# Bimaxillary Protrusion and Gummy Smile Treated with Clear Aligners: Closing Premolar Extraction Spaces with Bone Screw Anchorage


## Abstract

*Inadequate posterior anchorage is a serious limitation for aligner treatment involving extraction of four first premolars. Inappropriate axial inclinations may compromise intermaxillary occlusion and stability. OrthoBoneScrew (OBS®) anchorage is designed to augment the Invisalign® clear aligner G6 solution to produce more predictable outcomes as illustrated by the current case report. An 18-year-old female presented with two chief complains: (1) protrusive, incompetent lips, and (2) excessive gingival exposure when smiling ("gummy smile"). Clinical evaluation revealed bimaxillary protrusion, hypermentalis activity, anterior crowding, and excessive anterior axial inclinations, particularly of the lower incisors (116˚). The American Board of Orthodontics (ABO) Discrepancy Index (DI) was 21. The treatment plan was extraction of all four first premolars, and clear aligner (Invisalign®) therapy anchored with four OBS®s: infrazygomatic crest (IZC), and between the roots of the upper central and lateral incisors (Incisal) bilaterally. Eighteen months of initial treatment with 45 aligners retracted and intruded the anterior segments in both arches by closing the extraction spaces with supplemental anchorage provided by IZC and Incisal OBS®s. The final series of 20 refinement aligners achieved an excellent outcome as evidenced by an ABO Cast-Radiograph Evaluation (CRE) score of 10, and a pink and white (P&W) dental esthetic score of 3. Post-treatment analysis revealed multiple opportunities for improvement. The patient was well satisfied with the final outcome. (Reprinted with permission from APOS Trends Orthod 2020;10(2):120-31). (J Digital Orthod 2020;60:62-79)*



***Key words:***

*Bimaxillary protrusion, gummy smile, premolar extraction, clear aligner treatment, Invisalign G6, IZC, Incisal, bone screws, space closure, anchorage, torque control*


## Introduction

Modern aligner therapy has expanded the treatment perspective for managing complex malocclusions with removable appliances. The Invisalign® system (*Align Technology, Inc., San Jose, CA, USA*) is a leader in the applied technology. Over the years, clinical opinions of aligner therapy have progressed from doubtful[1] to reserved,[2] and they are now progressing to an evolving consensus that aligner therapy is an efficient solution for mild-to-moderate malocclusions.[3] Although some complex malocclusions have been treated with aligners,[4,5] the results are less accurate and predictable than treatment with fixed appliances.[6]

One of the more challenging clinical scenarios for aligners is the treatment of extraction cases. In particular, root paralleling after space closure is inconsistent.[7] Tipped teeth can be corrected with fixed appliances, but sequential treatment with two modalities may require more treatment time than with fixed appliances alone.[8,9]

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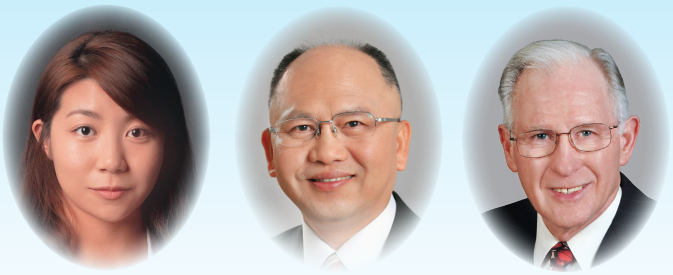

To improve clinical outcomes particularly for extraction of first premolars, Align Technology released the G6 protocol along with SmartStage® in 2015.[10] The principle of differential moments (*couples produced with coordinated sets of attachments*) is used for Invisalign® G6 to provide anterior retraction with maximum posterior anchorage.[11] SmartStage® is engineered to optimize the progression of tooth movement based on algorithms developed with a massive data base, i.e., artificial intelligence (*AI*).[12] The force system for G6 is indeterminate mechanics which are not intuitive. If a clinician accepts the G6 protocol with optimized attachments, the treatment plan cannot be changed.

The successful completion of treatment with the G6 protocol is followed at chairside.[13] However, a recent study conducted by Peking University reported that G6 showed molar anchorage loss that was similar to conventional attachments.[14] The retraction of incisors was less than predicted, and there were multiple side effects such as lingual tipping and extrusion.[14] The difference between the ClinCheck® prediction and the actual outcome was similar to loss of torque with fixed appliances due to the play between archwires and brackets slots.[15]

Clinicians who prescribe Invisalign® treatment still have much to learn regarding the biomechanics and efficacy of the system.[2] Clear aligner treatment can be enhanced with auxiliaries designed to improve the predictability of outcomes.[16] The aim for the present case report is to demonstrate the potential for OrthoBoneScrews (*OBS®s*) (*iNewton, Inc., Hsinchu City, Taiwan*) in supplementing anchorage. The authors feel this approach may evolve to be the "*gold standard*" for patients who demand inconspicuous aligner therapy for demanding malocclusions requiring extractions in all four quadrants.

The dental nomenclature for this report is the modified Palmer notation. Upper (*U*) and lower (*L*) arches, as well as the right (*R*) and left (*L*) sides, define the four oral quadrants: UR, UL, LR, and LL. Teeth are numbered 1-8 from the midline in each quadrant, e.g., a lower right first molar is LR6.

