

# Exploring the Possibilities of Treating Difficult Malocclusions Non-Surgically using the Tip-Edge Bracket System

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## Abstract

This article explores the clinical possibilities of treating other difficult malocclusions non-surgically using the Tip-Edge bracket appliance system. Three cases are presented to exhibit the versatility of the Tip-Edge bracket system.

*Key Words: Tip-Edge, Edgewise*

## Introduction

In 1986, Kesling and Rocke modified the Edgewise archwire slot [1]. They removed two diametrically opposed corners of the conventional Edgewise archwire slot, an alteration that enabled either mesial or distal crown tipping (*Figure 1*) [2,3].

The new design allowed teeth to tip and hence to move rapidly. Initial anterior bite opening and retraction were more readily achieved. The modification allowed for automatic variable anchorage when required, in one arch or the other or in both simultaneously [2]. The new bracket design combined the best qualities of its two predecessors, the ribbon arch and the Edgewise bracket. Anchorage reinforcement, for example by including second molars or by the use of a palatal bar, was found to be not needed. No second-order or tip-back bends were required to permit retraction. The incorporation of first, second and third order finishing prescriptions in the bracket slot provided automatic three-dimensional control [3].

Kesling claimed that the technique is ahead of its time and that it is the technique for the Twenty First Century [4]. He and other Tip Edge users have published numerous articles [6-10] on the ease of using this appliance and the successful outcome of applying this treatment modality.

Chamda and Evans in an in depth study in 2012 [11] retrospectively evaluated the skeletal, dental and profile changes that took place when a sample of Class II malocclusions were corrected using the Tip-Edge technique and with extraction of first premolars. Their research endorses the claim that the technique enables the correction of severe Class II maximum anchorage malocclusions without having to rely upon extra-oral anchorage or other additional anchorage devices.

This article explores the clinical possibilities of treating other difficult malocclusions non-surgically using the Tip-Edge bracket appliance system. Three cases are presented to exhibit the versatility of the Tip-Edge bracket system.

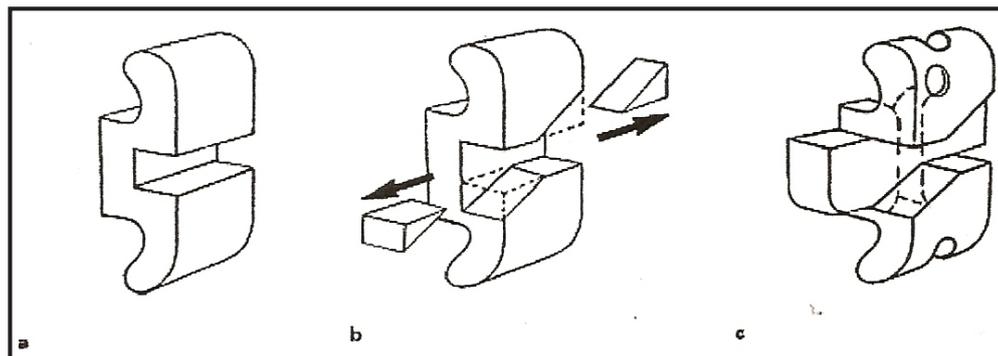
## Case 1

A seventeen-year old female was referred by her brother for an assessment for the correction of a severe Class III malocclusion. She had previous orthodontic treatment from an orthodontist who had extracted both the upper first premolars and levelled and aligned her teeth. She was then referred to a maxillofacial surgeon for correction of her severe skeletal base discrepancy. The patient was reluctant to undergo surgery and was then referred to the author's clinic for a non-surgical correction of her malocclusion.

A thorough intra, extra-oral and radiographic analysis was carried out (*Figures 2-4* and *Table 1*).

A diagnosis of a severe Class III malocclusion complicated by a maxillary deficiency, an anterior open bite, an anterior cross bite, a bilateral posterior skeletal crossbite, a tilted occlusal plane and crowding in the lower anterior inter-canine was region was made. The patient was advised that orthognathic surgery would be the optimal treatment in correcting such a difficult malocclusion. She refused the surgical option and requested an attempt at a non surgical correction. The patient was then advised that a full correction may not be attainable as the skeletal discrepancy was far too complex to correct with orthodontics alone. The treatment plan called for the extraction of the lower first molars.

