Principles For Use Of The Edgewise Bracket With Rotation Arms

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There has been little question among those who are adept with the edgewise orthodontic bracket that it is one of the most efficient attachments yet designed for the correction of malocclusion of teeth. Technically its scope is broad. It is possible to move teeth in any direction with round and rectangular archwires when they are used in conjunction with the edgewise bracket.

There is, however, one weakness in this mechanism as it has been used. It is the difficulty encountered in the correction of rotated teeth. Slight or severe tooth rotations are a problem to correct and, secondly, are a problem to maintain in their new positions after the correction. Staples are generally soldered or welded on the mesial and distal of each band in strategic positions from second bicuspid to second bicuspid for the purpose of applying leverage against the bracket for rotation movements. Ligatures running through these staples and ligated to the archwire slowly and gradually correct the rotation of the teeth after repeated activations.

This procedure is generally slow and can be painful to the patient. The tightening of the steel ligatures passing through the staples and then twisted tightly around the archwire frequently causes sudden tension, blanching of the tissues, and pain.

When threading ligatures through staples, it will often be found that the steel ligatures are quite loose even before the patient leaves the office. This seems to indicate that sometimes little has been accomplished by this method in the correction of these rotated teeth. Who has not forgotten to replace rotation ligatures when retieing an archwire and then, at a later appointment, find one or more teeth resuming their one time rotated positions? How often have you threaded a ligature and had the staple tear away from the band?

Many attempts have been made to overcome this weakness of the edgewise bracket. The most successful it seems now is the combination of the bracket and two rotation arms extending laterally from the bracket itself.

When the archwire, round or rectangular, is seated in the brackets and the teeth are in their relatively correct positions in the dental arch, the archwire rests not only in the bracket slots, but also on both edges of the rotation arms. Thus, instead of one, there are three points of contact possible with the archwire for each band with the application of a single ligature.

In cases where there are several severely rotated teeth, it is not always possible or advisable to fully seat a starting .016 archwire into each bracket the first time (Fig. 1). The archwire may be ligated into most of the brackets but only pulled close to

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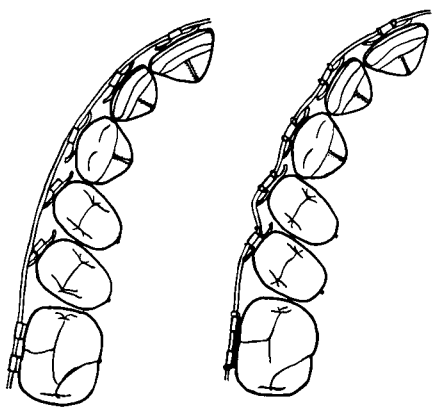


Fig. 1

or partially seated into others. The archwire generally rests against only one of the rotating arms on each rotated tooth and, when the steel ligature pulls the small round archwire into the bracket, the prominent portion of the rotated tooth is gently pushed into its correct position through the spring and resiliency of the archwire acting on the prominent rotation arm. Thus a gentle pull and push action starts the correction of rotated teeth.

In most cases after an appointment or two it is possible for each tooth to have the above mentioned three points of contact with the small round archwire.

It is quite obvious that this makes the use of staples unnecessary thus eliminating the time necessary for the soldering of two on each band. More important, however, is the elimination of the time consuming operation of tieing and retieing ligatures through staples on each rotated tooth. Simple ligature ties securing the archwire in each bracket are all that is necessary for each tooth when rotation arms are used.

Rotation

The bracket with rotation arms, while very efficient for rotated teeth, can be used as effectively on nonrotated teeth as well. Greater control for each tooth by virtue of the three points of contact with the archwire means increased stability. Each nonrotated tooth with its bracket and two rotation arms in contact with the archwire assists in the correction of adjoining rotated teeth and their maintenance.

Maintenance of corrected position is especially necessary and important in the case of the mandibular incisors when they are put under strain as when Class II elastic traction is being used. These incisors do not twist or turn during the time that elastics are being worn, but are easily maintained in straight alignment because of the constant three points of contact with the rectangular archwire.

