

Original Article

Expanding the concept of orthodontic camouflage for a skeletal Class II camouflage case through the use of skeletal anchorage system

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ABSTRACT:

This study aimed to report the treatment steps in a 26-year male patient, presented with a class II div 1 incisor relationship on a class II skeletal base with increased vertical proportions. The case was complicated by missing lower second premolars and retained lower second deciduous molars. Severe crowding was evident in the lower arch with mild crowding in the upper arch. The overbite and the overjet were increased. Scissor bite was evident in the left buccal segment. Treatment involved extraction of upper first premolars and lower second deciduous molars, utilizing moderate anchorage using a preadjusted edgewise fixed appliance (0.022" X 0.028") with Roth prescription. Treatment duration was 20 months in total. The envelope of discrepancy specifies strict rules when camouflaging class II cases. The ability to retract incisors and the use of class II mechanics are within limited range to avoid damage to the periodontium. The current case report showed that the ability of the clinician to retract incisors using TADs could be carried out with high rate of success and safety.

KEY WORDS: *Cl II div 1 Malocclusion, Overjet, En-Mass retraction, TADs*

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INTRODUCTION:

Class II malocclusion has been described by many authors and classified according to different measures. Angle described class II molar as disto-occlusion. He specified that the mesiobuccal cusp of the upper first permanent molar was mesially positioned in relation to the buccal groove of lower first permanent molar¹. On the other hand, The British Institute of Standards classified class II cases by the incisor's antero-posterior relationship². Whenever the lower incisal edge was distal to the upper cingulum plateau, then it was a class II case. If the upper incisors showed normal or proclined inclination, then it was considered a class II division 1 case. If the upper incisors showed retroclination, then it was described as a class II division 2 case^{3,4}. The etiology to class II cases was considered under two categories, 95% of the cases were due to abnormal development and had a genetic predisposition⁵. Only 5% of the cases were traced to specific environmental causes, such as thumb sucking and/or lip biting habits. Trauma to the condyles and infections of the temporomandibular joint were reported to cause severe class II cases⁶. Class II cases could present on a class I or class II skeletal patterns. The more severe the skeletal II pattern, the more complex and difficult the treatment modalities were. Class II cases with skeletal I relationship were easy to treat into full class I results. But class II cases with skeletal II patterns were representing a challenge⁷.

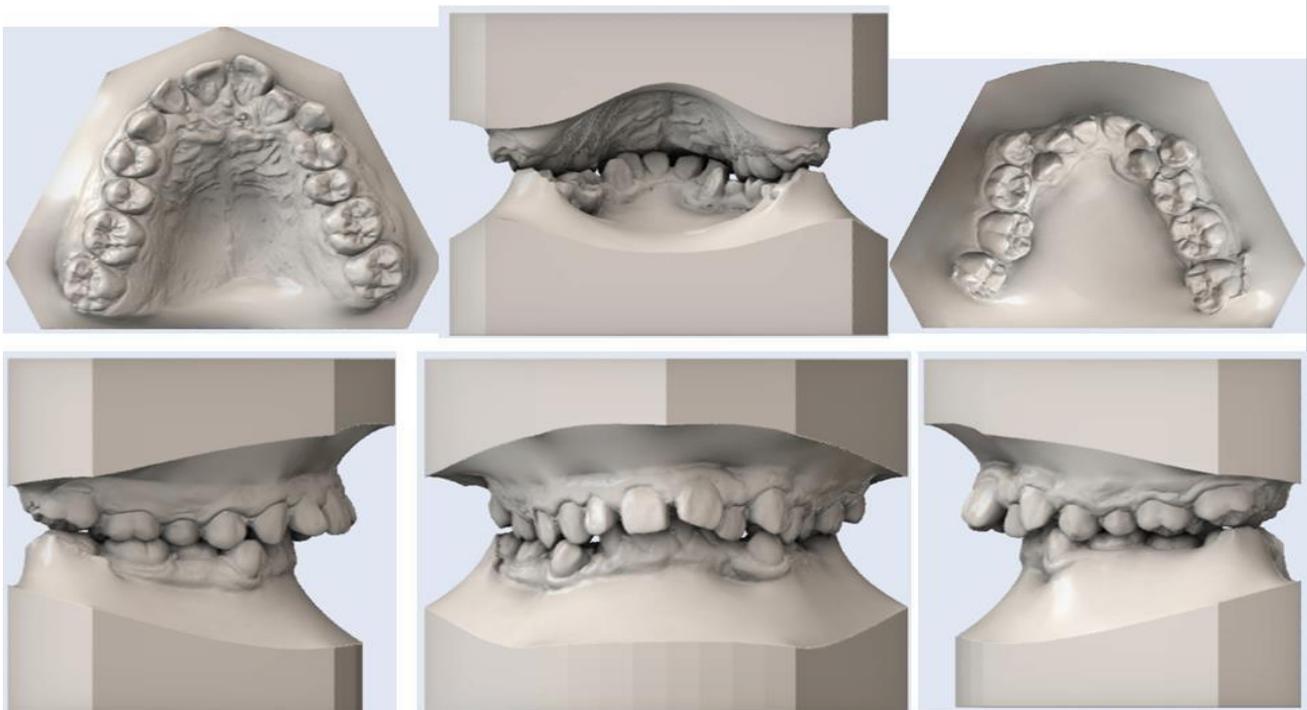
The general idea was that mild skeletal II cases should be treated by camouflage but severe class II skeletal patterns should be treated by orthognathic surgeries⁸. The main problem faced by the orthodontist was that the unclear guidelines to discriminate mild from severe skeletal patterns. The golden rule of "begin with the end in mind" was used to determine the maximum retraction of upper incisors allowed for a maximum of 7 mm. On the other hand, the maximum retraction of lower incisors allowed was of 3.5 mm. The idea was to avoid losing anchorage or suffering resorption of the roots due to early touching of the palatal/lingual cortical plates^{9,10}. The following case report presented a severe skeletal and dental class II case. According to the classical envelope of discrepancy, it should have been treated by orthognathic surgery, but with the use of screws and the modern orthodontic mechanics the case was treated to class I occlusion with camouflage and without any biological damage.

