Nonextraction Treatment An Atlas On Cetlin Mechanics

Author: Raffaele Spena

Part II

Space-gaining in the upper arch

Chapter 3
Introduction

Three appliances are used to gain space in the upper arch: the palatal bar, the headgear and the removable distalizing plate.

The ***palatal bar*** allows complete control of upper first and second permanent molars. Correction of molar crossbites and lateral overjets, as well as molar rotation, distalization and torque can be easily obtained with the palatal bar. But what makes this appliance unique is the possibility of controlling vertical molar position and eventually intruding upper molars.

The ***headgear***, occipital or cervical extraoral appliance, is chosen depending on the characteristics of the malocclusion and the biomechanical needs. It helps to distally incline upper molar roots and to control the vertical position of upper molars.

The ***removable distalizing plate*** is a modification of Mershon's removable plate. It is designed to distally incline upper molar crowns thanks to two distalizing springs placed against the mesial surface of the upper first permanent molars. Clasps on the first premolars or first deciduous molars and a labial acrylic shield on the upper incisors, helps to control anterior anchorage. The combined action of the extraoral force and the removable plate gives a net distal bodily movement of upper molars.

Space gaining is not a sagittal problem. It is a three-dimensional problem. With this biomechanical system, molars move distally and laterally in a wider part of the arch. If needed, their tendency to extrude during distalization can be neutralized. Premolars and canines tend to follow molars spontaneously, thus correcting their position without anchorage requirements. The entire upper arch changes form and becomes wider, thanks to the shielding effect of the inner bow of the headgear and the lip bumper, and to the disclusion provided by the plate.

The overjet often decreases because of two factors:

a) upper incisors reduce their proclination thanks to the available posterior space and the improvement of the lip setting

b) the mandible, freed from a constricted upper arch, grows forward and/or rotates counterclockwise

The objectives of the space gaining phase are to drive upper permanent molars in a "super Class I" relationship and to create ample diastemas for malocclusion correction. Overcorrection is an essential part of the regimen for long-term stability.

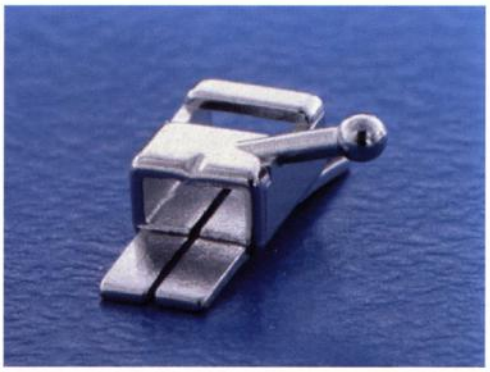
Chapter 4
The palatal bar

The palatal bar is an auxiliary orthodontic appliance particularly effective in solving several clinical problems. Introduced by Dr. R.H.Goshgarian, it was originally soldered to molar bands allowing only a few adjustments using its central Coffin loop. Dr. Cetlin has developed a customized form and use of the palatal bar, making it a versatile appliance. It can help control molar position and movement. The palatal bar, alone or together with headgear or distalizing plate, can gain enough space in the upper arch to treat most malocclusions without extractions.

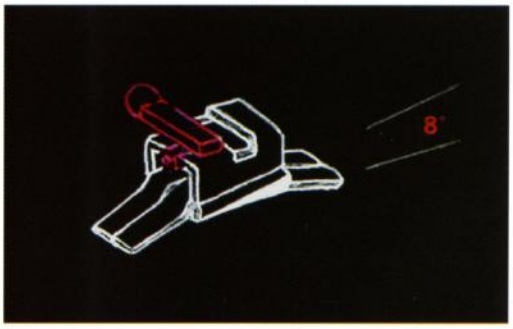
4.1 Characteristics of the palatal bar

The palatal bar (PB) design introduced by Dr. Cetlin is made out of a 0.036" stainless steel wire:

It is removable and inserted in 0.036" x 0.072" lingual sheaths soldered to molar bands.

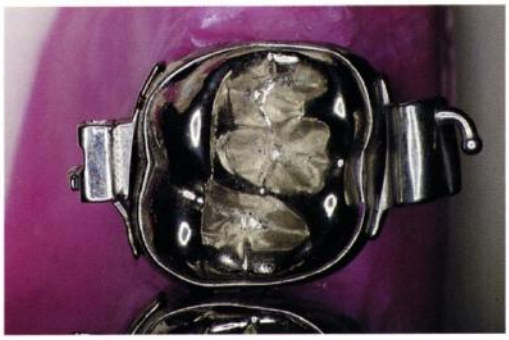


Lingual sheaths have an 8° mesial offset that eases insertion and removal of the PB avoiding entrapment behind premolars after molar rotation.



The sheathes have a distal locking indent and a gingival hook for ligating the PB and securing any intra-arch or inter-arch elastics.

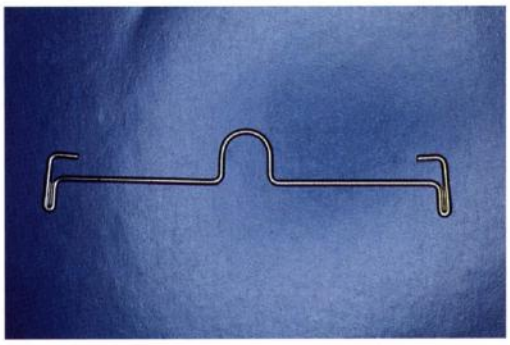
The sheathes are usually welded at the middle of the palatal surface, parallel to the occlusal surface of upper molars. This will prevent any tissue impingement and occlusal interference.



The PB has a Coffin loop positioned toward the mesial for two reasons:

a) the PB is more comfortable for the tongue and the soft palate

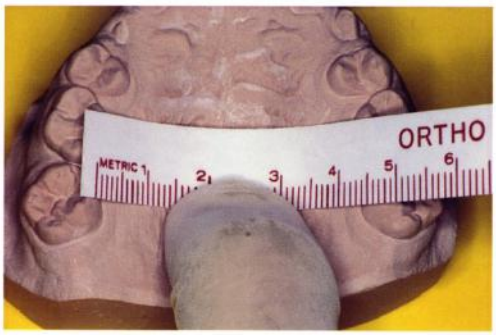
b) forces exerted by the tongue during speech and swallowing are anterior to the center of resistance of the molars, thus tending to incline molar roots to the distal



However, the direction of the loop properly inclines the upper molars only when the palatal bar is free from the palate and low in the oral cavity.

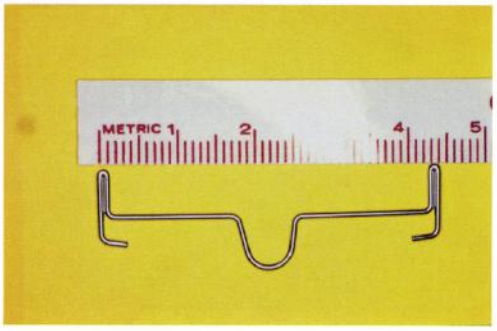
4.2 Measurement

In order to choose or construct a PB of the proper length, it is important to determine accurately the distance between the two sheaths. This can be done on the initial cast using two methods.



First method:

The distance between the two sheathes, or where the sheathes will be located, is determined with a millimetric ruler.

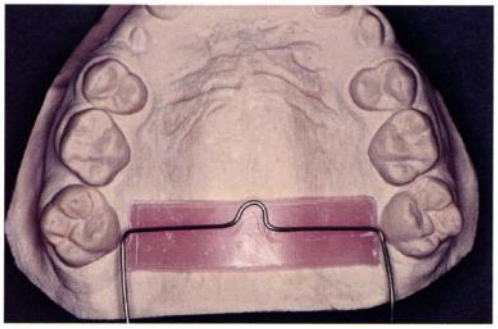


Two or three millimeters are substracted from the measured distance to allow 1.5-2.0 mm. clearance from the palatal mucosa.

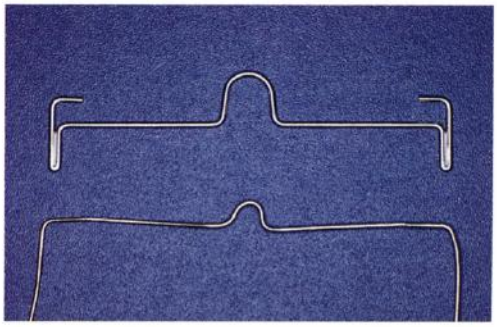
A PB of this length is chosen or constructed.

Second method:

A 2.0 mm thick wax layer is placed on the cast from molar to molar. Measurement from molar to molar is taken with a soft brass wire.



Choose or construct a PB of this length.



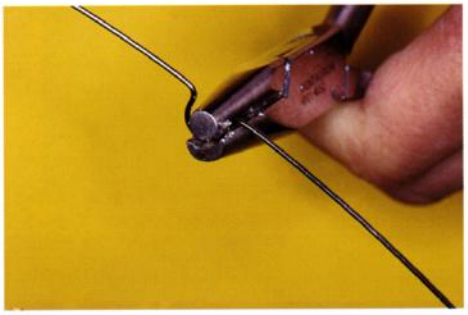
Measurements can be made intraorally after the bands have been cemented to the molars. A preformed ligature wire is modeled to the patient's palate and bent at the molar sheaths. The soft wire is then straightened. A PB, slightly shorter than this measurement, is then chosen.

4.3 Construction

Preformed PBs are available in different lengths and shapes. Usually the performed PB with mesial Coffin loops are used.

Special anatomical features or variations of the basic PB may require a customized PB. A step-by-step procedure of how to obtain a flat PB of a determined length is shown below. It is not recommended to bend and adapt the PB to the patient's palate at the same time.

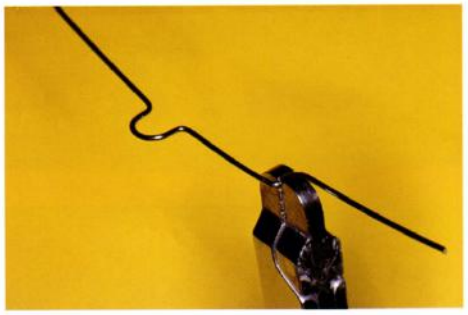
With Ruhland pliers, bend a 5.0 mm diameter Coffin loop.



With lingual arch-forming pliers (ODG 159), bend the wire at 90° at the following level:

Measured distance - 5.0

2

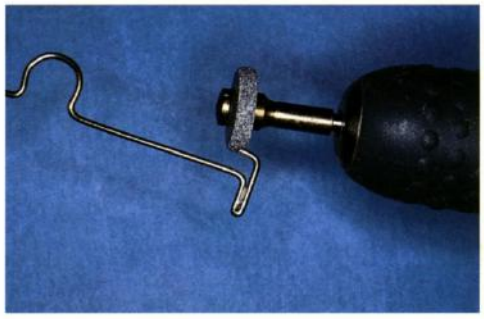


This 90° bend has to be on the opposite side of the Coffin loop, if a mesial loop is desired, or on the same side if a distal Coffin loop is desired.

With lingual arch-forming pliers (ODG 159), bend terminals as shown. Be careful to keep the two 0.036" wires perfectly parallel and superimposed, otherwise the terminal will not fit into the sheath. Both terminals must lie flat on a plane.

Bend both terminals toward the Coffin loop. This will give a good grip when inserting and removing the PB.

Round ends off with a bur and lubricate terminals with vaseline before inserting them into the sheaths.



4.4 Fitting

The objective is to obtain a PB well shaped to the palate, not impinging on soft tissues and exerting force only on molars. Since working with the PB is uncomfortable for both the patient and the clinician, it is advisable to get as close as possible to a well-fitted passive PB before starting final adjustments in the patient's mouth. This will avoid discomfort for the patient and chairtime.

