

Treatment of Full-Cusp Skeletal Class III Malocclusion with Facial Asymmetry without Surgery, Extraoral Anchorage or TADs

History and Etiology

A 17-year-11-month-old female presented for orthodontic consultation with chief complaints of anterior cross bite and facial asymmetry. She was previously advised by several orthodontists that surgery was the only viable option for correcting her malocclusion and facial asymmetry (*Figures 1-3*).

There were no contributing medical, dental or family histories. The etiology of the malocclusion was unknown, but it is probably genetic based on the nature of the skeletal malocclusion.

The patient was treated to an optimal result as documented in *Figures 4-6* without surgery, extraoral anchorage or temporary anchorage devices (TADs). The cephalometric and panoramic radiographs document the pre-treatment condition and the post-treatment results (*Figures 7, 8*). The cephalometric tracings before and after treatment are superimposed in *Fig. 10*.

Diagnosis

Skeletal:

Skeletal Class III ($SNA\ 81^\circ$, $SNB\ 85^\circ$, $ANB\ -4^\circ$)

Average mandibular angle ($SN-MP\ 35^\circ$, $FMA\ 27^\circ$)

Facial asymmetry: mandible deviation to right

Dental:

Bilateral full cusp Class III molar relationship

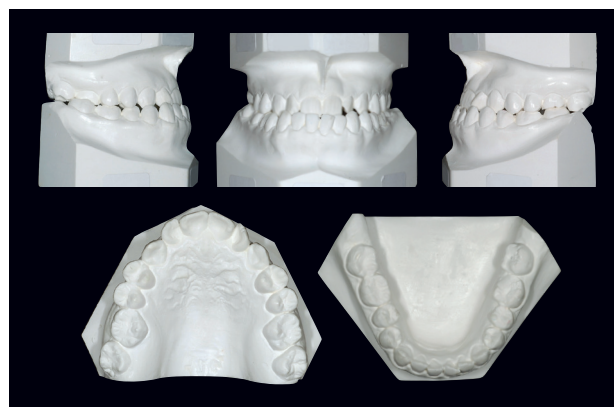
Bilateral Class III canine



■ Fig. 1: Pretreatment facial photographs



■ Fig. 2: Pretreatment intraoral photographs



■ Fig. 3: Pretreatment study models

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Functional shift from CO to CR was 1-2mm (Fig. 9)
 In CO the OJ was -4 mm, and the OB was 2 mm
 Maxillary right 1st molar (#3) was in lingual crossbite
 5 mm space deficiency for upper arch
 3 mm space deficiency for lower arch
 All four 3rd molars are missing
 ABO Discrepancy Index (DI) was 23, fitting the major malocclusion category (DI >20)

Facial:

Straight profile (Fig. 9)
 Protrusive lower lip

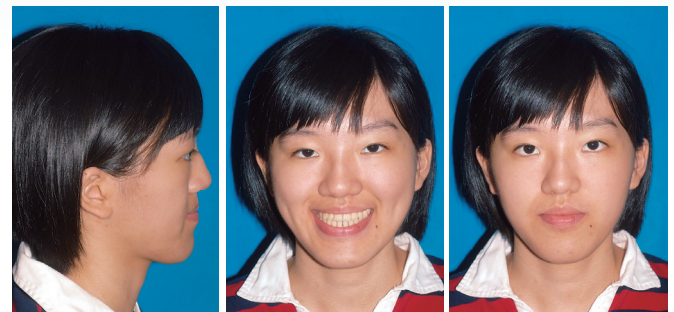


Fig. 4: Posttreatment facial photographs

Specific Objectives of Treatment

Maxilla (all three planes):

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

Mandible (all three planes):

- A - P: Retraction
- Vertical: Clockwise rotation to open the vertical dimension of occlusion (VDO)
- Transverse: Maintain

Maxillary Dentition:

- A - P: Slight flaring of incisors to achieve anterior cross bite correction
- Vertical: Extrude molars to open the VDO
- Inter-molar / Inter canine Width: Expansion to relieve crowding and #3 lingual cross-bite



