## **Original Article**

# Spectrum and Management of Dentofacial Deformities in a Multiethnic Asian Population

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## ABSTRACT

**Objective:** The aim of this retrospective study is to investigate the spectrum and management of dentofacial deformities in a multiethnic Asian community.

**Materials and Methods:** Over a period of 3 years (2001 to 2003), 212 patients with dentofacial deformities who had undergone orthognathic surgery in a national tertiary specialist center in Singapore were reviewed. Patients with cleft lip and palate or syndromes were excluded.

**Results:** The mean age (range: 16 to 58 years) of the patients was 24.0 years (SD 6.4) and the ratio of female to male was 1.3:1. The predominant ethnic group was Chinese (91.5%). The majority of the patients had skeletal Class III pattern (68%). Asymmetry was diagnosed in 36% of all cases and in 48% of skeletal Class III cases. Vertical maxillary excess was diagnosed in 21% of all cases and in 47% of skeletal Class II cases. Bimaxillary surgery involving LeFort and bilateral sagittal split osteotomies was performed in 84% of skeletal Class III cases. Segmental osteotomy and genioplasty were performed in 41% of the cases.

**Conclusions:** The findings suggest that the majority of the patients were young Chinese adults with two-jaw deformities requiring bimaxillary surgeries with genioplasty or segmental osteotomy. This finding may reflect the greater severity of dentofacial deformities in patients in the Asian community.

KEY WORDS: Orthognathic surgery; Dentofacial deformities; Multiethnic population

## INTRODUCTION

Dentofacial deformity has been described as a deformity that affects primarily the jaws and dentition and affects a variable proportion of the population in various societies. However, there is a paucity of data on the prevalence of dentofacial deformities because most studies have restricted their survey to the evaluation of dental occlusions and malocclusions without paying sufficient attention to the underlying facial form.<sup>1–7</sup>

Important advances in diagnostic and treatment planning tools as well as surgical techniques have made orthognathic surgery a common and safe procedure in the management of dentofacial deformities.

Accepted: October 2005. Submitted: July 2005. © 2006 by The EH Angle Education and Research Foundation, Inc. Recent literature on facial esthetics and surgical stability has also resulted in changing trends in the management of these patients.

Singapore is a multiracial country comprising the Chinese, Malays, Indians, and others of mixed origins with various ethnic differences. This study is a retrospective review of patients with dentofacial deformities who had undergone orthognathic surgery and will allow some insights into the spectrum and management of dentofacial deformities in this region.

## MATERIALS AND METHODS

This is a retrospective study of orthognathic patients based on examination of patients' records from the Dentofacial Deformities clinic that is run biweekly in the National Dental Centre in Singapore. Examination of each patient is carried out according to a strict protocol including clinical and radiographic data, study of dental casts, and computerized cephalometric analysis and surgical simulation. Each case is presented to a panel of orthodontists and oral and maxillofacial surgeons to reach a diagnosis and orthodontic surgical plan. In reaching a diagnosis, Chinese cephalometric norms are taken into account. The spectrum of den-

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Table 1.	Demographic Characteristics	of the Subjects	According to	Skeletal Groups

	n = 16)	II (n = 52)	III (n = 144)	Total (r	y = 212	DValue
	15 (64)			```	1 – 212)	P value
Mean age (SD) (y) 24	+.5 (0.+)	25.3 (8.2)	23.5 (5.6)	24.0	0 (6.4)	.96
Sex (%)						
Males	4	25	65	94	(44.3)	.252
Females	12	27	79	118	(55.7)	
Ethnic distribution (%)						
Chinese	13	45	136	194	(91.5)	.091
Malays	1	3	5	9	(4.2)	
Indians	2	2	1	5	(2.4)	
Others	0	2	2	4	(1.9)	

tofacial deformities is routinely categorized into three skeletal groups according to the anteroposterior skeletal pattern (Class I, II, or III). The presence of asymmetry, vertical maxillary excess, or bimaxillary protrusion is also routinely recorded.

