# Treatment of Blocked-In Upper Lateral Incisors and Congenitally Missing Premolars with 10mm Overjet

# Abstract

History: A 15-year-old female presented with flared upper central incisors and blocked-in upper lateral incisors with no lip contact.

**Diagnosis:** A skeletal Class I malocclusion (SNA 81°, SNB 77°, ANB 4°) and an end-on molar Class III relationship with canine Class II relationship were noted. Dental analysis revealed flared upper central incisors (U1-to-NA 7mm; U1-to-SN 110°), retroclined lower incisors (L1-to-MP 84°) with an excessive overjet of 10mm. LR5 and LL5 were found to be congenitally missing. The facial profile was slightly convex. The Discrepancy Index (DI) was 19.

**Treatment:** Upper two-bicuspid extraction (UR4 and UL4) was conducted to provide space for retracting U1s and bringing the blockedin U2s back into the arch. A passive self-ligating fixed appliance was introduced with upper anterior bite turbos and Class II elastics. Combining Class II elastics with anterior bite turbos can guide the mandible to occlude in a more protrusive position and open the bite to extrude the molars.

**Results:** After 25 months of treatment, a satisfactory profile and alignment was achieved. The Cast-Radiograph Evaluation (CRE) was 9, and the Pink and White esthetic score was 3. One discrepancy from an ideal occlusion was noted in the increased inclination of the lower incisors (L1-to-MP 103°).

**Conclusions:** This case report demonstrated the treatment of blocked-in U2s in conjunction with flared U1s and bilateral congenitally missing L5s. Extracting U4s to result in one missing premolar in each quadrant is an important element of treatment planning. With proper mechanisms, anterior bite turbos and Class II elastics, a 10mm overjet can be treated to a pleasing result. (J Digital Orthod 2021;64:46-61)

#### Key words:

Blocked-in teeth, congenitally missing teeth, excessive overjet, passive self-ligating brackets, anterior bite turbos, Class II elastics

# Introduction

The dental nomenclature used in this report is a modified Palmer notation with four oral quadrants: upper right (*UR*), upper left (*UL*), lower right (*LR*), and lower left (*LL*). From the midline, the permanent teeth are numbered 1-8.

Congenitally missing teeth, or hypodontia, is a prevalent craniofacial malformation in humans, especially among the Asian population,<sup>1</sup> and is surprisingly common in our daily dental practices.

Depending on the population studied, the most commonly missing teeth differ; nonetheless, missing mandibular second premolars rank highly among all ethnicities.<sup>2-4</sup> Individuals with hypodontia often present in clinical disguise on dental visits. Taking this case report as an example, the patient was a dental Class III case due to her missing L5s. Thus, it was still necessary to treat with Class II mechanics to fix the excessive overjet. There are different treatment options for hypodontia cases, for instance, resinbonded fixed partial dentures (*RBFPDs*), or dental implants<sup>5</sup> when the congenitally missing space is



the patient's perspective. Since there were flared upper central incisors and blocked-in upper lateral incisors, the maxillary arch length deficiency could be solved by two-bicuspid extraction. The excessive

maintained. However, that was not the case for the current patient. There was no space left for any restorations. Creating space for such procedures would be too expensive and make little sense from



**Fig. 1:** Pre-treatment facial and intraoral photographs

overjet could be solved with upper anterior bite turbos<sup>6,7</sup> in addition to Class II elastics.<sup>8,9</sup>

# History and Etiology

A15-year-old female sought orthodontic consultation for an unesthetic smile. Intraoral examination revealed flared U1s, blocked-in U2s, and bilateral congenitally missing L5s. Both arches showed anterior crowding with an excessive overjet of 10mm (*Figs. 1-3*). There were no contributing dental trauma, oral habits, nor significant signs and symptoms of temporomandibular dysfunction.

