

Dentoskeletal Changes of Skeletal Class III Malocclusion with Severe Facial Asymmetry after Orthognathic Surgery: Case Report

Toe Pyae Aung*[†], Aung Myat Shein[†], Zin Wai Myint[†], Zin Zin Win[†], Win Naing[‡], Hla Hla Yee[†]

[†]Department of Orthodontics, [‡]Department of Oral and Maxillofacial Surgery

University of Dental Medicine, Yangon

*Corresponding Author: toepyaung@gmail.com

Abstract - Craniofacial asymmetry is expressed as the difference in size between two parts of the face. It is originated by a discrepancy in size and position between the cranial base and the maxilla, between the cranial base and the mandible, or between the maxilla and the mandible. When the craniofacial asymmetry is severe and the patient has completed growth, the indicated treatment is performed in conjunction with orthodontics and orthognathic surgery, traditional approach or surgery first approach. A 24 year-old woman had chief complaints of mandibular protrusion and facial asymmetry. Extraoral examination indicated mandibular deviation to the right side, severe facial asymmetry, and a concave profile. Orthognathic surgical treatment plan was Lefort I osteotomy and two-piece maxillary osteotomy to correct the posterior crossbite. Concomitant surgical procedure for the mandible was bilateral sagittal split osteotomy to correct facial asymmetry and mandibular protrusion. After orthognathic surgery followed by postsurgical orthodontic treatment reveals skeletal Class I and acceptable facial aesthetics with Class I occlusion. According to this case report, double jaw surgical procedure including maxillary and mandibular movements is indicated for the treatment of severe facial asymmetry and skeletal Class III malocclusion.

Keywords; *facial asymmetry, mandibular protrusion, presurgical orthodontic treatment, orthognathic surgery, postsurgical orthodontic treatment*

Received: October 2019

Accepted: December 2019

Introduction

Facial asymmetry may be associated with class I occlusion, but this is more frequently associated with class II and III occlusions. In some cases, the facial asymmetry is secondary to condylar hyperplasia or hypoplasia, ankylosis of the temporomandibular joint, displaced condylar fractures, or hemifacial microsomia. The etiology of facial asymmetry for many other cases is still unknown. Facial asymmetry can be outlined and divided into three main categories; congenital, developmental, arising during growth with inconspicuous etiology; and acquired, resulting from injury or disease (Cohen, 1995; Hegtvedt, 1993; Reyneke *et al.*, 1997).

Facial asymmetry including mandibular deviation to the right or left side is one of the most challenging problems to correct in orthodontics. (Proffit, 1991; Pirttiniemi, 1994). Mandibular asymmetry is very common and may create the esthetic concerns and functional irregularities. In most cases, mandibular asymmetry is usually associated with an occlusal cant and cannot be treated without

double-jaw orthognathic surgery (Cheong & Lo, 2011).

Skeletal deformity requires surgical orthodontic treatment for correction. The traditional approach for these patients requires:

- Pre-surgical stage: leveling and alignment, correct dental compensations and coordinate arches,
- Surgical stage: to perform the orthognathic surgery procedures and
- Post-surgical stage: to detail occlusion.

The another new technology that is surgery first approach applied to the orthodontic systems and the new biological model allow the orthodontist to delay less time in the pre-surgical and post-surgical stages, condition appreciated by the patients, mostly because after relieving dental compensations there is a worsening of facial aesthetics and masticatory discomfort in the pre-surgical orthodontics stage (Montesinos *et al.*, 2017). Orthodontic treatment is usually an integral part of contemporary orthognathic treatment. In most cases, the attainment of a satisfactory post-surgical occlusion will require the use of fixed appliances to achieve optimal arch coordination and inter-digitation (Ayoub *et al.*, 2014).

Case Report

A 24 year-old woman had chief complaints of mandibular protrusion and facial asymmetry. Extraoral examination indicated mandibular deviation to the right side, severe facial asymmetry, and a concave profile, mandibular prognathism and increased lower one third of the face. The facial photographs of the patient indicated severe facial asymmetry with a mandibular deviation and a concave profile (Figure 1). Maxillary midline coincide with facial midline and mandibular midline was shift 5mm to the right from facial

midline. The mandibular dental midline was deviated 5 mm toward the right side according to the maxillary dental midline, and the patient had both anterior and posterior crossbites. Intraoral examination showed Class III canine and molar relationships on the left side and Class III canine and Class I molar relationships on the right side. Reversed overjet and 1 mm overbite was seen. There was a minus two millimeters arch length discrepancy on both arches. Inclinations of the occlusal plane greater than 4° and menton deviations observed in the posteroanterior cephalograms are important characteristics to determine the presence and extension of facial asymmetry. The patient of this case presented significant facial asymmetry, mandibular asymmetry and menton deviation to the right.