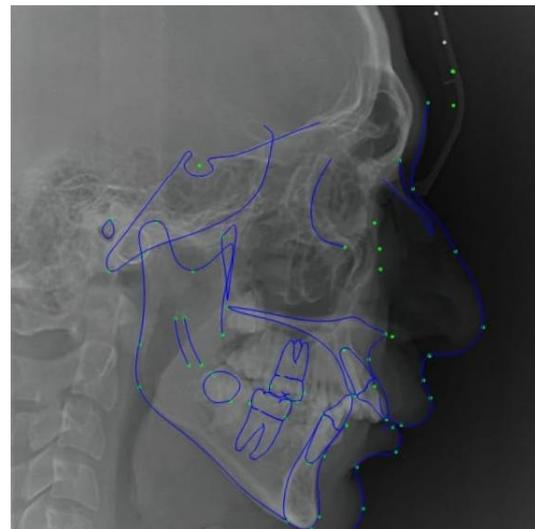
HISTORY:

The case MJ was a male patient of 26 years and 4 months of age. He presented with a chief complaint of "My teeth are crooked, and I hate my smile". The problem list was described through the following categories (figure 1).

Figure1: Pretreatment extra-oral and intra-oral pictures; digital dental casts and radiography (OPG and Cephalometric with Eastman analysis).







Group/Measurement	Value	Norm	Std Dev	Dev Norm
Skeletal				
SNA (°)	79.8	82.0	3.5	-0.6
SNB (°)	74.3	80.9	3.4	-2.0 **
ANB (°)	5.6	1.6	1.5	2.7 **
SN-Maxillary Plane (°)	11.0	7.3	3.5	3.1 *
Palatal-Mand Angle (°)	32.9	28.0	6.0	0.8
LAFH (Me-MxP) (mm)	66.6	66.0	3.5	0.2
UAFH (H-MxP) (mm)	57.6	55.0	3.0	0.9
LAFH/IAFH (s)	53.6	55.0	3.0	-0.5
LPFH (Go-MxP) (mm)	30.8	43.0	4.0	-3.1 ***
UPFH (S-MxP) (mm)	48.0	51.0	3.0	-2.0 **
PFH (S-Go) (mm)	75.8	79.0	4.5	-0.7
Wits Appraisal (mm)	12.1	-1.0	1.0	13.1 *****
Teeth				
Overjet (mm)	12.2	2.5	2.5	3.9 ***
Overbite (mm)	6.9	2.5	2.0	2.2 **
U1 - Maxillary Plane (°)	130.9	110.0	5.0	4.2 *****
IMPA (LI-MP) (°)	80.1	95.0	7.0	-2.1 **
Interincisal Angle (U1-L1) (°)	116.1	130.0	6.0	-2.3 **
L1 Protrusion (LI-APo) (mm)	-1.9	2.7	1.7	-2.7 **
L1 - Facial Plane (LI-NPo) (mm)	1.7	3.9	2.0	-1.1 *
Soft Tissues				
Upper Lip to E-Plane (mm)	-1.6	3.9	2.0	-2.7 **
Lower Lip to E-Plane (mm)	-1.3	-2.0	2.0	0.3
Nasolabial Angle (CoL-Sn-UL) (°)	102.0	102.0	8.0	0.0
Chin Thickness (Pg-Fg') (mm)	14.9	12.4	3.5	0.7
B - NPo (mm)	-2.8	-2.0	2.0	-0.4
L1 - MP (LADH) (mm)	48.1	40.0	3.0	1.7 *

