



CCO[®] System

Complete Clinical Orthodontics[®]
Principles and Technique

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Complete Clinical Orthodontics®

CCO System Principles and Technique

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I would like to dedicate this work to my family,
specifically to my wife Maria and my five children,
Sofia, Ella, Bella, Leonardo and Camilla
for their unconditional love and support.

1. Introduction

Treatment mechanics has always been of tremendous interest for all practicing orthodontists. Since the beginning of our specialty, we have looked for the best, fastest, more consistent and easiest way to achieve the orthodontic correction for our patients. This continuous quest has allowed emerging technologies to integrate, although slowly sometimes, with our everyday practice until they become a routine. Thus, as a consequence, new materials, improvement in design of appliances and innovative ideas repeatedly transform the way we practice. It is important for the contemporary orthodontist to be knowledgeable of current changes, so to take the best of them.

Today, after the first decade of the 21st century has already passed, orthodontic fixed appliances have experienced an interesting blend between technologies that have been around for decades, such as the Straight Wire Appliance (SWA), self-ligation and low deflection thermal-activated archwires. This integration, in my opinion, represents an

improvement that, when correctly applied, facilitates the practice of orthodontics.

In this manual the reader will find the author's interpretation of how the SWA integrates with self-ligation and how this appliance, with the combination of a specific archwire sequence, can help the orthodontist to correct different types of malocclusions in the adult dentition. Relevant characteristics of active self-ligating appliances, a modified prescription (CCO Rx), along with a specific wire sequence for different orthodontic scenarios, are among the areas covered.

To facilitate the understanding of the mechanics utilized in different situations, 10 cases "step by step" were included. Type of appliance, wire sequence, and any auxiliary used are specified. I selected these cases because I think they depict "everyday" problems we face in our practices.

2. Self-Ligation and The In-Ovation Bracket System

In the last few years self-ligating appliances have become very popular. A great deal of discussion has arisen around the friction these systems are able to generate. Self-ligating brackets have been classified as "Active" or "Passive" depending on the behavior of the gate or clip on the archwire.

Active self-ligating brackets (Fig. 2-1) have a clip with a springing effect that exerts pressure on the archwire pushing it onto the base of the bracket's slot. This pressure is based on the archwire size and or bracket/archwire configuration. On the other hand, passive self-ligating brackets (Fig. 2-2) have a gate that passively opens and closes without exerting pressure on the archwire. Passive self-ligating brackets have also been described as tubes.

The In-Ovation bracket system is a "true" SWA, which design corresponds with an active self-ligating appliance. As Fig. 2-3 shows, there is a difference in the depth of the slot between the gingival (.019" for a .022" slot) and the occlusal (.028" for a .022" slot) wall of the bracket. In a passive configuration such as in Fig. 2-4, the free end of the clip (gingival) is resting on the bracket without



Fig. 2-1



Fig. 2-2

exerting force upon the wire. If the wire placed is of a diameter .020" or bigger for round wires or has a horizontal dimension of .020" or bigger for square or rectangular wires, the clip is pushed back and it will start exerting force upon the wire. Consequently, the bracket/archwire configuration becomes active, such as shown in Fig. 2-5



Fig. 2-3



Fig. 2-4



Fig. 2-5



Fig. 2-6



Fig. 2-7

The clip of the In-Ovation bracket opens from the gingiva to the incisal/occlusal side. No specific instruments are required to open the clip. Fig. 2-6 and Fig. 2-7 show the clip being open with a scaler.



Fig. 2-8



Fig. 2-9

As shown in Fig. 2-8 and Fig. 2-9, it is important to keep the brackets clean of cement that could have overflowed when bonding and calculus that can accumulate in certain type of patients.



Fig. 2-10



Fig. 2-11

To facilitate bracket positioning, the In-Ovation brackets come with a colored dot that goes distogingival as shown in Fig. 2-10 and the close-up Fig. 2-11.



Fig. 2-12a



Fig. 2-12b



Fig. 2-12c

Fig. 2-12 shows an In-Ovation 'R' bracket with clip closed (a), the clip being opened with a commonly available scaler (b), and the clip completely opened (c).



Fig. 2-13a



Fig. 2-13b



Fig. 2-13c

Fig. 2-13 shows an In-Ovation 'R' bracket with clip opened and a round wire being placed into the slot with a ligature director (a), the clip being closed with a finger (b), and the clip completely closed (c).



Fig. 2-14a



Fig. 2-14b



Fig. 2-14c

Fig. 2-14 a, b and c show a sequence of bracket/wire engagement utilizing dental floss as an aid to engage the wire into the slot of the self-ligating bracket in a situation of severe crowding. The wire must be completely engaged into the slot of the bracket for the clip to be able to close.

CCO Rx

Offset

Torque

Tip

0°	0°	2°M	0°	10°D	10°D
12°/r	10°/s	-7°/0°	-9°	-14°	-20°
5°	9°	10°	0°	0°	0°

Tip

Torque

Offset

0°	3°	2°	-1°	-1°	-1°
-6°/-r	-8°	-12°	-17°	-25°	-20°
0°	0°	0°	0°	0°	0°

These are the values for tip, torque and offset of the CCO Rx. This Rx takes into account the play found between brackets, tubes and wires, the effect of the active clip on different wire sizes, the need for overcorrection and the final optimal tooth position. This prescription, along with

the right bracket system and archwire sequence, would help to efficiently move teeth to the desired position at each stage of treatment mechanics to achieve an optimal finishing while the appliance is still in place, as showing in Fig. 2-15.



Fig. 2-15a



Fig. 2-15b



Fig. 2-15c

Fig 2-15. Intraoral photos of a patient at the finishing stage. Upper and lower .021" x .025" ss braided wire.

CCO Rx – Rationale behind a new Rx.

Larry Andrews introduced the Straight Wire Appliance (SWA) in 1970. This was the first orthodontic appliance with all three dimensions for tooth position built into the bracket. Each bracket was designed to be tooth specific. Tip, torque and offset for each tooth were selected based on the measurements that Andrews obtained after examining 120 “ideal” sets of models from individuals who never had orthodontic treatment. The Andrews Standard Rx was born.

Andrews then introduced a series of additional brackets with different degrees of overcorrection to account for undesired tooth movement when sliding teeth in extraction cases. He called this series of overcorrected brackets, “Translation Brackets”.

In the early 80s’, Ron Roth combined some of the Andrews Standard Rx values with some of the values found in the Translation Bracket Rx to come out with the Roth setup. Filling the slot with a large stainless steel archwire to express the Rx was one of the premises of the Roth system. The Roth Rx was born.

In the early 90s’ McLaughlin, Bennett and Trevisi modified the SWA Rx based on the fact that most orthodontists would finish cases with a .019x.025 ss wire, which on a .022 slot could have up to 12° of play. Among others, they increased buccal crown torque for maxillary incisors, reduced lingual crown torque for mandibular molars, and increased lingual crown torque for mandibular incisors. The MBT Rx was born.

Over the last decade, I have used different “versions” of the SWA, studying its concept and development and collecting personal experiences as well as experiences from many clinicians. I have used different Self-Ligating Brackets (SLBs), studied the theory behind them, used them in my own patients (today 100% of my practice is Active SLB) and researched them in-vitro. After all, I came to the conclusion that once all the “dust” produced by unsupported claims favoring one specific passive SLB is cleaned, active SLBs have a lot to offer to facilitate and therefore improve the delivery of our treatment. However, based on the particular interaction between bracket and archwires due to the active clip, a “fine-tuning” of the Rx needed to be done, and then the CCO Rx was developed.

The CCO Rx

The CCO Rx was developed to take full advantage of the bracket/archwire interaction when using an active clip and to achieve optimal tooth position at the end of treatment.

Rotational Control

The springing capability together with the quite long mesial-distal span of the active clip in the In-Ovation brackets facilitate the correction of all rotations within the stage of leveling and aligning. Also, the active clip favors complete engagement of the wire into the slot. This means that if the wire is not fully engaged, the clip will not close. This avoids leaving small rotations uncorrected as the wire sequence progresses. Therefore, the CCO Rx removed some of the overcorrection of the offset found in previous Rxs.

Full Torque Expression

Thanks to the active clip of the In-Ovation brackets, full torque expression is achieved on a .019 x .025 ss archwire. The springing clip pushes the wire into the slot. Dr. Nobrega’s research shows that on the In-Ovation brackets a .019 x .025 ss wire can express the same amount of torque than a .021 x .025 ss wire. Therefore, some of the overcorrections of torque implemented in previous Rxs, to overcome the play between the bracket and a .019 x .025 ss, do not apply when using the In-Ovation bracket, and therefore the CCO Rx removed them.

Molars Control

It is the interaction between the bracket and the wire that will transfer the values of tip, torque and offset to the teeth. Tubes are passive attachments. Tubes are not able to transfer the values they have, specifically torque, even if large wires are used. Trouble correcting the curve of Wilson of maxillary molars and excessive lingual crown torque of mandibular molars are some of the problems commonly reported by many orthodontists. Therefore, the CCO Rx has a specific overcorrection for the maxillary and mandibular first and second molars to achieve proper molar control on a .019 x .025 ss archwire.

Incisors Control

Achieving optimal torque of the maxillary and mandibular incisors is very important for both esthetics and function. It affects lip support and consequently facial esthetics as well as anterior coupling of the incisors and therefore anterior guidance. For the maxillary incisors to achieve optimal torque is sometimes difficult due to the large amount of bone the roots must go through, specifically in extraction cases as well as Class II div II cases.

The inclination of the mandibular incisors is critical for both function and stability. Their position should be upright onto the alveolar bone. Class III camouflage, Class II mechanics, and deep curve of Spee are specifically challenging with regard to the upright position of mandibular incisors. The CCO Rx combines proven values of torque for maxillary incisors that can be fully expressed, thanks to the active clip, with a lightly overcorrection for the mandibular incisors to achieve optimal control in all kinds of clinical situations. The CCO Rx is conveniently and progressively expressed throughout the stages of treatment mechanics by using specific archwires at each stage. The ultimate goal is to achieve optimal tooth position at the end of treatment, even before the appliance is removed.

CCO Rx Highlights

The CCO Rx works as one system from second molar to second molar. The following are some of the highlighted changes that were introduced:

U1/U2: 12°/10° of torque have been selected. These values have been proven time after time to be optimal if full expression of torque is achieved. Thanks to the active clip, full expression can be achieved on a .019 x .025 ss wire. It is NOT necessary to increase and/or overcorrect these values.

U3: 10° of tip has been selected as the best of both worlds. The increased mesial crown tip found in some Rxs (13°) has shown undesired distal tip of the U3 root frequently seen in x-rays. However, an upright U3 (8° or less) could compromise proper coupling with the L3 and could also leave spaces in the upper arch that when closed could prevent a proper Class I relationship.

U4/U5: Same values of torque, tip and offset for both; U4 and U5 make them interchangeable and facilitate bracket inventory.

U6/U7: -14°/-20° of torque. Increased lingual crown torque, specifically for the second molar, facilitates the correction of the curve of Wilson and therefore arch coordination, minimizing the need to add extra torque through a bend in the wire or by using auxiliaries such as palatal bars.





L1/L2: -6°, 0°, 0° of torque, tip and offset have been selected. A small lingual crown torque overcorrection has been shown to help keep the incisors in an upright position when leveling and aligning and through Class II correction. 0° tip and 0° offset makes all 4 incisor brackets to be interchangeable, facilitating bracket inventory.

L3: -8° of torque: In many cases, where the width of the maxillary and mandibular arches is normal, an excessive lingual crown torque (-11°), found in some Rxs, makes difficult the coupling with the U3. Therefore, the torque for the lower canines was changed to -8°.

L4/L5: 2°/-1° of tip. Although this small difference of tip between the L4 and L5 will not be seen in non-extraction cases, it is in agreement with differences in anchorage requirement between extracting L4 or L5.

L6/L7: -25°/-20° of torque. These values have been selected to facilitate upright L6/L7, preventing them from rolling lingually.

The CCO System Rx

Maxillary Arch

TOOTH	TORQUE	TIP	OFFSET
U1	12	5	0
U1 Low Torque	7	5	0
U2	10	9	0
U2 Low Torque	3	9	0
U3 Hook*	-7	10	2M
U3 Low Torque Hook*	0	10	2M
U4 • 5	-9	0	0
U4 • 5 Hook*	-9	0	0
U6 Hook*	-14	0	10D
U7 Hook*	-20	0	10D

Mandibular Arch

TOOTH	TORQUE	TIP	OFFSET
L1 • 2	-6	0	0
L1 • 2 High Torque	-1	0	0
L3 Hook*	-8	3	0
L4	-12	2	0
L4 Hook*	-12	2	0
L5	-17	-1	0
L5 Hook*	-17	-1	0
L6 Hook*	-25	-1	0
L7 Hook*	-20	-1	0

*All hooks are placed disto-gingivally. Note: Values of torque, tip and offset refers to the crowns. Positive values of torque and tip mean buccal while negative mean lingual. Offset values are indicated as M (mesial) or D (distal).

Molar Tubes

Molar tubes are essentially passive attachments. They have four rigid walls that make a tunnel to what the archwire goes through. The passivity of the molar tubes has very important clinical implications that we should understand in order to take full advantage of our appliances.

Since molar tubes are generally wide in design (4 mm or more), they can control very well rotations and tip. Rotations and tip correction begin early in treatment with round wires. The problem with current tubes is the lack of torque they are able to express due to their passivity. It is quite impressive to see how much play large rectangular archwires have when coupling with molar tubes. Fig. 2-16 and 2-17 show a SEM picture of a .019" x .025" and a .021" x .025" ss wire respectively, coupled with a molar tube. In both pictures we can see the amount of space left between the wire and the buccal wall of the tube. In this regard, I challenge the readers to go back to their offices and grab any molar tube they are using and couple it with the biggest archwire they have (you can go up to a .021" x .028" ss). The amount of buccolingual play you will find, I know, will be rather unexpected.

When optimal occlusion is the goal, we need to understand that there aren't too many different ways we can position teeth to achieve an optimal intercuspation (Fig. 2-18). This concept of optimal tooth position is important to understand when using fully adjusted appliances because we rely on them to transfer the information they have to the teeth in order to obtain the desired tooth position. This is specifically relevant when moving molars to their optimal position because it is in this area where the fully adjusted appliances we use are not able to transfer the information they have to the molars and therefore optimal tooth position is difficult to achieve.

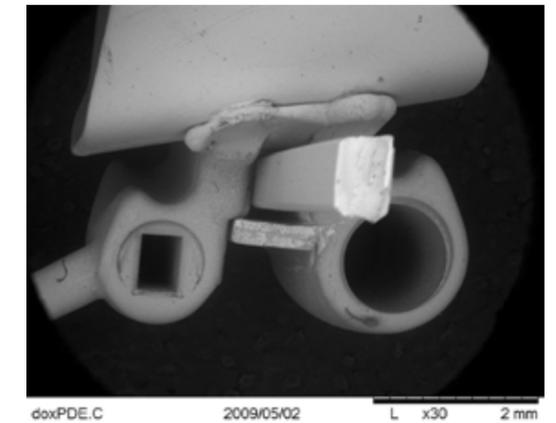


Fig. 2-16
SEM 30x picture of a molar tube coupled with a .019" x .025" ss wire.

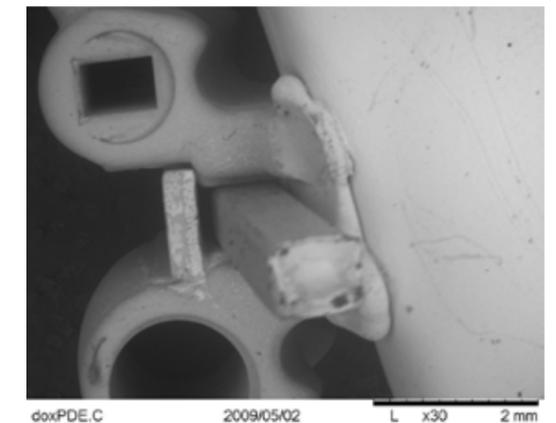


Fig. 2-17
SEM 30x picture of a molar tube coupled with a .021" x .025" ss wire.



Fig. 2-18

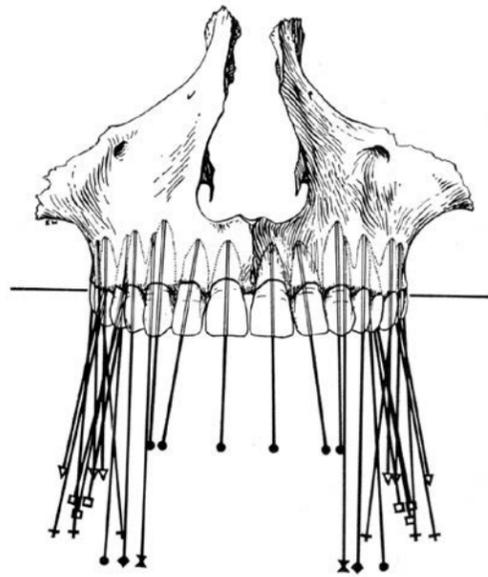
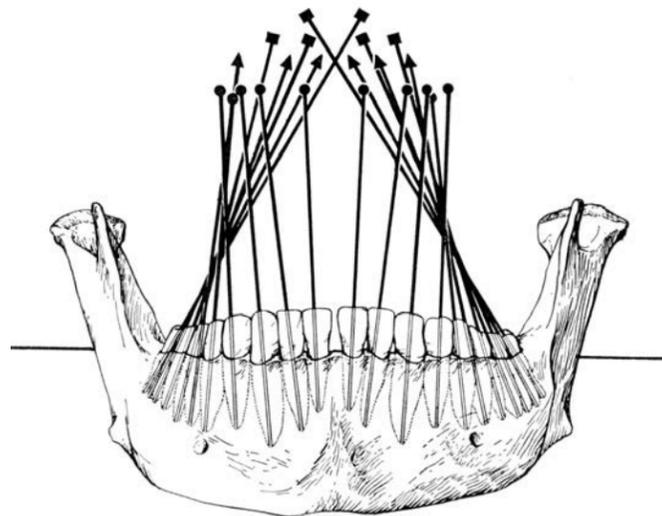


Fig. 2-19 & 2-20

Notice the buccal axial inclination of maxillary molars and lingual axial inclination of mandibular molars. (diagrams from "Orthodontics, Principles and Practice", Graber, Second Edition 1967, page 200 and 201.)



There are three reasons that explain the lack of torque control on maxillary and mandibular molars.

1. Molars' eruption pattern and occlusal forces.
2. Concept of terminal tooth for the second molars.
3. Molar tubes are passive attachments.

Molars' eruption pattern and occlusal forces

In the transverse plane, maxillary molars have a buccal axial inclination as they erupt into the arch. On the other hand, mandibular molars have a lingual axial inclination as they erupt into the arch (Fig. 2-19 and 2-20).

The normal occlusal forces load the molars axially. In an optimal occlusal scheme, the forces are distributed among all the teeth proportionally to their occlusal surfaces and root mass. However, in the presence of malocclusions, specifically when we have transverse skeletal discrepancies, the situation is different. Very often we find that in the presence of a discrepancy, between the width of the maxilla and the mandible there is a natural compensation of tooth position in order to avoid a posterior crossbite. In this situation, maxillary molars will erupt more buccally inclined whereas mandibular molars will do it more lingually inclined. This phenomenon becomes accentuated during orthodontic treatment, specifically at the stage of leveling and aligning since at this stage we usually use round wires that will not control the buccal-lingual inclination of molars. Therefore, often times we see the maxillary molars rolling buccally and the mandibular molars rolling lingually when we level and align.

Concept of terminal tooth for the second molars

Usually, the problem correcting the buccolingual inclination of molars is more common for the second molars than for the first one. This happens because the second molar is a terminal tooth in the arch. The fact that the archwire stops at the second molar tube and does not go to another more distal tooth diminishes substantially the amount of control we have over it. The lack of control occurs for any terminal tooth in the arch. For instance, we have all had the difficult experience of trying to correct a rotated premolar on a partially edentulous patient where the premolar is the terminal tooth. It can be done, but it is a lot easier when the wire goes from the premolar to the molar rather than stop at the premolar.



Fig. 2-21 & 2-22 show the before and after of second molar torque control with a transpalatal bar.

A large number of orthodontists are aware of some of these clinical problems and have developed different ways to manage the molars to obtain proper torque. The use of Transpalatal bars such as in Fig. 2-20 and 2-21 to obtain palatal crown torque; add extra torque in the wire; place mini-implants in the palate to upright the palatal cusp of the molars, etc. are some of the more common ways to provide proper torque to the first and second maxillary molars and therefore level the curve of Wilson. All these methods are either uncomfortable, time consuming, not reliable and/or expensive. Ideally, the combination of tubes and archwires should be enough to provide the desired torque. Therefore, modifications to the Rx were done.

Molar tubes are passive attachments

Molar tubes have always been and still are today, by nature of their design, passive attachments. Tubes are made with four walls. There is no force such as stainless or elastomeric ligatures pressing the wire onto the base of the tube. This passivity works very well in some stages of treatment mechanics but makes torque expression to be very difficult to achieve toward the end of the treatment. Also, don't forget, as I mentioned earlier, the considerable amount of play that even large size archwires have inside of the tubes.

Controlling molar inclination "torque"

Taking into consideration all the reasons stated above to explain why torque control of molars has been deficient when utilizing the SWA, I came to the conclusion that certain modifications to the tubes could be done, so to have better expression of tip, torque and offset at the molar level.

To reduce the lumen of the tubes, which appears to be larger than what it should be and therefore reduce the tube/archwire play to express more torque, could look like a good solution. However, it would make it very difficult for the orthodontist to engage the archwire through the tubes, specifically into the second molars. Therefore, it seems to be more practical to overcorrect the values of torque for the maxillary and mandibular molar tubes.

Fig. 2-23 shows the torque values for the maxillary and mandibular molars found in the Andrews standard Rx (A), the Roth Rx (B), the MBT Rx (C) and the CCO Rx values for the maxillary and mandibular first and second molars (D). The CCO Rx increases palatal torque for the maxillary molars with a difference of 6° between the first and second molars since the second molar is a terminal tooth and then is more difficult to control. The same situation was done for the mandibular molars where less lingual crown torque was placed to avoid the commonly seen "rolling in" of the molars.

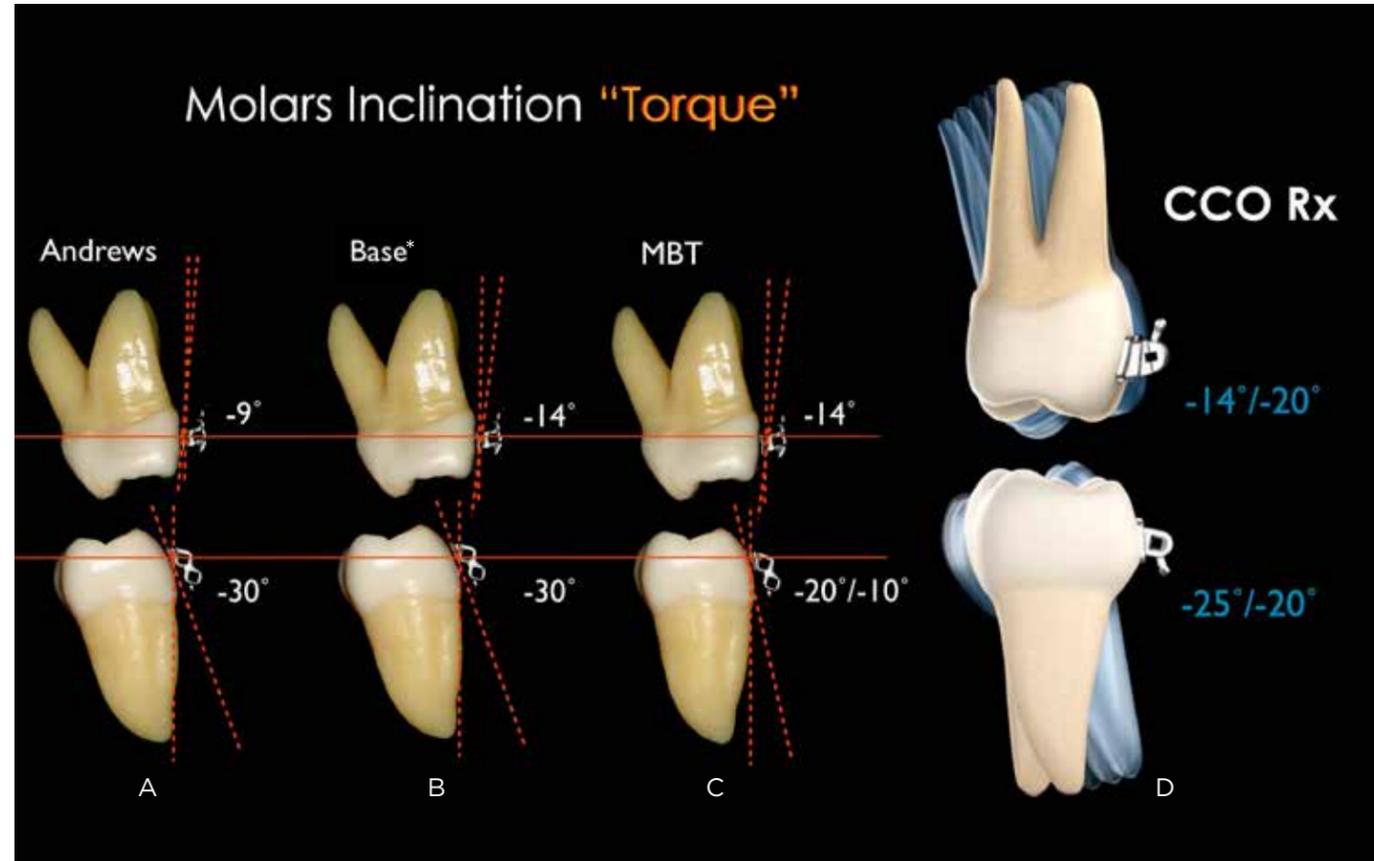
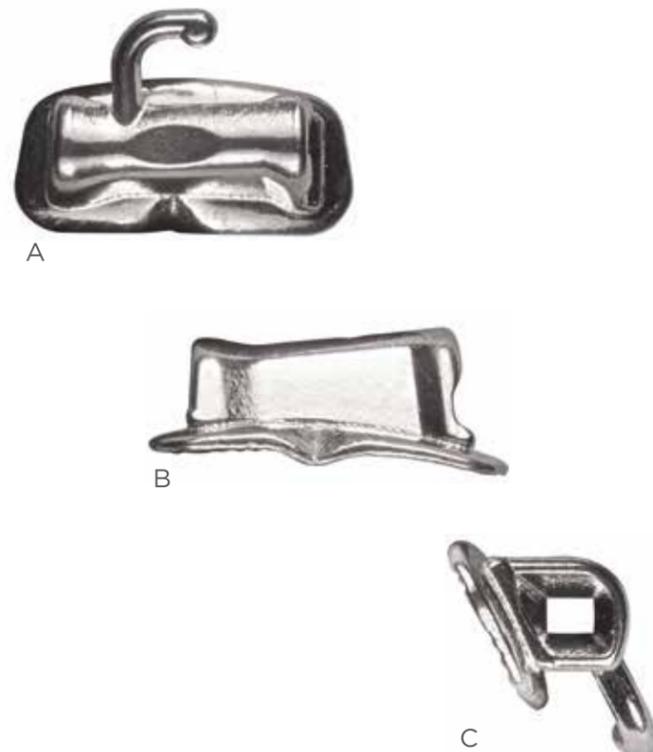


Fig. 2-23(A, B, C, D)

*Dentsply Sirona Orthodontics Base Rx has prescription values that are equivalent to the Roth prescription. ROTH is a registered trademark of Roth Licensing, LLC. All rights reserved.

Closer look at the CCO Molar Tubes

The new CCO tubes were developed with three concepts in mind: control, easy placement and optimal occlusion (intercuspatation). The mesio-distal length of the tubes was increased providing excellent tipping and rotational control. The bigger surface area also provides better adhesion when working with bondable tubes. A notch has been placed toward the occlusal side of the base, which facilitates tube position against the groove of the molars, an important reference for the molars in the Straight Wire Appliance. The mesial and distal entrance of the tubes were made similar to a "cone" shape or better like a "trumpet", facilitating wire placement. Also, the occlusal profile of the tubes was reduced diminishing considerably any tube interference when coupling the occlusion at the final stage. Finally, the CCO Rx was adjusted to provide better torque control.



Maxillary CCO Molar Tubes in action

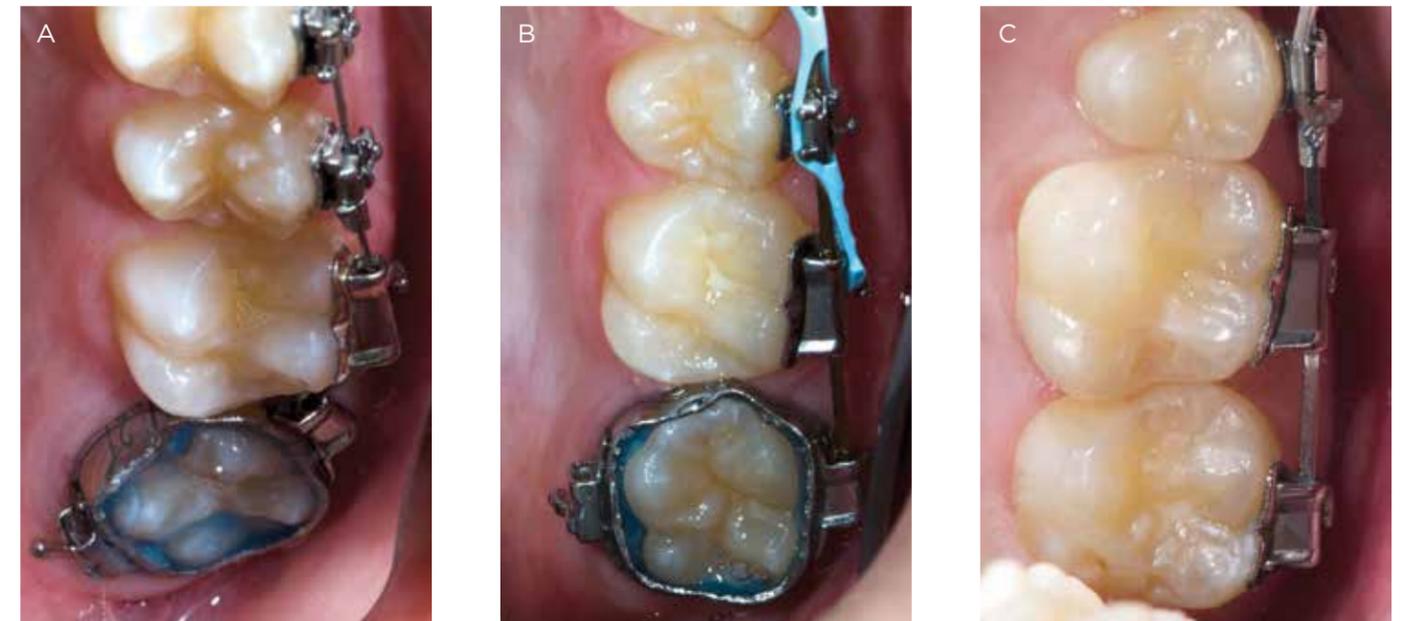


Fig. 2-25 A, B and C show the maxillary molars CCO tubes in action. Fig A and B show a second molar rotated before and after it has been corrected (wire .014" Sentalloy on A, and .019" x .025" ss on B). C, shows first and second molars aligned on a .019" x .025" ss archwire. Notice the proper alignment of the buccal cusps as well as the occlusal grooves.