Fig. 5: Posttreatment intraoral photographs



Fig. 6: Posttreatment study models



Fig. 7: Pretreatment pano and ceph radiographs

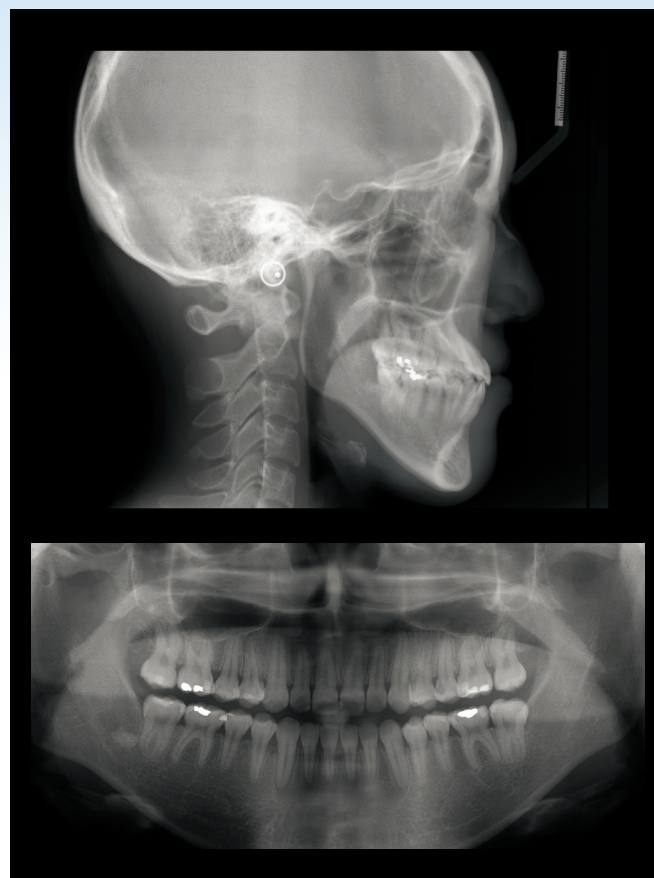


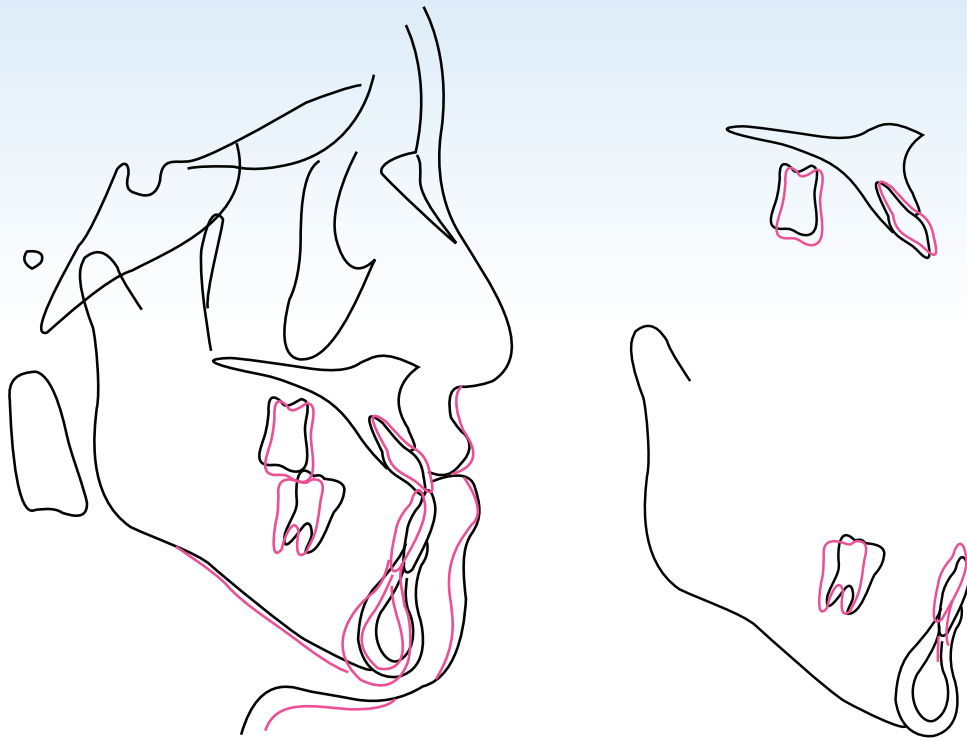
Fig. 8: Posttreatment pano and ceph radiographs