Six bends may be added to a PB. The first three bends are required all the time, while the other three may only be needed to adjust the appliance to specific anatomical characteristics of the patient's palate.

4.4.1 Required bends

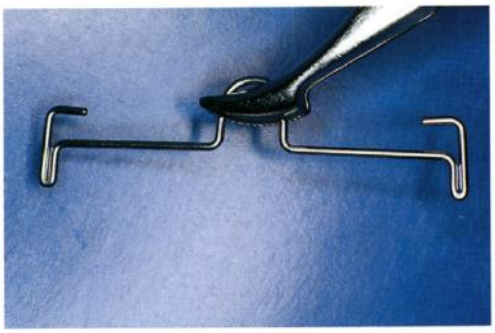
First bend : observe the shape of the palate

Two forms of palate are usually found: a flat wide palate and a narrow deep palate.

If the palate is flat and wide, use bird-beak pliers to give a gentle curvature to the arms of the PB close to the Coffin loop.

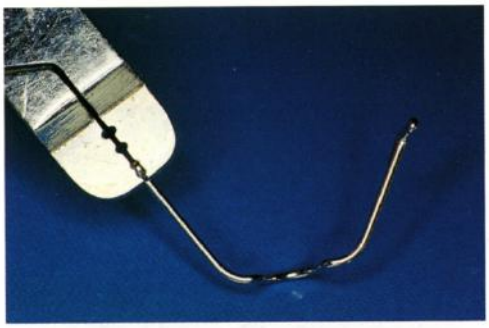
The other two thirds of the appliance must be kept straight, otherwise the PB may impinge upon the palatal mucosa.

If the palate is deep and narrow, hold the Coffin loop with pliers and bend down both arms of the PB, leaving them entirely straight.



Second bend: observe molar torque

Upper molars may be lingually inclined, upright or buccally inclined. With lingual arch-forming pliers, give both terminals an inclination as close as possible to that of the molar lingual sheathes.



Third bend: observe molar rotation

Upper molars may be rotated. Most frequently, in Class I and II malocclusions, they present variable degrees of mesial rotation. With lingual arch-forming pliers, rotate both terminals (toe-in or toe-out) as close as possible to the rotation of molar lingual sheathes.

4.4.2 Optional bends

Fourth bend: the grip

To simplify the grip during insertion and removal of the PB, the ends of the terminals can be bent toward the lingual with three-pronged pliers (Dentronix 344) or with two pliers as shown.

Fifth bend: thick palatal gingiva

To avoid a thick palatal, gingival tissue on upper molars, a gingival step-out can be added with lingual arch-forming pliers and then with Weingart pliers.

Thanks to the 8° mesial offset of the lingual sheaths, the need of offsetting the bar is rare. If older style sheaths without the offset are used, these two bends will be necessary in most circumstances.

Sixth bend: sagittal curvature of the palate

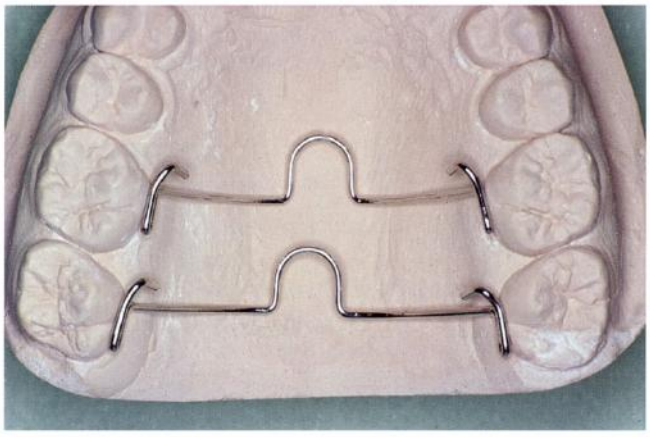
Sometimes the palate may have a peculiar anterio-posterior curvature and the Coffin loop may impinge against the mucosa behind the upper incisors. This may result in difficult insertion and removal of the PB or, worse, in lesions of the mucosa. To prevent this, the Coffin loop may be bent down and adapted to the anatomy of the palate.

4.4.3 Direct and indirect fitting

The PB can be fitted with a direct or with an indirect method.

With the ***direct method***, prewelded bands are fitted and cemented to the molars. At the chairside, the PB is fashioned largely on the study model and then fitted passively in the patient's mouth.

With the ***indirect method***, bands are fitted to the molars. An impression is taken. Bands are placed in the impression tubes and undercuts are waxed. The impression is poured with orthodontic stone. The PB is fitted passively to the sheaths on the cast. Bands and PB are cemented together as a soldered lingual arch. This method is advisable for those who are using PB for the first time, or those who prefer lab work versus chairtime.



4.5 How to make a PB passive

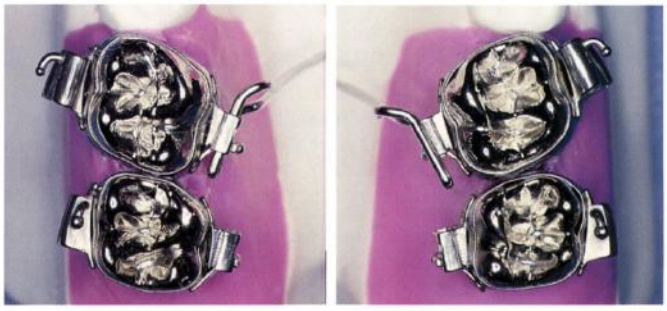
The first step is to obtain a PB that doesn't exert any force on the molars. Reasons to adjust a passive PB are:

a) Any activation will be easier to add

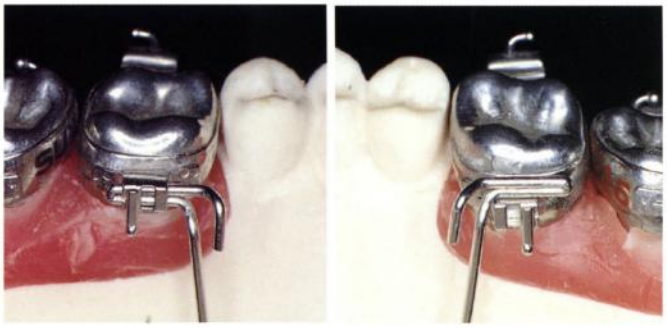
b) We may want to test patient's tolerance to the appliance and activate it at the next appointment

c) We may need the PB as an anchorage appliance only

Verification has to be in all the planes. The PB must not exert any rotational, tipping, torquing or expansive force.



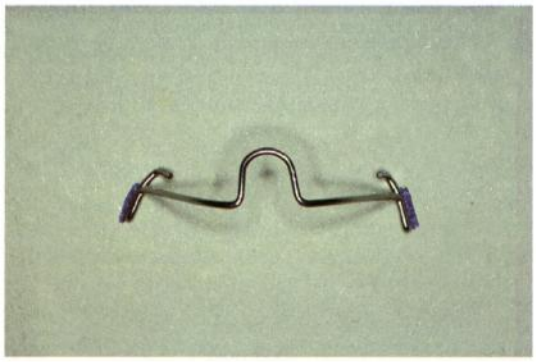
Insert one terminal in its sheath. Modify the angulation, inclination and torque until the other terminal lies at the same transverse level, with the same rotation and inclination of the sheath where it is to be inserted.



Reverse the procedure to make the other terminal passive.

This procedure is for PBs on both first and second molars. The indirect fitting of a PB allows time and progressive manual dexterity, as well as an understanding of the proper steps to achieve a passive PB.

The position of the terminals may be recorded on paper or on the patient's clinical chart with a blue pencil. These marks may be an excellent reference to test future activations or to easily form a new PB.



Chapter 5
Clinical use of the palatal bar

The palatal bar (PB) is applied to the first and second upper permanent molars.

The PB can be used to rotate, distalize, expand, constrict, intrude, extrude, torque and anchor the upper molars. Forces applied with this appliance should be light and in one direction. For example, never attempt to rotate and torque molars at the same time. Over-activations will lead to soreness, mobility, possible destruction of the lamina dura and periodontal damage and will not produce faster results.

The PB needs work in the back of the mouth, which is particularly uncomfortable for both the patient and the orthodontist. For this reason, when inserting and removing the PB, it is advisable to use at least two means to hold it: a hemostat, or dental floss tied around it, can be useful to safely hold the appliance while seating its terminals in their sheathes with a Weingart, or better ODG 149 pliers.

PBs must always be tied to molar sheathes. This can be done with an elastomer or an elastic chain from the hook of the sheath to the curved end of the bar. Ligation will prevent the PB from being dislodged or worse, aspirated.

PBs require reactivations approximately every six weeks. Always check to make sure the terminals are passive before adding additional forces.

Second molars should be banded whenever possible to facilitate the first molars control and movement.

Activations of a palatal bar

A BP can be used to:

1. Distalize
2. Rotate
3. Expand or constrict
4. Torque
5. Control vertically
6. Increase anchorage control of the upper first and second permanent molars.

In the following paragraphs, each activation will be demonstrated in detail.

5.1 Distalization

This is the only unilateral activation of the PB where rotation of one molar is used to distalize the contralateral one.

It may be used in two different clinical situations :

a) when in a malocclusion an asymmetrical molar relationship is present, that is, Class I molar relationship on one side and Class II molar relationship on the other side

b) when both upper molars need to be rotated and distalized and the patient does not want to, or cannot wear the extraoral appliance

In the first situation, the unilateral distal movement of the molar in Class II relationship is achieved by applying a PB rotation on the "good" side and distalization on the "bad" side, and trying to limit the rotation of the molar in Class I relationship. The offsetting is usually achieved with a headgear whose inner bow has a toe-out on the rotational side.

The resulting biomechanical system is as follows:

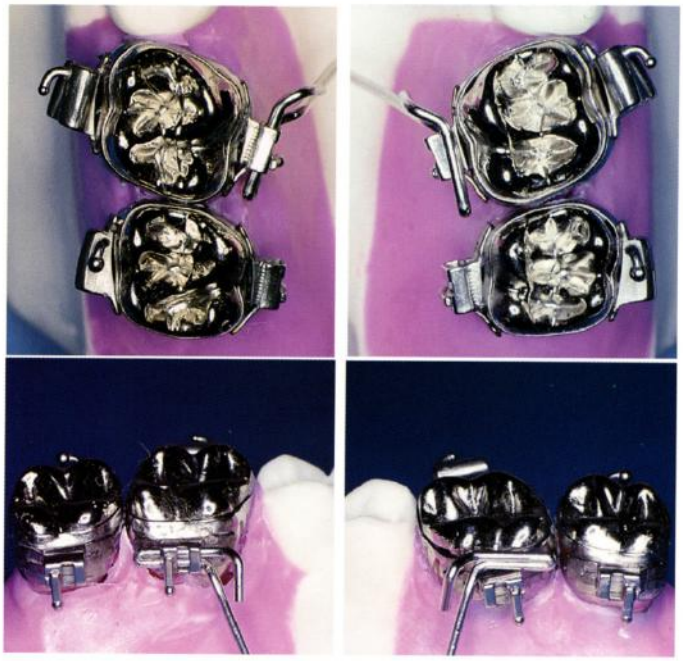
a) on the Class I side, the molar has a rotational force from the PB and an anti-rotational force from the headgear. The molar will move slightly toward the distal, thanks to the extraoral appliance

b) on the Class II side, the molar has a distal force from the headgear and a distal force from the PB. The net distal movement will be greater than the other side.

