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Non-Extraction Treatment of a Class III Skeletal Case

By Bulmario Gonzalez, DDS, IBO

Abstract: *Adult Class III Skeletal treatment options have generally included some form of surgery (Maxillary advancement in midface deficient cases and/or Mandibular set-back). This article discusses non-surgical treatment of an adult patient using the combined concepts of mandibular molar distalization enhanced with TADS and non-extraction comouflage dental correction through maxillary incisor protraction and mandibular incisor lingualization."*

One of the most challenging skeletal types to treat is the adult Class III skeletal in its various manifestations: 1) Normal maxillary position with mandibular prognathism, 2) Retrognathic maxillary position with a normal mandibular position and 3) Retrognathic maxillary position with prognathic mandible. The treatment for this varied group almost invariably includes discussion of the surgical/orthodontic team approach. However, the morbidity, cost and relapse associated with the surgical approach, as we will see, have led to many creative non-surgical alternatives that have given the treating doctor and patient satisfactory results.

A non-surgical treatment option for Class III cases is protraction therapy but most researchers seem to agree that beyond the age of twelve[1] this treatment has little to no effect; the most effective timing seems to be in the mixed to late mixed dentition stage.[2]

Another question that needs to be answered is how does chincup therapy work? Is the maxilla only being "protracted" as the name implies? What about the consequence to the TMJ complex in a developing patient? Newton's third law of motion taught us that for every force exerted in a direction there is an equal and opposite force being exerted in the opposite direction; the opposite is the TMJ complex. Treatment results clearly demonstrate that patients receiving protraction therapy with a chincup will end treatment with condylar necks bent forward and glenoid fossas wider and deeper.[3] It would appear that by anatomical design that the weaker part of the mandible would be the condylar neck, thus the area that receives the brunt of the protractive force.

The other obvious concern, but on which this author found no references yet, is the potential for real damage to the disc and its attachments; this should be a special concern due to the fact that those who advocate the use of protraction "expect" that this will include nighttime wear to get to the prescribed 14hr/day use, but when asleep the patient cannot "protect" his/her TMJ, and thus the potential for damage.

The surgical treatment alternative in conjunction with orthodontic treatment needs to be part of our "arsenal" and thus part of our treatment discussion. Who we refer our patients to for such a procedure merits careful consideration. Mandibular set-back surgery, as any other surgical procedure has morbidity, cost and relapse factors. Relapse is a concept that in orthodontics we need to become "intimately" acquainted with; a study found that after an average correction of 7mm of set-back surgical correction there was a 21% relapse after one year.[4] Mandibular set-back surgery has relapse but most importantly this procedure can have deleterious effects on the patients' airway. Some of the consequences are a narrowing of the airway that has also been linked to a post-treatment development of OSA (Obstructive Sleep Apnea).[5] Not only has the airway decreased after surgery, but in another study it continued to decrease to a dimension smaller that the pre-operative airway![6]

The case that will be demonstrated in this paper is that of an adult female patient who came seeking a non-surgical alternative. It employs the concept of "Lower Molar Distalization" with the MDX 2000 series (Dynaflex Laboratories), Class III mechanics, and enhanced anchorage using TADS both anteriorly and

posteriorly. Since the treatment plan, as will be seen, involved fixed appliances, a treatment goal was to accomplish a non-extraction type of camouflage therapy, through targeting a deeper overbite[7] and with continuous Class III elastics protract the upper incisors and lingualize the lowers[8, 1] to accomplish a more desirable correction.

The non-surgical treatment options include the traditional camouflage therapy involving extraction of the upper 5's and the lower 4's with the concomitant dental compensation. However, the non-extraction alternatives challenge the clinician in ways that no other skeletal case does. Molar Distalization involves planning the mechanics (force systems) carefully, always keeping in mind our promise to "do no harm" and we need to keep in mind father Newton's advice at all times.

TADS have been in use around the world for a lot longer than the three years or so, depending on when you read this article, in which they have been in FDA approved status. This author took the first course offered in the West coast with Dr Vanarsdall, in October 2005 at UCLA.

