

Original Research Article

ISW for the Treatment of an Adult Female Class II div. 2 with obvious chin button

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Abstract

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The objective of the treatment is for the treatment of adult female Class II div. 2 with obvious chin button by ISW (Improved Super-elastic Ti-Ni alloy wire, developed by Tokyo Medical and Dental University). An adult 19-year-old female came to our clinic with a chief complaint of poor bite and for esthetic consultation. Clinical examination revealed a convex lateral profile, bilateral Class II molar and canine relationship with anterior Class II division 2. Active treatment included non-extraction and ISW curve over the upper and lower arches with ideal vertical control by using long Class II intermaxillary elastics (IME). Treatment was completed within 24 months, a stable occlusion and a desirable esthetic outcome was achieved and the patient was pleased with the treatment result after the active treatment.

Keywords: ISW, ISW curve, skeletal Class II division 2, intermaxillary elastics (IME), non-extraction

INTRODUCTION

Treatment of adult skeletal Class II division 2 patients is considered one of the most challenging problems in orthodontics (Kook et al., 2009; Al-Khateeb and Al-Khateeb, 2009; Angle, 1907; Blair, 1954; Brezniak et al., 2002; Cleall and BEGoLE, 1982; Kim et al., 2006). In adult patients with severe Class II malocclusions, especially deficient mandibles; orthognathic surgery is sometimes the only possible treatment. We may find it difficult to meet the patient's soft-tissue needs even by extracting of premolars. In Class II patients with mild-to-moderate skeletal discrepancies, dental compensation and camouflage should probably be the treatment alternative. Class II division 2 cases are often featured with severe deep bites, deep curve of Spee, palatally/lingually inclined upper and lower incisors. These patients also tend to exhibit problems of the soft-tissue drape of the lips, causing the lips to be redundant with a deep mentolabial sulcus. Because of the deep bite and supraeruption of the maxillary incisors, the gingival margins of the maxillary anterior teeth are usually malaligned, and the lingually inclined mandibular incisors

may have excessively high gingival margins (Kim and Little, 1999; Litt and Nielsen, 1984; Pancherz et al., 1997; Peck et al., 1998; Uribe and Nanda, 2003; Uysal et al., 2005).

Common treatment procedures for such patients include flaring of incisors, flattening the curve of spee, and favorable mandibular vertical and sagittal control. Therefore, in this case, active treatment of non-extraction and ISW curve over the upper and lower arches with ideal vertical control by using long Class II intermaxillary elastics (IME) will be discussed and clinical fenestrations of correction toward anterior teeth inclination with esthetic correlation will also be taken into consideration. The treatment was completed efficiently without conventional fixed orthodontic appliances or bite plate due to the fact that those appliances sometimes incur inconvenience and patients' discomfort.

Treatment of an adult Class II division 2 patient requires appropriate diagnosis and treatment plan involving esthetic, occlusal, and functional considerations. The treatment objectives must include the



Figure 1. Facial photos before active treatment



Figure 2. Intraoral photos before active treatment

chief complaint of the patient, and the mechanics plan should be individualized based on the specific treatment goals.

History and Diagnosis

An adult 19-year-old female came to our clinic with a

chief complaint of poor bite and for esthetic consultation. Her lateral profile was convex with prominent chin button (Figure 1). Clinical examination revealed bilateral Class II molar and canine relationship, palatally-tipped upper incisors and lingually tipped lower incisors (Figure 2). Panoramic film showed #18, #28, #38, #48 existence (Figure 3).