If the upper arch is bonded, an edgewise wire, extended from the molar that is rotating to at least the contralateral premolars, may limit undesired movement, as well. This solution may be used in case of an uncooperative patient.

In the second case, the unilateral activation may be an alternative to the more usual rotation of the molars, followed by distalization with the headgear and the distalizing plate. The PB is activated on one side first and on the other side afterwards to achieve as much distalization as possible. Rotation may be limited by the use of a sectional wire extended from the first to the second permanent molar.

Activations on the first permanent molars are different from those on the second permanent molars.

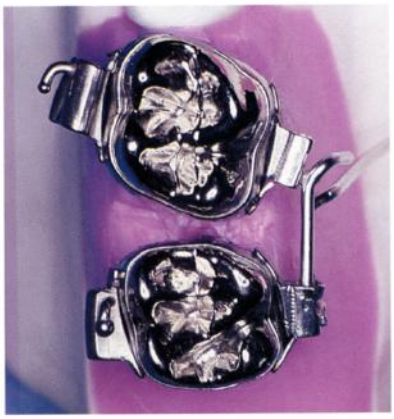


5.1.1 Distalization of first molars

With lingual arch-forming pliers, a light lingual bend is given on the side opposite to where distalization is desired and 0.5-1.0 mm of expansion is added.

Proper adjustment is checked intraorally.

The passive (none modified) terminal is inserted first. The other end should be slightly expanded and toed-in to its molar sheath.

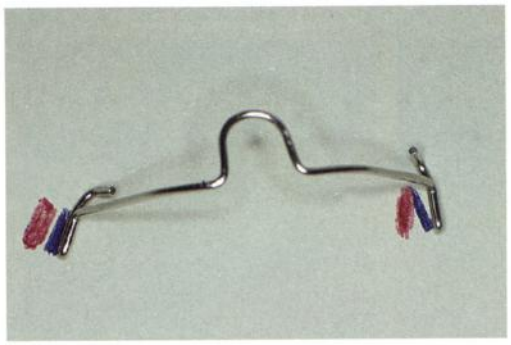


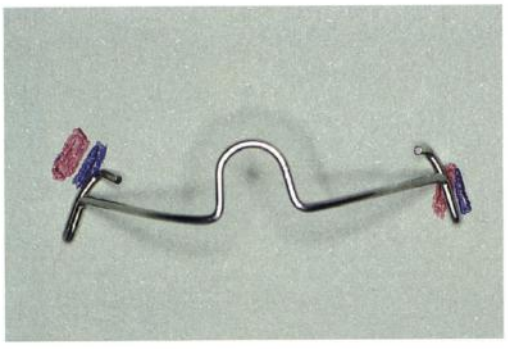
Insert the activated side.

Check the other side. Proper activation is reached when the other terminal is just distal and lateral (slightly expanded) to its sheath.

PB has to lie at the same vertical height (no torquing force) and at the same horizontal plane (no tipping force).

On the patient's clinical chart, where the passive position of the terminals have been recorded, the new position of the two terminals may be traced with a red pencil and proper activation may be verified before inserting the palatal bar.



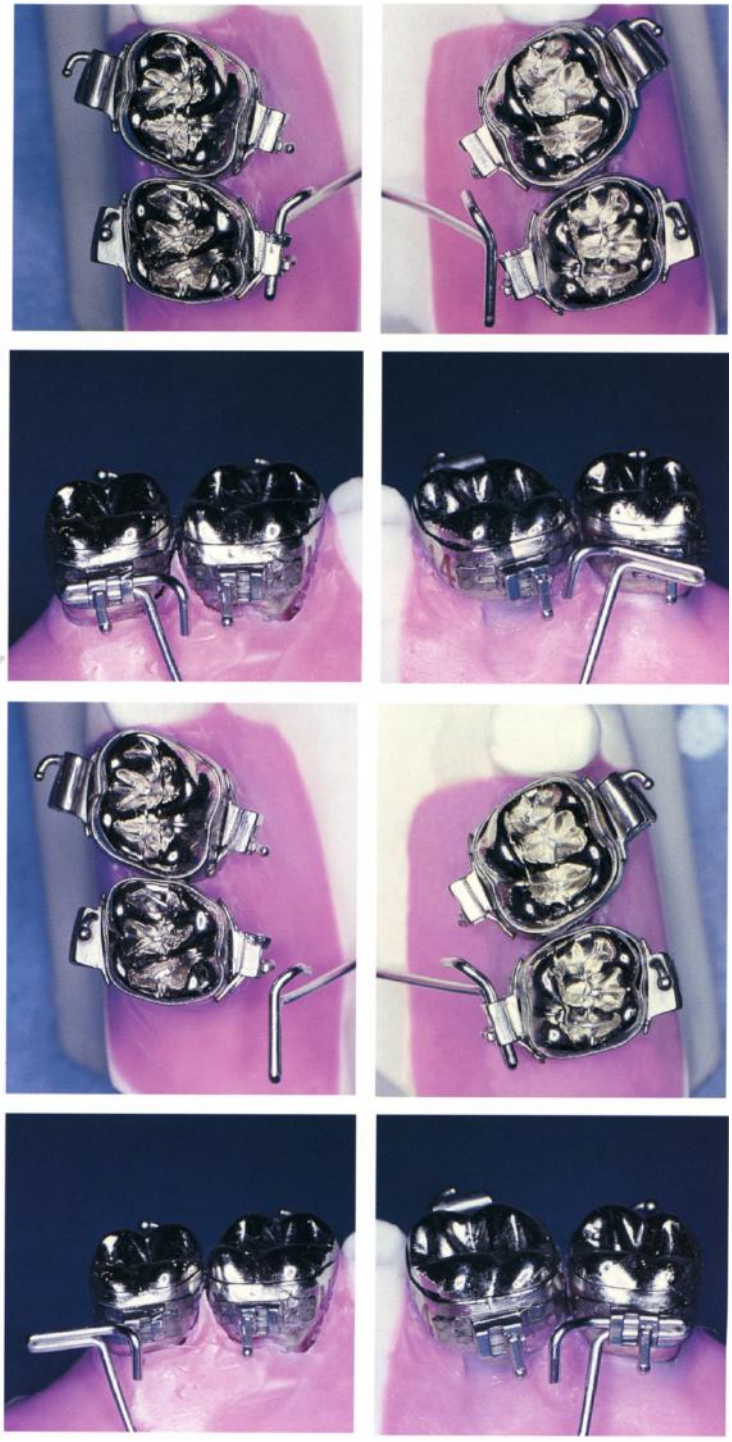


5.1.2 Distalization of second molars

The activation to distalized second molars is similar to the one on the first molars.

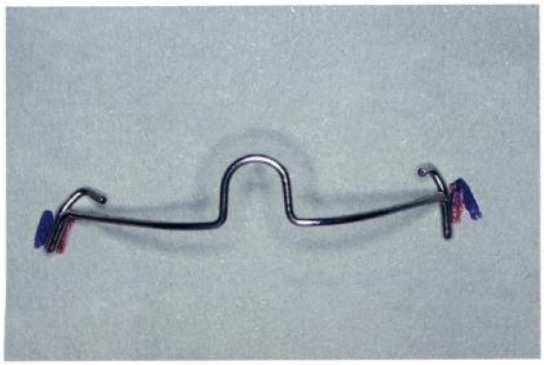
The only difference is that the PB should be constricted here approximately 0.5-1.0 mm. This constriction is needed because, at the beginning of treatment, the second molars are often found buccally displaced. As a final objective, a slightly lingual position is desired when compared to the first molars along the arch.

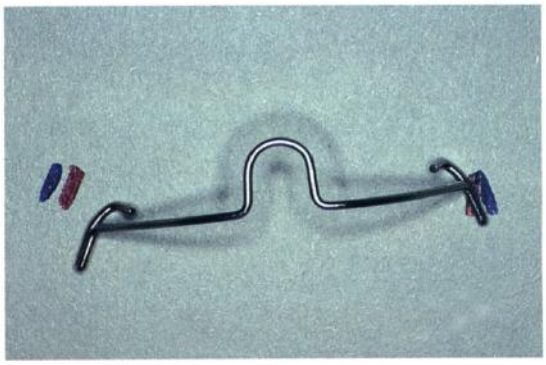
Proper activation of the PB on the second molars is shown here.



As already shown on the first molars, the new position of the two terminals should be traced with a red pencil on the patient's clinical chart where the passive position of the terminals have been recorded.

Proper activation should be verified before inserting the palatal bar.





Clinical case

Fig. 5-1

Unilateral Class II malocclusion with upper and lower crowding. The upper right canine has no room to erupt. The upper midline is slightly deviated to the right.

Fig. 5-2, A,B,C,D

A Class I molar relationship is found on the left and a Class II molar relationship is on the right. The upper right permanent molar is constricted and mesially rotated and displaced. The upper right second premolar is in cross-bite. The lower right second deciduous molar is ready to exfoliate.

A

B

C

D

Fig. 5-3, A,B,C,D

A PB was initially used to rotate the upper left first molar and distalize the upper right first molar. An occipital headgear was added to limit the rotation on the left side, achieve as much distal movement as possible on the right side, and control both molars vertically. Notice that the upper right second premolar has self-corrected its cross-bite.

Fig. 5-4, A,B,C,D

The right upper first molar has been rotated. A lip bumper has been added to the lower arch.

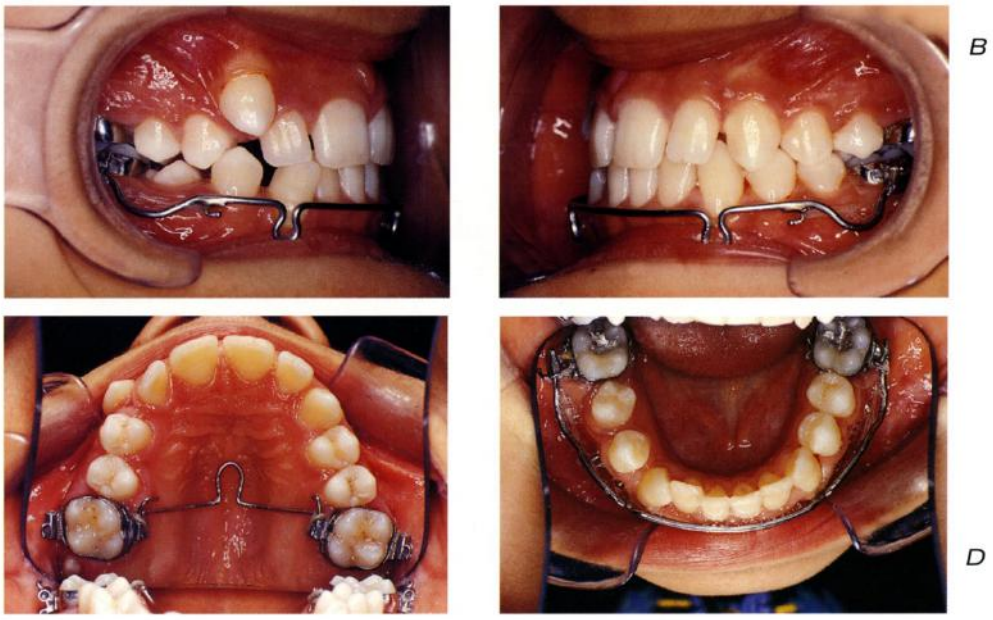


Fig. 5-5, A,B

The upper right canine has erupted. Upper and lower arches have been bonded with multibanded edgewise appliance. Two Warren torquing springs have been added to the upper canines to move their roots palatally. Final detailing of the occlusion will be achieved.