Mandibular CCO Molar Tubes in action

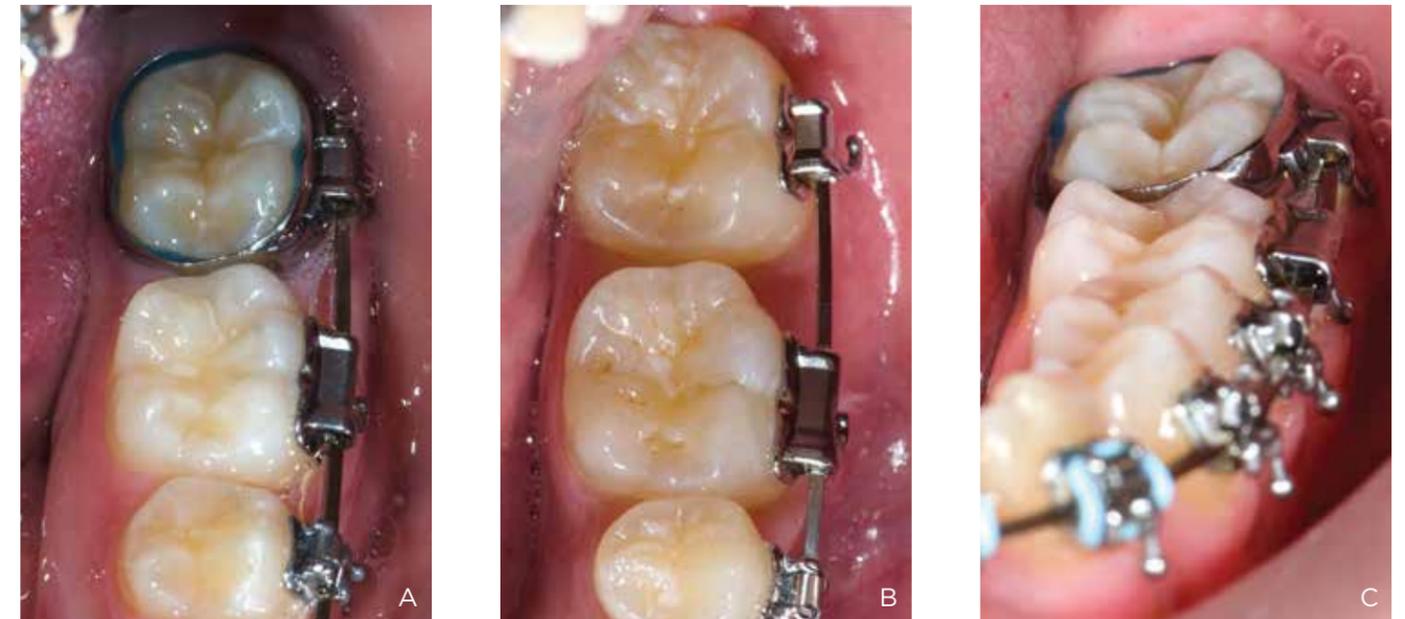


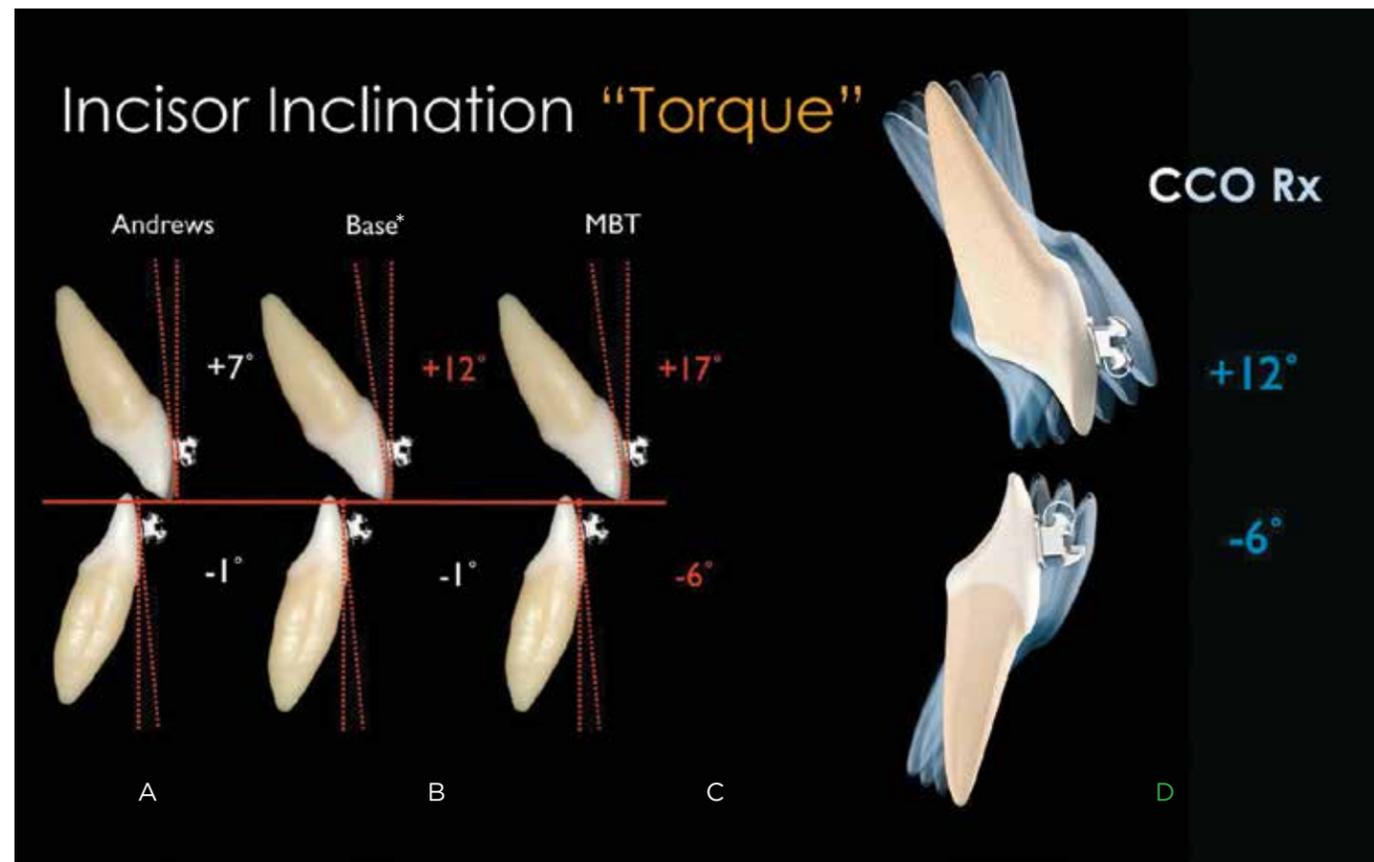
Fig. 2-25 A, B and C show the mandibular molars CCO tubes in action. Fig A and B show an occlusal view of the first and second molars properly aligned with a .019" x .025" ss archwire. C, shows lower molars with their proper inclination with a .019" x .025" ss archwire.

Controlling incisors inclination “torque”

The optimal inclination “torque” of the maxillary and mandibular incisors is a very important area to discuss. It affects the anterior coupling of the incisors and therefore the anterior guidance. Specifically for the maxillary incisors, to achieve optimal torque is sometimes difficult due to the large amount of bone the roots of these teeth must go through. The inclination of the mandibular incisors is important too since an orthodontic goal is to position them upright onto the alveolar bone for greater stability and function. The following clinical situations are more demanding with respect of torque control:

- some Class II div I extraction cases where maxillary incisors need to be retracted without losing inclination.
- Class II div II, where labial crown inclination of maxillary incisors has to be fully expressed.- Class III camouflage, crowding and Class II mechanics, deep curve of Spee, etc. are specifically challenging with regards of the upright position of mandibular incisors.

Fig. 2-27 (A, B, C, D) shows a comparison of the torque values of the maxillary and mandibular incisors between the Andrews standard Rx (A), the Base Rx (B), the MBT Rx (C) and the CCO Rx values (D).



*Dentsply Sirona Orthodontics Base Rx has prescription values that are equivalent to the Roth prescription. ROTH is a registered trademark of Roth Licensing, LLC. All rights reserved.

3. Optimal Bracket Placement

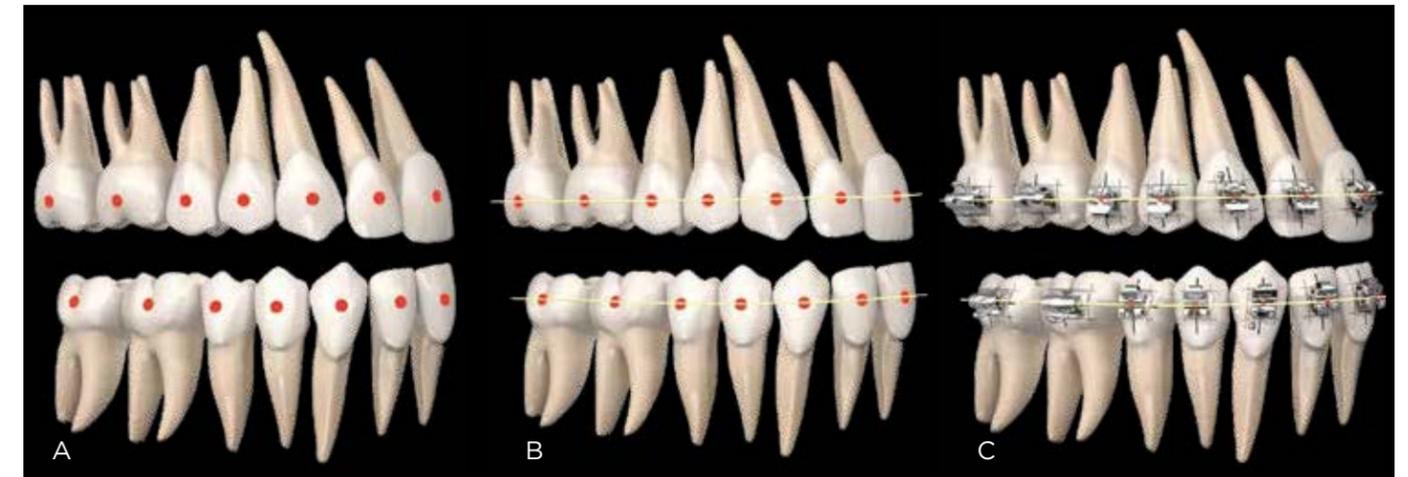


Fig. 3-1

Assuming we have the right appliance, the next most important factor when working with a SWA is bracket position. As Andrews described more than 40 years ago, the brackets should be placed at the FA point. The FA point is the middle of the clinical crown occlusogingivally and mesiodistally, following the long axis of the crown, for each tooth in the mouth (Figure 3-1A). When all the maxillary and mandibular teeth are perfectly leveled and aligned, the FA points of all the teeth should be aligned and sort of connected through a straight line (Figure 3-1B). Then it is the orthodontist's goal to place each bracket in agreement with the FA point (Figure 3-1C) so at the end of treatment all the teeth can be perfectly leveled and aligned with a straight archwire. Here is where the orthodontist's dexterity will be of great value. As with techniques that require bending the wire, the quality and precision of each bend will determine to some extent the quality of the final result that the precision of bracket placement will do when using a SWA. Interestingly, by following this concept, you “start finishing” your case the day you place the brackets! This is why an important percentage of problems that orthodontists experience toward the end of active treatment—such as marginal ridge discrepancies, difficulty correcting rotations, lack of root parallelism, and, ultimately, less than ideal tooth position—are due to incorrect bracket placement.

Because all the brackets are working at the same time through the wire, one misplaced bracket will automatically affect the adjacent brackets. If more than one bracket is misplaced, the problem will increase and become more noticeable as the leveling and alignment progresses. This

issue, if not corrected, can prevent the orthodontist from finishing the case in an optimal and efficient way.

Therefore, it is important to emphasize the following concepts toward achieving optimal bracket placement:

- We believe that trained clinicians are able to place brackets consistently at the FA point without any aids but their own eyes.
- The use of any gauge as an aid to position the brackets is not necessary; in fact, to use any predetermined height from the incisal edge to locate the brackets, as some orthodontists advocate, may cause problems and literally negates the use of the FA point, which is one of the fundamental concepts of the SWA development. However, it is important to take into account individual patient's tooth morphology such as shorter crowns due to excessive gingival tissue, worn teeth, and/or fractured teeth that eventually will be restored. In some of these situations, bracket placement should be adjusted accordingly and therefore on that particular tooth the bracket will look either more incisally or gingivally than the apparent middle of the clinical crown.

Figures 3-2A & 3-2B show that it is the Clinical crown, not the Anatomical crown, the reference to locate the FA point. When the periodontal tissue is normal, the clinical crown should be about 1.5 mm less than the anatomical crown. We suggest to use a periodontal probe to measure the distance between the gingival margin and the cemento-enamel-junction (CEJ) in those teeth that appear to have a very short clinical crown.

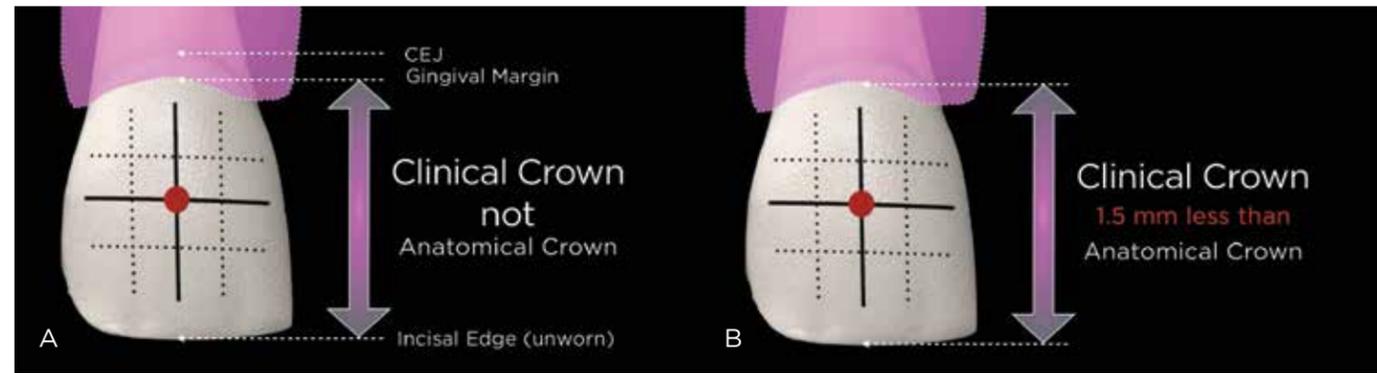


Fig. 3-2

The next reference we need to identify is the Facial Axis of the Clinical Crown (FACC). For the incisors, canines and premolars, the FACC can be found along the most convex part of the facial side of the clinical crown. It can be easily seen with a dental mirror from the occlusal of each tooth. Then, it is the FA point that is the next important reference. The FA point is located midway (occlusogingivally) along the FACC. The FA point is the target for optimal bracket placement.

We strongly believe that the FA point can be eyeballed. That is how Andrews taught it 40 years ago. Our clinical results as well as the results of clinicians we have trained support this method. The FA point should be the point where the center of the bracket's base should be placed. Then, the clinician can align the bracket along the facial axis.

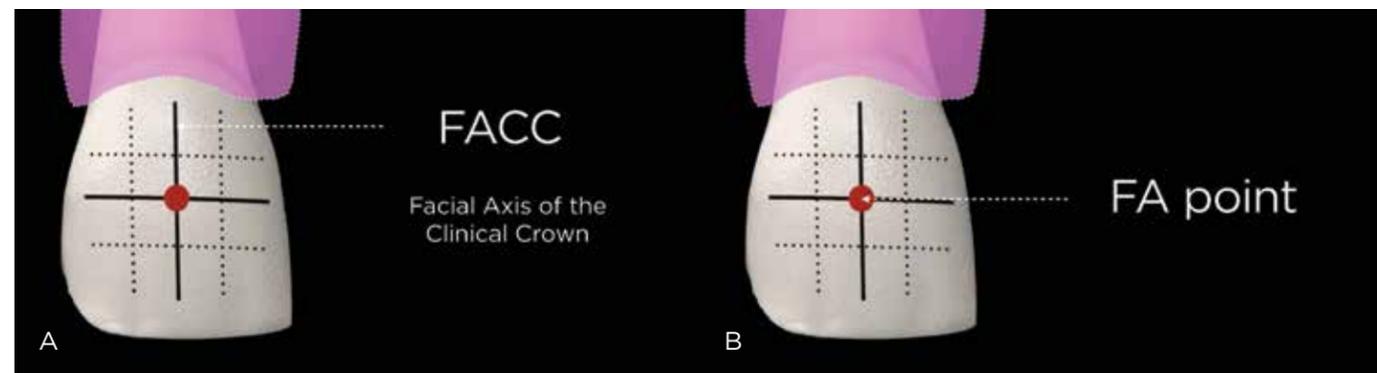


Fig. 3-3

For the In-Ovation brackets, the mesial and distal wings should be paralleled with the facial axis of the clinical crown.

Ideally, the FA point, the center of the bracket's base and the center of the bracket's slot, should be all aligned. The alignment of these three reference points is possible when the torque has been built in the base of the bracket rather than in the face of it. This feature of the design of some brackets will decrease placement errors, specifically occlusogingivally

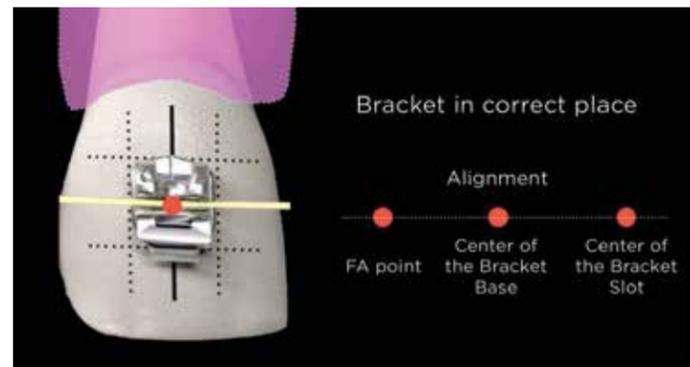


Fig. 3-4

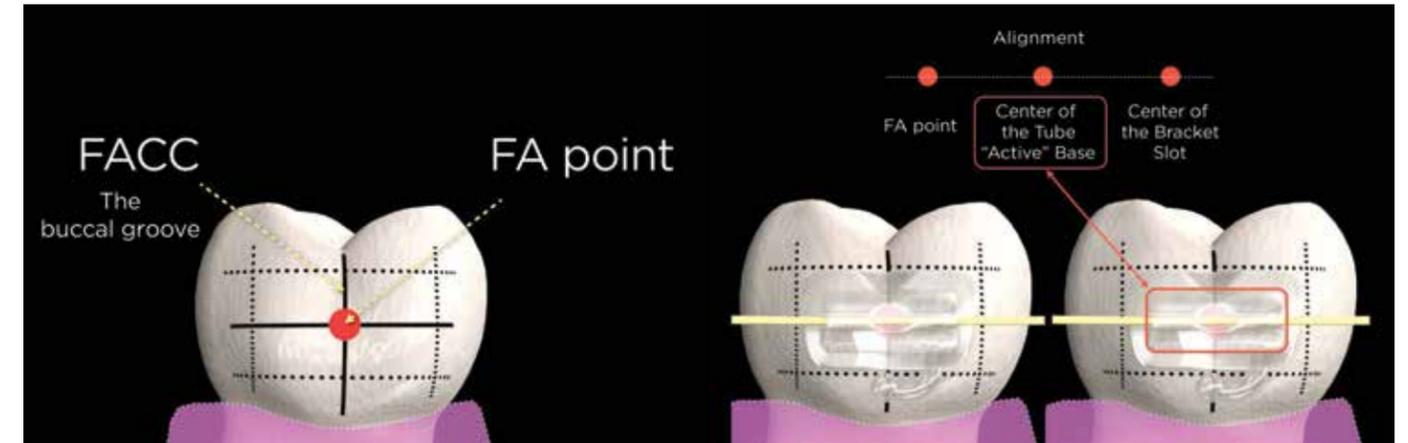


Fig. 3-5

For the maxillary and mandibular first and second molars the FACC is located along the buccal groove, as it was defined by Andrews when developing the SWA. The FA point then is on the buccal groove, midway occlusogingivally. Therefore, the center of the tube's base (bondable as well as weldable) should be in agreement with the FA point as shown in the diagrams above. Since the base of tubes varies in size and shape from one type to another, it is important to take the base of the "active" part of the tube as the reference point. This is the part of the tube where the wires goes through.

Fig. 3-6

The molars are dominant teeth with regards to orthodontic treatment. They can have a positive or negative effect on anchorage, arch coordination, the vertical plane as well as the transverse plane. The correct placement of tubes will enhance molar control during treatment and will facilitate an optimal occlusion when finishing.

For the CCO System, a new set of maxillary and mandibular tubes were designed. The mesiodistal length of the tube was increased to obtain better control of tip and rotations. The profile and height were decreased and wings were removed with the objective of reducing "metal" contacts and interferences when teeth are occluding. This will help optimal coupling of maxillary and mandibular teeth at the finishing stage. Also, the base of the tubes was slightly increased in size to have better retention.

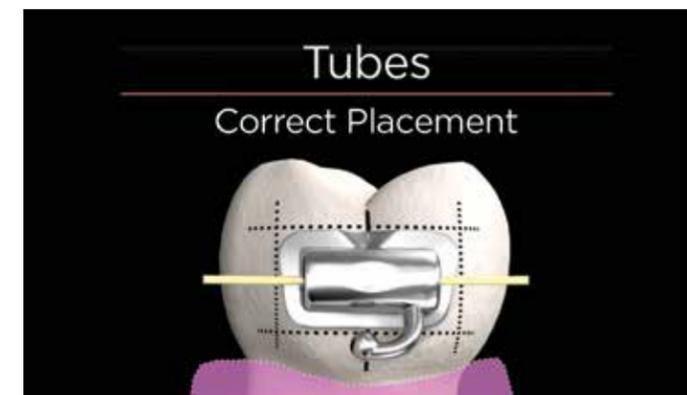


Fig. 3-7

Tubes are a very important part of our system and therefore we looked deep into their design, prescription, and position so the clinician can have an appliance that works from second molar to second molar!

Bracket Placement: Specific Considerations

Although the long axis of the clinical crown and the FA point are key reference points toward optimal bracket placement, there are a few specific considerations that will facilitate bracket placement on certain teeth that usually present some challenges for the orthodontist. Therefore, in the following diagrams we will review some of the most common challenges we have when positioning brackets and how to overcome them.

- **Upper Central Incisors:** Usually an easy tooth for bracket placement since direct vision is possible. We suggest looking at both central incisors from the same direction, first from the front, then from the occlusal view. Also, the

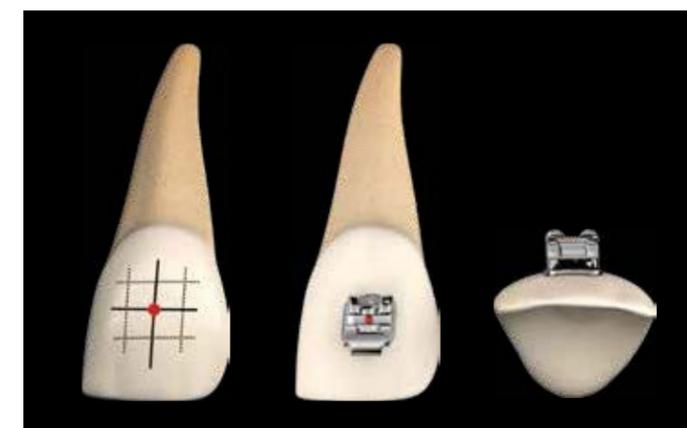
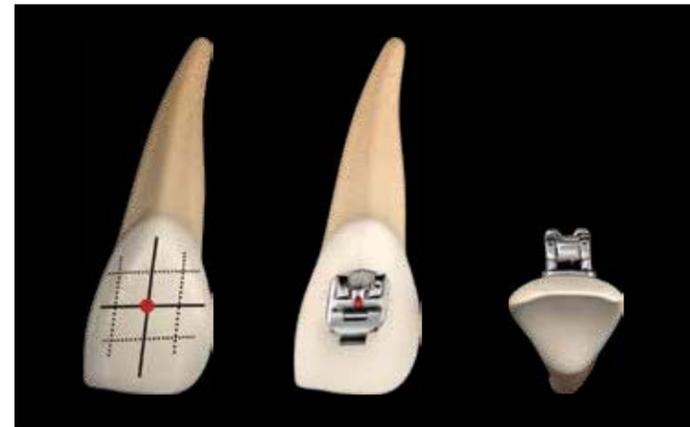
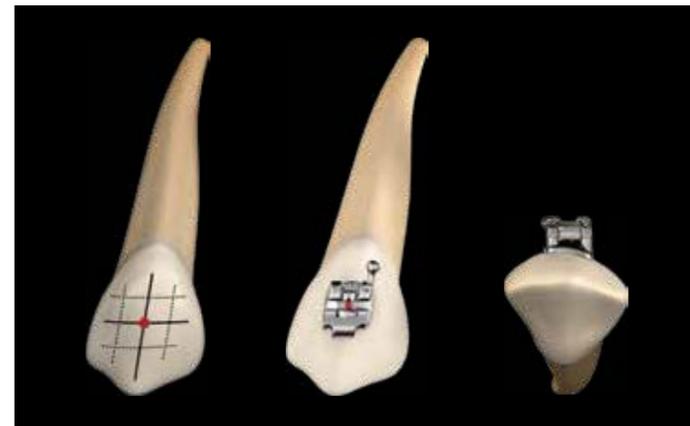


Fig. 3-8

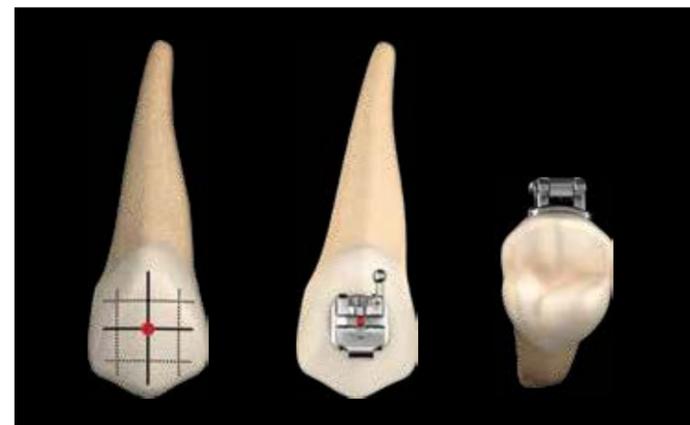


incisal edge of the tooth should not be used as a reference to make it parallel to the edge of the bracket's base as many clinicians do. This can be misleading if there is any wear in part or all the incisal edge of the tooth.

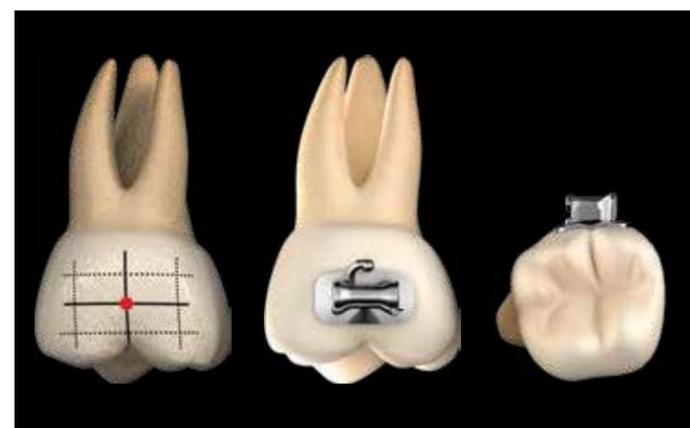
- Upper Lateral Incisors: After the third molars, upper lateral incisors are the teeth with more problems regarding size and shape. This makes it difficult to determine the long axis of the crown from the buccal. It is wise to use the mirror to look at the lingual surface of the incisor and then extend the long axis of the clinical crown from the lingual to the buccal.



- Upper Canine: The long axis of the upper canines, which is also the most convex part of the labial surface, is located more mesial than the true mesiodistal center of the tooth; therefore, the FA point looks a little bit more mesial than the dead center of the tooth. If you err and place the bracket on the center of the crown mesiodistally, the canine will rotate mesially. The more convex the canine is the more rotation will be observed. It is suggested to use the mirror to look at the canine from the occlusal.

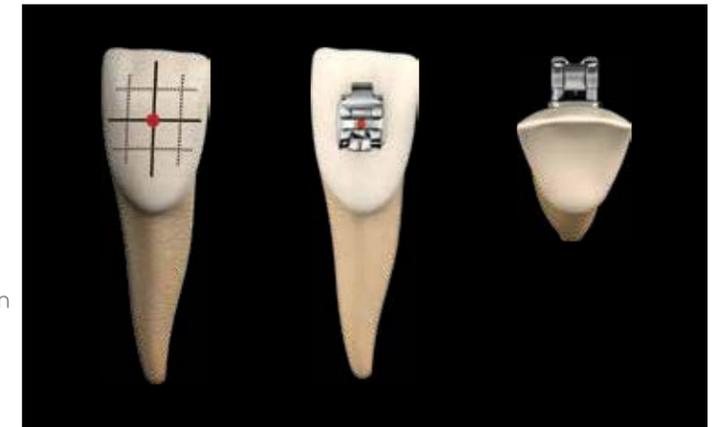


- Upper Premolars: Usually premolars, specifically second premolars, represent a challenge at the time of bonding due to lack of direct vision. Then it is advisable to look with the mirror from the occlusal and the buccal to locate the FA point and the long axis of the clinical crown.

