# Non-Extraction Treatment of a Class II Openbite with Amelogenesis Imperfecta


## Abstract

***Introduction***: *A 15-year-7-month-old female with a history of amelogenesis imperfecta (AI) presented with chief complaints of poor dental esthetics and anterior openbite.*

***History and Etiology***: *AI is a hereditary disorder that is usually manifested as an autosomal dominate trait involving defective ENAM gene(s). For the present patient, deficient enamel resulted in decreased biologic width of the epithelial attachment, in addition to dental attrition that reduced the heights of clinical crowns. Selective crown lengthening and complete provisional restoration were required. Habitual interdental tongue posture, which may reflect a history of airway compromise, resulted in an anterior openbite that induced posterior mandibular rotation to produce a long face.*

***Diagnosis***: *AI-related enamel deficiency has compromised the periodontium and dentition. Facial form was convex (12°) with increased lower facial height (59.5%), and a steep mandibular plane angle (FMA 37.5°). Cephalometrics revealed a protrusive maxilla (SNA 84.5°), retrusive mandible (77.5°), and an intermaxillary discrepancy of ANB 7°. The bilateral Class II malocclusion was complicated with anterior openbite, canted occlusal plane, and mandibular deviation to the left. The Discrepancy Index (DI) was 62.*

***Treatment***: *Crown lengthening surgery and revised provisional restorations established a healthy periodontium in preparation for orthodontic treatment. A fixed passive self-ligating appliance, with high torque brackets in the upper anterior segment, was bonded on both arches. Anchorage to intrude upper molars was provided with bilateral infra-zygomatic crest (IZC) bone screws. After initial orthodontic alignment, interproximal space was increased as needed with elastic separators to prepare gingival margins, and a new set of optimized provisional restorations was fabricated. Orthodontic finishing was accomplished with the same fixed appliance.*

***Results***: *Crown lengthening produced healthy periodontium with proper biological width in preparation for full provisional restoration and orthodontic alignment. As upper molars were intruded, the mandible rotated anteriorly, and the lower facial height decreased as lip and chin protrusion increased. This challenging openbite malocclusion, with a Discrepancy Index (DI) of 62, was treated in 22 months to an excellent outcome: Cast-Radiography Evaluation (CRE) score of 11, and Pink & White dental esthetic score of 1. An upper removable retainer was provided for night-time wear.*

***Conclusions***: *A patient with AI and an anterior openbite malocclusion was treated to a stable occlusion with a passive self-ligating fixed appliance and IZC bone screw anchorage. Interdisciplinary treatment with periodontics and prosthodontics was required before and after orthodontic therapy to appropriately restore dentofacial esthetics and function. (J Digital Orthod 2020;57:4-23)*



***Key words:***
*Class II, openbite, occlusal cant, bimaxillary protrusion, molar intrusion, infrazygomatic crest screw, amelogenesis imperfecta, therapeutic provisional restoration*

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## History and Etiology

A 15-year-7-month-old (*15y7m*) female with a history of amelogenesis imperfecta (*AI*) presented with a Class II malocclusion, crowding, asymmetric anterior openbite, enamel deficiency, periodontal impairment, and compromised provisional crowns (*Figs. 1-4*). Clinical and radiographic evaluation revealed a long face,

*Fig. 1: Pre-treatment facial and intraoral photographs, 15y7m of age*

*Fig. 2: Facial and intraoral photographs after the initial periodontal and restorative treatment, 17y4m of age*

protrusive lips, excessive mentalis strain, and excessive maxillary gingival exposure (*gummy smile*). An occlusal cant and mandibular deviation to the left were also noted (*Table 1; Figs. 2, 4 and 6*). The patient had additional concerns about tooth sensitivity, poor dental esthetics, and unclear pronunciation of the sounds [s] and [z]. Panoramic radiography was consistent with AI: reduced thickness and radio-opacity of enamel, as well as tight proximal contacts in the posterior region, pulpal calcification, and root anomalies.

## Diagnosis

Clinical examination, photography, casts, radiographs and cephalometrics (*Figs. 1-6, Table 1*) documented the following:

**Facial:**

- Length: *Long face (LHF 59.5%), relatively short upper lip, and incompetent lips*
- Protrusion: *Facial convexity (12°), hypermentalis strain for lip closure, flat chin, and relatively protrusive lips (1mm U, 3mm L to the E-Line)*

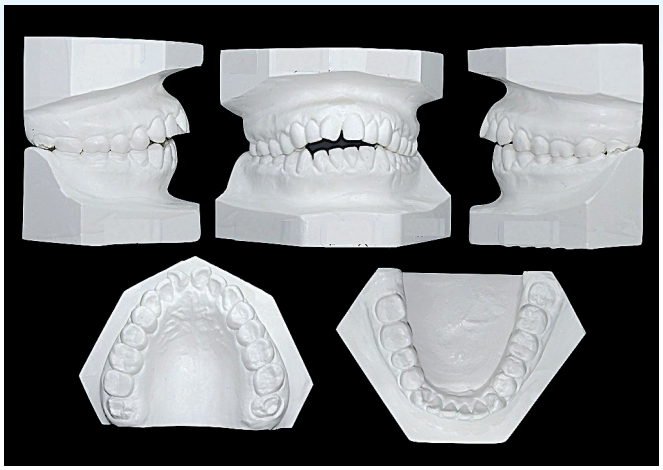

*Fig. 3: Pre-treatment dental models (casts)*

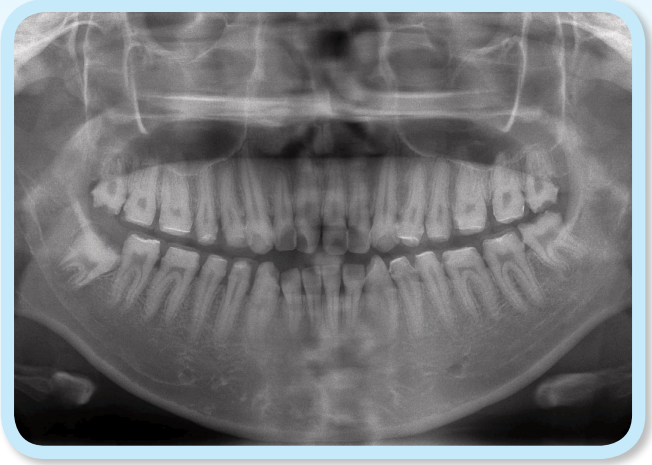

*Fig. 4: Pre-treatment panoramic radiograph*

- Symmetry: *Maxillary dental midline, canted occlusal plane, and mandibular deviation to the left (Fig. 2)*
- Smile: *Excessive gingival exposure with an anterior openbite*