Fig. 9: Lateral view at CO and CR position

CEPHALOMETRIC SKELETAL ANALYSIS			
	PRE-Tx	POST-Tx	DIFF.
SNA°	81°	81°	0°
SNB°	85°	83°	-2°
ANB°	-4°	-2°	2°
SN-MP°	35°	37°	2°
FMA°	27°	28°	1°
DENTAL ANALYSIS			
U1 TO NA mm	8 mm	9 mm	1 mm
U1 TO SN°	70°	69°	-1°
L1 TO NB mm	6 mm	6 mm	0 mm
L1 TO MP°	82°	74°	-8°
FACIAL ANALYSIS			
E-LINE (U)	-12 mm	-9 mm	3 mm
E-LINE (L)	-2.4 mm	-3 mm	0.6 mm

Table. Cephalometric summary



■ Fig. 10: Superimposed tracings

Mandibular Dentition:

- A - P: Anterior teeth retraction and posterior teeth tip-back
- Vertical: Lower incisors extrusion
- Inter-molar / Inter-canine Width: Maintain

Facial Esthetics:

- Protrude upper lip
- Retract lower lip

Treatment Plan

Non-extraction treatment with passive self-ligating bracket system (*Damon Q*) was indicated. Lingual buttons and cross elastics were used to correct the cross bite of molars and canines in the beginning of the treatment. Class III elastics were used to correct A-P discrepancy by flattening the plane of occlusion and opening the VDO (*nonsurgical camouflage treatment*). To enhance the camouflage effect, Class III elastics were initiated early in treatment (.014x.025 CuNiTi stage) while final alignment of the dentition was achieved near the end of active treatment.

Appliances and Treatment Progress

.022" slot Damon Q low torque brackets ($U1 = +2^\circ$, $U2 = -5^\circ$, $U3 = -9^\circ$) were selected. For lower incisors, brackets were bonded upside-down to have high torque ($L1 = L2 = +11^\circ$) expression (Fig. 11). Two lingual buttons were bonded on tooth #2 and #3 with cross elastics hooked to tooth #30 and #31 separately for posterior cross bite correction which were accelerated by using glass ionomer composite bite turbos on teeth #18 and #31 (Fig. 12) from the first day of bonding. The initial archwires were .013 CuNiTi.

In the 3rd month of treatment, the round wires was replaced with rectangular .014x.025 CuNiTi wires. Four crimpable hooks were installed for mid-line correction as showed in Fig. 13. Two months later, .018x.025 CuNiTi wires with two crimpable hooks in the lower anterior area were applied, and Class III elastics (*Kangaroo* 3/16, 4.5 oz) were used to correct the A-P discrepancy (Fig. 14).

After nine months of treatment, .019x.025 SS wires with two hooks crimped in asymmetric position in the lower anterior area were applied. The Class III elastics were continued to correct the mid-line and A-P discrepancies (Fig. 15). At this stage, the upper wire was cut off distal to the first molar to reduce friction (Fig. 16). After 22 months of active treatment, without any surgical procedure or additional anchorage devices (ex: *bone screws, bite fixers, facial masks etc.*), the treatment was completed and all appliances were removed (Figures 17, 18).



■ Fig. 11:
Low torque brackets of lower incisors were bonded up-side-down to have high ($L1=L2=+11^\circ$) torque expression.



■ Fig. 12:
Bite turbo made of GIC on lower secondary molars for bite opening to accelerate posterior X-bite correction.