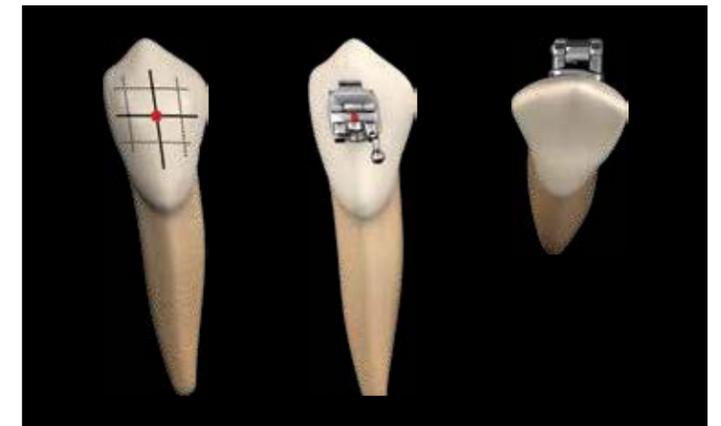


- Upper Molars: The landmark that Andrews used as the long axis of the clinical crown for the molar is the buccal groove. The FA point then lies along the buccal groove, midway occlusogingivally. It is important to realize that the center of the tube mesiodistally should be in agreement with the FA point. As some manufacturers have reduced the mesiodistal length of tubes, orthodontists have started positioning tubes too far mesial with the consequential distal overrotation of the molars.

- Lower Central Incisors: Excessive crowding, loss of proper gingival contour as well as wear facets and/or small fractures of the incisal edge are the most common problems challenging optimal bracket placement. We strongly suggest looking at these teeth from the front, occlusal, and lingual view to determine the proper long axis of the clinical crown. We have observed a tendency to place the bracket too incisally on these teeth. It is important to respect the middle third of the clinical crown (clinical crown is 1.5 mm less than the anatomical crown).



- Lower Canines: As well as for the upper canine, the long axis of the lower canines is the most convex part of the labial surface. It is also located more mesial than the true mesiodistal center of the tooth. The FA point then looks a little more mesial than the dead center of the tooth. If you err and place the bracket on the center of the crown mesiodistally, the canine will rotate mesially. It is suggested to use the mirror to look at the canine from the occlusal when positioning the bracket.



- Lower Premolars: The same challenge as for the upper Pm. There is not good direct vision. Again, for these teeth, it is suggested to look with the mirror from the occlusal and the buccal to locate the FA point and the long axis of the clinical crown. It will take only a few bondings before the clinician feels very comfortable using the mirror as an aid for bracket placement.



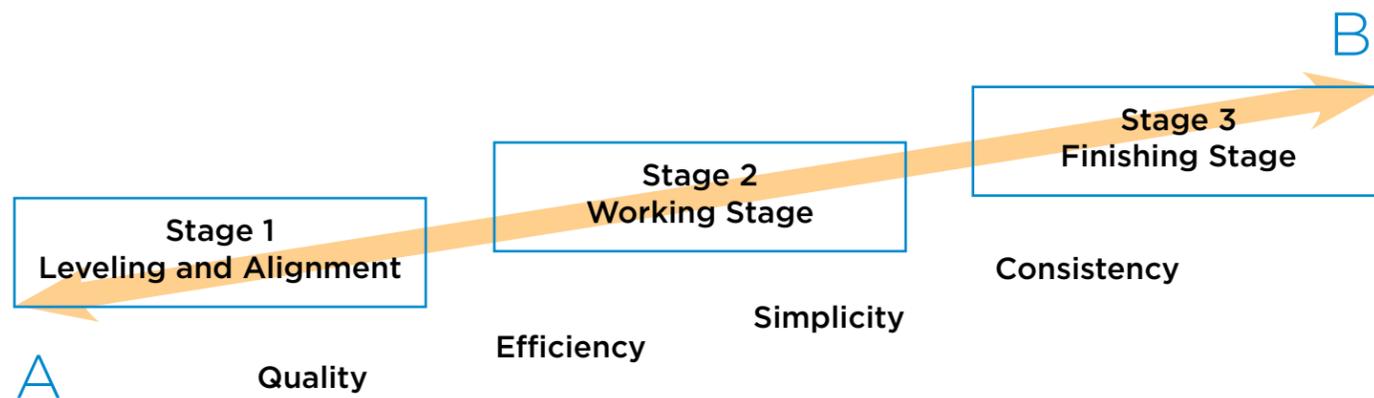
- Lower Molars: The same as for the upper molars. The landmark that Andrews used as the long axis of the clinical crown for the lower molars is the buccal groove. The FA point then lies along the buccal groove, midway occlusogingivally. The center of the tube mesiodistally should be in agreement with the FA point as previously discussed. This will prevent the commonly seen distal overrotation of the molars.



4. Treatment Mechanics

For didactic purposes, treatment mechanics has been usually divided into different stages, from three to seven, depending on authors' preference. Simplicity is of paramount importance when teaching, and therefore all the mechanics to be accomplished in our orthodontic treatments with the CCO System can be divided into three stages: stage 1, leveling and aligning; stage 2, working stage; and stage 3, finishing stage.

At each of these stages there are specific movements of teeth that will occur and specific goals that have to be achieved before continuing to the next stage of treatment. It is important to emphasize that both the treatment outcome and its efficiency will be greatly improved if the orthodontist follows these stages. The following stages of treatment mechanics, with their respective wire sequence, have been tailored for the CCO System.



Excellent treatment mechanics should allow the orthodontist not only to deliver optimal treatment to the majority of his or her patients achieving the esthetic and

functional predetermined goals but also to do it in the most efficient and simple way. Time is a valuable resource for both the orthodontist and the patient as well.

Stage 1: Leveling and Aligning

Leveling and aligning is a complex process where all the crowns are moving at the same time and in different directions. As the teeth level and align, reciprocal forces between them develop, which can be of great help to guide the movements to our advantage. Then, when possible, all teeth should be engaged from the beginning to obtain maximum efficiency of tooth movement.

Usually at this stage, round, small-diameter, thermal-activated wires, such as a .014" Sentalloy for severe crowding, or an .018" Sentalloy for moderate to minimum crowding, are preferred. It is recommended to place crimpable stops to avoid undesirable movement of the wire, which can cause discomfort to the patient. These round wires can be in place for as long as 8 to 12 weeks before proceeding to the next wire, which usually is a .020" x .020" BioForce.

The BioForce wire is a low-deflection, thermal-activated wire that works very well as a transitional wire from Stage 1 to Stage 2. The .020" x .020" BioForce corrects most of the rotations left by the previously used round wires and provides more stiffness to start leveling the curve of Spee and therefore flatten the occlusal plane. It is important to note that even if you could start treatment with a rectangular or square thermal-activated, low-deflection wire, with the assumption of saving time and providing torque from the beginning of treatment, this is absolutely not recommended, since it may cause loss of posterior anchorage. This happens for two main reasons: first, the only teeth with positive labial crown torque are the maxillary central and lateral incisors, and second, the mesial crown tip of the maxillary and mandibular canines is rather large. Therefore, if we start treatment resolving the crowding with a rectan-

Stage 1: Leveling and Aligning

gular or square wire, we are providing labial crown torque to the maxillary incisors and mesial crown tip to canines, which will increase our anchorage in the front part of the arch facilitating the loss of anchorage in the posterior part of the arch.

This is critical in cases where the treatment plan calls for maximum retraction of the maxillary and or mandibular incisors. Conversely, if we start treatment with a round wire of small diameter, we will not provide torque and the tip effect on the canines will be minimal. This will allow the molar and premolars to level, align, and upright, which will produce a "lasso" effect on the incisors that will upright and sometimes even retract them.

The .020" x .020" BioForce will make the clip of the SLB active and thus start delivering torque; nonetheless, its strength is not sufficient to compromise the anchorage that has already been created with the round wires. Usually, after 8 to 10 weeks with the .020" x .020" BioForce, the stage 1 of leveling and aligning is finished, and in the author's opinion it is the first time to evaluate bracket placement and debond/rebond as necessary. Then, we are ready to start Stage 2, the Working Stage.

Movements we should expect and goals we should accomplish when Leveling and Aligning before starting Stage 2:

- Teeth move individually
- Mainly crown movement
- Molars and Pm derotate and upright distally
- Incisors upright and sometimes even retract
- Mainly round, small diameter, superelastic wires (ideal thermoelastic)
- Square or rectangular superelastic wires to completely correct rotations
- Before going on to Stage 2, check bracket position (gross errors) and debond/rebond as indicated

Arch Wire Selection

Stage 1 Severe to Moderate Crowding

Type	Size / Sequence
Sentalloy*	.014"
	.018"
BioForce*	.020" x .020"

Stage 1 Mild Crowding

Type	Size / Sequence
Sentalloy*	.018"
BioForce*	.020" x .020"

*Sentalloy and BioForce are Thermalactivated wires

Stage 1: Leveling and Aligning

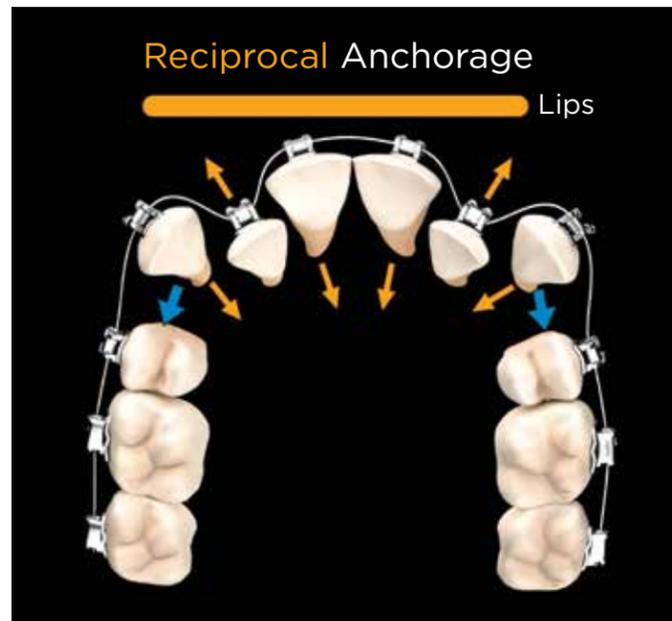


Fig. 4-1A

Figures 4-1A and 4-1B show the reciprocal forces that occur at the time of initial alignment. In a reduced-friction system, the canines will move back to the extraction space without any forward movement of the incisors. The extra amount of wire will move back distal of second molars. The bigger the amount of crowding, the bigger the amount of wire that will protrude distal of the last tooth when leveling and aligning.

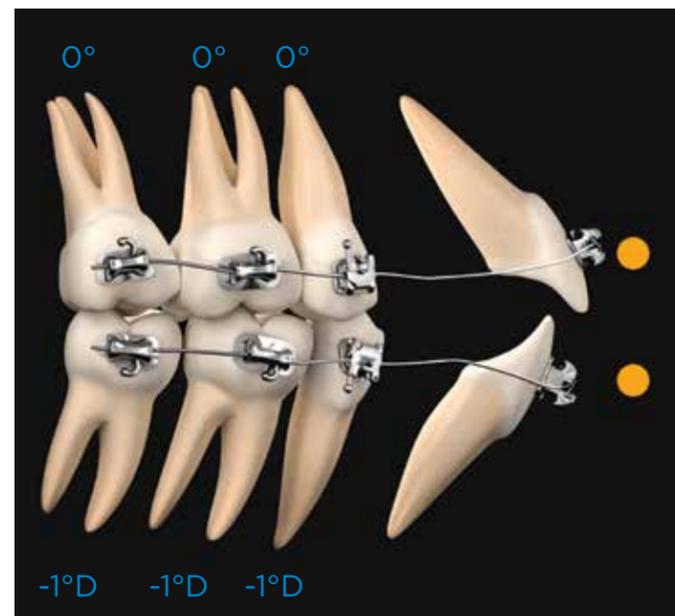


Fig. 4-2A

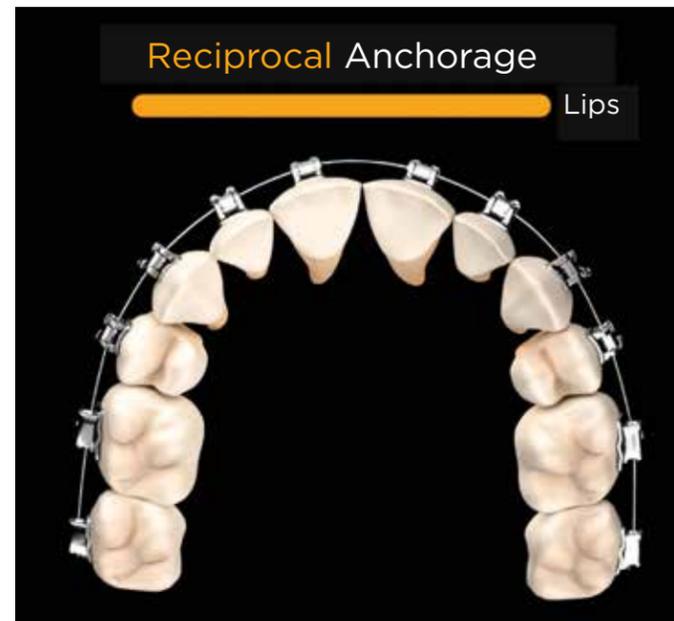


Fig. 4-1B

Figures 4-2A and 4-2B show the distal tip of the upper and lower molars and premolars built into the CCO Rx. As the molars and premolars level and align, they also upright. This, together with the force of the lips, will provide posterior anchorage allowing the incisors to upright, even retract, and consequently improve the overbite and overjet.

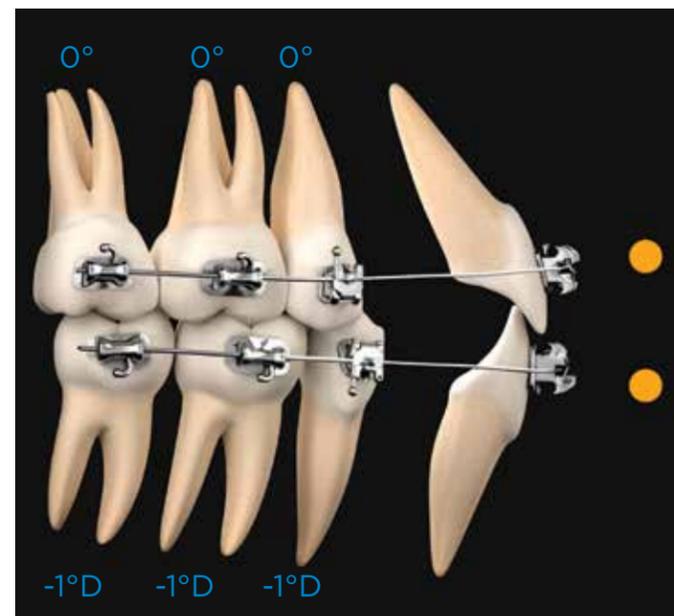


Fig. 4-2B

Stage 1: Leveling and Aligning

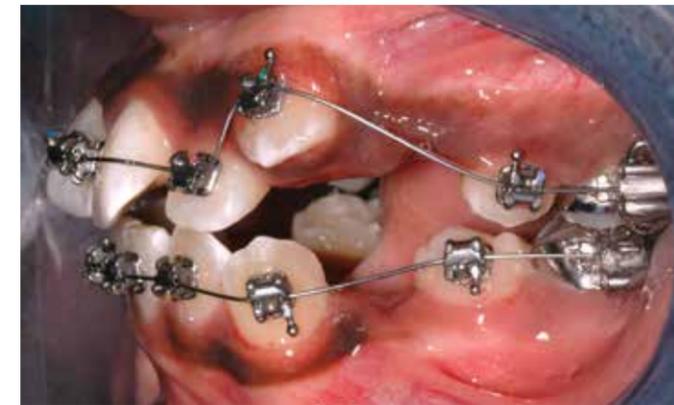


Fig. 4-3A

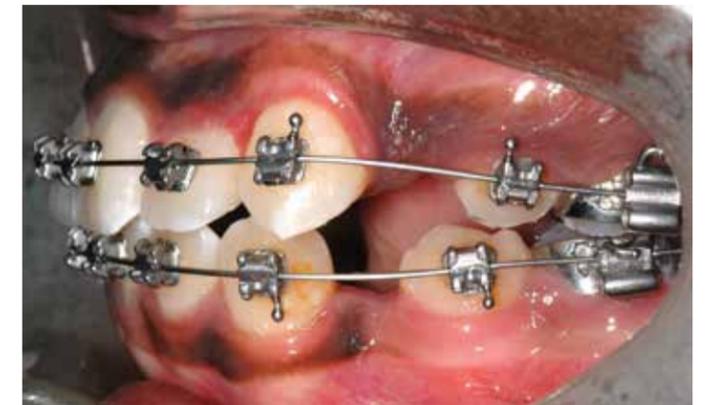


Fig. 4-3B



Fig. 4-3C



Fig. 4-3D

As shown in Figures 4-3A to 4-3D, as the initial alignment occurs, molars upright and the maxillary and mandibular plane of occlusion become more parallel. The incisors upright and even retract, and the overbite improves. The wire sequence is very important to control tipping, rotations and torque. Small, round Sentalloy wires such as .014" (4-3B) and .018" (4-3C) are excellent to control initial alignment, upright incisors, premolars and molars, and correct major rotations. BioForce wires such as .020" x .020" (4-3D) are ideal to finish with the leveling and aligning stage. This wire will finish correcting the rotations still present after the round wires. It will also express more crown tipping and will start providing a small amount of torque since its dimension will mildly activate the springing clip of the bracket.

Figures 4-4A and 4-4B show how as the initial alignment occurs, molars upright and the maxillary and mandibular plane of occlusion become more parallel helping uprighting and even retracting the incisors and also improving the overbite. Fig. 4-5A to 4-5C show the sequence from an initial .014" Sentalloy (4-5A) to a .018" Sentalloy (4-5B) to a .020" x .020" BioForce wire (4-5C). No elastics or extraoral force has been used.

Stage 1: Leveling and Aligning

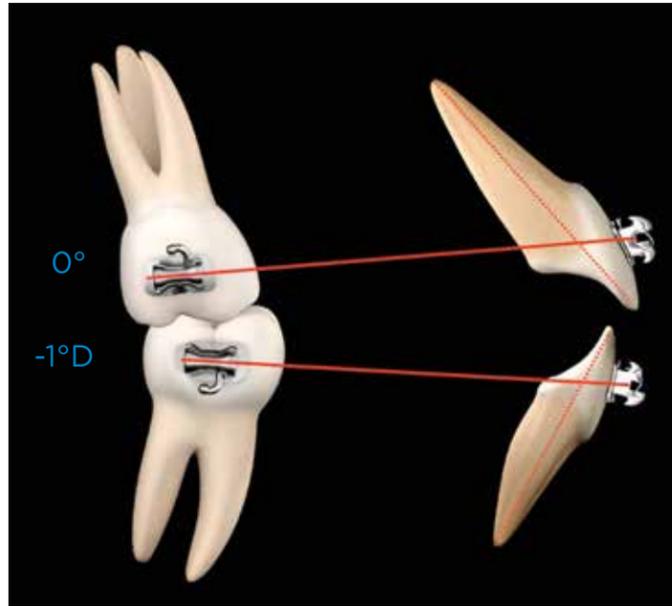


Fig. 4-4A

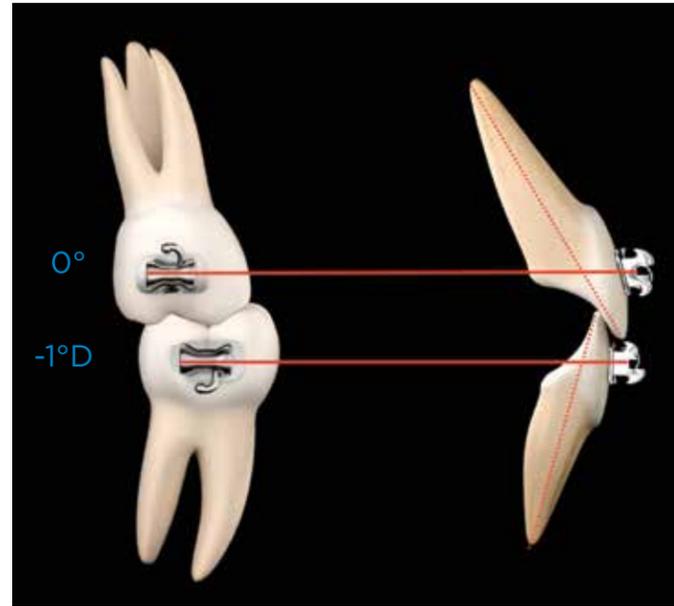


Fig. 4-4B

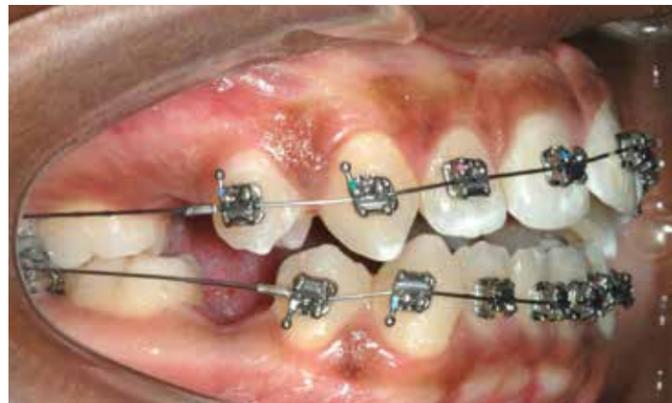


Fig. 4-5A

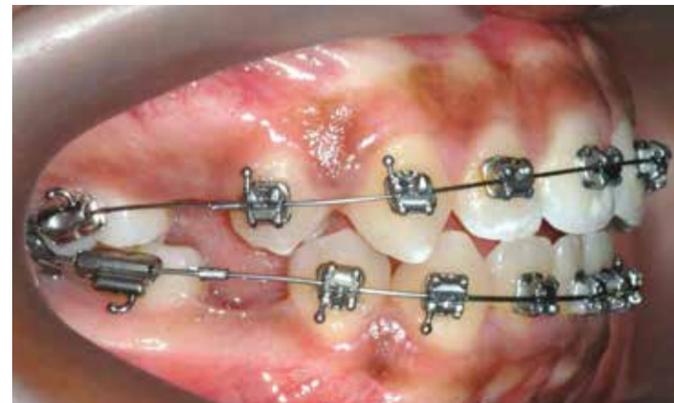


Fig. 4-5B

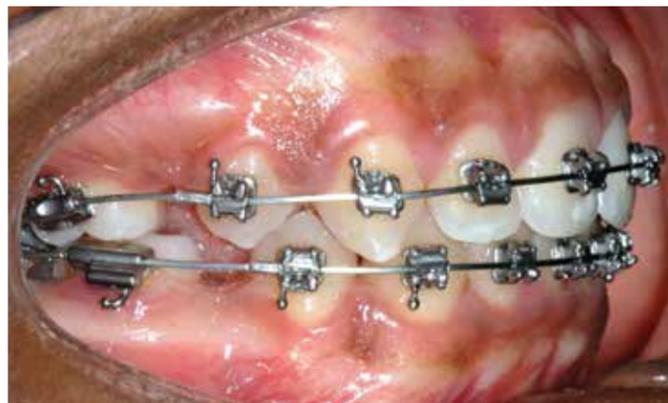


Fig. 4-5C

Stage 1: Leveling and Aligning



Fig. 4-6A



Fig. 4-6B



Fig. 4-6C



Fig. 4-6D

Figures 4-6A to 4-6D show another example of the favorable clinical effects of the distal-tip built into the molars and premolars to parallel the upper and lower occlusal planes. As the maxillary and mandibular occlusal

planes become parallel, the open bite closes. Initial leveling and aligning using light forces minimizes the extrusion of molars, which are held in the same vertical position by the normal occlusal masticatory forces.

Stage 2: Working Stage

This stage of treatment is the one on which we will spend more time. At this stage, the maxillary and mandibular arches are coordinated, proper overbite and overjet are achieved, Class II or Class III are corrected, maxillary and mandibular midlines are aligned, extraction spaces are closed, and maxillary and mandibular occlusal planes are paralleled. Although most of these corrections happen simultaneously, we will describe them separately for didactic reasons so key points can be emphasized.

Arch Coordination

The maxillary and mandibular archwires must be coordinated in order to obtain a stable occlusal intercuspation

and proper overjet. In an ideal intercuspation of a Class I, one-tooth to two-teeth occlusal scheme, the palatal cusps of the maxillary molars should intercuspate with the fossae and marginal ridges of mandibular molars, the buccal cusp of the mandibular premolars should intercuspate with the marginal ridges of the maxillary premolars, and the mandibular canines and incisors should intercuspate with marginal ridges of the maxillary canines and incisors. If this occlusal scheme occurs, it will then provide an overjet of 2 to 3 mm all around the arch from second molar to second molar. Then, the maxillary archwire must be 2 to 3 mm wider than the mandibular archwire. The archwire coordination is done with the stainless steel wire. Even if

Stage 2: Working Stage

they come preformed, the clinician should not rely on it and check them before insertion.

Another important aspect of arch coordination is the effect that it has on the vertical dimension and the sagittal dimension. Arch coordination is a transverse issue. The maxillary teeth should be upright and centered in the alveolar/basal bone and coordinated with the mandibular teeth, which should also be upright and centered in the alveolar/basal bone to obtain a proper intercuspation. Often this is not the case and we find maxillary molars buccally inclined, also referred as an accentuated curve of Wilson, which can produce contacts between the palatal cusp of maxillary molars and the inclines of the mandibular molars. This decreases the overbite and sometimes produces even an openbite (vertical problem), which in turn can produce a downward and backward movement of the mandible (sagittal problem). This phenomenon is due to the lack of palatal crown torque of the maxillary molars. The torque values for the molars in the CCO Rx should take care of this problem for the most part. However, in severe cases, we can add palatal crown torque to the working wire or use transpalatal bars (TPB), which are very effective delivering torque.

Overbite and Overjet Correction

An optimal overbite/overjet relationship does not have to be a certain predetermined number of millimeters. More important is the functional relationship they have. This means that the overbite/overjet should be compatible with a mutually protected occlusal scheme and thus allows for a proper anterior guidance in protrusion and lateral excursive movements. Although, as we said, the number of millimeters is less important than the function; we find that an optimal overbite is usually around 4 mm and an optimal overjet is 2 to 3 mm.

When diagnosing and treatment planning overbite/overjet problems, it is important to take the following key points into consideration: arch space management, position of the mandible in centric relation, and relationship of the upper/lower incisors with the lips. Arch space management is important to understand since the SWA tend to flatten the curve of Spee, which requires space in the arch. If not enough space is available or created, the incisors will procline, increasing the arch perimeter. This incisor proclination will also decrease the overbite and may help, if it

only occurs in the lower arch, to decrease the overjet.

Flattening the maxillary and mandibular occlusal planes proclining the incisors can be of help in deep bite cases. When the incisors are not allowed to procline, space in the arch must be created. This is specifically important to avoid periodontal problems in cases with thin bone surrounding the incisors area. Advanced diagnostic imaging tools such as the CBCT could be of great help to precisely identify the condition of the bone in this area. Up to 4 to 6 mm can be created with interproximal reduction of teeth, usually done on the incisors and, less often, the canines and premolars. If more than 6 mm of space is required, extraction of premolars could be indicated.

Another important factor to consider when evaluating overbite/overjet problems is the position of the mandible. Often, differences between a maximum intercuspation (MIC) and centric relation (CR) can produce significant differences in the overbite/overjet relationship. In many cases we find that as the mandible rotates close in CR, a primary contact, usually at the second molar, keeps the bite open in the anterior, decreasing the overbite and preventing the mandible to achieve a more stable occlusal scheme.

At last, but by no means the least important, is the sagittal and vertical relationship of the maxillary and mandibular incisors with the lips. In an openbite case, should we intrude the molars or extrude the incisors? In a deep bite case, should we intrude the maxillary incisors, the lower, both? These basic but very important questions can be answered through an understanding of the optimal relationship of the incisors with the lips. According to contemporary aesthetic trends and taking into account the aging process for adolescents and young adults, maxillary incisors should have, at rest, an exposure of about 4 mm beyond the most inferior point of the upper lip known as upper stomion. As explained earlier, an optimal functional overbite should be about 4 mm. Now, if we put together the last two concepts, the incisal edge of the lower incisors should be at the same level with the most inferior point of the upper lip. Therefore, any vertical change of the incisors will affect not only the function through changes of the anterior guidance but also the aesthetics through the amount of tooth exposure. These anterior functional/esthetic references explained by Ayala as the “upper

Stage 2: Working Stage

stomion concept” will help the clinician to determine the best strategies to correct overbite/overjet problems and will be of special importance for planning cases involving orthognathic surgery.

Movements that should be expected and goals that should be achieved before starting Stage 3.

- Movement of group of teeth in all planes of the space: Sagittal, Vertical and Transverse
- OJ/OB correction
- Class II and III correction
- Close all remaining extraction spaces
- Finish leveling the occlusal plane
- Arch coordination

Arch Wire Selection

Stage 2	Non-Extraction
Type	Size / Sequence
SW Stainless Steel	.019” x .025”
BioForce*	.019” x .025”

*BioForce is a Thermalactivated wire

Closing Extraction Spaces

Usually after leveling and aligning, the extraction spaces left are smaller than at the beginning of treatment since some of the space has been taken to unravel the initial crowding and to upright the maxillary and mandibular incisors, as described earlier in this manual. Also, the maxillary and mandibular occlusal planes should be flat or almost flat, and the six anterior teeth should be consolidated into one unit. Then, to efficiently close the remaining spaces, achieving the desired functional and aesthetic goals, we need to determine the anchorage requirement. This will allow us to know which teeth should be moved more mesially or distally and therefore to choose the appropriate mechanics.

We believe that one of the easiest ways to determine the anchorage requirement is to perform a visual treatment objective (VTO). The VTO is a cephalometric exercise where we modify the patient’s cephalometric tracing to achieve the desired “end of treatment” result and then, by superimposing both tracings, we can visualize the movements that need to occur to obtain that result. The VTO is not a formula or equation that will determine or impose a specific type of treatment but rather an exercise where we take into account our experience gathered from other similar cases, an estimation of the growth the patient will have during treatment, the patient’s biotype and soft tissue characteristic, and so on to more accurately treatment plan our cases and have a visual representation of it. Thus, after the VTO has been performed, the anchorage requirement can be minimum, medium, or maximum.

Before describing each one of these anchorage situations, it is important to indicate the wires and auxiliaries used at this stage. In our mechanics, we use a straight wire with hooks and Sentalloy coils (Sentalloy is a trademarked brand of Dentsply Sirona, Islandia, NY). The wire is stainless steel and can be either 0.019” × 0.025” or 0.021” × 0.025”, depending on the anchorage situation. The Sentalloy coils can be light (100 g), medium (150 g), or heavy (200 g). The most common coil I use is the medium (150 g). It works very well in all kinds of anchorage situations. It is important to remember that when the anchorage situation calls for it, we use some auxiliaries to enhance the posterior anchorage. Auxiliaries such as TPBs, temporary anchorage devices (TADs), and/or the use of extraoral anchorage such as High Pull or Cervical Head Gear.