# Diagnosis

#### Skeletal:

• Skeletal Discrepancy (SNA 81°, SNB 77°, ANB 4°)

#### Facial:

- Facial profile: Convex
- Lip Protrusion: Near normal lip profile (-1mm upper and -1mm lower to the E-Line)
- Symmetry: No midline deviation
- Smile Line: Despite the blocked-in U2s, the rest of the upper anterior dentition corresponded to the lower lip curvature.

## Dental:

- Occlusion: Bilateral end-on Class III molar relationship
- Overjet/overbite: 10mm/5mm
- Congenitally missing teeth: LR5, LL5

The American Board of Orthodontics (*ABO*) Discrepancy Index (*DI*) was 19 as documented in the supplementary Worksheet 1.<sup>10</sup>



#### Fig. 2:

Pre-treatment panoramic radiograph shows congenitally missing LR5 and LL5 (red ovals).



Fig. 3:

Pre-treatment cephalometric radiograph showing flared U1s and blocked-in U2s

# Specific Objectives of Treatment

The treatment objectives were to: 1. correct flared U1s, 2. align U2s, 3. relieve crowded dentition, and 4. obtain bilateral Class I molar and canine relationships.

## Maxilla (all three planes):

- A-P: Maintain
- Vertical: Maintain
- Transverse: Maintain

## Mandible (all three planes):

· Allow normal expression of growth in all three planes

#### Dentition:

- Achieve Class I molar relationship
- Level both upper and lower dentition
- Expand maxillary and mandibular width

## Facial Esthetics:

• Decrease the convex profile

# Treatment Plan

According to the extraction decision chart proposed by Chang,<sup>11</sup> extraction is viable for treating a case with flared upper central incisors, protruded lip, and increased mandibular plane angle. Since the patient was open to extraction, bilateral extraction of U4s was purposed in order to relieve the maxillary anterior crowding and flaring. With both lower second premolars congenitally missing, the extraction resulted in one missing premolar in each quadrant. Upper anterior bite turbos and Class II elastics were indicated to resolve the anterior-posterior relation between the jaws. Bilateral infrazygomatic crest (*IZC*) bone screws (*BSs*)<sup>12</sup> were also a feasible option if elastics alone were not able to correct the overjet. Both fixed and clear retainers were planned to retain the arches after active treatment. Extraction of all four third molars was also suggested (*Fig. 4*).

# **Treatment Progress**

CEPHALOMETRIC SUMMARY				
SKELETAL ANALYSIS				
	PRE-TX	POST-TX	DIFF.	
SNA° (82°)	81°	81°	0°	
SNB° (80°)	77°	77°	0°	
ANB° (2°)	4°	4°	0°	
SN-MP° (32°)	37°	37°	0°	
FMA° (25°)	30°	30°	0°	
DENTAL ANALYSIS				
U1 TO NA mm (4mm)	7	3	4	
U1 TO SN° (104°)	110°	102°	8°	
L1 TO NB mm (4mm)	3	6	3	
L1 TO MP° (90°)	84°	103°	19°	
FACIAL ANALYSIS				
E-LINE UL (-1mm)	-1	-2	1	
E-LINE LL (0mm)	-1	0	1	
%FH: Na-ANS-Gn (53%)	54%	55%	1%	
Convexity:G-Sn-Pg' (13°)	16°	15°	1°	

**Table 1:** Cephalometric summary

#### JDO 64 CASE REPORT

After the two maxillary first premolars were extracted, 0.022" slot Damon Q<sup>®</sup> passive self-ligating (*PSL*) brackets (*Ormco, Brea, CA*) were bonded on all upper teeth, and a 0.014" CuNiTi archwire was inserted. The torque selection for the upper central incisors and canines was high torque, while standard torque brackets were selected for the lateral incisors (*Fig. 5*).

To avoid the blocked-in U2s occluding on the mandibular brackets, bonding on the lower arch was postponed until the U2s were aligned into the dentition. Therefore, the upper arch was bonded two months before the lower arch. Meanwhile, two occlusal bite-turbos constructed with Fuji II® type II glass ionomer cement (*GIC*) (*GC America, Alsip IL*)



#### Fig. 4:

The treatment plan required extraction, anterior bite turbos, and Class II elastics. See text for details.