Results Achieved

Maxilla (all three planes):

- A - P: Maintained
- Vertical: Maintained
- Transverse: Maintained

Mandible (all three planes):

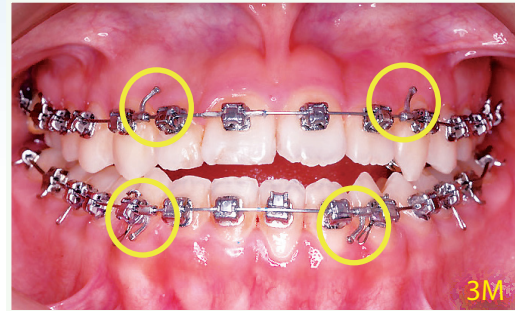
- A - P: Retracted
- Vertical: Clockwise rotation to open the VDO
- Transverse: Maintained

Maxillary Dentition:

- A - P: Incisors slightly flaring
- Vertical: Extrusion of the posterior teeth
- Inter-molar / Inter-canine Width: Crowding and cross bite corrected with arch expansion

Mandibular Dentition

- A - P: Incisor retracted and molars were tipped distally
- Vertical: Incisors extruded
- Inter-molar / Inter-canine Width: Crowding released and cross bite corrected



■ Fig. 13:
4 crimpable hooks on .014X.025 CuNiTi wire for mid-line correction.



■ Fig. 14:
2 crimpable hooks on .018X.025 CuNiTi wire for Class III elastics.



■ Fig. 15:
2 asymmetric crimpable hooks on .019X.025 SS wire for mid-line and A-P discrepancy correction.

Facial Esthetics:

- Upper lip slightly more protruded
- Lower lip was retruded slightly

Retention

Upper Hawley and lower spring retainers were delivered, and the patient was instructed to wear them full time for the first six months and nights only thereafter. In addition, the patient was instructed in proper home hygiene and maintenance of the retainers.



■ Fig. 16:
Upper wire cut distal to first molar to reduce friction.

Final Evaluation of Treatment

The CRE score was 25 points. The major discrepancies were uneven marginal ridges (7 *points*), buccolingual inclination of posterior teeth (5 *points*) and loss of some occlusal contacts (6 *points*), which resulted primarily from the tip-back of molars in the lower arch (Fig. 19). There was no appreciable change in facial asymmetry.



■ Fig. 17: Closed eruption surgery day and one week later.

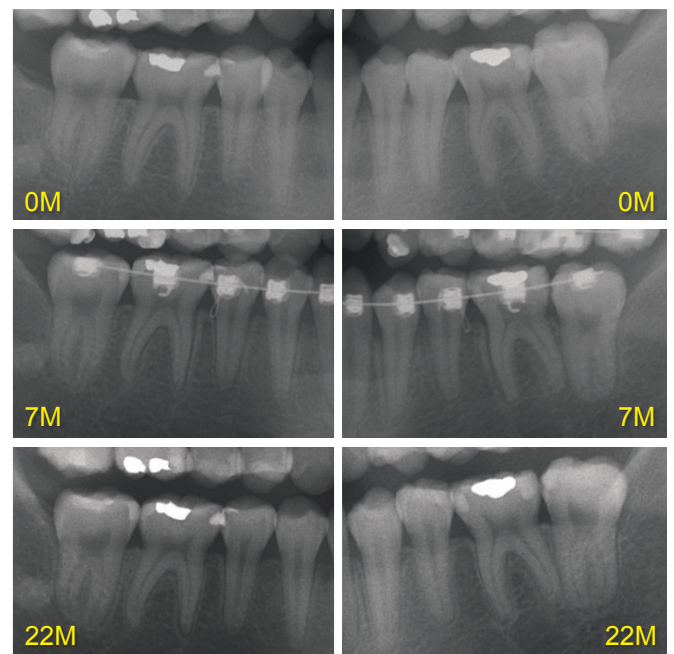


■ Fig. 18: Closed eruption surgery day and one week later.

The OB was 2 mm, OJ was 2 mm, molar relationship were Class I bilaterally, and the profile was improved. Overall, the treatment results for this challenging case were pleasing for both the patient and the clinician.