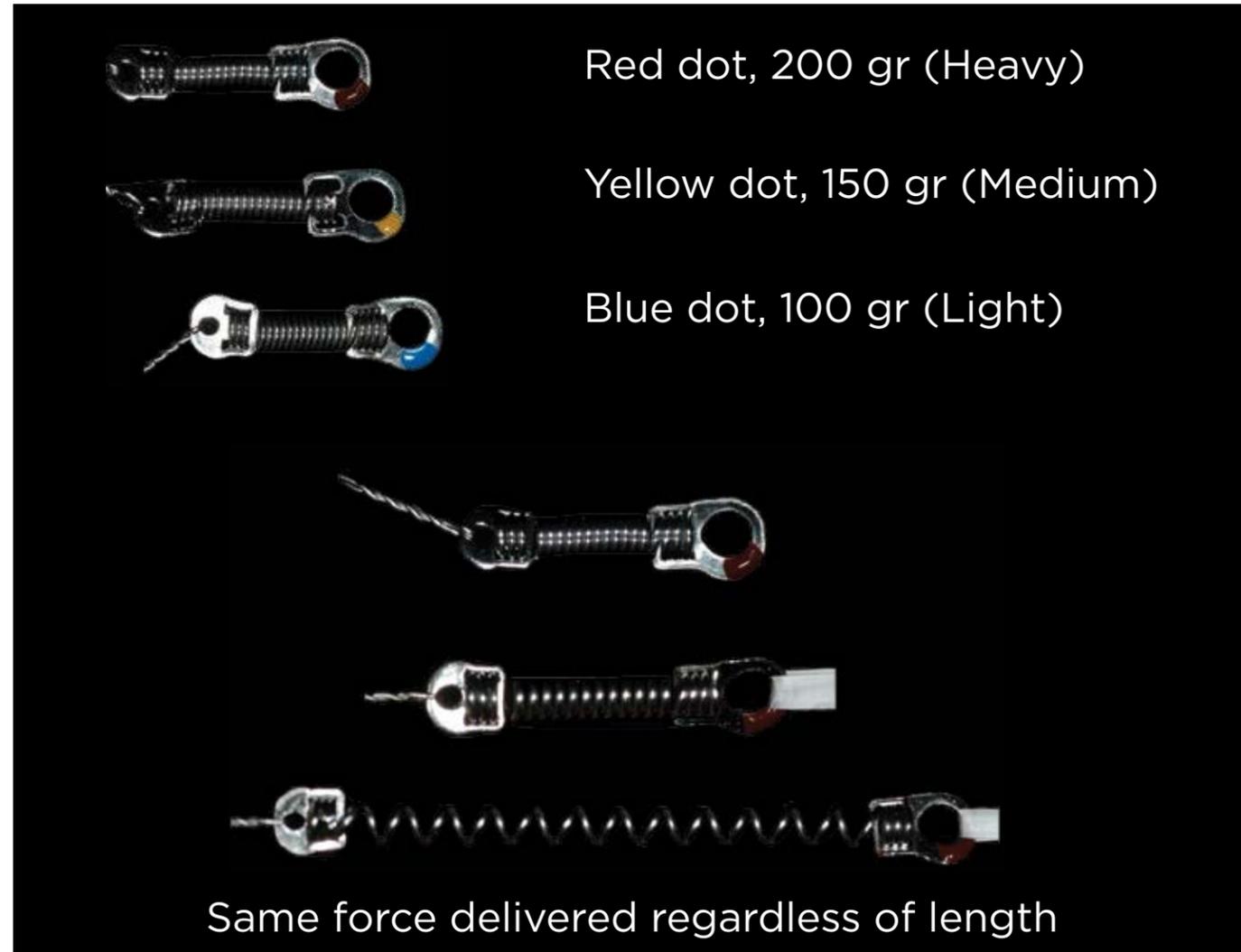
Stage 2: Working Stage (Closing Extraction Spaces)

Sentalloy Coil Activation

Sentalloy coils come in three different strengths, 100 g (blue dot), 150 g (yellow dot) and 200 g (red dot). It is the author's preference to use the 150 g Sentalloy coil. These coils deliver the same force independent of the amount of activation. In our mechanics, we usually crimp a surgical type of hook distal of the canine from which a Sentalloy

coil is engaged all the way to the hook of either the first or second molar. If a surgical hook is not available, the Sentalloy coil can be engaged to the hook of the canine's bracket. This situation requires the six front teeth to be tied together with either an elastomeric chain or a stainless steel ligature so they act as a unit.

Fig. 4-7



Stage 2: Working Stage (Closing Extraction Spaces)

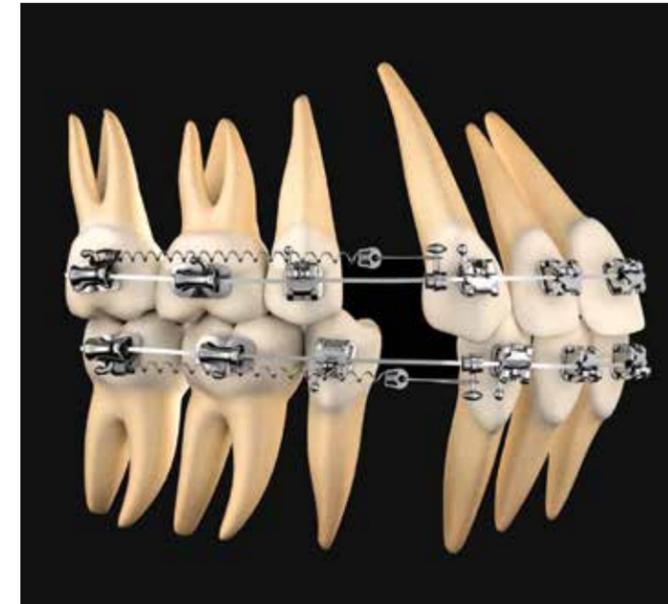


Fig. 4-8A



Fig. 4-8B

Sentalloy Coils

.019" x .025" ss or .021" x .025" ss. Depending on anchorage requirement as previously described.



Fig. 4-9A



Fig. 4-9B

This case was treated with extractions of upper and lower first premolars utilizing maximum anchorage. Figure 4-8A shows a mid-treatment stage where a Sentalloy coil spring (150 g)

activated from the second molar is being used to close the extraction spaces of the lower arch on a .019" x .025" ss wire with hooks. Figure 4-8B shows the case finished.

Stage 2: Working Stage (Closing Extraction Spaces)

Understanding Anchorage Requirement

- Minimum
- Medium / Reciprocal
- Maximum

VTO3
Visual Treatment
Objective in all
3 dimensions

Arch Wire Selection

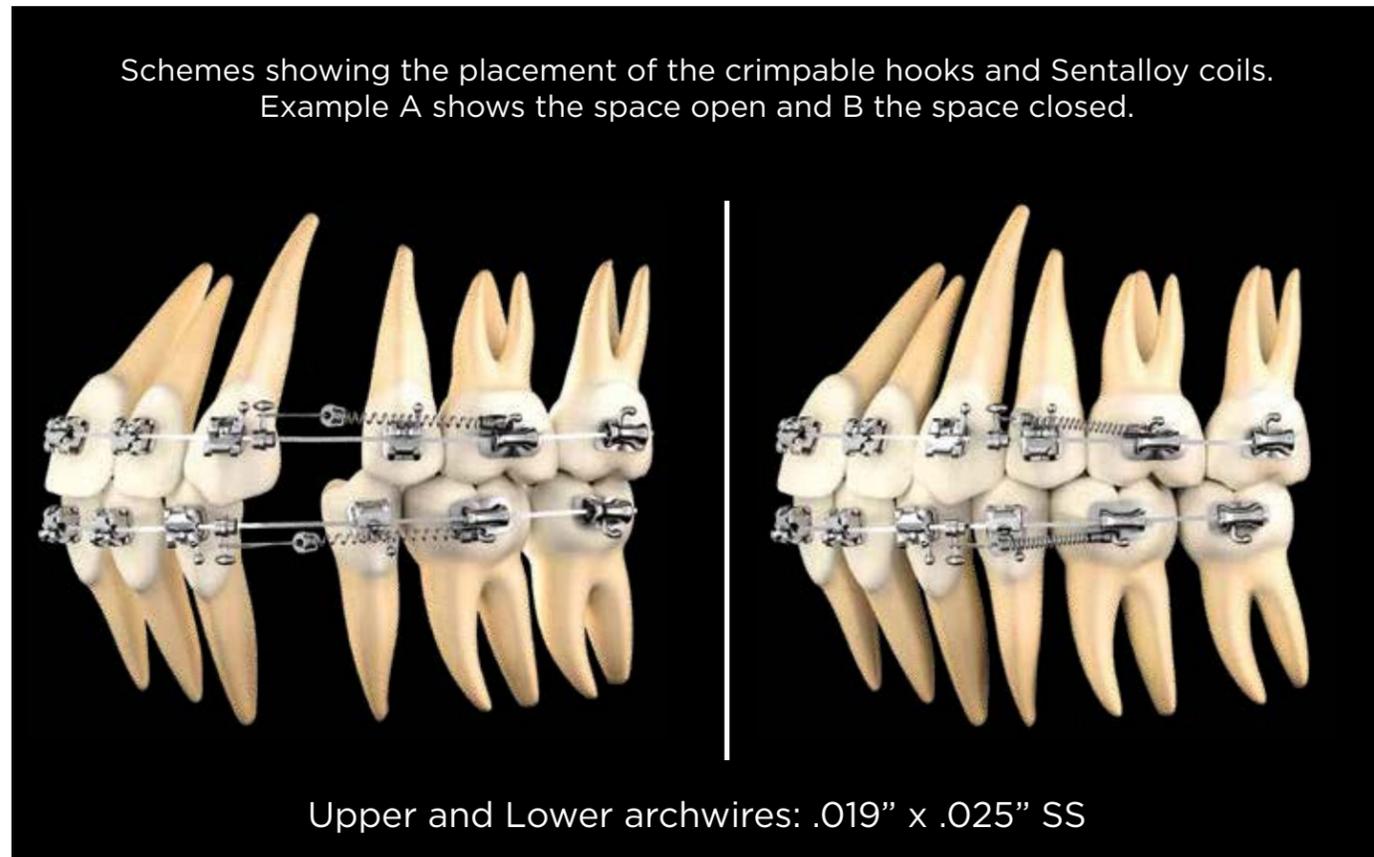
Stage 2	Extraction	
Type	Size	Sequence
Stainless Steel with hooks	.019" x .025"	Depends on Anchorage Requirement
	.021" x .025"	

Medium Anchorage

This is the most common anchorage situation we will encounter in our cases. Medium anchorage means that the remaining spaces should be closed reciprocally. For this situation, we use a .019" x .025" wire. The activation of the Sentalloy coils is done, most of the time, from the first molar. However, it can also be done from the second molars depending on how the case is progressing. The bone and attachment apparatus is not the same for every patient

and, therefore, the response to the closing mechanic could differ between cases. Then, a clinical examination of the overbite/overjet, canine and molar relationship, and facial aesthetic should be done at each visit to evaluate any changes in activation that may be required. This should not take any extra time since the management of the Sentalloy coil is a rather easy procedure.

Fig. 4-10



Stage 2: Working Stage (Closing Extraction Spaces)

Maximum Anchorage

In a maximum anchorage situation, most of the remaining space left after leveling and aligning is closed due to distal movement of the anterior teeth. We use a .019" x 0.025" wire. The Sentalloy coil is activated from the second molars.

Although not frequently required, auxiliaries to enhance posterior anchorage such as TPB, TADs, or extraoral force (headgear) can be used as needed.



Fig. 4-11-A

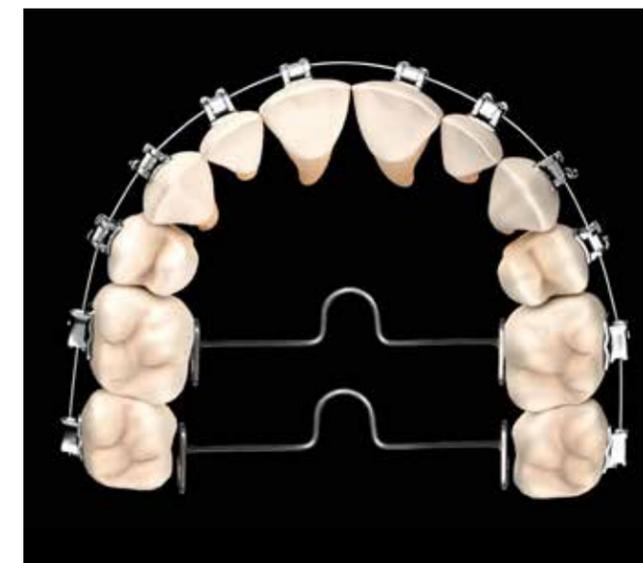


Fig. 4-11-B

Transpalatal Bars



Fig. 4-11-C

High Pull Head Gear

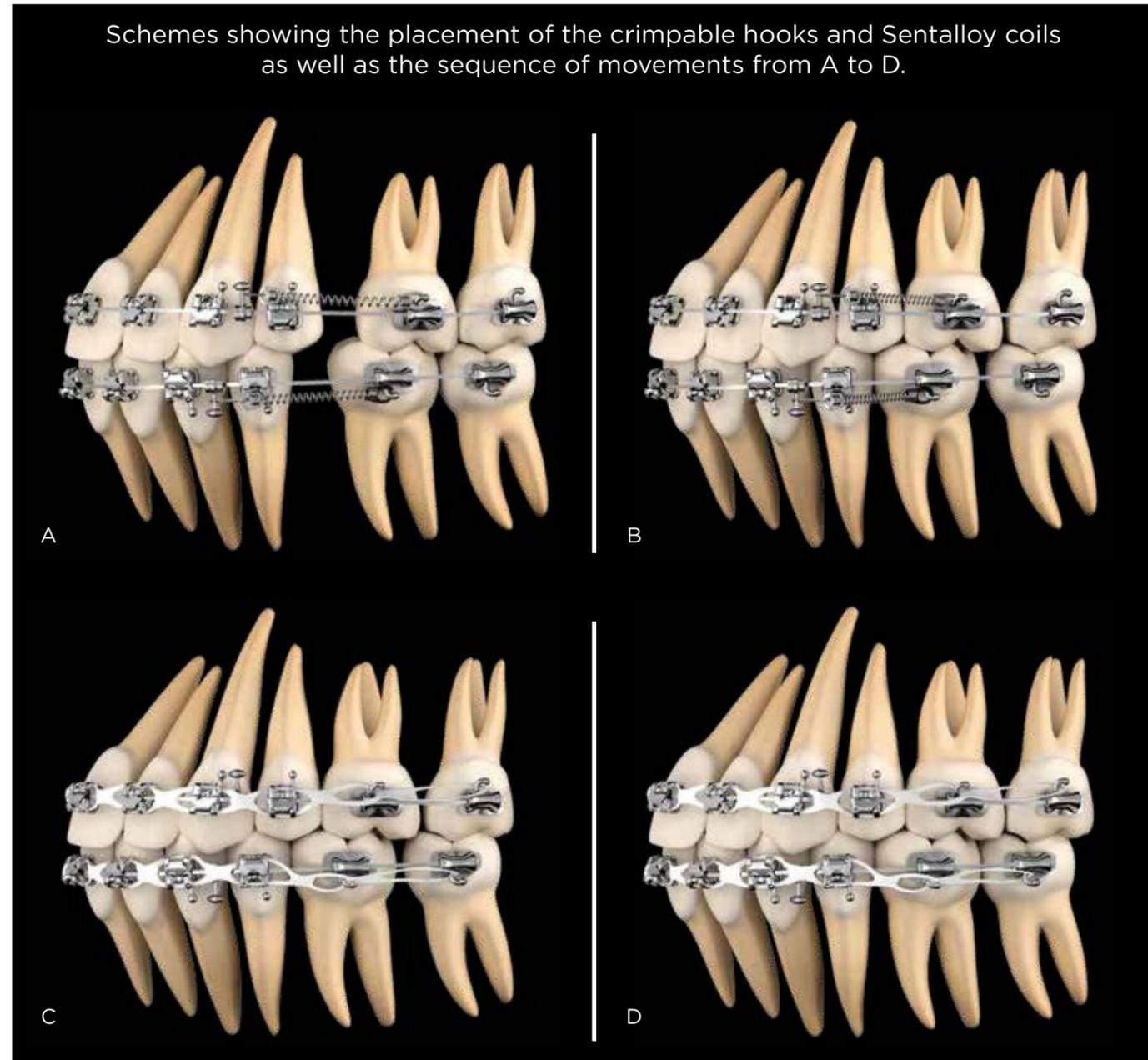
Stage 2: Working Stage (Closing Extraction Spaces)

Minimum Anchorage

In a minimum anchorage situation, molars will be moved mesially to close the remaining extraction spaces. We use a .021" x .025" wire. This wire will express the buccal crown torque of the maxillary incisors and the mesial tip of the canines. In the mandible, this wire will express the mesial tip of the canine. This situation will increase the anchorage in the anterior part of the mouth since it would be more difficult to retract or even tip back the anterior teeth while

moving the molars forward. The activation of the Sentalloy coils must be done from the first molars. Then, after the first molar has been moved forward as desired, the second molar can be activated and moved forward too. Often though, this is not required since the second molars will travel forward as we move the first molars and then the space remaining between the first and second molars will be very small and easily closed with an elastomeric chain.

Fig. 4-12



Stage 2: Working Stage (Closing Extraction Spaces)

Minimum Anchorage

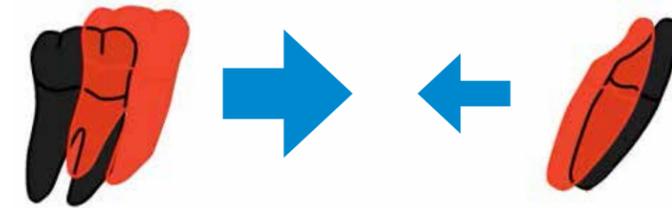


Fig. 4-13A



Fig. 4-13B



Fig. 4-13C

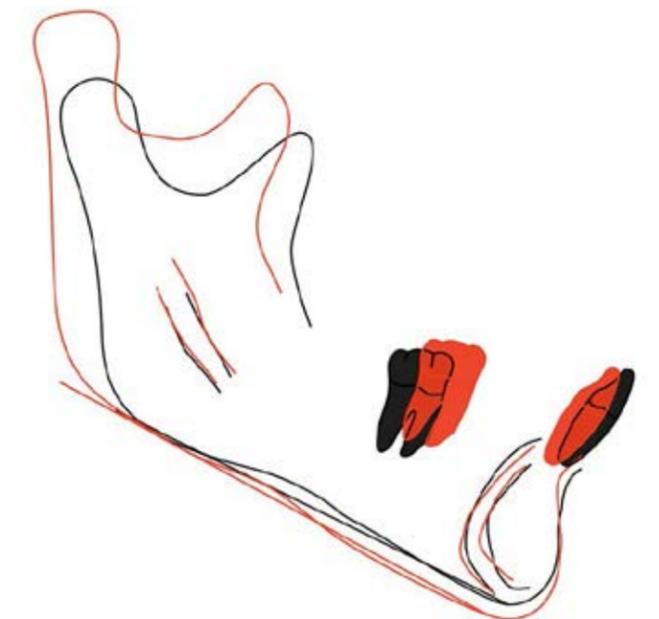


Fig. 4-13D

Figures 4-13A to 4-13D show a Class II case treated with extractions of maxillary first premolar and mandibular second premolars. Minimum anchorage was used for the mandibular arch. Fig. 4-13A shows the pretreatment intraoral pictures of the right side. Fig. 4-13B shows a lower .021"x.025" ss DKL activated with a ss ligature from

the first molar to move it mesially to a Class I. The .021"x.025" ss DKL provides sufficient anchorage of the anterior segment. Fig. 4-13C shows the posttreatment picture. Fig. 4-13D shows the superimposition of the pre and post-mandibular tracings where one can notice the mesial movement of the molars.

Stage 2: Working Stage (Closing Extraction Spaces)

Minimum Anchorage

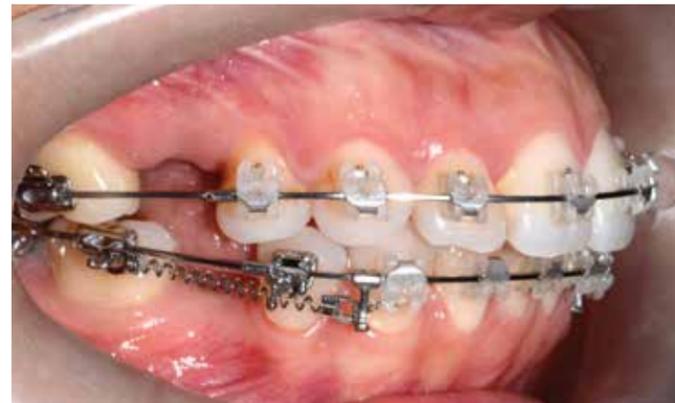


Fig. 4-14A

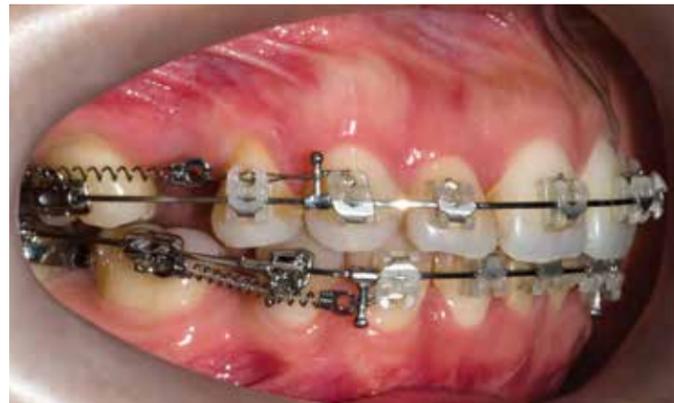


Fig. 4-14B



Fig. 4-14C



Fig. 4-14D

Figures 4-14A to 4-14D show another example of minimum anchorage in the mandible. After leveling and aligning has been completed and the occlusal plane has been leveled, the lower first molars are being moved mesially on a .021" x .025" ss wire with crimpable hooks where a Sentalloy coil (150 gr) is placed. Notice how the molar moved mesially closing the space. No change in OB/OJ or canine

relationship is observed. The patient used a short Class II elastic (3/16", 4 oz) at night time. These coils are very effective and efficient compared with the Double Loop wire, since it does not have to be activated every 4 weeks as the Double Loop wire has to. The coils remain active until the space is closed.

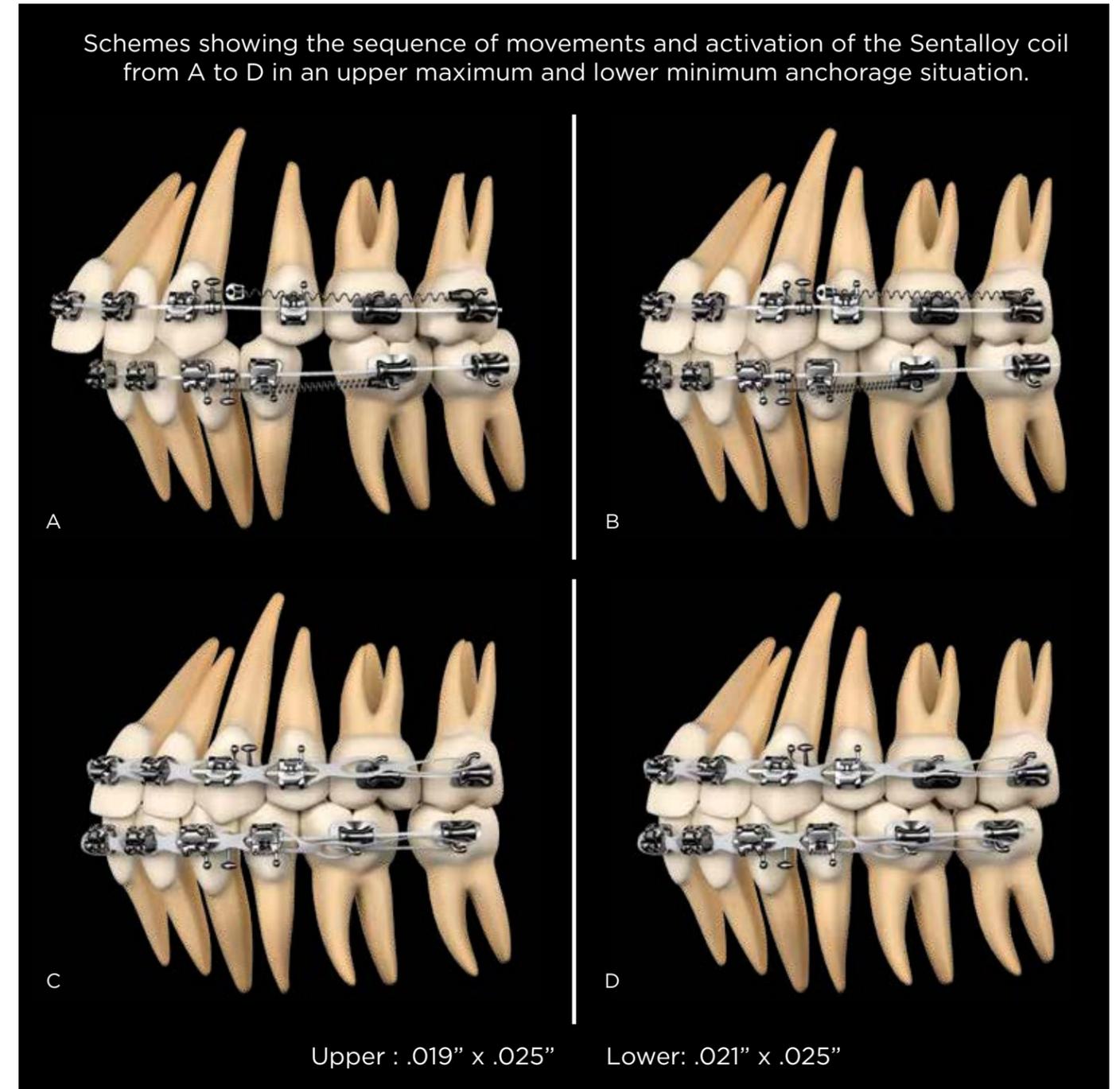
Stage 2: Working Stage (Closing Extraction Spaces)

Anchorage is arch specific

The anchorage requirement is arch specific and therefore there are clinical situations where the anchorage will be

maximum for the upper arch and minimum for the lower arch or vice versa.

Fig. 4-15



Stage 2: Working Stage (Closing Extraction Spaces)

Intermaxillary Elastics

Discretion is a good word to describe the use of intermaxillary elastics. We use them and like them, but it is important to understand how they are used in these mechanics to avoid problems.

We do not use intermaxillary elastics in the following situations:

- Round wires
- Initial leveling and aligning, low-deflection wires
- To a terminal tooth, last tooth in the arch
- In the anterior part of the mouth to close openbites
- In the posterior part of the mouth to correct crossbites
- For a long extended period of time

We use intermaxillary elastics in the following situations:

- At the working and finishing stages
- On square or rectangular stainless steel wires
- On the buccal side of the mouth, short Class II or III and/or triangular verticals

The three types of intermaxillary elastics we commonly use are 3/16-inch 4 oz, 6 oz, and 8 oz elastics. Short means, in a Class II for instance, from the maxillary canine to the mandibular second premolar in a nonextraction case and to the first mandibular molar in an extraction case.

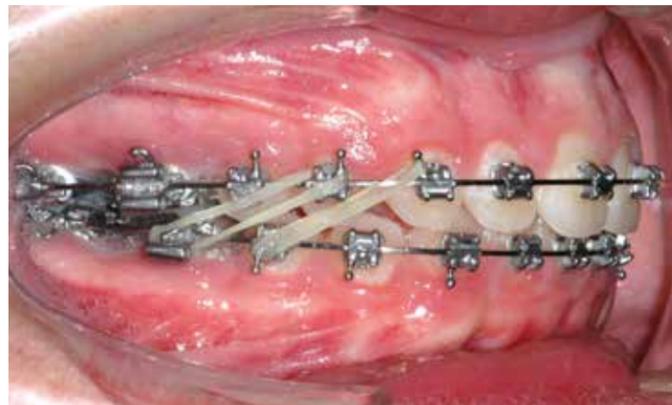


Fig. 4-16A Short double Class II 3/16" 6 oz. Maxillary and mandibular .019" x .025" ss wires.

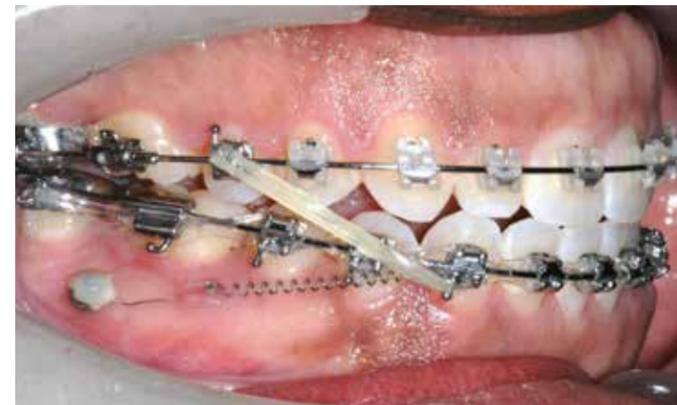


Fig. 4-16B Short Class III 3/16" 6 oz. Maxillary .021" x .025" ss and mandibular .019" x .025" ss wires.