Molar distalizers without regard for proper anchorage can have adverse results and simply put, the results desired will never crystallize. The loss of anterior anchorage is a fact that until the advent of the use of TADS was a detrimental inevitability at 8-10 months into treatment. Miniscrews for anchorage have been established as effective for anchorage support and the placement between the roots[2] as this case example will demonstrate; additionally, TADS have been used for intrusion and extrusion, to reposition malposed teeth, and thus correct an undesirable occlusion and also to provide orthopedic anchorage.[3,13]

Molar distalization and protraction can be difficult orthodontic movements to accomplish. However, with the advent of TADS distalization and protraction[4] have been more manageable to accomplish. The simple idea illustrated in the case here presented is the initial placement of a molar distalizers, like the MDX 2000, and at the same appointment placement of two 6mm long, 1.6mm in diameter (RMO), between the 4-5's and then with the use of SS ligature tie join the TAD to the band/bracket thereby "holding" this part of the force system in a more "secure" manner. This will allow the force to be manifested more effectively distal, perhaps 70% distal and 30% anterior; without TADS the ratio is simply 50/50 (this is a clinical opinion that this author has not seen quantified). The subsequent placement of another set of two TADS in the area buccal to the 7's at the completion of "maximum" distalization will allow the clinician to maximally maintain and prevent as much of the relapse that always occurs with mass orthodontic movements. A further thought that was instituted in this patient, considering the possibility of not having to place TADS "twice," was that of placing a set of only two buccal to the 7's at the delivery of the distalizer, and from there, with SS ligature, tie the anterior bracket and anchor our force system; this gave us good results and is a treatment change that we have used with a "good" degree of success.

CLINICAL EXAMINATION

Clinical evaluations are as varied as the individuals performing the examination; nevertheless, they should give us information to arrive at a comprehensive diagnosis and subsequent treatment plan. This author's evaluation is "simple" by most standards. For all cases these are some of the questions that we try to answer:

1) **TMJ:** ROM? Excursive? Noises? Pain? Trigger points?
2) **AIRWAY:** Nasal? Mouth? Both?
3) **GROWTH:** Stage? Direction?
4) **SKELETAL:** Vertical? Sagittal?
5) **DENTAL:** Molar? Cuspid? U-Incisor angulation? L-Incisor angulation?
6) **FACIAL FORM:** Brachycephalic? Mesocephalic? Dolichocephalic?
7) **SOFT-TISSUE:** E-Plane? S-Line? Nasolabial angle?

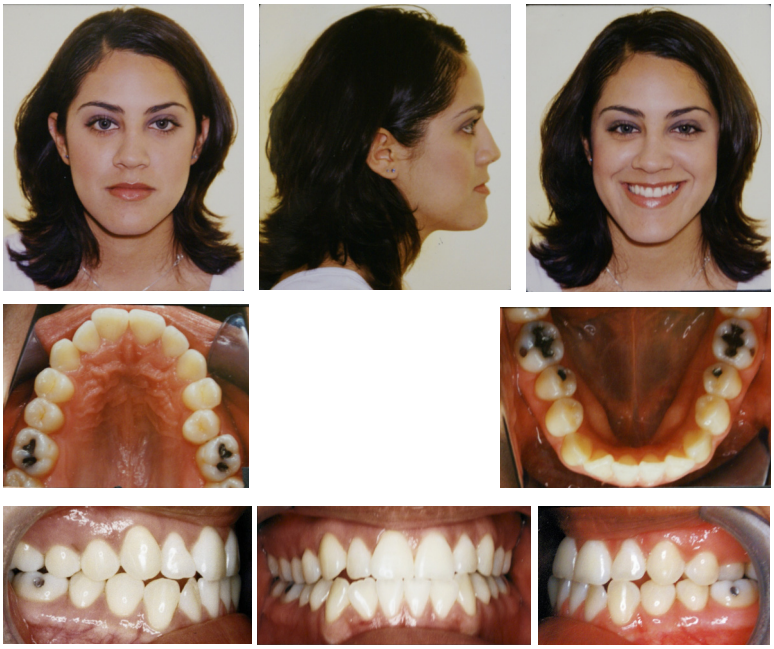


Figure 1: PRE-TREATMENT PHOTOS

CASE DATA:

PATIENT: ADULT FEMALE, 19.2 YEARS
CHIEF COMPLAINT: ANTERIOR OPEN BITE AND DESIRED NON-SURGICAL CORRECTION
MED HX: NO MEDICAL CONCERNS
DENTAL HX: NO DECAY, PRIOR AMALGAM RESTORATIONS, SEVERE CLASS III
PERIODONTAL: GOOD GINGIVAL HEALTH
AIRWAY: NASAL BREATHER, FAIR LIP SEAL, NO TONSILS
MUSCLE PALPATION: NO TRIGGER POINTS DETECTED
FACIAL FORM: DOLICHOCEPHALIC, ASYMMETRIC (SKELETAL MIDLINE TO RIGHT)
TMJ: ROM: 53 +1 = 54 mm, EXCURSIVE ~10 mm, NO JOINT SOUNDS, NO PAIN

(RIGHT) ASYMMETRY (LEFT)

The above "asymmetry" photos is a simple technique that this author has used for several years; using PowerPoint, you simply bisect the facial photo, then separate right and left sides, duplicate each side and then flip each duplicated side and "voila!" you now have the right face and the left face which is a great way to see the asymmetric parts. In this case the right ear, the closer right eye to the midline, the broader right nare, the more prominent right massetteric area, and of course the more prominently deviated right menton area are more clearly seen.

DIAGNOSIS

Based on the 7 questions posed earlier, this patient manifests no apparent TMJD, normal airway function, a vertical growth direction "masking" the mandibular prognathism, vertically long, sagittally Class III skeletal, right/left molar and cuspids in Class III relation (more severe on the left side), U/L incisor angulation relatively normal, dolichocephalic facial form, with nasolabial angle within norm, upper lip slightly behind and lower lip slightly ahead of the S-Line. Additionally patient has right and left lateral anterior open bite and cross bite and posterior cross bite; due to a very minimal overbite (1mm) this case is

PRE-TX CEPHALOMETRICS:

CLASS III SKELETAL CLASSIFICATION: ANB 0, WITS -6.5, and MODIFIED HARVOLD DIFFERENTIAL 39mm
LONG LOWER FACE HEIGHT: 71 mm, 58%
SLIGHLTY HIGH MANDIBULAR PLANE: TO SN 34.5 DEGREES, to FH 20.5
INCISOR ANGULATION: NORMAL U-INCISOR (to NS 112, U-INC to NA 6mm), SLIGHTLY LINGUAL LOWER INCISOR (IMPA 83, L-INC to NB 5mm)
HORIZONTAL GROWTH DIRECTION: Y-AXIS to SN 65, to FH 52, Facial-Axis 100

		(NORM)
Wits Appraisal (mm)	-6.3	-1.0
Mx/Md Diff (Co-Gn - Co-ANS) (mm)	38.7	14.0
ANB (°)	-0.2	1.6
Skeletal Class (mm)	-9.2	N/A
Facial Axis-Ricketts (NaBa-PtGn)(°)	100.3	90.0
Y-Axis (SGn-SN) (°)	65.3	67.0
Y-Axis — Downs (SGn-FH) (°)	52.0	61.4
FMA (MP-FH) (°)	20.3	26.0
Anterior Facial Ht (ANS-Me)(mm)	71.0	55.0
SN-GoGn (°)	34.5	32.9
Interincisal Angle (U1-L1) (°)	131.7	130.0
L1 Protrusion (L1-APo) (mm)	3.4	2.7
IMPA (L1-MP) (°)	82.7	95.0
U1 - SN (°)	111.9	101.7
U1 - NA (mm)	5.8	4.3
Nasal Length (Sn-Pn) (mm)	16.8	N/A
Nasolabial Angle (Col-Sn-UL) (°)	102.7	102.0
Upper Lip - S Line (mm)	-0.6	0.0
Lower Lip - S Line (mm)	2.6	0.0
Lower Lip to E-Plane (mm)	0.6	-2.0
Upper Lip to E-Plane (mm)	-4.2	1.2

