

Orthodontic Treatment After Unintended Unilateral Fixation Plate Removal Following Single-Jaw Orthognatic Surgery

Christina Agustine¹, Maria Purbiati^{1*}

1. Department of Orthodontics, Faculty of Dentistry, Universitas Indonesia, Depok 16424, Indonesia.

Abstract

A combination of orthodontic and orthognatic surgery was planned for a 18-year-old male with class III malocclusion, mandibular asymmetry, unilateral crossbite and open bite. After 10 month of pre-surgery orthodontic treatment, mandibular setback was done. Unexpectedly, two weeks later the right fixation plate were exposed intra-orally and had to be removed. Eventually, the return of mandibular assymetry and midline shifting were inevitable. This required an extensive post-surgery orthodontic treatment to distalize the right lower segment using miniscrew.

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Introduction

Class III malocclusion can be a result of pure mandibular prognathism or maxillary hypoplasia and retrognathism, or a combination of the two. A study excluding children under 11 years old found that the populations from Southeast Asian countries showed the highest prevalence rate of 15.8%.¹ Class III malocclusion in an adult patient which cannot be camouflaged with orthodontic treatment alone may require orthognatic surgery. This article presents a unique case of a post-surgery orthodontic treatment in an 18-year-old male with class III malocclusion, mandibular asymmetry, unilateral crossbite and open bite which unintended plate removal was done following a single jaw surgery (mandibular setback).

Case Report

An 18-year-old male came to the Orthodontic Department, Dental Teaching Hospital, Faculty of Dentistry, University of Indonesia complaining his inability to bite using

his front teeth. There was also a family history of mandibular prognathism. No bad habits history were recorded regarding malocclusion. Extraoral examination revealed a dolico-facial type, asymmetric chin to the left, concave profile with competent lips (Figure 1). Intraoral examination showed a moderate oral hygiene, moderate crowding on upper and lower arch with -6.5mm overjet and -1.5 mm overbite. There was also a unilateral crossbite on the right and a skeletal open bite in which only permanent maxillary first molar occluded with permanent mandibular second molar bilaterally. There were class III molar and canine relation on both sides, with 1 mm dental midline shift to the right on the upper arch and 2 mm dental midline shift to the left on the lower arch. A non-vital permanent maxillary right first molar, impacted permanent lower left third molar were also found (Figure 2). Joint sound were recorded on mouth opening and closing, but no complaints regarding TMJ problems. Postero-anterior cephalometric analysis revealed that he had skeletal and dental asymmetries on the lower third of his face, in which the menton was displaced 2.5 mm to the left. On the other hand, lateral cephalometric analysis revealed that he had a mandibular prognathism and normal vertical pattern. Cervical Vertebrae Maturation analysis showed that he was in CS-6 (Figure 3).²

Antero-posteriorly, the aetiology of this case was mandibular excess. Palatoversion of permanent maxillary right first, second molar

*Corresponding author:

Maria Purbiati
Department of Orthodontics
Faculty of Dentistry, Universitas Indonesia
Depok 16424, Indonesia
E-mail: mariapurbiati@gmail.com

and second premolar caused a unilateral crossbite on the right side. Extrusion of permanent maxillary second molar caused the open bite. In this case, camouflage treatment would not be sufficient to resolve patient's complaints and overcome such discrepancies. Hence orthodontic treatment combined with orthognatic surgery was planned not only to correct the occlusion and improving masticatory function but improving aesthetics (profile) as well.

Pre-orthodontic treatment consists of root canal treatment on permanent maxillary first molar, along with odontectomy of permanent mandibular third molars to facilitate mandibular setback. Pre-surgery orthodontic treatment was aimed to relieve the crowding, to make the upper midline coincide with the facial midline, to place the lower midline in accordance with the mandibular midline, incisors inclination correction, and to intrude permanent maxillary second molars. These were achieved with non-extraction in 10 months using MBT brackets slot 0.022" combined with miniscrew and modified Transpalatal Arch (Figure 1&2).



Figure 1. Extra-oral photographs.
 A. Before treatment. B. After pre-surgical orthodontic treatment. C. After Surgery

Bilateral Sagittal Split Osteotomy technique was chosen, in which the amount of setback on the right side were more than the left side to correct mandibular asymmetry. Rigid internal fixation (plate and screws) was used on both sides of osteotomy. Instead of rigid intermaxillary fixation, elastics were used post-surgery to help maintain the position and enhance healing process. After the surgery, the patient's profile improved significantly and his main concern had been addressed (Figure 1). Unfortunately, two weeks post surgery the patient came complaining of some loose brackets but on examination it was found that the plate was exposed intraorally.