The radiographic methods of the research include



Figure 3. Panoramic film before active treatment

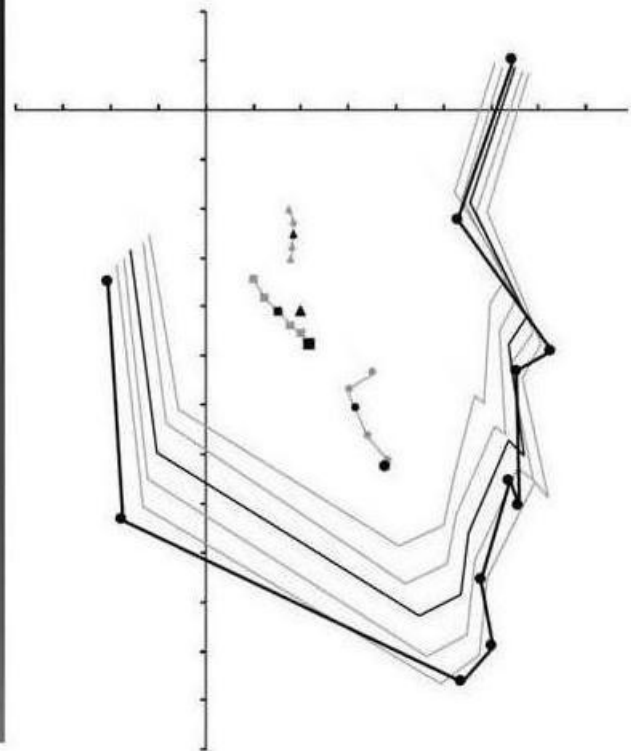


Figure 4. Lateral cephalometric film before active treatment

	Value	Mean.	S.D.	Diff.	SD diff.
Facial angle	87.9	84.83	3.05	3.10	1.02
Convexity	6.0	7.58	4.95	-1.61	-0.33
A-B plane	-7.9	-4.81	3.50	-3.10	-0.88
★ Mandibular plane	<u>24.8</u>	28.81	5.23	-4.02	-0.77
Y-axis	62.7	65.38	5.63	-2.70	-0.48
Occlusal plane	10.8	11.42	3.64	-0.57	-0.16
★ Interincisal	<u>147.9</u>	124.09	7.63	23.85	3.13
L-1 to Occlusal	16.7	23.84	5.28	-7.11	-1.35
★ L-1 to Mandibular	<u>92.8</u>	96.33	5.78	-3.55	-0.61
U-1 to A-P plane	3.0	8.92	1.88	-5.91	-3.14
FMIA	62.4	54.63	6.47	7.79	1.20
FH to SN plane	8.9	6.19	2.89	2.71	0.94
SNA	81.8	82.32	3.45	-0.49	-0.14
SNB	77.5	78.90	3.45	-1.40	-0.41
★ SNA-SNB diff.	<u>4.3</u>	3.39	1.77	0.94	0.53
U-1 to N-P plane	4.6	11.74	2.73	-7.14	-2.62
★ U-1 to FH plane	<u>94.5</u>	111.13	5.54	-16.65	-3.01
U-1 to SN plane	85.6	104.54	5.55	-18.96	-3.42
★ Gonial angle	<u>118.5</u>	122.23	4.61	-3.68	-0.80
Ramus inclination	86.2	87.07	4.40	-0.83	-0.19

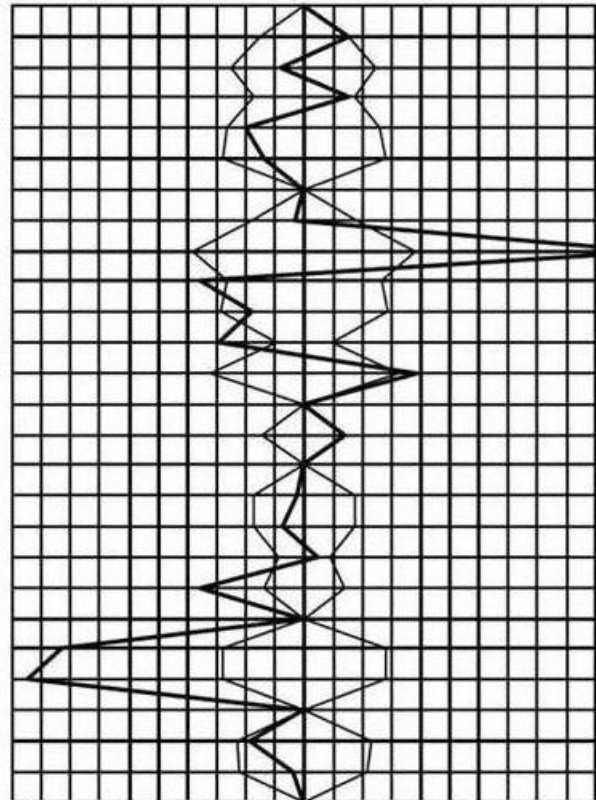


Figure 5. Polygon before active treatment

intraoral photos, lateral cephalometric projection and panoramic x-ray films. Also the cephalometric analyses before and after the treatment were presented in this case. The cephalometric analysis showed a skeletal Class II jaw relationships (SNA : 81.8°, SNB : 77.5°, ANB : 4.3°) and dental compensation (U1 to FH plane : 94.5°, interincisal angle : 147.9°). The low angle skeletal pattern can be seen prominently in the polygon (Gonial angle : 118.5°) (Figure 4 and Figure 5).

Therefore, the summary of diagnosis includes :

1. Functional (+) : Class II Div.2
2. Skeletal (+) : ANB = 4.3o, skeletal Class II
3. Denture (+) : U1 to FH plane (94.5o), L1 to mandibular plane (92.8o)
4. Dental (+) : Existence of #18, #28, #38, #48.
5. Discrepancy (+) : upper : R't: -2.0 mm / L't: -1.5 mm
lower :R't: -0.5 mm / L't: -1.0 mm

Treatment Objectives

Our treatment objectives were (1) to remove functional interference over Class II division. 2 anterior teeth regions, (2) to improve facial profile, (3) to establish

appropriate overbite, overjet and arch coordination, (4) to establish individualized occlusion

Due to the fact that the patient strongly refused the possibility of extraction bicuspid teeth. Therefore, treatment plan includes :

1. Extraction of #18, #28, #38, #48
2. Upper arch DBS and leveling
3. Observe the mandibular response
4. Lower arch DBS and leveling,

Long Class II inter-maxillary elastics (IME) used for vertical control

Treatment Progress

Treatment was started from 2016.05.11. with upper arch DBS and leveling with 0.016 x 0.022 ISW with curve. Mandibular response was planned to be observed at the next visit, brackets over the upper anterior teeth were placed rather incisally, for overbite reduction and for decrease of excessive tooth show/gingival display after active treatment and better relative torque control (Figure 6).