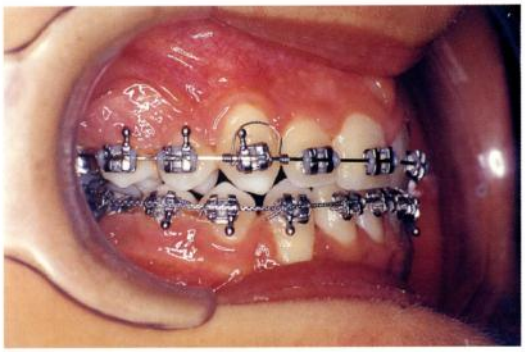
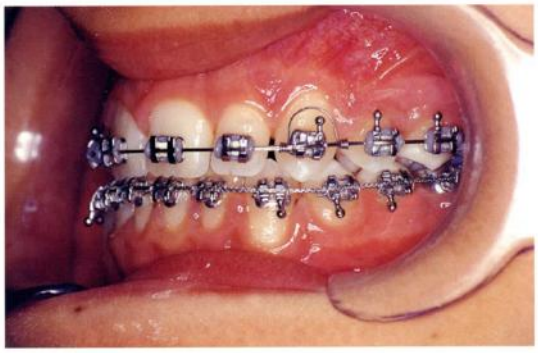
A   B

Fig. 5-6, A,B

Patient's smile and frontal intraoral view at the end of treatment. The upper midline is coincident to the lower one. A good vertical control has been maintained throughout the entire treatment.

A 

B 

Fig. 5-7, A,B,C,D

The left and right occlusion and the upper and lower arches at the end of treatment. Notice the overcorrected molar relationship.

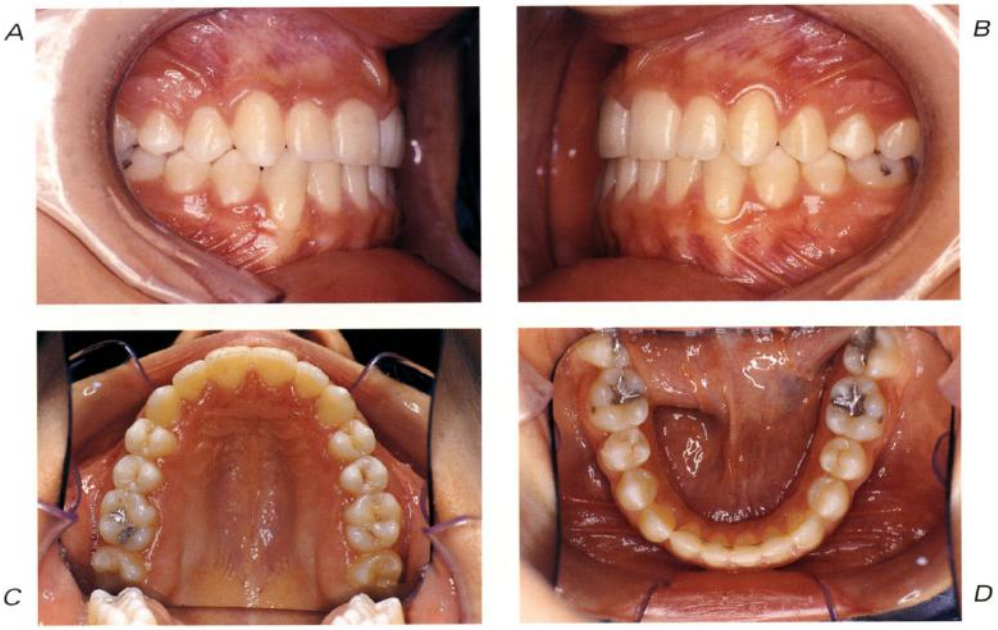


Fig. 5-8, A,B

The patient's smile and frontal intraoral view six years after the end of treatment. The lower midline has slightly shifted to the right, but a good stability of dental position and occlusion is still present.

Fig. 5-9, A,B,C,D

The left and right occlusion and the upper and lower arches six years after the end of treatment. Notice the overcorrected molar relationship still present. The settling of all teeth is excellent.

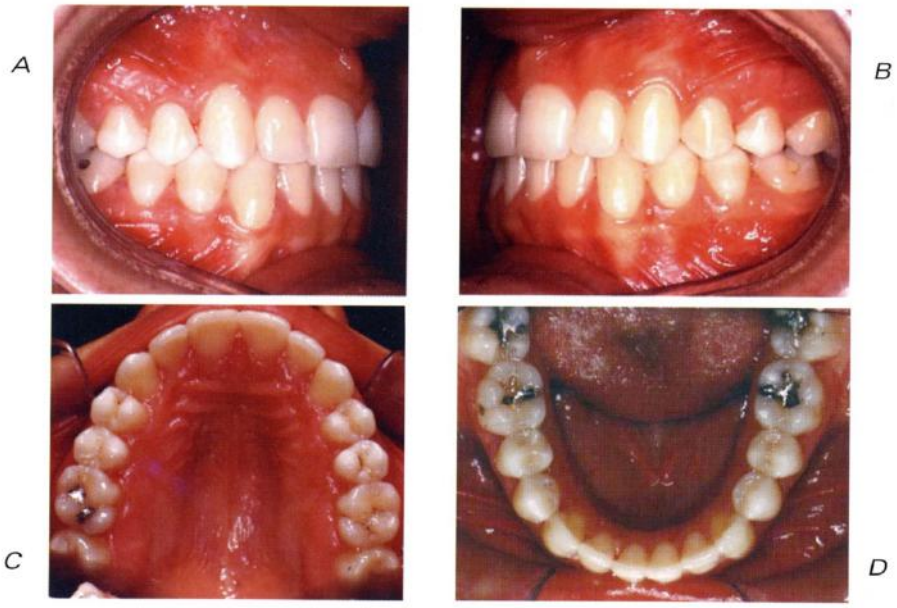


Fig. 5-10, A,B,C

Patient's profiles at the onset of treatment, at the end of treatment and six years after the end of treatment. A good balance has been reached and maintained through the years.

Clinical case

Fig. 5-11, A,B

Unilateral Class II malocclusion with upper and lower crowding. The upper left second premolar and the first and second molars are in cross-bite and full Class II relationship.

A   B

Fig. 5-12, A,B

Two palatal bars have been used on the first and second molars. Rotation has been achieved on the right side. A cervical headgear applied to the upper first molars has helped to limit rotation on the right side and increase the distal movement on the left side. A sectional wire on the right first and second molars has increased the rotational control. Notice the spacing in both the upper and lower arch after six months of therapy.

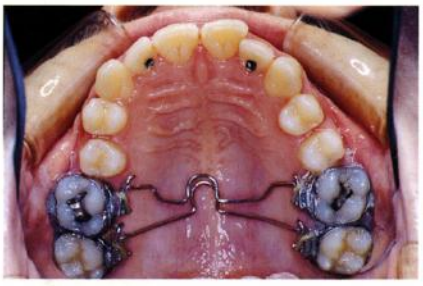
A   B

Fig. 5-13, A,B

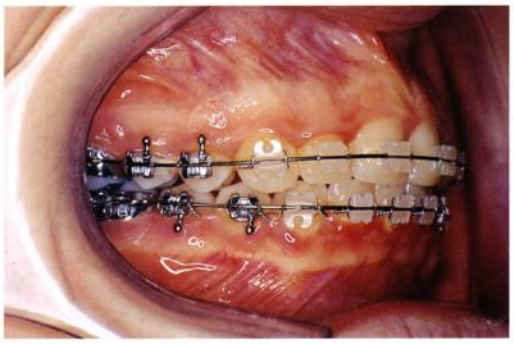
After six months, the left molars have reached an end-on relationship and the cross-bite has been corrected.

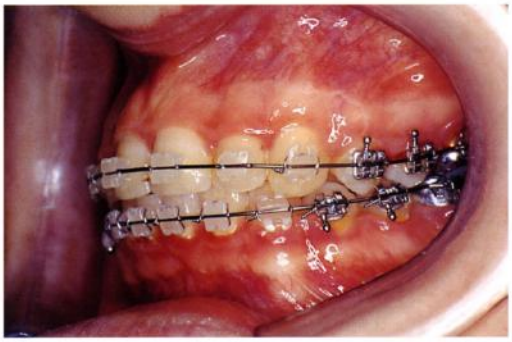
A   B

Fig. 5-14, A,B

The upper and lower arches have been treated with full fixed edgewise appliances. A Class I molar and canine relationship has been reached on both sides.

A





B

Fig. 5-15, A,B,C,D

The occlusion and the dental arches at the end of treatment.

A

B

C

D

Clinical case

Fig. 5-16, A,B

The patient's profile and frontal intraoral view at the onset of treatment. Mandibular retrusion, severe deep bite, and crowding are present.

A

B

Fig. 5-17, A,B,C,D

Class I malocclusion with upper and lower severe crowding.

Complete permanent dentition, mesially and lingually rotated upper molars, vertical upper and lower incisors and distally tipped upper canines are the main dental characteristics of this case.

A

B

C

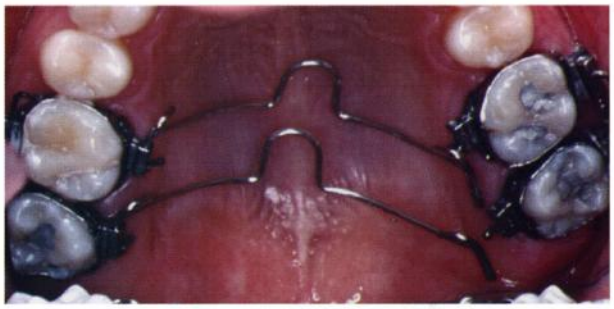
D

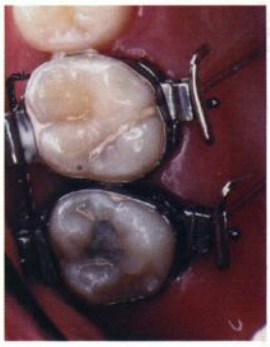
Fig. 5-18, A,B

The rotation and distal movement of the upper molars has been reached with alternated unilateral activations of the PB because the patient's cooperation with headgear was questionable.

The rotational control has been obtained by inserting a sectional on first and second molars during the distalization of the other side.

A





B

Fig. 5-19

After distalization of the left side first, and the right side afterwards, this is the amount of space that has been reached in the upper arch.

Notice the spontaneous change in the arch form and dimension.

Fig. 5-20, A,B

Once the upper molars have been driven in a "super Class I" relationship, intrusion of upper incisors to correct the deep bite has been initiated. In the lower arch, a four-looped lip bumper is applied to unravel the crowding.

A

B

Fig. 5-21, A,B

The patient's profile and frontal intraoral view at the end of treatment. Notice the convexity reduction of the profile and the opening of the bite.

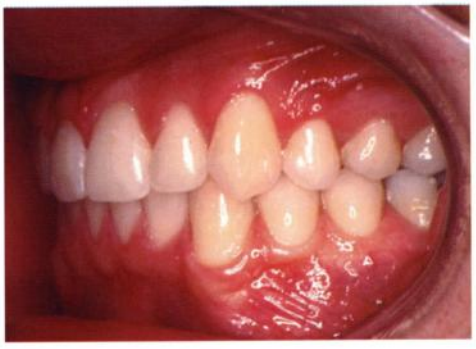
A

B

Fig. 5-22, A,B,C,D

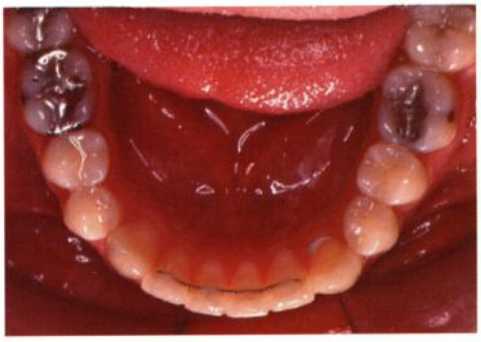
The left and right occlusion and the upper and lower arches at the end of treatment. Notice the inclination of the canines and the torque of the incisors. A good change in arch form and dimension has been reached.

