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CASE REPORT

Improved Superelastic NiTi wire for the Treatment of Adult Skeletal Class III Malocclusion in a Surgery-first Case

[1]Chih-Yu Fang, [2]Ya-Yu Tsai, [3]Jian-Hong Yu

ABSTRACT

A 19-year-old female came to our department with the chief complaint of facial asymmetry. Clinical examination showed skeletal class III relationship with mandibular prognathism, large reverse overjet, lower right mild crowding, and left hemi-mandibular elongation. After a thorough discussion with the patient, she accepted the proposal of orthognathic surgery and mandibular setback by bilateral sagittal split osteotomy (BSSRO), and therefore, tooth extraction was performed for 18, 28, 38, and 48 before the surgery. An improved superelastic Ti-Ni alloy wire (ISW wire), developed by Tokyo Medical and Dental University, was then used to facilitate the correction of lower crowding. Involved mechanism included intermaxillary elastics for a better interdigitation and jaw relationships. Adequate overbite and overjet were achieved after treatment completion.

Keywords: Improved superelastic Ni-Ti alloy wire, Orthognathic surgery-first approach, Skeletal class III.

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INTRODUCTION

Skeletal class III malocclusion is often associated with a retrusive maxilla, protrusive maxillary incisors, retrusive mandibular incisors, a protrusive mandible, or any combination of these.[1] There are three main treatment options for skeletal class III malocclusion, including growth modification of the maxilla, orthodontic camouflage, and surgical intervention. Because the treatment for restriction of excessive mandibular growth might result in extra pressure on the temporomandibular joint, maxillary expansion before the growth spurt can produce more favorable outcomes. After the growth spurt, the latter two treatment options may be considered more appropriate.

[1,2]Resident, [3]Associate Professor

[1]Department of Orthodontics, China Medical University and Medical Center, Taichung, Taiwan

[2,3]Department of Dentistry, College of Medicine, China Medical University, Taiwan

Corresponding Author: Chih-Yu Fang, Resident, Department of Orthodontics, China Medical University and Medical Center Taichung, Taiwan, Phone: +886983294475, e-mail: bsbyaa@gmail.com

Dentoalveolar camouflage with the use of multiloop edgewise archwire (MEAW)[2] or mini-implants[3] are considerably more favorable to achieve better results when surgery is not undertaken. However, the treatment of class III malocclusion by orthodontic camouflage has some limitations and may cause an excessive lingual tiling of the lower incisors. Therefore, orthognathic surgery is an appropriate treatment option for patients with high esthetic expectations.

At present, mini-screws can be used to destabilize mandibular dentition and correct class III malocclusion with mild anterior crossbite.[3] However, orthognathic surgery should be considered more effective for patients with excessive crossbite or high esthetic expectations. Conventionally, orthognathic surgery is an orthodontics-first approach. Presurgical decompensation can provide a reasonable amount of surgical correction. During surgery, splints may not show better and accurate fitting to the arch alignment in the crowded teeth. Recently, surgery-first approach has become a favorable treatment option for optimal esthetic outcome and the phenomenon of postoperatively accelerated tooth movement.[4]

In this article, we describe the treatment of a 19-year-old female with skeletal class III and mild dental crowding. The procedures included orthognathic-first approach and orthodontics adjustment and the use of improved superelastic Ni-Ti alloy wire (ISW), IME (intermaxillary elastics), and elastic chains.