It has always been good judgment to use small round starting archwires in most of our cases after the bands have been cemented. It is a more physiologic action in relationship to both hard and soft tissues to get bracket engagement and start the levelling procedure with these small round wires, and is certainly less painful to the patient. This is also ideal for the correction of rotations. Rotated teeth respond quickly and, in many instances, without pain or annoyance to the patient when a little care is exercised in forming these starting archwires. Often the patient is not aware that correction or rotations are being accomplished and, only when shown the original casts, do they realize the change that is taking place.

It is easy to realize that the most successful corrections of rotated teeth are those that are accomplished very early in treatment. When rotation arms are used and rotations are corrected, the once irregular teeth are never allowed to return to their former

malpositions in the dental arch. The longer the rotated tooth is maintained in a corrected position, the less difficulty is encountered in its retention.

Cases in which extreme rotations must be corrected have always been a hazard to successful treatment and retention. Often these cases have proven a disappointment because such teeth proved mechanically difficult to rotate and just as difficult to maintain during and after treatment. A partial return to their former positions seemed almost inevitable unless a constant vigil was kept by always maintaining tension on these teeth by ligatures through staples. Rotated bicuspids and cuspids, as well as anteriors, fall into this category and occur in one or both arches.

Overrotation or, more accurately, overcorrection of rotated teeth has been mentioned many times in the past, but only now do we have a simple technic and an efficient instrument to actually and efficiently overcorrect the once badly rotated tooth. With a pair of pliers either rotation arm may be bent outward just enough farther so that, when the light round archwire is drawn into the bracket by the ligature, the prominent rotation arm is pushed away from the archwire, thus actually overcorrecting the once rotated tooth.

Whenever possible on the average rotation, the bracket is placed ideally in the middle third of the tooth mesiodistally. In cases of extreme rotation it may be impossible to use both rotation arms, in which case one of them is cut off close to the bracket before the band is cemented. The remaining arm is bent out so it is a more prominent fulcrum when the bracket is ligated; sometimes it will help to notch the edge of the rotation arm slightly to receive the round archwire. A spur soldered on the lingual of the band

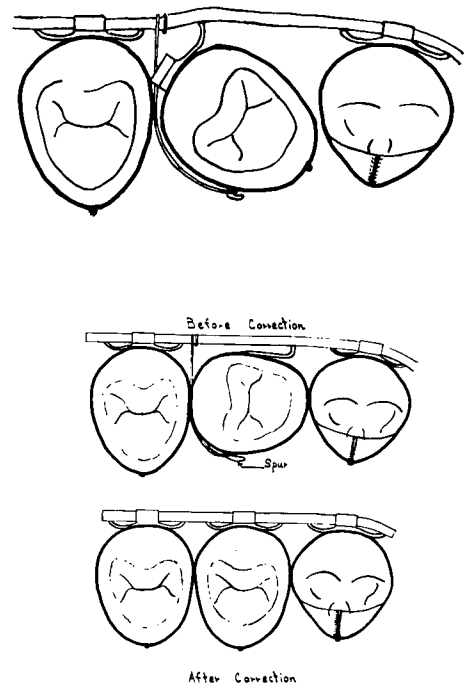


Fig. 2 above, Fig. 3 below.

from which a ligature can be applied is very effective in the early stages of correction, Fig. 2.

On occasion, the rotation will be so extreme that the archwire cannot be ligated into the bracket for an appointment or two and a ligature from the lingual spur to the archwire starts the rotation with the notched arm acting as a fulcrum against the archwire. As soon as the bracket is available for ligation, the lingual spur is no longer necessary. At a later appointment a new band with rotation arms may be made and cemented.

There are, in fact, instances in which no bracket at all can be used at first, due to the extreme rotation of the tooth, Fig. 3. A plain band is made with a lingual spur and a notched rotating arm to serve as a fulcrum. After the rotation is partially corrected through the action of the ligature and the archwire on the ful-

crum, the band is removed, a bracket ideally placed, and the correction completed. Fortunately these latter instances are not too common.