## Diagnosis

An 18-year-old female presented with chief complaints of protrusive lips and a gummy smile tendency, which affected her confidence and productivity. The patient had no significant medical or dental history. Oral hygiene was acceptable, and her motivation for treatment was to improve smile esthetics with clear aligner treatment.

Pretreatment facial photographs showed balanced facial proportions. A functional exam documented lip incompetence with hyperactive mentalis muscles

to achieve lip closure (*Fig. 1*). Analysis of the pre-treatment diagnostic records revealed Class I molar and Class II canine relationships bilaterally (*Fig. 1*). Bimaxillary protrusion with an 5mm overjet and 2mm overbite was associated with ~3mm of crowding in the upper arch and an anterior Bolton ratio of 75.9%. The maxillary and mandibular midlines were deviated by 0.5mm and 1.5mm to the right, respectively. The panoramic radiograph showed four unerupted third molars, and cephalometric analysis revealed a normal skeletal relationship with flared incisors (*Fig. 2, Table 1*). The ABO Discrepancy Index (*DI*) was 21 as shown in the subsequent Worksheet 1.

## Treatment Objectives

The treatment objectives were to: (*1*) reduce dental protrusion by improving lip profile; (*2*) achieve normal overjet and overbite; (*3*) maintain a bilateral Class I molar relationship; (*4*) obtain a bilateral Class I canine relationship; (*5*) coordinate midlines; and (*6*) align arches.

*Fig. 1: Pretreatment extraoral and intraoral photographs*

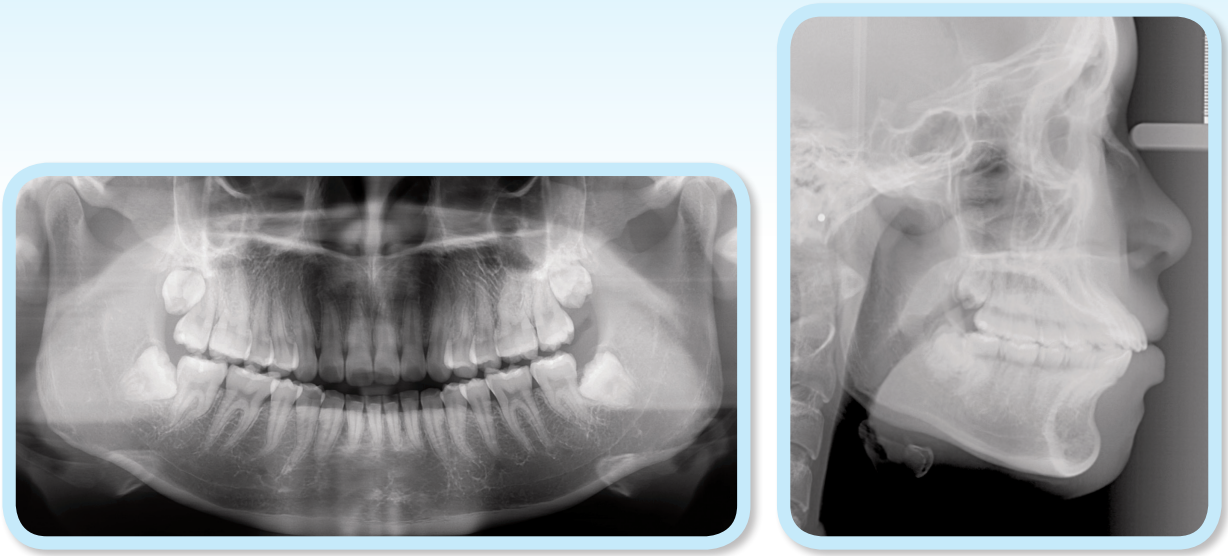

*Fig. 2: Pretreatment panoramic radiograph (left) and lateral cephalometric radiograph (right)*

| CEPHALOMETRIC SUMMARY | | | |
|---|---|---|---|
| SKELETAL ANALYSIS | | | |
| | PRE-Tx | POST-Tx | DIFF. |
| SNA° (82°) | 83.5° | 83.5° | 0° |
| SNB° (80°) | 80.5° | 81.5° | 1° |
| ANB° (2°) | 3° | 2° | 1° |
| SN-MP° (32°) | 27.5° | 26.5° | 1° |
| FMA° (25°) | 20.5° | 19.5° | 1° |
| DENTAL ANALYSIS | | | |
| U1 To NA mm (4mm) | 10 | 3.5 | 6.5 |
| U1 To SN° (104°) | 118° | 107° | 11° |
| L1 To NB mm (4mm) | 9.5 | 4 | 5.5 |
| L1 To MP° (90°) | 115° | 96° | 19° |
| FACIAL ANALYSIS | | | |
| E-LINE UL (-1mm) | 1 | -2 | 3 |
| E-LINE LL (0mm) | 3 | -2 | 5 |
| %FH: Na-ANS-Gn (53%) | 56% | 55% | 1% |
| Convexity: G-Sn-Pg' (13°) | 15° | 11° | 4° |

*Table 1: Pre-treatment and post-treatment cephalometric analysis*

## Treatment Alternatives

The focus of Invisalign® aligner treatment was correction of the lip protrusion and gummy smile (*Fig. 3*). A non-extraction treatment approach was considered: arch retraction of 3mm in every quadrant, interproximal reduction (*IPR*) to relieve crowding, and rounding-out the arch form.[17] Extraction of all the third molars was discussed