On 2016.07.06. after one month of active treatment, upper ISW curve was added for (1) overbite reduction (2) an increase in overjet, both benefits in subsequent lower



Figure 6. Period of active treatment : 0 month



Figure 7. Period of active treatment : 1 month

bonding (Figure 7).

On 2016.07.25., after 3 months of active treatment, since overjet was adequate for the bracketing over the lower arch, lower arch DBS was performed with 0.016 x 0.022 ISW with lower ISW curve added (Figure 8).

On 2017.02.13., after 9 months of active treatment, lateral ISW Crossbite Arch was performed over the region #34~#36 and #44~#46. R(14-46) and L(24-36) IME (intermaxillary elastics) were used for reinforcement of the ISW lateral crossbite arch technique and for

better vertical control (Figure 9).

On 2017.03.13., after 10 months of active treatment, elastic chain was used for lower midline correction and R(13-44) and L(23-34) IME (intermaxillary elastics) were used for reinforcement of canine relationship. (Figure 10)

On 2017.11.27., after 18 months of active treatment, re-bonding of #13 (mesially down) for #13 axis correction and R(16-43) and L(23-36) IME (intermaxillary elastics) were used for slight correction of midline (Figure 11).



Figure 8. Period of active treatment : 3 months

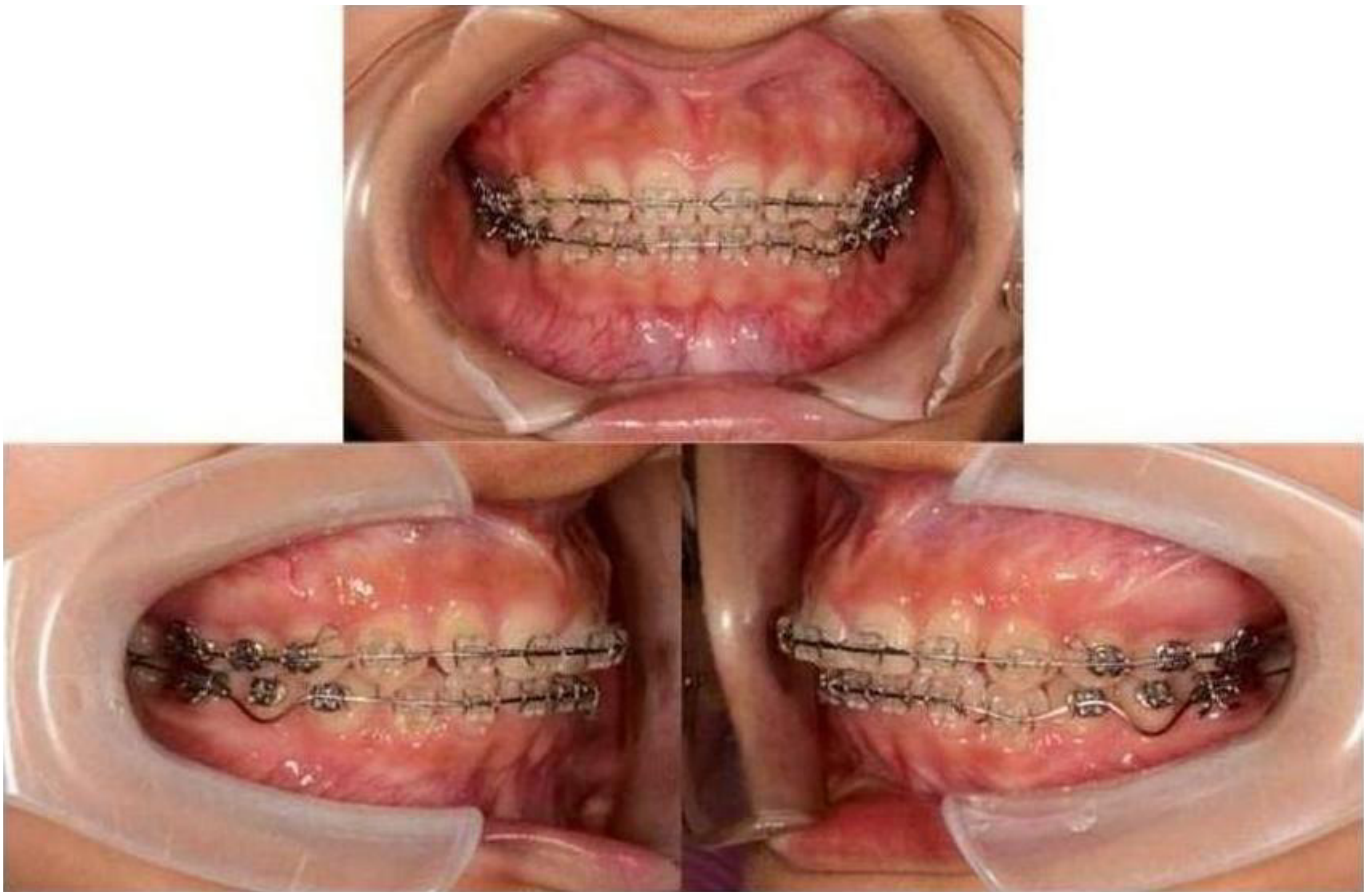


Figure 9. Period of active treatment : 9 months



Figure 10. Period of active treatment : 10 months



Figure 11. Period of active treatment : 18 months

Treatment Results

After 21 months of active treatment, on 2018.02.07, root parallelism was checked and re-bonding of #12 for ideal root parallelism, elastic chain for space closure over the upper anterior teeth and R(12-43) and L(22-33) IME (intermaxillary elastics) were used for anterior overjet reduction (Figure 12).