**Skeletal:**

- Intermaxillary Relationship: *Protrusive maxilla (SNA 84.5°), retrusive mandible (SNB 77.5°), and intermaxillary skeletal discrepancy (ANB 7°)*
- Mandibular Plane: *Excessive (SN-MP 45°, FMA 37.5°)*
- Vertical Dimension of Occlusion (*VDO*): *Excessive ANS-Gn segment (59.5% of the Na-ANS-Gn dimension)*
- Symmetry: *Maxilla deviated to the left with a 4° counterclockwise occlusal cant*

| CEPHALOMETRIC SUMMARY | | | |
|---|---|---|---|
| SKELETAL ANALYSIS | | | |
| | PRE-Tx | POST-Tx | DIFF. |
| SNA° (82°) | 84.5° | 84.5° | 0° |
| SNB° (80°) | 77.5° | 78.5° | 1° |
| ANB° (2°) | 7° | 6° | 1° |
| SN-MP° (32°) | 45° | 44° | 1° |
| FMA° (25°) | 37.5° | 36.5° | 1° |
| DENTAL ANALYSIS | | | |
| U1 To NA mm (4 mm) | 6.5 mm | 4.5 mm | 2 mm |
| U1 To SN° (110°) | 108.5° | 102° | 6.5° |
| L1 To NB mm (4 mm) | 10 mm | 11 mm | 1 mm |
| L1 To MP° (90°) | 85.5° | 86° | 0.5° |
| FACIAL ANALYSIS | | | |
| E-LINE UL (-1 mm) | 1 mm | -0.5 mm | 1.5 mm |
| E-LINE LL (0 mm) | 3 mm | 2 mm | 1 mm |
| %FH: Na-ANS-Gn (53%) | 59.5% | 59% | 0.5% |
| Convexity: G-Sn-Pg' (13°) | 12° | 5° | 7° |

*Table 1: Cephalometric summary*

*Fig. 5: Pre-treatment cephalometric radiograph*

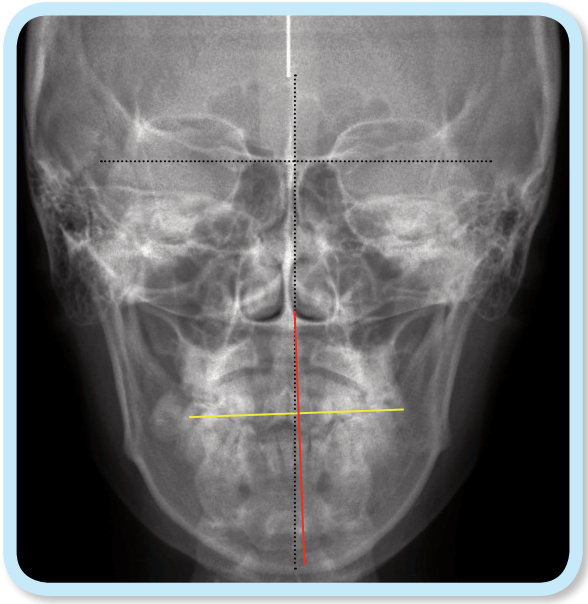

*Fig. 6:*
*An anterior-posterior cephalometric radiograph documents facial asymmetry, occlusal canting and mandibular deviation.*

**Dental:**

- Classification: *Class II buccal segments (6mm bilaterally)*
- Overbite: *-5mm*
- Overjet: *2mm*
- Missing/Unerupted/Impacted: *Impacted LR8 (Fig. 4)*
- Morphology: *Enamel hypoplasia and hypo-mineralization*
- Symmetry: *Upper midline deviated 1mm to the right with a 4° occlusal cant*
- ABO Discrepancy Index (*DI*) of 62, as documented in Worksheet 1

**Facial Esthetics:**

- Convex with incompetent lips
- Protrusive upper and lower lips (*1 and 3mm to the E-Line, respectively*)

## Treatment Alternatives

Females over 15 years of age are usually skeletally mature, so treatment options are similar to other non-growing adults. The anterior openbite could be corrected with fixed appliances and two-jaw orthognathic surgery: (*1*) 3-piece Le Fort I maxillary advancement osteotomy for expansion of the posterior segments, (*2*) down-fracture of the maxillary anterior segment, and (*3*) bilateral sagittal split osteotomy for autorotation of the mandible. Another approach is orthodontic treatment with extraction of four premolars to upright maxillary incisors, close spaces, and retract anterior segments to close the anterior openbite and reduce protrusion.

An alternate form of camouflage treatment is a non-extraction orthodontic treatment combined with bone screws to intrude the posterior teeth, increase the overbite, and improve the openbite.[1,2] The treatment options as illustrated in Fig. 7 are summarized bellow:

- Option 1: Combine initial dental alignment, orthognathic surgical correction, and finishing.
- Option 2: Extract four first premolars, place fixed appliances, and close extraction spaces. Bone screws can be used as supplemental anchorage.[1,2]
- Option 3: Use infra-zygomatic crest (*IZC*) bone screws to intrude the posterior maxillary dentition and retract the anterior segment.[3]

The patient chose the third option because it was deemed the least invasive.

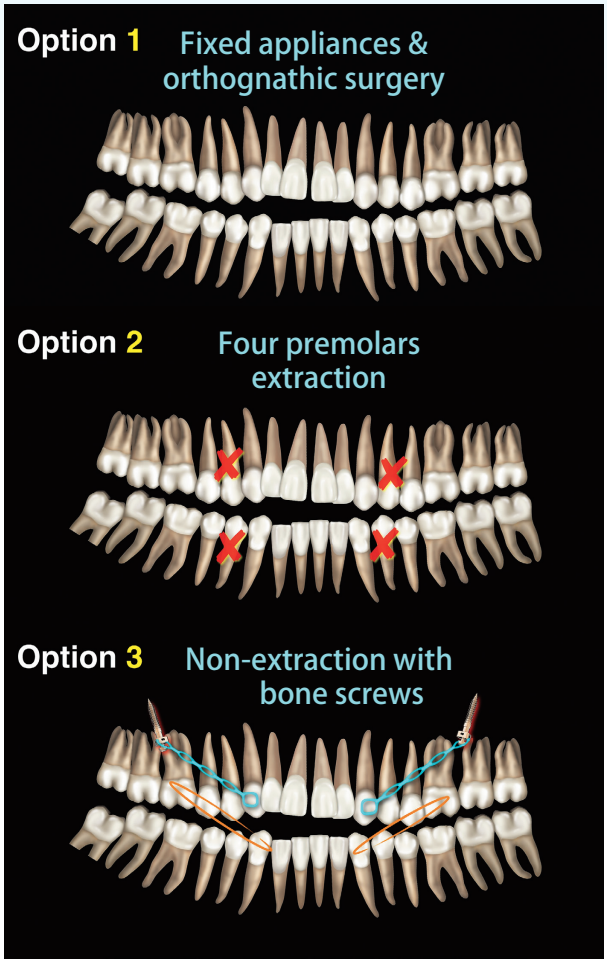


*Fig. 7:*
*Three treatment options are illustrated in panoramic drawings.*

## Specific Objectives of Treatment

1. Expand both arches.
2. Align and level.
3. Correct the anterior openbite.
4. Improve facial and lip protrusion.

## Treatment Progress

Prior to orthodontics, periodontal crown lengthening was performed to correct biologic width as needed. An optimal soft tissue response was achieved in 21 months by combining periodontal and prosthetic treatment, and then orthodontic therapy commenced. A 0.022-in slot Damon Q® fixed appliance system (*Ormco, Glendora, CA*) with passive self-ligating (*PSL*) brackets was bonded on both arches. A standard torque appliance was utilized except for high torque brackets in the maxillary anterior segment. The maxillary arch was bonded first, and a 0.013-in copper-nickel-titanium (*CuNiTi*) archwire was placed (*Figs. 8-9*). The lower molars