*Fig. 3:*
*Pretreatment extraoral photograph revealed patient's gummy smile tendency. Note that the width of exposed gingiva is 4mm superior to the U2s.*

because it would aid with arch retraction, but the patient declined the projected result for non-extraction treatment because it failed to adequately reduce dental protrusion and mentalis strain. The alternative treatment option was extraction of four first premolars, followed by Invisalign® treatment supplemented with OBS® anchorage to retract and intrude the incisors. The patient accepted the extraction treatment plan which involved: (*1*) two 2x12-mm OBS®s installed bilaterally in the infra-zygomatic crest (*IZC*), (*2*) two additional 1.5x8-mm Incisal OBS®s in the maxillary anterior inter-radicular (*I-R*) region between central and lateral incisors bilaterally, (*3*) elastics (*Ormco Corporation, Brea, CA*) hooked on the bone screws to retract and intrude the maxillary anterior segment, and (*4*) IPR to address a Bolton discrepancy between the arches.

## Treatment Progress

iTero Element® intraoral scans (*Align Technology, Inc., San Jose, CA, USA*) provided a 3D dataset.[18] The ClinCheck® (*Align Technology, Inc., San Jose, CA, USA*) system was used to plan the treatment and project the outcome. Both optimized and conventional attachments were applied in sequential staging (*Fig. 4*). The treatment was conducted in two phases: initial and refinement. Oral hygiene and aligner fit were monitored at monthly intervals.

## Initial Phase

The major goals of the initial treatment were to retract the anterior segments as the arches were intruded (*Fig. 5*). A total of 45 sets of aligners were used over 13 months. According to the clinician's

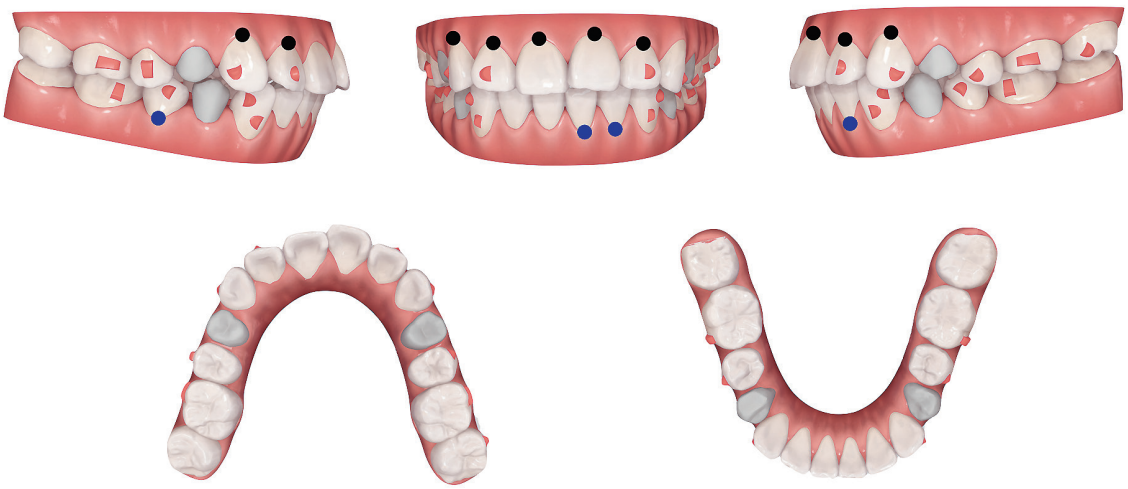

*Fig. 4:*
*ClinCheck® treatment plan and prescribed attachments are shown for the initial phase of treatment. Blue dots indicate variably predictable tooth movement (2.5-3mm intrusion for lower incisors; 4-6mm root movement for LR5). Black dots indicate less predictable tooth movement (>3mm intrusion for upper incisors; >6mm root movement for UR3). See text for details.*

instructions, the first set of 38 aligners were changed every 10 days, and then every 7 days for the last 7 aligners. Optimized root control attachments were used on canines in combination with precision cuts. Optimized anchorage attachments were provided for the posterior teeth (*Fig. 6*). Half pontics were used for esthetic replacement of missing teeth. SmartStage® technology was used for the upper incisors to minimize unwanted tipping and anterior extrusion.[12]

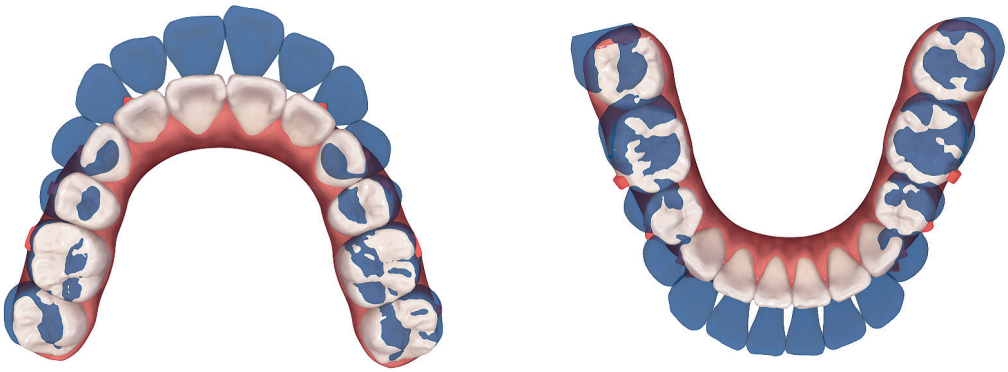

*Fig. 5:*
*ClinCheck® initial phase treatment is projected by superimposition (blue: original tooth position; white: simulation of final tooth position) on dental landmarks that are programmed to be stable. Maximum anchorage is planned in the upper arch, consistent with more moderate anchorage for the lower arch. The anchorage requirements in both arches are quite challenging, and require TAD anchorage.*

