Probable Airway Etiology for a Severe Class III Openbite Malocclusion: Conservative Treatment with Extra-Alveolar Bone Screws and Intermaxillary Elastics

Abstract

A 20yr female presented with a severe Class III malocclusion, anterior openbite, posterior crossbite, facial asymmetry, and mandibular deviation to the left. Chief concerns were poor esthetics, and compromised occlusal function.

Diagnosis: The bilateral full-cusp (8-9-mm) Class III malocclusion was complicated with maxillary retrusion (SNA 78°), prognathic mandible (ANB -2°), steep mandibular plane (FMA 39.5°), anterior crossbite/openbite, peg-sharped upper lateral incisors, ectopic eruption of the upper right (UR) canine, and a 3-mm lower left (LL) mandibular deviation. The Discrepancy Index (DI) was 62.

Etiology: Dentofacial morphology was consistent with compensation for a childhood airway problem, resulting in posterior mandibular rotation, a long face, habitual low tongue position, and an interdental soft tissue posture (tongue and/or lower lip) between the anterior segments. Md deviation to the left in the absence of a history or evidence of an occlusal shift appears to be related to habitual sleep posture on the right side of the face. The peg lateral incisors, and ectopic eruption of the UR canine are genetic traits.

Treatment: Most complex functional malocclusions are best managed with conservative (non-extraction and non-surgical) treatment that tends to reverse the etiology of the problem. A full-fixed passive self-ligating appliance with extra-alveolar (E-A) bone screw anchorage was indicated. Since the patient's lips were marginally competent, the preferred anchorage were three extra-alveolar (E-A) bone screws: right mandibular buccal shelf (MBS), and infrazygomatic crest (IZC), bilaterally. Differential Class III intermaxillary elastics were used to correct the Class III occlusal relationship and midline discrepancy.

Results: Superimposition of cephalometric tracings documented retraction and rotation of the lower arch to correct the Class III discrepancy and the anterior openbite. The mandibular plane remained stable, and dentofacial esthetics were markedly improved, resulting in a Pink & White dental esthetics score of 2. The interdental soft tissue posture and anterior openbite resolved spontaneously as the dental alignment was corrected to an excellent cast-radiograph evaluation (CRE) of 17 points. (Int J Orthod Implantol 2017;45:4-20)

Key words:

Self-ligating appliance, IZC (infrazygomatic crest), buccal shelf, miniscrew, open bite, cross bite, midline off, chin deviated, peg laterals, Tomy's LH (Low Hysteresis) MEAW wire

History and Etiology

A 20-year-4-month-old female presented for orthodontic consultation with multiple concerns: compromised facial esthetics, inability to incise food, and poor masticatory function overall. A clinical exam revealed a Class III malocclusion with anterior openbite, crossbite, delayed exfoliation of the deciduous upper right canine (*URc**), ectopic eruption of the permanent upper right canine (*UR3**), bilateral peg upper lateral incisors,

^{*} International nomenclature is a modified Palmer notation relative to the midline for: 1. quadrants which are upper (U) and lower (L) on the right (R) and left (L) sides, 2. deciduous teeth are a-e, and 3. permanent teeth are 1-8.

Conservative treatment for a Severe Class III Openbite Malocclusion IJOI 45



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Fig. 1: Pre-treatment facial photographs



Fig. 4: Post-treatment facial photographs



Fig. 2: Pre-treatment intraoral photographs







Fig. 3: Pre-treatment study models (casts)



Fig. 6: Post-treatment study models (casts) revealed modest expansion in both arches.



Fig. 7: Pre-treatment panoramic (upper) and cephalometric (lower) radiographs



Fig. 8:

Post-treatment panoramic (upper) and cephalometric (lower) radiographs



Fig. 9:

Superimposed tracings of the pre-treatment (black) and post-treatment (red) cephalometric radiographs show the dental and skeletal changes during treatment. See text for details.



Fig. 10:

A tracing superimposed on a pre-treatment frontal (posterior-anterior view) cephalogram shows ~2-mm mandibular deviation to the left.

upper dental midline deviated about 1-mm to the right, lower dental midline shifted 3-mm to the left, chin deviation to the left, and an excessively prominent mandible in the vertical dimension (Figs. 1-3). The intermaxillary relationship was a full cusp (or more) Class III molar and canine, bilaterally. Medical and dental histories were non-contributory, and there was no evidence of temporomandibular dysfunction (TMD). The morphology of the malocclusion was consistent with a specific scenario for airway compensation: 1. low tongue posture, 2. marginally competent lips, 3. anterior interdental soft tissue posture, and 4. mandibular midline deviation. The soft tissue functional problems resolved spontaneously as the dental alignment was corrected (Figs. 4-6), and no myofunctional therapy was needed. The cephalometric and panoramic radiographs document the pre-treatment condition (Fig. 7) and the post-treatment results (Fig. 8). The superimposed cephalometric tracings document treatment effects (Fig. 9).