The records of 212 consecutively treated orthognathic patients from the above joint clinic treated over a 3-year period (2001–2003) were reviewed. Patients with cleft deformities or syndromes were excluded. All patients had presurgical orthodontics before the surgery. The age, race, and sex of the patients were recorded. The type of surgical procedure for osteotomies was recorded as one of the following: bilateral sagittal split osteotomy (BSSO), Le Fort osteotomy, bimaxillary osteotomies (ie, BSSO and Le Fort osteotomies), anterior segmental osteotomy, and genioplasty.

#### **Statistical Analyses**

Besides descriptive statistics, chi-square tests were used to analyze the differences between the three skeletal groups. Where appropriate, a P value equal to or less than .05 was considered significant.

Statistical analysis was performed with the Statistical Package for Social Sciences (SPSS) version 12.0.

## RESULTS

The mean age of the patients was  $24.0 \pm 6.4$  years with a range of 16 to 59 years (Table 1). About 70% of the patients were between 18 and 30 years of age. The ratio of female to male patients was 1.3:1. The ethnic distribution of patients in this study was 91.5% Chinese, 4.2% Malay, 2.4% Indians, and 1.9% others.

A skeletal Class III pattern was the most common dentofacial deformity (67.9%). This was followed by skeletal Class II pattern (24.5%) and skeletal Class I pattern (7.5%). There was no significant difference in the age, sex, and ethnic distribution of anteroposterior skeletal pattern (Table 1).

Asymmetry was diagnosed in 35.8% of all cases, whereas vertical maxillary excess was found in 22.2%

 Table 2.
 Incidence of Asymmetry, Vertical Maxillary Excess, and

 Bimaxillary Protrusion According to Skeletal Groups

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	l (n = 16)	II (n = 52)	III (n = 144)	Total (n = 212)	P Value	
Asymmetry (%)						
Present	3	4	69	76 (35.8)	.000	
Absent	13	48	75	136 (64.2)		
Vertical maxi	illary exce	ss (%)				
Present	8	25	14	47 (22.2)	.000	
Absent	8	27	130	165 (77.8)		
Bimaxillary protrusion (%)						
Present	7	3	0	10 (4.7)	.000	
Absent	9	49	144	202 (95.3)		

(Table 2). There were significant differences in the incidence of vertical maxillary excess, asymmetry, and bimaxillary protrusion among the three skeletal groups (P < .001). In the skeletal Class III group, 47.9% of the cases presented with asymmetry and 9.7% presented with vertical maxillary excess. Vertical maxillary excess was found in 53.2% of patients with skeletal Class II pattern. All patients with skeletal Class I pattern had vertical maxillary excess, bimaxillary protrusion, or asymmetry.

Bimaxillary osteotomy involving Le Fort osteotomy and BSSO was the most common surgical procedure performed, accounting for 73.1% of all patients treated (Table 3). Single-jaw surgeries involving Le Fort osteotomy were performed in 13.2% of the cases, whereas BSSO was performed in 10.4% of the cases. A small number of patients (3.3%) who presented mainly with bimaxillary protrusion on a skeletal Class I pattern had segmental osteotomy only. However, segmental osteotomy was carried out in 13.7% of cases involving bimaxillary and single-jaw osteotomies, and genioplasty was performed as a secondary procedure in 29.7% of all cases.

	Skeletal Groups				
	l (n = 16)	II (n = 52)	III (n = 144)	Total (%) (n = 212)	
BSSO + Le Fort osteotomy + genioplasty/segmental	3	15	45	63 (29.7)	
BSSO + Le Fort osteotomy	2	14	76	92 (43.4)	
BSSO + genioplasty/segmental osteotomy	0	3	5	8 (3.8)	
BSSO only	0	7	7	14 (6.6)	
Le Fort + genioplasty/segmental osteotomy	4	8	3	15 (7.1)	
Le Fort osteotomy only	3	4	6	13 (6.1)	
Segmental osteotomy only	4	1	2	7 (3.3)	

Table 3. Surgical Procedures According to Skeletal Groups<sup>a</sup>

<sup>a</sup> BSSO indicates bilateral sagittal split osteotomy.