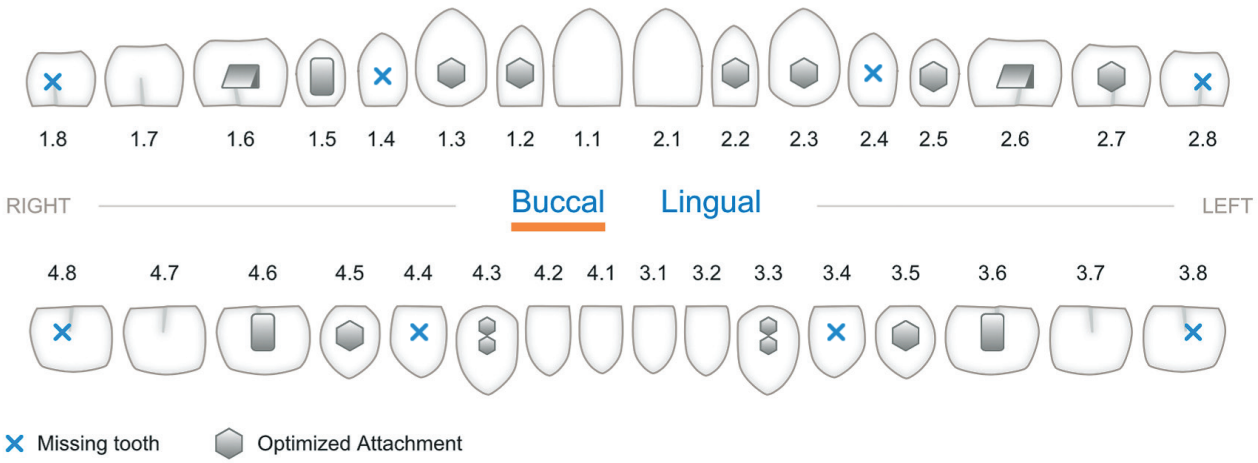


*Fig. 6:*
*The initial phase of Invisalign® treatment utilizes SmartForce® features (optimized attachments in hexagon) for the Invisalign G6 solution to provide maximal posterior anchorage for distal translation of canines. See text for details.*

Anterior and IZC OBS®s were placed when the tenth aligner was delivered. Elastics (3.5oz) were worn full-time from the U3s to the IZC OBS® and from the anterior segment of the aligner to the Incisal OBS®s bilaterally (*Fig. 7*). Inwardly-inclined cuts were made chair side with dedicated cutting pliers for every aligner, and all elastics were preloaded. The patient was trained to hook the elastics intraorally from the OBS®s to the aligner cuts. An overlapping two-elastic design in the maxillary anterior avoided irritating the labial frenum. OBS® anchorage was essential for achieving the ClinCheck® simulations

*Fig. 7:*
*Intraoral photographs show the mechanics after OBS® placement and the application of 3.5oz elastics for retraction of buccal segments and intrusion of the maxillary anterior segment.*

*Fig. 8:*
*A progressive series of left buccal intraoral photographs show the progress of treatment compared to ClinCheck® simulations: left 3 months,10/45 aligners; center 6 months, 21/45 aligners; right 10 months, 32/45 aligners. Note a modified G6 attachment is specified for the UL3 to accommodate a precision cut for an elastic anchored by the IZC OBS®. For the colored markings in the simulations, see Fig. 4 for details.*

during treatment with the initial series of aligners (*Fig. 8*). The outcome at the conclusion of the initial phase of treatment was dependent on bone screw anchorage (*Fig. 9*).

## Refinement Phase

Refinement (*finishing*) with 20 additional aligners was conducted to correct the Class II relationship on the right side by retracting the UR quadrant 1mm (*Fig. 10*). After all extraction spaces were closed, IPR was carried out to reduce black triangles and address the Bolton discrepancy (*Fig. 11*). In the finishing stage, the heavy occlusal contacts on posterior teeth were reduced. Subsequently, conventional attachments replaced the optimized attachments to provide predictable retention. Precision cuts were again prescribed for the finishing mechanics and retention. The patient continued to use all elastics bilaterally as prescribed.

## Retention

Essix retainers (*Dentsply Sirona, Charlotte, NC, USA*) retainers were delivered for both arches. The patient was instructed to wear them full time for the first 6 months post-treatment and nights only thereafter.