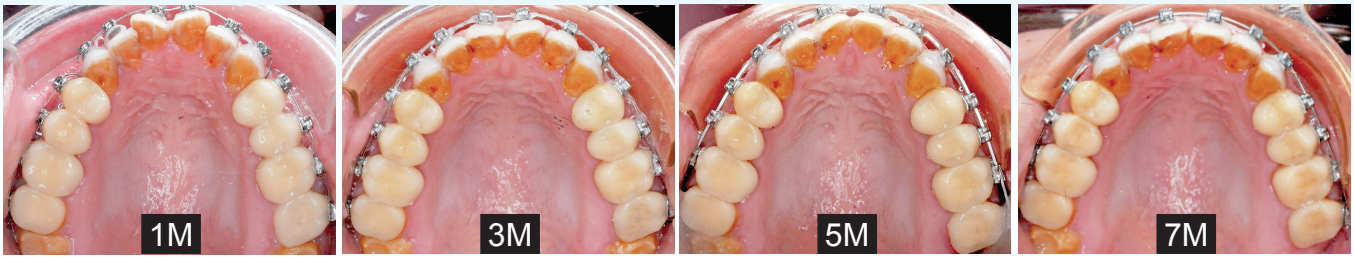


*Fig. 8: A progressive sequence of occlusal photographs show treatment progress from 1-7 months (M).*

were separated on the mesial and distal surfaces (*Fig. 10*) to provide space for banding. Ten days later, a standard torque appliance was bonded on the entire lower arch, and a 0.013-in CuNiTi archwire was placed (*Fig. 11*). One month later (*2M*), the brackets on UR1, UR3, UL1 and LL3 were repositioned, and a 0.016-in CuNiTi archwire was inserted in the lower arch. The following month (*3M*), the UR2 bracket was repositioned, and the patient was referred for third molar extraction. One month later (*4M*), an intra elastic (*Fox 1/4-in, 3.5-oz*) was placed from UR3 to UL3. Provisional restoration on LR3 was defective (*Fig. 12*), so the patient was referred for restorative care. Five months (*5M*) into treatment, a 0.014x0.025-in CuNiTi upper archwire was inserted, and IZC bone screws were placed to initiate retraction of the upper arch (*Fig. 13*).[4]

Two months later (*7M*), the upper archwire was increased to 0.018-in CuNiTi, and a 0.014x0.025-in CuNiTi was placed in the lower arch. To close anterior interproximal spaces, elastic chains were placed from canine to canine in both arches. In addition, anterior horizontal elastics (*Fox 1/4-in, 3.5-oz*) were utilized from canine to canine.

One month later (*8M*), archwires were changed to a 0.014x0.025-in and 0.018-in CuNiTi in the lower and upper arches, respectively. Interproximal reduction (*IPR*) of enamel thickness was performed in the lower anterior segment. Two months later (*10M*), the brackets on UR5, UR2, UR1 and LL2 were repositioned, and both arches were engaged with 0.014x0.025-in CuNiTi archwires. Elastic chains were utilized to consolidate both arches, and Class II elastics were placed. In the 14$^{th}$ month (*14M*) of treatment, anterior horizontal elastics (*Fox 1/4-in, 3.5-oz*) were applied to complete openbite correction.[5] Fifteen months (*15M*) into treatment, the provisional restorations were replaced and rebonded with similar PSL brackets (*Figs. 14 and 15*). Seven months later (*22M*), fixed appliances were removed, and an upper removable retainer was delivered. The archwires and treatment sequence are summarized in Table 2.

## Results Achieved

After 22 months of active treatment, the periodontally and restoratively compromised malocclusion (*DI of 62, Worksheet 1*) was corrected to a near ideal result: cast-radiograph evaluation (*CRE*)

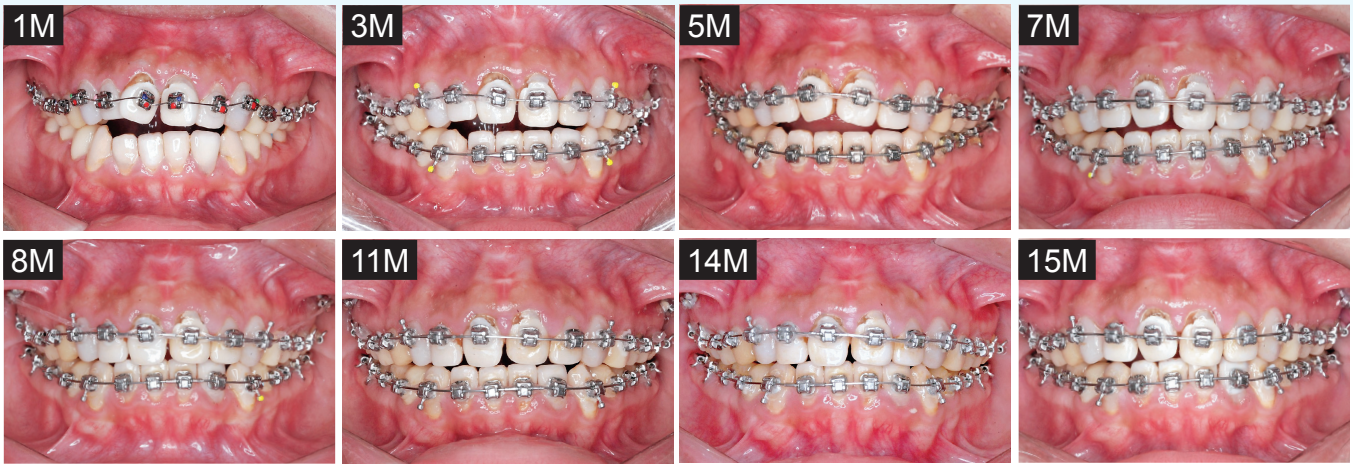


*Fig. 9: A progressive sequence of frontal intraoral photographs document treatment progress from 1-15 months (M).*

of 11 (*Worksheet 2*),[6] and a Pink & White esthetic score of 1 (*Worksheet 3*).[7] Non-extraction alignment and IZC bone screw anchorage reduced facial height (*0.5°*), convexity (*5°*), and the MPA (*1°*) (*Table 1*). Consistent with conservative correction of anterior openbite,[8,9] the axial inclination of maxillary incisors was decreased 6.5° to 102° (*Fig. 16*). Excessively upright upper incisors were masked with restorative veneers at the end of treatment (*Fig. 17*). As shown in Figs. 18-23 and Table 1, outcomes for specific treatment objectives[6] are outlined below:

**Maxilla** (all three planes):

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

**Mandible** (all three planes):

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

**Maxillary Dentition:**

- A-P: *Incisors and molars retracted*
- Vertical: *Molars intruded/Incisors maintained*
- Inter-molar/Inter-canine Width: *Maintained/Expanded*