Discussion

In treating Class III cases, correct diagnosis, appropriate timing for treatment and treatment mechanics have long been challenging for most clinicians due to unpredictable growth and development. However, the following indicators often suggest favorable prognosis: (1) orthognathic profile in the retruded centric relation position, (2) a functional shift, (3) low to average mandibular plane angle, (4) no open bite, and (5) no significant crowding.



■ Fig. 19: Radiographs show the progress of tip-back.

Generally, treatment is delayed until the end of puberty for true skeletal Class III patients, especially for the mandibular deviation cases, as they tend to worsen with growth.¹ Although age 18 is often recommended as the minimal age for definitive treatment of skeletal Class III malocclusions for both males and females, it is important to inform patients and parents about the possibility of profile changes due to future growth. Thus extraction therapy, extraoral anchorage, TADs or even orthognathic surgery are commonly suggested as treatment options for true skeletal Class III patients.

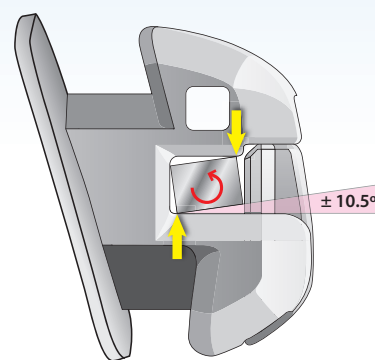
According to the prediction indicators mentioned previously, the prognosis for the present patient was favorable. Hence, a relatively simple treatment plan was indicated using passive self-ligating brackets and Class III elastics.

In the past, Kim's MEAW technique was commonly used to treat open bites, severe Class II, Class III, and asymmetric malocclusions. Presently the 10.5° of play between .019x.025 SS wire and a .022 slot Damon Bracket (Fig. 20) can also create a MEAW-like effect. The multiloop MEAW archwire is replaced by a passive self-ligating bracket, so both patients and clinicians can benefit from decreased treatment time and better oral hygiene.

Conservative treatment of Class III skeletal malocclusions with intermaxillary elastics usually results in distal tipping of the mandibular molars. Thus, unerupted mandibular 3rd molars should be extracted before the start of treatment to prevent them from being impacted.³

Side effects of Class III elastics include labial tipping of upper incisors, extrusion of upper molars and tip-back of lower molars.⁴ Since these effects are favorable for the present patient, Class III elastics were used rather than inserting bone screws in the buccal shelf of the mandible⁵ to provide skeletal anchorage to retract the lower dentition.

Class III elastics are frequently used for A-P discrepancy correction, but torque selection for anterior teeth is crucial. Low torque brackets for upper incisors and high torque brackets for lower incisors are recommended to compensate for the side effects of the elastics. Additionally, bonding a low torque bracket upside down



■ Fig. 20: "Play" between .019x.025 SSW in .022X.028 slot

on lower incisors is a viable alternative if high torque bracket are unavailable. For Class III elastics application, crimple hooks are preferable to K-hooks or dropping hooks for preventing single teeth from rotation. At the .019x.025 SS stage, the upper wire distal to the first molar was cut to reduce friction.⁶

Patient cooperation is essential for treatment with intermaxillary elastics. In this case, the patient was informed about the benefits and risks of wearing elastics, compared to surgical correction. She made a decision to cooperate before treatment commenced. Good patient cooperation contributed substantially to the success of this treatment.

Conclusion

This case report demonstrates that patients with a skeletal Class III, full cusp Class III molar relationship bilaterally, and a mild prognathic profile in the centric relation position are good candidates for conservative treatment with Damon self-ligating brackets and Class III elastics.

The patient was pleased to achieve a good result without any extractions, surgery, extraoral anchorage, TADs or complex, multiloop archwires. Moreover, successful management of such difficult cases with relatively simple mechanics increases the patient's confidence and trust in the clinician.