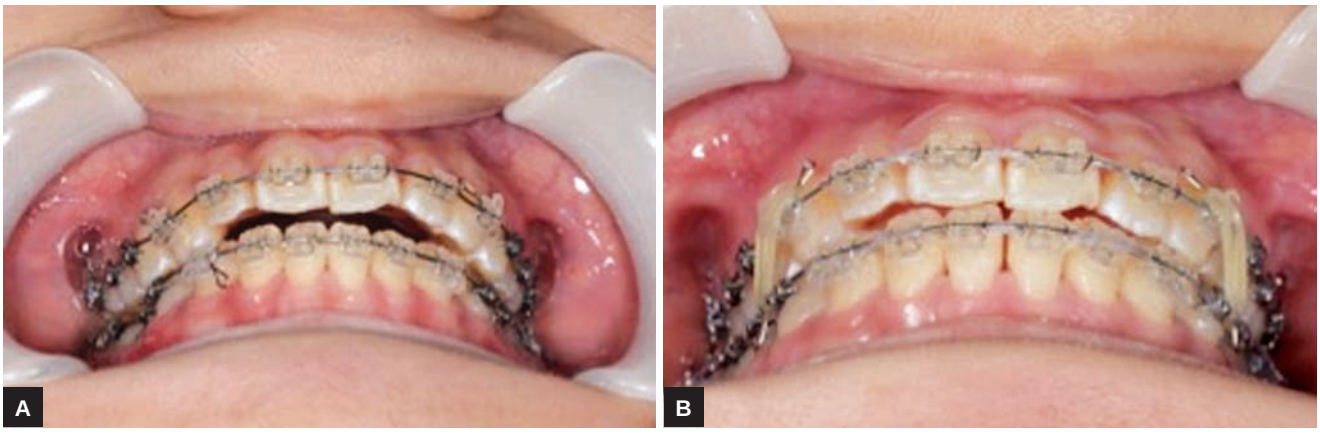
DIAGNOSIS AND TREATMENT PLAN

A 19-year-old female came for orthodontic treatment to our Department of Orthodontics with the chief complaint of facial asymmetry. She had no history of drug allergy or temporomandibular disorder. Pretreatment cephalometric and posteroanterior film shows a class III molar and canine relationship with an average mandibular plane angle. The lower arch was 3.5 mm deviated to the right side (Figs 1A to E). Besides, lower arch crowding of the right side was noted. The treatment plan included teeth extraction of #18, #28, #38, and #48. Clear and metal brackets* and Superbond** were used to bond the teeth surface. After surgery-first approach, detailing and finishing were achieved by using arch

*TOMY INCORPORATED, Tokyo, Japan

** SUN MEDICAL Corporation, Shiga, Japan

Figs 1A to E: Pretreatment examination



Figs 2A and B: Orthodontic adjustment after surgery

wire (TOMY L&H superelastic nickel titanium wire) and intermaxillary elastics (3M Unitek superchain medium 3/16" size).