Pathological problems: The patient was presented with small occlusal pits and some stains and calculus on teeth. Moreover, mild marginal gingival inflammation was evident. Functional problems: The patient presented with a lower lip trap behind the upper incisors. Skeletal problems: The bone was of class II relationship, with mandibular deficiency in relation to the skull base. The mandibular plane angle was increased compared to the normal references. Dental problems: The upper arch was presented with mild spacing with proclined upper incisors. The arch was symmetric and the midline was coincident with the facial midline. The upper wisdom teeth were impacted. The lower arch on the contrary was severely crowded with retroclined lower incisors. The left buccal segment was shifted 1 mm mesially than the right side. The lower midline was onto the facial midline. The lower second deciduous molars were retained together with the lower second premolars were missing. The lower wisdom teeth were impacted. Regarding the occlusion, the incisors were of class II division 1 relationship, with overjet of 11 mm and proclined inclination to the palatal plain. The lower incisors were retroclined to the mandibular plane. Regarding the overbite, it was deep, complete and traumatic to the palatal gingiva. The upper and lower midlines were coincident onto the facial midline. The smile arc was non consonant. The canines on the other hand presented with class II $\frac{3}{4}$ unit relationships both on the right and the left sides. The molars on the right and the left sides were in class I relationship with the right-side molar in good interdigitation and normal over jet, while the left molar was in deep bite with lingual cross bite relationship. Soft tissue problems: The extraoral soft tissue assessment revealed Mesoprosopic face with the vertical thirds of the face equal to each other and the transverse fifths also in equal proportions except for the outer fifths which were increased in width. The tip of the nose was blunt with good malar eminence on both sides. The intraoral soft tissue assessment presented a thin gingival biotype.

