



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

INTERNATIONAL JOURNAL  
OF CURRENT RESEARCH

International Journal of Current Research  
Vol. 11, Issue, 01, pp.231-240, January, 2019

DOI: <https://doi.org/10.24941/ijcr.33784.01.2019>

## RESEARCH ARTICLE

### ISW FOR THE TREATMENT OF ANGLE CLASS I CASE WITH LOWER CONGENITAL MISSING CENTRAL INCISOR

<sup>1</sup>Chun-shuo HUANG and <sup>1,2</sup>Jian-hong YU

<sup>1</sup>Department of Orthodontics, China Medical University and Medical Center, Taiwan, R.O.C

<sup>2</sup>School of Dentistry, College of Dentistry, China Medical University, Taiwan, R.O.C

#### ARTICLE INFO

##### Article History:

Received 10<sup>th</sup> October, 2018

Received in revised form

26<sup>th</sup> November, 2018

Accepted 24<sup>th</sup> December, 2018

Published online 30<sup>th</sup> January, 2019

##### Key Words:

ISW, Central Incisor Congenital Missing, Skeletal Class I, ISW Active tie Back, Closed Coil-Spring, Canine Distal Drive, Anterior Retraction, Inter-Maxillary Elastics (IME).

Copyright © 2019, Chun-shuo Huang and Jian-hong. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Chun-shuo HUANG and Jian-hong YU. 2019. "ISW for the treatment of Angle Class I case with lower congenital missing central incisor", *International Journal of Current Research*, 11, (1), 231-240.

#### ABSTRACT

The objective of the case study is for the treatment of Angle Class I with lower central incisor congenital missing case by ISW (Improved Super-elastic Ti-Ni alloy wire, developed by Tokyo Medical and Dental University). A young female (16 years old) came to our clinic with a chief complaint of maxillary protrusion and mild crowding. Clinical examination revealed lower central incisor congenital missing, large overjet, and anterior crowding. In order to relieve crowding and to correct large overjet, extraction of #14 #25 (due to large decay) was performed. ISW Active tie back was performed to correct anterior tooth inclination and to reduce large overjet. Inter-maxillary elastics (IME) were also used for inter-digitation during the treatment.

#### INTRODUCTION

Exact etiology of congenital missing of mandibular central incisors remains unknown nowadays. Although several factors such as trauma, radiation, infection and metabolic disorders could be considered, Endo et al. (2007) have found that before planning orthodontic treatment on a patient with congenital missing incisors, some factors like reduced mandibular alveolar bone area should be considered (Endo et al., 2007; Newman, 1967). Some orthodontists (Kokich, 1984; Canut, 1996) even believed that congenital absence of both mandibular central incisors is advantageous, as the extraction of mandibular central incisors is considered as the treatment of choice in crowded Class I malocclusion, especially when there is toothsize discrepancy (Kokich, 1984; Nagaveni, 2009; Grob, 1995; Curiel, 2002). There are four main theories emphasized by some orthodontist mainly for the cause of congenital missing of incisors (Newman, 1967). Primary cause is the heredity or familial distribution. The second theory stated that anomalies in the development of the mandibular symphysis may affect the dental tissues forming the tooth buds of the lower incisors (Newman, 197). Third, a reduction in the dentition regarded as nature's attempt to fit the shortened dental arches (an expression of the evolutionary trend)

(Lavelle, 1973) and finally, localized inflammation or infections in the jaw and disturbance of the endocrine system destroying the tooth buds (Newman, 1998). The clinical manifestations of congenital missing of mandibular incisors include the orthodontic speculation of Bolton ration before active treatment and therefore congenital missing of mandibular incisors can lead to compromised dental and facial aesthetics and therefore requires appropriate treatment.

**History and Diagnosis:** An adult 16-year-old female came to our clinic with a chief complaint of maxillary protrusion and mild crowding. Her lateral profile was straight with mandible slightly shifted to the left side (Fig1). Clinical examination revealed bilateral Class I molar relationship, labially-tipped upper incisors and lingually-tipped lower incisors with large overjet and lower central incisor congenital missing, along with lower anterior teeth crowding (Fig2). Panoramic film showed #18, #28, #38, #48 existence and upper left second bicuspid residual root and previous root canal treatment received (Fig 3). The radiographic methods of the research include 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 I jaw relationships (SNA: 75.3°, SNB: 72.1°, ANB: 3.1°) and dental compensation (U1 to FH plane: 132.9°, L1 to

\*Corresponding author: Chun-shuo HUANG,

1Department of Orthodontics, China Medical University and Medical Center, Taiwan, R.O.C.

2School of Dentistry, College of Dentistry, China Medical University, Taiwan, R.O.C.

