

Class II Deep Bite Malocclusion with Posteriorly-Inclined Upper Incisors

History and Etiology

A 21-year-5-month-old girl was accompanied by her parents for evaluation of dental crowding (Figures 1-3). Oral soft tissues, frena, and gingival health were all within normal limit. There was no history of dental trauma, aberrant oral habits or significant signs and symptoms of temporomandibular dysfunction. There was no contributory medical or dental history. The patient was unaware of the peg lateral (#10) and a deep bite. The patient and her parents desired comprehensive orthodontic treatment to achieve an ideal alignment of the entire dentition (Figures 4-6).

The initial clinical examination revealed a Class II molar relationship bilaterally. The overjet was 4 mm and overbite was 10mm (>100%) with gingival impingement. The maxillary dental midline was 1 mm to the left of the facial and mandibular midlines. A peg lateral incisor was noted on the upper left side (Fig. 9). The pretreatment panoramic radiograph (Fig. 7) revealed a deep bite occlusion and low mandibular plane angle. The post-treatment panoramic radiograph shows normal overjet and overbite (Fig. 8). Fig. 10 documents the cephalometric history of the treatment rendered.

Diagnosis

Skeletal:

Skeletal Class II (SNA 82°, SNB 76.5°, ANB 5.5°)

Low angle (SN-MP 24°, FMA 19°)



Fig. 1: Pretreatment facial photographs



Fig. 2: Pretreatment intraoral photographs



Fig. 3: Pretreatment study models

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Dental:

Right full cusp Class II molar relationship Left end-on Class II molar relationship OJ 4 mm; OB 10 mm (>100%) with gingival impingement The maxillary dental midline was 1 mm to the right of the facial and maxillary midlines. Peg lateral of #10 LR central incisor attrition

Facial:

Straight profile with acceptable lip position.



■ 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: Maintain
- Vertical: Maintain
- Transverse: Maintain

Maxillary Dentition:

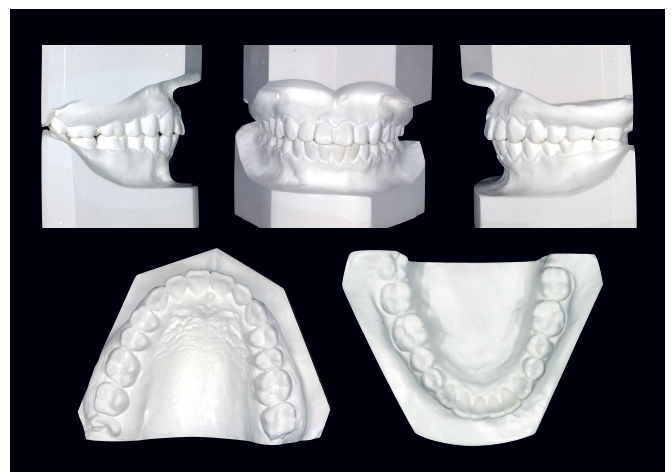
- A - P: Retract to correct Class II buccal segments and excessive overjet. Flare incisors to correct U1-SN angle
- Vertical: Intrude incisors
- Inter-molar Width: Maintain

Mandibular Dentition:

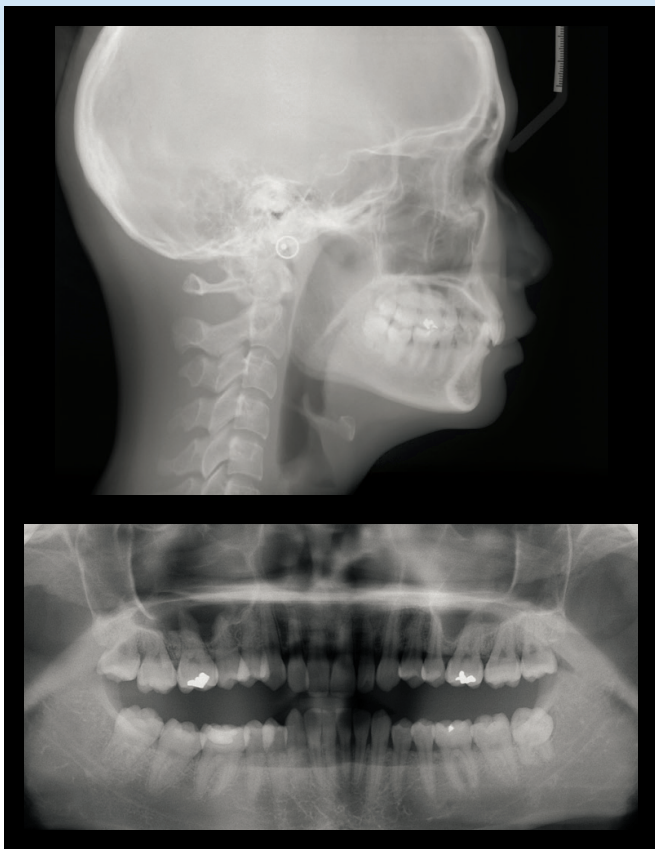
- A - P: Increase the axial inclination of the incisors to correct excessive overjet



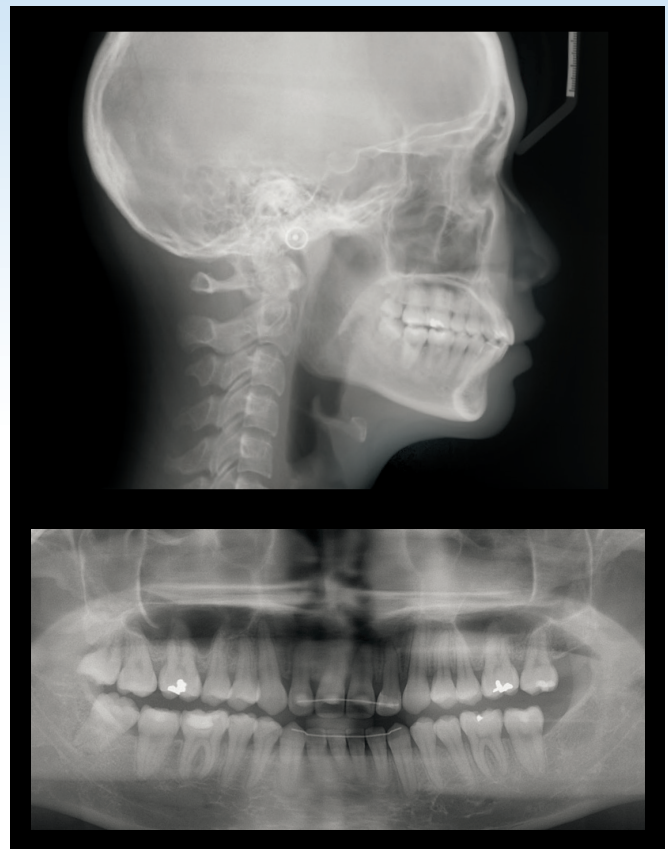
■ Fig. 5: Posttreatment intraoral photographs



■ Fig. 6: Pretreatment study models



■ Fig. 7: Pretreatment pano and ceph radiographs show the low mandibular plane angle and deep bite.



■ Fig. 8: Posttreatment pano and ceph radiographs show a balancing lip profile.



■ Fig. 9: A peg lateral incisor was noted on the upper left side.