The Tip-Edge bracket appliance system was placed and round 0.016 inch stainless steel upper and lower archwires



*Figure 1. Development of Tip-Edge bracket design.*



Figure 2. Extra and intra-oral pre-treatment photographs.

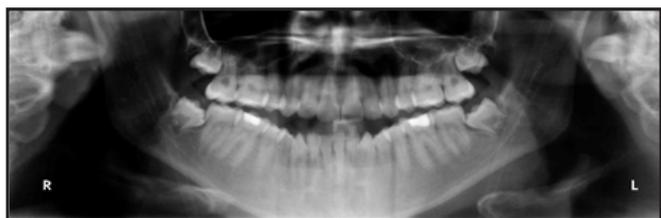


Figure 3. Pre-treatment panoramic radiograph.

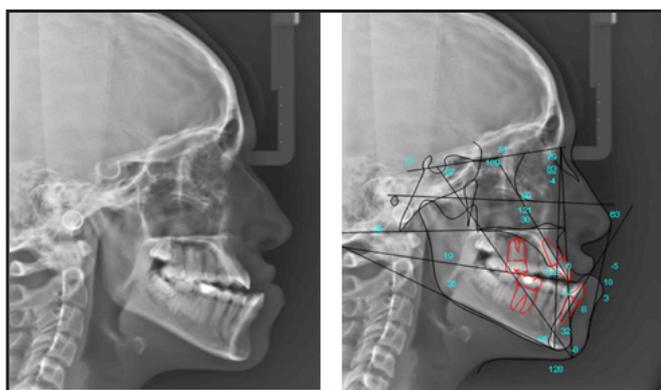


Figure 4. Pre-treatment lateral cephalograms.

were inserted. The patient was instructed to wear 2oz 5/16 inch Class III three elastics for at least twenty 23 hours/day (Figure 5).

After five months when the anterior crossbite was corrected a round 0.022 inch stainless steel lower archwire was inserted and size 5 E-links® were attached onto the circle of the archwire and hooks on the first molars to retract all the anterior teeth and to close all residual spaces. A rectangular 0.0215x0.0275 with an 8 degree built in torque\* (retroclination) stainless steel archwire was placed in the upper arch and a round 0.014 nitinol wire placed in the tunnel slot. The patient was told to wear 4oz 1/4 inch Class II elastics

Table 1. Cephalometric analysis.

Parameter	Pre-treatment	End of treatment	Norm	SD
SNA (°)	78.7	79.9	82	3.5
SNB (°)	83.2	81.5	80	3.4
ANB (°)	-4.5	-1.6	2.0	1.5
SND (°)	80.1	78.5	80	3
Upper Incisor to NA (mm)	6.4	6.1	4	2.7
Upper Incisor to NA (°)	30.2	29	22	5.7
Lower Incisor to NB (mm)	8.0	0.0	4.0	1.8
Lower Incisor to NB (°)	32.1	6.7	25	6
Pog-NB	2.4	-0.2	0	1.7
Interincisal Angle (°)	122.3	145.9	130	6
Occlusal plane to SN (°)	19.1	13.7	14	2.5
SN-GoGn (°)	35.3	36.5	32	5.2
Y-axis (°)	66.9	69.1	67	5.5
Lower incisor to Apo (mm)	10.4	1,1	1	1.7
Upper Lip to E-plane (mm)	-5.5	-5.2	-6	2
Lower Lip to E-plane (mm)	3.2	-0.4	-2	2
Wits (mm)	-13.7	-5.2	-1	1



Figure 5. Early phase I treatment with Class III elastics in position.

for at least twenty 23 hours/day as positive overjet was present (Figure 6).

Five months later when all the spaces were closed in the lower arch a rectangular 0.0215x0.0275 ®\* TP Orthodontics, Inc. 100 Center Plaza. La Porte, Indiana 46350 USA rectangular stainless steel archwire with 5 degree built in torque\* (retroclination) was placed in the lower arch and a round 0.014 nitinol wire was placed in the tunnel slot. The patient was then instructed to wear 4oz 1/4 inch Class II elastics for at least twenty 23 hours/day as a positive overjet was present (Figure 7).