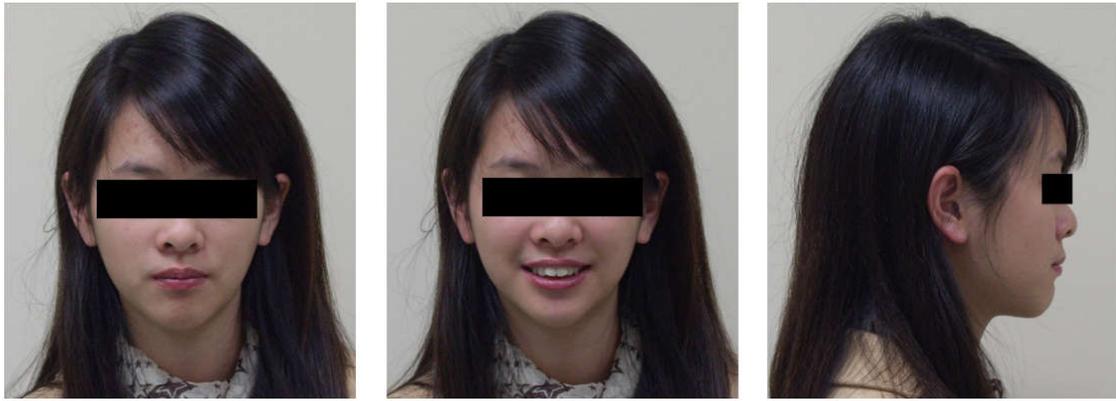


Figure 1. Facial photos before active treatment



Figure 2. Intraoral photos before active treatment



Figure 3. Panoramic film before active treatment

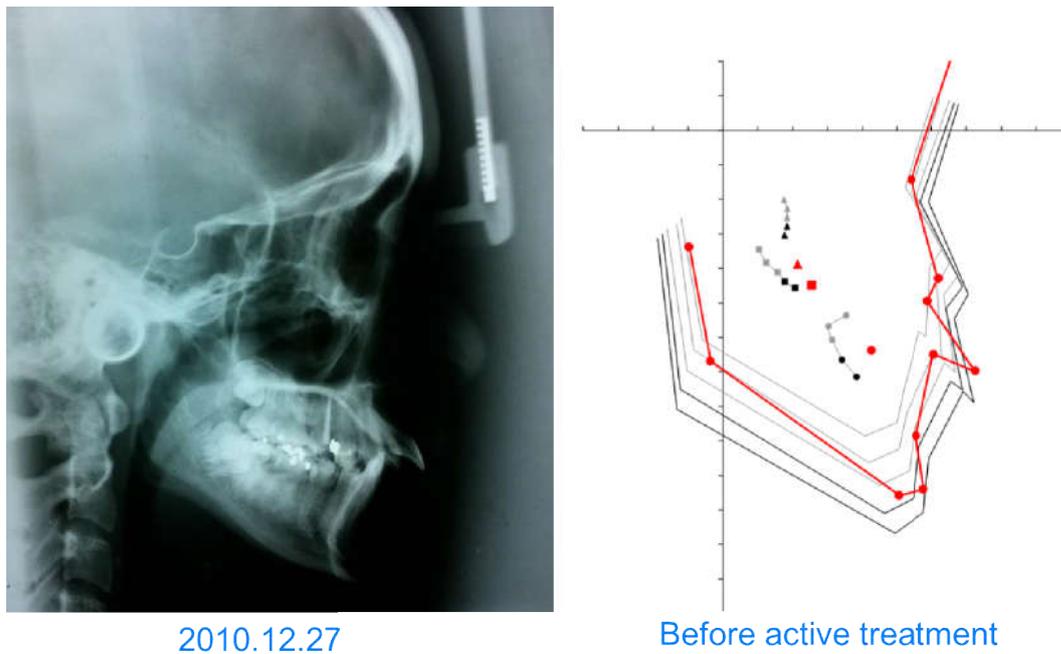


Figure 4. Lateral cephalometric film before active treatment

## Polygon- Before active treatment

	Value	Mean.	S.D.
Facial angle	90.5	84.83	3.05
Convexity	4.2	7.58	4.95
A-B plane	-6.6	-4.81	3.50
Mandibular plane	29.4	28.81	5.23
Y-axis	58.6	65.38	5.63
Occlusal plane	3.7	11.42	3.64
★ Interincisal	<u>117.3</u>	124.09	7.63
L-1 to Occlusal	16.1	23.84	5.28
★ L-1 to Mandibular	<u>80.4</u>	96.33	5.78
U-1 to A-P plane	13.5	8.92	1.88
FMIA	70.2	54.63	6.47
FH to SN plane	<u>17.0</u>	6.19	2.89
★ SNA	<u>75.3</u>	82.32	3.45
★ SNB	<u>72.1</u>	78.90	3.45
SNA-SNB diff.	3.1	3.39	1.77
U-1 to N-P plane	14.9	11.74	2.73
★ U-1 to FH plane	<u>132.9</u>	111.13	5.54
★ U-1 to SN plane	<u>115.9</u>	104.54	5.55
Gonial angle	125.9	122.23	4.61
Ramus inclination	83.8	87.07	4.40