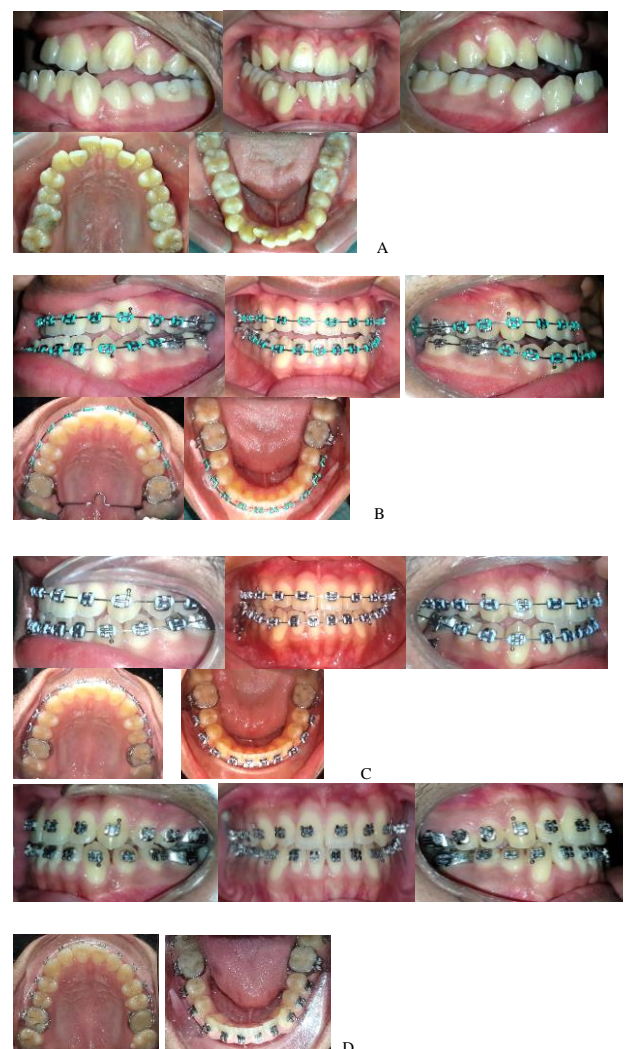


Figure 2. Intra-oral Photographs. A. Before treatment, B. After pre-surgery orthodontic treatment, C. After plate removal Post-Surgery, D. After Post-surgery Orthodontic Treatment.

The patient was referred back to the oral surgery department. Curettage was done and stitches were placed on the area of plate exposure. However two weeks later it was exposed again with the loosened fixation screws, which made plates removal mandatory. Hence the return of mandibular asymmetry and 1.5 mm lower midline discrepancy with minimal overjet on the right posterior area were inevitable (Figure 2).

The patient refused to take second surgery, hence post-surgery orthodontic treatment was directed to correct the midline, transversal discrepancy and right posterior interdigitation by lower posterior distalization using miniscrew. Miniscrew was used as an indirect anchorage and placed between permanent maxillary right first molar and second premolar. The head of the screw was ligated with wire ligature then covered with composite resin. Intermaxillary elastic (5/16", 4.5 oz) were connected from the miniscrew to the hook of permanent mandibular right canine bracket. Open coil spring was put between permanent mandibular right first and second molars on 0.016x0.022 stainless steel wire (Figure 4).



Figure 4. Miniscrew as indirect anchorage to distalize right posterior lower segment.

Elastics were then changed gradually to 1/4", 4.5 oz. The distalization process took more time than expected, since the patient got a period of demotivation by not wearing elastics regularly and frequent loosening of the brackets. 15 months later, the patient's motivation improved and intermaxillary elastic was gradually changed (1/4", 6 oz) and open coil springs were moved after each tooth distalized. After six months, lower midline was coincide with the upper, class I canine were achieved and better posterior interdigitation was evident (Figure 2). However, since we only changed the dental condition, mandibular asymmetry was still uncorrected (Figure 1). The case was finished within 37 months.

Discussion

In this case the considerations to do camouflage or orthodontic treatment combined with orthognatic surgery were the patient's main concern, profile, the amount of skeletal discrepancy, skeletal maturation stage, and the presence of mandibular asymmetry. In order to gain positive overbite, intrusion of permanent maxillary second molars had to be done, but this would cause a counterclockwise movement of the mandible, increasing the negative overjet. In this case, the result of camouflage treatment was predicted to be compromised as the inclination of the upper incisors had already been protrusive and the lower had already been retrusive. Hence, orthodontic treatment combined with orthognatic surgery was chosen. The patient had a relatively flat occlusal plane other than the extruded permanent maxillary second molars and a thick lip soft tissue, so the decision was to do single jaw surgery with more setback on the right side to correct mandibular asymmetry. (Table 1)

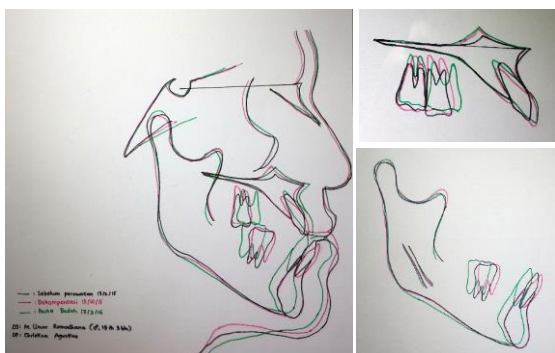
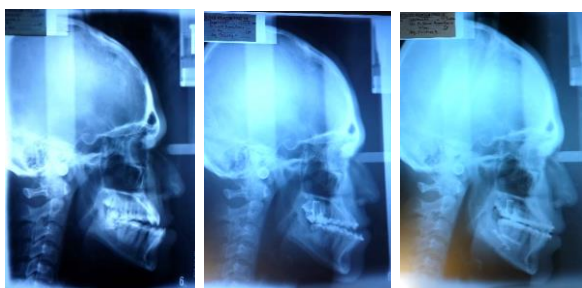


Figure 3. Cephalometric analysis and superimpositions: Black line: Before treatment. Red line: After decompensation phase. Green line : Post-surgery.