Diagnosis

Facial:

- Length: Long tapered face in the frontal plane.
- Protrusion: Facial convexity was a relatively straight 3° (G-Sn-Pg'), which is within normal limits (WNL) despite midface deficiency and a long mandible (Table 1).
- Symmetry: Maxillary midline 1-mm right, chin deviation 2-mm left.
- Smile: Incisal exposure is WNL, but buccal corridors are excessive.

CEPHALOMETRIC				
SKELETAL ANALYSIS				
	PRE-Tx	POST-Tx	DIFF.	
SNA° (82°)	78°	79°	1°	
SNB° (80°)	80°	79.5°	0.5°	
ANB° (2°)	-2°	-0.5°	1.5°	
SN-MP° (32°)	46.5°	47°	0.5°	
FMA° (25 °)	39.5°	40°	0.5°	
DENTAL ANALYSIS				
U1 TO NA mm (4 mm)	6 mm	7 mm	1 mm	
U1 TO SN° (110°)	113°	119°	6°	
L1 TO NB mm (4 mm)	5 mm	4 mm	1 mm	
L1 TO MP° (90°)	74°	72.5°	1.5°	
FACIAL ANALYSIS				
E-LINE UL (2-3 mm)	-4 mm	-3.5 mm	0.5 mm	
E-LINE LL (1-2 mm)	-0.5 mm	-2 mm	1.5 mm	
Convexity:G-Sn-Pg' (13°)	3.0°	3.0°	0°	
%FH:Na-ANS-Gn (53%)	63%	63%	0%	

Table 1: Cephalometric summary

Skeletal:

- Intermaxillary Relationship: Retrusive maxilla (SNA 78°, SNB 80°, ANB -2°)
- Mandibular Plane: Excessive (SN-MP 46.5°, FMA 39.5°)
- Vertical Dimension of Occlusion (VDO): Excessive as evidenced by ANS-Gn 63% of Na-ANS-Gn dimension, compared to a norm of ~53%.
- Symmetry: Mandible is deviated to the left about 2-mm (Fig. 10).

Dental:

- Classification: Full-cusp Class III relationship (8-9mm) bilaterally
- Overbite: -5-mm (openbite)
- Overjet: -5-mm (anterior crossbite)
- Posterior Crossbite: UR4, UL4, UL5 in lingual version
- Anomalies: Upper peg-shaped lateral incisors (localized microdontia), retained UR deciduous canine, and buccal ectopic eruption of the succedaneous canine.
- Symmetry: Mandibular dental midline deviated 3-mm right

The ABO Discrepancy Index (*DI*) was 62 as documented in the subsequent worksheet.

Specific Objectives of Treatment

The treatment objectives were: 1. retract and posteriorly rotate the lower arch to correct the sagittal and vertical discrepancies in occlusion, 2. align arches to correct crossbites, and 3. maintain the VDO, and 4. open space to restore the peg lateral incisors.

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: Maintain
- Vertical: Maintain
- Inter-molar / Inter-canine Width: Expand

Mandibular Dentition:

- A P: Retract incisors and tip-back molars
- Vertical: Extrude incisors
- Inter-molar / Inter-canine Width: Constrict

Facial Esthetics:

Retract lower lip

Treatment Plan

Use bilateral infrazygomatic crest (*IZC*) bone screws (*miniscrews*) to retract both arches and control extrusion of the upper posterior segment, due to the use of Class III elastics. Correct the maxillary midline with differential retraction force with *IZC* anchorage. Install a LR mandibular buccal shelf (*MBS*) bone screw to correct the lower midline deviation. Detail the occlusion with bracket repositioning, archwire adjustment and intermaxillary elastics, as needed. Retain the lower anterior segment with a spring retainer, and use a clear overlay retainer in upper arch.



Fig. 11:

At one month (1M) into treatment, two 2x8-mm stainless steel (SS) IZC bone screws were installed buccal to the maxillary molars, and power chains were extended to the UR3 and UL4. Early light short elastics (ELSE) (Quail 2-oz) were applied bilaterally from the lower first premolars to the upper first molars. See text for details.