A



B

C



D

Fig. 5-23, A,B

Patient's profile and frontal intraoral view six years after the end of treatment. Good dental stability and occlusion are still present. No relapse of the deep bite has occurred.

A

B

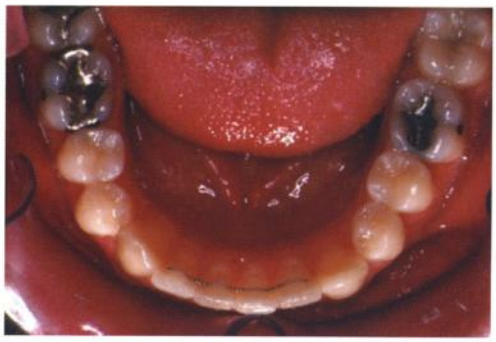
Fig. 5-24, A,B,C,D

The left and right occlusion and the upper and lower arches six years after the end of treatment. The teeth are well seated and third molars are erupting.

A

B

C



D

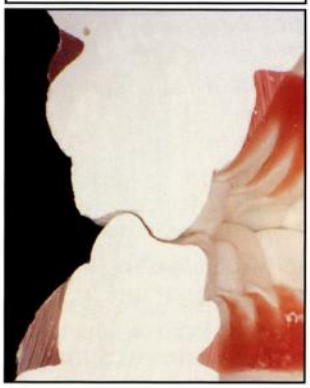
5.2 Rotation

In his 1972 published article "The Six Keys to Normal Occlusion," Andrews observed that molar relationship in non-treated normals is defined by three contacts between upper first molars and lower molars:

1) The mesiobuccal cusp of the first upper molars occludes with the mesiobuccal groove of lower first molars

2) The distal marginal ridge of the upper first molars contacts the mesial marginal ridge of lower second molars

3) The big palatal cusp of upper first molars occludes with the central fossa of lower first molars

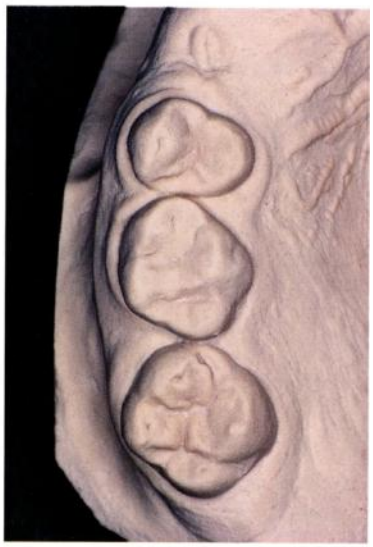


Most Class I and Class II malocclusions present mesiolingually rotated and constricted upper molars. When the upper first permanent molars are rotated, several problems occur:

a) Their relationship with lower first molars on the buccal side is usually different from the one on the lingual side. More specifically, the molar relationship will always be worse on the buccal side. For this reason, two different Class II molar relationships may be found clinically

In the so-called "false" Class II relationship, the big palatal cusp of the upper first molar seats in the lower central fossa. The mesiobuccal cusp of the upper rotated molar is mesial to the mesiobuccal groove of the lower molar. Its correction is easier, since it requires just a distal rotation of the upper molars

If the palatal cusp of upper molars is mesial to the central fossa of lower molars, the Class II relation is generally defined "true" and will be a lot more difficult to resolve.



b) The distal surface of the upper first permanent molar faces buccally and may cause a lateral ectopic eruption of the second molar. This is why correction of rotation of upper first molars is preferably achieved during the interceptive stage of treatment

c) When banded, the severe angulation of the buccal tubes makes it difficult or impossible to insert the archwires and headgear

An upper first molar has a mesial-distal measurement of approximately 10 mm. From its mesiobuccal corner to its distopalatal corner is 13 mm.

For this reason, distal rotation of upper molars around the big palatal cusp may help gain up to three millimeters of space per side, thus correcting a Class II relationship. The palatal bar is very effective in achieving this result.

Upper first molars should lie in a wider part of the arch when compared to the second molars. Therefore, activations of the palatal bars will be different on the first and second molars.

It should take three to four months to completely rotate the upper molars. Premolars usually follow molars toward the distal thanks to the transeptal fibers, and do not need appliances and mechanical forces that may hamper molar anchorage.

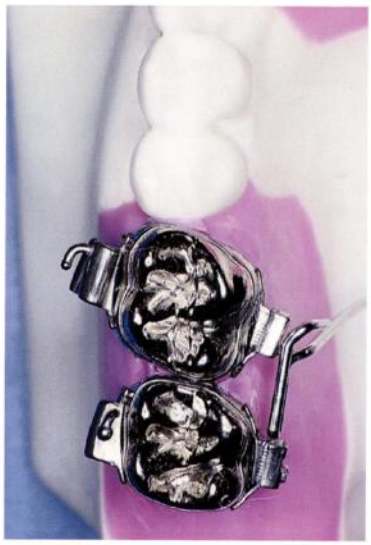
When needed, an extraoral force may be added to the first molars as soon as it can be easily inserted.

The objective is to finish the treatment with the mesiobuccal cusp of upper molars distal to the groove of lower molars. This helps premolar and canine intercuspation and increases stability.

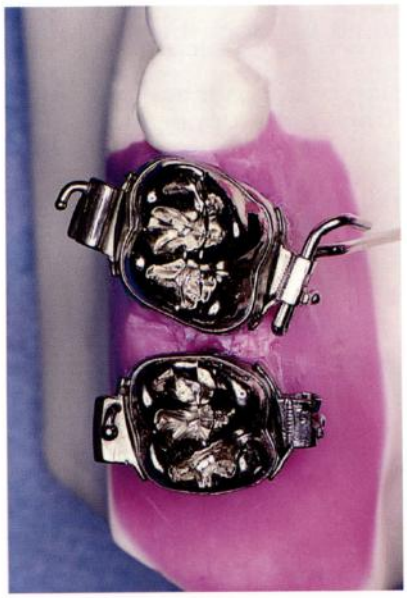
5.2.1 Rotation of first molars

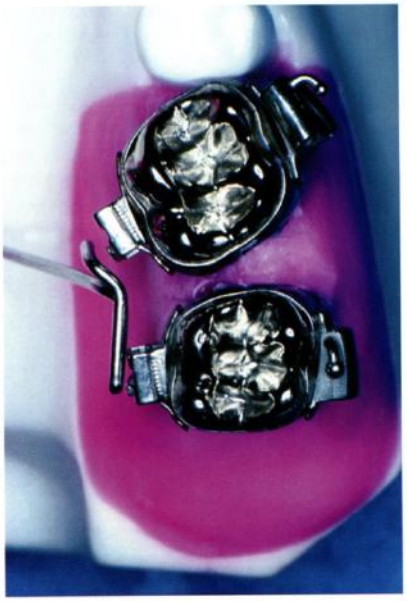
With lingual arch-forming pliers, a light lingual bend is given to both terminals of the PB. A 0.5-1.0 mm. of expansion is then added. Proper adjustment is checked intraorally.

One terminal is inserted. The controlateral terminal should be just distal and lateral to its sheath. This amount of activation delivers approximately 30 grams of force.



Verify the same activation on the other terminal.





As shown for distalization, the new position of the two activated terminals may be traced on the patient's clinical chart with a red pencil. The quality and quantity of applied forces may be checked outside the patient's mouth before inserting the PB using this method.

5.2.2 Rotation of second molars

Upper second molars are usually triangular and may present a mesiolingual rotation, as well. Their rotation helps to gain additional space in the upper arch and distalize the upper first molars.

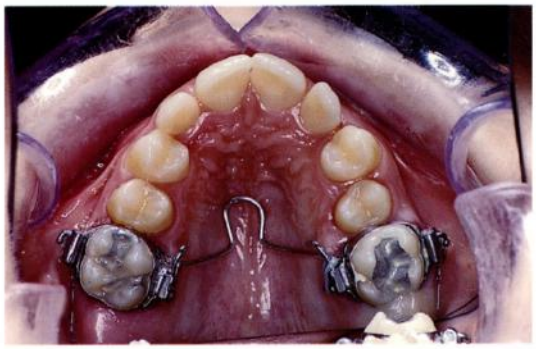
The adjustment rotation is similar to the one for first molars. The difference is that the PB here should be constricted 0.5-1.0 mm, because a more lingual final position in the arch is desired at the end of treatment.

5.3 Expansion - constriction

The PB-BP (bite plane) can be used to solve transverse problems like cross-bite and lateral overjet. Correction of these transverse problems should be done before rotation and distalization of molars.

Starting with a passive PB, add 1.0-1.5 mm. of expansion or constriction per side and per activation until the transverse problem is corrected. Transverse upper molar movement can be either a coronal tipping or a bodily movement. If a bodily movement is desired, buccal-root torque when expanding or lingual-root torque, when constricting, should be added (see section 5.4). The PB allows correction of unilateral cross-bite. In this situation, we add a vertical elastic to maintain occclusion on the proper side, while a cross-elastic increases lateral movement of the upper molar on the misplaced side (Fig. 5-24, A,B,C,D).

A



B

C

D

Thanks to the transeptal fibers, premolars tend to follow molars spontaneously and, if in cross-bite, generally do not require appliances or lateral forces to correct their position.

In growing patients opening of the palatal suture may be observed during molar expansion with a PB.

Clinical case

Fig. 5-25, A,B,C,D,E,F

Unilateral Class II malocclusion with unilateral cross-bite extended from upper first premolar to upper second molar. No side-shift has been detected. Upper and lower severe crowding, upper right canine is blocked out of the arch. An open bite tendency is present.

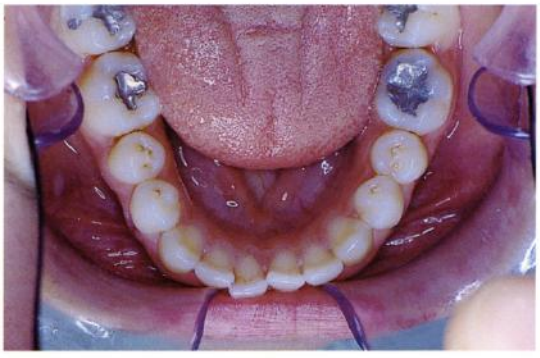
A

B

C

D

E



F

Fig. 5-26

An expanded PB on upper first molars, a lower lip bumper and a vertical elastic on the normal side have been used to correct the unilateral crossbite. The PB has been modeled low in the oral cavity to counteract extrusive movement of the molars during the expansion. Notice how premolars are self-correcting their positions.