Eight months later the appliances were removed and an upper Hawley and lower fixed 2-2 Lingual retainer was fitted. The pre and end of treatment photographs and lateral cephalograms are shown in figures 8 and 9. The pre and end of treatment cephalometric measurements are shown in Table 1.

Figure 10, shows the frontal and lateral views of the end of treatment study casts in occlusion.

### Case 2

A fifteen year old post pubertal male was referred by his dentist for correction of a severe anterior open bite. A thorough intra,



**Figure 6.** Frontal and intra-oral views. Upper rectangular 0.0215×0.0275 and lower 0.022 round stainless steel archwires. Four oz 1/4 inch Class II elastics.



**Figure 7.** Intra-oral views of stage 3 archwires (0.0215x0.0275) rectangular stainless steel archwires with four oz 1/4 inch Class II elastics.

extra-oral and radiographic analysis was carried out (Figures 11-13 and Table 2).

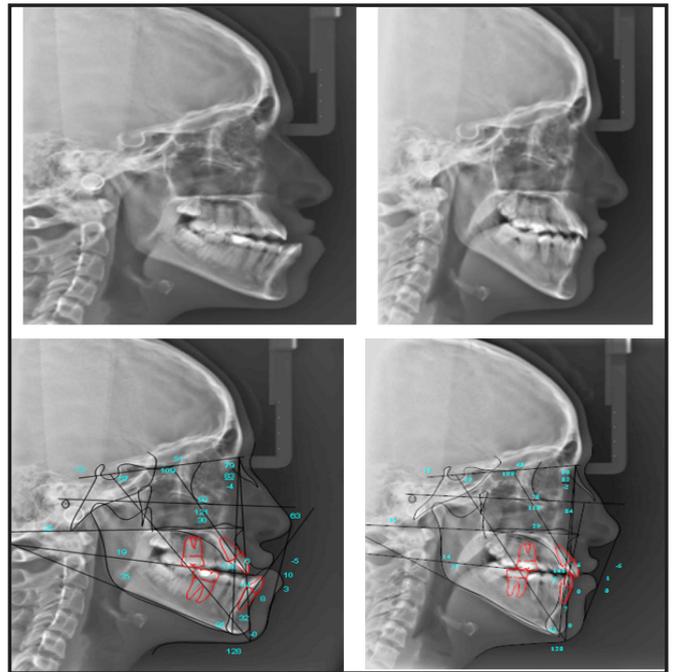
A diagnosis of a Class III severe bimaxillary protrusion complicated by an anterior openbite a bilateral posterior skeletal crossbite with an increased vertical height was made. The patient was advised that orthognathic surgery would be the best treatment in treating such a challenging malocclusion. The patient and parents refused the surgical option and requested a non surgical option. The treatment plan called for the extraction of all four first premolars.

The Tip-Edge bracket appliance system was placed and round 0.016 inch stainless steel upper and lower archwires were inserted. The patient was instructed to wear 2oz 5/16 inch Class II elastics were worn by the patient for at least twenty 23 hours/day (Figure 14).

Three months later round 0.022 inch stainless steel upper and lower archwire's were placed, size 5 E-links® were



**Figure 8.** Frontal and lateral pre and end of treatment views.



**Figure 9.** Pre and end of treatment lateral cephalograms.



**Figure 10.** Frontal and lateral views of the end of treatment study casts.

inserted to retract all the anterior teeth and to close all residual spaces.

Five months later an upper stainless steel rectangular archwire 0.0215x0.0275 with an 8 degree built in torque\*(proclination) and a lower stainless steel rectangular archwire 0.0215x0.0275 with a 5 degree built in torque\*(retroclination) were inserted. In addition both arches had a 0.014 nitinol wire placed in the tunnel slots. The patient was instructed to wear 4oz 1/4 inch Class II elastics for at least twenty 23 hours/day. These elastics were supplemented with anterior box elastics (Figure 15).

Eleven months later the appliances were removed and an upper Hawley and fixed lower 2-2 Lingual retainer was fitted. The patient was given post operative instructions on tongue thrusting exercises.