#### Fig. 5:

Torque selection for maxillary anterior teeth (H: high toque; S: standard torque)



#### Fig. 6:

Glass ionomer cement was placed on L6s to increase the level of occlusion to prevent bracket interference



Fig. 7: Anterior bite turbos were installed on U1s to reduce overjet.

were added on the L6s to increase intermaxillary space and keep the mandibular brackets from interfering with the maxillary occlusion (*Fig. 6*).

In the 4<sup>th</sup> month of treatment, anterior bite turbos were attached on the U1s to allow the mandible to occlude in a more anterior position to reduce the overjet (*Fig. 7*). In the same appointment, Class II elastics (*Parrot, 5/16," 20z*) were attached to accelerate the process of reducing the excessive overjet. They were bilaterally attached from U3 drop-in hooks, passing inferior to the L6 brackets, and extending to



**Fig. 8:** Class II elastics to facilitate anterior positioning of the mandible.

L7 hooks. The elastics were extended to L7s rather than L6s to increase the horizontal force pulling the maxillary dentition backwards (*Fig. 8*).

In the 6<sup>th</sup> month of treatment, the bilateral occlusal bite turbos for gaining intermaxillary space were removed, and both upper and lower archwires were changed to 0.014x0.025" CuNiTi. A power chain was applied from UR3 to UL3 to consolidate and close spaces between them. In the 10<sup>th</sup> month, both archwires were changed to 0.017x0.025" TMA. Figure-eight ties were applied on both arches from canine to canine in order to fix anterior teeth as segments (*Fig. 9*).

In the 13<sup>th</sup> month, the primary problems - namely flared central incisors, blocked-in lateral incisors, and molar relationship - were significantly improved. Thus, at the same appointment, 0.016x0.025" SS archwires were fitted on both arches (*Fig. 10*). Three months later, in the 16<sup>th</sup> month of treatment, the lower wire was reversed for flattening the curve of Spee and achieving a better occlusion.

Another ten months were required to detail the occlusion. Intermaxillary elastics (*Chipmunk, 1/8*,"



Figure-eight ties from canine to canine to bind anterior teeth as a group while closing extraction spaces.



**Fig. 10:** 13 months into treatment, all major problems were corrected. Power chain was kept in place from canine to first molar to keep the extraction sites closed.

*3.5oz*) were utilized to correct the slight posterior scissor bite. The maxillary archwire was sectioned distally to the second premolars to increase posterior occlusal contacts. Inter-proximal reduction (*IPR*) was conducted on the maxillary central incisors to remove the black triangles and tighten the contact in-between teeth.

After twenty-five months of active treatment, all appliances were removed, and retention was

achieved with fixed and clear overlay retainers on both arches. Full treatment progress is documented in Figs. 19-22.

# **Treatment Results**

After 25 months of active treatment, the blocked-in upper lateral incisors, flared upper central incisors, and crowding (*DI=19*) were corrected to an optimal alignment (*CRE=9*) as shown in the supplementary Worksheet 2. Treatment results are detailed in Figs. 11-15. The maxillary arch inter-molar width was decreased. The inter-canine width was increased as the upper molars were protracted while the canines were retracted. Class I molar and canine relationships were achieved. Compared to the protrusive upper lip before orthodontic treatment, the facial profile was near ideal to the E-line (*Fig. 11*). The right posterior occlusion was compromised because the LR7 was



Fig. 11:

Pre- and post-treatment photographs showing lip position changes and overjet correction

tipped medially as the LR8 erupted. Third molar extractions were suggested but the parents declined the procedure. The three-year follow-up evaluation documented the stability of the final occlusion (*Fig. 16*).