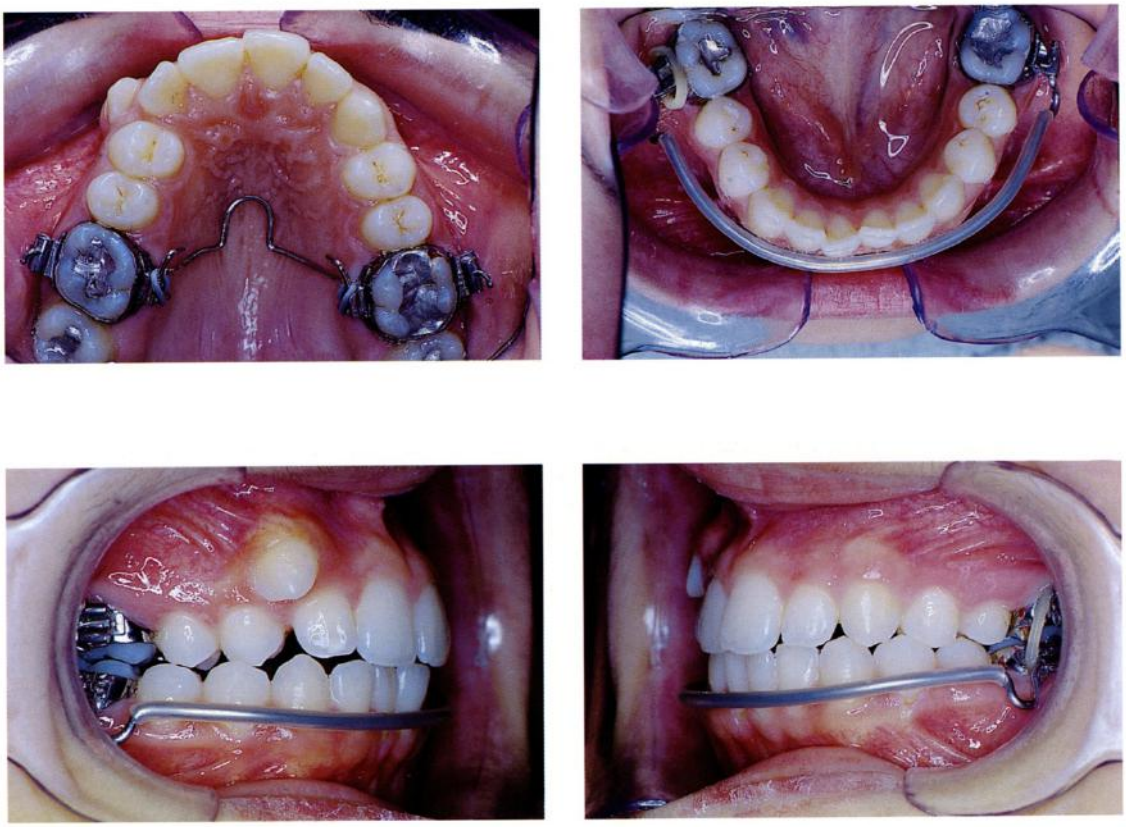


Fig. 5-27

An occipital extraoral force is added as soon as possible to control vertical position of the upper molars and to start their distal movement.

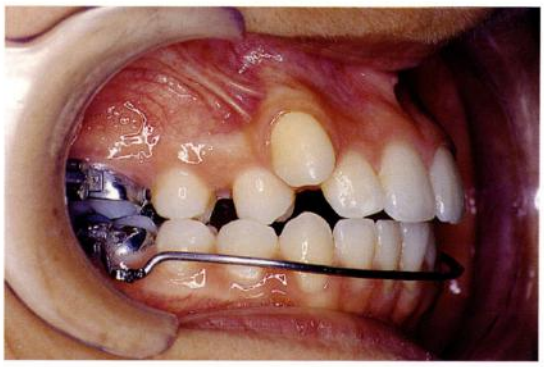
Fig 5-28, A,B

Once the transverse problem has been corrected, the PB has been activated unilaterally. A toe-in was added on the left side. In this way, we applied rotation on the left molar and distalization on the right molar. The inner arch of the facebow of the occipital headgear has been modified with a light toe-out on the left side, to counteract molar rotation from the PB.

Let us summarize forces involved in this simple force system:

a) On the upper first left molar, a distal rotation from the PB, acting 24 hours a day, and a mesial rotation + distalizing force from the headgear whenever the patient wears it

b) On the upper right molar, a constant distalizing force from the PB and an intermittent distalizing force coming from the headgear



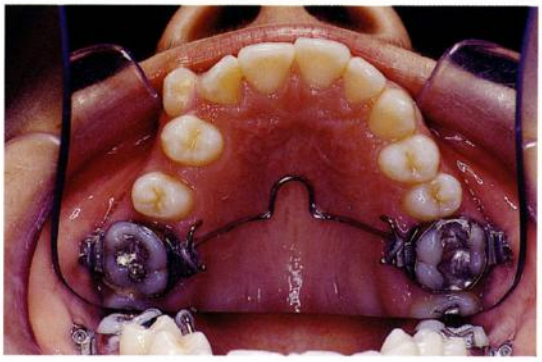


Fig. 5-29, A,B

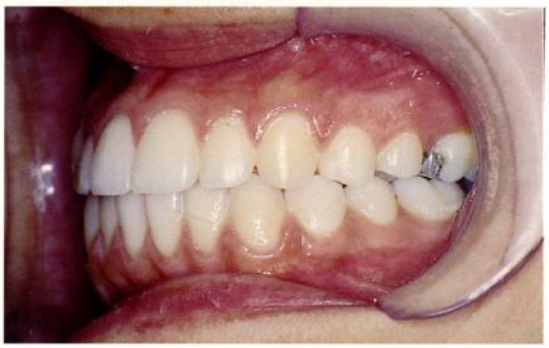
The patient at the end of treatment. The midline has been kept aligned and the unilateral cross-bite has been corrected.

A

B

Fig. 5-30

The occlusion and the arches three years after the end of treatment. Patient refused any periodontal therapy for the recession on the upper right canine.



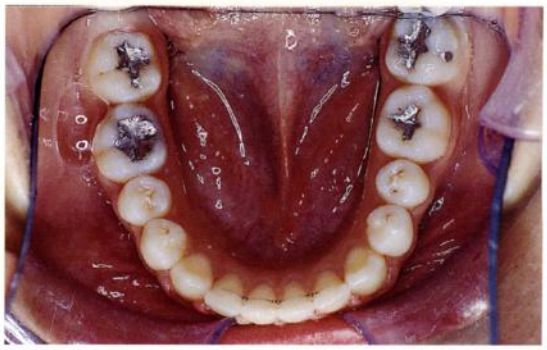
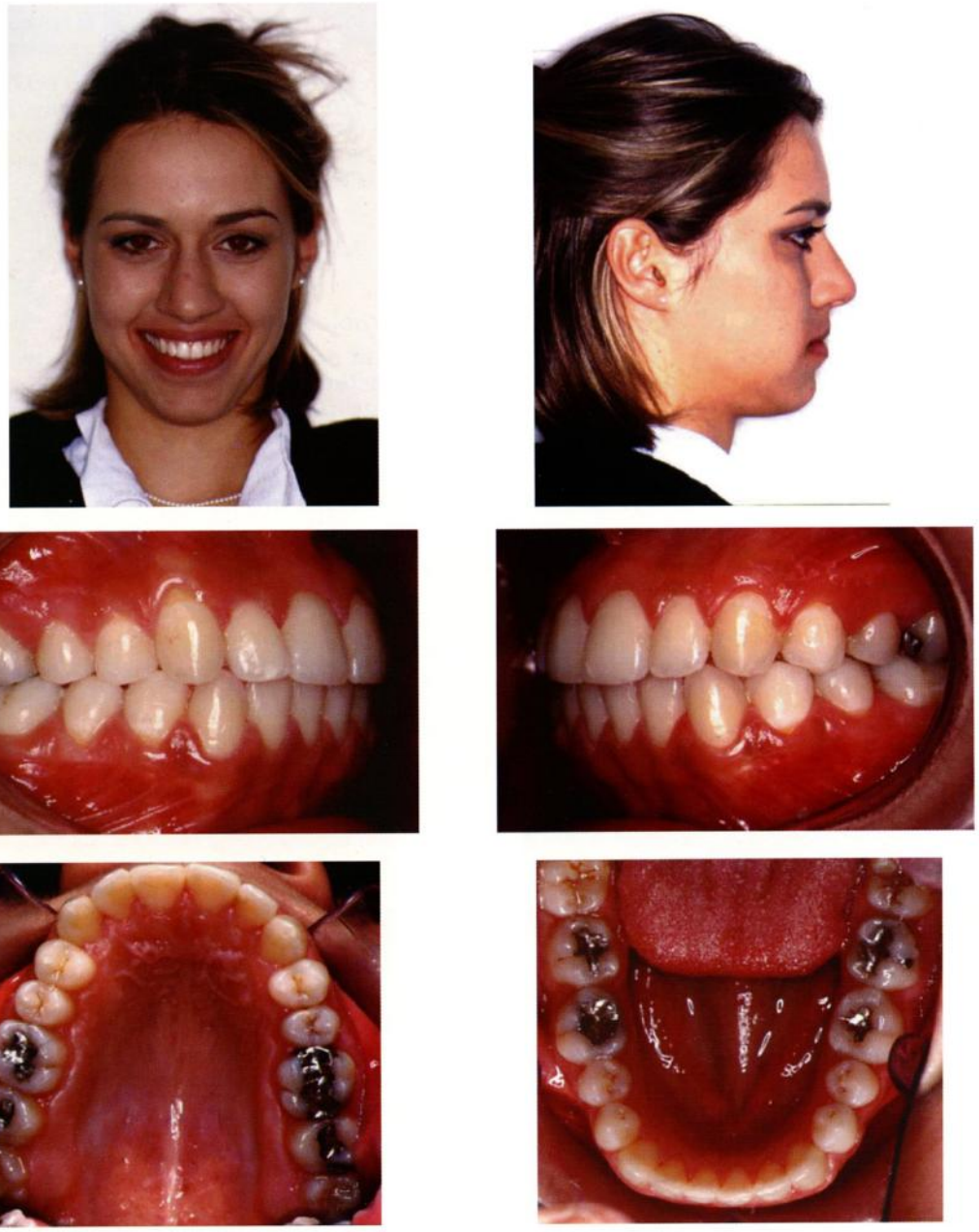


Fig. 5-31

The patient's occlusion seven years after treatment. Upper and lower third molars have fully erupted. Stability is still excellent. The patient still refused any periodontal treatment for upper right canine.



5.4 Torque

Torque control of upper molars is crucial in almost any treatment mechanics. Certain mechanics or appliances tend to extrude or make the molar palatal cusps more prominent:

a) hi-pull headgear

b) lateral expansion

c) archwires with curve of Spee

d) intrusion arches for upper front teeth

Others tend to extrude or make the molar buccal cusps more prominent:

a) cervical headgear

b) lateral constriction

The PB provides an excellent control of the upper molar torque.

Third order activations on PBs are generally bilateral and must be added with the lingual arch-forming pliers to keep the two 0.036" wires perfectly parallel and superimposed. Any distortion may cause a fracture of the terminal or a difficult insertion.

Palatal torque is rarely needed.

More frequent activations in buccal root torque control palatal cusps prominence, avoid occlusal interference, and keeps molar roots in marrow bone.

To apply buccal root torque with a PB, twist both terminals so that when one is inserted in the sheath the opposite terminal stands low to its sheath (Fig. 5-32).

As shown, this activation causes extrusion of upper molars. If control of the extrusive component is needed, PB should be kept low in the oral cavity yet away from the palate (see section 5.5) and/or a hi-pull headgear could be added to upper molars.

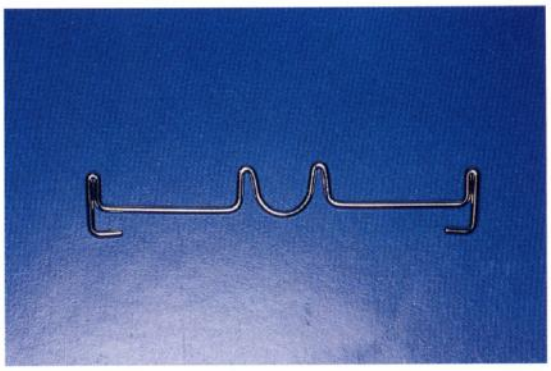
Light bilateral activations allow occlusal forces to limit molar extrusion.