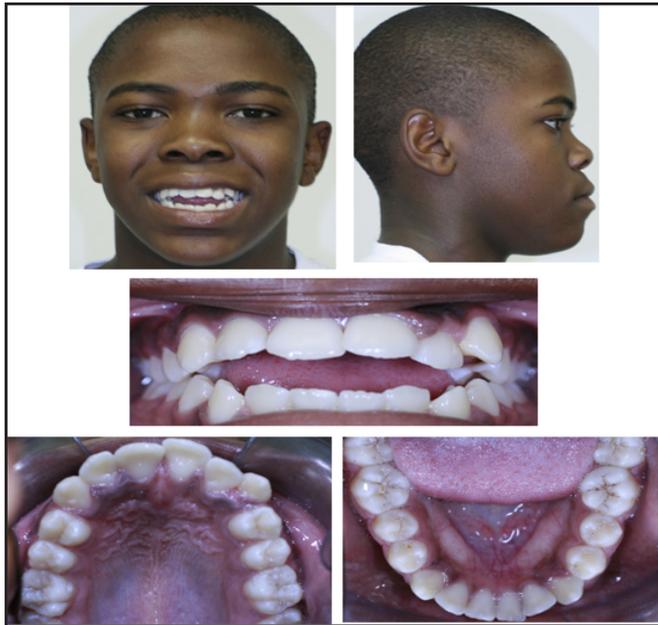


Figure 11. Pre-treatment extra and intraoral photographs.

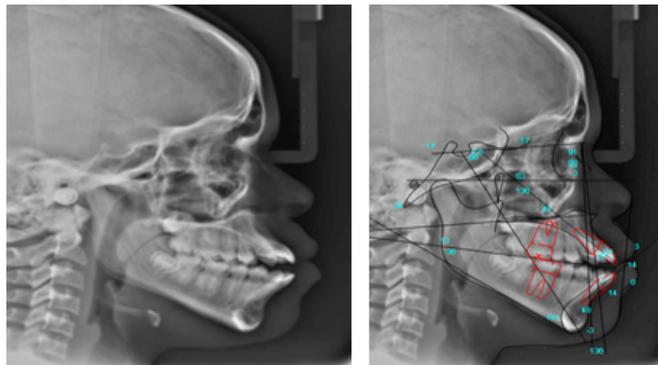


Figure 12. Pre-treatment lateral cephalograms.



Figure 13. Pre-treatment lateral cephalogram.

The end of treatment photographs and Lateral cephalograms are shown in figures 16-19. The pre and end of treatment cephalometric measurements are shown in Table 2.

### Case 3

A thirteen year old male was referred by his dentist for an assessment for the correction a severe Class II malocclusion. The patient had limited previous orthodontic treatment from the dentist who had extracted the upper left first premolar and then referred the patient. The patient's mother was the head theatre nurse for the local maxillo-facial surgeon.

A thorough intra, extra-oral and radiographic analysis was carried out (Figures 20-22 and Table 3).

A diagnosis of a severe Class II malocclusion complicated

Table 2. Cephalometric analysis.

Parameter	Pre-treatment	End of treatment	Norm	SD
SNA (°)	89.6	87.1	82	3.5
SNB (°)	87.1	85.6	80	3.4
ANB (°)	2.5	1.5	2.0	1.5
SND (°)	82.2	81	80	3
Upper Incisor to NA (mm)	11.2	5.6	4	2.7
Upper Incisor to NA (°)	42.3	24	22	5.7
Lower Incisor to NB (mm)	14.2	4.5	4.0	1.8
Lower Incisor to NB (°)	47.6	16.5	25	6
Pog-NB	-2.5	-2.1	0	1.7
Interincisal Angle (°)	87.6	138	130	6
Occlusal plane to SN (°)	13.6	13.5	14	2.5
SN-GoGn (°)	36	33.5	32	5.2
Y-axis (°)	66.1	67.3	67	5.5
Lower incisor to Apo (mm)	14.2	4.3	1	1.7
Upper Lip to E-plane (mm)	3.3	1.7	-6	2
Lower Lip to E-plane (mm)	7.5	4.1	-2	2
Wits (mm)	-6.5	-5.6	-1	1