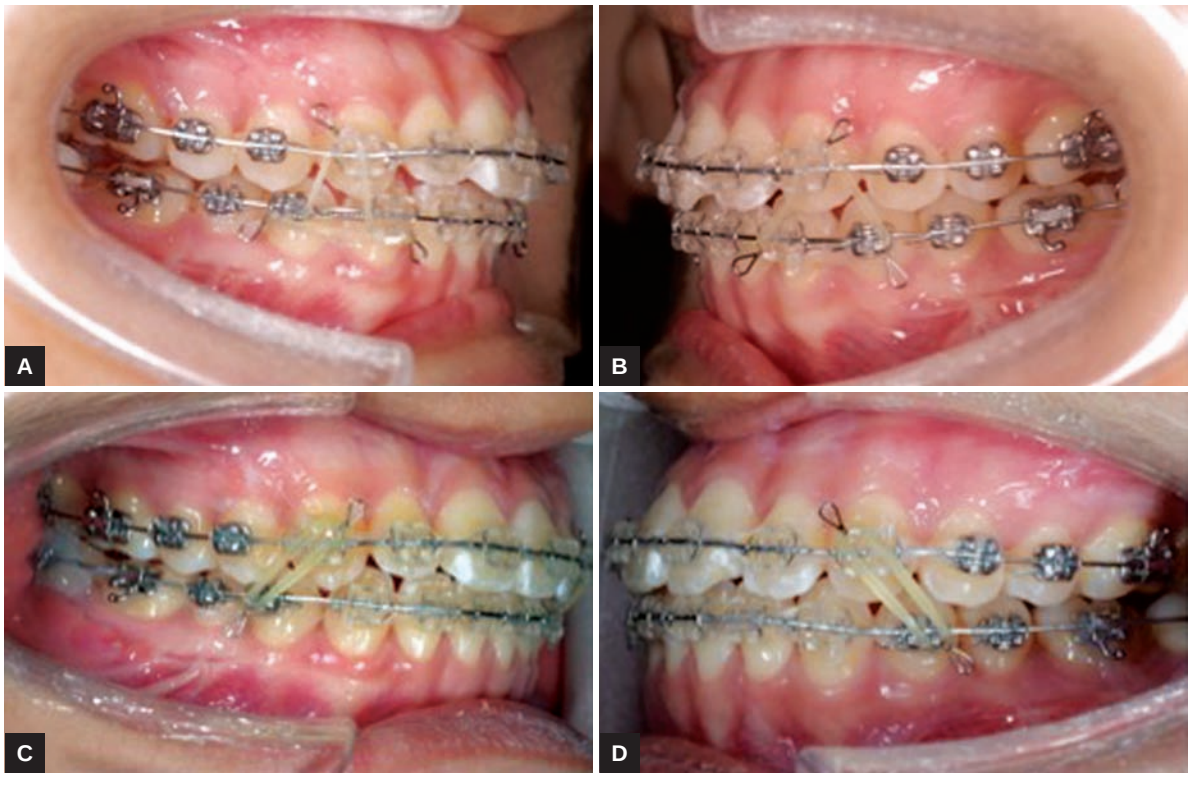
TREATMENT PROGRESS

During the initial stage of treatment, a round wire* was passively engaged the brackets. The bilateral sagittal split osteotomy (BSSRO) technique was used for mandibular setback 2 days after the initiation of the treatment. For the lower dental, the midline was shifted to the left by 3.5 mm; the amount setback of the mandibular body on the right side was 6.5 mm and the left side was 9.5 mm, with bilateral fixation of mandibular bone plates.

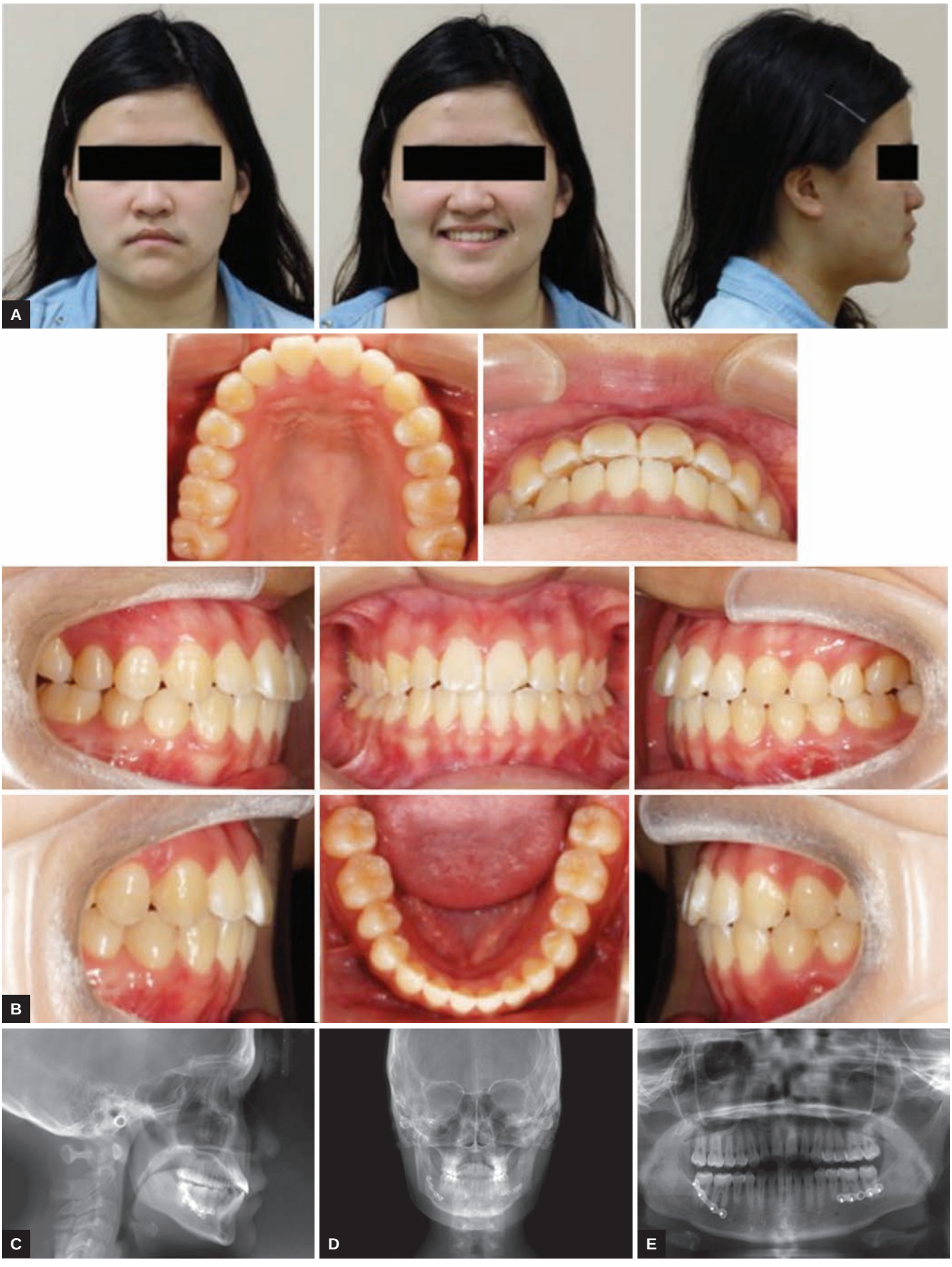
After surgery, archwires (TOMY L&H® Titan superelastic nickel titanium alloy wire, 0.016×0.022″ Accu Form®) were used to achieve the leveling of upper and lower arches. In a surgery-first case like this one, decompensation is performed postoperatively to eliminate the compensation of the anterior teeth.