*Fig. 10: Blue elastic separators are placed mesial and distal to the lower first molars to prepare restorative margins for provisional restorations. Later bonding of lower first molars was successful. No bands were used.*

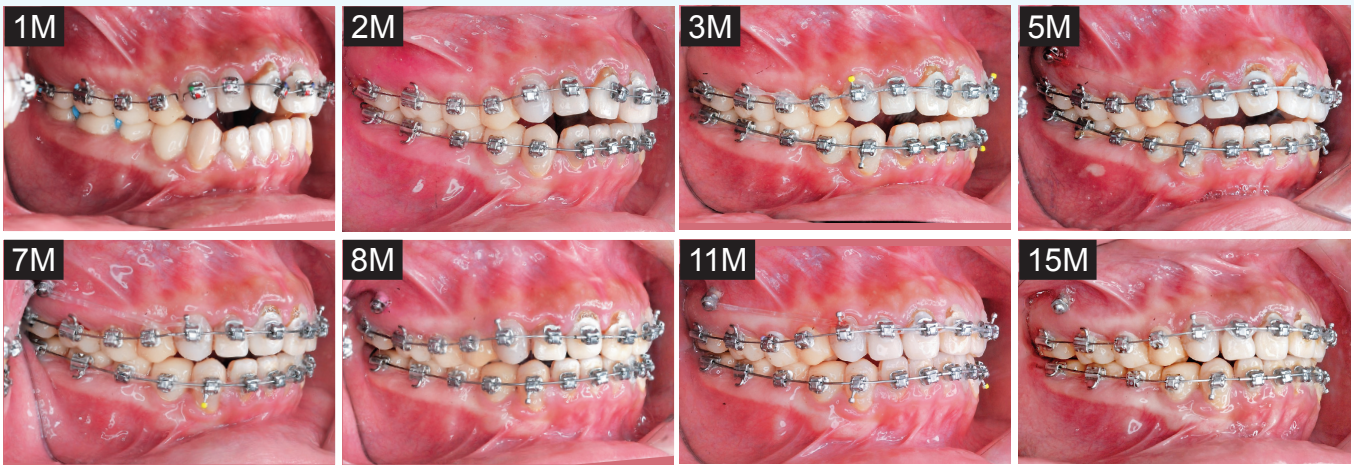


*Fig. 11: A progressive sequence of right buccal photographs document treatment progress from 1-15 months (M).*

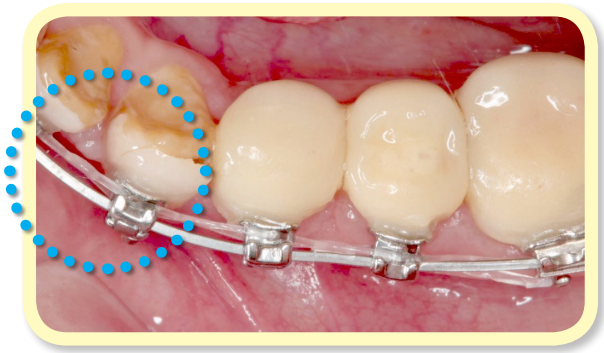

*Fig. 12: The provisional veneer on LR3 was cracked and displaced.*

*Fig. 13: IZC bone screws were placed buccally to the upper molars.*

**Mandibular Dentition:**

- A-P: *Retracted*
- Vertical: *Intruded*
- Inter-Molar/Inter-Canine Width: *Expanded*

**Facial Esthetics:**

- Both upper and lower lips were retracted

## Discussion

Etiology of anterior openbite is an interdental tongue posture that often reflects a past or present airway compromise. Swallowing requires a tongue thrust to seal the oral cavity. The tongue thrust is commonly thought to be the proximal cause of the openbite, but Proffit et al.[10] have clearly shown that the constant force of soft tissue posture is more efficient than the intermittent force of a tongue thrust for producing openbite malocclusion. Anterior openbite is often associated with increased FMA, reduced inter-incisal angle, increased lower facial

height, and incompetent lips.[8,9] This morphologic pattern compromises both dentofacial esthetics and functional occlusion. Affected individuals experience difficulty incising food and articulating the normal sounds of speech. Repetitive mechanical loading of a tongue thrust may contribute to periodontal compromise.[10]

There are many treatment options for correcting anterior openbite: fixed appliances with/without extractions, multi-loop edgewise archwires, functional appliances, high-pull headgear and/or bite blocks. Some malocclusions are exacerbated with growth. Severe openbite may require a combination of orthodontics and orthognathic surgery. The most common surgical procedure is a Le Fort I osteotomy with posterior maxillary impaction and/or bimaxillary osteotomy.[8,9] Orthognathic surgery for openbite correction may be unstable.

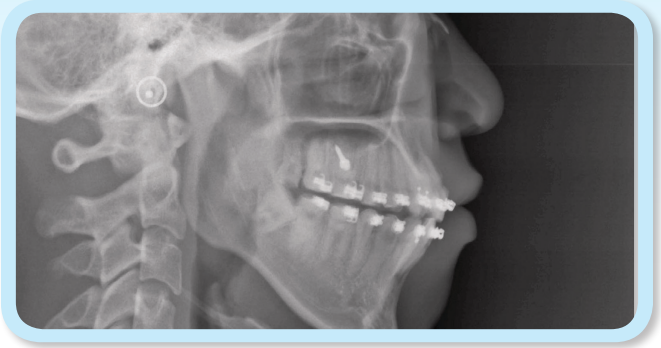

*Fig. 14:*
*Progress cephalometric radiograph at 14 months shows dentofacial changes.*

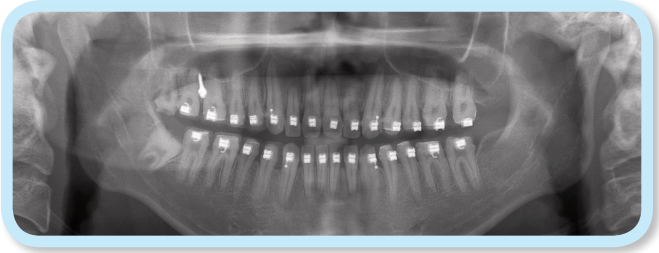

*Fig. 15:*
*Progress panoramic radiograph at 14 months documents initial orthodontic alignment.*

