The Technic of Modifying the Edgewise Arch for the Production of Distal Movement of the Buccal Teeth

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It seems certain that the discussion of Class II cases of malocclusion which is begun in the current number of the "Angle Orthodontist," will stimulate a desire on the part of many readers to care for these malformations in conformity with Dr. Angle's principles of treatment. This paper is offered as an aid to those who are thus interested. The technic of producing distal mass movement of the buccal teeth, as demanded by these principles, is as carefully and clearly presented as the writer's capabilities permit. He strongly advises that the various operative steps be not only thoughtfully read but also practiced repeatedly on a technic model before being used in the treatment of any patient.

One of the greatest advantages of the edgewise arch mechanism is its ability to execute distal mass movements of teeth. No other appliance exhibits this degree of efficiency. The first requisite for accomplishing this multiple tooth change is bracket engagement of all the teeth that are to be so moved. *Therefore, distal mass movement must necessarily be secondary to any movements of the first order that are required to make possible the placing of the archwire in the slots of the brackets.*

After the brackets on the teeth that are to be tipped distally en masse have been seated on the archwire, the changes necessary to start this posterior tooth shifting may be incorporated in the alinement arch. The placing of these tip back bends is not a difficult task provided the operator approaches the problem in an intelligent manner.

In our work with all archwires, but most emphatically so with this newest form of expansion arch, we must recognize and appreciate the importance and influence of the changes in the lines of force that take place at the canine areas of the wire due to the divergence, at these points, of the anterior and buccal planes of the dental arch. For instance it is to be noted that occlusal and gingival bends placed in the incisor section of the edgewise archwire, where they produce mesial and distal tooth tipping ac-

tions, are automatically modified into buccal or lingual tipping forces combined, respectively, with depressing and elevating actions, at the canine, premolar and molar areas of the archwire. Fig. 1. In a like manner, occlusal and gingival bends in the canine, premolar and molar areas of this expansion arch are transformed into labial and lingual tipping forces with depressing or elongating influences, in the incisor section of the edge-

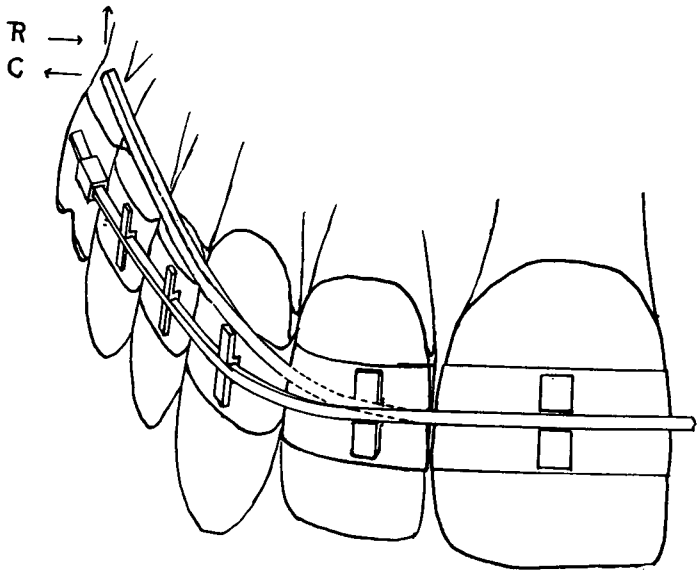


Figure 1

The effect on the buccal section of the archwire caused by a single gingival bend made in the anterior portion. "C" shows buccal tipping of the crowns; "R", lingual tipping of the roots. There will also be a tendency for these teeth to be depressed which increases as the molar is approached.

wise arch. Consequently in making the first bend in the canine area of this archwire for the purpose of obtaining the posterior tipping effect on the canine crown, the pliers with which this modification is made must be so adjusted to the archwire as to avoid all tendency toward labial crown tipping of this canine tooth, a complication that all too frequently appears because of the location of this tooth at the point of meeting of the two previously mentioned denture planes. If the following technic is carefully practiced then the correct action is bound to be imparted by the modified expansion arch.

1. Before removing the alinement arch from the mouth, scratch on its buccal edge with a sharp knife or small file, the locations of the mesial and distal edges of the brackets on those teeth that are to be distally tipped. These are usually the canines, premolars and molars. Then also mark the location of the anterior end of the rectangular tube of the clamp band and the position of the brackets of the lateral incisor teeth.