CEPHALOMETRIC

SKELETAL ANALYSIS

	PRE-Tx	POST-Tx	DIFF.
SNA°	82°	80°	2°
SNB°	76.5°	76.5°	0°
ANB°	5.5°	3.5°	2°
SN-MP°	24°	27°	3°
FMA°	19°	21°	2°

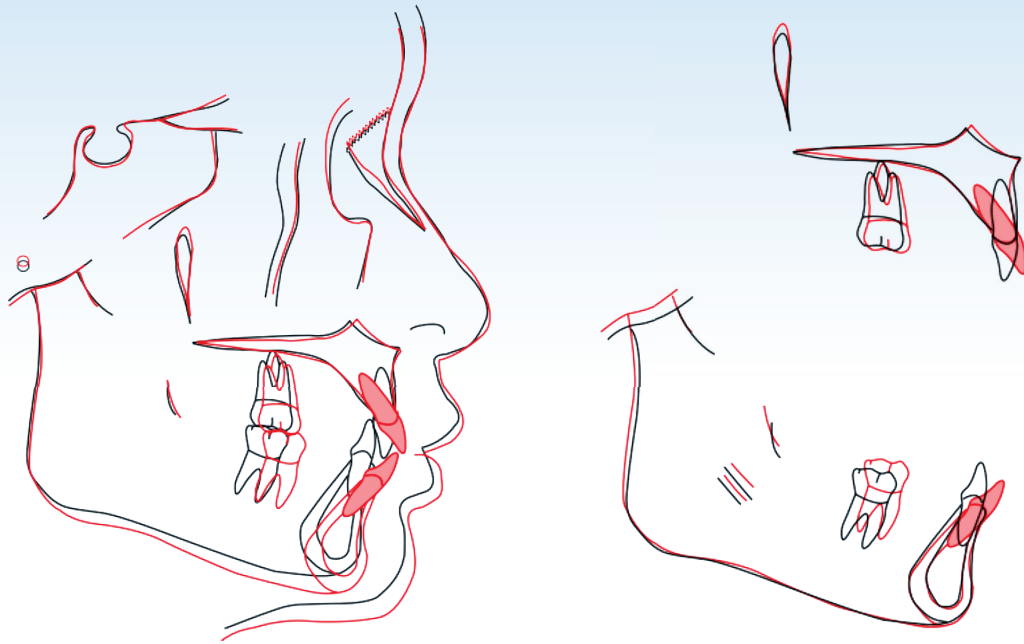
DENTAL ANALYSIS

U1 TO NA mm	-2 mm	3 mm	5 mm
U1 TO SN°	88°	110.5°	22.5°
L1 TO NB mm	0 mm	6 mm	6 mm
L1 TO MP°	88°	115°	27°

FACIAL ANALYSIS

E-LINE (U)	+2 mm	+1 mm	1 mm
E-LINE (L)	+1 mm	0 mm	1 mm

■ Table. Cephalometric summary



■ Fig. 10: Superimposed tracings show the change of incisor inclination & extrusion of mandibular molars.

- Vertical: Intrude incisors, extrude molar to correct short face and over bite
- Inter-molar / Inter-canine Width: Maintain

Facial Esthetics: Maintain

Treatment Plan

Non-extraction treatment, with a full fixed orthodontics appliance, was indicated to correct the crowding, level the curve of Spee, and coordinate the arches. Standard Damon MX3 brackets were used. Anterior bite turbos and CI II elastics were indicated to intrude lower incisors, as well as to resolve the CI II occlusion and the sagittal discrepancy. The size discrepancy between the upper lateral incisors would be corrected by interproximal augmentation of the upper left lateral incisor. Detailing bends with seating elastics were planned to produce the final occlusion. At the debonding visit, upper clear

overlay retainer and upper 2-2 & lower 3-3 fixed retainers were planned.

Appliances and Treatment Progress

.022" Damon MX3 standard torque brackets (*Ormco*) were selected. The archwire sequence for upper arch was .014 CuNiTi, .014x25 CuNiTi, .016x25 pretorqued CuNiTi and .017x25 TMA. The lower archwire sequence was .014 CuNiTi, .014x25 CuNiTi, and .017x25 TMA. Anterior bite turbos were then bonded to the maxillary central incisors to accelerate the CI II correction at the subsequent bonding visit (*Figures 11-13*). After 12 months, open coil springs were applied bilaterally to the UR lateral incisor to create space for a composite build-up one month later (*Fig. 14*). In the 10th month of the treatment, CII occlusion was achieved. Bracket repositions were performed as indicated by sequential panoramic films.