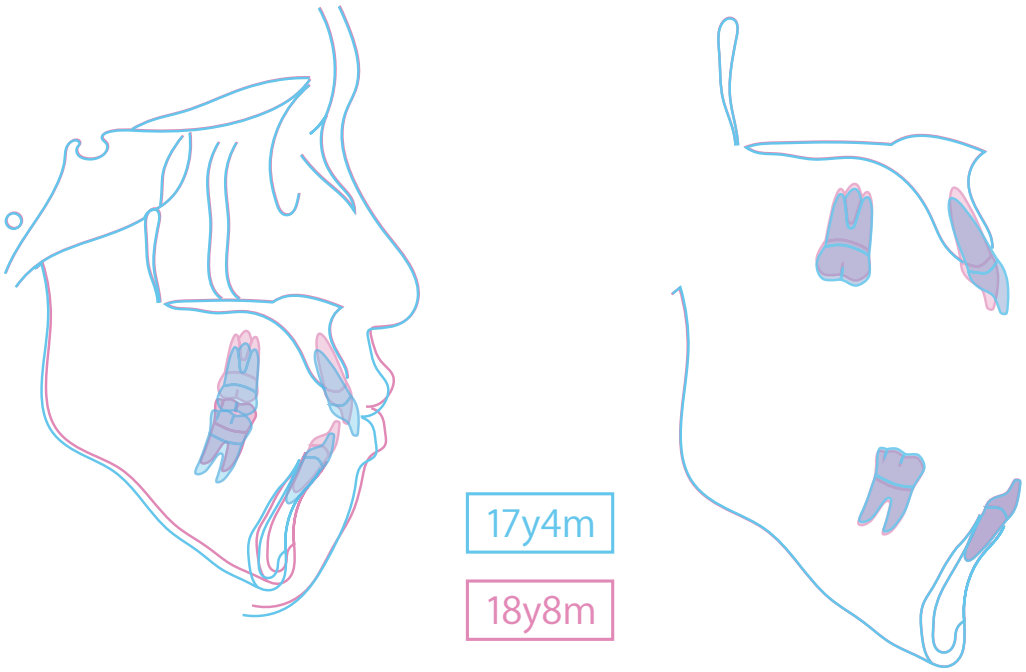


*Fig. 16:*
*Superimposition of cephalometric tracings (17y4m and 18y8m) reveals 16 months of progress. Note that the mandible has rotated anteriorly (counter-clockwise). See text for details.*

*Fig. 17: Post-treatment facial and intraoral photographs*

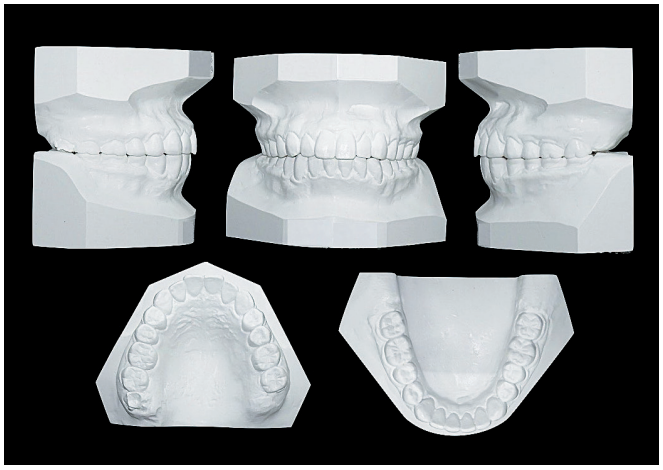

*Fig. 18: Post-treatment dental models (casts)*

Proffit et al.[10] found maxillary impaction was less prone to relapse (*7% overbite decrease*) compared to two-jaw surgeries (*12% overbite decrease*). Teittinen et al.[11] compared maxillary impaction and mandibular rotation to close anterior openbite. The maxilla tends to relapse vertically, but the mandible experienced both vertical and sagittal changes, particularly with two-jaw procedures. Furthermore, Frey et al.[12] described a greater relapse tendency for counter-clockwise rotation of the mandible. Overbite relapse is a statistically significant problem following orthognathic surgery.[13] In the past decade,

skeletal anchorage devices have evolved to intrude molars for achieving improvement in occlusion, facial height and lateral profile.[14-17] Bone screws and miniplates are stationary osseous anchorage for retraction and intrusion of the dentition. The surgical procedure for miniplate placement is more invasive and relatively complicated, compared to self-drilling screws that penetrate the soft tissue. The latter are inserted directly into cortical bone and have a very high rate of success.[17,18] No surgical flap or pilot drilling are necessary. Avoiding the trauma and pain of more extensive surgery is an attractive feature, and an additional advantage is the simple removal of the screw without anesthesia after treatment.

The extra-alveolar location of the bone screw permits selective retraction and intrusion of the dentition.[18,19] When combined with the Damon PSL appliance, a light force can expand (*develop*) a narrow arch without periodontal compromise.[20] Sequential or simultaneous correction in three planes of space with bone screw anchorage is more effective than routine fixed appliance therapy, and is much less traumatic compared to orthognathic surgery.[18-20]

Amelogenesis imperfecta (*AI*) is usually an autosomal dominant trait affecting all teeth.[10] Lack of enamel may result in dental attrition and compromise of the epithelial attachment. Crown lengthening and extensive restorative dentistry are often required prior to orthodontics (*Figs. 24 and 25*).[21,22] Periodontal and radiographic evaluation suggested that a passive eruption mechanism contributes to the compromised gingival and osseous relationships.[23] For the current patient, the periodontium presented

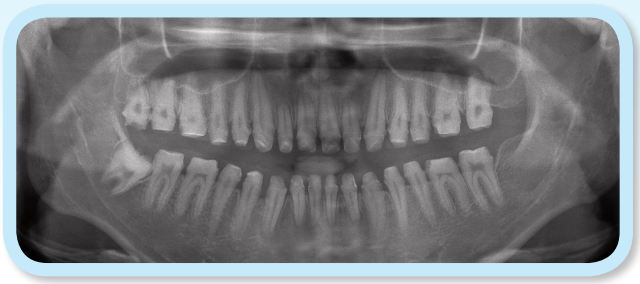

*Fig. 19: Post-treatment panoramic radiograph*

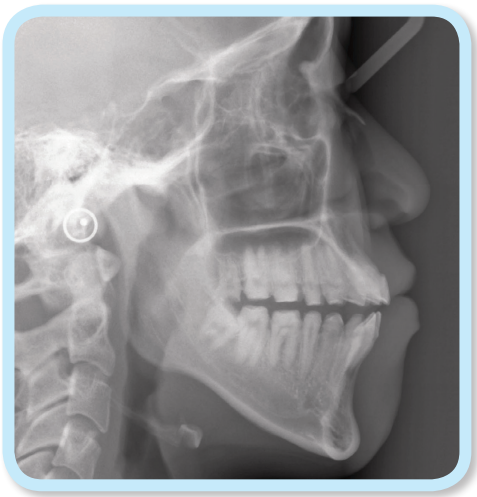

*Fig. 20: Post-treatment cephalometric radiograph*

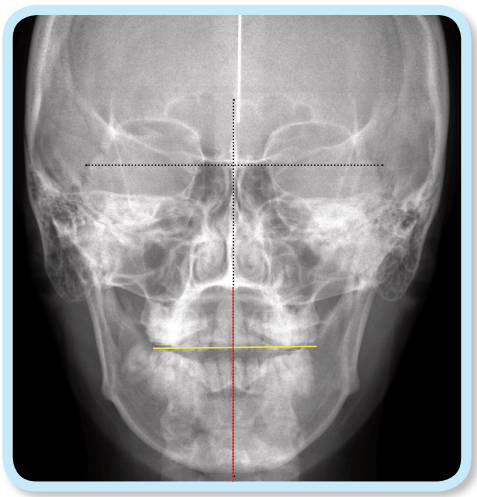

*Fig. 21:*
*A post-treatment anterioposterior cephalometric radiograph with superimposed reference lines shows a near ideal dentofacial symmetry. Compare to Fig. 6, and see text for details.*