Furthermore, class II IME (intermaxillary elastics) and elastic chain were applied for reducing the overjet (Figs 2A and B, and 3A to D). The active orthodontic treatment was completed within 5 months, and successful correction for both the profile and the occlusion was achieved (Figs 4A to E and 6A to D).

*Sentalloy Arch Wire, TOMY INCORPORATED, Tokyo, Japan

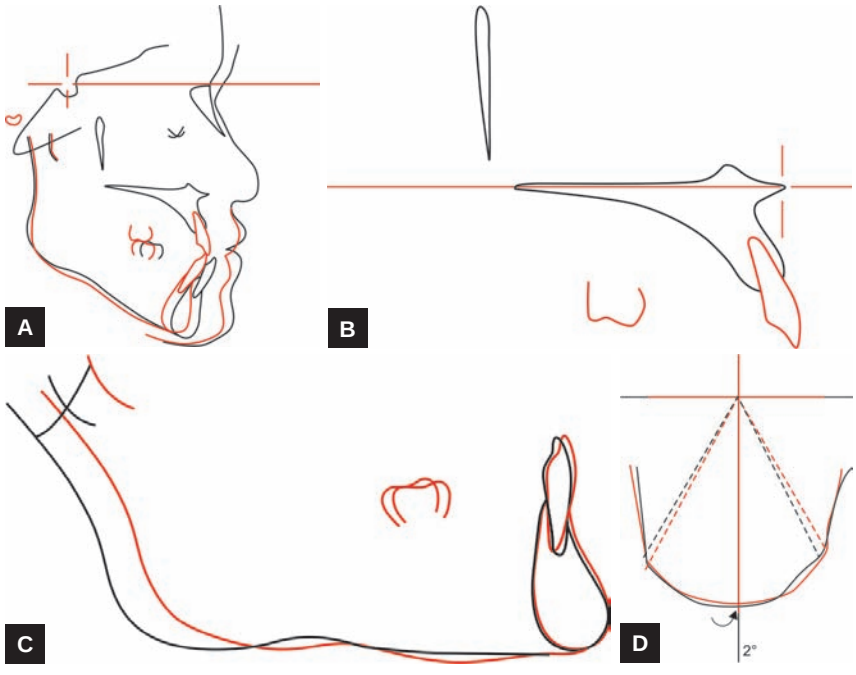


Figs 3A to D: Detailing and finishing



Figs 4A to E: Ideal profile and occlusion were achieved

Figs 5A to C: Retention



Figs 6A to D: Superimposition before and after treatment

DISCUSSION

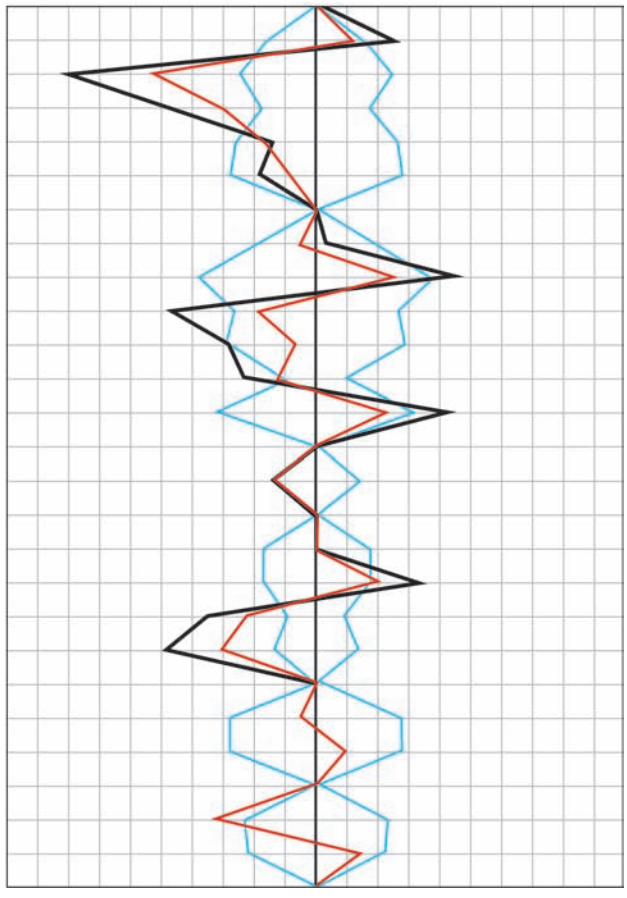
Conventionally, the treatment for patients with skeletal class III malocclusion must include the alignment of crowded arch and decompensation of the anterior dentition before surgery. However, in recent years, the surgery-first approach has become a favorable option for patients with skeletal class III malocclusion and well-aligned dentition. Reasonable indications for surgery-first approach include mild crowded dentition, mild curve of Spee, and mild proclined or retroclined incisors. The surgery-first approach can provide some benefits, such as shorter treatment time and early esthetic improvement; however, it might bring disadvantages because the final occlusion cannot be easily predicted. The surgery-first approach is different from the surgery-second approach in which decompensation of the incisors is required to produce a larger anterior crossbite. For the surgery-first approach, a larger overjet remains after the surgery, and a later orthodontics treatment is necessary for further correction. The phenomenon of postoperatively accelerated orthodontic tooth movement has been extensively discussed in recent years. The surgical incisions initiate a regional acceleratory phenomenon and can result in a shortened treatment progress.[5]