■ Fig. 11:
Anterior bite turbos were then bonded to the maxillary central incisors to accelerate the CI II correction



■ Fig. 12:
Frontal view after anterior bite turbos applied



■ Fig. 13:
2nd month, anterior bite turbos and early light short elastics were applied to retract the anterior segment and level the curve of spee.



■ Fig. 14:
12th month, two sections of open coil spring were applied around UR lateral incisor to create spaces for restoration.

One month prior to the completion of active treatment, the upper archwire was sectioned distal to the first molar bilaterally. After the 2nd molars were seated in occlusion, fixed appliances were removed and retainers were delivered. Total treatment time was 16 months. One week after fixed appliance removal, a gingivectomy of the maxillary incisors was performed with a diode laser to improve the incisal exposure (Fig. 15). Post-treatment panoramic and cephalometric radiographs (Fig. 8), and superimpositions of cephalometric tracings (Fig. 10) document the final result.

Results Achieved

Maxilla (all three planes):

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

Mandible (all three planes):

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

Maxillary Dentition:

- A - P: Upper incisors slightly flared
- Vertical: Maintained
- Inter-molar / Inter-canine Width: Maintained

Mandibular Dentition:

- A - P: Lower incisors axial inclination increased
- Vertical: Extruded molars
- Inter-molar / Inter-canine Width: Left first molar uprighted

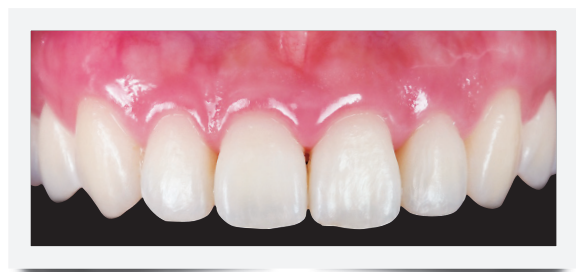
Facial Esthetics: Optimal achieved

Retention

The upper fixed retainer 2-2 and the lower fixed retainer 3-3 were bonded on every tooth. An upper clear overlay retainer was delivered. The patient was instructed to wear it full time for the first 6 months and nights only thereafter. The patient was instructed to home care and maintenance of the retainers.

Final Evaluation of Treatment

The IBOI Cast-Radiograph Evaluation was scored at 21 points. The major discrepancies were alignment and rotation problems (4 points) and unevenly marginal ridges (9 points) (Fig. 16).



■ Fig. 15: Gingivectomy to improve the incisal exposure.



■ Fig. 16: Unevenly marginal ridge on upper left side

Retraction, intrusion, alignment of upper incisors and restorative recontouring of upper left lateral incisor helped resolve the patient's chief complaint. The excessive overjet and overbite was reduced. Wearing elastics as instructed was essential for correction of the Class II occlusion. Mandibular anterior flaring is a challenge for stability, so the patient was informed that permanent retention is necessary and she will be on long-term recall indefinitely.

The mandible moved in a clockwise direction. This was due to extruding of lower molars by using bite turbos and class II elastics. The posterior intercuspation was excellent and the panoramic radiograph (Fig. 8) showed good root position. Posttreatment facial photographs are shown in Fig. 4. Overall, there was significant improvement in both dental esthetics and occlusion.

Discussion

Agensis of the maxillary lateral incisor is linked with anomalies and syndromes such as agensis of other permanent teeth, microdontia of maxillary lateral incisors (*peg laterals*), palatally displaced canines and distal angulations of mandibular second premolars.¹⁻⁴ Since agensis of teeth has been shown to have a genetic link, often parents or siblings of patients experiencing agensis have had similar clinical situations, which may influence treatment decisions. Arte et al.³ also found strong genetic relationships between hypodontia and tooth anomalies such as ectopic maxillary canines.