5.5 Vertical control - Intrusion

The possibility to vertically control upper molars is a peculiar aspect of Cetlin's mechanics. Most nonextraction approaches deal nicely with molar distalization, but little or no vertical and transverse control is allowed. Vertical control of upper molars is needed in almost every case, but it is certainly essential in nonextraction treatment of dental and/or skeletal open-bite cases.

The PB can be used to take advantage of the intrusive forces exerted by the tongue during chewing, swallowing and speech. By controlling molar eruption or, even intruding them, we can correct or prevent vertical problems, obtain a counterclockwise rotation of the mandible and correct sagittal Class II problems.

Choose a PB 4 or 5 mm. longer than the measured distance from sheath to sheath. With heavy-duty bird beak pliers add two extra loops lateral to the Coffin loop. Then adapt and fit the PB passive to the molar sheaths (Fig. 5-33).



The extra loops will increase the surface on which the tongue rests and acts.

Initially, the PB is adapted close to the palatal mucosa. As the patient adapts, loops are adjusted four to five millimeters away from the palate. An acrylic button around the loop will make the PB more comfortable and will further increase the surface where the tongue will rest and function. An occipital headgear may enhance the action.

Lip seal exercises may be assigned to the patient.

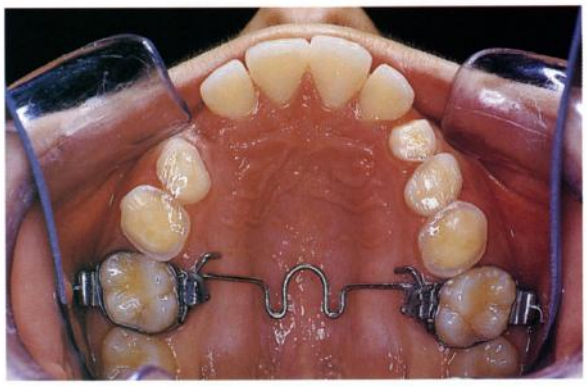
If a thumb-sucking or a tongue-thrust habit is diagnosed, open cleats may be bonded to the lingual surface of upper incisors as a reminder to keep thumb and/or tongue away.

Clinical case

Fig. 5-34
Class II malocclusion with anterior open-bite and early mixed dentition.

Fig. 5-35, A,B
The patient has been treated with a low PB, high-pull headgear and progressive grinding of deciduous teeth while vertically controling the upper permanent molars.

A



B

Fig. 5-36
Improvement after twelve months of therapy. Notice the closure of the bite.

Fig. 5-37
Lateral cephalograms before and after twelve months of treatment.

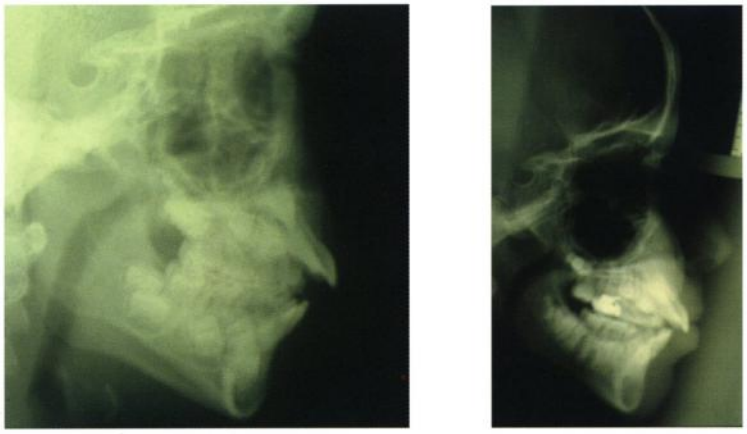


Fig. 5-38
Superimposition of the before and after tracings on SN line and Sella point.

Clinical case

Fig. 5-39

Class I malocclusion with anterior open bite, maxillary constriction and bilateral crossbite. The young patient was a constant mouthbreather and had lip incompetence.

Fig. 5-40

The patient was treated with a low palatal bar and exercises for lip competence and nasal breathing. The palatal bar was activated to expand and rotate upper first molars. Progressive grinding of upper and lower primary teeth allowed bite closure. At the end of this first phase of treatment of 15 months, patient was given a removable upper retainer.

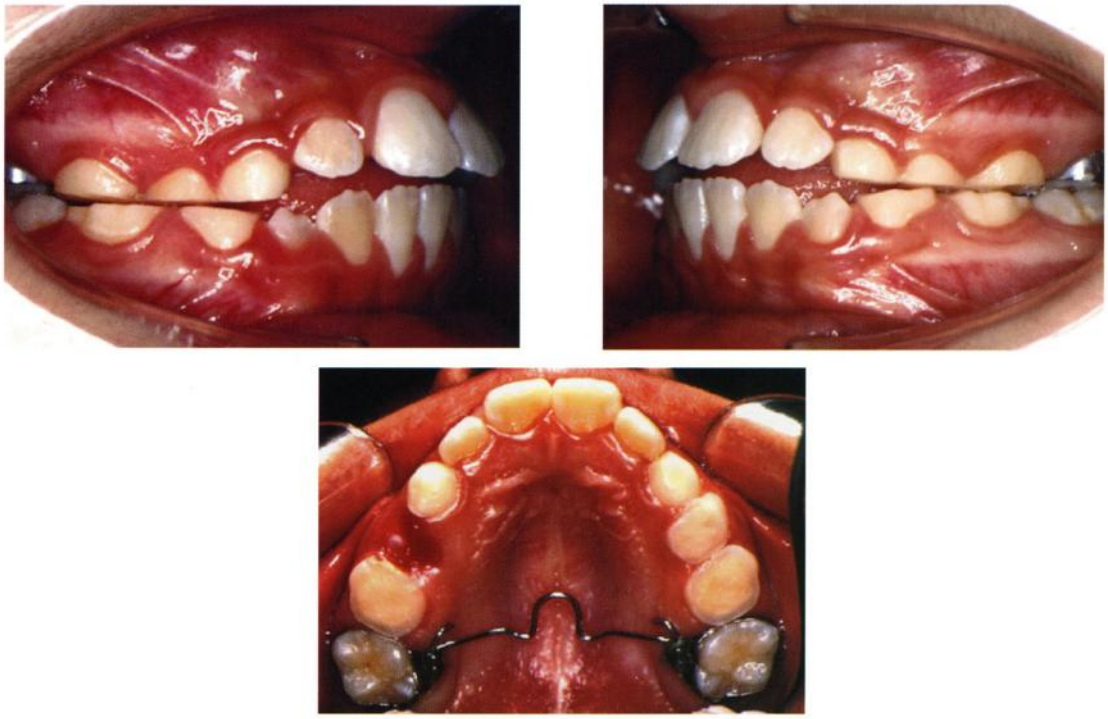


Fig. 5-41

Profile and frontal intraoral view at the end of the eruption of all permanent teeth.

Fig. 5-42

The occlusion and upper and lower dental arches at the end of the eruption of all permanent teeth.

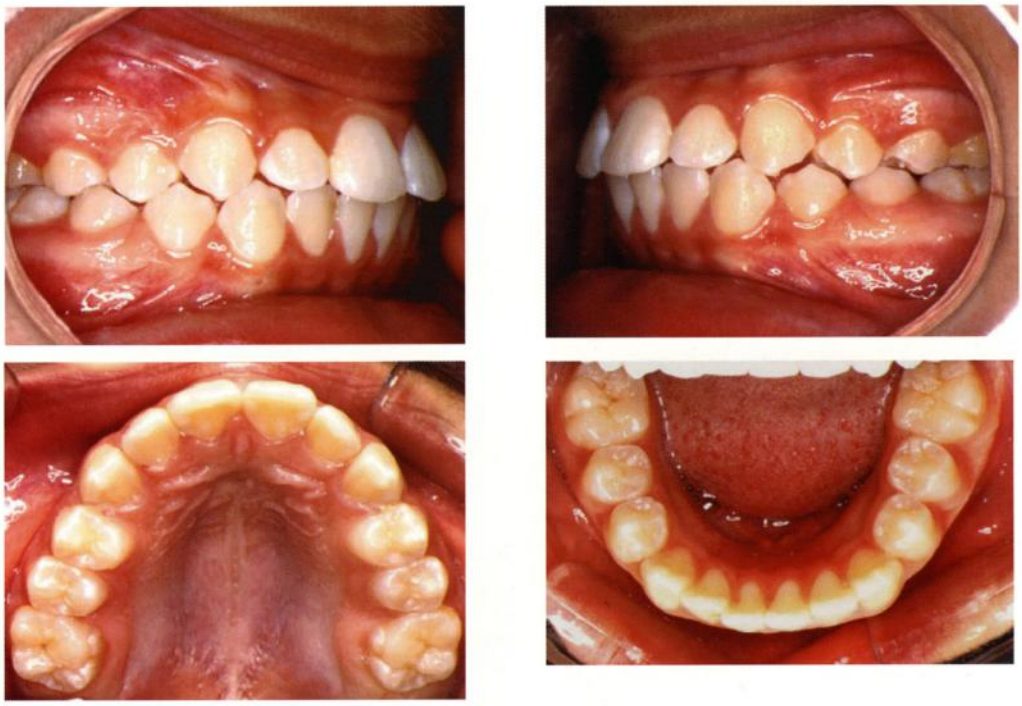


Fig. 5-43

The patient's parents complained about the slight protrusion of the incisors and wanted to get a better alignment of the arches. A PB, together with a cervical headgear was installed. After gaining a "super Class I" molar relationship, the upper arch was completely bonded, the lower arch was progressively bonded and Class III mechanics was initiated.

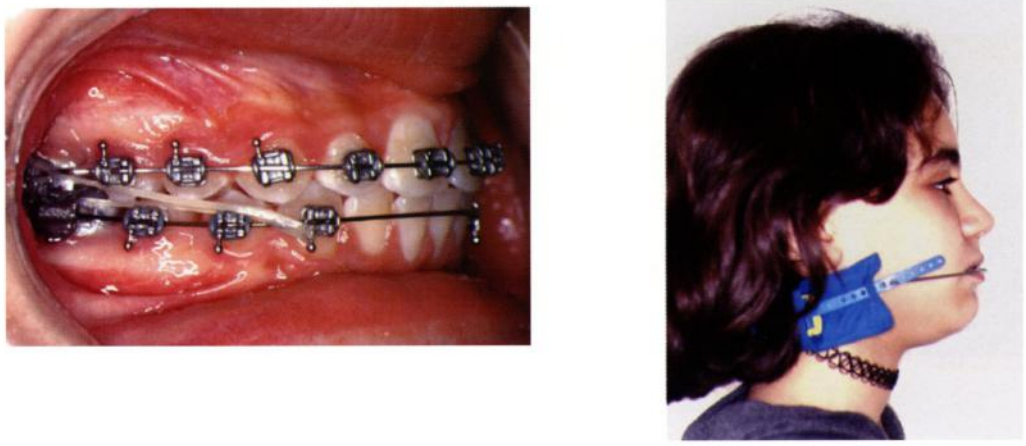


Fig. 5-44
The patient at the end of treatment.

Clinical case

Fig. 5-45

Class I malocclusion with anterior open bite in adult patient.

Fig. 5-46

The patient has been treated with a low PB, an acrylic button on the Coffin loop, and a high-pull headgear.

