in the long-term.

Patient's experience of healthcare and its providers is an important aspect to be assessed. The subjects of this study revealed very high scores for the surgeon and medical team signifying their satisfaction with the professional care they have received throughout the treatment. Orthognathic patients face drastic changes in daily life, once the facial appearance changed after the orthognathic surgery. The subjects in the present study have presented very high scores for the satisfaction of decision and outcome, in line with the high scores for the self-perceived improved facial appearance. These two very important scales should be highly considered to be assessed in all orthognathic patients, as changes in the facial appearance after the surgery cannot be reverted.

Orthognathic surgical outcomes are often assessed by non-validated questionnaires, condition-specific questionnaires i.e. Orthognathic Quality of Life Questionnaire (OQLQ) and/or generic questionnaires e.g. Oral Health Impact Profile (OHIP), Rosenberg Self-Esteem Scale and health-related quality of life (HRQoL). The generic questionnaires are being considered less sensitive in detecting condition-specific measures or disease-related attributes.(Baherimoghaddam et al., 2016) Although OQLQ covers the domains of social aspects of dentofacial deformity, facial aesthetics, oral function and awareness of dentofacial aesthetic(Cunningham et al., 2002), the psychological well-being and aesthetic satisfaction with each specific facial part cannot be assessed. FACE-Q is not developed specifically to assess orthognathic outcomes, which is why the oral function is not assessed in this study. For a more complete and comprehensive outcome assessment of orthognathic patients, future studies might use FACE-Q together with other questionnaires such as OQLQ or OHIP-14. FACE-Q, therefore, is not an alternative, but a complementary questionnaire for a better understanding of the patient's perceived treatment outcomes. Assessment of patient's satisfaction with facial appearance is crucial as a plethora of orthognathic patients are seeking

aesthetic enhancement over functional improvement after orthognathic surgery (Baherimoghaddam et al., 2016).

The satisfaction with facial appearance scales was not assessed during the short-term review (T1). Apart from findings published elsewhere that patient only perceives esthetic improvement 2 months post-surgically(Kavin et al., 2012), these patients will most probably still experiencing oedema, pain and limited mouth opening during that early follow-up review. There are a few shortcomings for this study: (1) Due to time constraints, different patients have completed the questionnaires during the various studied timeline. In the future, a long-term longitudinal study design would be recommended to avoid this shortcoming. (2) The small sample size of dento-skeletal class II subjects has caused subgroup analyses of gender differences and the effect of genioplasty in the FACE-Q score impossible. This shortcoming might be overcome in the future with long-term longitudinal or multicenter study design that enables the researchers to extend the data collection period for dento-skeletal class II patient, as dento-skeletal class III orthognathic patients are much more frequent in Hong Kong(Lee CTY et al., 2014). Additionally, the satisfaction with facial appearance among orthognathic patients compared with a norm population might be considered in future research projects.

Conclusion

Previously validated **and into Cantonese translated** Face Q questionnaires are valuable instruments to measure clinical outcomes, psychological well-being and social function in **Hong Kong Chinese** patients. Findings **obtained by the same instrument** in other ethnicities could be widely confirmed. Both Class II and Class III patients showed significantly improved satisfaction with facial appearance, psychological well-being and social function after orthognathic surgery, regardless of their skeletal pattern or gender.

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312 Table 1. The FACE-Q scales and checklist included in the study and their timely sequence of

313 application

Domains	Scales/checklist[#]	T0	T1	T2
Satisfaction with appearance	1. Satisfaction with facial appearance overall*	/		/
	2. Satisfaction with lower face and jawline*	/		/
	3. Satisfaction with chin*	/		/
	4. Satisfaction with nostril*	/		/
Quality of Life	5. Psychological well-being*	/		/
	6. Social function*	/		/
Adverse effect checklist	7. Recovery early life impact*		/	/
	8. Recovery early symptoms[#]		/	/
	9. Late negative sequelae-lower face and neck[#]			/
Patient experience of care	10. Satisfaction with decision*			/
	11. Satisfaction with outcome*			/
	12. Satisfaction with surgeon		/	/
	13. Satisfaction with the medical team		/	/

314 * Translated and validated into Hong Kong Chinese

315 Table 2. Subjects' demographic profile.

	T0 versus T2		**T1 versus T2**	
	Class II (*n=23*)	Class III (*n=111*)	Class II (*n=15*)	Class III (*n=93*)
Age, *years* (mean±sd)	20-40 (25.8±4.8)	19-38 (24.5±3.3)	21-31 (24.47±3.8)	19-38 (24.7±3.8)
Gender				
Male	6	46	11	41
Female	17	65	4	52
Post-surgical duration,				
T1, days (mean±sd)	-	-	5-26 (12.6±5.97)	5-21 (11.27±6.28)
T2, *months* (mean±sd)	7-27 (15.78±6.54)	5-31 (15.58±7.19)	6-26 (14.33±7.04)	5-28 (15.23±7.14)

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Table 3. FACE-Q score for pre-surgical (T0) versus long-term postsurgical (T2) self-perceived changes.