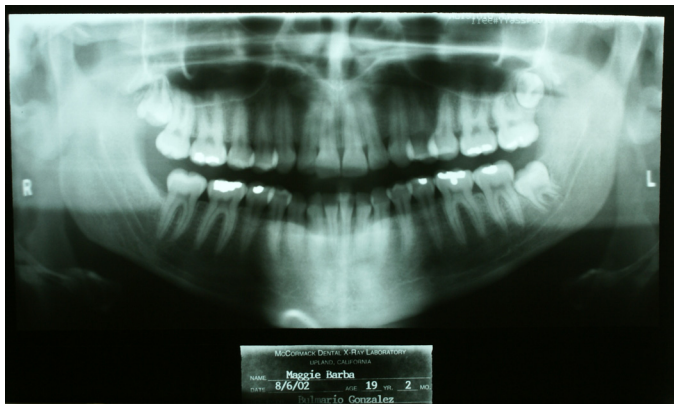


Figure 3: Pre-Treatment Radiographs

considered to have an "open bite tendency," which means that in setting up the force mechanics the likely development of an open bite needs to be countered.

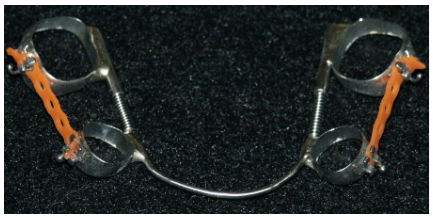
TREATMENT PLAN:

What realistic attainable treatment goals are the clinician and patient trying to accomplish? This author determines skeletal goals first and then dental goals last.

Maxilla: "Round-out" arch form with fixed upper appliances .022 Rx (high torque) and set-up "bite closing" mechanics as well as setting-up arch for class III mechanics.

Mandible: Two Molar Distalization Appliances, this case only the second appliance's anchorage

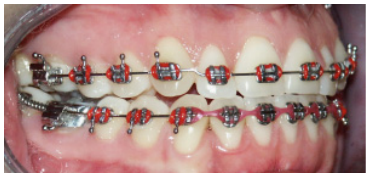
MJX 2000 SERIES
(Jack screw)



MDX 2000 SERIES (No jack screw)

MX ARCH IN TX

MD ARCH IN TX W/FIRST MDX
(Double finger rests)



END OF FIRST PHASE (14 MONTHS)

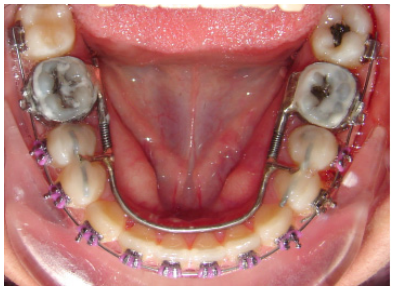
enhanced by TADS (MDX 2000 Series, Dynaflex Lab), and fixed appliances .022 Rx (-6° anterior torque, 0° torque L-3's) and Class III elastics. Most importantly, the vertical dimension needs to remain as unchanged (no further opening) as much as possible. Difficult when the treatment proposed involves distalization, which can definitely further open the bite.

PROGRESS CEPHALOMETRICS (14 mos):

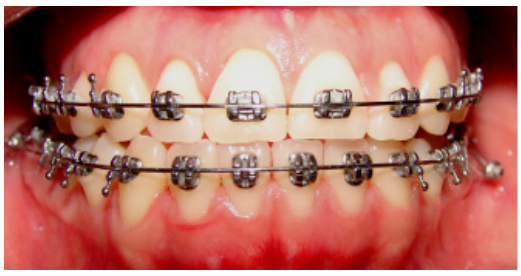
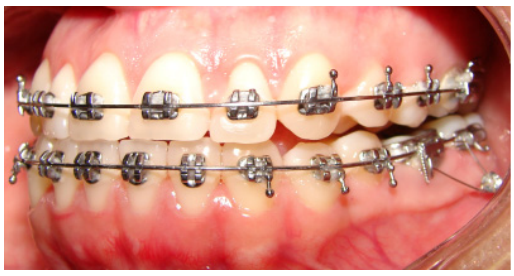
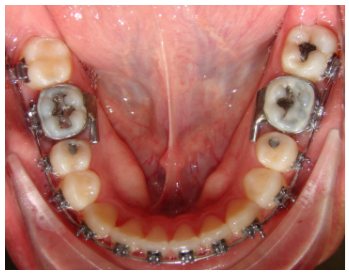
CLASS III SKELETAL CLASSIFICATION: ANB 0, WITS -2, and MODIFIED HARVOLD DIFFERENTIAL 38mm
LONG LOWER FACE HEIGHT: 70 mm, 58%
HIGH MANDIBULAR PLANE: TO SN 34.5 DEGREES, to FH 26
INCISOR ANGULATION: NORMAL U-INCISOR (to NS 115, U-INC to NA 5mm), SLIGHTLY LINGUAL LOWER INCISOR (IMPA 83, L-INC to NB 5mm)
VERTICAL GROWTH DIRECTION: Y-AXIS to SN 67