On 2018.05.21., de-bonding of full mouth bracket was

performed and circumferential retainer was delivered for the upper arch and Hawley retainer for the lower (Figure 13).

For the total treatment time of 24 months, a stable occlusion was achieved and esthetic appearance was improved after the treatment (Figure 14 and 15).

After 24 months period of orthodontic active treatment, lateral cephalometric projection and panoramic x-ray films was taken, polygon and superimposition after active



Figure 12. Period of active treatment : 21 months



Figure 13. Period of active treatment : 24 months

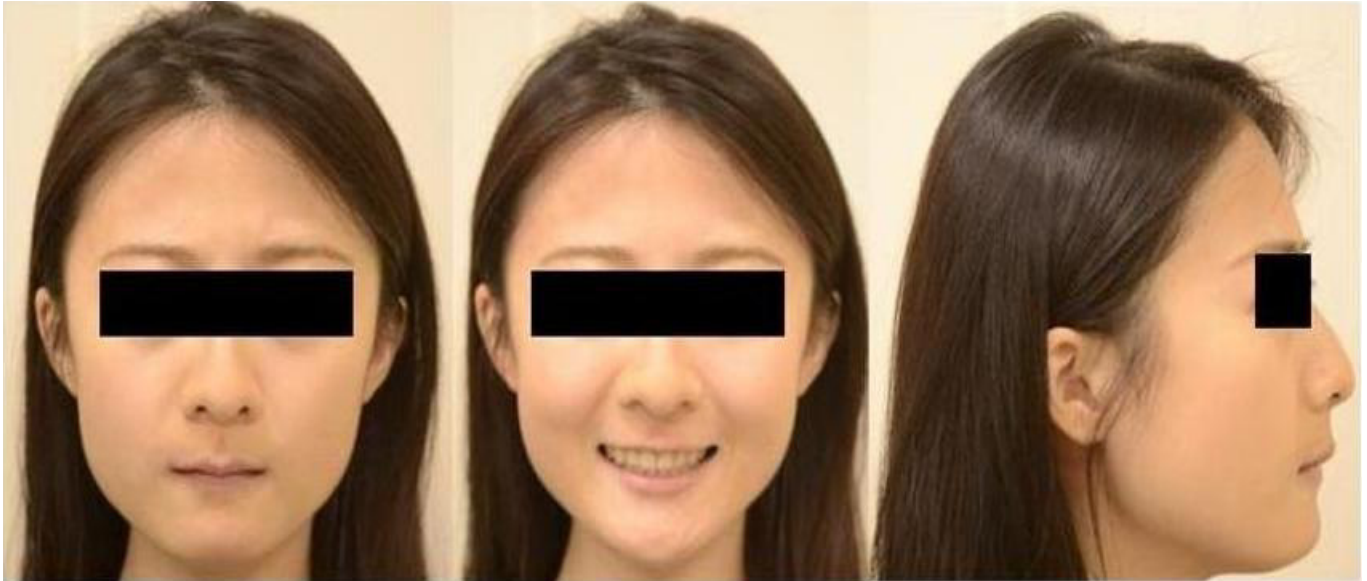


Figure 14. Facial photos after active treatment

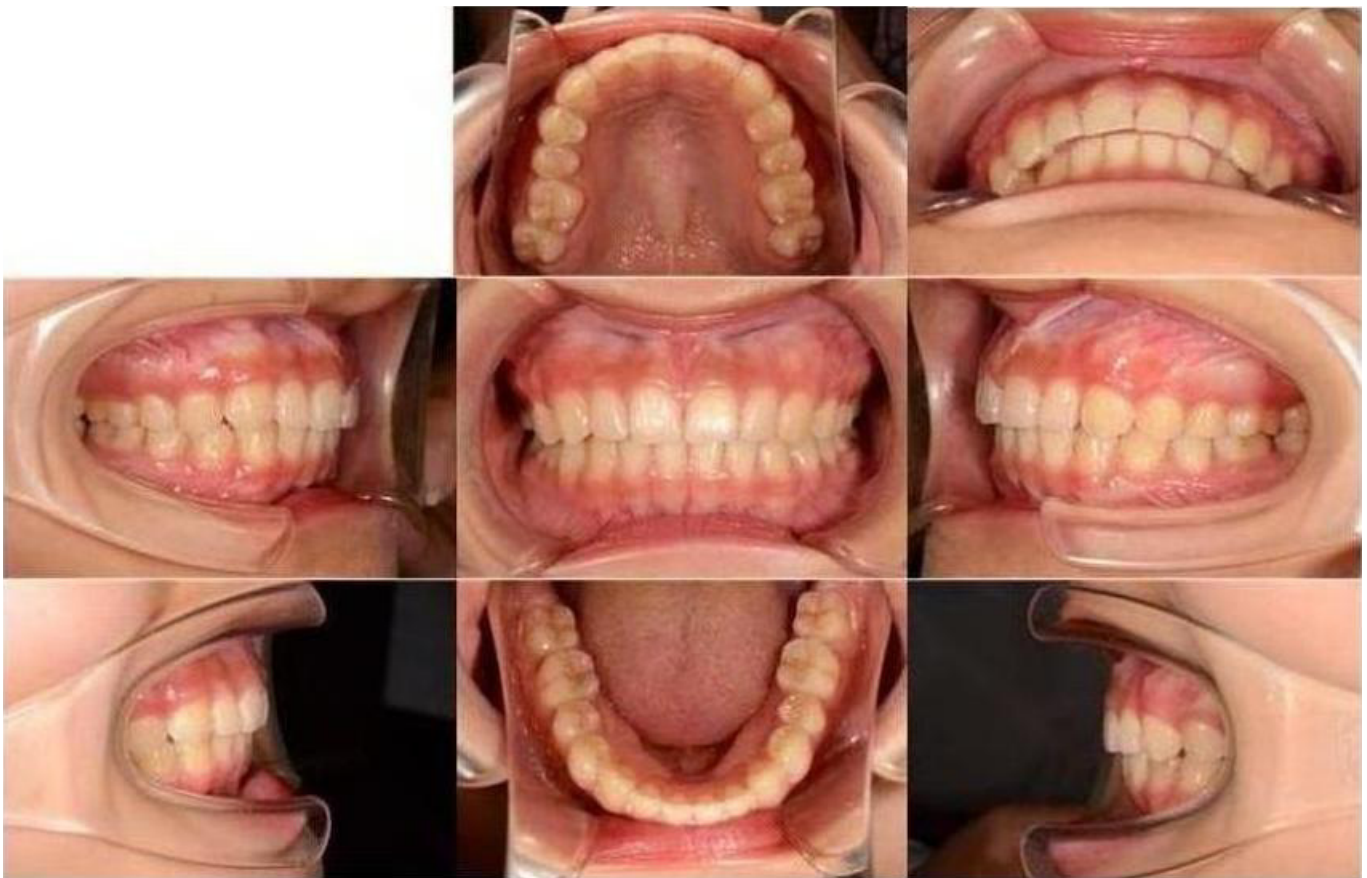


Figure 15. Intraoral photos after active treatment

treatment was analyzed and denture pattern improved prominently (U1 to FH plane: $94.5^{\circ} \rightarrow 115.0^{\circ}$, L1 to

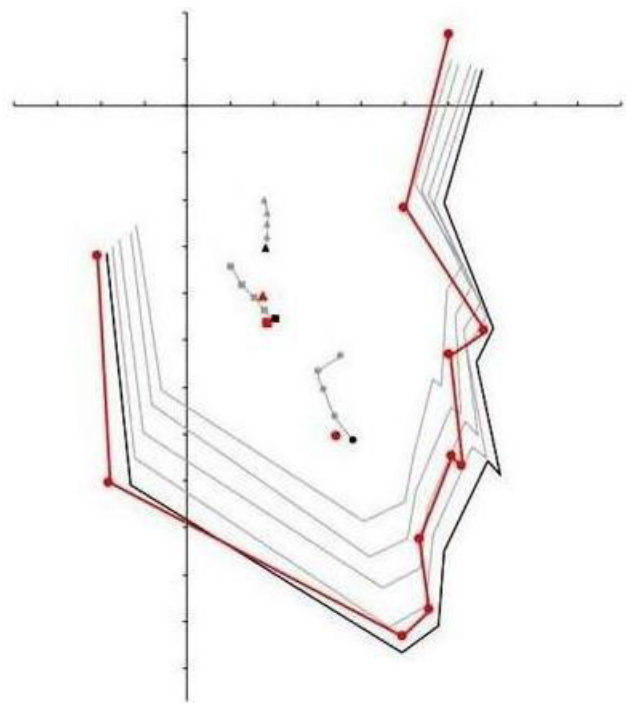
Mandibular plane: $92.8^{\circ} \rightarrow 104.1^{\circ}$ Interincisal angle: $147.9^{\circ} \rightarrow 115.0^{\circ}$). (Figure 16~19)