Parallel Roots

Certainly one of the most valuable assets of the bracket and, possibly, one that is least understood, is the ability to control the tipping of teeth. An individual tooth or group of teeth can be prevented from tipping by and through the use of spurs. Spurs strategically soldered on the rotation arms prevent the undesirable tipping of some teeth during orthodontic movement and on other teeth can cause desirable tipping when needed.

Canines and premolars in both jaws, but particularly in the mandible, often tip undesirably during space closure in extraction cases. Who hasn't struggled with these teeth to maintain them in a somewhat upright position and failed by several degrees to finish with parallel roots of the teeth on either side of the extraction spaces at the end of treatment.

Just how important are parallel teeth and roots for our patients? What if lower canines do tip distally 6 degrees, and second premolars tip forward a similar amount? Is this dangerous? Will they straighten up eventually? If you are lucky, these mandibular teeth will straighten up by themselves, but there most probably will be a large open contact between the canines and second premolars. Well, that is better, one might argue, than a slightly loose contact. That is true, but what about the resultant occlusion where large open contacts exist? If the occlusion allows the canines and premolars to straighten up, is not one apt to complete treatment with premolars and molars in an end to end relationship instead of the cusps in correct occlusion?

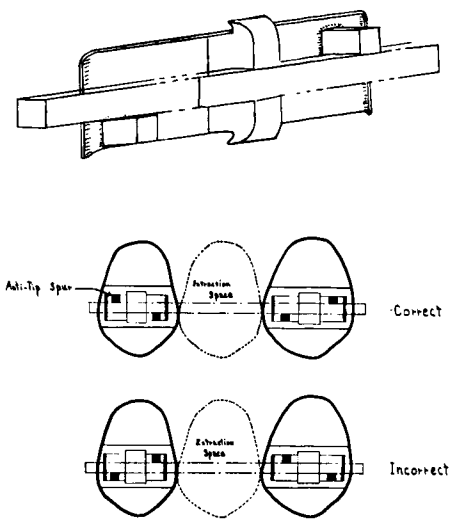
Suppose we are unlucky and the mandibular canines and premolars do not come out of their tipped positions? Periodontists tell us that the "V" area caused by the tipping of two teeth creates a food trap which ultimately may cause periodontal breakdown. Orthodontically, too, tipped teeth in the mandibular arch can easily lead to an increase of the curve of Spee and a return of a deep overbite.

Anti-tip Spurs

In extraction cases anti-tip spurs soldered on the rotation arms of canine bands gingivally to the archwire on the mesial, and occlusally on the distal, prevent these teeth from tipping as they are being moved distally. Likewise, on the premolar bands, spurs soldered gingivally on the distal and occlusally to the archwire on the mesial, assist in keeping these teeth from tipping in the closure of spaces. Over the past ten years this has been proven a countless number of times with good results when this technic is followed.

The technic for soldering on these spurs is as follows: After the band has been formed and soldered, a small pellet of solder is fused on the surfaces of both rotation arms near their terminal ends. A piece of round or rectangular gold wire is soldered at right angles to each rotation arm at the spots where the solder was previously placed. The gold wires are cut off and smoothed flush with the archwire, forming spurs, one gingivally, and the other occlusally, Fig. 4.

There are several ways to solder on these spurs; perhaps the easiest way is to ligate a short section of .022 x .028 stainless steel wire snugly into the bracket. The spurs can then be soldered accurately onto the rotation arms and flush with the stainless steel section. Spurs can be positioned, after a little practice, almost as easily as staples are soldered.



"ANTI-TIP SPUR" PLACEMENT

Fig. 4 above, Fig. 5 below.

Anti-tip spurs, as their name implies, when properly placed on the rotation arms prevent the tipping of premolars and canines as they are being moved in extraction cases, Fig. 5. Mechanically the spurs greatly increase the leverage action of the archwire thus enhancing the success of bodily movement of these teeth. The rotation arms correct and/or prevent the undesirable rotations; the spurs soldered on the arms act as brakes or controls as the teeth are moved along the archwire. When the extraction space is closed between the canine and premolar, the spurs continue to hold these adjoining teeth in parallel positions. At any time the spurs can be clipped off and smoothed down if desired.