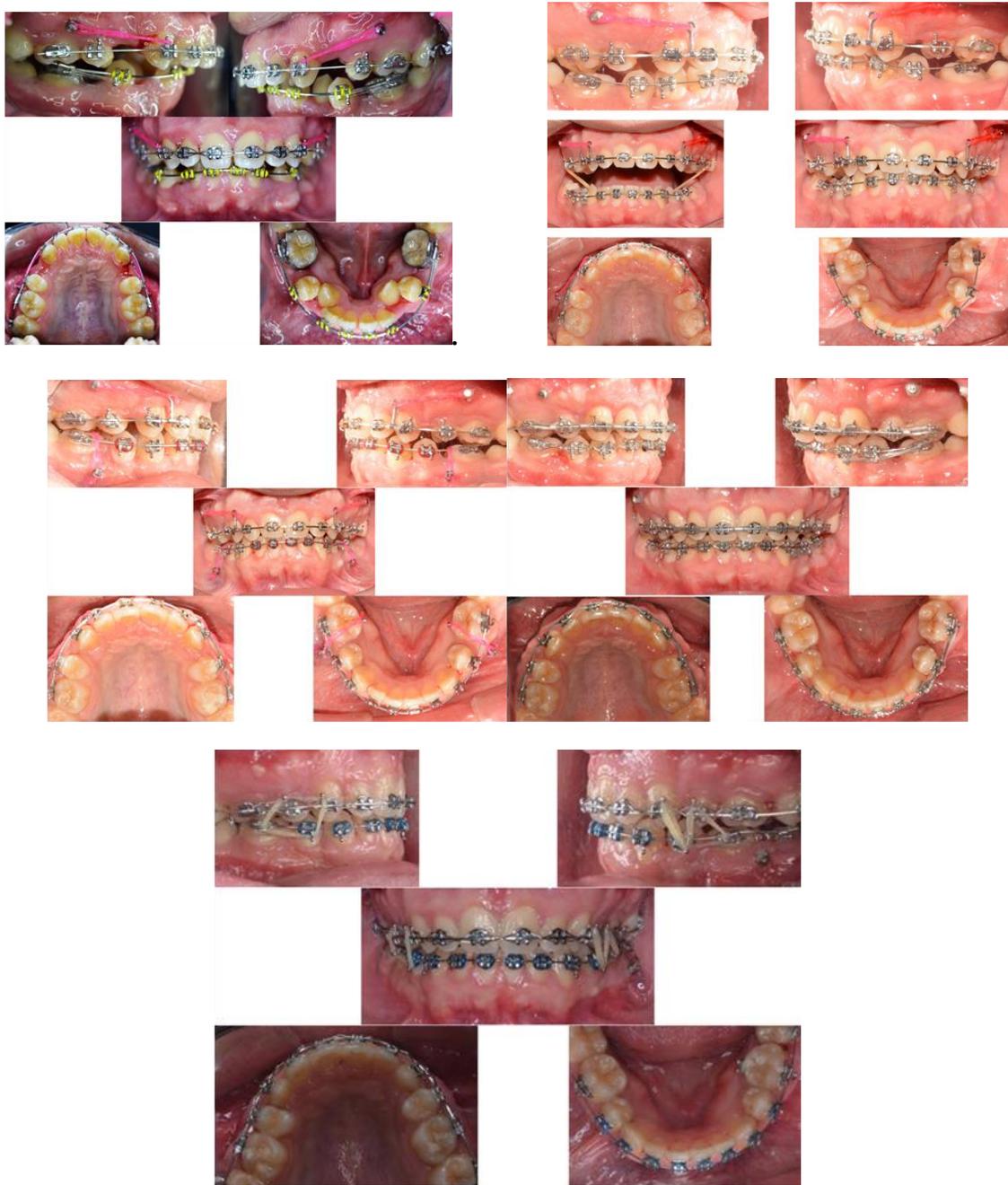
TREATMENT PLAN:

The patient was referred for treatment of the occlusal caries and the gingival inflammation. The oral hygiene had to be improved. The skeletal class 2 relationship and the high mandibular plain angle were to be camouflaged. The upper arch was to have its spaces closed and the upper incisors were retracted into normal position with proper torque. The retained teeth in the lower arch were to be extracted and the arch was to gain levelling and alignment with the lower incisors torque adjusted to normal. The occlusion was to be corrected and delivered into class I incisors, canines and molars relationships together with mutually protected occlusal scheme. The extraoral soft tissue features and profile were to be accepted except for the smile esthetic which was planned for improvement.

TREATMENT PROGRESS:

The patient referred for upper first premolars extraction and lower second deciduous molars extraction. Full fixed appliance of MBT prescription was installed on the patient's teeth. Mini-screws 8 mm length and 1.6 mm diameter were placed in the buccal cortical plates of the upper arch to gain full retraction of the anterior segment into the extraction spaces. Crimpable St-St hooks were applied to 0.019" x 0.025" St-St upper arch wire and light power chain modules were used directly from the hooks till the TADs. Hence, the spaces were to be closed by absolute retraction of the upper anterior segment without suffering any loss of the anchorage. The upper incisors torque was fully corrected by the time the space was fully closed (figure 2). The direction of pull of the power chain modules from the hooks upward and backward to the TADs allowed for intrusion effect on the anterior segment to help in correction of the deep bite. Levelling and alignment were initiated by the use of NiTi arch wires gradually increasing the gauge from 0.012" till 0.019" X 0.025" wires driving the teeth into ideal positions and solving the increased overjet of the canines and solving the scissor bite of the left molar. The use of cross elastics 5/16" from the lingual side of the lower first molars to the buccal side of the upper first molar was implemented to help correcting the scissors bite (figure 2). Insertion of TADs 8 mms length and 1.5 mm diameter in the buccal cortical plate of the lower arch and the use of light power chain modules allowed for correction of the lower molar torque and corrected the scissors bite fully (figure 2). After completion of levelling and alignment, St-St ligature wires were applied to keep the anterior segment together as one unit preparing for the spaces closure phase. The lower molars were driven forward by direct traction through light power chain modules to the anterior segment (figure 2)

FIGURE 2: Show treatment mechanism and progressing including En. Mass retraction technique with using crossing elastic and delta elastics



TADs were removed on both sides and gingiva allowed to heal. The retention protocol was to use vacuum retainers in both arches to avoid relapse. The upper vacuum retainer included an anterior bite plane to guard against deep bite relapse. The good interincisal angle with good torque control were extremely important factors in bite stability (figure 3). The good interdigitation of the posterior segment together with lower lip covering the incisal third of the upper incisors were main factors to improve stability.