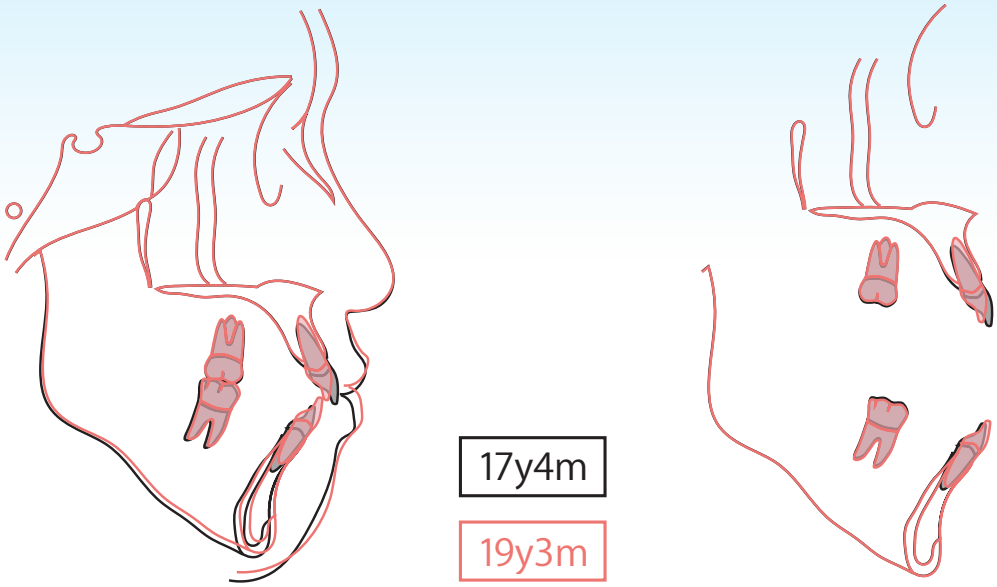


*Fig. 22:*
*Cephalometric tracings superimposed on the anterior cranial base (left), maxilla (upper right), and mandible (lower right) show dentofacial changes during active orthodontic treatment. The black tracing at 17y4m is the start, and the red tracing at 19y3m is the finish. See text for details.*

*Fig. 23:*
*Orthodontic correction was maintained with an upper removable retainer. See text for details.*

with a wider band of keratinized tissue and osseous crest at about the same level as the cementoenamel junction (*CEJ*). The periodontal surgical procedure included thinning of both soft and hard tissue to minimize rebound of the apically repositioned gingiva soft tissue. The improved periodontal contours facilitate oral hygiene and result in a more esthetic outcome prior to orthodontic treatment.[24]

The crown lengthening procedure apically repositioned the gingiva on an osseous base that was reduced to provide for adequate biologic width. Under local anesthesia, the location of the anatomical CEJ and alveolar bone crest were determined using a periodontal probe. Sub-marginal parabolic incisions corresponding to the anatomical CEJ reproduced the natural scalloping of a gingival

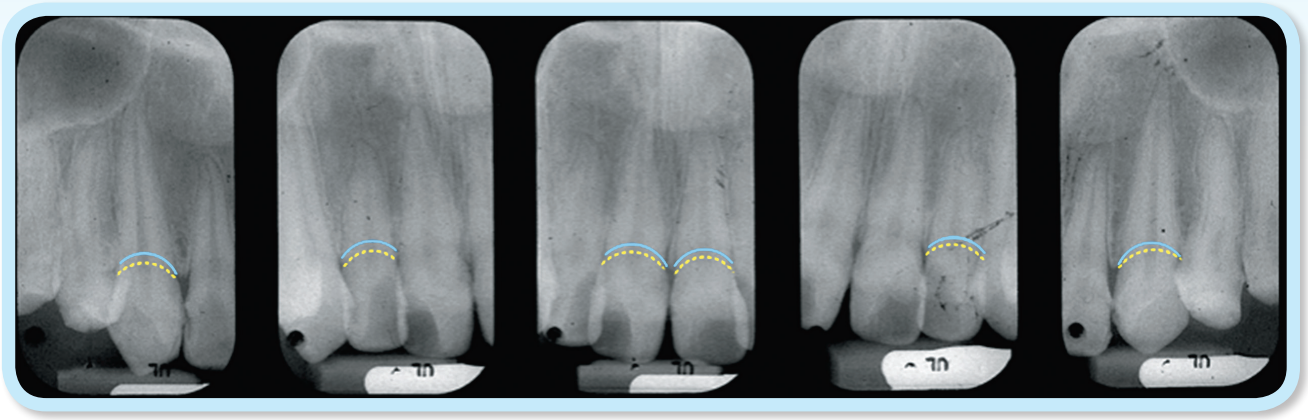

*Fig. 24:*
*Intraoral radiographs prior to treatment were used to assess the morphology of the anatomical cementoenamel junction (aCEJ) and alveolar bone crest (ABC). The blue lines mark the ABC, and the yellow dotted lines mark the aCEJ. Note the distance (ABC-aCEJ) is less than 2mm, which is a biologic width violation that induces inflammation. See text for details.*

margin (*Fig. 26*). After full-thickness gingival flap elevation, an osteotomy was performed to provide at least 3mm clearance between the bone crest and the desired level of gingival margin. Vertical grooving and radicular blending of bone created a physiological morphology with appropriate root prominence (*Fig. 27*). The flap was closed with dissolvable sutures and covered with a periodontal dressing.

Crown lengthening exposed the margins of defective restorations and rough enamel surfaces (*Fig. 28*). It is important to correct the biologic, functional, and esthetic deficits prior to initiating orthodontics (*Fig. 2*).[25] Health of the periodontium was maintained with provisional restorations that had physiologic contours and gingival embrasures.[26] Auto polymerized polymethyl methacrylate [PMMA] was the restorative material of choice because of adequate strength and good color stability. An indirect-direct technique with a provisional shell was used to produce the provisional prostheses.