Figure 16. Panoramic film after active treatment



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After active treatment

Figure 17. Lateral Cephalometric film after active treatment

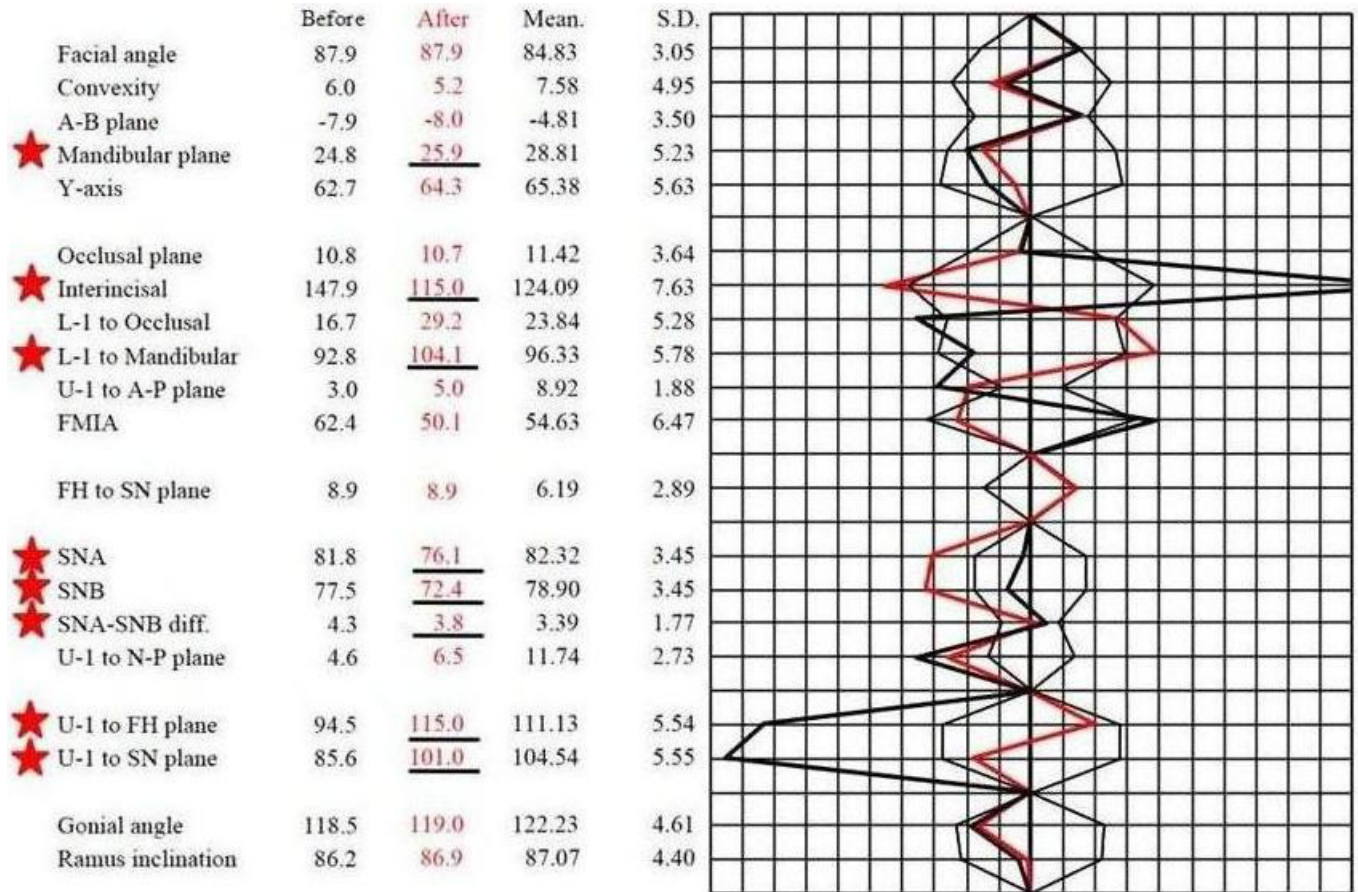


Figure 18. Polygon after active treatment

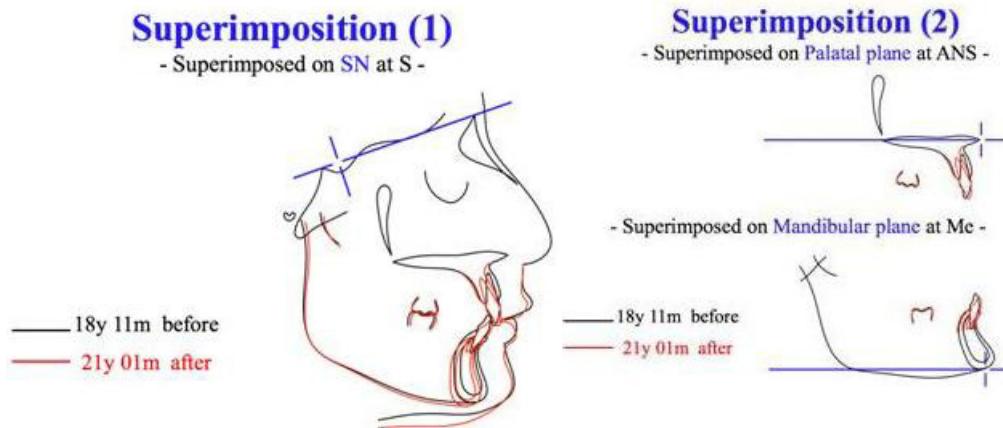


Figure 19. Superimposition after active treatment

DISCUSSION

Vertical control and better anterior relative torque control for decrease of excessive tooth show/gingival display after active treatment is very important for the treatment of an adult Class II div. 2 with obvious chin button. This

case showed palatally/lingually tipped anterior teeth and a rather steep reverse curve of Spee over the lower arch. By using ISW upper and lower Curves and long Class II intermaxillary elastics (IME), Class II div.2 malocclusion was corrected easily with favorable anterior overjet and inconspicuous chin button. After 24 months of