		(NORM)
Wits Appraisal (mm)	-1.9	-1.0
Mx/Md Diff (Co-Gn - Co-ANS) (mm)	37.9	14.
ANB (°)	0.6	1.
Skeletal Class (mm)	-6.8	N/A
Facial Axis-Ricketts (NaBa-PtGn)(°)	97.0	90
Y-Axis (SGn-SN) (°)	66.7	67.0
Y-Axis — Downs (SGn-FH) (°)	54.3	61.4
Anterior Facial Ht (ANS-Me)(mm)	69.6	55.0
FMA (MP-FH) (°)	26.1	26.0
SN-GoGn (°)	34.6	32.9
Interincisal Angle (U1-L1) (°)	123.9	130.0
L1 Protrusion (L1-APo) (mm)	3.3	2.7
IMPA (L1-MP) (°)	82.9	95.0
U1 - SN (°)	114.6	101.7
U1 - NA (mm)	5.0	4.3
Nasal Length (Sn-Pn) (mm)	15.1	N/A
Nasolabial Angle (Col-Sn-UL) (°)	104.4	102.0
Upper Lip - S Line (mm)	-2.5	0.0
Lower Lip - S Line (mm)	0.9	0.0
Lower Lip to E-Plane (mm)	-1.2	-2.0
Upper Lip to E-Plane (mm)	-6.1	1.2

The progress records serve to re-evaluate our treatment goals, skeletally, dentally, etc. as well as helping us to critically re-evaluate the placement of our mechanics system (i.e. bracket placement); we can take a "fresh" look at our molar, cuspid, midline and marginal ridge alignment and make any necessary corrections as our treatment hopefully travels toward a successful finish line. At this juncture, our cephalometric analysis suggests that our vertical is relatively unchanged, one of our pre-treatment goals, this has been maintained due to the nice "rigid" design of the MDX 2000 in promoting molar "bodily" movement. Dentally, it

PHOTOS AT THE START OF SECOND MDX 2000 AND TAD PLACEMENT 4/5 AREA

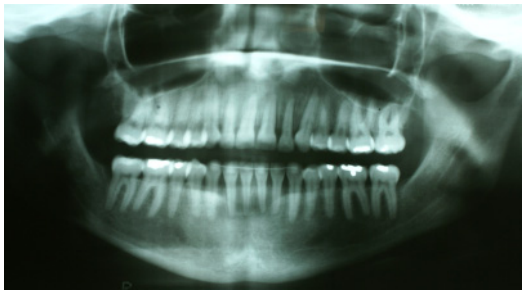




PHOTOS AT PLACEMENT OF DISTAL TAD TO ENHANCE AND MAINTAIN DISTALIZATION AT THE END OF MAXIMUM DISTALIZATION TO "MAINTAIN" MOLAR POSITION









FINAL RESULTS (24 MONTHS)

is confirmed that the upper incisor has protracted and the lower has lingualized, as expected.

This was the time that the second the second MDX 2000 was deemed necessary, with the placement of the TADS with this new appliance. There was a 3 month "wait" between appliances to allow for "bone healing" between the first and second MDX.