*Fig. 9:*
*Extraoral and intraoral photographs show the outcome for the initial phase of aligner treatment. A canine Class II window (interocclusal space) distal to the UR3 cusp is noted.*

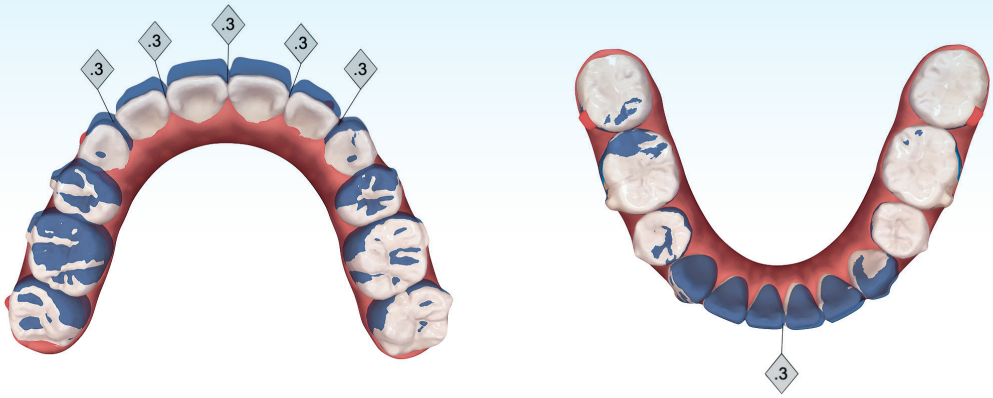


*Fig. 10:*
*Refinement phase of treatment is programmed into ClinCheck® to retract the UR quadrant 1mm (blue: original tooth position; white: simulation of final tooth position). IPR of 0.3mm is planned for five sites in the maxillary anterior segment, but for only one site in the lower arch, to correct a perceived Bolton discrepancy.*

*Fig. 11:*
*Post-treatment extraoral and intraoral photographs. Gingivoplasty, as well as labial frenectomy, was performed with diode laser at the completion of the treatment. Note the buccal segments are slightly Class II, but there is no overjet, suggesting that more refinement of IPR was indicated in programming the refinement stage on ClinCheck®.*

Instructions were provided for home care, as well as for maintenance of the retainers.

## Treatment Results

This case report describes the correction of a malocclusion with a DI of 21, which was treated to an excellent CRE of 10 and a P&W esthetic score of 3, as shown in the subsequent worksheets (*Worksheets 2 and 3*). The total treatment duration was 18 months with a total of 65 aligners (*45+20*). Post-treatment records document achievement of all treatment objectives relative to good dental alignment and dentofacial esthetics (*Fig. 11*). Ideal overbite and overjet were achieved. Most importantly, all extraction spaces were closed with good maintenance of root parallelism (*axil inclination*) (*Fig. 12*). Upper and lower incisors were retracted and uprighted, improving the patient's lip profile and facial esthetics (*Table 1, Fig. 13*). The intrusion of the entire maxillary dentition corrected the gummy smile, and produced a slight counterclockwise rotation of the mandible to close the vertical dimension of occlusion. Buccal segments were corrected to Class I bilaterally. Upper and lower midlines were coincident with the facial midline. The patient was highly motivated and compliant with aligner wear and elastics. She was extremely happy with the treatment results. Overall, a near ideal outcome was achieved. Arrangements will be made in the future for third molar extractions.

## Discussion

Extraction of four first premolars is often indicated for Asians to correct typically Class I malocclusions with bimaxillary protrusion with or without crowding.[19,20] Initial crowding may contribute to anchorage loss with fixed appliances[21] and aligners.[14] However, with the current Invisalign® approach, crowding is directly related to predictable tooth movement with aligners. Thus, the overall tooth movement, as well as mesial

*Fig. 12:*
*Post-treatment panoramic radiograph (left) and lateral cephalometric radiograph (right). Good root parallelism is noted in the maxillary buccal segments, but all the teeth are more upright than normal (Fig. 3), which contributes to the Class II windows distal to the cusps of the U3s (Fig. 11).*