Appliances and Treatment Progress

An 0.022-in slot Damon Q[®] passive self ligating (PSL) brackets (Ormco, Glendale, CA) with standard torque were bonded on all teeth except the mandibular incisors. The latter were bonded with low torgue brackets positioned upside down. All archwires and elastics were produced by the same manufacturer (Ormco), except as specified to the contrary. The initial archwires were 0.013in CuNiTi. One month later, two 2x8-mm stainless steel (SS) IZC bone screws were installed, and bilateral elastic chains were attached from the miniscrews to the UR3 and UL4. Early light short elastics (ELSE) (Quail 3/16, 2-oz) were applied from the lower first premolars to the upper first molars bilaterally (Fig. 11). To correct the mandible deviation, a MBS miniscrew was inserted mesial side to the LR7 to anchor a power chain, applied to the LR first premolar (Fig. 12).

In the 2nd month of treatment, the lower arch wire was changed to an 0.016x0.022-in LH (*Low Hysteresis*) MEAW wire (*Tomy, Tokyo, Japan*). This LH MEAW with accentuated buccal curvature and a

reverse curve of Spee facilitates retraction of lower posterior segments and opens space mesial to the first premolars to retract the anterior segment (*Fig.* 13). A Soarer-X[®] heat treatment device, for direct electric resistance heat treatment,¹ was used to make permanent bends in the super-elastic wire to upright mesially-inclined posterior teeth to achieve Class I relationship.² To prevent incisal flaring, the uprighting moment was "activated" with Class III intermaxillary elastics from IZC or MBS bone screws.



Fig. 12:

At one month (1M) into treatment, immediately following the IZC bone screw placements, a MBS bone screw was installed buccal to the lower molars, and a power chain was extended to the LR3. See text for details.

Five months into the treatment, short Class III elastics (*Fox 1/4, 3.5-oz*) were attached from the lingual surface of the upper first molars to the labial surface of the LR4 and LL3, while also expanding the upper inter-molar width (*Fig. 14*). Two months later, an 0.016x0.025-in SS archwire was used in the upper arch to expand the maxillary posterior segments to correct lingual cross-bite.

In the 6th month, a panoramic radiograph showed that the MBS bone screw was tilted mesially (*Fig. 15*). Since the screw was also loose, it was removed.

In the 9th month of the treatment, an 0.018x0.025in LH archwire was used in the mandibular arch, and the upper archwire was replaced with an 0.016x0.025-in SS wire. An open coil spring was



Fig. 13: Five months (5M) into treatment, a LH (Low Hysteresis) MEAW wire (center) was installed. See text for details.



Fig. 14:

Short Class III elastics (Fox 1/4, 3.5-oz) were attached from the lingual surface of the upper first molars to the labial surface of the LR4 and LL3.





Fig. 15:

A panoramic radiograph (1M) shows the position of the three E-A bone screws at the time of placement. Five months later, six months (6M) into treatment, the lower right MBS bone screw has tipped to the mesial.

placed between UR1 and UR3 to open space to restore the peg lateral. At the same appointment, short Class III elastics (*Kangaroo 3/16, 4.5-oz*) were attached bilaterally from the LR4 and LL3 to the upper first molars (*Fig. 16*). In the 13th month, the midlines were coincident and bilateral upper peg-shaped lateral incisors were restored with composite resin (*Fig. 17*). The anterior crossbite

was corrected in 15 months (*Fig. 18*). Bracket repositioning was performed repeatedly throughout treatment as indicated by sequential panoramic radiographs (*Fig. 19*). Archwires were adjusted to detail the occlusion. Bilateral torquing springs were placed on the upper lateral incisors to move the crowns palatally, as the maxillary arch was finished (*Fig. 20*).



Fig. 16:

At nine months (9M), an open coil spring was placed between the UR1 and UR2 to open space to restore the peg-shaped incisor. Short Class III elastics (Kangaroo ¾6, 4.5-oz) were attached bilaterally from the upper first molars to LR4 and LL3.



Fig. 17:

The upper peg-shaped lateral incisors are shown at the start of treatment (1M). Five months later (6M) initial alignment is complete. In the 13th month (13M), the midlines were coincident and the peg-shaped lateral incisors were restored.



Fig. 18: The anterior openbite correction is shown from the start of treatment (0M) up through 15 months (15M).



Fig. 19:

Bracket repositioning was performed as indicated by panoramic radiographs obtained at ten (10M) and seventeen (17M) months.