The type of restoration for the upper lateral incisor could be resin, veneer, or a crown. The decision of which type of restoration to choose is based upon

several factors. These include the amount of ferrule remaining on the tooth, the amount of porcelain necessary to restore esthetics and function, the type of tissue surrounding the crown, the vitality of the tooth to be restored, the age of the patient, and economic consideration. For the present patient, the tooth was restored with a resin build-up.

Severe Class II deep-bite correction had been a challenge. Currently bite turbos are bonded on the upper incisors and light short elastics are used from the initial bracket bonding appointment to close occlusal space as soon as possible.⁵ With this method the problem can be easily solved.

Posteriorly-inclined upper incisors is another issue that should be addressed when using bite turbos. We should take in consideration the center of rotation of upper incisors. In severe retroinclined cases, correction of this problem first is the key point. When using bite turbos, only upper incisors contact with lower arch and are impacted by occlusal force. In this case, it is preferable to bond upper brackets first and wait 2 month to bond lower arch.

Lip profile change is not always obvious after treatment. Although the esthetic line is preserved and improved by the lip curl, the lip profile appears a little protrusive. L1 to MP° (*table*) change is excessive in this case. The overjet before treatment was only 4 mm. But if the upper incisors were in ideal position, there would be almost 9mm overjet discrepancy. Considering this large discrepancy, using miniscrews or stripping upper and lower anteriors, along with low torque brackets in lower arch may be preferable to only Class II elastics for achieving optical outcomes relative to lip profile.⁶

Proclination of the lower anterior teeth was expected in this case due to bony discrepancy and nonextraction treatment plan. According to Mills⁷ the average amount of “stable” proclination of lower incisors is only about 1 to 2 mm, and even that modest protrusion usually requires fixed retention. For the present patient, the proclination of the lower incisors was 4 mm beyond the normal range, so a lower anterior fixed retainer was essential for long-term stability.

The major deduction of scores in the IBOI Cast-Radiograph Evaluation of this patient was for the unevenly marginal ridges of the posterior teeth. The best way to avoid is to take a diagnostic model before appliance removal. In brief, pre-torqued self ligated brackets and anterior bite turbos in conjunction with CI II elastics are effective mechanics for nonextraction correction of class II low angle in an adult. A satisfactory result was achieved with 16 months of active treatment. Long-term stability of the present camouflage approach requires careful adherence to the retention protocol.

Conclusion

To treat class II deep bite case, we can bond bite turbos on upper incisors and use light short elastics in the beginning of brackets bonding appointment to close occlusal space as soon as possible. And the problem can be easily solved. If upper anteriors are retroinclined, the timing of bite turbos and miniscrew should be taken into consideration.

Numerous methods are available to correct class II deep bite patients: class II elastics, miniscrews, head gear, bracket torque selection and bite turbos.

In this case we only used class II elastics and bite turbos. In the future miniscrews in the upper bilateral zygomatic processes would be effective for retracting the entire maxillary arch. The lower incisor angulation can be controlled by bracket angulation and interproximal stripping of enamel.

ACKNOWLEDGEMENT

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References

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4. Peck S, Peck L, Kataja M. Concomitant occurrence of canine malposition and tooth agnesis: evidence of orofacial genetic fields. *Am J Orthod Dentofacial Orthop* 2002;122:657-60.
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7. Mills JR. The stability of the lower labial segment: a cephalometric survey. *Dent Pract Dent Rec* 1968;18:293-306.