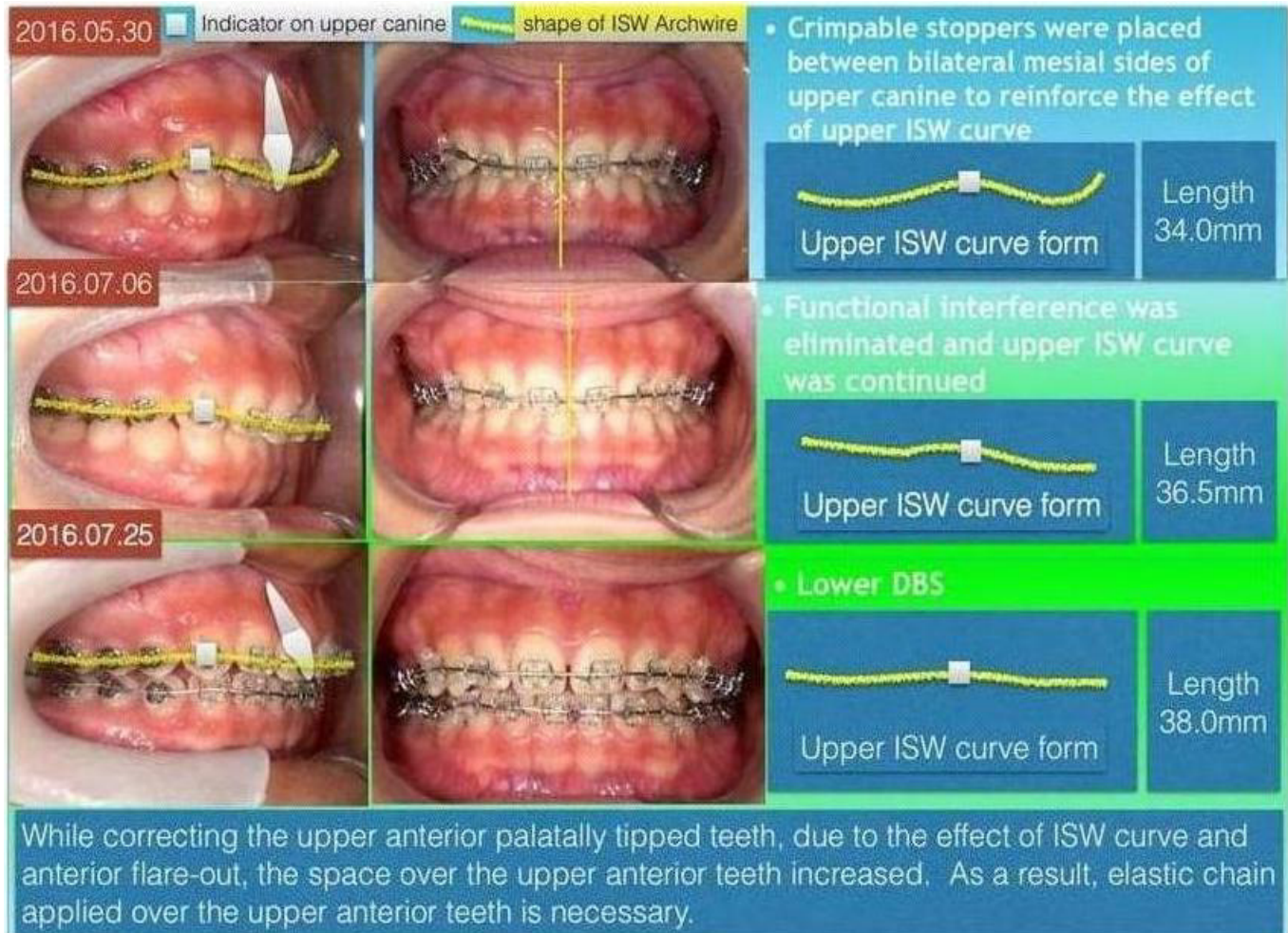


Figure 20. Changes of Shape of ISW Curves

treatment, a better interdigitation was built up and a desirable esthetic outcome was achieved. This patient was pleased with the treatment result.

Changes of Shape of ISW Curves

On 2016.05.30, after two weeks of upper arch DBS, crimpable stoppers were placed between bilateral mesial sides of upper canine to reinforce the effect of upper ISW curve. After two months of active treatment we can observe that functional interference was eliminated and upper ISW curve was continued. On 2017.07.25, after two months of active treatment, lower arch DBS was performed and the space between bilateral upper incisors can be noticed due to the effect of upper ISW curve technique. While correcting the upper anterior palatally tipped teeth, due to the effect of ISW curve and anterior flare-out, the space over the upper anterior teeth increased. As a result, elastic chain applied over the upper anterior teeth is necessary. (Figure 20)

Changes of Profile

The effect of long long Class II intermaxillary elastics (IME) results in response of mandibular clockwise rotation and advancement, which change the lateral profile. In the meantime, for the soft tissue changes of outline of Orbicularis oris muscle and mentalis strain can be noticed. In addition, it can also be observed apparently that the distance of lower mandibular advancement can be measured (15.0mm) in lateral cephalometric film. And the long Class II IME resulted in the extrusion effect of lower molars, which ensured a favorable vertical control. (Figure 21)

Change in buccal corridor

The importance of upper anterior teeth controlled torquing can be explained by proclination of maxillary incisors which can affect incisor display at rest and on smile. Flared maxillary incisors tend to reduce incisor