#### DISCUSSION

This 212 patients sampled were known to have a dentofacial deformity and as such, no conclusion can be drawn on the incidence of these deformities in the population at large. The higher ratio of female patients and the predominant age group in this group of patients were expected findings.<sup>8-12</sup> The higher ratio of Chinese patients compared with the population norms would indicate either higher awareness among the Chinese or a greater incidence of dentofacial deformities in this ethnic group. The general higher socio-economic status of the Chinese in the community may also influence the selection of such a costly treatment.

The high incidence of skeletal Class III malocclusions in this study is in agreement with results of studies of dental malocclusions in the Chinese.<sup>1–4</sup> This finding may also suggest that this skeletal malocclusion is relatively unacceptable within the population and prompt many patients to seek treatment. Studies on profile preferences amongst Asian laypersons had consistently found that a concave profile due to a prognathic mandible was rated amongst the worst in facial attractiveness.<sup>12–14</sup> Research has also shown that patients with severe sagittal Class II deformities are more inclined toward orthodontics rather than surgery,<sup>15</sup> whereas a greater number of severe Class III subjects sought orthognathic surgical treatment compared to those with severe mandibular deficiency.<sup>16</sup>

It is expected that individuals seeking orthognathic surgical treatment would have a high prevalence of detectable asymmetry caused by anomalous growth patterns. In this study, asymmetry was diagnosed in about one-third of all patients and this would be a significant esthetic reason for patients to seek orthognathic surgery. This is in agreement with the findings of Severt and Proffit<sup>17</sup> who also reported incidence of clinically apparent asymmetry in 34% of patients with dentofacial deformities.

Haraguchi et al<sup>18</sup> found that in a study sample of 220 Class III Japanese patients, 56% had soft tissue asymmetry and 80% had some degree of hard tissue asymmetry. These findings were supported by this study in which 48% of the Class III patients were diagnosed with clinical asymmetry. The incidence of asymmetry was also significantly higher in Class III patients compared with Class II and Class I patients. It is reasonable to expect asymmetry to be more frequently associated with excessive growth especially in the case of mandibular prognathism, and we suggest that special attention should be paid to Class III patients during initial examination for the detection of hard and soft tissue asymmetry.

The high incidence of two-jaw surgery may reflect the greater severity of dentofacial deformities seen in this region. Recent advances in diagnostic and surgical techniques have also allowed clinicians to correctly identify and treat the sites of the deformity and this may in part explain the higher incidence of two-jaw surgery in this study compared with earlier studies.<sup>8,19</sup>

In this study, bimaxillary surgery was most commonly done in skeletal Class III cases (84%). This can be explained in part by the greater severity of skeletal Class III malocclusions seen amongst the Chinese population.<sup>20</sup> In the 1980s, the ramus osteotomy for mandibular setback used to be the standard procedure for skeletal Class III correction. However, with improvements in surgical techniques and with the demonstration that maxillary advancement is unlikely to cause speech problems in noncleft patients and with documentation that better esthetics and stability can be achieved with combined maxillary and mandibular surgery, bimaxillary procedures are now the commonest surgery in skeletal Class III corrections.<sup>19</sup>

The incidence of bimaxillary protrusion, expected to be relatively high in this population, was found only in 4.7% of the sample with slightly more than half of these cases recorded as having an additional deformity. The relatively low incidence of segmental osteotomies to treat bimaxillary protrusion in this sample may suggest that this deformity is relatively acceptable within the population at large.

## CONCLUSIONS

- The majority of the patients who had orthognathic surgery were young Chinese adults with two-jaw deformities requiring bimaxillary surgery.
- Skeletal Class III pattern was the most common dentofacial deformity among patients seeking orthognathic surgery.
- Our findings may also reflect the greater severity of dentofacial anomalies seen in patients in this Asian community.

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