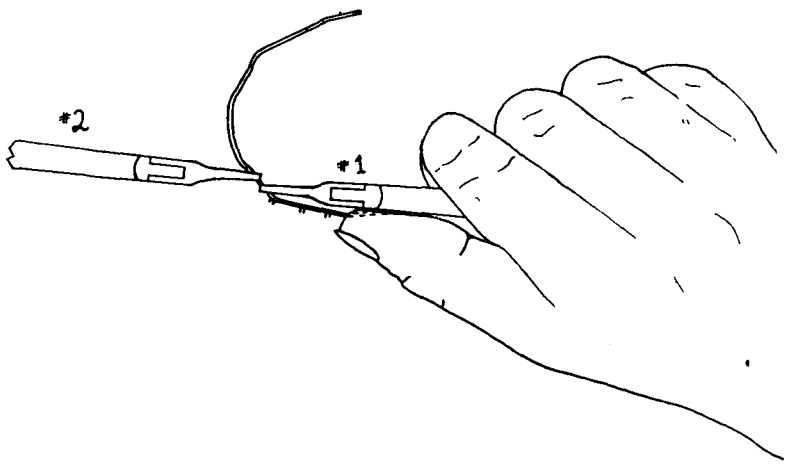


Figure 2

The correct plier positions and the hand grip used in making the first distal tipping bend on the *left* side of the archwire.

2. Place the archwire on a paper and make a tracing of its outline form after which procedure, anneal the archwire if necessary.

3. Two pairs of arch bending pliers, No. 142, are then used for making the first bend in the wire. These will be designated as pliers No. 1 and No. 2.

Pliers No. 1 are now taken in the right hand and the beaks are adjusted to the left side of the expansion arch just mesial to the canine bracket area, with the plier handles lying *parallel* to and on the *lingual* side of the left premolar and molar areas of the archwire and held in contact with the wire by the right thumb. Fig. 2.

Pliers No. 2 are then grasped in the left hand and the beaks are placed on the archwire one-thirty-second of an inch mesial to pliers No. 1 and on a plane that parallels the anterposterior alinement of pliers No. 1. Fig. 2. The operator must be sure that the beaks of pliers No. 2 do not encroach upon the lateral incisor bracket area.

If intermaxillary hooks have been soldered to the archwire these may interfere with the use of pliers No. 2 and this will necessitate the application of a more delicate plier than No. 142. Often pliers No. 112 (How pliers) will be more advantageous although their grip is not as secure as that of No. 142 and hence greater caution must be taken against slipping and imperfect arch bending.

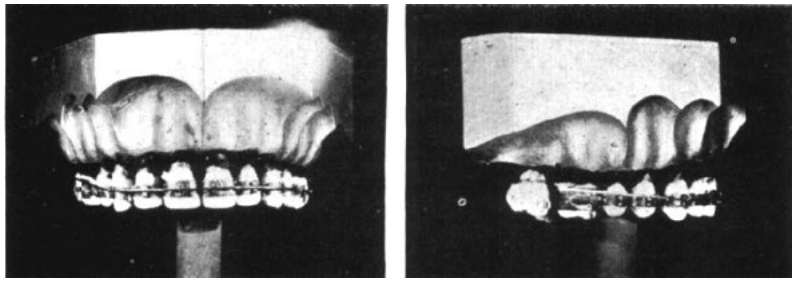


Figure 3

The effect produced on the right side of the archwire after the first distal tipping bend has been made on that side. It lies gingivally to the distal portion of the bracket opening of the canine tooth and will tip the crown of this tooth distally but there will be no tendency toward labial crown tipping.

4. After these two pliers have been adjusted to the archwire as described in step No. 3, pliers No. 1 are rotated, handles gingivally, which will deflect gingivally the canine, premolar and molar section of the left side of the archwire. This bend is of *very minor degree* being approximately 22 degrees.

Care must be taken to maintain the plier handles that are rotated gingivally, in the same vertical plane during the movement or otherwise a labial (buccal) or a lingual torque twist will be placed in the canine, premolar and molar areas of the modified section. Fig 3 shows the right side of the archwire with this one bend incorporated therein, placed upon the technic model to demonstrate the relationship of the changed section to the canine bracket of the corresponding side.

5. For this next bend and all subsequent modifications of this side of the archwire but one pair of pliers is required. These are used as holding instruments and the bends are made with the fingers.