Cephalometric analysis indicated Class III relationship (ANB, -5.2°), average maxillary basal bone (SNA, 81.3°) and mandibular protrusion (SNB, 88.4°), and high mandibular plane angle (FMA, 32.3°). The upper incisors were proclined (U1 to SN, 116.5°), whereas the lower incisors were retroclined (IMPA, 80.1°) (Table 1). Concave facial profiles, mandibular prognathism and increased lower one third of the face (Table 1, Table 2, Figure 2).



Figure 1. (A) Front view of pretreatment photographs showed facial asymmetry (B) Profile view of pretreatment photographs showed skeletal class III

Table 1. Comparisons of skeletal changes before treatment, before surgery and after surgery

Skeletal Parameters	Before Treatment	Before Surgery	After surgery
Palatal plane to Mandibular Plane	28.6°	27.3°	27.2°
FMA	32.3°	32°	31.1°
Y-Axis	62.1°	63°	63.4°
Nasion Perpendicular to A point	-5.4 mm	-5.8 mm	-2.4 mm
Nasion perpendicular to Pogonion	3.1 mm	-1.6 mm	-2.4 mm
SNA	81.3°	81.3°	81.5°
SNB	88.4°	85.3°	80.8°
ANB	-7.1°	-4°	0.7°
Wits	-13.8 mm	-9.5 mm	-0.3 mm
Maxillary length	76.2 mm	76.2 mm	75.6 mm
Mandibular length	125.9 mm	111.4 mm	105.5 mm

Table 2. Comparisons of dento-facial changes before treatment, before surgery and after surgery

Dento-facial Parameters	Before Treatment	Before Surgery	After surgery
Interincisal Angle	128.9°	121.4°	119.8°
Lower 1 to MP	80.1°	87.4°	88.5°
Lower 1 to NB	4.1 mm	5.8 mm	5 mm
Lower 1 to APo	7.5 mm	7.7 mm	3.6 mm
Upper 1 to SN	116.5°	116.7°	114.5°
Upper 1 to APo	3.9 mm	4.3 mm	7.1 mm
Nasolabial Angle	100.2°	104.8°	108.4°



Figure 2. (A) Pretreatment lateral cephalometric radiograph showed mandibular prognathism (B) Frontal cephalometric radiograph showed skeletal asymmetry of face

Treatment Planning

The treatment objectives were as follows:

- (1) to correct the skeletal discrepancy between the maxilla and mandible;
- (2) to correct the skeletal and dental midlines;
- (3) to achieve good facial esthetics and symmetry;
- (4) to obtain Class I canine and molar relationships, including a normal overjet and overbite.

The orthognathic surgery was unavoidable because of severe skeletal mandibular asymmetry. Therefore, treatment plan was double- jaw surgery for the patient. To correct class III facial profile, advancement surgery with Lefort I osteotomy was planned. To correct the facial asymmetry and mandibular protrusion, concurrent bilateral sagittal split osteotomy was performed.

Treatment

Full fixed 0.022 inch MBT prescribed appliances were placed on the teeth in both arches. Leveling and aligning was initiated by 0.012 inch nickel-titanium archwire and continuing upto 0.016×0.022 inch stainless steel archwire placed just before surgery.

The advancement surgery with Lefort I osteotomy and two pieces maxillary osteotomy at maxillary to correct the posterior crossbite was performed together with bilateral sagittal split osteotomy to correct the facial asymmetry and mandibular protrusion.

Orthodontic treatment was started one and half months post-surgery and bonded the brackets on the some of the teeth where the brackets were popped off during and after surgery. The 0.014 inch NiTi archwire was used to align the teeth and continuing the treatment (Figure 3).

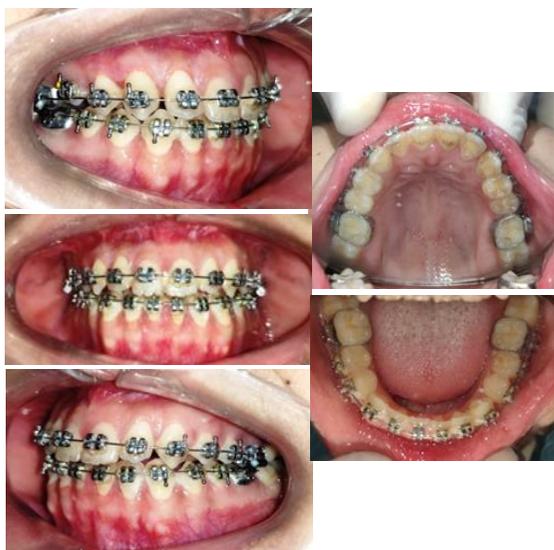


Figure 3. Intraoral photographs (One and half months after surgery) after rebonding of brackets