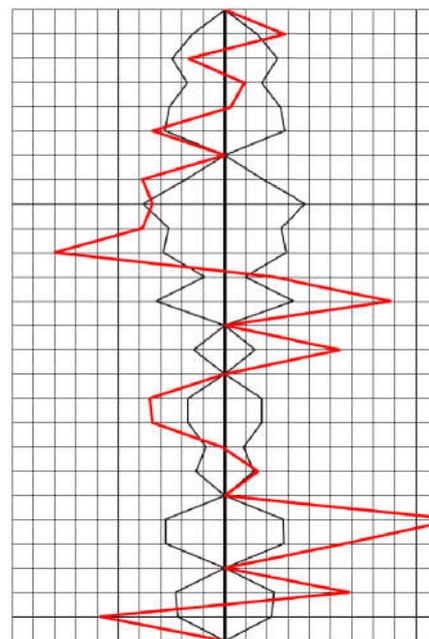


Figure 5. Polygon before active treatment

Mandibular plane: 80.4°、Inter-incisal angle: 117.3°). The high angle skeletal pattern can be seen prominently in the polygon (Gonial angle: 125.9°) (Fig 4 and Fig 5).

Therefore, the summary of diagnosis includes:

- Functional (-)
- **Skeletal (±):** SNA(75.3°)、SNB(72.1°)、ANB = 3.1°, skeletal Class I
- **Denture (+) :** U1 to FH plane(132.9°), L1 to mandibular plane(80.4°)
- **Dental (+):** #25 residual root, #18 #28 #38 #48 existence and #31 congenital missing

- Discrepancy (+) : upper : R't: -3.0 mm / L't: -2.0 mm
- **lower:** R't: -3.0 mm / L't: -6.0 mm

**Treatment Objectives:** Our treatment objectives were (1) to improve facial profile, (2) to establish appropriate overbite, overjet and arch coordination, (3) to establish individualized occlusion. Due to the fact that the patient strongly refused any possibility of orthognathic surgery. Therefore, treatment plan includes:

- Extraction of #14, #25, #38, #48
- Full mouth DBS(Direct-Bonding System)& leveling
- Class II inter-maxillary elastics(IME) used for mandibular response