FINAL CEPHALOMETRICS:

CLASS I SKELETAL CLASSIFICATION: ANB 1, WITS -2.5, and MODIFIED HARVOLD DIFFERENTIAL 39 mm
LONG LOWER FACE HEIGHT: 73 mm, 58%
HIGH MANDIBULAR PLANE: TO SN 34.5 DEGREES, to FH 25
INCISOR ANGULATION: FLARED U-INCISOR (to NS 116, U-INC to NA 7 mm), LINGUAL LOWER INCISOR (IMPA 75, L-INC to NB 3 mm)
VERTICAL GROWTH DIRECTION: Y-AXIS to SN 66

		(NORM)
Wits Appraisal (mm)	-2.5	-1.0
Mx/Md Diff (mm)	39.1	14.
ANB(°)	0.6	1.
Skeletal Class (mm)	-9.2	N/A
Facial Axis-Ricketts (NaBa-PtGn) (°)	97.1	90.0
Y-Axis (SGn-SN) (°)	65.6	67.0
Y-Axis — Downs (SGn-FH) (°)	52.6	61.4
SN-GoGn (°)	34.8	32.9
Anterior Facial Ht (ANS-Me) (mm)	73.1	55.0
FMA (MP-FH) (°)	25.1	26.0
Interincisal Angle (U1-L1) (°)	130.5	130.0
L1 Protrusion (L1-APo) (mm)	1.6	2.7
IMPA (L1-MP) (°)	75.2	95.0
U1 - SN (°)	116.2	101.7
U1 - NA (mm)	6.8	4.3
L1- NB (mm)	3.2	4.3
Nasal Length (Sn-Pn) (mm)	16.8	N/A
Nasolabial Angle (Col-Sn-UL) (°)	114.2	102.0
Upper Lip - S Line (mm)	-3.0	0.0
Lower Lip - S Line (mm)	-1.4	0.0
Lower Lip to E-Plane (mm)	-3.6	-2.0
Upper Lip to E-Plane (mm)	-6.5	1.2

An honest evaluation of our accomplished treatment results which greatly depend on teamwork between clinician, patient and degree of difficulty of each case needs to be done; this is how we continue to learn with every case that we choose to treat. Relapse is an issue that all treating clinicians need to be at "peace" with; many Class III Skeletal cases have an airway component that affects tongue position ("low") which in turn broadens the lower arch and allows the upper arch to constrict before and after treatment.

Cephalometrically, comparison between the skeletal measurements MHD clearly demonstrate no change in the mandibular/maxillary length differential (none expected), the ANB also remained unchanged, the skeletal measurement with the most change is the WITS appraisal and first glance someone could draw the wrong conclusion, if this was the only measurement looked at, that we have "changed" the skeletal classification or that our treatment somehow "improved" the skeletal class; but it is well understood that WITS is not the best measurement to compare before and after treatment classification because of the obvious effect of how the occlusal plane "changes" this measurement and also how the change in upper and lower incisor torque also affects the "position" of A and B points without any of this reflecting any skeletal change at all. The LFH appears to have increased ~2mm, not significant and desired little to no change, since we began with a significant long lower face that we did not want to increase further; all other measurements Y-axis to SN, to FH and Facial-axis seem to also support this finding. The incisor angulations basically changed as desired; the interincisal angulation remained about the same but this is due to the protraction of the upper incisors and the lingualization of the lower incisors; thus no net change interincisally.

The soft tissue profile looks acceptable, however close examination of the nasolabial angle before treatment (103°) and after treatment (114°) and looking at the photos we can clearly see the loss of upper lip support a direct result of the upper incisor protraction and the lower lip also retracted likely also due to the lower incisor ligualization.

We can see in the two-year photos the evidence of relapse in the bicuspid areas and in the posterior segments. However, this case's general results are acceptable and most of the credit is given to a superb patient that followed directions during and after treatment. If this case walked into my office today I would likely treat her in a similar manner; perhaps the only further discussion might be consideration to extraction of lower second molars to facilitate the distalization of the lower 6's.

"Man approaches the unattainable truth, through a succession of errors." -Aldous Huxley

TWO YEAR FOLLOW-UP PHOTOS

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