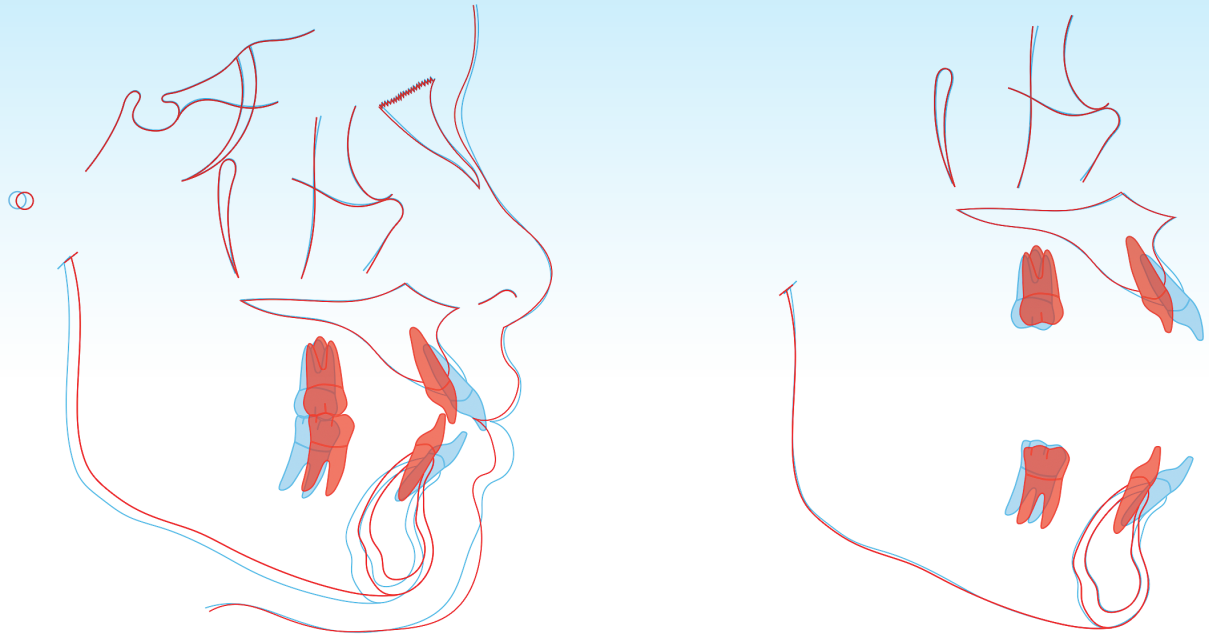

*Fig. 13:*
*Superimposed tracings of the pre-treatment (blue) and post-treatment (red) lateral cephalometric radiographs show that bimaxillary protrusion was resolved dramatically (U1 and L1 retracted 6.5 and 5.5mm, respectively). The intrusion of entire upper dentition (U1 and U6 intruded 2.2 and 1.5mm, respectively) was consistent with the counterclockwise rotation of the mandible.*

tipping and translation of first molars, is close to the pretreatment prediction.[14] Because the current patient had minimal crowding but severe protrusion, firm posterior anchorage (*OBS®s*) was indicated.

The ideal soft tissue display when smiling is 1-2mm of attached gingiva.[22] While orthodontists rate 2-3mm of gingival exposure as unattractive, general dentists and laypeople feel that >4mm is required to rate a smile as unattractive (*Fig. 3*).[23,24] A "*gummy smile*" may have both extra-oral and intra-oral dimensions.[25] The differential diagnosis for the current patient favored a dental origin because the morphology was not consistent with anterior dentoalveolar extrusion nor vertical maxillary excess. The patient's lips were incompetent at rest, but did contact with hypermentalis activity, so it was important to control the vertical dimension of occlusion (*Fig. 1*). The use of the maxillary anterior miniscrews was originally proposed by Lin et al.[26]

Extraction cases with gummy smile are recognized as challenging malocclusions for clear aligner treatment.[1-3,9] Ideal ClinCheck® simulations are difficult to achieve. The "*bowing*" and/or "*bite block*" effect[27] may enhance the gummy smile tendency or deepen the bite with conventional aligners, so miniscrews play a vital role in expanding the scope for clear aligner treatment.[28] As shown in Fig. 14, an extra-alveolar (*E-A*) retracting force on the dentition anchored with IZC OBS®s produced a favorable clockwise moment to deepen the plane of occlusion, but the position of the center of rotation ($C_{rot}$) in 3D was unknown. The $C_{rot}$ for posterior rotation of the lower arch with mandibular buccal shelf OBS® is actually an axis of rotation in 3D that has been calculated with finite element analysis (*FEA*) of cone beam commuted tomography (*CBCT*)

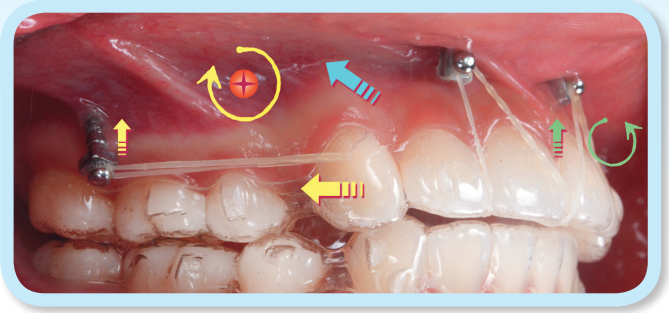

*Fig. 14:*
*The force system is diagrammed in 2D to explain the mechanics in the sagittal plane for an IZC and Incisal OBS®s. Based on the presumed center of resistance (CR, red circle with a cross) for the maxillary arch, the elastic force from the IZC screws to the cuspid precision cut has both distal and vertical components (straight yellow arrows) that produce a clockwise moment around the CR (curved yellow arrow). The anterior I-R screws anchor an intrusive force (green arrow) that creates a counterclockwise moment (curved green arrow) tending to flare the maxillary incisors. The presumed resultant for overall applied loads is the blue arrow.*

images.[29] The calculated $C_{rot}$ was far more anterior and occlusal than previous 2D estimates. If the calculated $C_{rot}$ is similar for IZC anchorage in the upper arch, E-A posterior anchorage has less of an effect on steepening the maxillary plane of occlusion to produce incisor extrusion than is implied in 2D (*Fig. 14*). The scientific evolution of IZC OBS® anchorage for aligner therapy requires 3D assessment of the $C_{rot}$ because a relatively simple change in the direction of the elastics force may eliminate the need for Incisal OBS®s. Steepening the plane of the buccal elastic by screwing the OBS® deeper into the buccal fold and attaching the elastic near the cusp tip of the canine may eliminate the need for the uncomfortable and unattractive Incisal miniscrews. Patients desiring aligner treatment prefer the most esthetic and the least invasive approach, so eliminating Incisal miniscrews would be a very attractive option.

