

Class III Malocclusion Treated Non-Surgically with Invisalign, Mandibular Fixed Appliances and Mandibular TADs

by Randy J. Weinstein, DDS

History

A 25-year-old Taiwanese male patient presented with the chief complaint of, “My new girlfriend recommended fixing my bite,” and, “More of my upper and lower teeth should touch.” The medical history was unremarkable. The dental history revealed that, as a teenager, he received non-extraction orthodontic therapy for an unknown correction with removable appliance.

Clinical findings

Clinical findings revealed neither signs nor symptoms of temporomandibular joint dysfunction. The maxillary dental midline was coincident to the facial midline, and the mandibular midline was deviated 2mm to the left due to a functional shift. The lower facial third was increased.

The clinical intraoral exam revealed the patient had a Class III malocclusion with 0mm to 2mm overjet, 0mm to -2mm overbite, and a crossbite extending from the maxillary lateral incisors to the premolars. Due to the crossbite of the maxillary right lateral, interarch contact was limited to the lateral and second molars only.

There was 7mm of crowding in the maxillary arch, with a marked mid-arch constriction. There was minimal crowding (3mm) in the mandibular arch. Dental

measurements revealed no significant Bolton discrepancy (77.9 percent).

The patient had received previous dental treatment (one crown, and a few occlusal restorations) and had regular dental visits. Although there was no gingival display when the patient was smiling, about 70 percent of the maxillary incisors were displayed. About eight maxillary teeth were shown with buccal corridors within normal limits (Fig. 1).

Cephalometric analysis

A lateral cephalometric radiograph revealed a significant Class III skeletal discrepancy (SNA: 78.3 degrees, SNB: 80.1 degrees, ANB: -1.7 degrees, Wits Appraisal: 7.1mm). The patient exhibited a prognathic profile, a slight midface deficiency, with mildly increased nasolabial

angle, shallow labio-mentolabial sulcus and prominent lower lip.

No mentalis strain was present. Although facial evaluation revealed mandibular prognathism and possibly maxillary deficiency (Fig. 2), a proportional analysis, such as the modified Moorrees mesh diagram analysis using the Chinese adult norms, was computed (Fig. 3). This diagram reveals proclined maxillary incisors (U1-FH: 130.2 degrees) with a mandibular prognathism (L1-APo: 9.5mm). The mandibular incisors exhibit an almost normal inclination (IMPA: 85.3 degrees).

“Facial disharmony can be determined most efficiently by proportional analysis.”¹ The modified Moorrees mesh diagram analysis utilizes an individualized norm for the patient and provides a graphical guide to assess the patient’s hard and soft



Fig. 1



Fig. 2: Overlay

tissue. This diagram is particularly useful in surgical correction to achieve a harmonious facial balance. Instead of objectively evaluating these structures individually via cephalometric values, one can readily obtain an overall visual of these discrepancies to determine structures that are not proportionate.

Given the major discrepancies between the mesh norm and the patient's tracing, "regional" registrations or superimpositions were more diagnostic in regard to the lower face (Figs. 4a & 4b).

Manipulating the patient's tracing over his or her individual norm can be helpful in formulating alternate treatment plans to better assess the dysmorphic aspects of the face. Superimposing the upper lip along the occlusal plane (Fig. 4a) allows one to generate relative conclusions. This shows maxillary incisor proclination and a prognathic mandible.

However, this registration does not tell if the maxilla is retrognathic—yet, it is in normal relation to the tip of the nose. Since the nose will not be changed, the positions of the upper lip and present maxilla appear acceptable. However, if the upper incisors were decompensated (uprighted), the upper lip would be posteriorly displaced, warranting maxillary advancement.

Registration on the maxillary incisor (Fig. 4b) demonstrates that the position of the mandibular incisor is in proper inclination. Therefore, if there is surgery, there will be no change in position of the mandibular incisor. If there is no surgery, the tip of the mandibular incisor should be retroclined (respecting the hard tissue's conditions) to create a positive overjet closer to the projected normal mesh tip of the mandibular incisor.