IBOI Discrepancy Index Worksheet

TOTAL D.I. SCORE =

OVERJET

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

Total =

OVERBITE

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

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 =

CROWDING (only one arch)

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

OCCLUSION

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

LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total =

BUCCAL POSTERIOR X-BITE

2 pts. per tooth Total =

CEPHALOMETRICS (See Instructions)

- ANB ≥ 6° or ≤ -2° = 0 pts.
- Each degree < -2° x 1 pt. =
- Each degree > 6° x 1 pt. =

SN-MP

- ≥ 38° = 0 pts.
- Each degree > 38° x 2 pts. =
- ≤ 26° = 1 pt.
- Each degree < 26° x 1 pt. =

- 1 to MP ≥ 99° = 0 pt.
- Each degree > 99° x 1 pt. =

Total =

OTHER (See Instructions)

- Supernumerary teeth x 1 pt. =
- Ankylosis of perm. teeth x 2 pts. =
- Anomalous morphology x 2 pts. =
- Impaction (except 3rd molars) x 2 pts. =
- Midline discrepancy (≥3mm) @ 2 pts. =
- Missing teeth (except 3rd molars) x 1 pts. =
- Missing teeth, congenital x 2 pts. =
- 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. =
- Add. treatment complexities x 2 pts. =

Identify:

Total =

IMPLANT SITE

- Lip line : Low (0 pt), Medium (1 pt), High (2 pts) =
- Gingival biotype : Low-scalloped, thick (0 pt), Medium-scalloped, medium-thick (1 pt), High-scalloped, thin (2 pts) =
- Shape of tooth crowns : Rectangular (0 pt), Triangular (2 pts) =
- Bone level at adjacent teeth : ≤ 5 mm to contact point (0 pt), 5.5 to 6.5 mm to contact point (1 pt), ≥ 7mm to contact point (2 pts) =
- Bone anatomy of alveolar crest : H&V sufficient (0 pt), Deficient H, allow simultaneous augment (1 pt), Deficient H, require prior grafting (2 pts), Deficient V or Both H&V (3 pts) =
- Soft tissue anatomy : Intact (0 pt), Defective (2 pts) =
- Infection at implant site : None (0 pt), Chronic (1 pt), Acute (2 pts) =

Total =

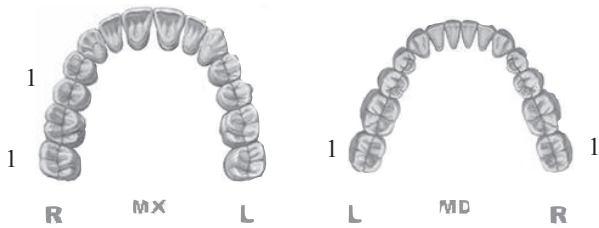
IBOI Cast-Radiograph Evaluation

Case # 1 Patient

Total Score: **21**

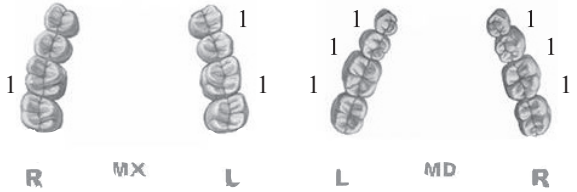
Alignment/Rotations

4

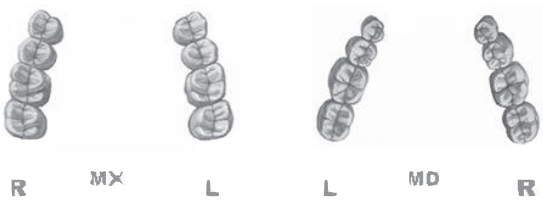


Marginal Ridges

9



1



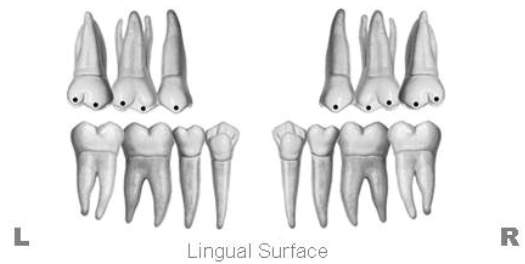
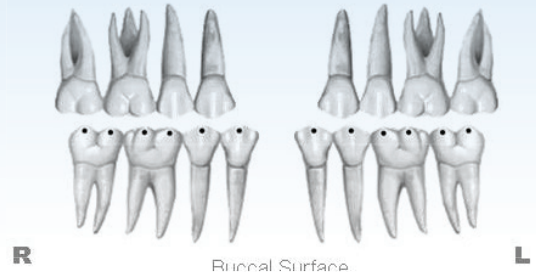
Overjet