Figure 6. Period of active treatment: 0 month



Figure 7. Upper space closure



Figure 8. Change in Overjet

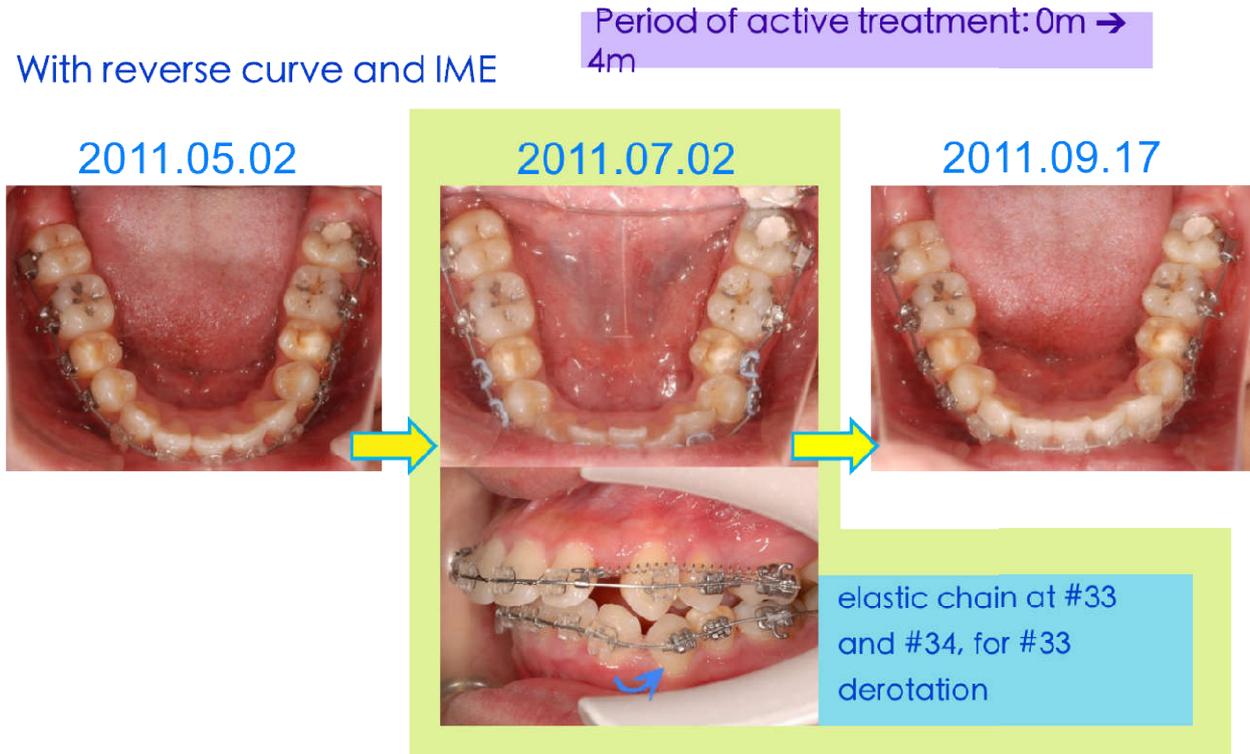


Figure 9. Lower arch leveling



Figure 10. Period of active treatment: 16 months

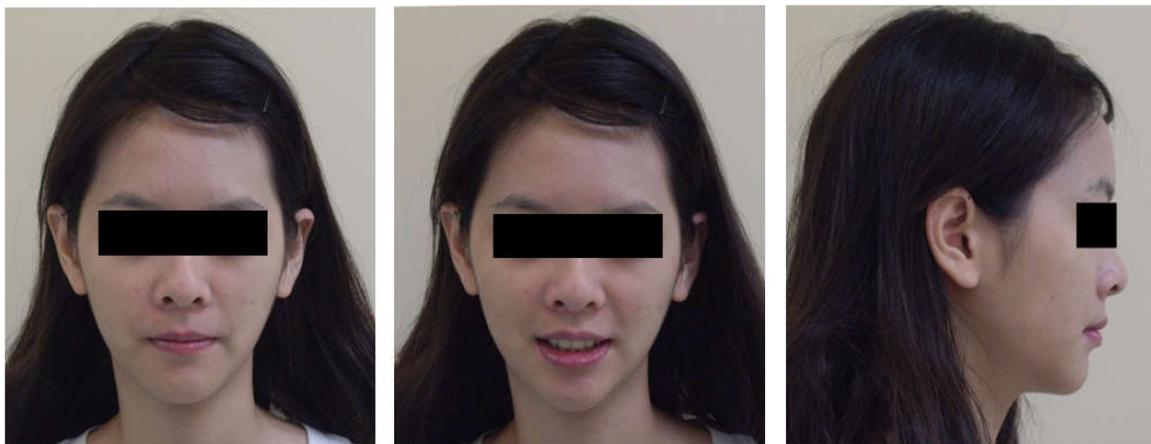


Figure 11. Facial photos after active treatment



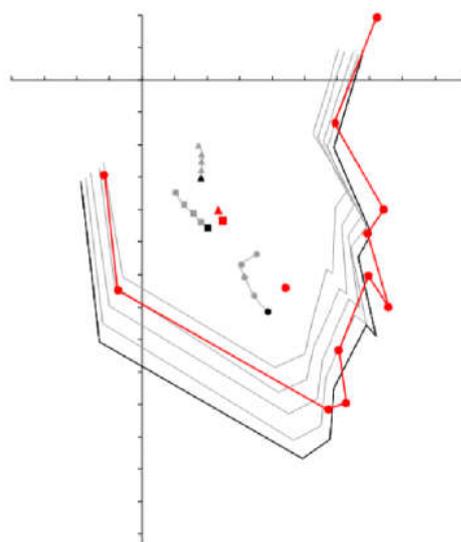
Figure 12. Intraoral photos after active treatment



Figure 13. Panoramic film after active treatment



2014.05.03



After active treatment

Figure 14. Lateral Cephalometric film after active treatment

# Polygon

	Value	After	Mean.	S.D.
Facial angle	90.5	85.6	84.83	3.05
Convexity	4.2	4.7	7.58	4.95
A-B plane	-6.6	-3.2	-4.81	3.50
Mandibular plane	29.4	29.7	28.81	5.23
Y-axis	58.6	59.4	65.38	5.63
Occlusal plane	3.7	1.9	11.42	3.64
Interincisal	117.3	125.0	124.09	7.63
L-1 to Occlusal	16.1	24.5	23.84	5.28
★ L-1 to Mandibular	80.4	86.7	96.33	5.78
U-1 to A-P plane	13.5	9.2	8.92	1.88
FMIA	70.2	63.6	54.63	6.47
FH to SN plane	17.0	15.0	6.19	2.89
★ SNA	75.3	72.7	82.32	3.45
★ SNB	72.1	70.8	78.90	3.45
SNA-SNB diff.	3.1	1.9	3.39	1.77
U-1 to N-P plane	14.9	10.6	11.74	2.73
U-1 to FH plane	132.9	118.6	111.13	5.54
U-1 to SN plane	115.9	103.5	104.54	5.55
Gonial angle	126.0	125.9	122.23	4.61
Ramus inclination	83.4	83.8	87.07	4.40

— before treatment  
— after treatment

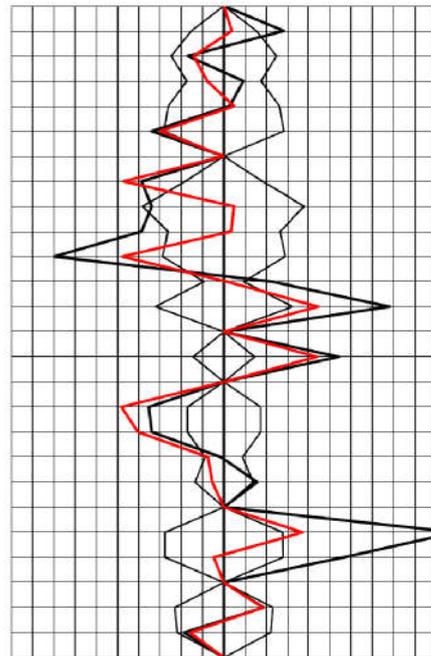
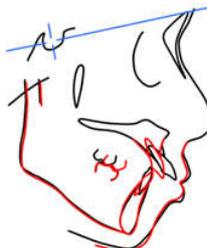


Figure 15. Polygon after active treatment

## Superimposition (1)

- Superimposed on SN at S

— 16y5m before  
— 19y9m after



## Superimposition (2)

- Superimposed on Palatal plane at ANS -

- Superimposed on Mandibular plane at Me -

— 16y5m before  
— 19y9m after



Figure 16. Superimposition after active treatment

This is a case with one central incisor congenital missing resulting in a large overjet (10mm), so extraction of two upper bicuspids to get a desirable treatment result can be taken into account.