Fig. 20:

At twenty-one (21M) months, orthodontic finishing was accomplished with archwire adjustments and torquing auxiliaries to move the UR2 and UL2 roots labially.

After 23 months of active treatment, all fixed appliances were removed.

Maxillary Dentition

Results Achieved

Maxilla (all three planes):

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

Mandible (all three planes):

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

- A P: Molars retracted
- Vertical: Incisors and molars intruded
- Inter-molar / Inter-canine Width: *Expanded to correct crossbites*

Mandibular Dentition

- A P: Incisors and molars retracted
- Vertical: Incisors extruded
- Inter-molar / Inter-canine Width: Maintained

Facial Esthetics: Lower lip was retracted

Retention

A mandibular spring retainer was used on the lower

anterior segment. The upper arch was retained with a clear overlay appliance. The patient was instructed to wear it full time for the first 6 months and nights only thereafter. Instructions were provided for home hygiene as well as for maintenance of the retainers.

Final Evaluation of the Treatment

Overall, there was a substantial improvement in facial esthetics, dental alignment and functional occlusion. The ABO Cast-Radiograph Evaluation³ score was 17 points. There were minor discrepancies in two categories: marginal ridges (*6 points*) and occlusal relationships (*5 points*). The mandibular second molars were tipped distally because there was inadequate root-distal moment in the archwire, which resulted in marginal ridges discrepancies in the posterior segments (*Fig. 21*). The Pink & White dental esthetic score was 2 points (*Worksheet 3*),⁴ as documented later in this report.

Alignment and restorative recontouring of the upper anterior lateral incisors, along with retraction of the lower dentition and correction of the dental midline deviation helped to resolve the patient's chief complaints. However, long-term retention is necessary to prevent relapse.

Discussion

Prevalence of Class III malocclusion ranges from 0.8 to 4.0% in Caucasians, but its much more prevalent, about 12-13% in Chinese and Japanese populations.⁵ The etiology of Class III malocclusion may be genetic and/or environmental.⁶⁻⁹ Incisal interference may be compensated by protruding the mandible to achieve a more functional occlusion.⁶ Compensations for breathing problems (*sleep apnea*) are well documented.⁷⁻¹⁵ Airway compromise may be compensated by forward posturing the mandible to achieve increased airway volume.^{7,10,11} A low tongue posture, with soft tissue positioned between the teeth, is associated with openbite.^{8,9}

Etiology for the present malocclusion is probably genetic and environmental. Midface deficiency (*SNA 78°, ANB -2°*) is a genetic trait that is often associated with airway problems.⁸⁻¹⁰ Typical airway



Fig. 21:

At twenty-three months (23M), the mandibular second molars are tipped distally, as documented in a panoramic radiograph to the right. See text for details.

compensations (environmental effects) are forward positioning of mandible, low tongue posture, and posterior rotation of the mandible to increase the VDO.⁸⁻¹¹ The latter results in a steep mandibular plane (39.5°), constricted maxillary arch, and may be associated with anterior openbite if there is a soft tissue (lower lip and tongue) posture between the incisors. Sleeping in a lateral head position, i. e. one side of the face resting on the pillow, is a natural compensation that opens the airway.^{12,13} However, it is well known that habitual sleeping on one side distorts craniofacial morphology.¹⁵ Thus, the etiology of the present malocclusion appears to be airway compensation, resulting in a long face with mandibular deviation, superimposed on genetic predisposition for midface deficiency.

Asymmetric, skeletal Class III malocclusion with an openbite is one of the most challenging malocclusions to treat and retain. The Lin 3-Ring Diagnosis System¹⁶ is an effective method for differential diagnosis to determine which Class



Fig. 22:

The apparent center of rotation (red asterisk) for the right posterior segment of the maxilla is estimated at around the apexes of the maxillary 1st and 2nd premolar roots. The line of force from the bone screw to the attachment on the archwire mesial to the canine (dotted black arrow) tends to rotate the entire maxillary arch (red curved arrows). Illustration is by courtesy of Dr. Rungsi Thavarungkul. III malocclusions are favorable candidates for conservative treatment. Interradicular (*I-R*) miniscrews¹⁷⁻¹⁸ have limitations for management of complex malocclusions. On the other hand, E-A bone screws do not interfere with the path of tooth movement,¹⁶ so they have greatly expanded the scope for conservative management of severe Class III openbite malocclusions.¹⁹⁻²¹

The infrazygomatic crest (*IZC*) is an ideal maxillary site for the placement of orthodontic miniscrews to retract both arches. Assuming the center of rotation for the whole maxillary arch is near the apexes of the maxillary 1st and 2nd premolar roots, a distal force from an IZC bone screw produces a clockwise rotation of the maxillary occlusal plane (*Fig. 22*), which is helpful for correcting an openbite.