Panoramic radiograph analysis

All third molars were congenitally missing. There was evidence of a post/core and crown on the maxillary left second premolar as well as some molar restorations.

Treatment objectives

The treatment objectives were to eliminate the anterior crossbite, align the

maxillary anterior teeth, obtain a positive overbite and overjet while creating a more functional occlusion and reduce the mandibular prognathism.

Recommended treatment

Orthognathic surgery following orthodontic decompensation of the dental arches, including extraction of maxillary premolars, was suggested to the patient to address the underlying Class III skeletal discrepancy. The patient declined this treatment.

Alternate treatment plan

An alternative option was presented to the patient. With this option, the dental malocclusion would be corrected and the skeletal discrepancy camouflaged. It included extraction of the mandibular first premolars and placement of mini screws for anchorage. At the patient's request, the maxillary arch was treated with the Invisalign system, and fixed appliances in the mandibular arch with a 0.022 edgewise appliance.

Treatment progress

Several ClinChecks were requested to explore treatment options and reviewed with the patient. It was agreed to extract the two lower first premolars, with possible anterior interproximal reduction. Expansion and proclination were tolerated to align and develop the maxillary dental arch, and allow for acceptable occlusion with the mandibular arch (Fig. 5).

Nineteen maxillary aligners were initially fabricated and monitored/delivered on an every-other-month basis to the patient. The patient was instructed to wear the aligners 22 hours/day and change them at two-week intervals. After 9.5 months, the maxillary arch was aligned, expanded, and more esthetic. The patient continued to wear aligner 19 as a "retainer" every night.

At the same time, fixed appliances were bonded first molar to first molar on the lower arch. A 0.014 NiTi wire was first inserted, and after four months a 0.018x0.025 SS archwire was placed.

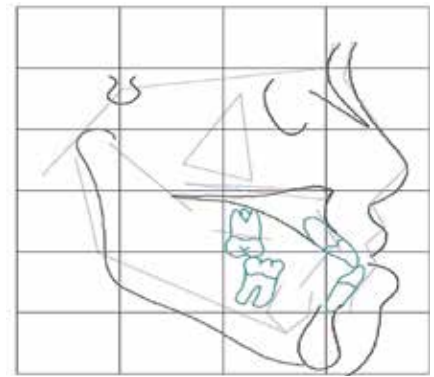


Fig. 3: Modified Moorrees Mesh Diagram Analysis

Figs. 4a & 4b: Regional Registrations of the Modified Moorrees Mesh Diagram Analysis

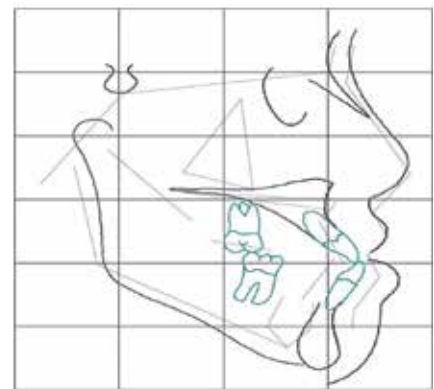


Fig. 4a: Registration on upper lip along occlusal plane

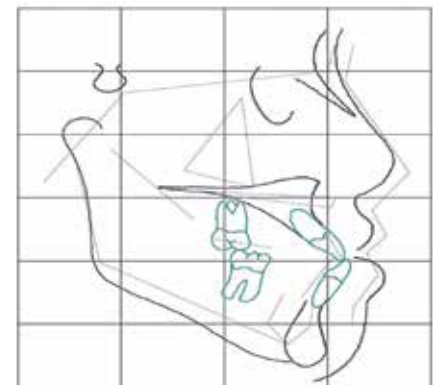


Fig. 4b: Registration on maxillary incisor



Fig. 5: Blue teeth denote stage 0. White teeth stage 19 (Grid scale 1mm)



Fig. 6: Taken following status/post TAD placement



Fig. 7: Mid-course correction records submitted to Align Technology (Note: excessive tipping of the lower anterior teeth and overjet)



Fig. 8: Blue teeth denote stage 0, White teeth stage 22 (IPR U3-3 was recommended, but patient declined.)