Based on the Bolton's ratio, the data we measured are as follows

•Anterior ratio:  $\frac{\#33 \text{ to} \# 43}{\#13 \text{ to} \# 23} \times 100\% = 65.6\%$  (mean 80%) (#31 congenital missing)

•Over-all ratio:  $\frac{\#36 \text{ to} \# 46}{\#16 \text{ to} \# 26} \times 100\% = 80.3\%$  (mean 90%)

Because of large decay (#25), if # 14 and #25 were extracted

•Over-all ratio:  $\frac{\#36 \text{ to} \# 46}{\#16 \text{ to} \# 26} \times 100\% = 93.3\%$  (mean 90%)

Therefore, we extracted #14 and #25 for a better arch coordination.

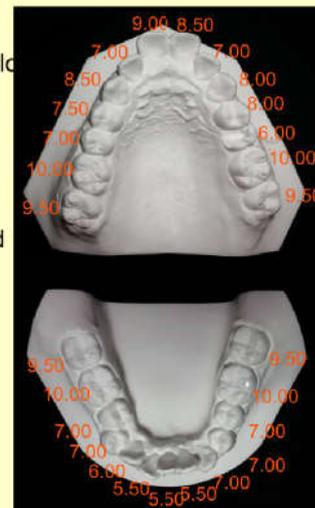


Figure 17. Extraction strategy

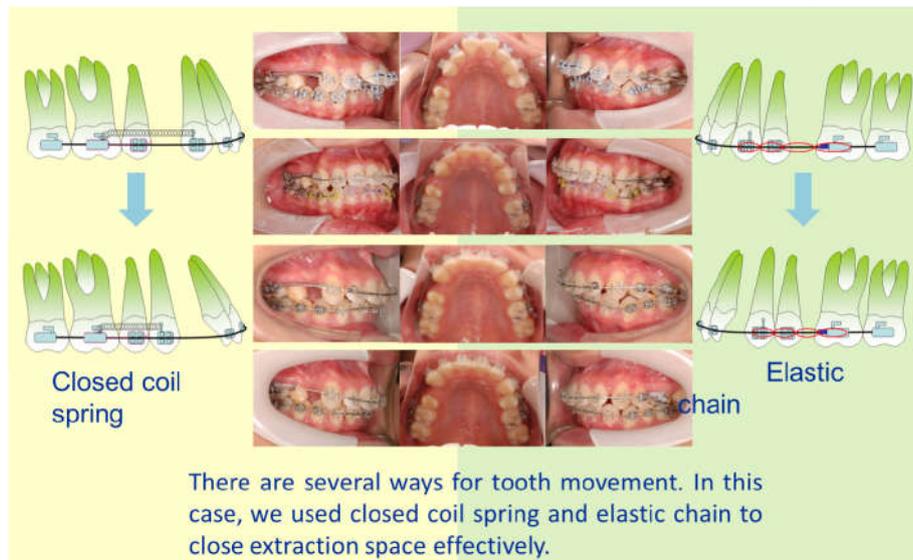


Figure 18. Atypical extraction

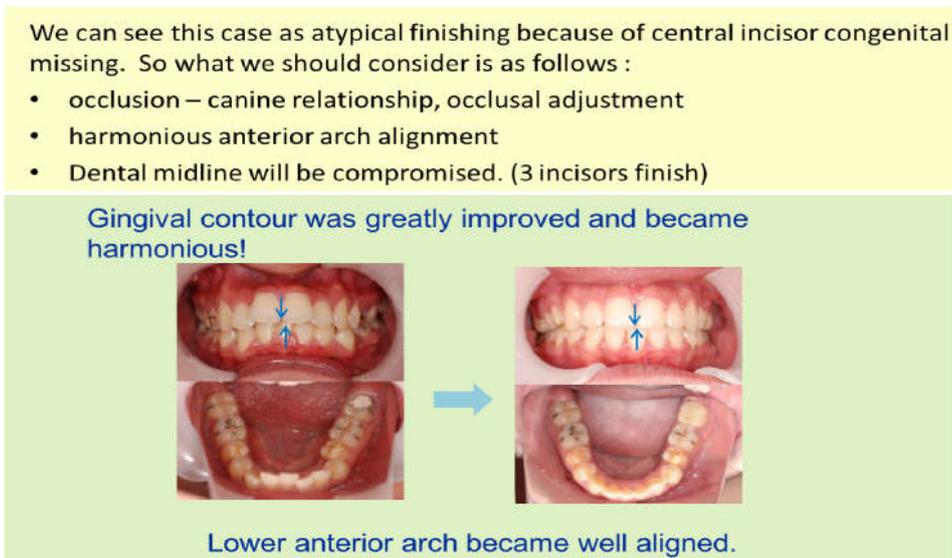


Figure 19. Atypical finishing

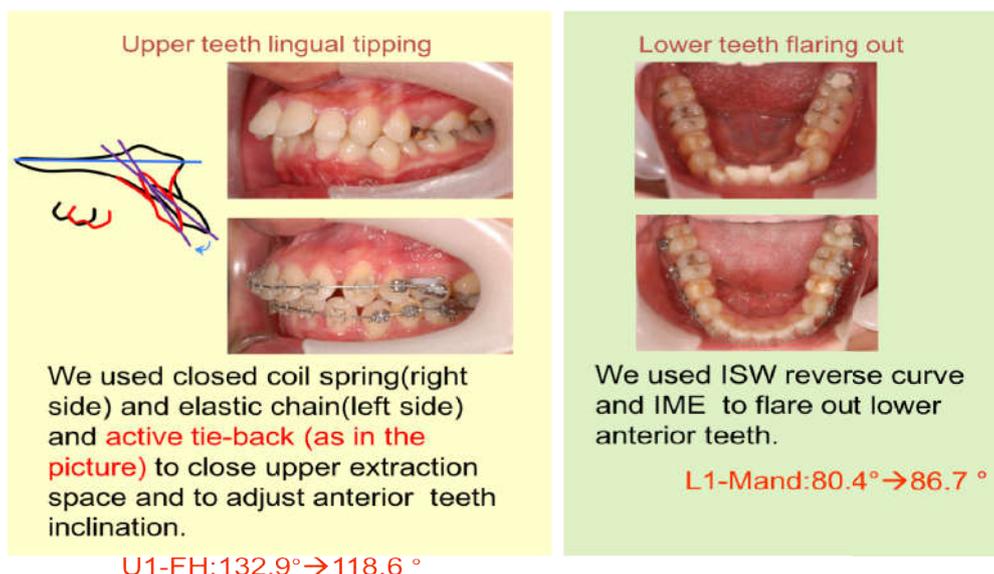