FIGURE 3: Shown the retention protocol was to use vacuum retainers in both arches to avoid chances of relapse.

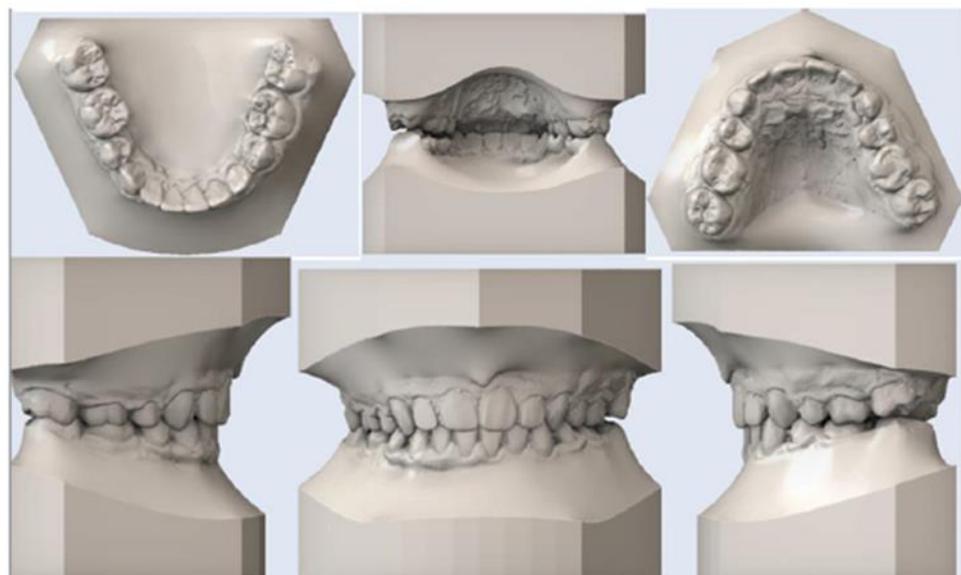


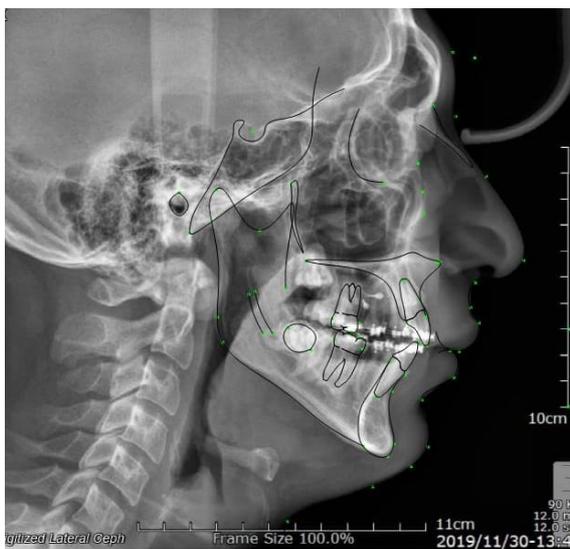
RESULTS:

The clinician was able to achieve full interdigitated class I mutually protected occlusal scheme in that case. The smile esthetics were improved tremendously and the lip trap was eliminated fully. The patient was avoided surgery while achieved excellent occlusal features while camouflaging the skeletal problems (figures 4). Cephalometric superimposing show the amount of treatment changes (figure 5).

FIGURE 4: Posttreatment extra and intraoral images; digital dental casts and radiograph (OPG and Cephalometric with Eastman analysis). *T1: before treatment, T2 after treatment.