From the superimposed cephalometric tracings (Fig. 12), the mandible was rotated clockwise, the vertical dimension was increased, and molars were extruded. These were due to the effect of anterior bite turbos and Class II elastics. The upper incisors were retracted 4mm by closing upper premolar spaces (Table 1). Discrepancy from an ideal occlusion was noted in the increased inclination of the lower incisors due to the influence of Class II elastics. Even though the lower incisors were more proclined, the occlusion was stable at the three-year follow-up (Fig. 16). The superimposed cephalometric tracings show increased mandibular ramus length, which seemed to be mandibular growth. Nonetheless, the age of this patient has to be taken into consideration.<sup>13-15</sup> Usually, the mandibular growth spurt in female occurs between 11 and 12 years of age (Fig. 17). There is little mandibular growth for a fifteen-year-old girl. Hence, the mandible was repositioned forward by the anterior bite turbos and Class II elastics, but whether there was true mandibular growth is uncertain.

The Pink and White esthetic score of 3 was due to wider upper central incisors, as shown in the supplementary Worksheet 3.<sup>16</sup> Full treatment progress is documented in Figs. 19-22.

# Discussion

The treatment of this patient may appear intuitive, but the excellent result required a series of precise decisions. Below are some notable keys for success in the correction of this type of malocclusion.



#### Fig. 12:

Superimpositions of the cephalometric tracings before (blue) and after (red) treatment document the clockwise rotation of the mandible, increased vertical dimension, molar extrusion, U1s retraction, and increased inclination of the L1s. See text for details.

## **Torque Selection**

Torque is an applied moment that leads to tooth rotation.<sup>17</sup> When retracting anterior teeth to close extraction spaces, upper anterior teeth are prone to tip distally.<sup>18</sup> To compensate for this, high-torque brackets were chosen for the upper central incisors. Aligning blocked-in lateral incisors resulted in labial flaring. Thus, the torque selection for lateral incisors remained standard. Due to their location in the arch, canine roots usually lodge into the buccal cortical bone as they are retracted, so high-torque brackets were chosen for the canines (*Fig. 5*).

#### **Anterior Bite Turbo and Class II Elastic**

The mechanism of anterior bite turbos plus Class II elastics is similar to the mandibular advancement seen with Twin block, Frankel appliance, and clear aligners. Repositioning the mandible forward during puberty can stimulate growth of the condyles and ramus, which can decrease the discrepancy between the maxilla and the mandible.

Another critical step in this treatment was to attach Class II elastics in the same appointment as when anterior bite turbos were added. Anterior bite turbos were bonded to shift the mandible forward and to create vertical spaces in the posterior area for molars



**Fig. 13:** Post-treatment facial and intraoral photographs



**Fig. 14:** Post-treatment cephalometric radiograph



**Fig. 15:** Post-treatment panoramic radiograph



**F**ig. 16:

Three-year follow-up showing the stability of the final occlusion



Fig. 17:

Growth curve of mandible and maxilla for both genders (Courtesy of Dr. Kazuto Kuroe)

to extrude by virtue of the shape and thickness of the bite turbos.<sup>18</sup> Due to their sloped shape, the anterior bite turbos provided guidance for lower central incisors to slide forward and occlude in a protracted position so as to reduce the overjet. In this way, the overbite would not deepen as the upper anteriors were retracted to close the extraction spaces. Class II elastics were implemented to facilitate backward rotation of the maxilla and forward motion



**Fig. 18:** Mechanism of anterior bite turbo and Class II elastics

of the mandible to bite on the anterior bite turbos, and thereby to foster lower molar extrusion (*Fig. 18*).

#### Space Closure without Deepening the Bite

Generally, it is inevitable that the bite becomes deeper after closing extraction space (*drawbridge effect*). This is a particularly crucial point for the present patient because she already had a deep bite. With upper bicuspid extraction, her anterior overbite and curve of Spee should be carefully controlled and monitored during treatment. The key was to close the space with 0.016x0.025" stainless steel wire. Anterior bite turbos were also necessary to maintain the interincisal relationship. Since there was play within the system, bending a reverse curve of Spee in the main archwire compensated for some torque loss. With adequate precautions, extraction and subsequent space closure is a routine strategy to improve alignment.