Stage 2: Working Stage (Distal movement of maxillary molars with open coils)

There are some cases where the distal movement of maxillary first and second molars is a great solution to correct Class II dental relationships. Open coils provide an easy and efficient way to distalize molars without losing control. However, certain precautions must be taken into account:

- It only provides a dental correction
- Useful in cases where no more than 3 mm of correction is needed
- It is not indicated in severe vertical cases
- The maxillary occlusal plane must be leveled
- To allow enough sliding with tooth control, a .019" x .025" ss wire is preferred
- Anchorage of the anterior segment is provided by using short Class II elastics. TADs can be also used in non-compliance patients

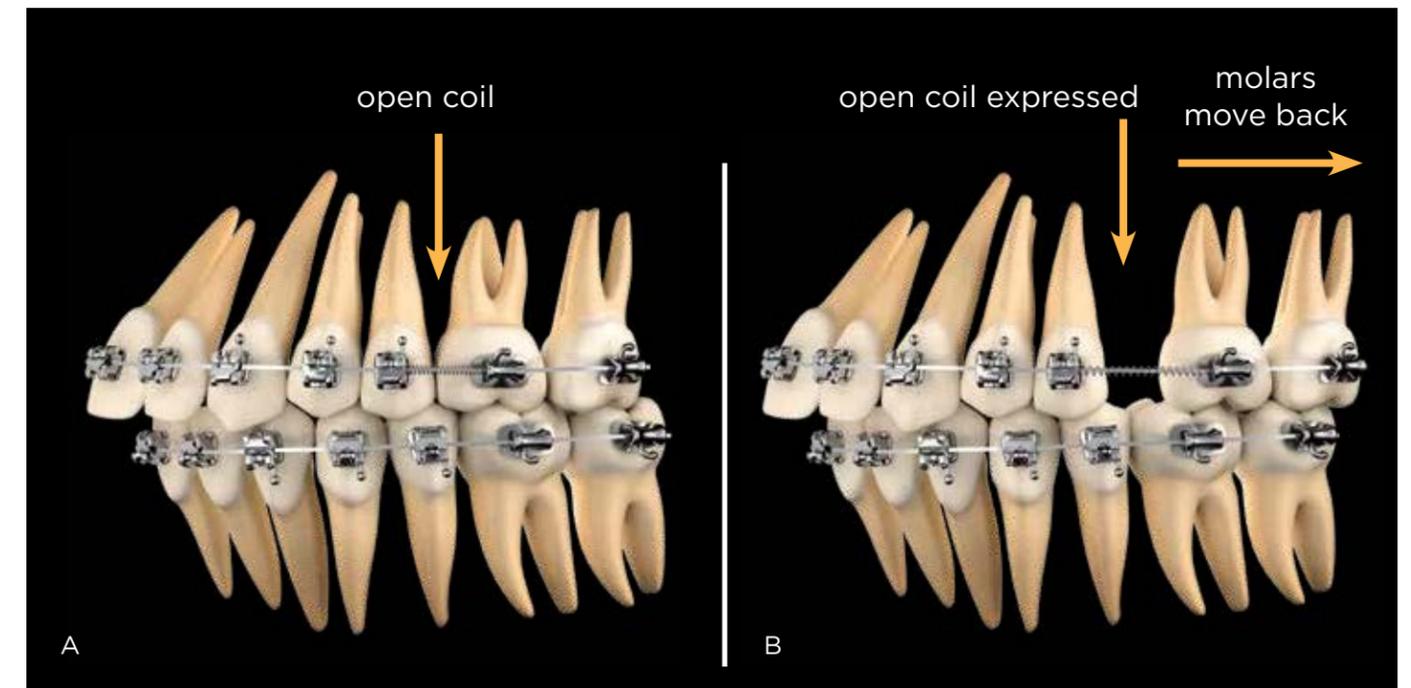


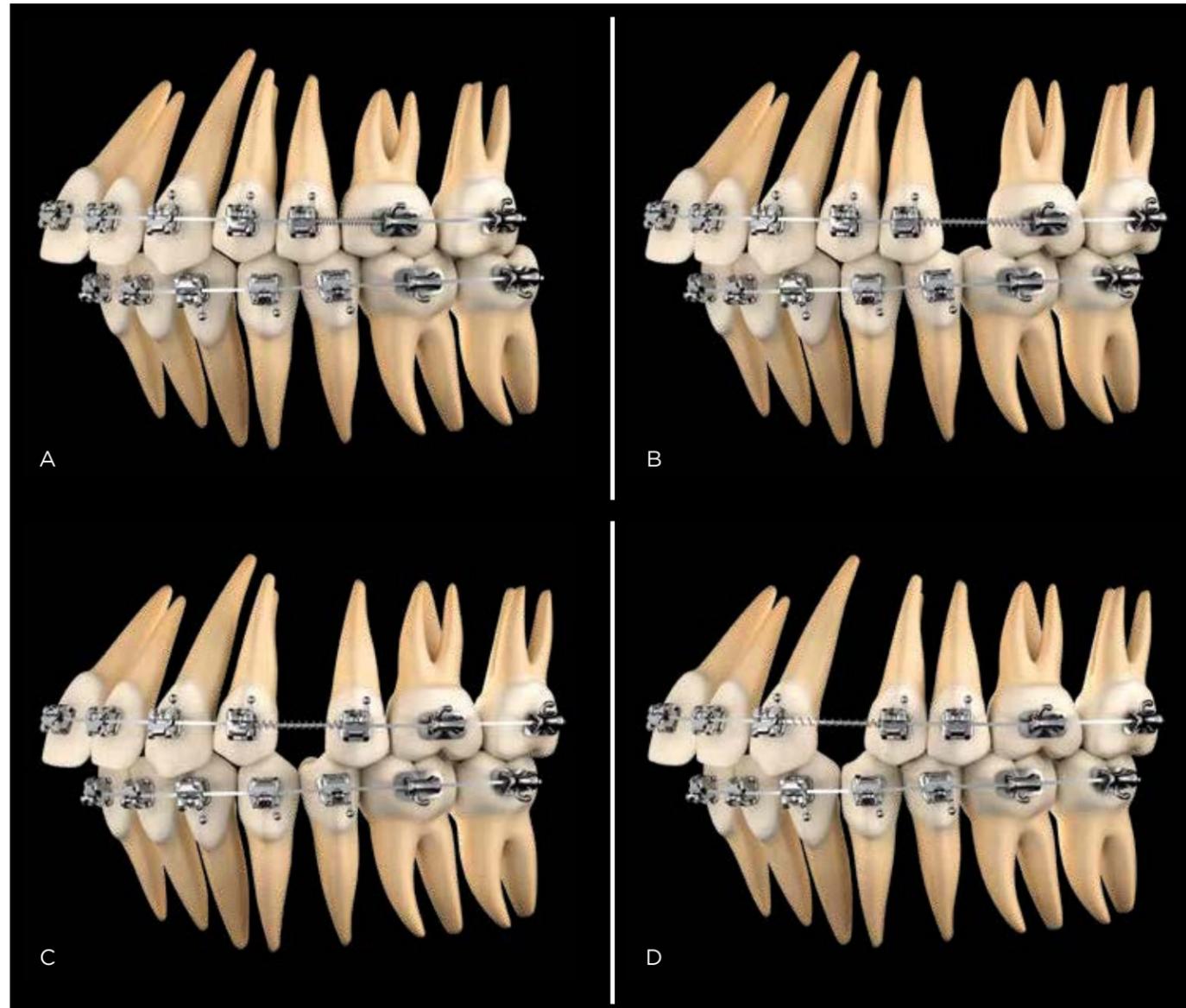
Fig. 4-17

Stage 2: Working Stage (Distal movement of maxillary molars with open coils)

Fig. 4-18A shows an open coil compressed between maxillary second premolar and first molar. The coil must be compressed as much as possible, and the archwire must be left long about 1 to 2 mm to allow the molars to slide through it. A Class II 4 oz. from maxillary canine to mandibular second premolar is used as anchorage to avoid maxillary canine and incisors to move forward. Fig. 4-18B shows maxillary first and second molars distalized to a Class I relationship.

After molars have been moved into Class I, the open coil is placed between maxillary first and second premolars to move the second premolar distally. Then, between canine and first premolar to move the first premolar distally. The Class II 4 oz. must be used at all times. Figs. 4-18C and 4-18D show the open coil in place before and after the distal movement of the maxillary second premolar.

Fig. 4-18



Stage 2: Working Stage (Distal movement of maxillary molars with open coils “Step by Step”)



Fig. 4-19A



Fig. 4-19B

Intraoral photos before treatment. Class II canines and end-on first molars on the right side.

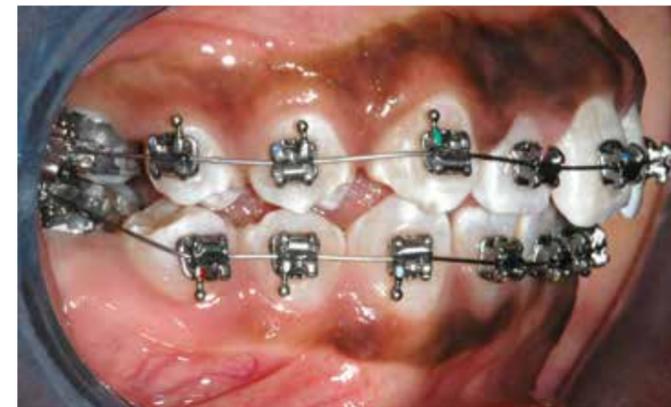


Fig. 4-19C



Fig. 4-19D

In-Ovation 'R' brackets and upper and lower .014" Sentalloy Medium wires.



Fig. 4-19E



Fig. 4-19F

Upper .020"x .020" Bioforce Medium wires to complete the stage of leveling and aligning.



Fig. 4-19G

Fig. 4-19H

Beginning of working stage with an upper and lower .019" x .025" ss wire. The occlusal plane has been leveled. An open coil has been placed between the second premolar and first molar. A short Class II 4 oz elastic is used for anchorage (from upper canine to lower second premolar).



Fig. 4-19M

Fig. 4-19N

Upper first and second molar have been moved to a Class I. The occlusal view shows the amount of space gained by the open coil.



Fig. 4-19I

Fig. 4-19J

First and second molars have been moved distally. The open coil can be easily activated by placing a crimpable stop as shown in the above picture.

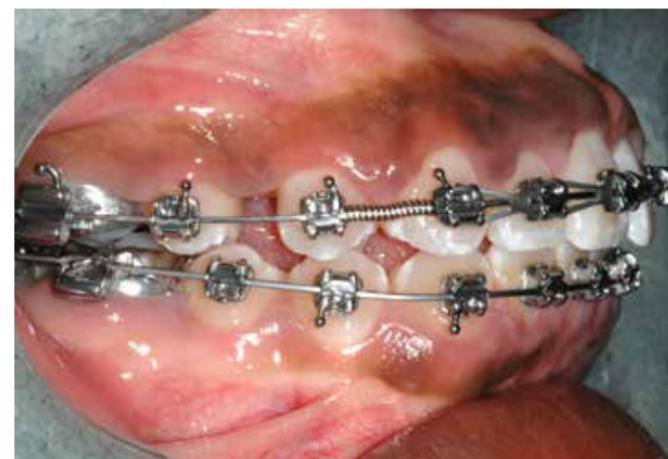


Fig. 4-19O

Fig. 4-19P

The second premolar has been moved distally using the same open coil. Now, the first premolar is being moved distally. A short Class II 4 oz is used as anchorage.



Fig. 4-19K

Fig. 4-19L

More activation of the open coil is needed. Notice the placement of two crimpable stops.



Fig. 4-19Q

Fig. 4-19R

The first premolar has been moved distally using the same open coil. Now, the first canine will be moved distally.



Fig. 4-19S

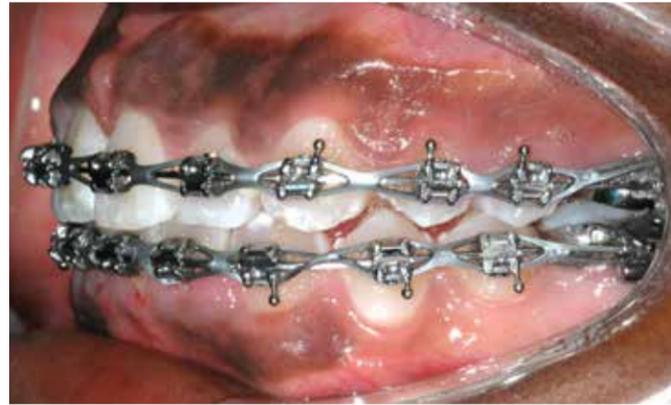


Fig. 4-19T

Upper and lower C-chain is used to consolidate remaining spaces. Interproximal reduction of lower incisor is done and short Class II 6 oz elastics are used.

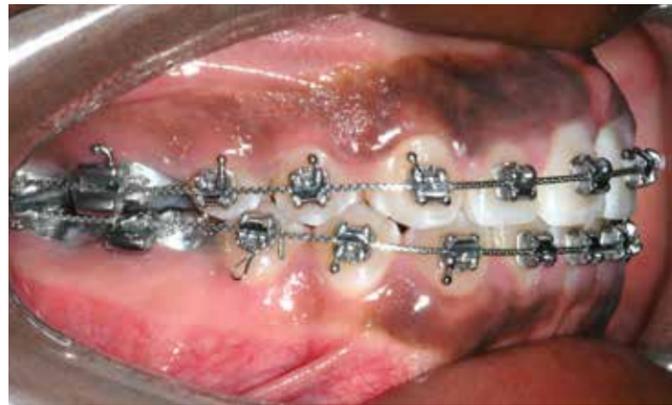


Fig. 4-19U

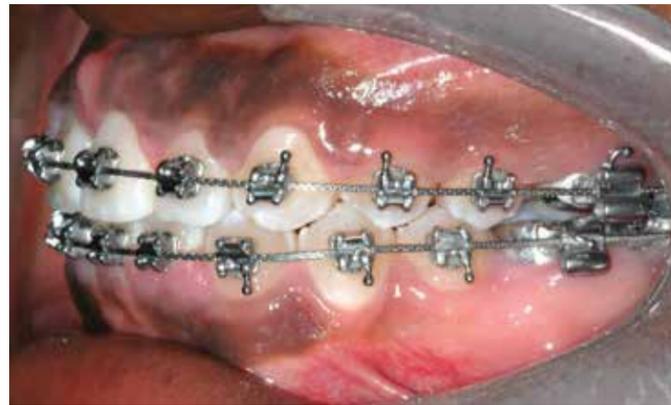


Fig. 4-19V

Upper and lower .021" x .025" ss braided wire and triangular vertical 8 oz elastics.



Fig. 4-19W



Fig. 4-19X

Final intraoral photos. Note Class I relationship right and left side.



Pre-treatment photos. Class II end-on molar and full Class II canine on right side. 2 mm diastema between upper central incisors and midlines off 2 mm.



Post treatment photos. Class I molar and canine right and left side. Diastema closed and midlines on.

Stage 3: Finishing Stage

In our experience using the In-Ovation bracket system, which is an active SLB with the clip pushing and sitting the wire onto the slot, optimal torque expression is achieved after a .019" x .025" stainless steel has been in place for a few months. This is especially true in nonextraction cases with an average curve of Spee. However, in some cases the size and stiffness of a .021" x .025" stainless steel or .022" x .028" stainless steel are indicated, such as in cases with a deep curve of Spee, extraction cases that have required an important amount of tooth movement, and cases that required significant labial crown torque of maxillary incisors such as Class III camouflage cases and Class II, Division 2 cases.

Once the maxillary and mandibular occlusal planes are parallel and all the bracket slots are aligned, bracket position should be carefully checked for minor correction of tooth position and therefore the second time of debond/rebond should be done. The last wire we use is a stainless steel multibraided .021" x .025" archwire. Although this wire is large enough to fill the slot of the bracket and then maintain the tip, torque, and offset of each tooth, its resilience permits both minor bracket repositioning and "end of treatment" optimal intercuspation.

It is important to notice that at this point in treatment, all the appliance interferences should be removed using a finishing carbide burr on a high-speed handpiece. With a thin articular paper, all contacts must be checked. Only tooth-tooth contacts should be allowed. All brackets, tubes, or band contacts must be removed to allow proper settling. Vertical triangular 3/16-inch elastics, either 6 oz or 8 oz, are used to achieve proper intercuspation. These vertical elastics should not be used with the braided wire for more than 6 weeks to avoid rolling premolars and molars lingually, which cannot be detected from the buccal but rather from the lingual where premolars and/or molars will not be contacting. Finally, before removing the appliance, a complete assessment of the occlusal "end of treatment" goals should be performed. We strive to finish our cases with a static occlusal scheme compatible with the six keys of optimal occlusion as described by Larry Andrews and a dynamic mutually protected occlusal scheme in centric relation as described by Ronald Roth.

- Fill the bracket slot with a straight wire so optimal tooth position, in all planes, can be achieved**
- Finishing wire: .019" x .025" or .021" x .025" Braided wire
- Check bracket position - Debond/Rebond as indicated (minor corrections)
- Short, heavy (3/16" 6-8 oz) Class II, III or vertical triangular elastics as indicated to achieve optimal intercuspation

***On a traditional ligated .022" slot bracket, a .019" x .025" ss has about 12° of play. On a Passive SLB the play is even greater!! However, on an Active SLB (In-Ovation brackets), a .019" x .025" ss provides full expression of torque.*

Arch Wire Selection

Stage 3

Type	Size / Sequence
Braided Stainless Steel	.019" x .025"
	or
	.021" x .025"

Stage 3: Finishing Stage

Repositioning of brackets to achieve optimal intercuspation

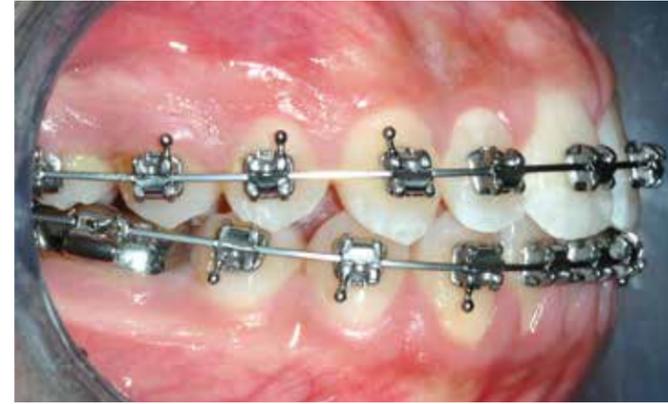


Fig. 4-17A



Fig. 4-17B

Upper and lower .019"x.025" ss wire for 12 weeks to fill the slot of the bracket, so the appliance can express the desired tooth position.



Fig. 4-17C



Fig. 4-17D

Reposition brackets as needed to achieve optimal intercuspation. Upper and lower .021"x.025" braided wire and vertical/triangular 5/16" 6 oz elastics for 4 weeks.



Fig. 4-17E



Fig. 4-17F

Lateral intraoral photos one week after debonding.

Stage 3: Finishing Stage

Intermaxillary vertical elastics to achieve optimal intercuspation



Fig. 4-18A



Fig. 4-18B

Upper and lower .021"x.025" ss wire for 12 weeks to fill the slot of the bracket, so the appliance can express the desired tooth position.



Fig. 4-18C

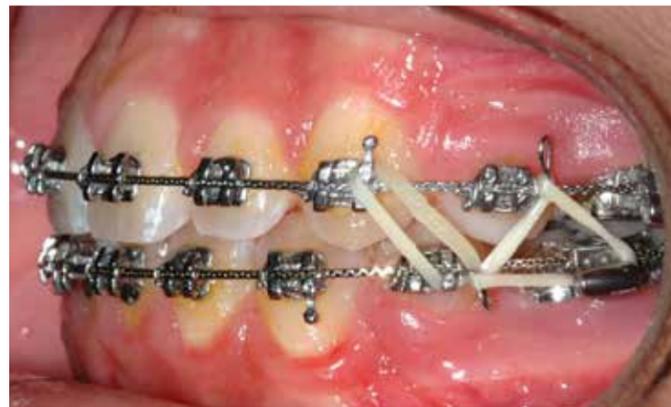


Fig. 4-18D

Upper and lower .021"x.025" braided wire and vertical/triangular plus short Class II 5/16" 6 oz elastics left side for 4 weeks.



Fig. 4-18E



Fig. 4-18F

Lateral intraoral photos one weeks after debonding.

5. Clinical Case

The objective of the following display of clinical cases is to show step by step the correction of different types of commonly found orthodontic problems in the adult dentition. Emphasis is placed on the concepts of mechanics

previously discussed in this manual- such as stages of treatment, wire sequence, etc. Specific mechanics for Class III malocclusions, combined orthodontic/surgery treatment, TADs, etc. will be discussed separately.

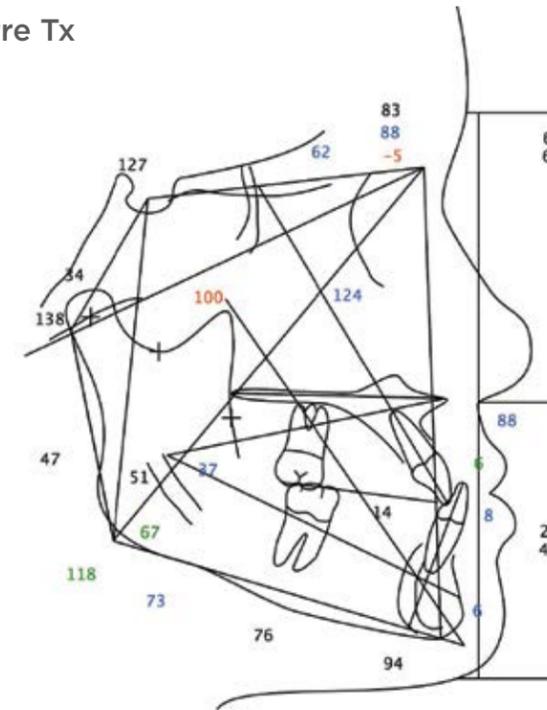
- Case # 1:** Class III, Non-extraction, no surgery, minimum/maximum anchorage.
- Case # 2:** Class I, Bimaxillary protrusion, severe mandibular crowding. Extractions UL 5', medium anchorage.
- Case # 3:** Class II end on with upper right canine block out, extractions U4'/L5', medium/minimum anchorage.
- Case # 4:** Class II end on, crowding and protrusion, extractions UL 4', medium anchorage.
- Case # 5:** Class II end on with deep overbite. Non-extraction.
- Case # 6:** Class II end on with deep overbite. Non-extraction.
- Case # 7:** Class I with an open bite and posterior crossbite. Non-extraction.
- Case # 8:** Class II skeletal and dental with a narrow maxilla. Non-extraction.
- Case # 9:** Class I deep overbite and crowding. Non-extraction.
- Case # 10:** Class II right side with a deep overbite and increased curve of Spee. Midlines off. Non-extraction, molar distalization.

Case #1, Female, 13:6 yrs.



Initial extraoral photos

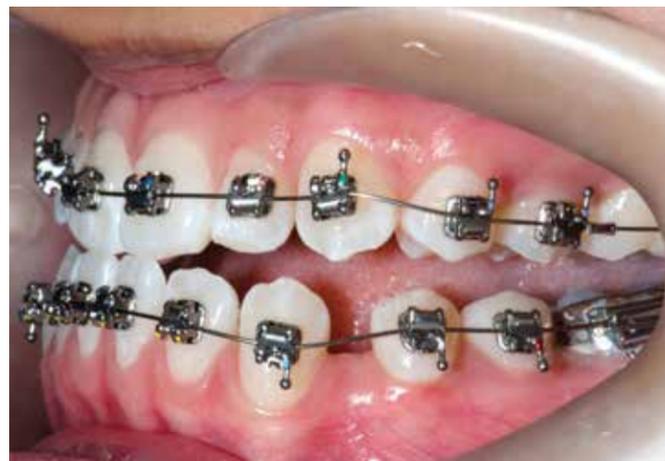
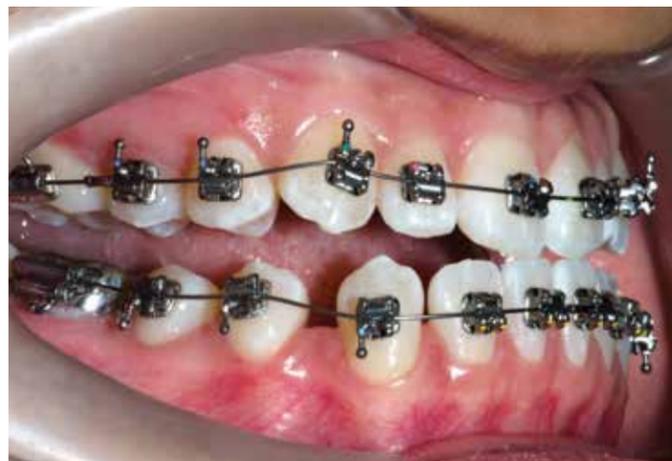
Pre Tx



- Class III with an anterior functional shift
- Class III mechanics, Leveling occlusal plane, Close mandibular spaces, Correct tip of maxillary canines, Achieve optimal OB/OJ.
- Maxilla: medium anchorage
- Mandible: maximum anchorage



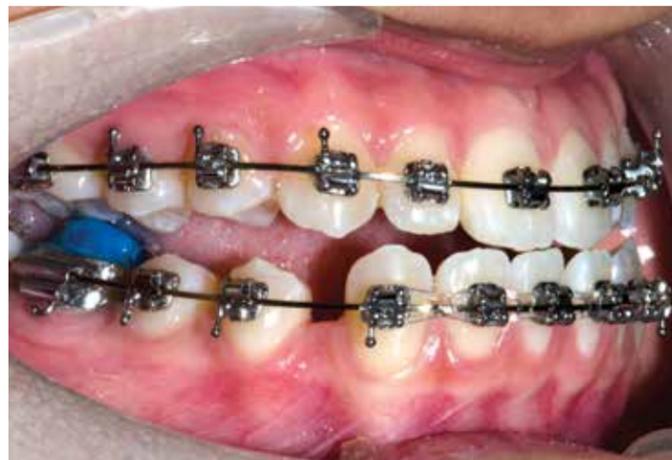
Intraoral photos before treatment.



In-Ovation "R" brackets with upper and lower .014" Sentalloy Medium wires. Patient is touching bis a bis in centric.



Upper and lower .020"x.020" BioForce Medium wires.



Upper and lower .019"x.025" ss. Build ups on lower molars to open the bite.



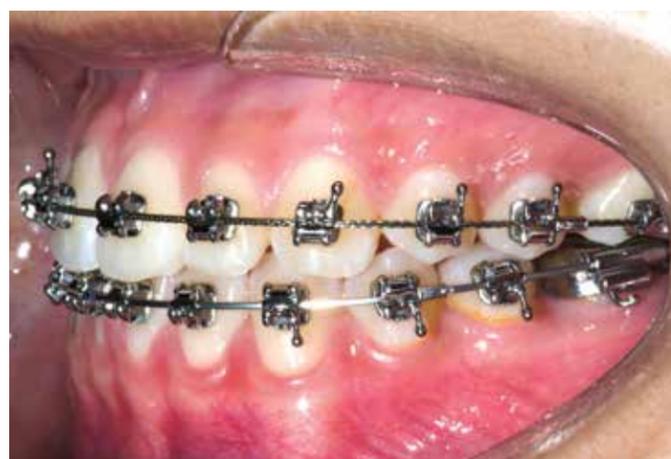
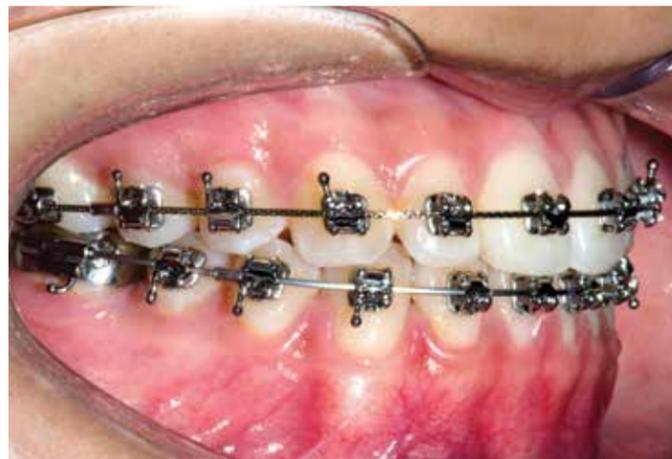
Upper and lower .019"x.025" ss. Notice how the upper archwire is now completely leveled. Lower Sentalloy coils (150 gr) and Class III elastics (night time), to close spaces.



Upper and lower occlusal planes leveled and parallel. Finishing space closure.



Spaces are consolidated. Good OJ/OB. triangular elastics 3/16" 6 oz.



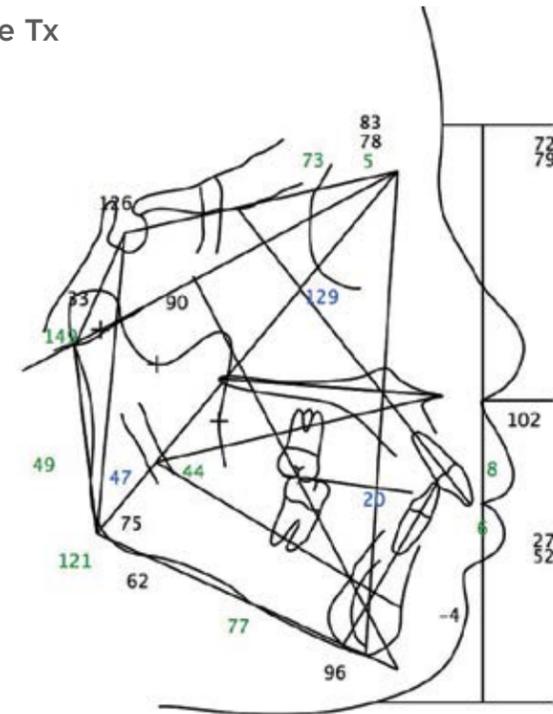
Upper .019"x.025" ss Braided wire and vertical triangular 3/16" 6 or 8 oz.

Case #2, Female, 12:7 yrs.