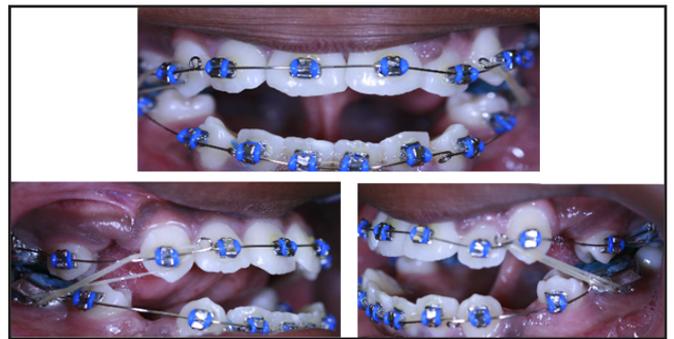


Figure 14. Phase I treatment frontal and lateral intra-oral views with Class II elastics in position.

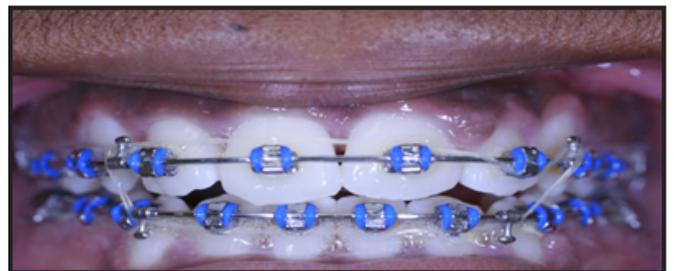
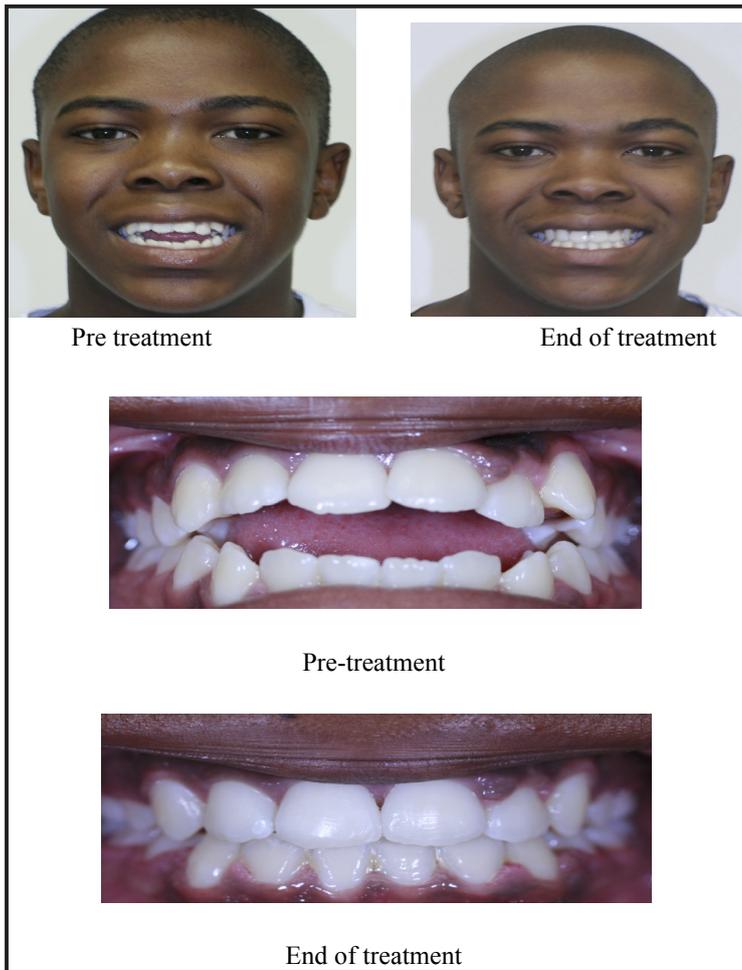


Figure 15. Frontal intra-oral view of upper and lower rectangular stainless steel archwire with box elastic in position.