# Conclusions

Assessing the etiology of a malocclusion is the first step for establishing an optimal treatment plan. As

bilateral U2s were blocked-in, and flared U1s with excessive overjet were also present, bicuspid extraction was a viable choice to provide sufficient space for upper anterior teeth retraction. Anterior bite turbos and Class II elastics were synergistic for repositioning the mandible forward and reducing the overjet.



#### **Fig. 19**:

Treatment progression from the frontal view. Deeper overbite is inevitable for upper bicuspids extraction cases. However, thanks to anterior bite turbos, the overbite was maintained.



**Fig. 20**: Treatment progression from the right buccal view. U4s were extracted to relieve upper anterior crowding.



#### **Fig. 21**:

Treatment progression from the left buccal view. The bite turbos on LL6 and LR5 were made of GIC type II in order to open the bite and spare mandibular brackets from being interfered by maxillary teeth. Class II elastics were applied to decrease overjet.



**Fig. 22**: Treatment progression of the overjet. Overjet was decreased and blocked-in U2s were corrected within 10 months.

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# **Discrepancy Index Worksheet**

TOTAL D.I. SCORE



## **OVREJET**

=	
=	0 pts.
=	2 pts.
=	3 pts.
=	4 pts.
=	5 pts.

Negative OJ (x-bite) 1 pt. per mm. Per tooth = 0

Total

=	5

## **OVERBITE**

0 - 3 mm.	=	0 pts
3.1 - 5 mm. 5mm	=	2 pts
5.1 - 7 mm.	=	3 pts
Impinging (100%)	=	5 pts
	_	

Total

2	

## **ANTERIOR OPEN BITE**

0 mm. (Edge-to-edge), 1 pt. per tooth Then 1 pt. per additional full mm. Per tooth

Total

=	

# **LATERAL OPEN BITE**

2 pts. per mm. Per tooth

Total

= 0

## **<u>CROWDING</u>** (only one arch)

1 - 3 mm. 3.1 - 5 mm. 5.1 - 7 mm. > 7 mm.	6mm (upper)	= = =	1 pt. 2 pts. 4 pts. 7 pts.
		Г	

Total



#### **OCCLUSION**

Class I to end on	=	0 pts.
End on Class II or III	=	2 pts. per sidepts
Full Class II or III	=	4 pts. per sidepts
Beyond Class II or III	=	1 pt. per mmpts
		additional
Total	=	0

LINGUAL POST	ERIOR X-BITE	
1 pt. per tooth	Total	= 0
BUCCAL POSTE	CRIOR X-BITE	
2 pts. Per tooth	Total	= 0
<u>CEPHALOMETI</u>	RICS (See Instruct	tions)
$ANB \ge 6^{\circ} \text{ or } \le -2^{\circ}$		= 4 pts.
Each degree < -2	2° x 1 pt.	=
Each degree > 6	° x 1 pt.	=
SN-MP		
$\geq$ 38°	37°	= 2 pts.
Each degree > 3	8° x 2 pts.	=
$\leq 26^{\circ}$		= 1 pt.
Each degree < 2	6° x 1 pt.	=
1 to MP $\ge$ 99°	84°	= 1 pt.
Each degree > 9	9° x 1 pt.	=
	Total	= 0

#### **<u>OTHER</u>** (See Instructions)

Supernumerary teeth	x 1 pt. =
Ankylosis of perm. Teeth	x 2 pts. =
Anomalous morphology	x 2 pts. =
Impaction (except 3 <sup>rd</sup> molars)	x 2 pts. =
Midline discrepancy (≥ 3mm)	@ 2 pts. =
Missing teeth (except 3rd molars)	x 1 pt. =
Missing teeth, congenital <u>2</u>	x 2  pts. = 4
Spacing (4 or more, per arch)	x 2 pts. =
Spacing (Mx cent. diastema ≥2mm)	@ 2 pts. =
Tooth transposition	x 2 pts. =
Skeletal asymmetry (nonsurgical tx)	@ 3 pts. =
Addl. treatment complexities	x 2 pts. =