Transfer pliers No. 1 to a point midway between the bracket markings of the left canine and first premolar tooth and, holding the pliers in the right hand, adjust the flat portion of the beaks to the archwire in such a manner that the pliers will project bucally and be at *exact right angles* to the

line of the archwire. Fig. 4. If this detail is not observed then the alinement of the wire will be distorted when the subsequent bends are made therein.

6. With the proper finger hold and fulcrum support for the left hand, bend the anterior portion (canine and incisor section) of the archwire in an occlusal direction to an angle of about 45 degrees.

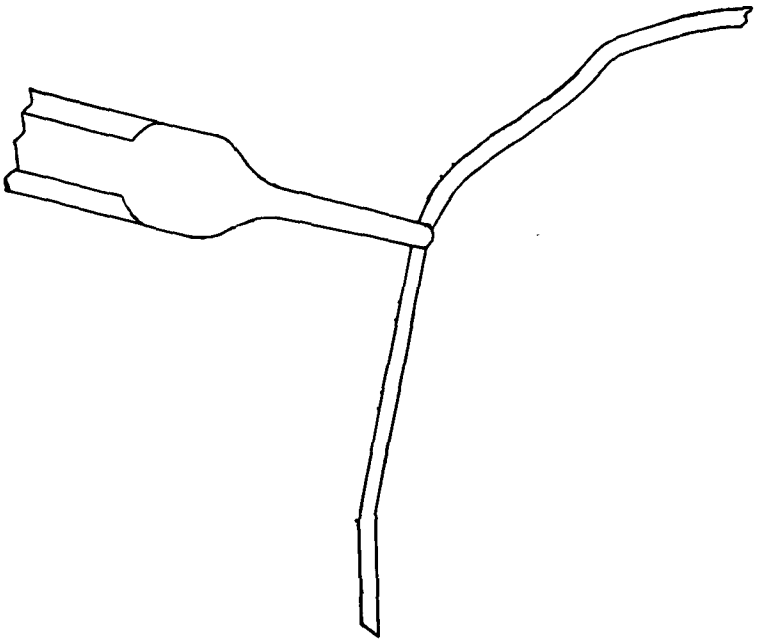


Figure 4

Plier location for making the second of the mass distal tipping bends.

7. Without changing the plier grip, transfer the fingers of the left hand to the archwire on the distal side of the plier beaks, take the correct grip and fulcrum adjustment, and then give this section of the wire a gingival bend of sufficient amount to cause this portion of the archwire to lie in a plane that is parallel to that of the modified canine bracket area section. Fig. 5, shows the archwire with these two bends completed.

8. Again move the pliers distally to the midpoint between the first premolar and second premolar bracket areas, carefully place the beaks at a right angle to the wire and then make the same kind and equal degree of bends on each side of the pliers as were made in steps 6 and 7.

9. Transfer the pliers to a position one-eighth inch distal to the bracket markings of the second premolar, adjust them to an exact right angle relationship to the wire and give the mesial section of the archwire an occlusal bend equal in degree to all similar previous modifications. Then without moving the pliers, bend the distal end of the edgewise arch gingivally, *one-half* the amount of the previously made gingival bends.

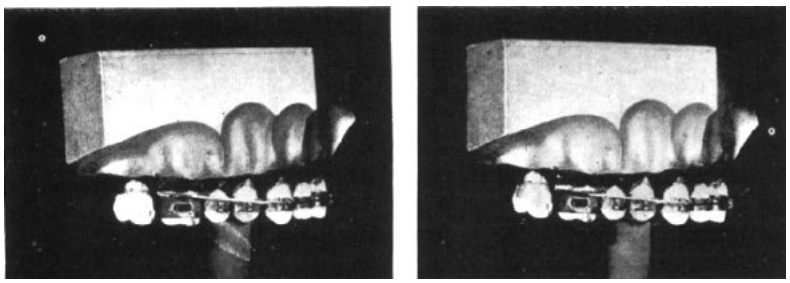
10. Place the pliers with their distal edge on the mark indicating the location of the anterior end of the molar tube and with their beaks adjusted at an *exact right angle to this lingually deflected section* of the archwire, give the free end of the archwire another *gingival* bend until it lies parallel to the archwire sections at the bracket areas of the canines and premolars. This division of the gingival bending in the molar section into two parts is advisable because it makes it much easier to spring the wire into the second premolar brackets in the seating process previous to the application of the ligatures, than would be the case if but one gingival bend was made.