Acknowledgment

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References

1. Lin JJ. Creative orthodontics blending the Damon system & TADs to manage difficult malocclusions second edition. Yon-Chien Ltd. 2010:298
2. Kim YH. Anterior open bite and its treatment with multiloop edgewise archwire. Angle Orhtod. 1987;57:290-321
3. Lin JJ. Creative orthodontics blending the Damon system & TADs to manage difficult malocclusions second edition. Yon-Chien Ltd. 2010:397
4. Huang S. Non-extraction management of skeletal Class III malocclusion with facial asymmetry. News & Trends in Orthodontics. 2010; vol. 20 Oct. 1:22-31
5. Lin JJ. Treatment of severe class III with buccal shelf mini-screws. News & Trends in Orthodontics 2010: vol. 18 Apr 1:4-15
6. Huang S. Tom Pitts' secrets of excellent finishing. News & Trends in Orthodontics. 2009: vol. 14 Apr. 1:6-23

CASE # 1 **PATIENT** Shi-Yen Chen
TOTAL D.I. SCORE 23

0 mm. (edge-to-edge)	=	1 pt.
1 – 3 mm.	=	0 pts.
3.1 – 5 mm.	=	2 pts.
5.1 – 7 mm.	=	3 pts.
7.1 – 9 mm.	=	4 pts.
> 9 mm.	=	5 pts.

Total	=	6
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0 – 3 mm.	=	0 pts.
3.1 – 5 mm.	=	2 pts.
5.1 – 7 mm.	=	3 pts.
Impinging (100%)	=	5 pts.

Total	=	0
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0 mm. (edge-to-edge), 1 pt. per tooth
then 1 pt. per additional full mm. per tooth

Total	=	0
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2 pts. per mm. per tooth

Total	=	0
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1 – 3 mm.	=	1 pt.
3.1 – 5 mm.	=	2 pts.
5.1 – 7 mm.	=	4 pts.
> 7 mm.	=	7 pts.

Total = 4

Class I to end on	=	0 pts.	
End on Class II or III	=	2 pts. per side	<u> </u> pts.
Full Class II or III	=	4 pts. per side	<u> 8 </u> pts.
Beyond Class II or III	=	1 pt. per mm.	<u> 1 </u> pts.
			additional

Total	=	9
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EXAM YEAR	2011
ABO ID#	9999

1 pt. per tooth	Total	=	1
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2 pts. per tooth	Total	=	0
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$$\text{ANB} \geq 6^\circ \text{ or } \leq -2^\circ = 4 \text{ pts.}$$

Each degree $< -2^\circ$ _____ x 1 pt. = _____

Each degree $> 6^\circ$ x 1 pt. =

$$\geq 38^\circ = 2 \text{ pts.}$$

Each degree $> 38^\circ$ _____ x 2 pts. = _____

$$\leq 26^\circ = 1 \text{ pt.}$$

Each degree $< 26^\circ$ x 1 pt. =

1 to MP $\geq 99^\circ$ = 1 pt.

Each degree $> 99^\circ$ _____ x 1 pt. = _____

Total	=	0
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Supernumerary teeth	x 1 pt. =	
Ankylosis of perm. teeth	x 2 pts. =	
Anomalous morphology	x 2 pts. =	
Impaction (except 3 rd molars)	x 2 pts. =	
Midline discrepancy ($\geq 3\text{mm}$)	@ 2 pts. =	
Missing teeth (except 3 rd molars)	x 1 pts. =	
Missing teeth, congenital	x 2 pts. =	
Spacing (4 or more, per arch)	x 2 pts. =	
Spacing (Mx cent. diastema $\geq 2\text{mm}$)	@ 2 pts. =	
Tooth transposition	x 2 pts. =	
Skeletal asymmetry (nonsurgical tx)	@ 3 pts. =	3
Addl. treatment complexities	x 2 pts. =	

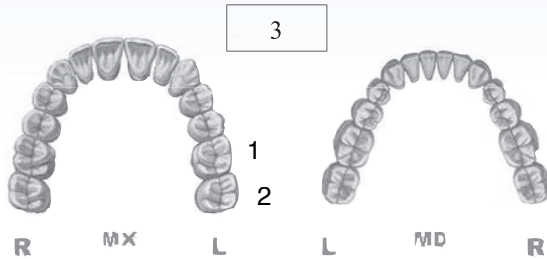
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Total = 3