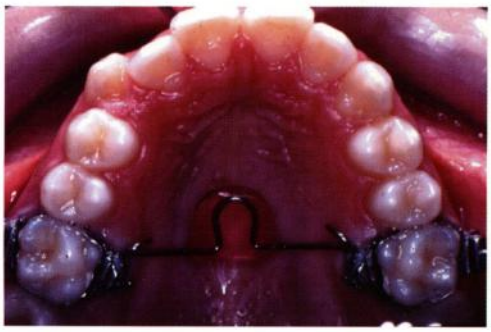


Fig. 5-47

Improvement of the open bite, thanks to the vertical control, rotation and distalization of upper first molars. Notice the improvement of premolar occlusion.

Fig. 5-48
The case after fixed appliance treatment to complete correction.

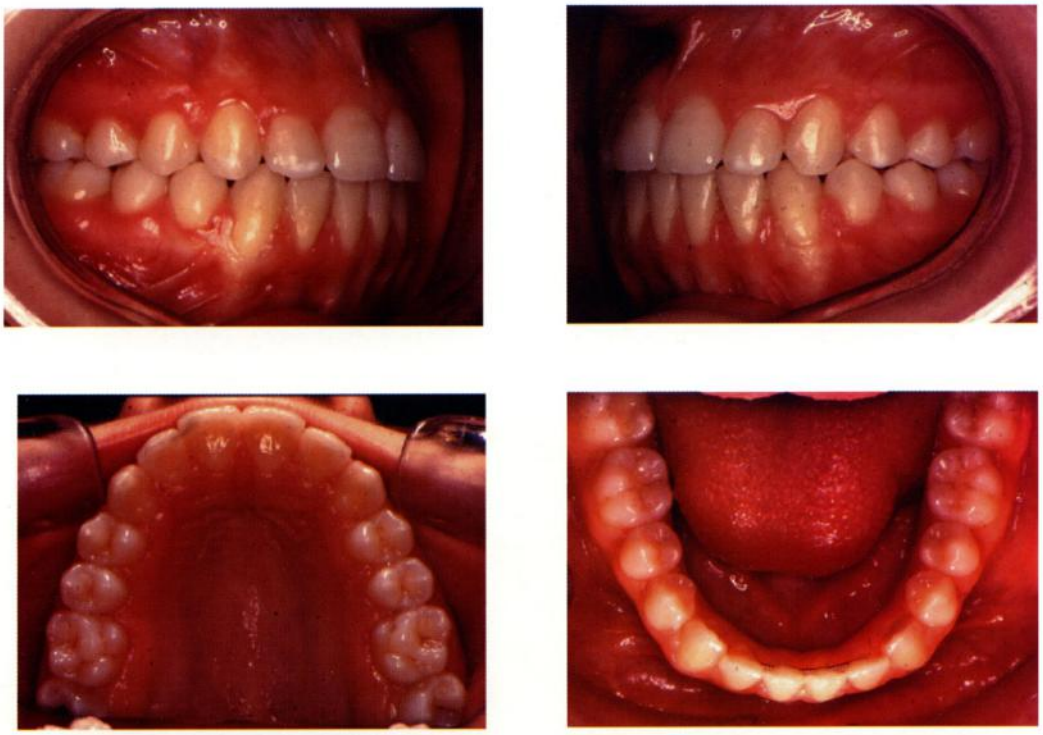


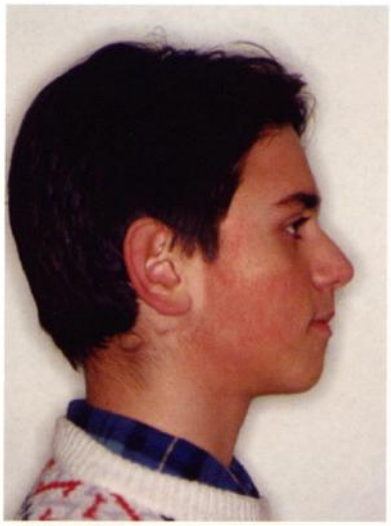
Fig. 5-49
The patient six years after the end of treatment.

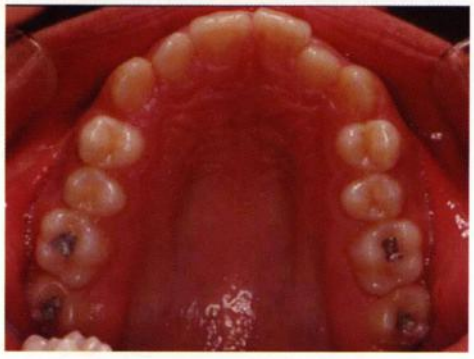
Fig. 5-50
The occlusion and the arches six years after the end of treatment.

Clinical case

Fig. 5-51

A Class III malocclusion with severe open-bite, occlusal contacts on second molars only. Patient refused a combined orthodontic-surgical treatment.





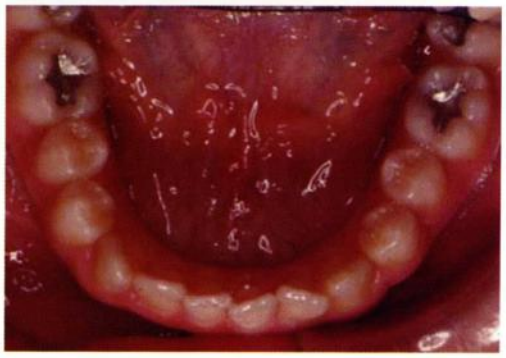


Fig. 5-52, A,B,C,D

The patient started treatment with a low palatal bar and a high-pull headgear. The PB was activated to expand and rotate upper molars. He has been wearing the headgear 24 hours a day except during sport (he was a basketball champion). After seeing some improvements, upper arch was bonded. Alignment and change of the archform was progressively obtained.

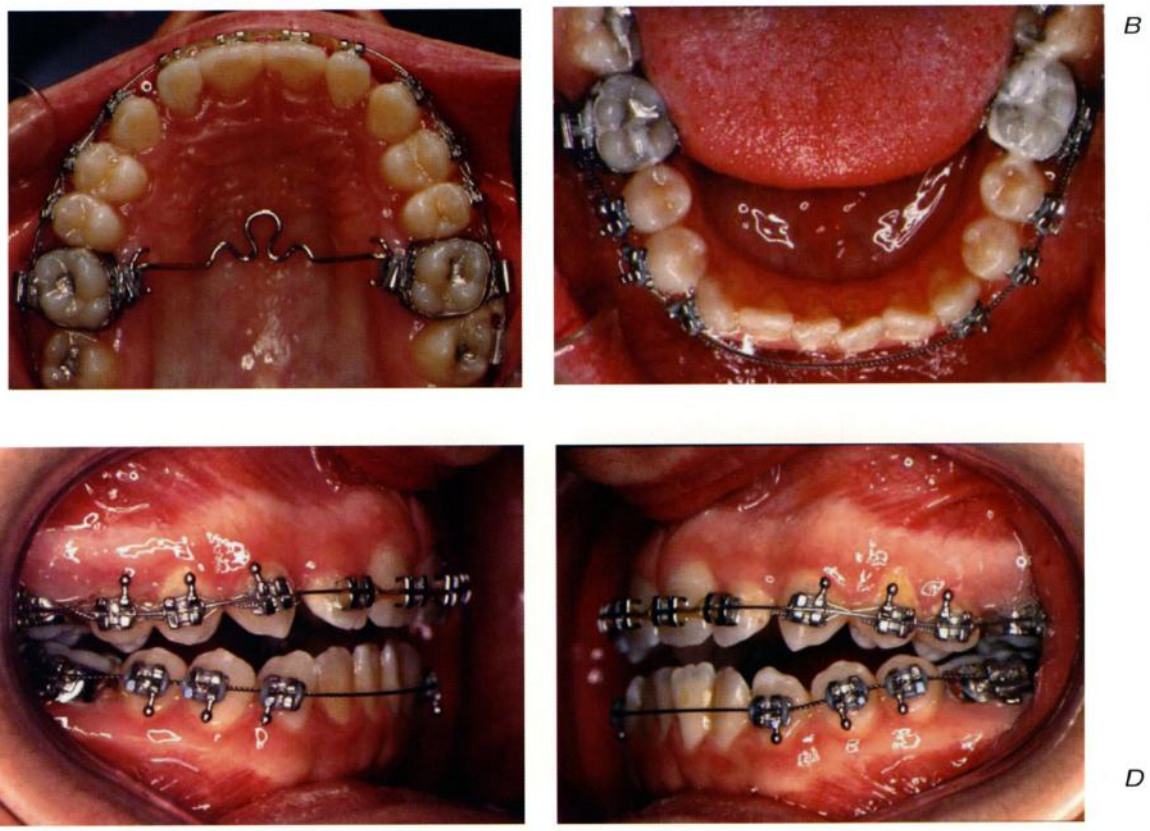
Lower arch was then bonded in the lateral segments and, as soon as possible, Class III mechanics were started. Patient was taught to wear the elastics only together with the headgear.

The Class III mechanics allowed:

a) space gain in the lower anterior area

b) counterclockwise rotation of the occlusal plane

c) Close the bite

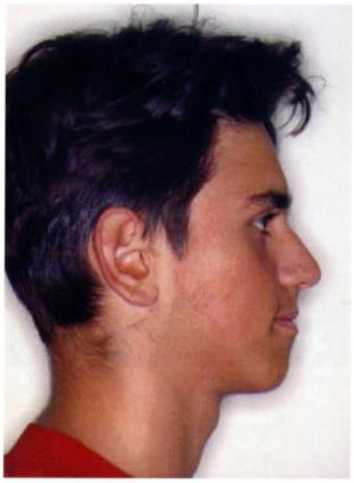


Lower incisors were then bonded and retracted.

Case was finished with upper and lower 0.021" x 0,025" multibraided archwires.

Fig. 5-53

The case at appliance removal. Notice the reduction of Class III profile, the good smile line and the overcorrected position of upper and lower teeth. Retention was initially done with a lower fixed retainer bonded to the incisors and the use of a positioner. The positioner was dismissed after 6 months and substituted by an upper removable retainer.



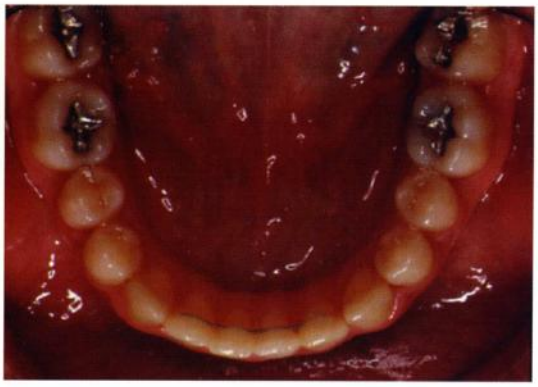


Fig. 5-54
Films of the head before and after treatment. The parents would not allow retake of the initial x-ray.

Fig. 5-55
Superimposition of before and after tracings on the SN line at Sella point. Notice the dramatic change in the occlusal plane inclination.

Fig. 5-56

The patient and his occlusion 5 years post treatment. He is wearing only a lower fixed retainer. Lower third molars are erupting. Stability is still good.

5.6 Anchorage

The anchorage of upper molars is crucial once space has been gained in the entire arch. This anchorage has to be in all three planes of space: transverse, sagittal and vertical.

Transverse

Lateral forces are applied to upper molars when correcting transverse problems or when using extraoral forces. Stabilization of upper molars may be needed after correction of transverse problems.

Sagittal

Mesial intra-arch forces (horizontal elastics to retract upper front teeth) and mesial inter-arch forces (Class III elastics to the lip bumper) on upper molars may be part of the mechanics used during treatment.

Vertical

Extrusive forces on upper molars may be applied when intruding upper incisors, or when using Class III elastics.

The PB, either passive or activated to counteract these forces, effectively controls the upper molars. A headgear may be added to enhance this control.