Figure 20. Overjet control

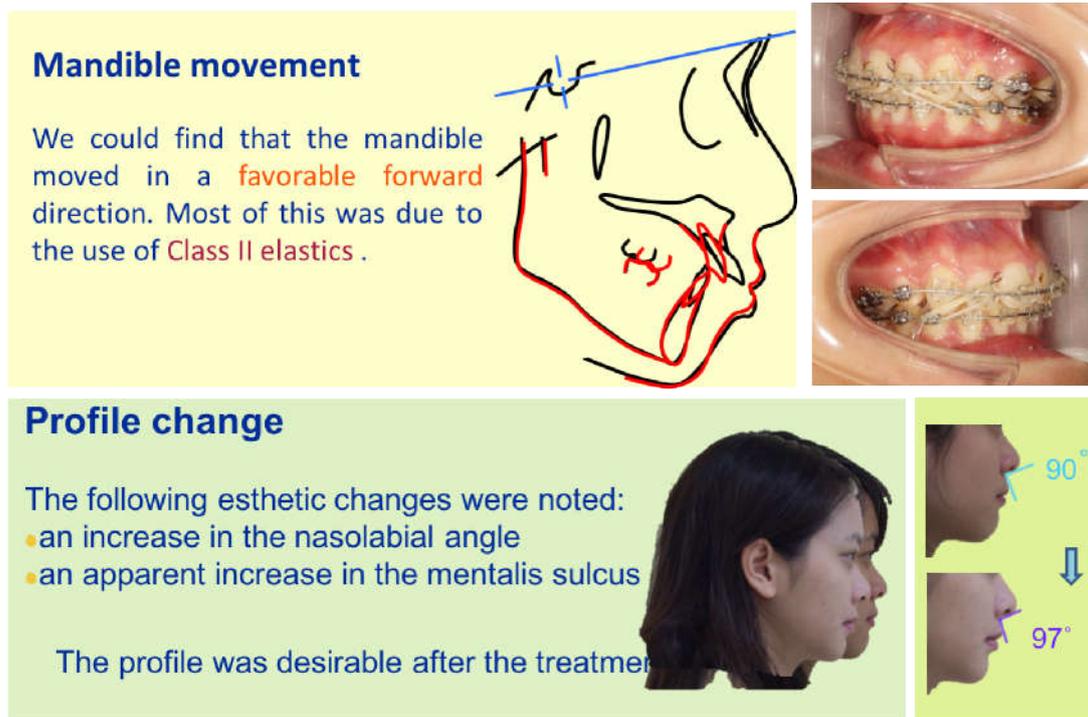


Figure 21. Mandibular response

**Treatment Progress:** Treatment was started from 2011.05.02. with upper and lower arch DBS and leveling with 0.016 x 0.022 ISW with curve added. #13 distal drive with 100gf closed coil-spring and #23 #24 distal drive with FMR was performed at the first day of DBS. (Fig.6). On 2011.07.02. after two months of active treatment, anterior retraction was followed by canine distal drive and on 2012.03.03. IME was used for achievement of better inter-digitation (Fig.7). Active tie back over upper arch and IME was also used in the treatment and overjet was decreased and shown in the figure (Fig.8). Lower arch leveling with ISW curve and elastic chain over #33 and #34 for #33 derotation was also performed. (Fig.9)