If deciduous molars are in place instead of premolars or if there is an exceedingly wide interval between any of the bracket markings, thus producing a greater amount of archwire area at such points than is ordinarily found, a change in the technic steps 5, 6, and 7 is necessary. Instead of placing the plier beaks midway between the bracket markings, they are first located a beak's width distal to the bracket markings of the tooth anterior to the wide archwire area and the mesial section of the archwire then given the correct occlusal bend. Then the pliers, instead of remaining fixed at this point, are shifted to a position that is a beak's width mesial to the bracket markings of the tooth posterior to this wide area and the distal section of the archwire is given the gingival bend of the same degree as all previously made gingival bends. A similar technic is applied to all extra wide areas that must be included in the archwire modification.

If the space between the bracket markings is very narrow then the bending between these bracket areas must be segregated to a small section of the wire. In this case, pliers No. 139, are best adapted to the procedure and a *slight* distal shifting of the beaks is made subsequent to incorporating the primary occlusal bend in the wire and then the secondary gingival bend is made distal to the plier beaks.

After the left buccal section of the archwire is thus completely modified the same precedure is carried out on the right side. In doing this plier No. 1, in step 3 is held in the *left* hand while plier No. 2 is in the *right* hand. Fig. 6. All the other details of the operation are duplicated exactly on the two sides.

When this completely modified archwire is now placed in the brackets of the incisors, it will be seen that the distal ends lie far gingivally to the clamp band sheaths, while if placed in the clamp band tubes, the incisor section lies well gingivally to the brackets on these anterior teeth. Fig. 7.



A B

Figure 5

A. The archwire with the first and second distal tipping bends completed on the right side.
B. The archwire with all the distal tipping bends all completed.

This means that in the distal tipping process there will also be a depression of the incisors taking place, which is usually a most desirable movement. If it is not indicated it can be prevented by the use of vertical intermaxillary elastics and then some shortening of the premolars and molars may result.

In this distal tipping it will be found that the molars may travel farther than the premolars, while the canines will move distally the least of all. This is due to the mechanics of the lever. Owing to a greater divergence of the lever arm in the molar region there will be more movement in this location and it will decrease proportionately as the canine area is approached. Therefore, as future bends of the same character are placed in the archwire to continue this distal movement, they will probably need to be of proportionately less degree in the molar and second premolar areas and greater in the canine and first premolar regions.

When this modified edgewise arch is adjusted to the dental arch the ends are first inserted in the rectangular sheaths and the median line scratch marks properly centered. Then the incisor section is ligated to its brackets. Brodie teaches to next seat and ligate the canine brackets, then the first and finally the second premolar brackets but the author has found that the most difficult brackets to seat are the ones on the second premolar teeth and that this operation is much more readily accomplished if there is a free, unligated section of archwire extending from each lateral incisor bracket to each molar tube thus making the wire in this area very flexible. Care must

be taken, however, to be sure that the archwire ends are inserted completely into their sheaths or there will be an excess of wire present after the premolar brackets are engaged and ligated that will make it impossible to gain bracket seating in the canine region.

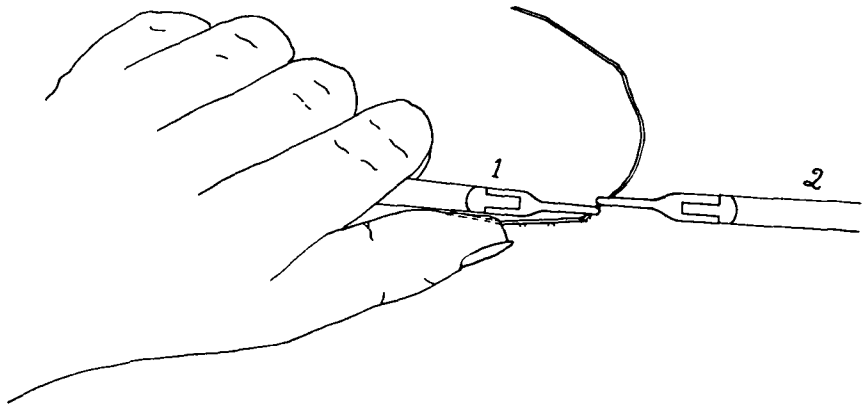


Figure 6

The plier and hand grip for making the first or canine distal tipping bend on the right side of the archwire.

In seating the archwire in the premolar and canine brackets it is advisable to use the "arch seating pliers," No. 151, that were designed for a similar operation with the ribbon arch appliance. In using these, the wire is grasped in such a way that the indent in their beaks lies opposite the bracket. The pliers are then rotated in the proper manner to cause the arch area within the grasp of the beaks to lie parallel to the bracket opening when the archwire is carried into seating capacity in the bracket by the pliers and gently released. It should then bind on the bracket sides sufficiently to retain itself until a ligature can be adjusted.