A previously fabricated custom shell for each tooth was relined intra-orally immediately after tooth preparation was completed. The indirect-direct procedure reduced chair time. It is important to adequately seat the shell during the reline procedure to decease adjustments as well as to control heat generation and chemical irritation. The indirect approach with PMMA as a reline material reduces polymerization shrinkage compared with the direct technique. After the reline and adjustment procedures, the surface of the provisional crowns were polished to facilitate soft tissue healing along the desired cervical contours.[27] This method is well suited for helping resolve anterior openbite restoratively.[28] After fourteen months of orthodontic alignment, a second set of provisional restorations was constructed. Each tooth was restored as ideally

*Fig. 25:*
*Initial photographs of the maxillary anterior segment show the swelling and inflamed gingiva that is characteristic of an inadequate biologic width. See text for details. (Courtesy of Dr. Po-Jan Kuo)*

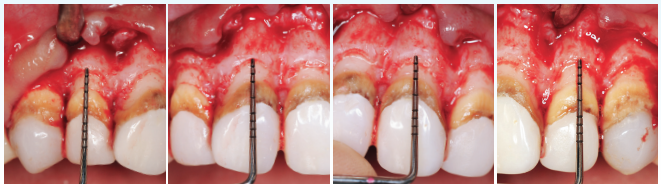

*Fig. 27:*
*Reduction osteotomy of the alveolar crest in the maxillary anterior segment increases the distance from ABC to aCEJ to <3mm for each tooth. See text for details.*

*Fig. 26:*
*A surgical flap is raised with an internal bevel incision between the line angles of each tooth. See text for details.*

*Fig. 28:*
*Left view shows healing 2 weeks post-operatively, and the right view documents pink, healthy gingiva 4 weeks after surgery.*

as possible to facilitate the final interdigitation, overjet, and overbite during orthodontic finishing (*Fig. 16*). The provisional restorations were adjusted as desired by the patient, so they could serve as the pattern for the permanent restorations. This approach fulfilled the patient's needs for a harmonious and healthy dentition.

In interpreting Fig. 22, it is important to understand that the mandible was rotated clockwise due to thick posterior provisional restorations to provide adequate strength. Future permanent crowns will have thinner occlusal surfaces, so the mandible will rotate anteriorly (*counter-clockwise*) to improve the facial profile.

## Conclusions

An AI compromised dentition developed into a complex malocclusion that required interdisciplinary treatment to achieve an optimal esthetic and functional outcome. Provisional restorations supported by healthy periodontium were the prerequisite for orthodontic alignment. A passive self-ligating appliance with IZC bone screw anchorage achieved optimal dentofacial form and function. To facilitate optimal finishing, a new set of provisional restorations was constructed after 14 months of orthodontic alignment. Carefully coordinated periodontal, restorative and orthodontic treatments were required to achieve a near ideal outcome.

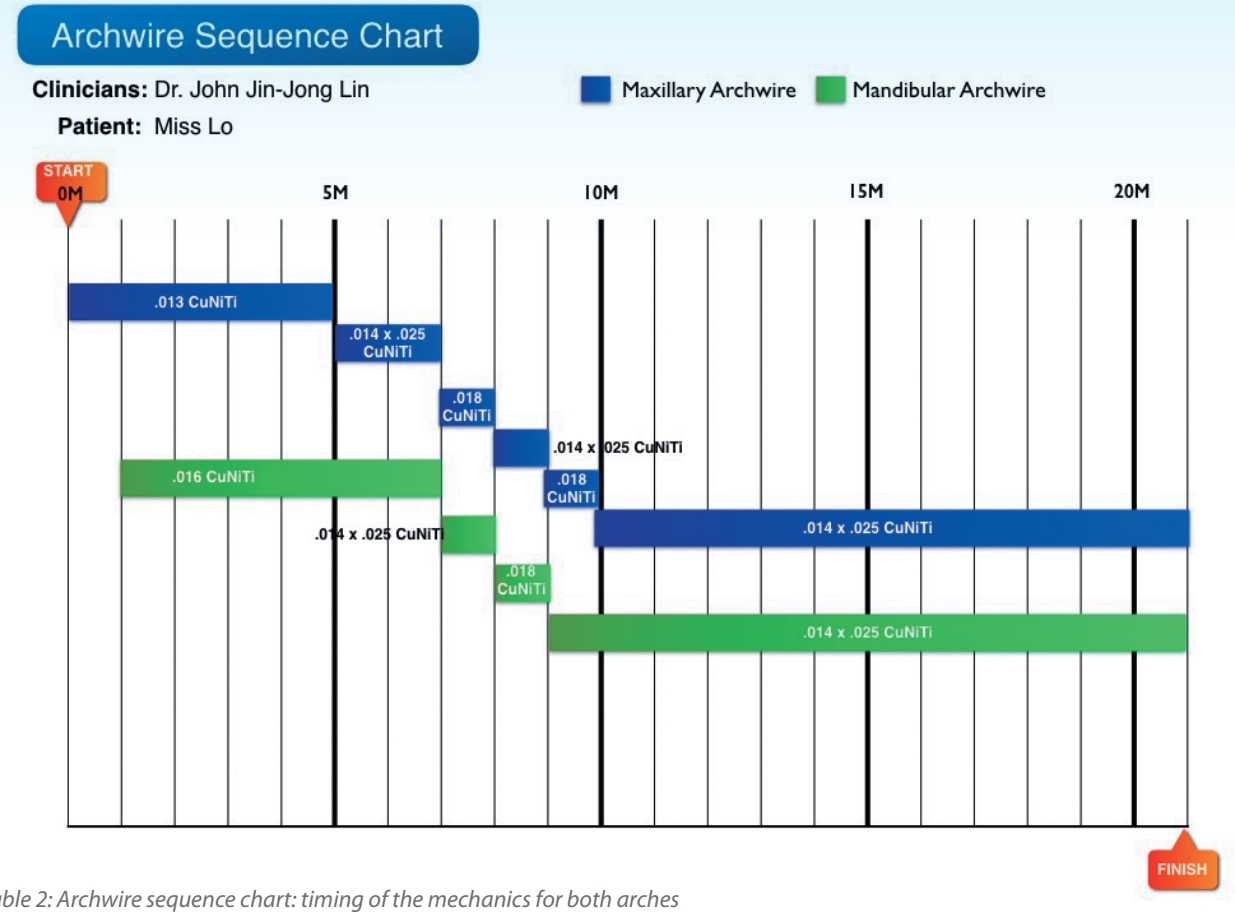


*Table 2: Archwire sequence chart: timing of the mechanics for both arches*

## Acknowledgment

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# Discrepancy Index Worksheet

**TOTAL D.I. SCORE** 62

## 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 = 3

## OVERBITE

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

Total = 0

## ANTERIOR OPEN BITE

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

Total = 21

## LATERAL OPEN BITE

2 pts. per mm. per tooth

Total = 0

## 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 = 4

6 mm (upper)

## 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 | 8 pts. |
| Beyond Class II or III | = | 1 pt. per mm. additional | ____ pts. |

Total = 8

## LINGUAL POSTERIOR X-BITE

1 pt. per tooth Total = 0

## BUCCAL POSTERIOR X-BITE

2 pts. per tooth Total = 0

## CEPHALOMETRICS (See Instructions)

ANB ≥ 6° or ≤ -2° 7° = 4 pts.

Each degree < -2° _____ x 1 pt. = _____

Each degree > 6° 1° x 1 pt. = 1

SN-MP 45°

≥ 38° = 2 pts.

Each degree > 38° 7 x 2 pts. = 14

≤ 26° = 1 pt.

Each degree < 26° _____ x 1 pt. = _____

1 to MP ≥ 99° = 1 pt.