Initial extraoral photos

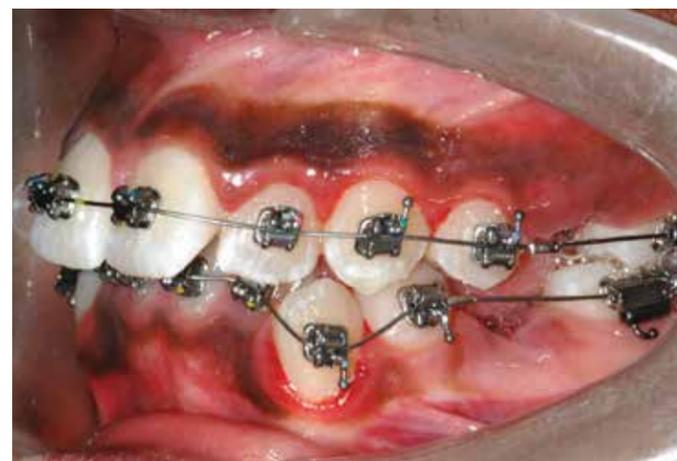
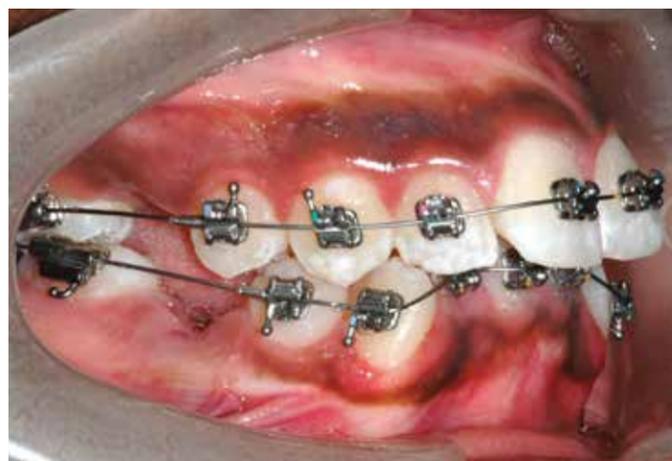
Pre Tx



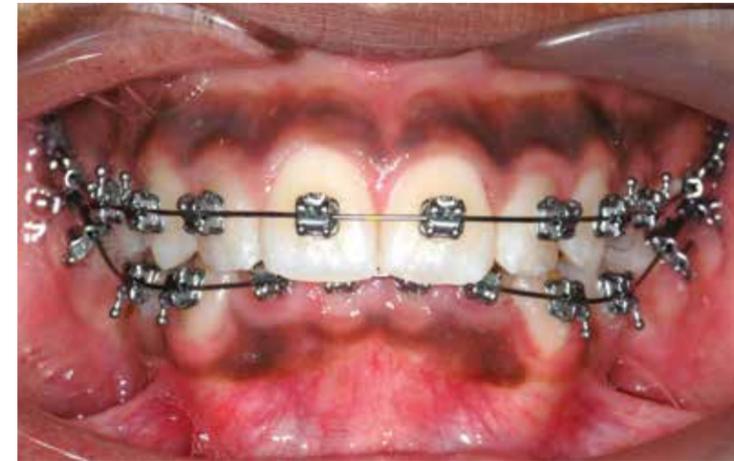
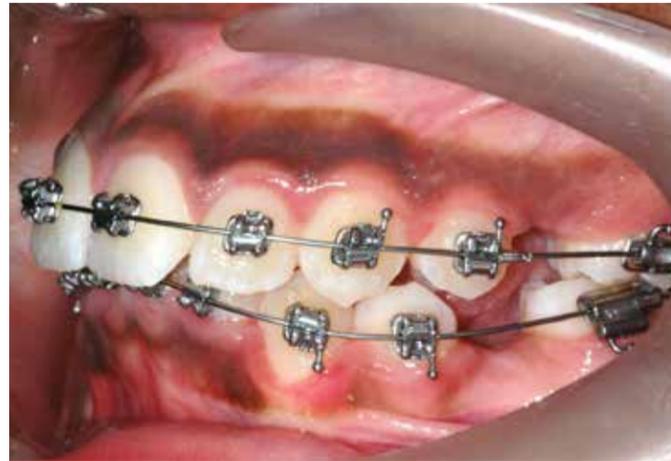
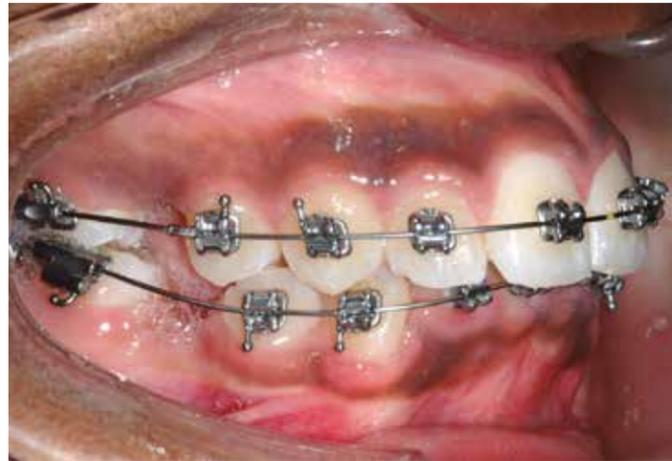
- Class I with severe mandibular crowding
- Bimaxillary protrusion
- Extractions of UL5'
- Maxilla: medium anchorage
- Mandible: medium anchorage



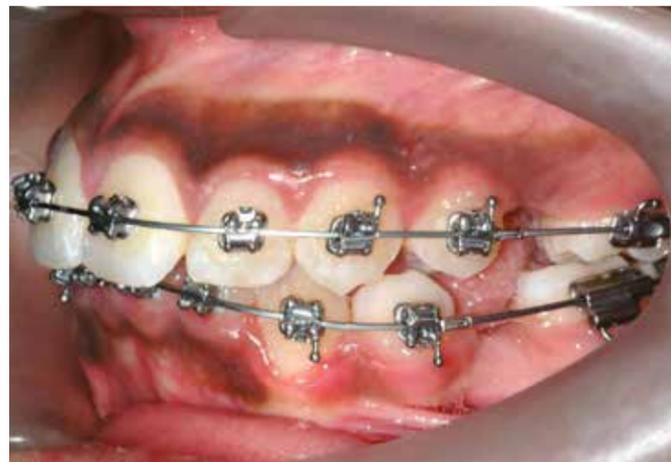
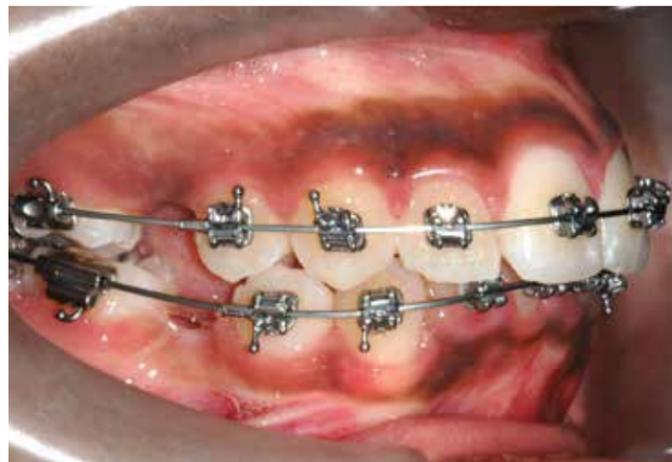
Intraoral photos before treatment. Note protrusion of maxillary teeth and position of lower canines.



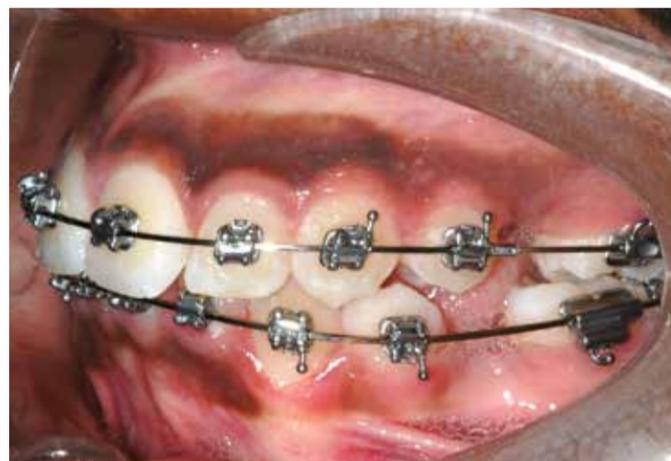
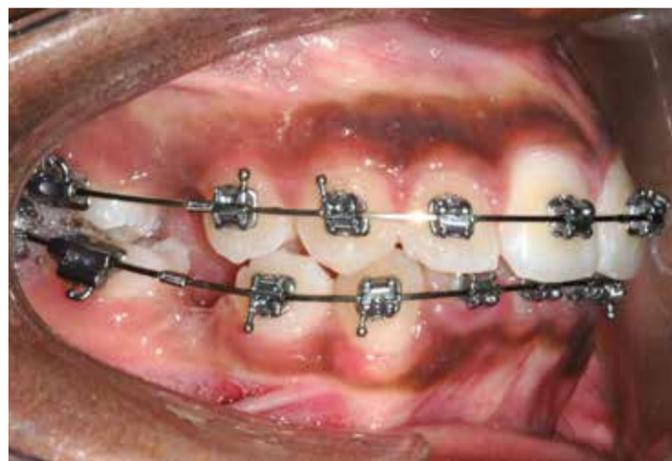
Extraction of upper and lower second premolars. In-Ovation R brackets and upper and lower .014" Sentalloy Medium wires. Note the wire is engaged in all the teeth with crimpable stops distal of premolars.



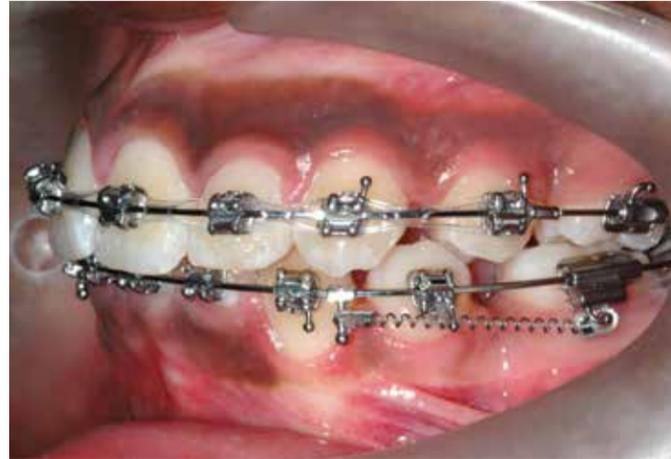
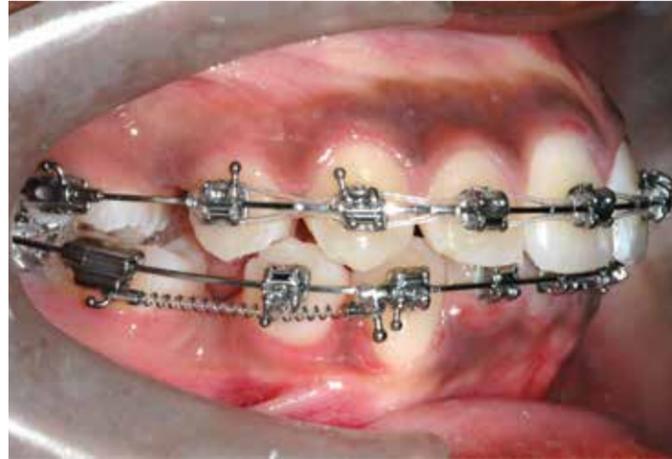
Upper and lower .018 Sentalloy Med.



Upper and lower .020"x.020" BioForce Med. Notice leveling and aligning, no elastics or auxiliaries have been used.



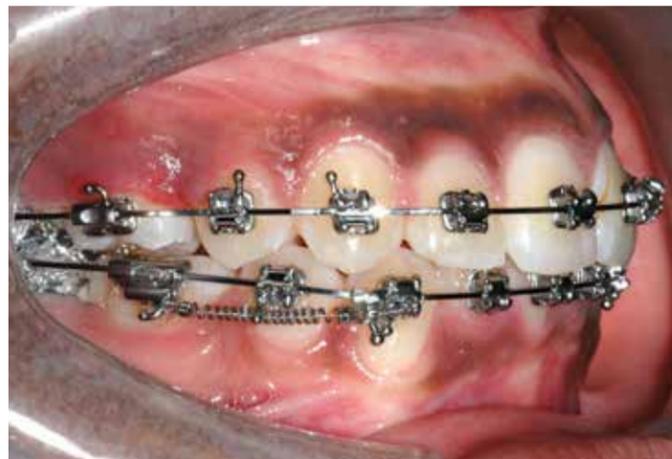
Upper and lower .019" x .025" ss coordinated wires. Beginning of working stage.



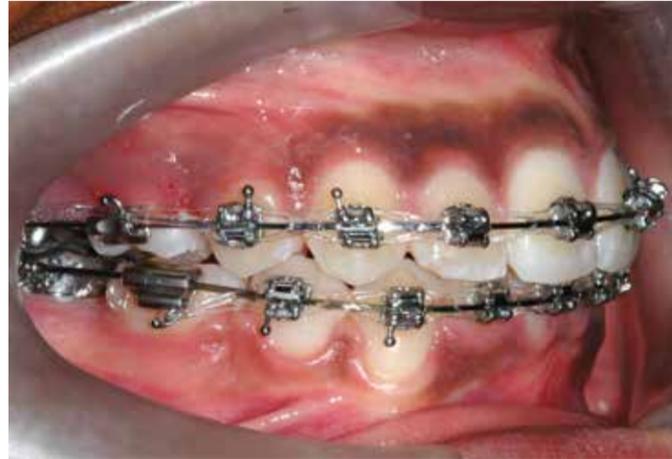
Sentalloy coil (150 g) attached from lower first molar to crimpable hook placed distal of canines. 3/16" 4 oz. short Class II elastics at nighttime.



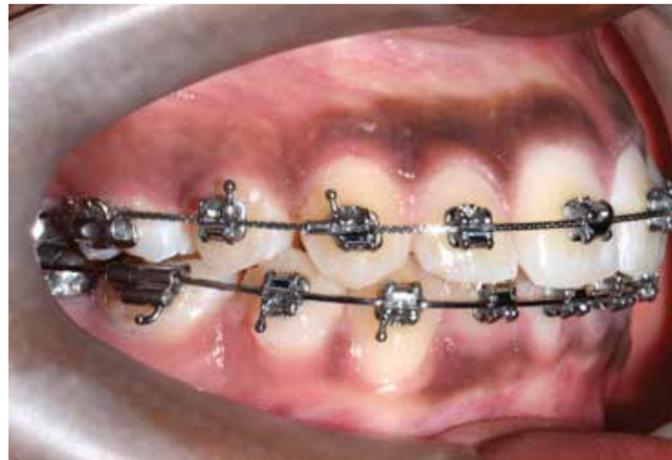
Note mesial movement of mandibular molars. Maintained OJ and OB.



Extraction spaces are closed. Sentalloy coils do not need to be activated. They maintain their activation throughout the treatment.



Same working wires as previous photos. C-chain upper and lower arch to consolidate spaces.



Upper .021"x .025" Braided wire with triangular vertical elastics to achieve proper intercuspation.



Intraoral final photos. 23 months of active Tx.

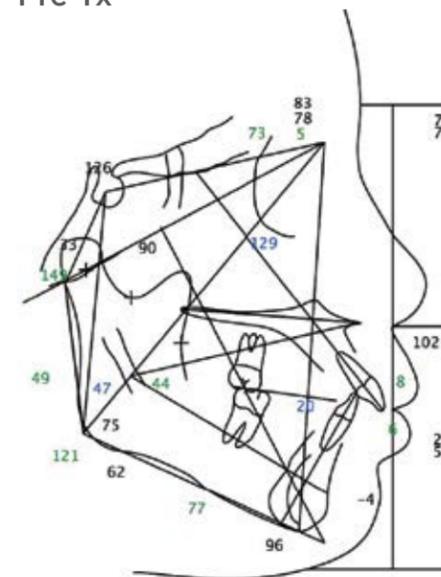


Intraoral photos 1 year post treatment.

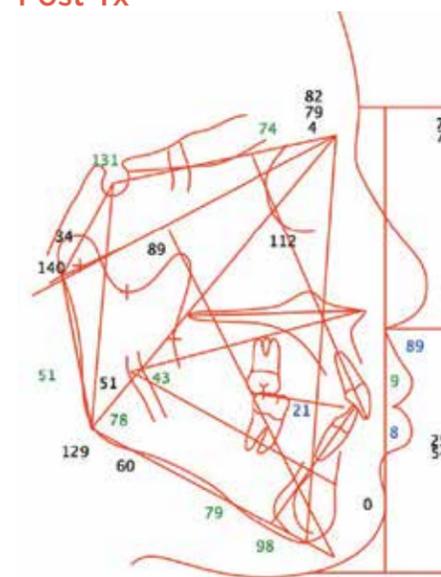


Extraoral final photos.

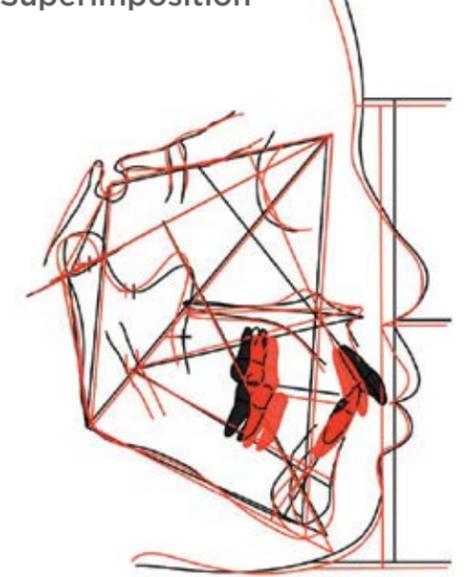
Pre Tx



Post Tx



Superimposition

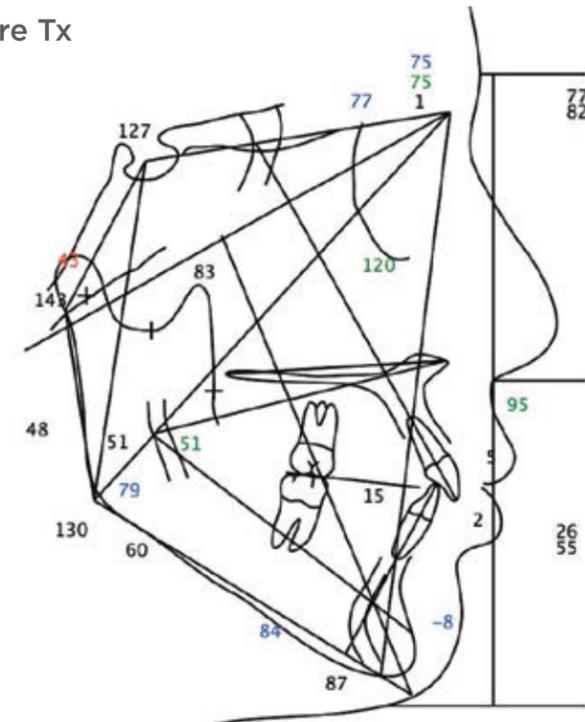


Case #3, Male, 14:03 yrs.



Initial extraoral photos

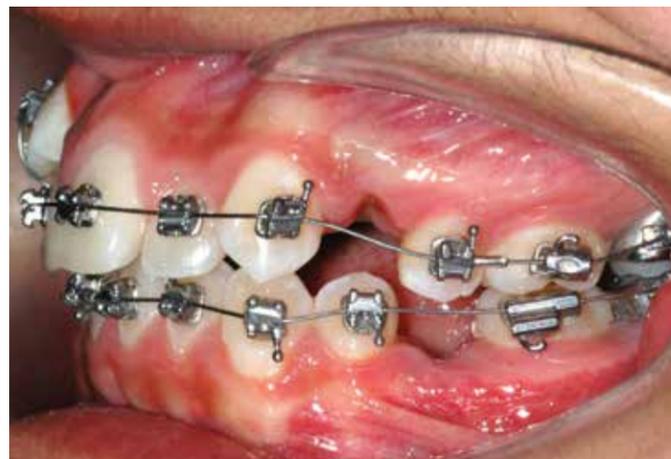
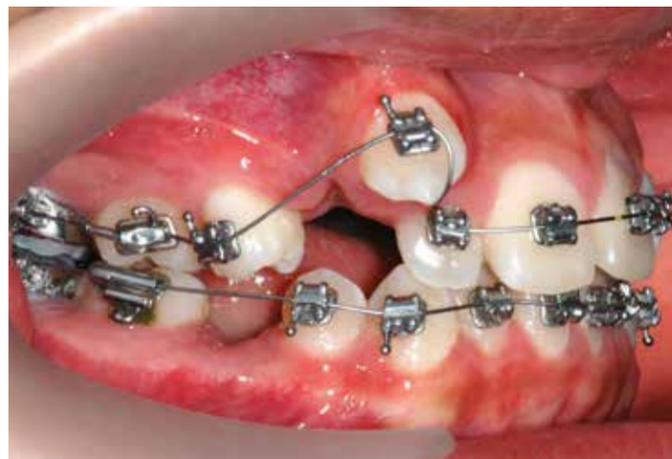
Pre Tx



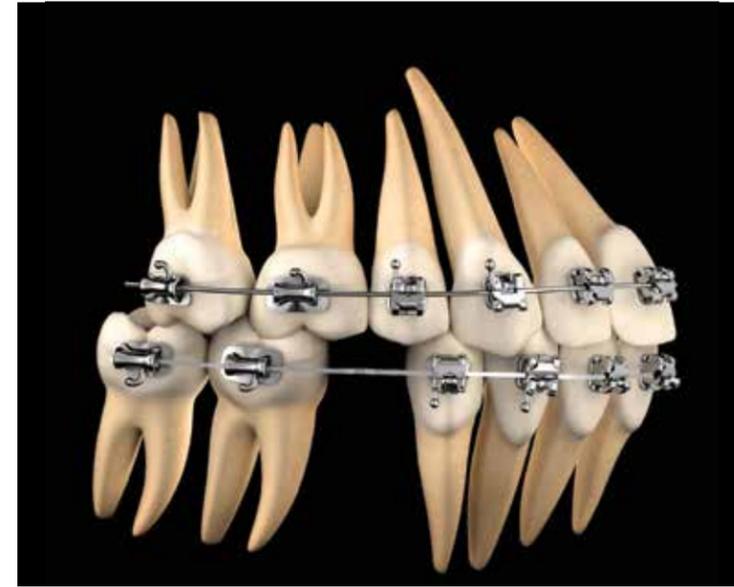
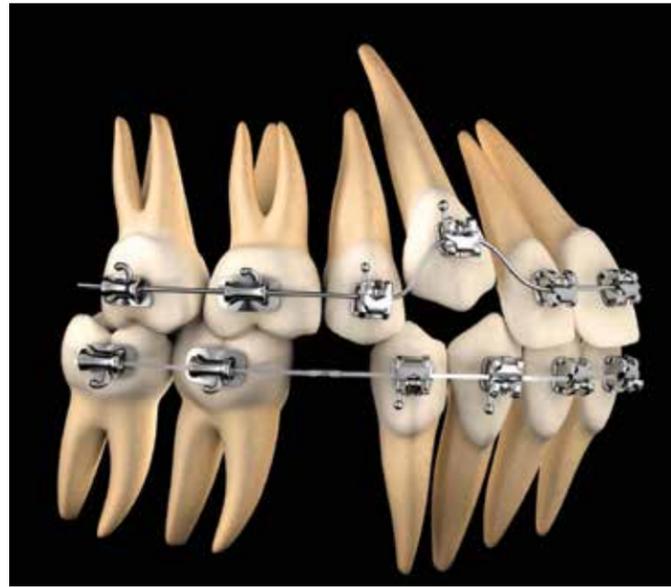
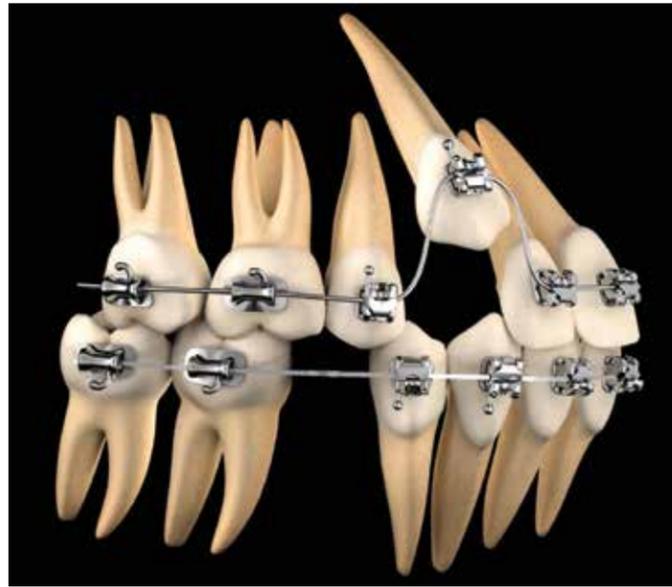
- Class II end-on right and left side.
- Upper right canine blocked out.
- Upper midline deviated to patient's right
- Extractions of U4' and L5'
- Maxilla: medium anchorage
- Mandible: minimum anchorage



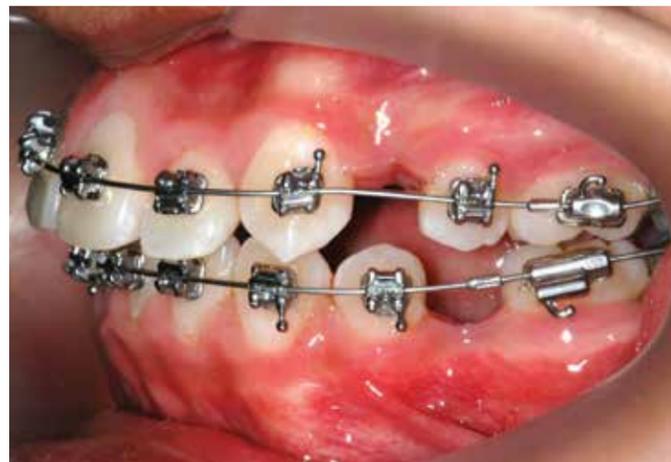
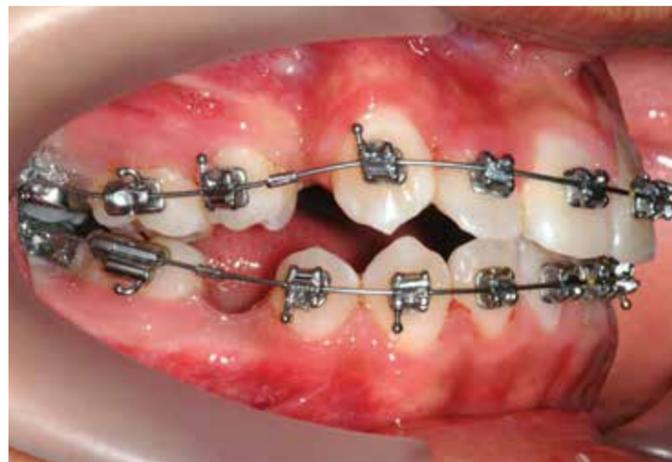
Intraoral photos before treatment.



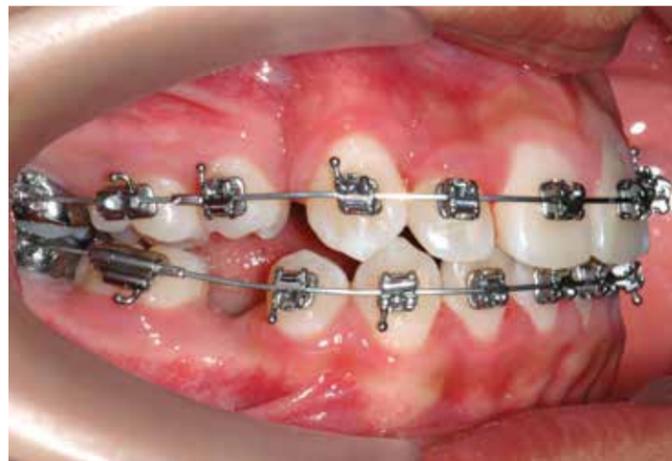
Extraction of upper 4' and lower 5'. In-Ovation R brackets and upper and lower .014" Sentalloy Medium wires.



The combination of a bracket system with reduced resistance to sliding and heat-activated archwires results in a movement of the maxillary canine into alignment without disturbing adjacent teeth. Elastics are NOT used. As the canine moves down, the wire slides back.



Upper and lower .018" Sentalloy wires to continue leveling and aligning.



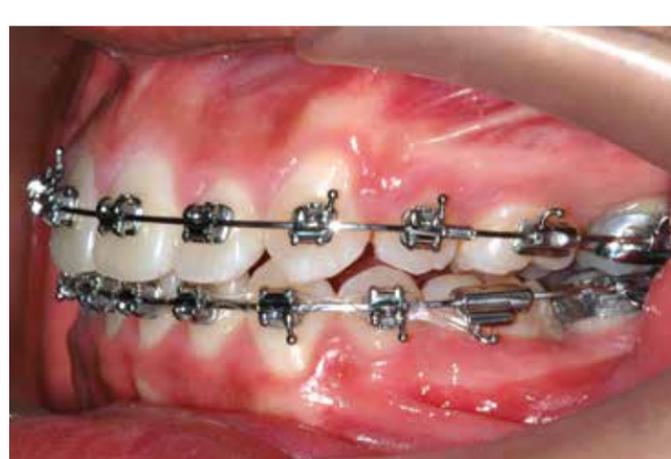
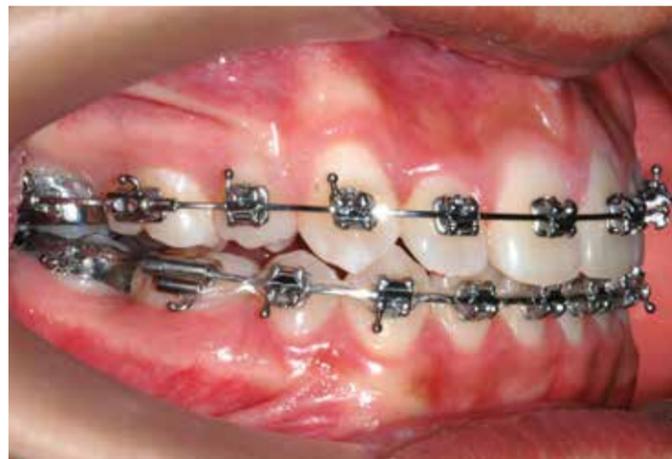
Upper and lower .020"x.020" BioForce wires. With this wire we will finish Stage 1; arches should be level and align and all rotations corrected.



Stage 2, upper .019"x .025" ss and lower .021"x.025" DKH activated with a ss ligature from first molar for minimum anchorage. Patient was asked to wear short Class II 3/16" 4 oz elastics at night.



Continuous with DKH activation. Notice how first molars are moving forward to a Class I.



After spaces are closed, upper and lower .021"x .025" ss wire with triangular vertical 6 oz elastics to finish flattening the occlusal plane.



Extraoral final photos.



Upper and lower .021"x.025" Braided wire with triangular vertical 6 oz elastics to detail the occlusion.

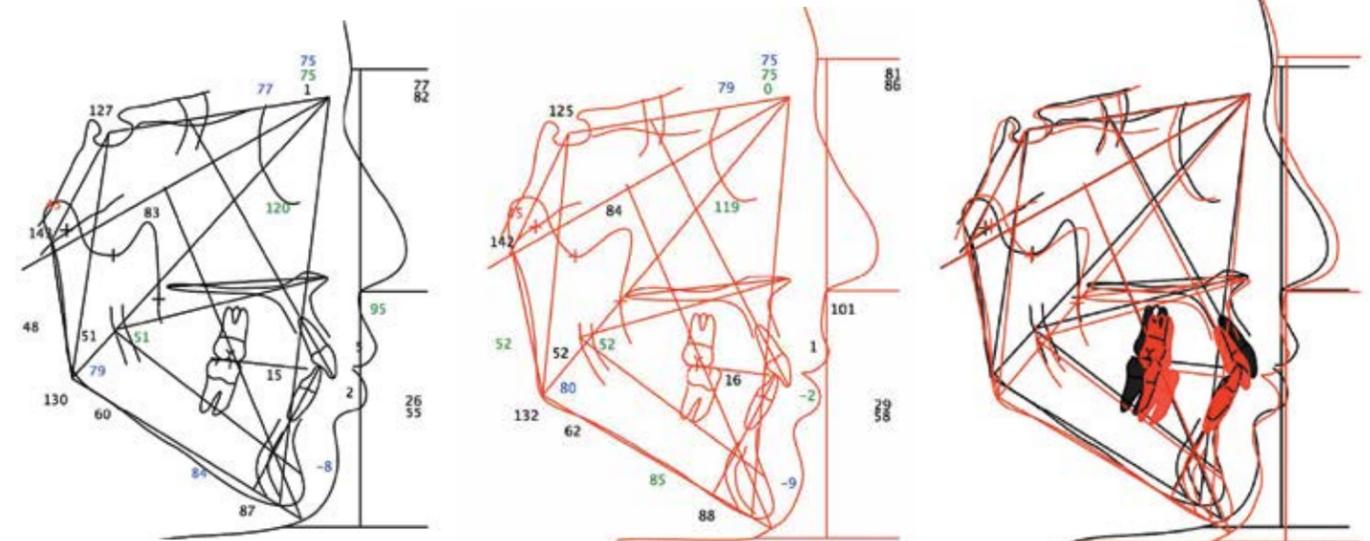


Intraoral final photos. 20 months of active Tx.