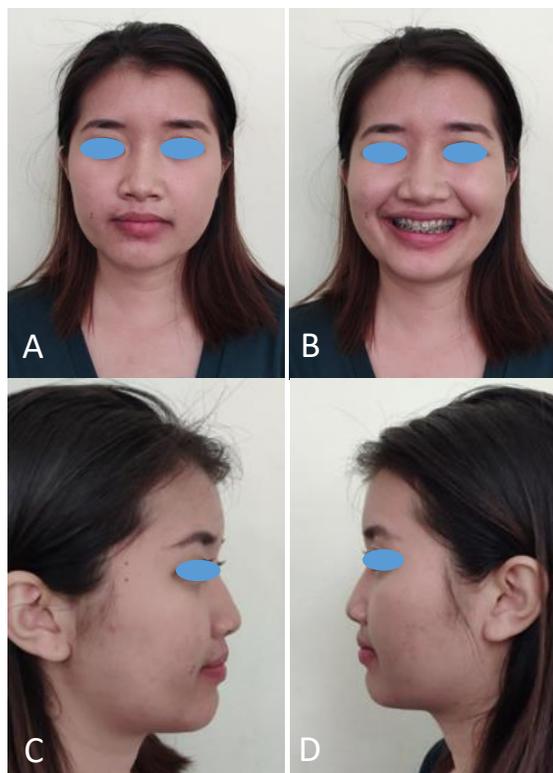


Figure 4. (A, B) Extraoral photographs of front view, (C, D) Extraoral photographs of profile view (One and half months after surgery)



Figure 5. Intraoral photographs (3 months after surgery) after space closure of residual spaces

Treatment Results

As a result of slight advancement of the maxilla, setback and transverse rotation of the mandible, facial esthetics was improved. The anterior and posterior crossbites were corrected; maxillary and mandibular midlines were made coincident with each other. The post-treatment posteroanterior cephalometric radiograph showed improvement of the mandibular symmetry. Class I canine and molar relationships were obtained (Figure 5).

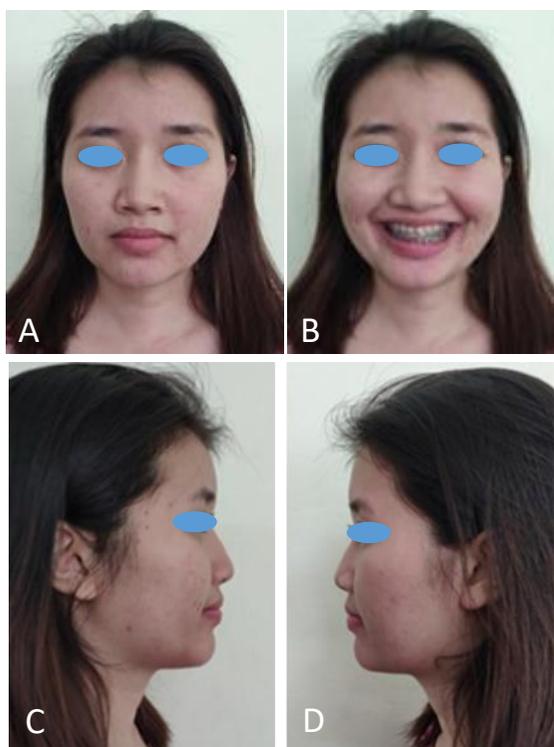


Figure 6. (A, B) Extraoral photographs from front view showed improvement of mandibular symmetry, (C, D) Extraoral photographs from profile view showed skeletal class I (3 months after surgery)

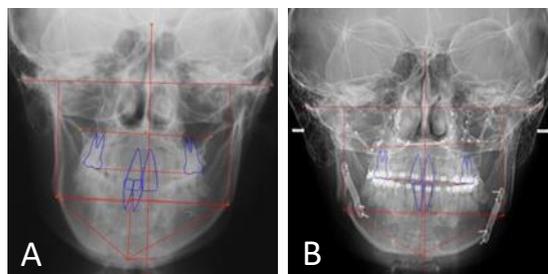


Figure 7. Frontal Cephalometric Radiographs: (A) Facial asymmetry before surgery, (B) Improvement of facial asymmetry after surgery

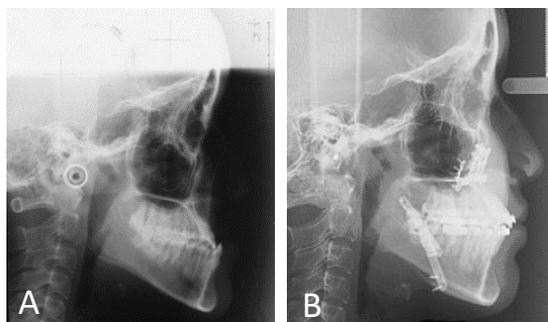


Figure 8. Lateral Cephalometric Radiographs: (A) Skeletal class III mandibular protrusion before surgery, (B) Changes of skeletal pattern after surgery