# Identify: Congenitally missing LR5, LL5

Total

=



**INSTRUCTIONS:** Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

# **IBOI Pink & White Esthetic Score**

**Total Score =** 



1. Pink Esthetic Score





2. White Esthetic Score (for Micro-esthetic)





10tur -			
1. M & D Papillae	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity ( Torque )	0	1	2
6. Scar Formation	0	1	2

Total –

0

1. M & D Papillae	0 1	2
2. Keratinized Gingiva	0 1	2
3. Curvature of Gingival Margin	0 1	2
4. Level of Gingival Margin	0 1	2
5. Root Convexity ( Torque )	0 1	2
6. Scar Formation	0 1	2

Iotal =	2		
1. Midline	0	1	2
2. Incisor Curve	0	1	2
3. Axial Inclination (5°, 8°, 10°)	0	1	2
4. Contact Area (50%, 40%, 30%)	0	1	2
5. Tooth Proportion	0	1	2
6. Tooth to Tooth Proportion	0	1	2

*T* , ,

2

1. Midline	0 1	2
2. Incisor Curve	0 1	2
3. Axial Inclination (5°, 8°, 10°)	0 1	2
4. Contact Area (50%, 40%, 30%)	0 1	2
5. Tooth Proportion	0 1	2
6. Tooth to Tooth Proportion	0 1	2



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此外,透過數位影片反覆觀看,結合矯正與電腦教學,課堂助教協助操作,以及診間臨床見習,讓學員在短時間能快速上手,感染「熱愛學,熱愛學矯正」的熱情。

名額有限,一年僅有一次機會在台完整體驗 Damon 矯正大師課程, 錯過只能等明年囉!

#### Module 1 - 4/14

- 1. Selecting your ideal first case
- 2. Bonding position
- 3. Bonding + BT + Ceph tracing
- 4. TADs + space closing + hook + spring
- 5. Finishing bending & fixed retainer

Practice: Clinical photography

#### Module 2 - 4/28

- 1. Four stages of efficient orthodontic treatment
- 2. Simple and effective anchorage system
- 3. Extraction vs. Non-extraction analysis

Practice: Patient photo management

#### Module 3 - 5/12

- 1. Soft & hard tissue diagnostic analysis
- 2. Big overjet correction
- 3. Damon diagnosis & fine-tuning

Practice: Ceph tracing

#### Module 4 - 6/2

- 1. Excellent finishing
- 2. Retention & relapse

Practice: Ceph superimposition & measurement

#### Module 5 - 6/16

Simplify your system
 Extraction vs. non-extraction

Practice: Case report demo

Lomputer training (Mac): 1:30-2:30 pm

時間:週四全天(9 am - 5 pm) 地點:金牛頓藝術科技(新竹市建中一路 25 號 2 樓) 費用含課程視訊、iPad、課程電子書與材料。

#### 報名專線 湧傑 Yong Chieh

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#### Module 6 - 7/21

- Class III correction
  Class II correction
  - opic: Early orthodontic treatment (曾淑萍醫師)

#### Module 7 - 8/18

- 1. Upper impaction
- 2. Lower impaction
- 3. Gummy smile correction

opic: Modfied VISTA (蘇筌瑋醫師

#### Module 8 - 9/15

1. ABO DI, CRE workshop 2. Open bite

pic: Modified 2X4 appliance in ortho treatment (徐玉玲麗師

#### Module 9 - 9/29

Asymmetry
 Implant-ortho combined treatment
 Interdisciplinary treatment-adult complex cases

Topic: Interdisciplinary approach (邱上珍醫師)

#### Module 10 - 10/13

Minor surgeries in orthodontics
 Digital orthodontics

opic: Ortho-viewed interdisciplinary treatment (徐重興醫師)

#### <u>Module 1</u>1 - 11/10

1. Aligner & TADs 2. Keys to aligner learnir

Topic: Pre-aligner treatment (林詩詠醫師)

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