The entire mandibular arch can be retracted with the MBS miniscrews. I-R miniscrews are inappropriate for full arch retraction, because they interfere with



Fig. 23:

Posterior rotation (red arrows) of the lower arch is produced by a force from the MBS bone screw to the attachment on the archwire mesial to the cuspid (black dotted arrow). The presumed center of rotation (red asterisk) is near the apices of the roots of the premolars. Illustration is by courtesy of Dr. Rungsi Thavarungkul. However, the actual axis of rotation for the lower arch for these mechanics is through the midroot area of the canines, as shown by FEA of CBCT images. See Roberts et al. 2015 (reference 13) for details.

root movement.^{16,18} The limitation of the MBS bone screw for retraction of buccal segments is an anatomic restraint. In the lower arch, there must be adequate space between the terminal molar and the external oblique ridge of the ascending ramus. The axis of rotation, for retracting the the lower arch as a segment with MBS bone screws, is through the mid-root area of the cuspids bilaterally.¹⁹ This result was calculated with finite element assessment (FEA) of cone-beam computed tomography (CBCT) images, and is consistent with the cephalometric results of treatment. This approach appears to be more accurate than 2D estimations or photoelastic stress analysis (Fig. 23).²² The biomechanics of MBS bone screw retraction tend to posteriorly rotate the mandibular arch and close the VDO.¹⁹ A line of force to the lower canines from IZC bone screw anchorage retracts the mandibular arch as a segment but failed to close the VDO because there is little or no intrusion of the mandibular molars.¹⁹ These data are consistent with the present clinical results (Figs. 8 and 9). Retracting the mandibular arch with a flexible archwire results in distal tipping of the terminal molar (Fig. 8). This problem is best prevented or corrected by repositioning the terminal molar bracket or adjusting the archwire to deliver a root distal moment.

MBS bone screws are 99% successful compared to about 85% for IZC bone screws.¹⁵ Table 2 is a comparison of MBS and IZC bone screws relative to ease of use, compliance requirements and clinical effects. A more detailed discussion comparing the biomechanics of MBS and IZC bone screws for mandibular arch retraction is published.¹⁹

Asymmetries are classified according to the structures involved as: a. dental, b. skeletal, c. muscular and d.

companson between ize a bs serews					
	IZC Screw	Buccal Shelf Screw			
Self Drilling	Easy	More difficult Very difficult for extra- radicular			
Results of Class III Elastics	More lower anterior extrusion	Less lower anterior extrusion			
Compaince	Need	No need			
Opposite Arch Distalization	CIII elastics on the lower distalization	CII to distalize upper seems not as efficient			
Same Arch Distalization	Easy	Easy			
Lower Molar Intrusion	Impossible	Easier			

Comparison Between IZC & BS Screws

Table 2: Comparison of IZC and buccal shelf (BS) bone screws for retraction of the maxillary and mandibular arches.

functional asymmetries. Diagnosing facial and dental asymmetries requires a thorough clinical examination and radiographic survey to determine the extent of the soft tissue, skeletal, dental and functional components.²³ MBS and IZC bone screws are effective anchorage for managing dental midline discrepancies because they can be placed in the E-A posterior areas of both arches. The MBS bone screw failed after 5 months (*Fig. 15*) but still provided adequate anchorage for lower midline correction.

Peg-shaped maxillary lateral incisors are a genetic problem related to hypodontia.²⁴ The prevalence of small lateral incisors (*localized hypodontia*) is 5.6% compared to 1.3% for peg-shaped laterals, the problems are slightly more common in females.²⁵ Peg-Laterals are usually managed with tooth movement to correctly position adjacent teeth followed by restoration of normal incisor form, with composite resins, porcelain veneers, or crowns.

Bracket positioning and repositioning as needed are key to precise finishing. The ideal bracket position criteria involve: 1. smile arc, 2. mutually protected occlusion, 3. marginal ridges and contacts, 4. symmetry, 5. transition from anterior incisal edges to buccal cusps in the posterior segments, and 6. torque control. Studying and perfecting bracket positions results in the most efficient path to an optimal alignment.^{26,27} Despite the complexity of the malocclusion (*DI=62*), this method produced a pleasing result with only 23 months of active treatment.