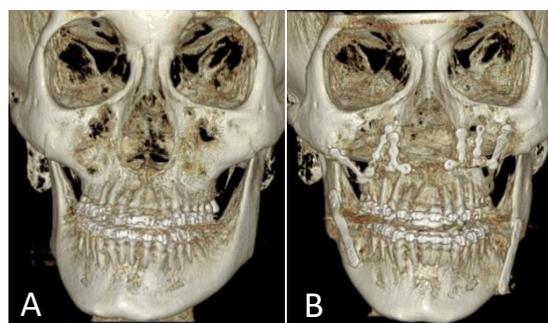


Figure 9. Changes of skeletal asymmetry seen on CBCT: (A) Before surgery, (B) Improvement of skeletal asymmetry after surgery

Discussion

The aims of the treatment in Class III malocclusion are to improve the facial esthetics and correct the malocclusion. Facial asymmetry is one of the most challenging problems in orthodontic treatment. Dental asymmetries without occlusal cant can be treated by orthodontic mechanics, including diagonal and midline elastics or using asymmetric tooth-extraction sequences (Atik *et al.*, 2016). However, severe skeletal asymmetries, especially in Class III malocclusions, usually require a series of complex surgical procedures combined with orthodontic treatment. Improvement of the facial profile in cases with severe facial asymmetry occurs with surgery to the mandible. Bilateral sagittal split osteotomy is the most common procedure to surgically correct mandibular deformity. When double-jaw surgery is planned for an asymmetric case, the positioning of the maxilla is considered more crucial than the repositioning of the mandible. Comparison of the initial and post-operative postero-anterior cephalometric tracings showed the improvement of mandibular asymmetry. Since the pretreatment cephalometric measurements indicated mandibular protrusion, the Class III malocclusion was corrected by a combination of mandibular setback and maxillary advancement.

Conclusion

Traditional approach of double-jaw surgical procedures, including maxillary and mandibular movements, was effective to correct severe facial asymmetry and skeletal Class III malocclusion both in the horizontal and vertical directions.

Acknowledgments

The authors are grateful to Dr. Lew Chee Kong and Department of Oral and

Maxillofacial Surgery, University of Dental Medicine, Yangon, Myanmar for performing the orthognathic surgery.

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The authors declare there is no potential conflict of interest.

References

- [1] Atik, E., Konaş, E. & Kocadereli, İ. (2016). Orthognathic Treatment of Skeletal Class III Malocclusion with Severe Facial Asymmetry. *Turk J Orthod*, 29(1), pp. 22-61.
- [2] Ayoub, A., Khambay, B., Benington, P., Green, L., Moos, K. & Walker, F. (2014). *Handbook of Orthognathic Treatment: A team approach*. 1st Edition. John Wiley & Sons, Ltd.
- [3] Cheong, Y.W. & Lo, L.J. (2011). Facial asymmetry: Etiology, evaluation, and management. *Chang Gung Med J*, 34, pp. 341-51.
- [4] Cohen, M.M. Jr. (1995). Perspectives of craniofacial asymmetry. Part III. Common and/or well-known causes of asymmetry. *Int J Oral Maxillofac Surg*, 24, pp.127-33.
- [5] Hegtvedt, A.K. (1993). Diagnosis and management of facial asymmetry. *Oral and Maxillofacial Surgery*, 3, Philadelphia. Lippincott. pp. 1400-14.
- [6] Méndez, I. H. & Lozano, M. B. (2017). Surgical Orthodontic Treatment in a Skeletal Class III patient with severe facial asymmetry. *Revista Mexicana de Orto-doncia*, 5(2), pp. e111-e119.
- [7] Montesinos, A. F., Paulina, P. & Raymundo, R. (2017). Surgical Orthodontic Treatment for a Skeletal Class III and Asymmetric Patient: Case report, *International Journal of Clinical Oral and Maxillofacial Surgery*, 3(2), pp. 11-15.
- [8] Proffit, W.R. (1991). *Surgical Orthodontic Treatment*. St. Louis, 1st Edition. Mosby Year Book. pp. 24-70.
- [9] Pirttiniemi, P. M. (1994). Associations of mandibular and facial asymmetries; A

review. *Am J Orthod Dentofacial Orthop*, 106, pp. 191-200.

- [10] Reyneke, J. P., Tsakiris, P. & Kienle, F. (1997). A simple classification for surgical planning of maxillomandibular asymmetry. *Br J Oral Maxillofac Surg*, 35, pp. 349-51.