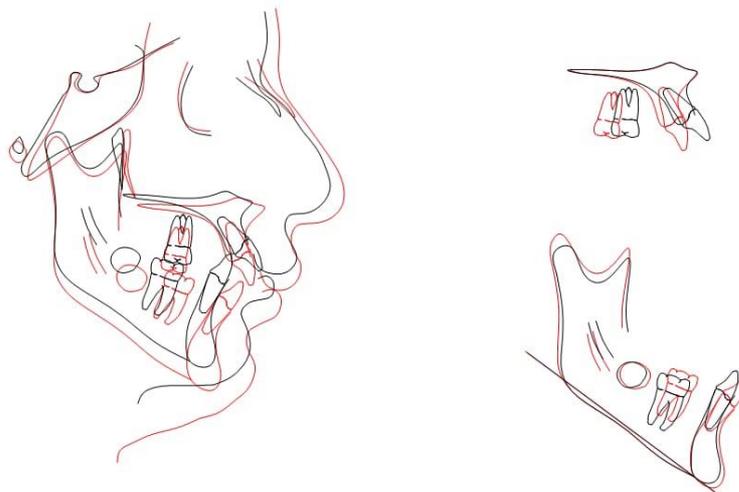






Measure/Parameter	Value	Normal	Diff	Significance
Skeletal				
SNA (°)	78.3	82.0	3.5	-1.1 *
SNB (°)	73.8	80.9	3.4	-2.1 **
ANB (°)	4.5	1.6	1.5	1.9 *
SN-Maxillary Plane (°)	8.5	7.3	3.5	0.3
Palatal-Mand Angle (°)	36.3	28.0	6.0	1.4 *
LAFH (Me-MxP) (mm)	71.3	66.0	3.5	1.5 *
UAFH (N-MxP) (mm)	60.3	55.0	3.0	1.8 *
LAFH/TAFH (%)	54.2	55.0	3.0	-0.3
LPFH (Go-MxP) (mm)	31.6	43.0	4.0	-2.9 **
UPFH (S-MxP) (mm)	49.9	51.0	3.0	-0.4
PFH (S-Go) (mm)	81.5	79.0	4.5	0.6
Wits Appraisal (mm)	6.1	-1.0	1.0	7.1 *****
Teeth				
Overjet (mm)	3.7	2.5	2.5	0.5
Overbite (mm)	0.9	2.5	2.0	-0.8
U1 - Maxillary Plane (°)	109.7	110.0	5.0	-0.1
IMPA (L1-MP) (°)	90.1	95.0	7.0	-0.7
Interincisal Angle (U1-L1) (°)	123.9	130.0	6.0	-1.0 *
L1 Protrusion (L1-APo) (mm)	1.7	2.7	1.7	-0.6
L1 - Facial Plane (L1-NPo) (mm)	4.4	3.8	2.0	0.3
Soft Tissues				
Upper Lip to E-Plane (mm)	-4.2	3.7	2.0	-4.0 *****
Lower Lip to E-Plane (mm)	-3.3	-2.0	2.0	-0.7
Nasolabial Angle (CoI-Sn-UL) (°)	97.6	102.0	8.0	-0.6
Chin Thickness (Pg-Fg') (mm)	13.0	12.4	3.5	0.2
B - NPo (mm)	-3.2	-2.0	2.0	-0.6
L1 - MP (LADH) (mm)	44.7	40.0	3.0	1.6 *

FIGURE 5: Shown cephalometric superimposing.



DISCUSSION:

The rule of thumb was taught in different orthodontic schools to refer the patient for orthognathic surgery whenever the overjet was more than 9 mm. One has to consider that such rules were correct while using the classical appliances and mechanics which caused high range of anchorage loss ¹¹. But with the introduction of modern anchorage means as TADs and modern mechanics that allowed more anchorage preservation, allowed the clinician to treat more cases without surgical option. The camouflage option was developed to gain ideal occlusion on skeletal bases that were not ideal ^{12,13}. The concept was interpreted by the clinicians into two major categories, the functional orthodontists insisted on achieving ideal occlusion with normal torque of upper and lower incisors or else, they choose to refer the patient to surgery ^{14,15}. The second stream was the esthetic orthodontists who focused on improving the smile and focusing to solve the chief complaint of the patient while accepting wider range of torquing angulations up to 10 degrees more or less than the normal range ^{16,17,18}. The conflict between the two streams was evident till recent years were new modalities and mechanics were introduced that allowed both aims to be fulfilled. Now we can treat wider range of malocclusion on camouflage bases without violating the normal range of inclination of upper or lower incisors ^{19,20}. In the case presented above, the clinician was able to treat that patient through camouflage route and achieved ideal occlusion with normal torquing inclination of the upper and lower incisors at the same time. The esthetic section of the plan was achieved and chief complaint of the patient was fulfilled with high improvement in the smile esthetics provided.

CONCLUSION:

The use of TADs and the careful control of mechanics with low grade of retraction forces proceeded by clear planning allowed to solve overjet more than 9 mm while camouflaging the skeletal class II bases.

DATA AVAILABILITY:

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest

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