Stability of the correction is expected because: 1. the pharyngeal airway of adults tends to increase as the lymphoid tissue of the tonsils and adenoids atrophies,^{28,29} and 2. the patient is not overweight. Sleep apnea in adults is strongly associated with obesity.³⁰ Correction of a malocclusion related to airway compensation tends to be more stable in patients who are not overweight.

was an essential component for the efficient correction of this severe malocclusion.

- Upper peg-shaped lateral incisors are a substantial dental esthetic problem requiring precise orthodontic positioning of the anterior segments, followed by restoration of normal form and function of the affected teeth.
- This difficult malocclusion (*DI=62*) was treated to an excellent alignment (*CRE=17*) in 23 months. The patient and clinician were pleased with the near ideal esthetics and function.

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Conclusion

- Efficient management of severe skeletal malocclusion is best managed by establishing the etiology to plan precise mechanics to reverse the developmental pattern of the problem(s).
- E-A bone screw anchorage outperforms all other forms of mechanics, with or without orthognathic surgery, for correction for severe Class III skeletal malocclusion, complicated with anterior openbite and multiple crossbites.
- Compliance with the intermaxillary elastics



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Discrepancy Index Worksheet 62 **TOTAL D.I. SCORE OVERJET** 0 mm. (edge-to-edge) _ 1 - 3 mm.0 pts. = 3.1 – 5 mm. 5.1 – 7 mm. 7.1 – 9 mm. 2 pts. = 3 pts. = = 4 pts. > 9 mm. _ 5 pts. Negative OJ (x-bite) 1 pt. per mm. per tooth =Total = 16 **OVERBITE** 0 - 3 mm. = 0 pts. 3.1 – 5 mm. 2 pts. = 3 pts. 5.1 – 7 mm. = 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

LATERAL OPEN BITE

2 pts. per mm. per tooth

Total



1

0 pts.

9

2 x 4 pts. per side

2 pts. per side _

1 pt. per mm.

additional

pts. 8

pts.

<u>_pts.</u> Right

1

17

CROWDING (only one arch)

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

OCCLUSION

=

=

=

=

=

Class I to end on End on Class II or III Full Class II or III Beyond Class II or III

Total

LINGUAL POSTERIOR X-BITE				
1 pt. per tooth	Total	=		3
BUCCAL POSTERI	OR X-E	BITE		
2 pts. per tooth	Total	=		0
CEPHALOMETRIC	2 <u>S</u> (Se	ee Instruct	ions)
ANB $\geq 6^{\circ}$ or $\leq -2^{\circ}$			=	4 pts.)
Each degree $< -2^{\circ}$		_x 1 pt.	=_	
Each degree $> 6^{\circ}$		_x 1 pt.	=_	
SN-MP				
$\geq 38^{\circ}$			=	2 pts.
Each degree $> 38^{\circ}$	1	_x 2 pts	. =_	2
$\leq 26^{\circ}$			=	1 pt.
Each degree $< 26^{\circ}$		_x 1 pt.	=_	
1 to MP $\geq 99^{\circ}$			=	1 pt.
Each degree $> 99^{\circ}$		_x 1 pt.	=	1
				[
	Tota	al	=	8

OTHER (See Instructions)

Supernumerary teeth	x 1 pt. =		
Ankylosis of perm. teeth	x 2 pts. =		
Anomalous morphology	2 x 2 pts. =	4	
Impaction (except 3 rd molars)	x 2 pts. =		
Midline discrepancy (\geq 3mm)	@ 2 pts. =	2	
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 2mm)	@ 2 pts. =		
Tooth transposition	x 2 pts. =		
Skeletal asymmetry (nonsurgical tx)	@ 3 pts. =		
Addl. treatment complexities	x 2 pts. =		

Identify:

Total

6

=

Conservative treatment for a Severe Class III Openbite Malocclusion IJOI 45



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 (Before Surgical Crown Lengthening)

Total Score: =

2

1. Pink Esthetic Score





2. White Esthetic Score (for Micro-esthetics)





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

Total =

1. Midline 0 1 2 2. Incisor Curve 1 2 0 3. Axial Inclination (5°, 8°, 10°) 2 0 1 4. Contact Area (50%, 40%, 30%) 0 1 2 5. Tooth Proportion (1:0.8) 0 1 2 6. Tooth to Tooth Proportion 2 0 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 (0) 1 2 6. Tooth to Tooth Proportion

Total =

1