This technic, to describe, may seem complicated but it is really quite simple and readily acquired. It should be practiced, however, upon a technic model before being tried in the mouth so that accuracy and skill in the procedure may be developed.

The mechanical actions involved in this distal mass movement are interesting and instructive. They may be tabulated as follows:

(a) By bending the edgewise arch in the manner described there is produced a series of short spring levers that are set into action when the wire is sprung into the brackets.

(b) In addition to these levers, there is a reciprocal force exerted by each tooth in the buccal series and by the four incisor teeth en masse, which is the means of establishing activity in the levers. In Fig. 7, it will be noted that when the archwire ends are placed in the molar tubes, that the wire anterior to these tubes lies gingivally to the bracket openings in an increasing degree as the incisors are approached. When the archwire is sprung occlusally and twisted slightly until the second premolar area of each side is seated in its bracket, then there is an occlusal pull exerted on the

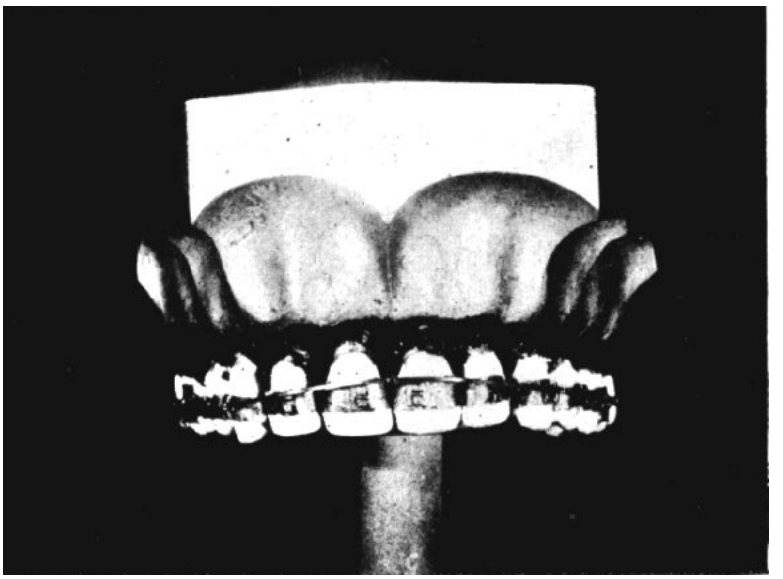


Figure 7

The location of the anterior segment of the archwire in which mass distal tipping bends have been placed in both buccal sections and the ends placed in their respective molar sheaths with the premolar and canine brackets also seated on the archwire.

mesial section of the first molars by virtue of the resistance of the second premolars and a gingival pressure on the distal section of each molar because of the spring lever within its buccal sheath. There is also a gingival pressure on the distal section of the second premolars by virtue of the resistance of the first molars. Now when the expansion arch, in turn, is sprung occlusally and seated in each first premolar bracket, there is an occlusal pressure on the mesial section of second premolars from the resistance of the

first premolars and a gingival pressure on the distal section of the first premolars by virtue of the resistance of the second premolars.

The same mechanics are found on the canine teeth as a result of the anchorage gained on the first premolar teeth and the four incisors. The latter teeth will receive a strong gingival thrust. Intermaxillary elastics are required to strengthen the force of the distal movement. As the teeth on the sides of the dental arches move posteriorly, the incisors will be carried lingually unless the expansion arch is continually shifted mesially by changing the position of the stop spur at the mesial end of the molar tubes.

Thus we see that this expansion arch modification is ideal to tip the canines, premolars and molars distally and the incisors lingually at one and the same time. Coincidently to this posterior movement the incisors will be depressed and there will be some tendency to elongate the molars and second premolars.

These movements are ideal in the treatment of Class II, Division 1 cases. In Class II, Division 2 malocclusion, where the central incisor teeth need to be brought labially, the anterior section of the archwire must be kept from pressing on these front teeth by the use of stop spurs soldered to the ends of the wire in such positions as to rest against the front walls of the rectangular sheaths. As the molar teeth travel distally, these stop spurs are "teased" distally along the archwire ends. Traction ligatures are placed on the incisor teeth to carry these labially and steady the anterior section of the archwire.

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