1



Occlusal Contacts

0



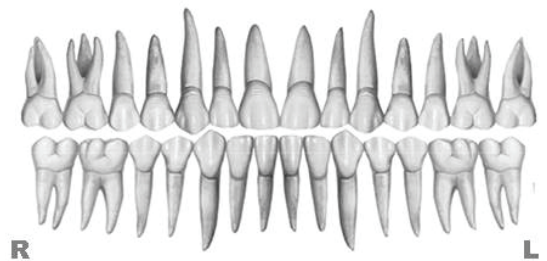
Occlusal Relationships

2

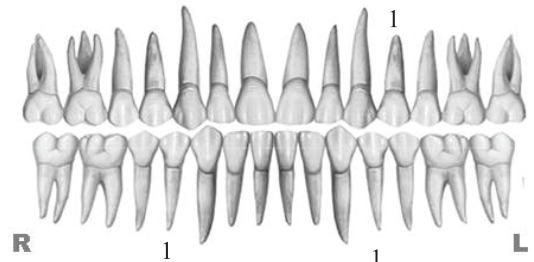


Interproximal Contacts

1



3



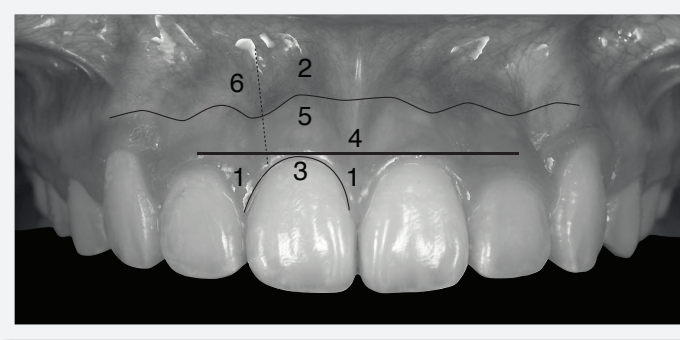
INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.

IBOI Pink & White Esthetic Score

Total Score: = 2

1. Pink Esthetic Score

Total = 2



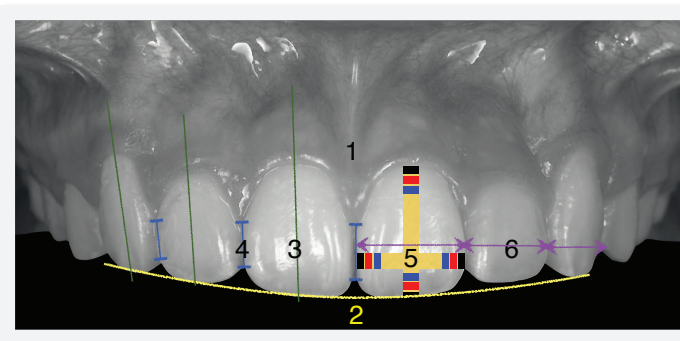
1. M & D Papilla	0	1	2
2. Keratinized Gingiva	0	1	2
3. Curvature of Gingival Margin	0	1	2
4. Level of Gingival Margin	0	1	2
5. Root Convexity (Torque)	0	1	2
6. Scar Formation	0	1	2



1. M & D Papilla	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

2. White Esthetic Score (for Micro-esthetics)

Total = 1



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 (1: 0.8)	0	1	2
6. Tooth to Tooth Proportion	0	1	2



1. Midline	0	1	2
2. Incisor Curve	0	1	2
3. Axial Inclination (5°, 8°, 10°)	0	1	2
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