Treatment for this case was completed within 5 months from the initiation. We evaluated that the treatment duration was shorter than most cases receiving surgical-orthodontic combination therapy. The shortened treatment duration was likely to be associated with several factors, including the improvement of dental-muscular function through postoperative elimination of dental interference and physiological and metabolic changes induced by surgery.

The correction of facial asymmetry and profile change were successfully achieved, and the patient was satisfied with the outcomes (Fig. 4). Since the skeletal and occlusal relationships were corrected within a short period of time, more attention and more time can be paid on how the muscle and soft tissue adapt to the new position

Table 1: Cephalometric analysis before and after treatment

	Value	After	Mean.	S.D.
Facial angle	90.0	87.3	84.83	3.05
Convexity	–8.5	–3.0	7.58	4.95
A-B plane	4.0	1.3	–4.81	3.50
Mandibular plane	25.9	25.5	28.81	5.23
Y-axis	61.8	63.4	65.38	5.63
Occlusal plane	12.0	10.4	11.42	3.64
Interincisal	133.2	129.3	124.09	7.63
L-1 to Occlusal	14.5	20.1	23.84	5.28
L-1 to Mandibular	90.7	95.0	96.33	5.78
U-1 to A-P plane	4.3	6.4	8.92	1.88
FMIA	63.4	59.5	54.63	6.47
FH to SN plane	3.8	3.8	6.19	2.89
SNA	82.1	82.1	82.32	3.45
SNB	85.7	83.2	78.90	3.45
SNA-SNB diff.	–3.6	–1.1	3.39	1.77
U-1 to N-P plane	2.0	5.6	11.74	2.73
U-1 to FH plane	110.2	110.2	111.13	5.54
U-1 to SN plane	106.5	106.5	104.54	5.55
Gonial angle	115.9	115.5	122.23	4.61
Ramus inclination	90.0	90.0	87.07	4.40



(Figs 6A to D, Table 1). A circumferential retainer was delivered to provide a retention for the upper arch, and a Hawley retainer was used for the lower arch (Figs 5A to C).

CONCLUSION

Dentistry is varying with induction of modern science to practice dentistry.[6] For the case presenting both skeletal and dental problems with mild crowding and mandibular prognathism, the timing of surgical intervention should be considered carefully to balance the benefits and disadvantages. This article describes the treatment procedures of orthognathic surgery and the use of ISW wire combined with IME to achieve a desirable occlusion and facial profile within 5 months.

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