Realistic assessment of the 3D biomechanics relative to IZC anchorage for aligner treatment is not possible without FEA of CBCT images.[29] However, in the meantime 2D analysis is helpful for routine clinical applications (*Fig. 14*). When the buccal elastic force is parallel to the occlusal plane, clockwise rotation of the occlusal plane is expected to extrude the incisors. I-R OBS®s in the incisal anchorage position between the central and lateral incisor roots are essential for reversing the extrusive component on the anterior segment. In addition, the anterior vertical force resulted in a slight flattening of the occlusal plane and net intrusion of the maxillary arch (*Fig. 15*). The combination of all four OBS® fixtures (*2 IZC and 2 Incisal*) retracted and intruded

*Fig. 15:*
*The application of anterior I-R screws to anchor elastics fitted into palatal cuts (blue curved lines) in the aligners is shown in the occlusal view (upper) and the frontal view (lower). The palatal cuts inclined to the mesial are good attachments for elastics attached the Incisal OBS®s bilaterally.*

the maxillary incisors (*Fig. 13*). In addition, the roots in the buccal segments were well aligned (*parallel*) at the end of treatment, but they were perpendicular to the occlusal plane rather than distally oriented (*Fig. 2*). One can view the impressive results (*Figs. 11-13*) as achieving the full potential of aligners, but, more properly speaking, it was OBS® anchorage that expanded the scope of aligner treatment.[30] However, there is room for improvement particularly in regard to root angulations in the maxillary posterior segments.

Fig. 15 demonstrates the application of anterior I-R bone screws with elastics attached to "*inwardly inclined*" cuts on the palatal surface of the central incisors. The cuts are made chairside for every aligner specified with a special cutting plier. The patient fits elastics into the slots before seating the aligner on the arch, and then stretches the elastics over the Incisal bone screws with finger pressure (*Fig. 15*).

The overall failure rates for anterior I-R screws and IZC E-A screws are 7.2%[31] and 6.3%[32], respectively. The failure rates for TADs anchoring aligners is unknown, but the hypothesis is the failure rate will be lower for Incisal OBS®s because the applied force is lower and it is not applied full time. Further study is required to resolve this important issue.

All treatment objectives were met. Despite the patient's compliance in wearing aligners and elastics, there were Class II "*windows*" along the distal incline of the incisal edge of both maxillary canines, which extended posteriorly for all the interproximal intercuspation in the buccal segment (*Fig. 11*). This problem could be more clearly assessed with articulated casts. There were several contributing factors for the occlusal irregularities: (*1*) slight Class II relationship of the U3s and U4s, (*2*) inadequate distal moment of the U3 roots, and (*3*) insufficient extrusion of the L4s. In retrospect, closer monitoring of the ClinCheck® setup to resolve the Class II buccal segments may have indicated less IPR in the maxillary anterior region (*Fig. 10*) and more IPR of the lower anterior segment to create additional overjet to accommodate the Class II correction. In addition, distal root movement for all teeth in the maxillary buccal segments was needed. The roots were parallel (*Fig. 12*), but they were too upright to achieve an ideal intercuspation relationship. Overall, the result was excellent (*CRE 10*), but there was potential for a more ideal outcome.

The compensatory mechanism in the setups for Invisalign® extraction cases with miniscrew anchorage are similar to treating gummy smile cases. Four screws can prevent unattractive bowing effects, and at the same time save dozens of additional aligners. Once realistic 3D biomechanics are calculated,[29] it will be possible to further refine aligner alignment with TAD anchorage to achieve even more ideal results. The goal is to be competitive with the high accuracy for non-extraction aligner treatment.[33]

## Conclusions

Closure of extraction spaces with Invisalign® appliances alone can be challenging and frustrating. Clinicians should be prepared for anterior dumping

and posterior torque loss. Prevention is better than cure. Aligners can be well integrated with TAD anchorage to execute a broad range of malocclusion corrections. Despite the excellent outcome for the current case, the treatment details should be carefully interpreted. 3D studies of the biomechanics are needed to formulate robust clinical recommendations.

## Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consent documents. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that her name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Nil.

## Conflicts of Interests

There are no conflicts of interest.

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# Discrepancy Index Worksheet

**TOTAL D.I. SCORE** 21

## 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 = 0

## 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 = 1

## 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 = 1

## 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. additional _____ pts. |

Total = 0

## 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° = 4 pts.

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

Each degree > 6° _____ x 1 pt. = _____

SN-MP

≥ 38° = 2 pts.

Each degree > 38° _____ x 2 pts. = _____

≤ 26° = 1 pt.

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

1 to MP ≥ 99° = 1 pt.

Each degree > 99° 16 x 1 pt. = 16

Total = 17

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

Identify: Gummy smile correction.