by a severe mandibular deficiency, a deep bite, crowding in the upper and lower anterior inter-canine regions and a fractured incisal tip of the upper left central was made. The patient was advised that orthognathic surgery would be the best treatment option in correcting such a complex malocclusion. The patient and parents refused the orthognathic option and requested a non surgical approach. The parents were informed that a full correction may not be attainable as the skeletal discrepancy was far too excessive to correct with orthodontics alone. The treatment plan called for the extraction of the upper right first and both the lower second premolars. The Tip-Edge bracket appliance system was placed and round 0.016 inch stainless steel upper and lower archwires were inserted. The patient



**Figure 16.** Pre and end of treatment frontal extra-oral and intra-oral views.



**Figure 17.** Pre and end of treatment lateral views.

was instructed to wear 2oz 5/16 inch Class II elastics for at least twenty 23 hours/day (Figure 23).

Seven months later 0.022 inch round stainless steel upper and lower archwire's were placed and size 5 E-links® were inserted to retract all the anterior teeth and to close all residual spaces.

Upper and lower rectangular stainless steel archwires (0.0215x0.0275) were inserted eleven months later. In addition both arches had a 0.014 nitinol wire placed in the tunnel slots. The patient was instructed to wear 4oz 1/4 inch Class II elastics for at least twenty 23 hours/day.

Ten months later the appliances were removed and an upper Hawley and a fixed lower 2-2 lingual retainer were fitted.

The pre and end of treatment cephalometric measurements are shown in Table 3. The pre, end and one-year treatment photographs and lateral cephalograms are shown in figures 24-27.

The pre and end of treatment lateral intra-oral views are shown in Figure 28.

### Discussion

Many patients are reluctant to undergo orthognathic surgical intervention in the correction of difficult malocclusions. Fear of surgery and the financial implications are the primary factors in refusing to undergo surgical intervention. The practitioner is often asked to improve the malocclusion as an alternative "i.e. to straighten the teeth". A realistic approach would be to

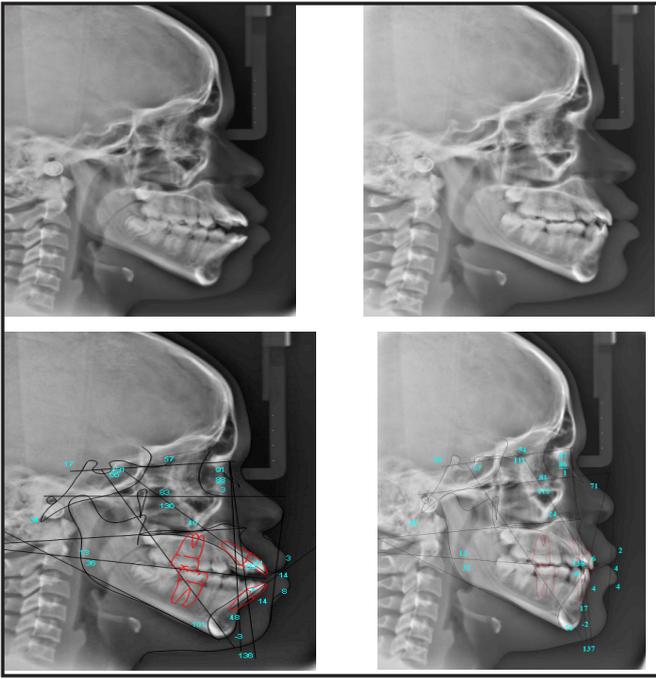


Figure 18. Pre and end of treatment lateral cephalograms.



Figure 19. End of treatment frontal and lateral photographs.



Figure 20. Pre-treatment extra oral photographs.



Figure 21. Pre-treatment intraoral photographs.

level and align the teeth with an informed understanding that the skeletal bases cannot be corrected by orthodontics alone.