Pre Tx

Post Tx

Superimposition

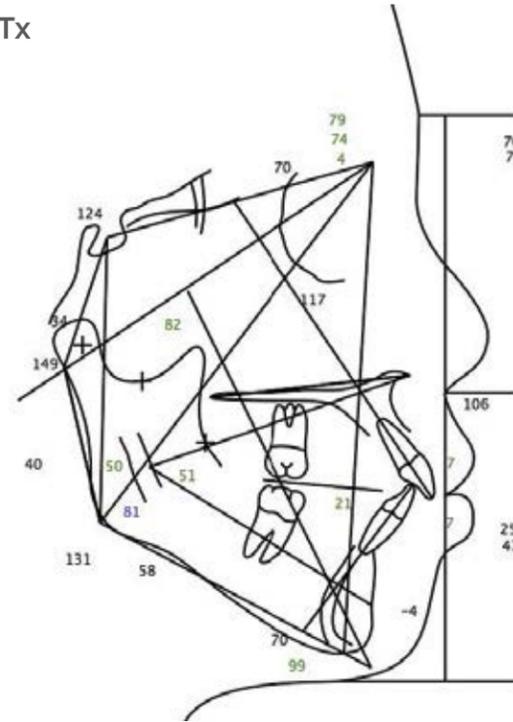


Case #4, Female, 30:11 yrs.



Initial extraoral photos

Pre Tx



- Class II end-on right side and Class I left side, with crowding
- Extractions of UL4'
- Maxilla: maximum anchorage
- Mandible: medium anchorage



Intraoral photos before treatment. Note bimaxillary protrusion, Class II and high canine on right side



Extraction of upper and lower first premolars. In-Ovation C brackets and upper and lower .014" Sentalloy Medium wires.



Upper .018" Sentalloy to preserve anchorage and lower .020"x.020" BioForce Medium wires. Note uprighting of maxillary and mandibular incisors, reduction of extraction spaces, maintained molar relationship and improved canine relationship.



Upper .019"x.025" ss and lower .019"x.025" ss with crimpable hooks. Sentalloy coils (150 g) are used to close mandibular spaces.



Remaining spaces were closed with C-chain and short Class II 6 oz elastics.



Upper and lower .021"x.025" ss wires to express torque and flatten occlusal plane. Continue with short Class II 6 oz elastics.



Upper and lower .021"x.025" Braided wire with triangular vertical 6 oz elastics to detail the occlusion.



Intraoral final photos. 23 months of active Tx.

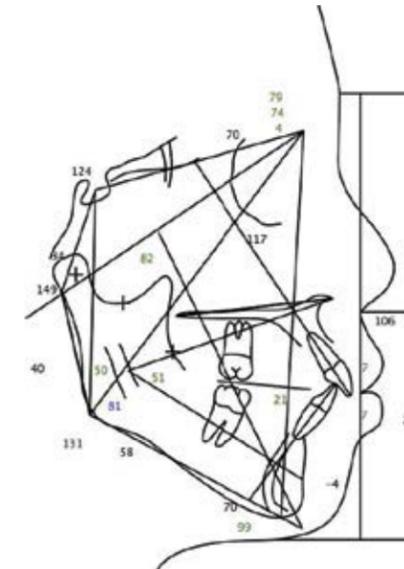


Intraoral photos 3 years post Tx.

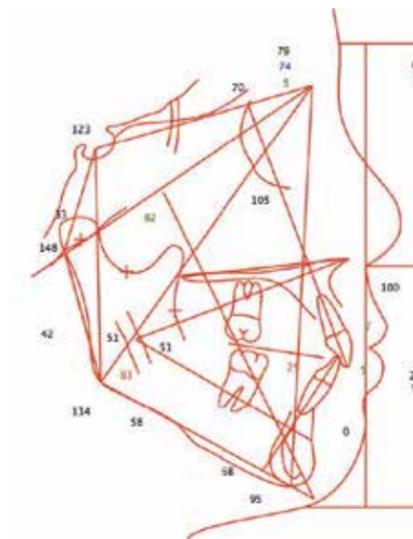


Extraoral final photos.

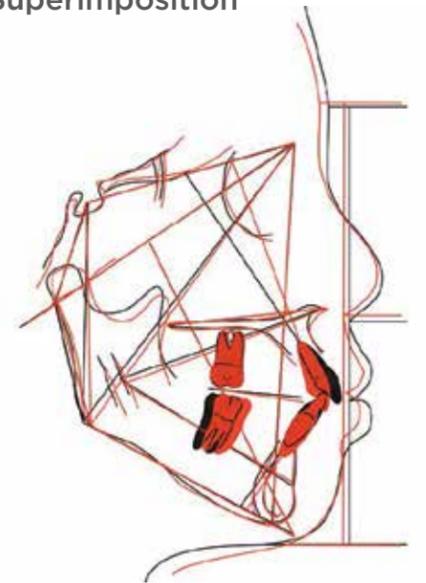
Pre Tx



Post Tx



Superimposition

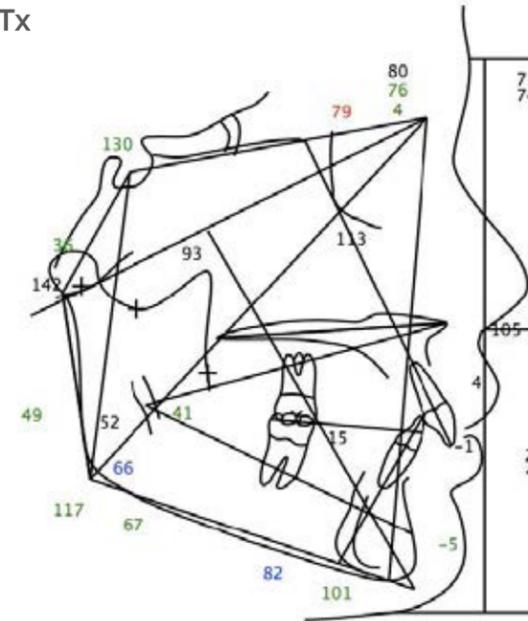


Case #5, Male, 11: 07 yrs.



Initial extraoral photos

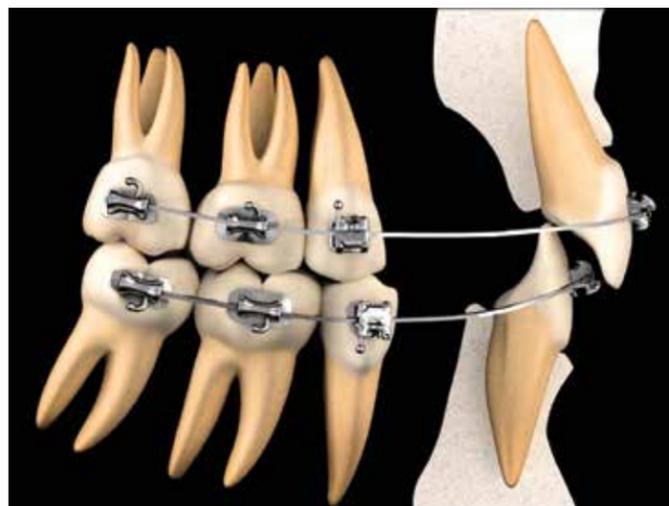
Pre Tx



- Class II end-on and deep overbite
- Fixed appliances
- Reverse curve of Spee
- Orthopedic correction with Headgear
- Short Class II elastics

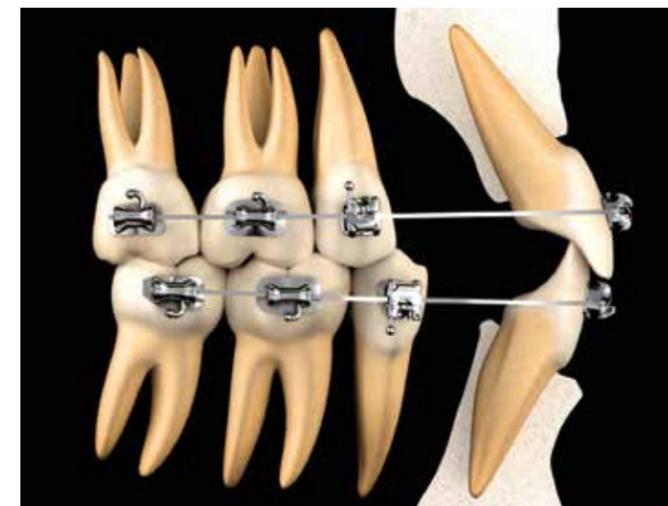


Intraoral photos before treatment.



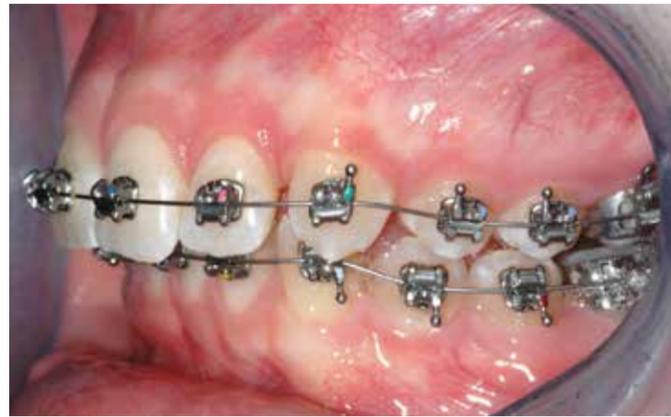
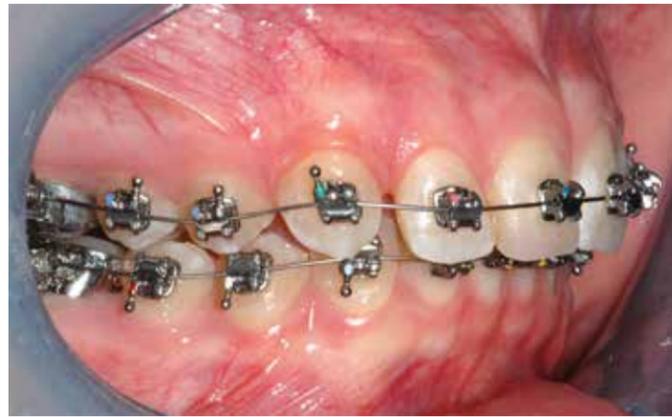
Deep Bite problems

- Deep curve of Spee
- Increased OB and/or OJ
- Usually low angle, brachycephalic
- Good synfisis

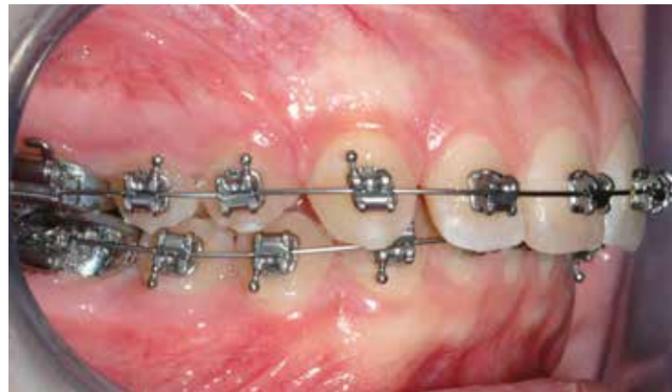


Objective to accomplish

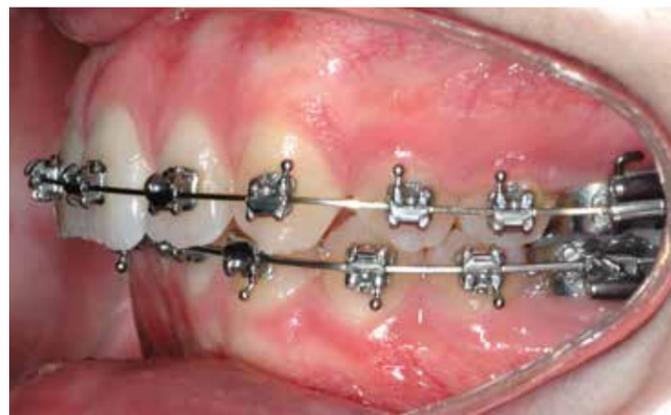
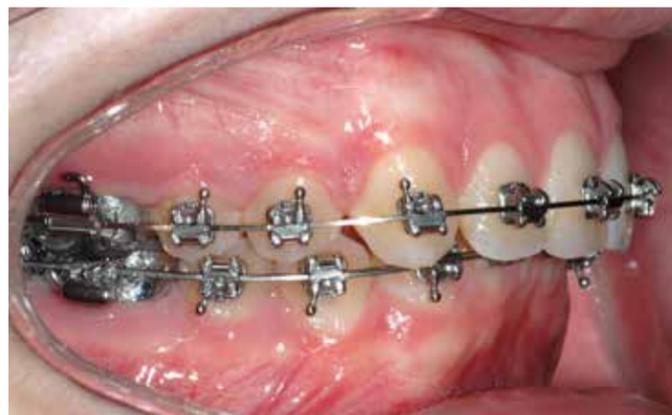
- Flat and parallel occlusal planes
- Lower incisors are allowed to procline
- Improved torque of upper incisors



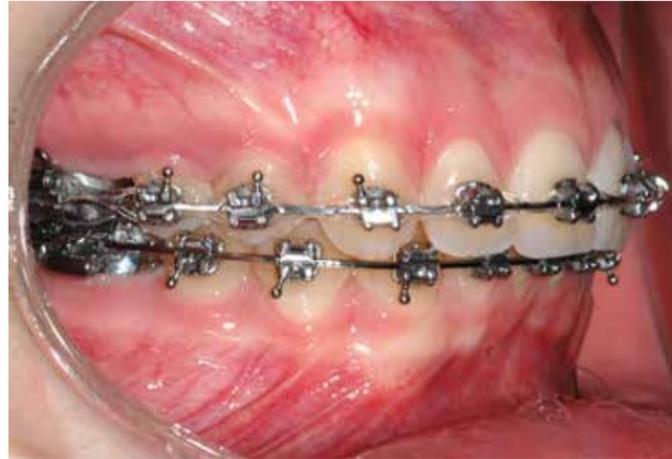
In-Ovation R brackets and upper and lower .014" Sentalloy Large wires. Patient was given a cervical headgear to be worn at nighttime.



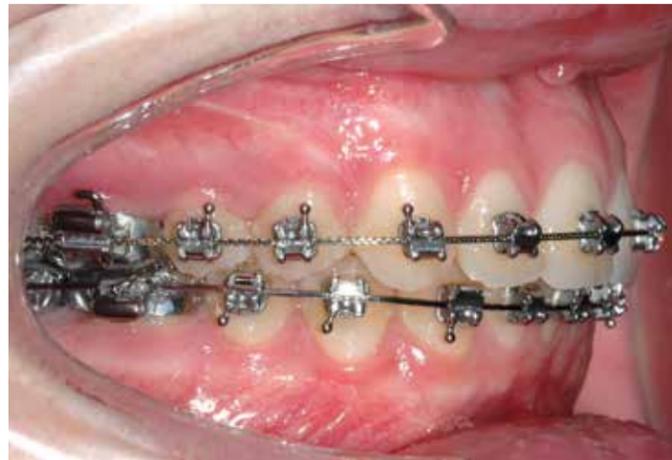
Upper and lower .018" Sentalloy Large wires. Note the leveling and correction of the rotations already achieved.



Upper and lower .019"x.025" ss. Reverse curve of Spee was added to the lower wire.



Upper .021"x.025" ss and C-chain to flatten maxillary occlusal plane, consolidate spaces and express proper torque. Note opening of the bite and flattening of the mandibular occlusal plane.



Upper .021"x.025" ss Braided wire and short Class II 8 oz elastics. Note overcorrection of the lower occlusal plane.



Intraoral final photos. 22 months of active Tx.

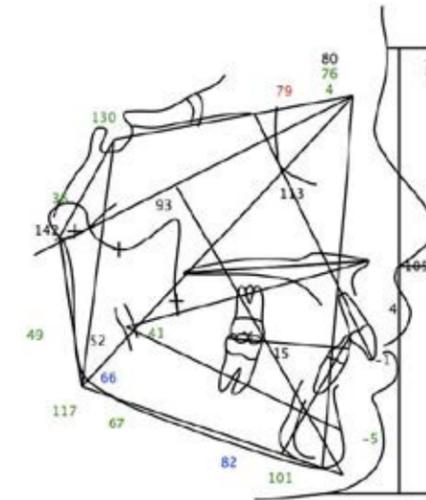


Intraoral photos 2 years post treatment.

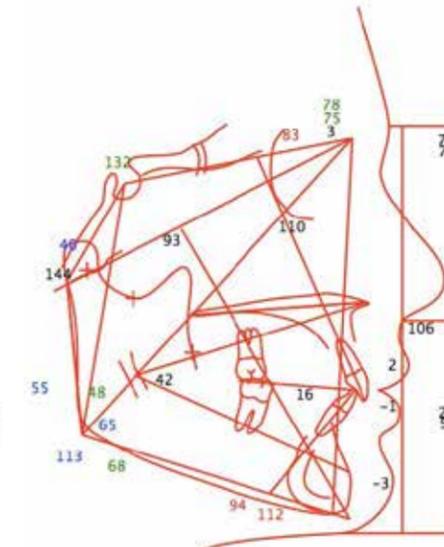


Extraoral final photos.

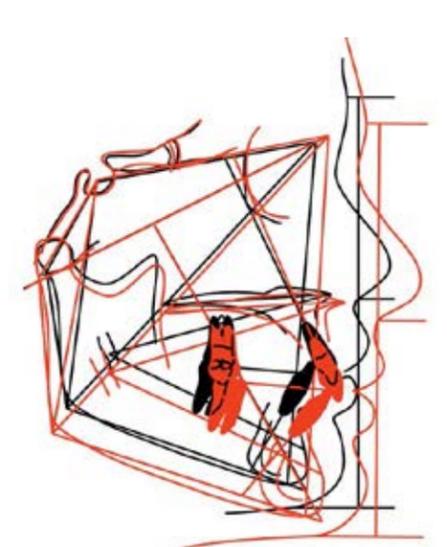
Pre Tx



Post Tx



Superimposition

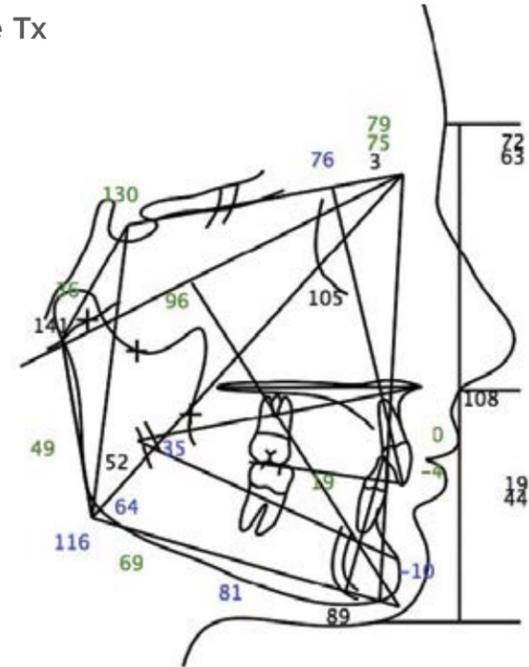


Case #6, Female, 12: 03 yrs



Initial extraoral photos

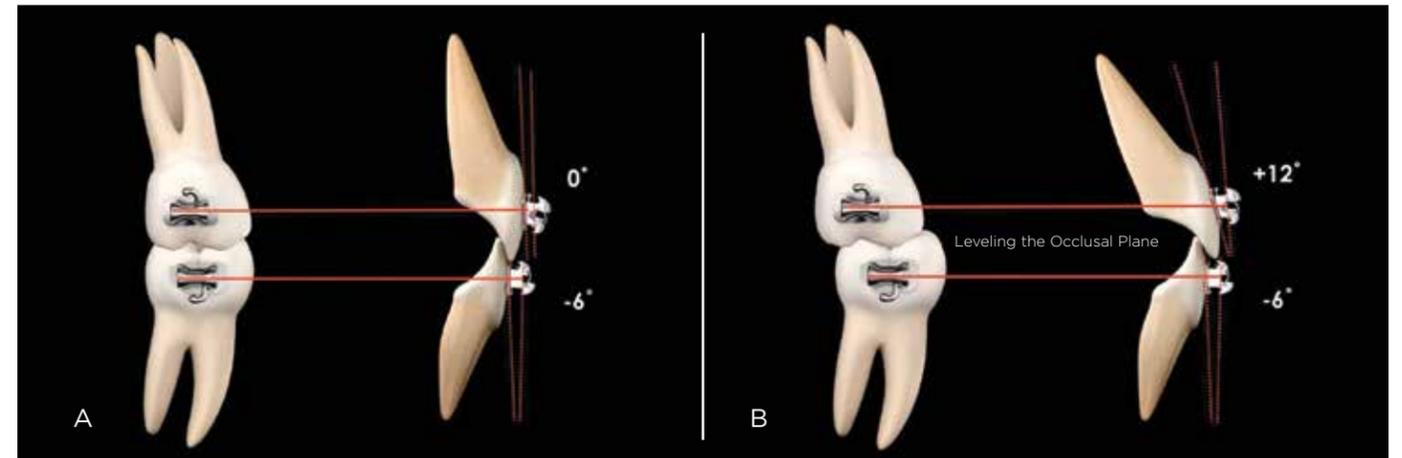
Pre Tx



- Class II end-on
- Deep overbite
- Collapse lower arch
- Buccal crossbite
- Fixed appliances, reverse curve of Spee and short Class II elastics



Intraoral photos before treatment.



There are situations where lack of torque of maxillary incisors can affect molar and canine relationship since the arch length will be decreased as shown in scheme A. Scheme B shows the correct relationship.



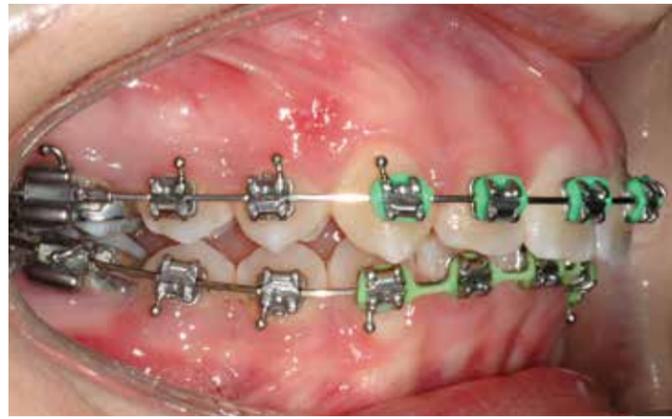
In-Ovation R brackets and upper .014" Sentalloy Med wires. Upper arch was bonded first to level and align and to create space for the lower appliance.



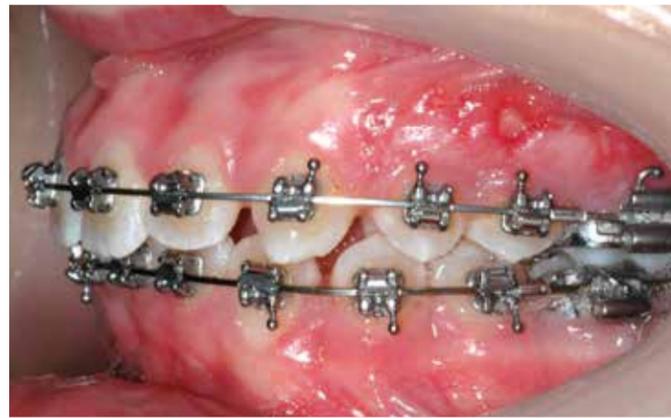
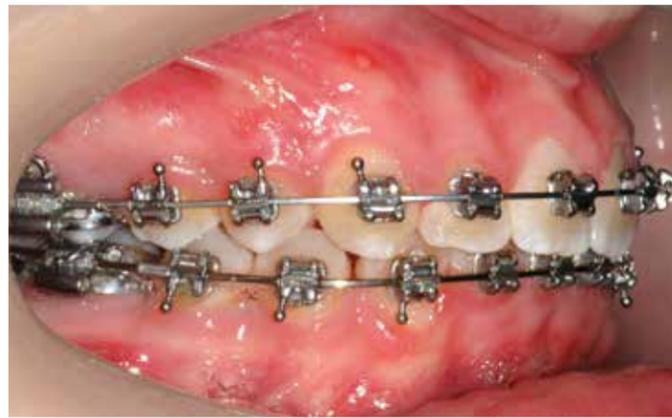
Upper .020" x .020" BioForce Medium wires.



Upper .019" x .025" ss. Lower In-Ovation R appliance and a .014" Sentalloy Medium wire. Mandibular molars were built up with composite to temporarily open the bite.



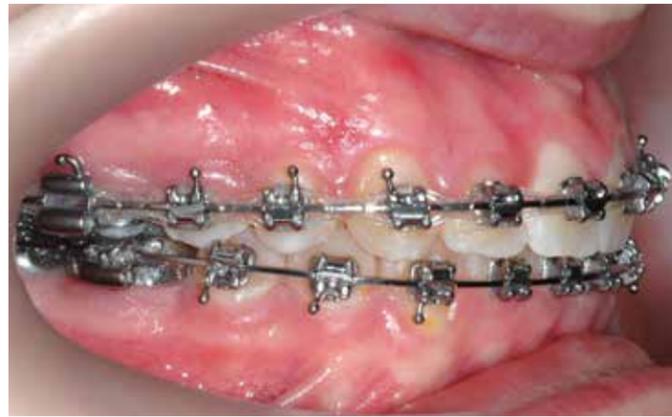
Lower .019"x.025" ss with reverse curve of Spee and C-chain from canine to canine to prevent opening spaces. Class II short 6 oz elastics.



Improvement of Class I molar and canine, occlusal planes begin to flatten.



Upper and lower .021" x .025" ss and Class II short 6 oz elastics.



Good Class I molar and canine has been achieved and occlusal planes are parallel.



Upper .021" x .025" ss Braided wire and triangular vertical 6 oz elastics to finish and detail the occlusion.



Intraoral final photos. 27 months of active Tx.



Intraoral photos 4 years post Tx.



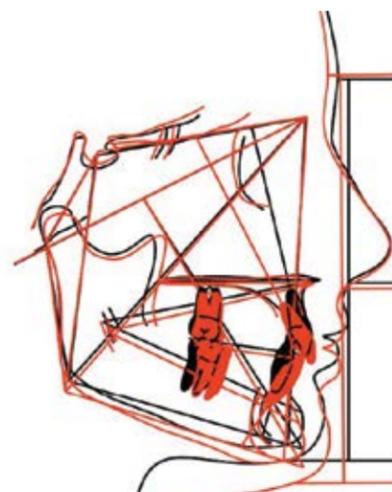
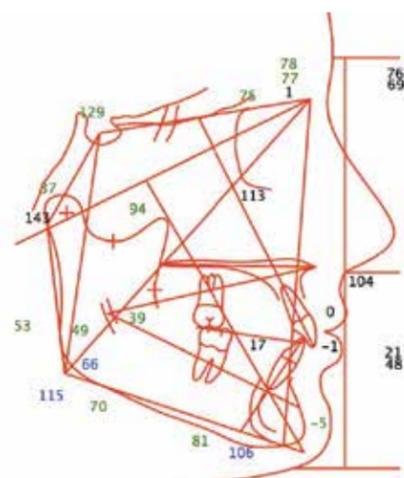
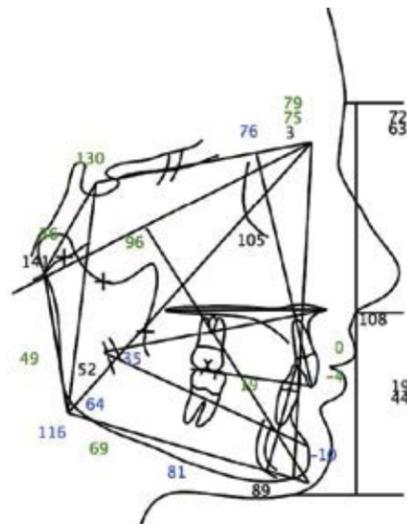
Extraoral final photos.



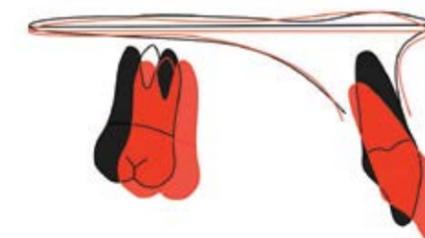
Pre Tx

Post Tx

Superimposition



It is important to emphasize that the active clip of the In-Ovation brackets plus the 12°/10° (central/lateral incisors) of labial crown torque in the Rx allow for proper inclination of maxillary incisors without the need of any torquing auxiliary, pre-torque wires or "super torque" brackets.

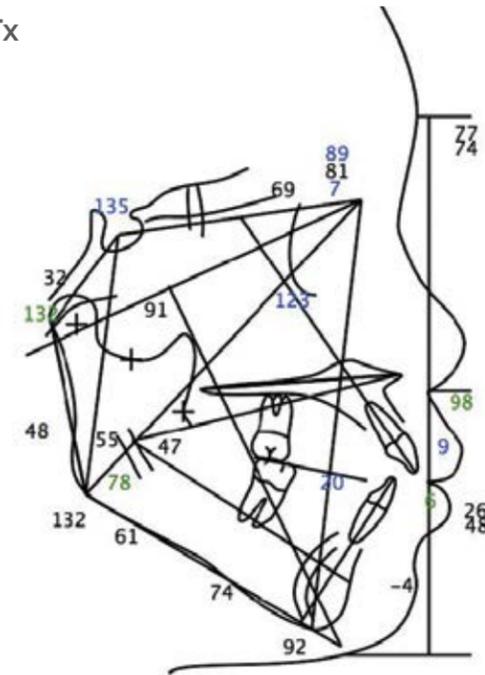


Case #7, Female, 20: 05 yrs



Initial extraoral photos

Pre Tx



- Class I open bite
- Posterior unilateral crossbite
- Fixed appliances, transpalatal bars for vertical control and arch coordination

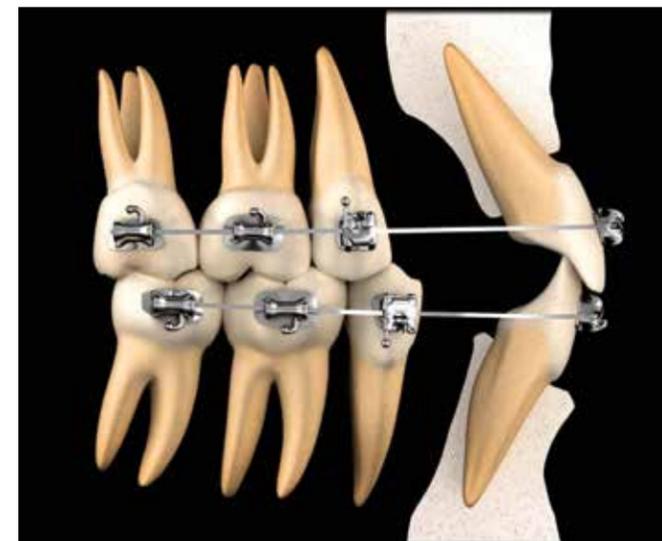


Intraoral photos before treatment.