TADs were inserted after topical and local infiltration. Bone sounding was performed mesial to the mandibular first molars, and around the level of the mucogingival junction with a periodontal probe. Six-millimeter VectorTAS mini-screws (Ormco) TAD were selected and inserted.

VectorTAS crimpable posts were secured distal to the mandibular lateral incisors, and a VectorTAS single delta 10mm 150g spring with swivel was attached from each TAD to a crimpable post (Fig. 6).

The patient was seen every eight weeks for progress evaluation. Once a normal canine relationship was achieved (about six months), the archwire was reduced with a carbide bur, distal to the lower canines to reduce posterior friction. Elastic chains from second premolar to second premolar were used to close the remaining spaces distal to the canines (about three months). TADs were removed when canines and second premolars and elastic chains were used to finish the space closure.

At this point, the patient's facial appearance had improved and the anterior dental relationship had been corrected. There was, however, excessive overjet, and the two dental arches were in need of coordination. At the patient's request, the finishing phase of treatment were performed with aligners, and the fixed appliances removed (Fig. 7).

To improve the occlusion, arch coordination and power ridges were requested for the lower incisors to improve their angulations (torque). Precision cuts on the maxillary canines and button cutouts on the lower second molars were used with Class II elastics, and a Class II jump simulation was prescribed. Maxillary interproximal reduction was considered, but not incorporated, since the patient refused this treatment (Fig. 8). Bonded attachments were necessary to achieve the anticipated movements.

Twenty-one maxillary and mandibular trays were necessary to complete treatment. Buttons were bonded on L7's after the third aligners and bilateral ¼-inch 4.5oz Class II elastics were started. All attachments were

removed after completion of aligner 15 because of the patient's wedding. Elastics were continued and the remaining aligners delivered. Buttons were removed after 10.5 months and final records taken (Fig. 9).

Retention included full-coverage 0.040 Trutain retainers for both arches to be worn at night only. The three-month follow-up was unremarkable and the nine-month retainer check revealed a stable occlusion. With no change at the two-year check, the patient was instructed to wear retainers every other night.

Treatment outcomes

The treatment revealed an acceptable facial esthetic and good occlusion. Lateral cephalometric superimpositions (Fig. 10) demonstrate a reduction of the lower-lip prominence as a result of retroclination and retrusion of the mandibular incisors.

Cephalometric measurements showed many measurable changes as well. The dentoalveolar complex showed significant changes in protrusion and angulation of the mandibular incisors: the lower incisors were retracted more than 7mm comparing to the A-Pog line and their angulation reduced by about 17 degrees compared to IMPA. The Wits Appraisal improved positively by 4.2mm.

Discussion

The overall treatment outcome of this malocclusion is excellent, given that the treatment option indicating orthognathic surgery had been declined and that the treatment plan camouflaged a significant skeletal discrepancy. The patient would have benefitted from a more balanced facial appearance and most likely better occlusion. The patient's chief complaint was, however, corrected and most objectives were met, including an improved smile. The occlusion following extraction of two lower first premolars is very good. Although one could argue that a molar mesiocclusion (Class III) is not conducive to a good posterior dental interdigitation, the patient's occlusion is acceptable and the contacts are bilaterally balanced.

There is an excellent root parallelism



Fig. 9: Final records



Fig. 10: Overall superimposition (Initial - Black, Progress - Blue, Final - Red)

of the teeth adjacent to the extraction spaces of the extraction space despite the short time span of space closure and finishing. It is possible that shorter intervals between appointment and earlier removal of the TADs may have limited the amount of over-retraction of the lower incisors and minimized the amount of torque necessary during the second phase.

This treatment plan provided an excellent outcome and benefit to the patient, despite the numerous restrictions he imposed on the treatment plan and appliances to be used. In this case, TADs helped control the anchorage to allow for maximum mandibular incisor retraction in this prognathic patient. There was strong control of the vertical dimension; it did not increase. Perhaps this was due to the occlusal coverage that was present during aligner therapy.