Total = 2

# Cast-Radiograph Evaluation

**Patient**

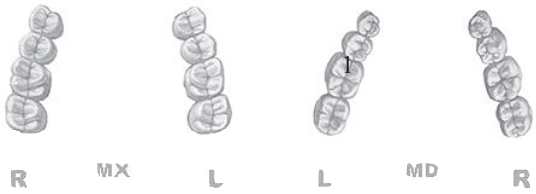
**Total Score:** 10

**Alignment/Rotations**

1

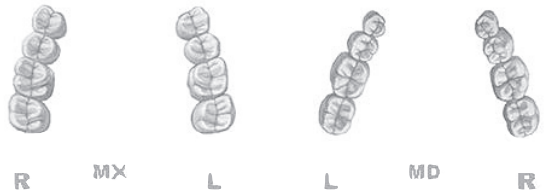

**Marginal Ridges**

0




**Buccolingual Inclination**

0

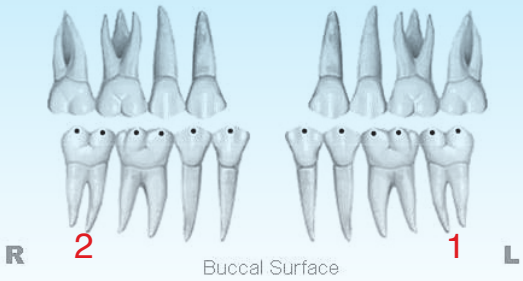


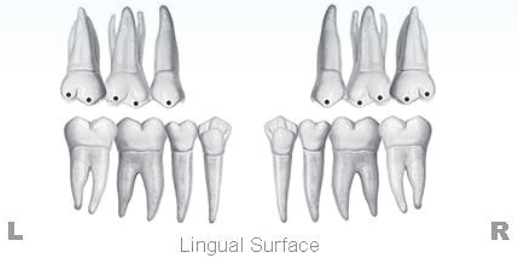

**Overjet**

0


**Occlusal Contacts**

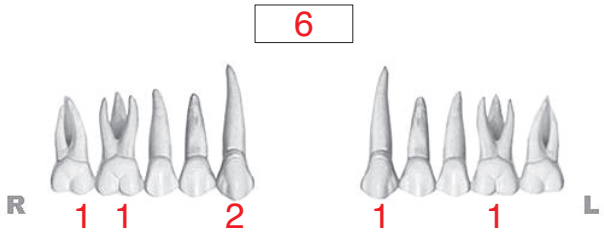
3



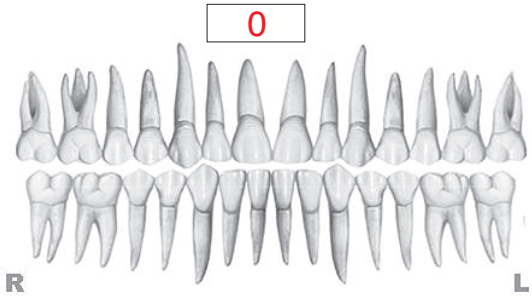

**Occlusal Relationships**

6



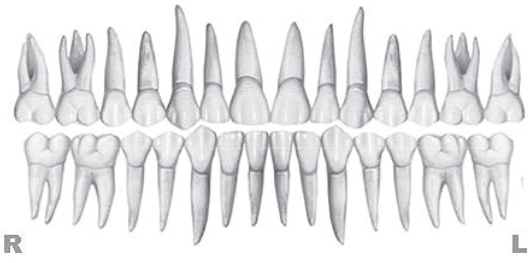

**Interproximal Contacts**

0




**Root Angulation**

0



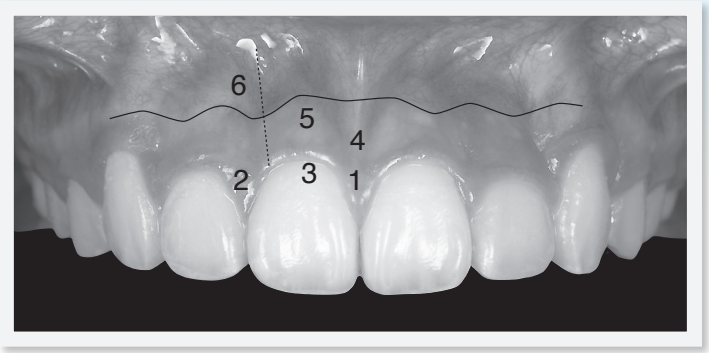

***INSTRUCTIONS: Place score beside each deficient tooth and enter total score for each parameter in the white box. Mark extracted teeth with "X". Second molars should be in occlusion.***

# IBOI Pink & White Esthetic Score

**Total Score: =** 3

## 1. Pink Esthetic Score

Total = 2

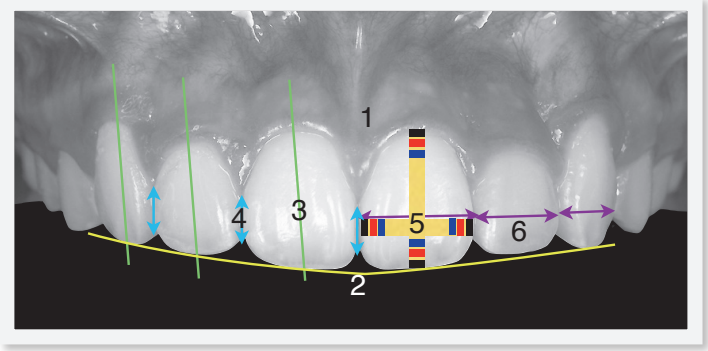



| | | | |
|---|---|---|---|
| 1. M & D Papillae | 0 | 1 | 2 |
| 2. Keratinized Gingiva | 0 | 1 | 2 |
| 3. Curvature of Gingival Margin | 0 | 1 | 2 |
| 4. Level of Gingival Margin | 0 | 1 | 2 |
| 5. Root Convexity ( Torque ) | 0 | 1 | 2 |
| 6. Scar Formation | 0 | 1 | 2 |

| | | | |
|---|---|---|---|
| 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 = 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 |
| 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 |