**Treatment Results:** After 16 months of active treatment, on 2012.07.25, root parallelism was checked and re-bonding of teeth for ideal root parallelism, IME (inter-maxillary elastics) were used to achieve better cusp inter-digitation (Fig.10). For the total treatment time of 16 months, a stable occlusion was achieved and esthetic appearance was improved after the treatment (Fig. 11&12). After 16 months period of orthodontic active treatment, lateral cephalometric projection and panoramic x-ray film was taken, polygon and superimposition after active treatment was analyzed and denture pattern improved prominently (U1 to FH plane:  $132.9^{\circ} \rightarrow 118.6^{\circ}$ , L1 to Mandibular plane:  $80.4^{\circ} \rightarrow 86.7^{\circ}$ , Inter-incisal angle:  $117.3^{\circ} \rightarrow 125.0^{\circ}$ ). And the change of skeletal pattern was also considerable noticed after active treatment (SNA:  $75.3^{\circ} \rightarrow 72.7^{\circ}$ , SNB:  $72.1^{\circ} \rightarrow 70.8^{\circ}$ , ANB:  $3.1^{\circ} \rightarrow 1.9^{\circ}$ ) (Fig. 13~16)

## DISCUSSION

Patient showed congenital missing central incisor and large overjet. In this case, we corrected anterior tooth inclination and reduced her large overjet rapidly by ISW. Because of congenital missing tooth, an attempt to obtain an adequate overjet should be considered carefully.

Furthermore, we referred to the Bolton ratio in order to decide extraction strategy. ISW showed good resilience to achieve better physiologic arch form adaption. IME were used to achieve better inter-digitation. After the active treatment, a desirable outcome was achieved and the patient was pleased with the treatment result (Tsai, 1998; Anderson, 1975; Kindelan et al., 1998; Stafne et al., 1975; Sperber, 1963; Arte, 1963; Burzynski, 1983; Hoffmeister, 1977; Lapter et al., 1988; Newman, 1988; Stimson, 1997; Ulrich, 1990; Goldenberg et al., 2000; Bolton, 1962; Buchner, 1964; Levin, 1964; Nagaveni, 2009; Newman, 1967; Silva Meza, 2003).

**Extraction strategy:** This is a case with one central incisor congenital missing resulting in a large overjet (10mm), so extraction of two upper bicuspids to get a desirable treatment result can be taken into account. The over-all ratio of #14#25 extraction was calculated more accurate to the mean value of the definition. Therefore, extraction of 14 and #25 becomes the extraction strategy of the case (Fig.17)

**Atypical extraction:** There are several ways for tooth movement. In this case, we used closed coil spring and elastic chain to close extraction space effectively. (Figure.18)

**Atypical finishing:** We can see this case as atypical finishing because of central incisor congenital missing. So what we should consider is as follows:

- Occlusion – canine relationship, occlusal adjustment
- Harmonious anterior arch alignment
- Dental midline will be compromised. (3 incisors finish)

Gingival contour was greatly improved and became harmonious and lower anterior arch became well aligned after the active treatment (Figure.19)

**Overjet control:** We used closed coil spring (right side) and elastic chain (left side) and active tie-back (as in the figure) to close upper extraction space and to adjust anterior teeth

inclination(U1-FH:132.9°→118.6°). In the same time, we used ISW reverse curve and IME to allow the lower anterior teeth flared-out (L1-Mand:80.4°→86.7°). (Figure.20)

**Mandibular response:** We could notice the mandibular movement that the mandible moved in a favorable forward direction. The effect was mainly resulted from the use of Class II elastics. And for the profile change, the following esthetic changes were noted:

- Increase in the nasolabial angle
- Apparent increase in the mentalis sulcus

The profile was desirable after the active treatment. (Figure.21)

## Conclusion

Treatment of Angle Class I with lower central incisor congenital missing case by ISW (Improved Super-elastic Ti-Ni alloy wire, developed by Tokyo Medical and Dental University) was discussed in the article. With successful ISW Active tie back, anterior tooth inclination was improved and large overjet was reduced. Inter-maxillary elastics (IME) were also used for inter-digitation during the treatment. After

16 months of active treatment, a stable occlusion and a desirable esthetic outcome was achieved and the patient was pleased with the treatment result after the active treatment. To conclude, congenital missing of mandibular incisors can lead to compromised dental and facial aesthetics and therefore requires appropriate treatment, but adult patient case with Angle Class I lower central incisor congenital missing can be treated with ISW treatment.