Occlusal harmony is only one piece of the puzzle. One cannot ignore the resultant facial changes. "Facial disharmony can be determined most efficiently by proportional analysis."¹ The modified Moorrees mesh diagram analysis utilizes an individualized norm for the patient and provides a graphical guide to assess the patient's hard and soft tissue. This diagram is particularly useful in surgical correction to achieve a harmonious facial balance. Instead of objectively evaluating these structures individually via cephalometric values, one can readily obtain an overall visual of these discrepancies to determine structures that are not proportionate.

Conclusion

The literature has shown many publications on maxillary camouflage treatment with extraction of the upper first premolars with the aid of TADs. However, this case report focuses on the opposite. The treatment started with maxillary Invisalign and mandibular fixed appliances. A mid-course correction of the maxillary and mandibular Invisalign to finish and detail was a unique approach to satisfy the aesthetic restrictions set forth by the patient.

Although this Class III skeletal patient declined an orthognathic treatment, it allowed an outside-of-the-box approach: mandibular camouflage treatment with extraction of the mandibular first premolars for retraction utilizing TADs. This

case presentation // feature

mandibular camouflage technique was possible due to careful patient selection: a mild to moderate prognathism with mandibular anterior crowding.

Cases like these encourage me to reflect on how much of a positive impact our profession has on the lives of those patients (and their families) who have the dedication and ambition to do whatever it takes to reach success. Together—both patient and doctor—we joined forces and worked as a team to accomplish our goals. It was a privilege and honor seeing the remarkable transformation in this

patient's self-confidence. If you treat solely on correction of the malocclusion—you win, you lose. However if you treat the person, I guarantee you, no matter what the outcome is, you'll always prevail! (Patch Adams, 1998)

Acknowledgement

The author would like to thankfully acknowledge his colleague Efraim G. Zak, DDS, for our collaborative discussions, through which new concepts were developed. Further appreciation is extended to Joseph G. Ghafari, DMD, for guidance,

critical review and recommendations regarding the modified mesh analysis. Online cephalometric services were provided by cephX. And of course, I extend special thanks to my outstanding family for their love and support (including our dog, Tad). ■

References

1. Ghafari JG. The Moorrees mesh diagram: proportionate analysis of the human face. In: *Radiographic Cephalometry - From Basics to 3-D Imaging*. Second edition. A. Jacobson and R. L. Jacobson (editors). Chicago: Quintessence Publishing Co. 161-184, 2006.
2. Patch Adams. Dir. Tom Shadyac. Perf. Robin Williams. Universal Pictures, 1998. Movie.

Questions for the author? Comment on this article at Orthotown.com/magazine.aspx.

Author Bio



Dr. Randy J. Weinstein graduated from Lehigh University and then pursued his dental degree from NYU College of Dentistry. After completing a general practice residency at Stony Brook University Hospital, he returned to NYU College of Dentistry Department of Orthodontics for his postgraduate studies. Currently, Weinstein is in private practice in orthodontics, in Queens and Long Island, New York. Weinstein is a member of the ADA, AAO, NESO, NYS Dental Association, as well as the Suffolk County Dental Society. When not debugging computers, he spends quality time with his wife, their dog, Tad, and family and friends.

Ad Index

Our advertisers make it possible for us to bring Orthotown to you free of charge. Almost all of the advertisers provide telephone numbers in their advertisements for your convenience and fast response. Our advertisers want to hear from you.

PG #	ADVERTISER	PG #	ADVERTISER
011	American Orthodontics	037	OrthoLync
017	Burleson Seminars	031	OrthoSelect, Inc.
009	Dolphin Imaging and Management Solutions	007	OrthoSynetics
023	Henry Schein Orthodontics	BC	Planmecca, Inc.
IBC	Henry Schein Orthodontics	045	Precision Plier Service
041	MidAtlantic Ortho	015	Quick Ceph System, Inc.
IFC	Ormco Corporation	013	Reliance Orthodontic Products
027, 029	Ortho2	005	Specialty Appliances, Inc.
001	OrthoAccel Technologies, Inc.	003	Ultradent Products, Inc.
019	OrthodonticMarketing.net		