However, unfavorable outcome could still happen even in a carefully planned orthodontic treatment. This could jeopardize both the treatment result and the motivation of the patient. In this case, plate exposure and removal after surgery had prolonged the treatment time and had made the mechanotherapy more difficult. Little et al (2015) found 3.2% of 202 patients had their plates removed and proportionally more plates removed from the mandible than the maxilla within the first post-operative year due to plate exposure and infection.³ Furthermore, Falter et al (2011) reported 27.6% in 570 patients undergoing orthognatic surgery needed plate removal but only 13,7% were due to infection. They stated that one of the possible

explanation was the absence of intermaxillary fixation postoperatively, which might cause micromotions at the fracture site that provoke a reaction near the surgical wound and the manual tightening of the screw had been too tight causing microfractures close to the osteotomy site.⁴

In this case, the patient refuse to do secondary orthognatic surgery. Post-orthodontic surgery need to correct the midline, transversal discrepancy and right posterior interdigitation by distalizing the lower posterior segment. Most of distalizing mechanics in orthodontics placed the miniscrews in the same arch of the intended area to be distalized as had been described by Safavi et al (2013) and Polleti et al (2013).^{5,6}

Parameter	Mean	Before Treatment	Decompensation (5 months before surgery)	Post-surgery
Skeletal (Horizontal)				
SNA	82°±2	91°	90°	91°
SNB	80°±2	91.5°	91.5°	88.5°
ANB	2°±2	-0.5°	-1.5°	2.5°
The Wits	±1 mm	-13.5 mm	-13.5 mm	-6.5 mm
Facial Angle	87°±3	84°	84°	85°
Angle of Convexity	0°-10°	-2°	-3.5°	3.5°
Pg-NB	4 mm±2	1 mm	1 mm	2 mm
Skeletal (Vertikal)				
Y-axis	60°±6	65°	65°	65.5°
Go angle	123°±7	129°	128.5°	130°
MMPA	27°±4	23.5°	25°	25°
SN-MP	32°±3	29.5°	30.5°	32°
PFH (S-Go)	87.8 (67-104.5)	92.5 mm	94.5 mm	92 mm
AFH (N-Me)	130.6 (100-147.5)	134 mm	135.5 mm	133 mm
UFH (N-ANS)	58.6 (49.5-64.5)	60.5 mm	57.5 mm	58.5 mm
LFH (ANS-Me)	72.5 (60-90)	73.5 mm	78 mm	75.5 mm
Dental				
Interincisal Angle	135°±10	122.5°	119°	120°
UI-MxP	109°±6	124°	122°	128°
UI-SN	104°±6	114°	116°	121°
UI-NA	4 mm±2	3.5 mm	7 mm	7 mm
UI-Apg	4 mm±2	3 mm	5.5 mm	8 mm
LI-Apg	2 mm±2	9.5 mm	12 mm	5 mm
LI-MP	90°±4	88.5°	94°	87°
LI-NB	4 mm±2	9 mm	11.5 mm	7.5 mm
Soft Tissue				
Upper lip-E line	1 mm	-5.5 mm	-2.5 mm	-2 mm
Lower lip-E line	0 mm	0 mm	+1.5 mm	-0.5 mm

Table 1. Cephalometric analysis: Before treatment, Decompensation phase (Pre-surgery), Post-surgery.

The miniscrew was intended to be placed on the retromolar area, but the patient refused because he was anxious if another sequelae would happen if it was put near the removed plate area. Hence we chose to put the miniscrew on the upper arch as indirect anchorage. We ligated the miniscrew with ligature tie to prevent slippage and cover the screw head using composite resin to reduce irritation. We connected an elastic from the screw to the hook of permanent right lower canine and put an open coil spring to distalize the tooth one by one. From a biomechanical standpoint, this technique was beneficial by not only assisting distalization, but also to collapse the right side of the lower arch to increase the posterior overjet and to produce extrusion of the canine. For the first 15 months of post-surgery orthodontic treatment the patient was not cooperative using the elastics. But eventually he got motivated and diligently wearing them hence in 6 months a good Class I canine on both sides, lower midline coincide with the upper and facial midline, and overall good occlusion could still be achieved without having to do secondary orthognathic surgery.

Conclusions

Post surgical complications could compromise the result and prolong the post-surgery orthodontic treatment time, which in turn could also demotivate the patient to continue the treatment. However, with good cooperation and proper mechanics, such unexpected surgical outcome could still be manage optimally.

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