Each degree > 99° _____ x 1 pt. = _____

Total = 21

## 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. = | 3 |
| Addl. treatment complexities | 1 | x 2 pts. = | 2 |

Identify: Amelogenesis imperfecta

Total = 5

## 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 = 0

# Cast-Radiograph Evaluation

**Case #** **Patient**

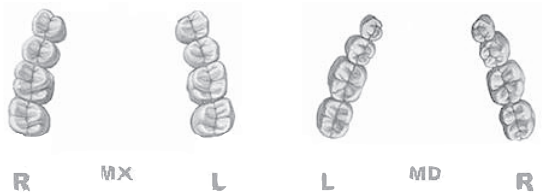
**Total Score:** 11

## Alignment/Rotations

0

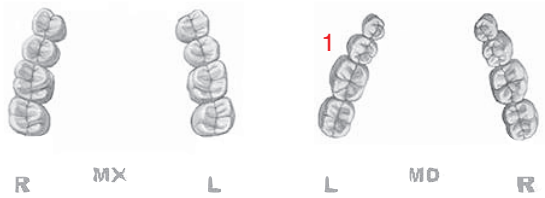

## Marginal Ridges

0




## Buccolingual Inclination

1

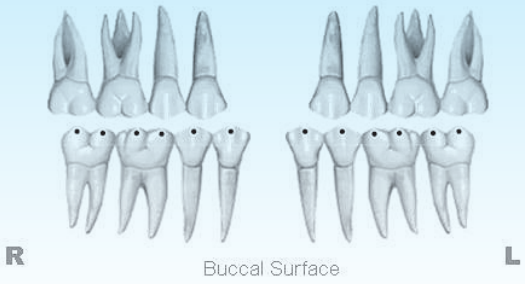


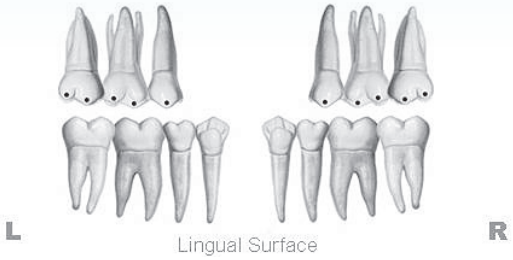

## Overjet

0


## Occlusal Contacts

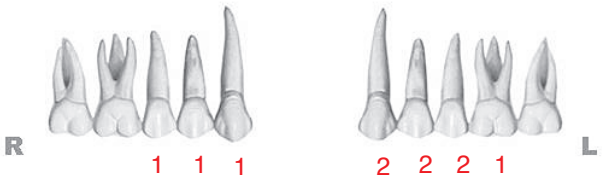
0



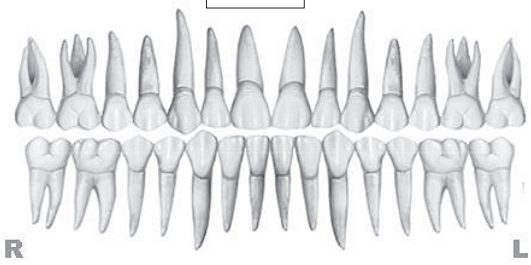

## Occlusal Relationships

10



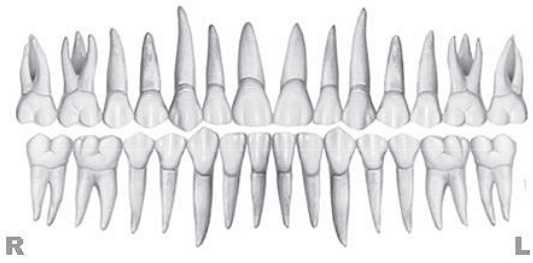

## Interproximal Contacts

0




## Root Angulation

0



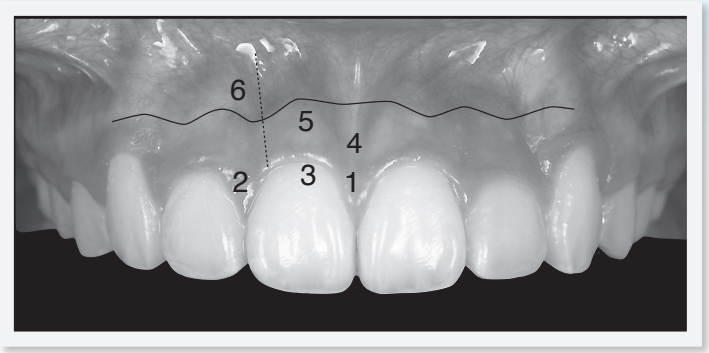

***INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.***

# IBOI Pink & White Esthetic Score

**Total Score: =** 1

## 1. Pink Esthetic Score

*Total =* 1

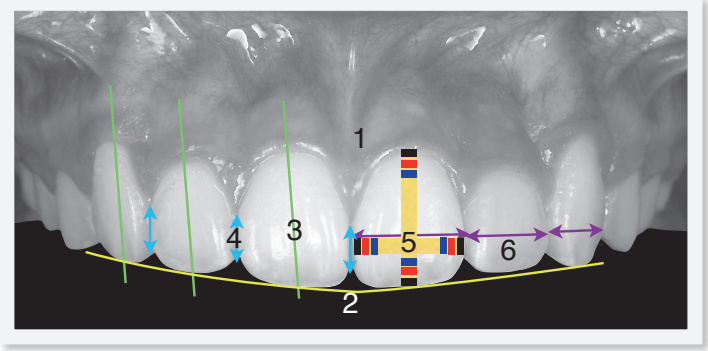



| | | | |
|---|---|---|---|
| 1. M & D Papillae | 0 | 1 | 2 |
| 2. Keratinized Gingiva | 0 | 1 | 2 |
| 3. Curvature of Gingival Margin | 0 | 1 | 2 |
| 4. Level of Gingival Margin | 0 | 1 | 2 |
| 5. Root Convexity ( Torque ) | 0 | 1 | 2 |
| 6. Scar Formation | 0 | 1 | 2 |

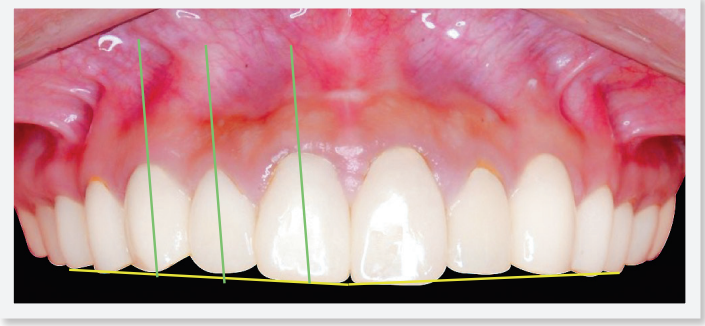
| | | | |
|---|---|---|---|
| 1. M & D Papilla | (0) | 1 | 2 |
| 2. Keratinized Gingiva | (0) | 1 | 2 |
| 3. Curvature of Gingival Margin | 0 | (1) | 2 |
| 4. Level of Gingival Margin | (0) | 1 | 2 |
| 5. Root Convexity ( Torque ) | (0) | 1 | 2 |
| 6. Scar Formation | (0) | 1 | 2 |

## 2. White Esthetic Score ( for Micro-esthetics )

*Total =* 0




| | | | |
|---|---|---|---|
| 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 |
| 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 |