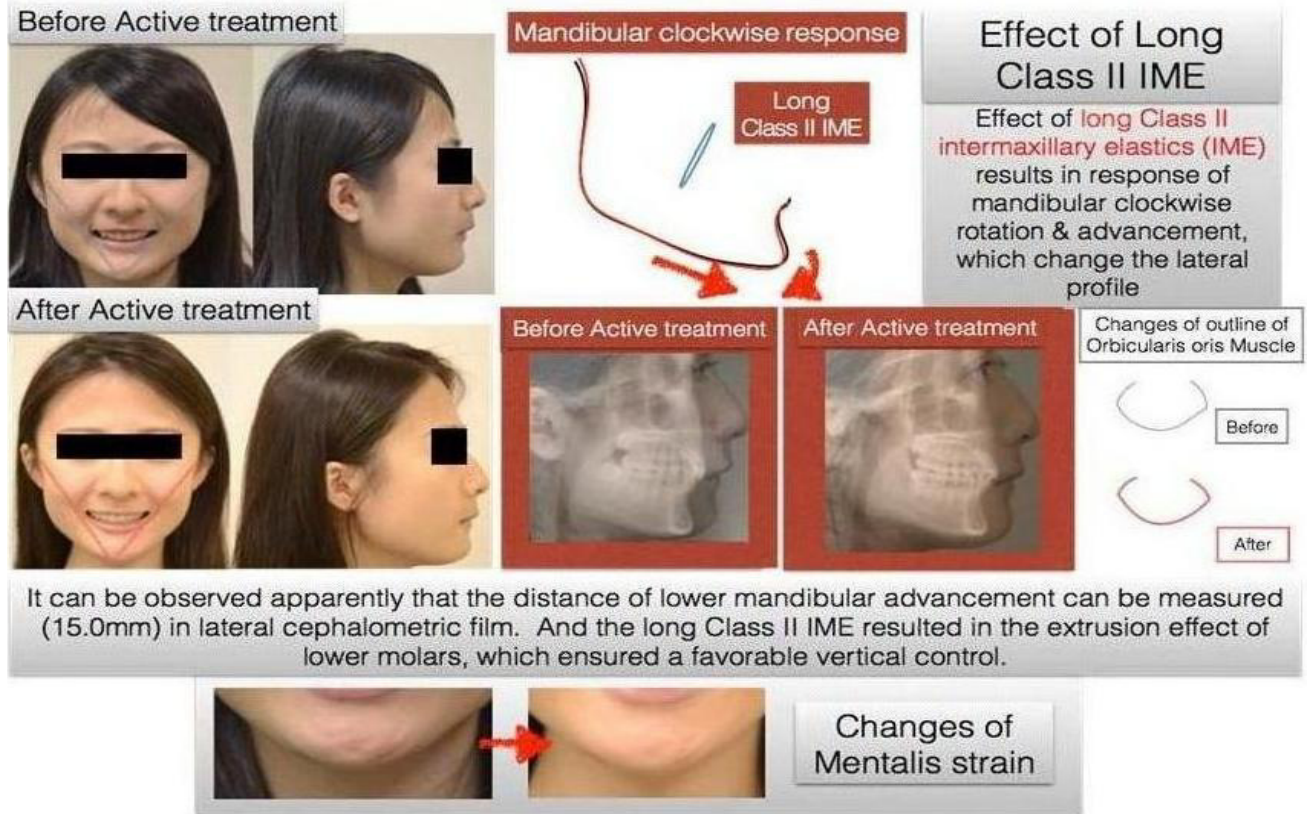


Figure 21. Changes of Profile



Figure 22. Change in buccal corridor



Figure 23. Lateral ISW Crossbite Arch technique

display, and upright maxillary incisors tend to increase incisor display. Therefore, Smile arch index and Buccal corridor spaces (BCSs) can be summarized based on the definition accordingly. And "Relative upper tipping amount" and "Mandibular advance amount" is equal to the "Correction of anterior overjet amount" (Figure 22).

Lateral ISW Crossbite Arch technique

By the use of Lateral ISW Crossbite Arch technique, arch width can be increased and with good use of long Class II IME, R(14-46) and L(24-36) IME used for reinforcement of the ISW lateral crossbite arch technique, a better vertical control can also be achieved. Crimpable stoppers were placed bilaterally mesial to first molars with a view to maintain the arch length and to activate the lateral ISW crossbite arch. Moreover, anterior overjet problem can be solved by the anterior expansion of the lower arch (Figure 23).

CONCLUSION

Treatment for the adult patient with Class II div.2 with

obvious chin button by ISW (Improved Super-elastic Ti-Ni alloy wire, developed by Tokyo Medical and Dental University) was discussed in the article. With successful ISW curve technique over the upper and lower arches with ideal vertical control by using long Class II inter-maxillary elastics (IME), Class II div. 2 was corrected efficiently with non-extraction treatment plan. After 24 months of active treatment, a stable occlusion and a desirable esthetic outcome were achieved and the patient was pleased with the treatment result after the active treatment.

Therefore, adult patient with Class II div.2 with obvious chin button can be treated with ISW treatment.

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