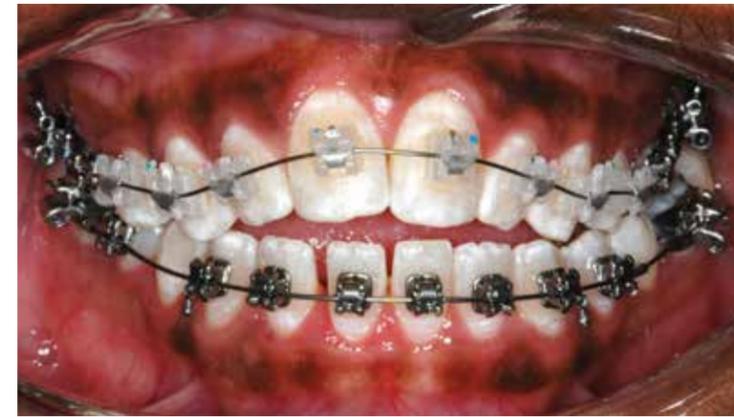
Problems

- Open bite pattern
- Divergent occlusal planes
- Usually narrow and long synfisis



Solution

Low deflection thermal-activated wires do not overcome occlusal forces, and posterior teeth do not extrude. Then, as the occlusal planes flatten and parallel, the open bite closes.



In-Ovation C brackets for maxillary teeth and R for mandibular teeth. Upper and lower .014" Sentalloy Medium wires.



Upper and lower .020" x .020" BioForce Medium wires. Note leveling of the occlusal plane and overbite improvement. No intermaxillary elastics have been used.



Upper and lower .019" x .025" ss wires. Transpalatal bars on maxillary first and second molars have been placed to coordinate maxillary arch.



The bite opens temporarily while the upper arch is dentally expanded with transpalatal bars.



Posterior arch coordination has been achieved. Vertical triangular elastics 6 oz are used to level the occlusal plane. Note how the bite has been closed to a better overbite.



Upper and lower .021" x .025" ss wires and triangular vertical 6 oz elastics.



Upper and lower .021" x .025" ss Braided wire and triangular vertical 8 oz elastics.

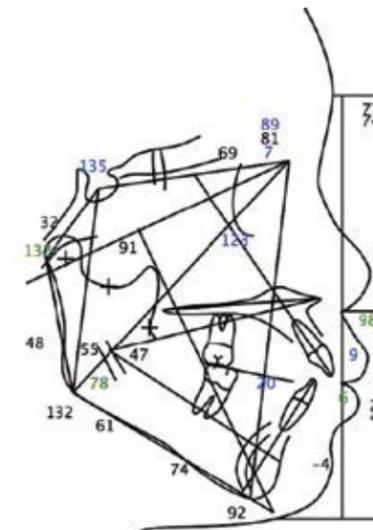


Intraoral final photos. 15 months of active Tx.



Extraoral final photos.

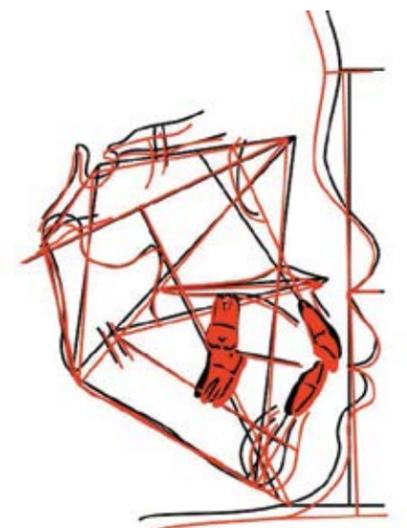
Pre Tx



Post Tx



Superimposition

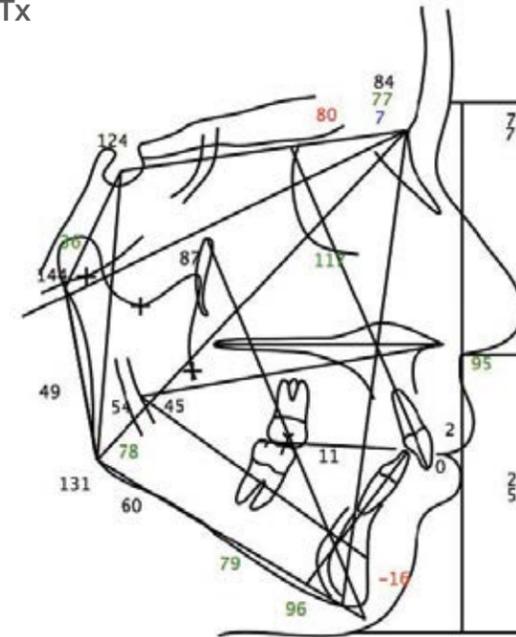


Case #8, Male, 13: 03 yrs.

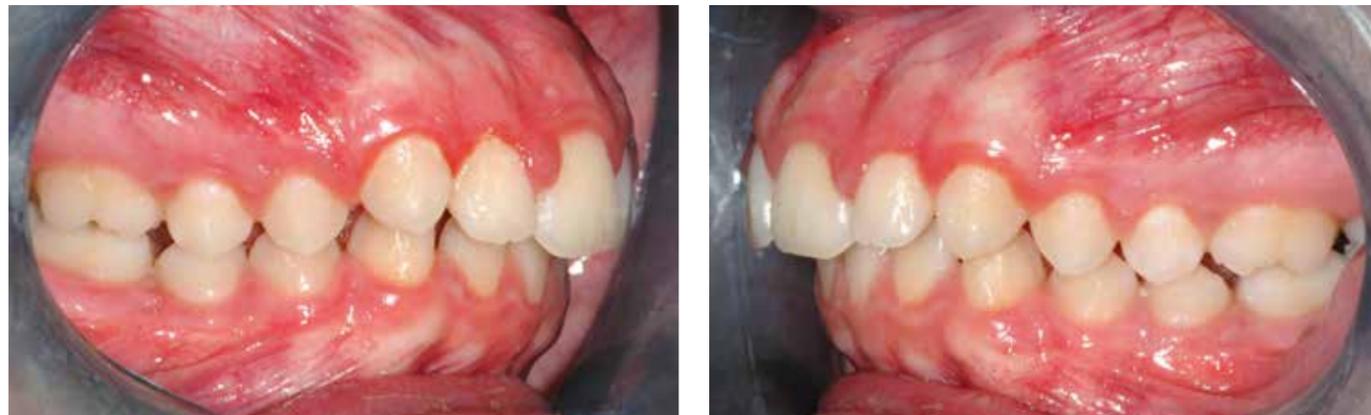


Initial extraoral photos

Pre Tx



- Class II dental and skeletal.
- Narrow maxilla.
- RPE, fixed appliances, HPHG and short Class II elastics.



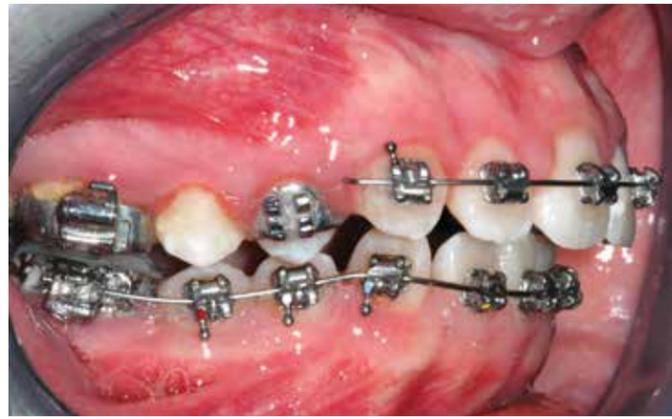
Intraoral photos before treatment. Note Class II and deep overbite.



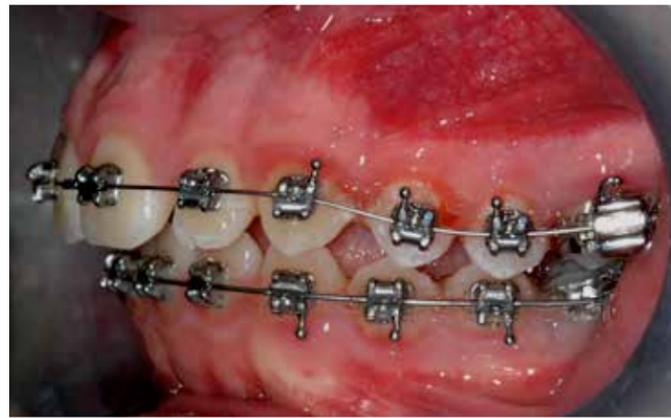
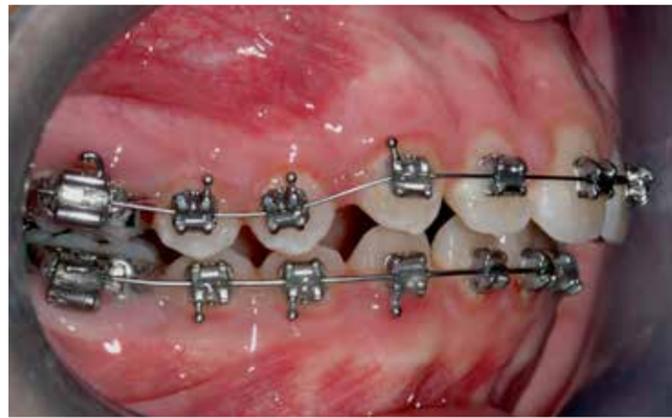
Maxillary Haas-type expander in place.



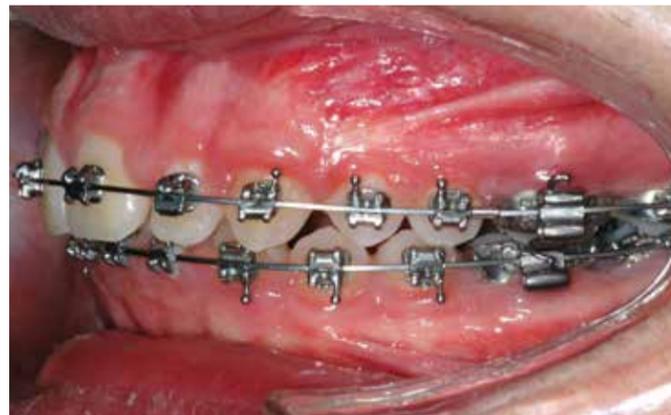
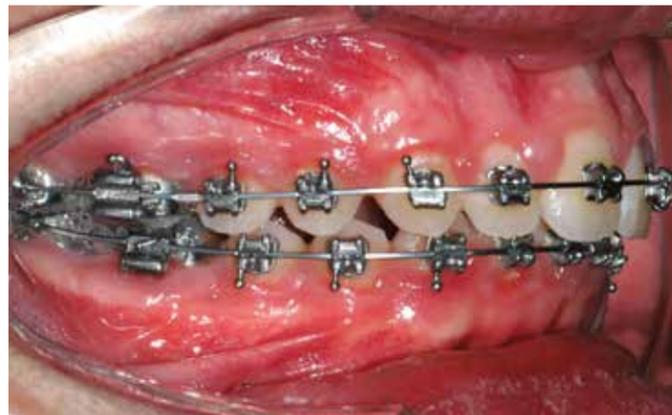
After two weeks of rapid maxillary expansion (two turns per day).



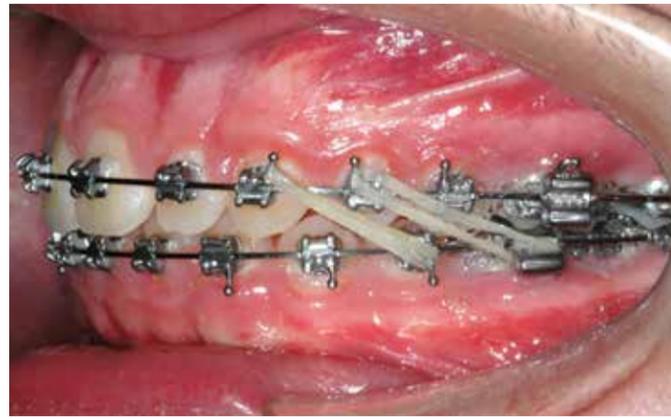
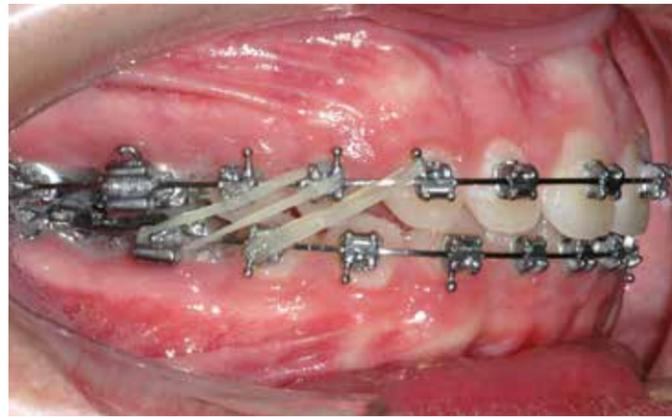
Upper and lower In-Ovation R brackets and .014" Sentalloy Medium wires. Since the expander is still in place, the leveling of the upper arch has started only from canine to canine to avoid distorting the arch form or canting the occlusal plane.



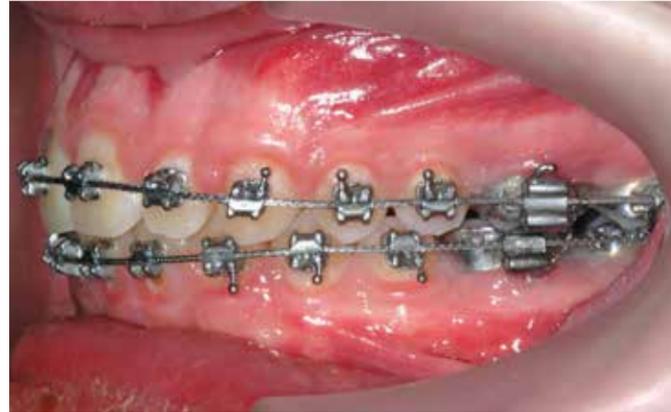
The expander is removed and full upper arch is bonded. High-Pull Headgear is delivered to be worn at nighttime.



Upper and lower .020"x .020" BioForce wires. Note the improvement in the sagittal relationship and the leveling of the occlusal plane.



Upper and lower .019" x .025" ss wires and short Class II 6 oz elastics. Mild reverse curve of Spee is added to the lower wire.



Upper and lower .021" x .025" ss Braided wire and triangular vertical 8 oz elastics.



Intraoral final photos. 24 months of active Tx.



Intraoral photos 2 years post treatment.

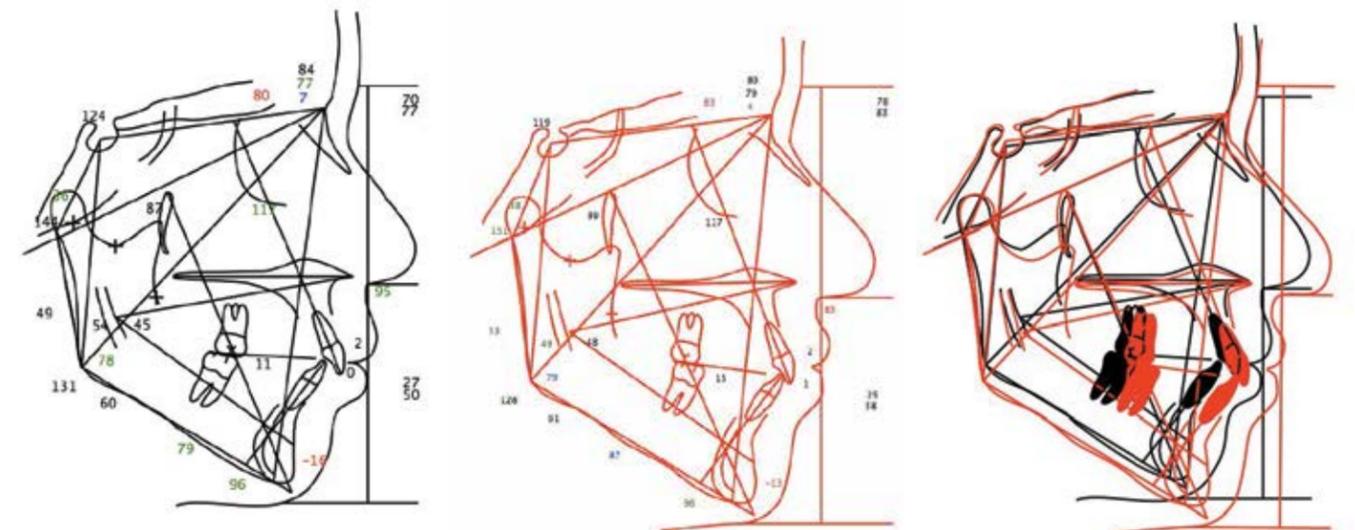


Extraoral final photos.

Pre Tx

Post Tx

Superimposition

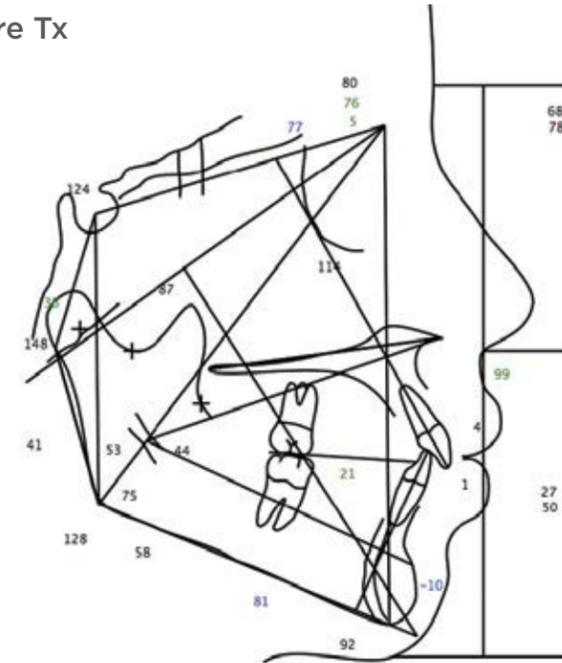


Case #9, Male, 11: 10 yrs



Initial extraoral photos

Pre Tx



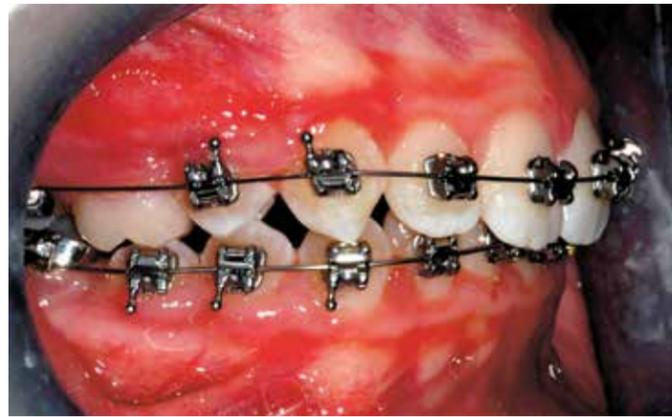
- Class I with increased overbite and crowding of lower incisors.
- Fixed appliances and TPB.



Intraoral photos before treatment. Note deep overbite.



Upper and lower In-Ovation R brackets and .014" Sentalloy Medium wires for initial leveling and alignment. Upper wire was covered with a plastic tubing between lateral incisors and first molar.



Upper .018" Sentalloy and lower .020" x .020" BioForce Medium wires.



A transpalatal bar is placed to derotate maxillary first molars and preserve the leeway space.



Occlusal views showing maxillary molars aligned with the TPB.



Upper and lower .019" x .025" ss wires and short Class II 6 oz elastics.



Upper and lower .021" x .025" ss wire. C-chain to consolidate spaces and short Class II 6 oz elastics.



Upper and lower .021" x .025" Braided wire. Vertical triangular 6 oz elastics to achieve optimal intercuspation.



Intraoral final photos.



Intraoral photos 2 years post treatment.



Pictures A, B and C showing lower occlusal view before tx (A), midcourse tx (B), and after tx (C). Note correction of crowding.

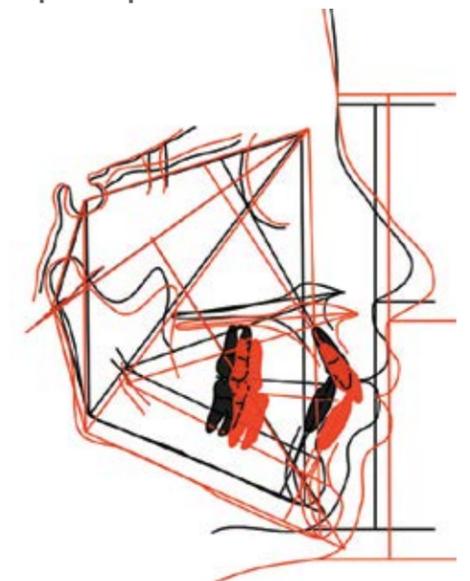
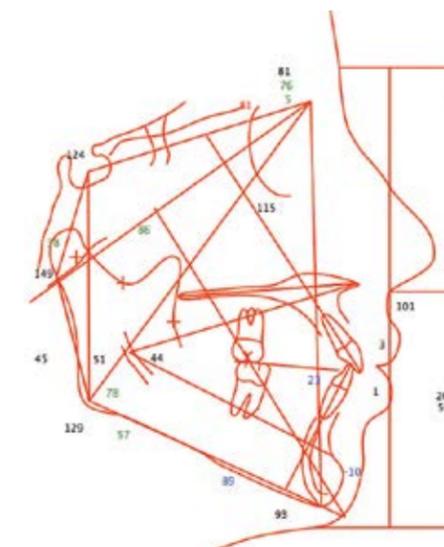
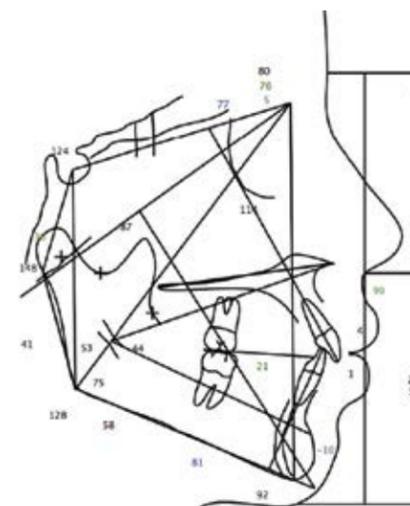


Extraoral final photos.

Pre Tx

Post Tx

Superimposition

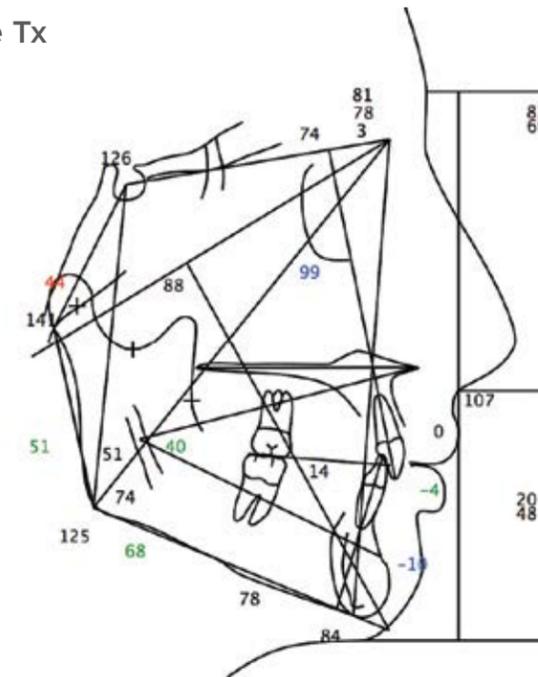


Case #10, Male, 16: 06 yrs



Initial extraoral photos

Pre Tx



- Class II right side
- Deep overbite and increased curve of Spee.
- Midlines off.
- Fixed appliances, open coil and Class II elastics to distalize right segment.



Intraoral photos before treatment.

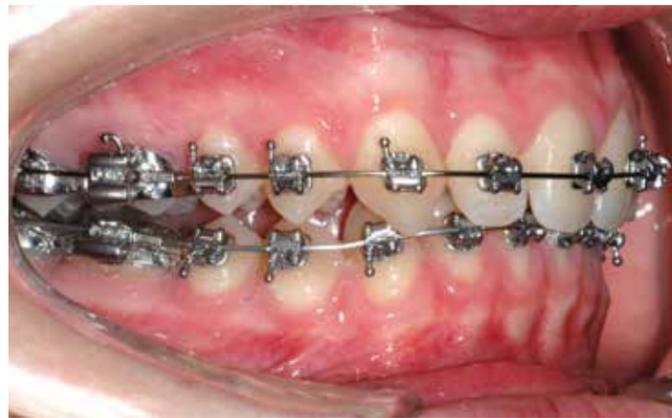


In-Ovation R brackets for maxillary teeth and a .014" Sentalloy Medium wire.





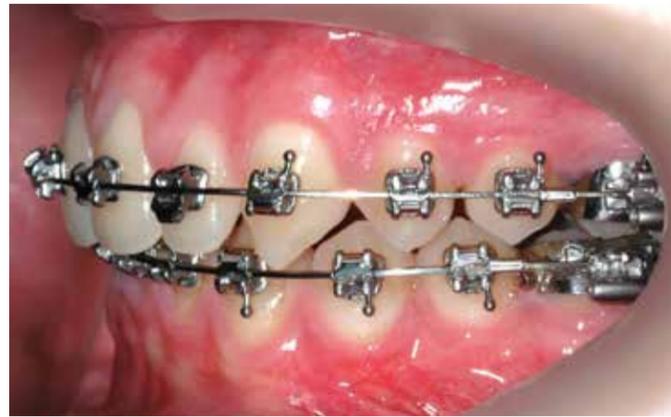
Upper .020"x .020" BioForce Medium wires.



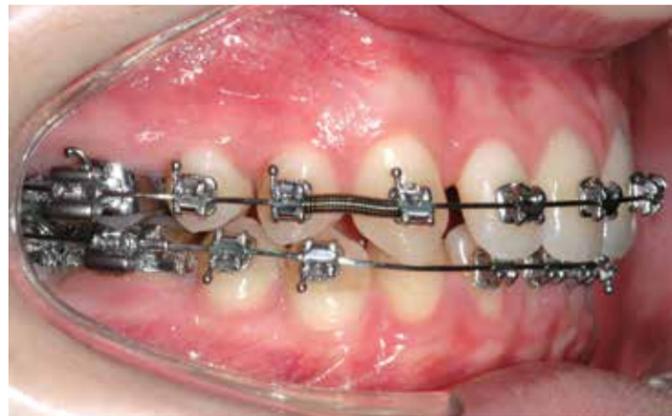
Upper .019"x .025" ss and lower .020"x .020" BioForce wires. Biturbos bonded on the palatal surface of upper central incisors were used to open the bite temporarily.



Lower .019"x .025" ss, open coil between upper right first molar and second premolar. Short Class II 3/16" 4 oz from upper canine to lower second premolar.



Upper right first and second molars have been distalized to a Class I. Open coil has been moved between first and second premolars. Continues with short Class II elastics.



Upper first and second premolars have been distalized and now one open coil has been placed between canine and first premolar. Continues with short Class II elastics.



Upper and lower .021" x .025" ss wires to provide proper torque and flatten occlusal plane. Elastomeric chain to consolidate remaining spaces. Right side a short Class II and left side a triangular vertical 3/16" 6 oz elastic.



Upper .021" x .025" ss Braided and lower .021" x .025" ss wires; right and left side with triangular vertical 3/16" 6 oz elastics.

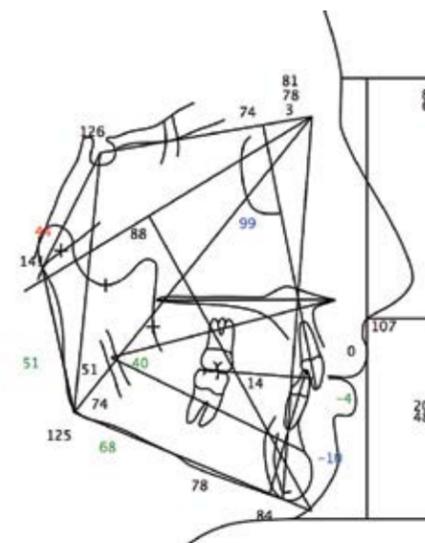


Intraoral final photos. 26 months of active Tx.



Extraoral final photos.

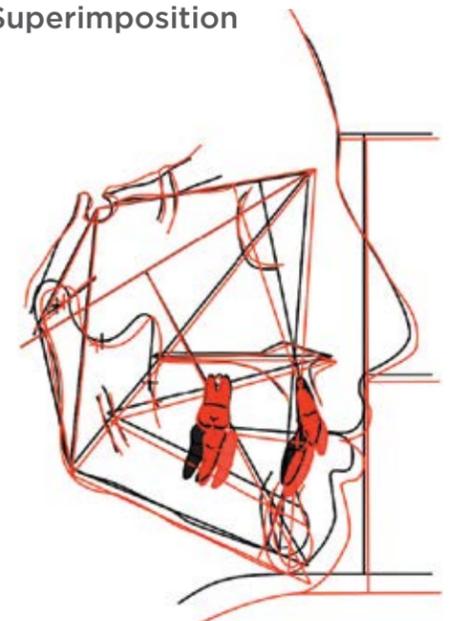
Pre Tx



Post Tx



Superimposition



Dr. Antonino Secchi



Dr. Secchi maintains a private practice in Devon, PA. He is a Diplomate of the American Board of Orthodontics and member of the Edward H. Angle Society of Orthodontists.

Dr. Secchi received his DMD, Certificate in Orthodontics, and a Master of Science in Oral Biology from the University of Pennsylvania, same institution where he taught for over 10 years holding the position of Clinical Assistant Professor and Clinical Director of the Department of Orthodontics.

Dr. Secchi has published in various dental and orthodontic peer review journals in the areas of treatment mechanics and the straight wire appliance. He wrote the chapter “Contemporary Mechanics Using the Straight Wire Appliance” for the last two editions of the Graber/Vanarsdall/Vig orthodontic textbook.

Dr. Secchi received the 2005 David C. Hamilton Orthodontic Research Award from the Pennsylvania Association of Orthodontists (PAO) and the 2010 and 2013 Outstanding Teacher Award from the Department of Orthodontics of the University of Pennsylvania.

Dr. Secchi is the founder of the “Complete Clinical Orthodontics System” (CCO System™) and the Secchi Institute™, which provides continuing education for orthodontists in the USA as well as throughout the world.

Dr. Secchi loves to spend time with his wife and 5 children. He is a passionate photographer and likes people, traveling and sports.



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