Scales/checklist[#]	Class II			Class III		
	T0	T2	*p*-value	T0	T2	*p*-value
Satisfaction with appearance						
1. Satisfaction with facial appearance overall*	41.09±8.57	67.65±20.11	<0.001*	43.56±11.84	66.93±17.95	<0.001*
2. Satisfaction with lower face and jawline*	31.22±15.44	69.74±20.87	<0.001*	37.62±15.69	70.33±20.35	<0.001*
3. Satisfaction with chin*	42.57±13.92	72.65±21.58	<0.001*	41.96±12.10	71.59±20.29	<0.001*
4. Satisfaction with nostril*	59.96±20.85	67.74±24.70	0.231	60.15±17.26	68.12±22.64	0.003*
Quality of Life						
1. Psychological well-being*	50.57±14.50	68.09±19.04	0.003*	56.44±13.85	74.59±18.43	<0.001*
2. Social function*	47.87±12.25	68.78±18.83	0.001*	51.34±15.61	71.57±19.58	<0.001*

*Significant *p*-value <0.05

Table 4. The correlations between age, changes in psychological well-being, social function and satisfaction with facial appearance.

	Psychological well-being		**Social function**		**Satisfaction with overall facial appearance**		**Satisfaction with lower face and jawline**		**Satisfaction with chin**		**Satisfaction with nostril**	
	Class II	*Class III*	*Class II*	*Class III*	*Class II*	*Class III*	*Class II*	*Class III*	*Class II*	*Class III*	*Class II*	*Class III*
	r (p)	*r (p)*	*r (p)*	*r (p)*	*r (p)*	*r (p)*	*r (p)*	*r (p)*	*r (p)*	*r (p)*	*r (p)*	*r (p)*
Psychological well-being												
Social function	0.694 (<0.001)*	0.836 (<0.001)*										
Satisfaction with overall facial appearance	0.755 (<0.001)*	0.618 (<0.001)*	0.694 (<0.001)*	0.634 (<0.001)*								
Satisfaction with lower face and jawline	0.649 (0.001)*	0.655 (<0.001)*	0.645 (0.001)*	0.625 (<0.001)*	0.723 (<0.001)*	0.751 (<0.001)*						
Satisfaction with chin	0.656 (0.001)*	0.572 (<0.001)*	0.619 (0.002)*	0.506 (<0.001)*	0.713 (<0.001)*	0.711 (<0.001)*	0.638 (0.001)*	0.794 (<0.001)*				
Satisfaction with nostril	0.485 (0.019)*	0.474 (<0.001)*	0.516 (0.012)*	0.421 (<0.001)*	0.430 (0.041)*	0.483 (<0.001)*	0.316 (0.141)	0.470 (<0.001)*	0.189 (0.389)	0.420 (<0.001)*		
Age	-0.264 (0.224)	0.835 (0.111)	-0.236 (0.279)	0.033 (0.733)	-0.373 (0.080)	-0.017 (0.862)	-0.387 (0.068)	0.074 (0.442)	-0.238 (0.275)	-0.035 (0.717)	0.231 (0.288)	0.097 (0.309)

* Significant *p*-value.

Table 5. FACE-Q score for early post-surgical (T1) versus long-term postsurgical (T2) changes related to possible adverse effects of the surgery.

Scales/checklist[#]	**Class II**			**Class III**		
	T1	**T2**	***p*-value**	**T1**	**T2**	***p*-value**
Adverse effect checklist						
1. Recovery early life impact	50.53±8.79	86.00±13.60	<0.001*	51.71±11.11	82.33±23.89	<0.001*
2. Recovery early symptoms	34.47±3.94	19.13±2.53	<0.001*	33.11±6.64	19.41±3.91	<0.001*

*Significant *p*-value <0.05

Table 6. FACE-Q score for patient's experience of care and late adverse effect.

Scales/checklist	**Class II**	**Class III**	*p*-value
Adverse effect checklist			
1. Late negative sequelae-lower face and neck^	17.33±2.64	18.01±5.33	0.631
Patient's experience of care			
1. Satisfaction with decision	73.39±20.60	79.58±18.65	0.157
2. Satisfaction with outcome	64.57±18.58	71.20±19.24	0.133
3. Satisfaction with surgeon	77.83±16.85	81.82±20.08	0.587
4. Satisfaction with the medical team	98.67±3.27	93.38±12.65	0.539

^min score: 15, max score: 45

*Significant *p*-value <0.05