## REFERENCES

Anderson BL., Thompson GW., Popovich F. 1975. Evolutionary dental changes. *American Journal of Physical Anthropology*, 43 (1): 95–102.

Arte S., Nieminen P., Pirinen S., Thesleff I., Peltonen L. 1996. Gene defect in hypodontia: exclusion of EGF, EGFR, and FGF-3 as candidate genes. *Journal of Dental Research*, 75 (6): 1346–1352.

Bolton WA 1962. The clinical application of a tooth-size analysis. *American Journal of Orthodontics* 48(7): 504–529.

Buchner, H. J. 1964. "Treatment of cases with three lower incisors." *The Angle Orthodontist*, 34(2):108-114.

Burzynski NJ., Escobar VH. 1983. Classification and genetics of numeric anomalies of dentition. *Birth Defects Original Article Series*, 19 (1): 95–106.

Canut JA. 1996. Mandibular incisor extraction: indications and longterm evaluation. *Eur J Orthod* 18(5): 485–489.

Curiel P., Santoro M. 2002. Treatment of a patient with a crowded Class I Malocclusion and a congenitally missing mandibular incisor. *Am J Orthod Dentofacial Orthop* 122(6): 661-665

Endo T., Ozoe R., Kojima K., Shimooka S. 2007. Congenitally missing mandibular incisors and mandibular symphysis morphology. *Angle Orthod* 77(6): 1079-1084.

Goldenberg M, Das P, Messersmith M, Stockton DW, Patel PI, D'Souza RN. Clinical, radiographic, and genetic evaluation of a novel form of autosomal-dominant oligodontia. *Journal of Dental Research* 2000; 79 (7): 1469–1475.

Grob DJ. 1995. Extraction of a mandibular incisor in a Class I malocclusion. *Am J Orthod Dentofacial Orthop.*, 108(5): 533-541.

Hoffmeister H. 1977. Micro symptoms as an indication for familial hypodontia, hyperdontia and tooth displacement. *Deutsche Zahnärztliche Zeitschrift* 32 (7): 551–561.

Kindelan JD., Rysiecki G., Childs WP. 1998. Hypodontia: genotype or environment? A case report of monozygotic twins. *British Journal of Orthodontics*, 25 (3): 175–178.

Kokich VG., Shapiro PA. 1984. Lower incisor extraction in orthodontic treatment: four clinical reports. *Angle Orthod* 54(2): 139-153.

Lapter M., Slaj M., Skrinjaric I., Muretic Z. 1998. Inheritance of hypodontia in twins. *Collegium Antropologicum*, 22 (1): 291–298.

Lavelle CL. and Moore WJ. 1973. The incidence of agenesis and polygenesis in the primate dentition. *Am J Phys Anthropol*, 38(3): 671-679.

Levin, S. (1964). "An indication for the three incisor case." *The Angle Orthodontist* 34(1): 16-24.

Nagaveni BN., Umashankara KV. 2009. Congenital bilateral agenesis of permanent mandibular incisors: case reports and literature review. *Archives of Orofacial Sciences* 4(2): 41-46.

Nagaveni, N. and K. Umashankara 2009. "Congenital bilateral agenesis of permanent mandibular incisors: case reports and literature review." *Archives of Orofacial Sciences* 4(2): 41-46.

Newman GV 1967. Congenitally missing mandibular incisors: treatment procedures. *Am J Orthod.*, 53(7): 482-491.

Newman GV 1967. Congenitally missing mandibular incisors: treatment procedures. *Am J Orthod.*, 53(7): 489-491.

Newman GV. 1977. Transposition: orthodontic treatment. *J Am Dent Assoc*, 94(3): 544-547

Newman GV. and Newman RA. 1998. Report of four familial cases with congenitally missing mandibular incisors. *Am J Orthod Dentofacial Orthop.*, 114(2): 195-207.

Newman GV., Newman RA. 1998. Report of four familial cases with congenitally missing mandibular incisors. *American Journal of Orthodontics and Dentofacial Orthopedics*, 114 (2): 195–207.

Newman, G. V. 1967. "Congenitally missing mandibular incisors: treatment procedures." *American Journal of Orthodontics* 53(7): 482-491.

Silva Meza, R. 2003. "Radiographic assessment of congenitally missing teeth in orthodontic patients." *International journal of paediatric dentistry*, 13(2): 112-116.

Sperber GH. 1963. Anodontia: Two cases of different etiology. *Oral Surgery Oral Medicine and Oral Pathology*, 16: 73–82.

Stafec EC., Gibilisco JA. 1975. Oral roentgenographic diagnosis. Philadelphia, London, Toronto: W. B. Saunders, 16–43.

Stimson JM., Silvers JE., Hlava GL. 1997. Features of oligodontia in three generations. *Journal of Clinical Pediatric Dentistry*, 21 (3): 269–275.

Tsai PF., Chiou HR., Tseng CC. 1998. Oligodontia. Case report. *Quintessence International*, 29 (3): 191–193.

Ulrich K. 1990. Freckles and dysplasias of the eyebrows as indicators for genetic abnormalities of the development of the teeth and jaws. *Stomatologie der DDR*, 40 (2): 64–66.