A realistic pre-treatment assessment should be made. The following factors have to be considered: -

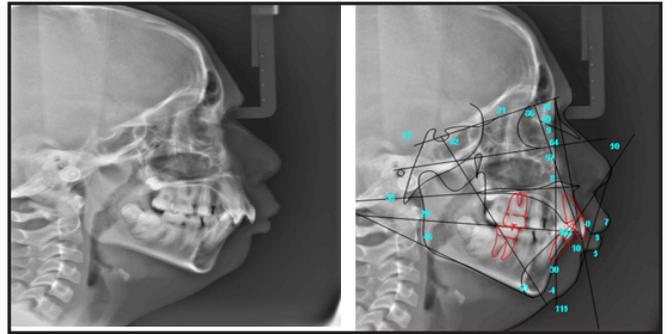


Figure 22. Pre-treatment lateral cephalogram.



Figure 23. Phase I treatment frontal and lateral intra-oral views with Class II elastics in position.

Table 3. Cephalometric analysis.

Parameter	Pre-treatment	End of treatment	Norm	SD
SNA (°)	78.4	84.2	82	3.5
SNB (°)	69.2	75.5	80	3.4
ANB (°)	9.2	8.7	2.0	1.5
SND (°)	63.6	70.8	80	3
Upper Incisor to NA (mm)	0.0	-5.9	4	2.7
Upper Incisor to NA (°)	7.7	-4.5	22	5.7
Lower Incisor to NB (mm)	10.0	4.4	4.0	1.8
Lower Incisor to NB (°)	30.4	30.9	25	6
Pog-NB	-4.4	-2.2	0	1.7
Interincisal Angle (°)	132.8	144.9	130	6
Occlusal plane to SN (°)	26.0	26.3	14	2.5
SN-GoGn (°)	45.9	34.4	32	5.2
Y-axis (°)	82.1	75.5	67	5.5
Lower incisor to Apo (mm)	5.2	0.4	1	1.7
Upper Lip to E-plane (mm)	7.1	-0.1	-6	2
Lower Lip to E-plane (mm)	5.4	-0.4	-2	2
Wits (mm)	5.5	-0.5	-1	1



Figure 24. Pre treatment, end of treatment and one year post treatment frontal views.

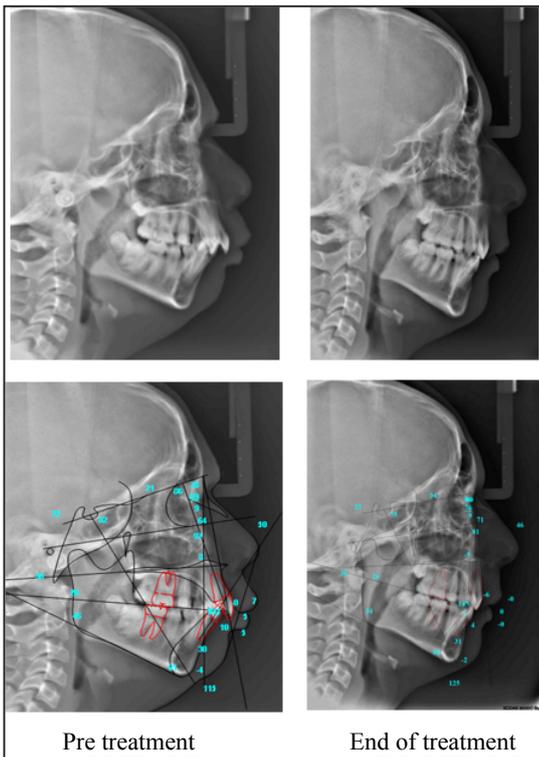
1. Can the function be improved?
2. Will there be an improvement of the soft tissue aesthetics?



**Figure 25.** Pre treatment, end of treatment and one year post treatment frontal intra-oral views.



**Figure 26.** Pre treatment, end of treatment and one year post treatment lateral views.



**Figure 27.** Pre and end of treatment lateral cephalograms.



**Figure 28.** Pre and end of treatment lateral views.

3. Can occlusal stability be achieved?
4. Is it economically feasible for the patient? and
5. Honesty –informed consent that an ideal correction cannot be attainable.

### Conclusion

The cases that are presented have achieved many of the pre-treatment objectives and demonstrate the versatility of the Tip-Edge bracket in the treatment for the correction of difficult Class III, openbite, anterior crossbite and bilateral posterior crossbite malocclusions. There was no need in these cases for the use of extra-oral anchorage, other additional anchorage devices or orthognathic surgery.

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