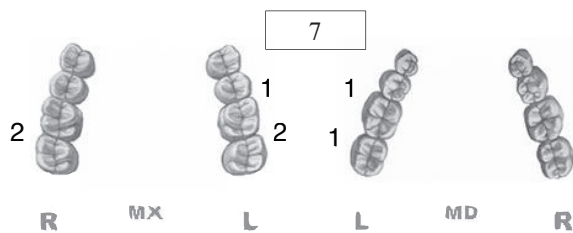
Exam Year	2011
ABO ID#	9999
<i>Examiners will verify measurements in each parameter.</i>	

Case # **1** Patient **Shi-Yen Chen**
 Total Score: **25**

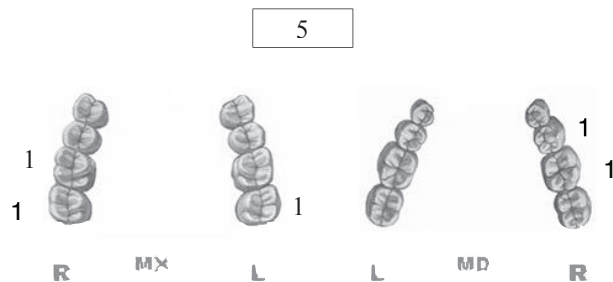
Alignment / Rotations



Marginal ridges



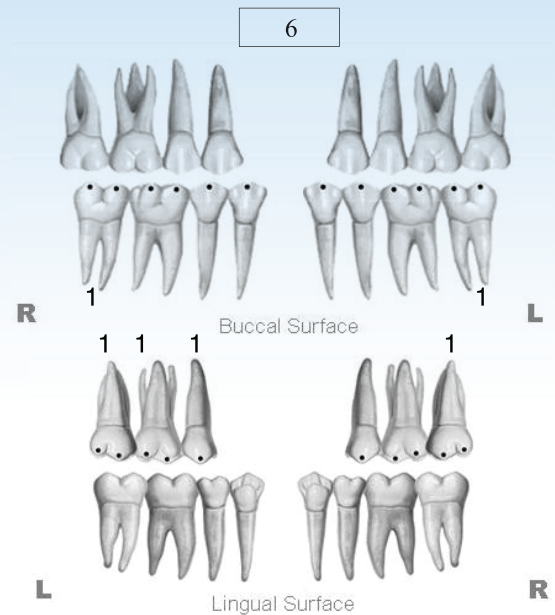
Buccolingual Inclination



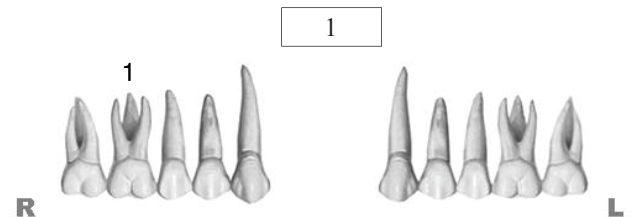
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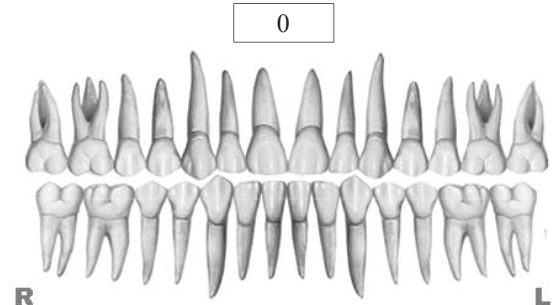
Occlusal Contacts



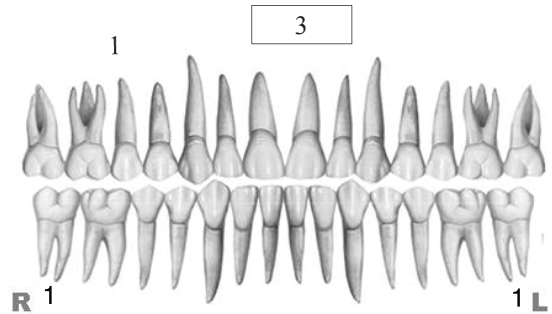
Occlusal Relationships



Interproximal Contacts



Root Angulation



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.