We all have cases, now and again, in which canines originally present distal axial inclinations and second premolars, particularly the lowers, may also exhibit marked mesial axial inclinations, Fig. 6. The small round starting archwires are very effective in correcting this undesirable tipping when anti-tip spurs are used as described. The spurs vastly increase the leverage action of the starting round archwire in uprighting initially-tipped canines and premolars. The application of these spurs is obviously not limited to extraction cases alone.

Spurs soldered on rotation arms have another function only mentioned so far. It is the ability to start or initiate the tipping of a tooth or a group of teeth when and where desired. I refer to the normal artistic tipping or positioning of maxillary lateral incisors by means of spurs, tip spurs in fact, soldered on the mesial rotation arms of these two bands. Fig. 7. The spurs are usually soldered on the mesial arms so that they are in contact with the rectangular archwire when it is seated in the incisor brackets.

Thus only very slight artistic bends

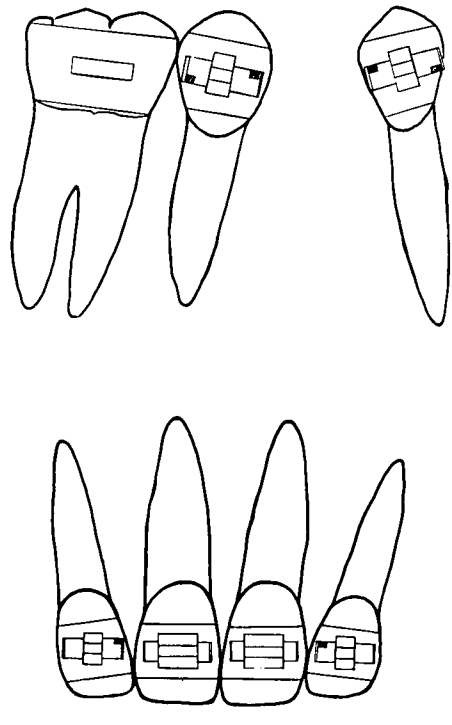


Fig. 6 above, Fig. 7 below.

are necessary in the archwire to move the central and lateral root apices away from each other. Generally, however, these bends are not needed. The spurs on the lateral bands at times are actually anti-tip in character because they prevent the central and lateral crowns from tipping away from each other and, at the same time, stop their root apices from tipping toward one another. It is still a good idea to ligate these four teeth together to prevent diastemas from occurring.

These spurs are especially effective in correcting perverted axial inclinations of the maxillary centrals and laterals. Often extreme tipping of these teeth presents quite a problem in correction. The starting round archwires, acting on these spurs, initiate ideal or normal tipping of malinclined incisors early in treatment. Later, when a rectangular archwire is used, the desirable tipping is continued. In some instances these spurs can be used on lower incisors as well.

Controlling Anterior Axial Inclination

Double width brackets with two rotation arms for maxillary central incisors also are very effective on these two upper teeth. Lingual root torque, so necessary for most maxillary centrals, is more easily accomplished with the double width brackets, while the rotation arms further add to the efficiency of the bracket as has been described.

It was stated earlier that it is highly desirable in most cases to start tooth movement with light round resilient archwires. Bracket engagement, leveling and first steps in the correction of rotations are begun after the first archwire is placed. If possible, all rotations are completed with the .016, .018, or .020 round archwires. Lest anyone think, however, that round archwires are overly favored in the treatment of our cases, it should be stated clearly that rectangular archwires are used just as early in treatment as is feasible in all cases. Greater control in every direction is possible with the rectangular wire after rotations, bracket control, and initial leveling have been effected.

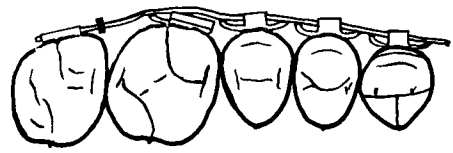


Fig. 8.

Maxillary six-year molars often rotate unfavorably and the correction of these rotations is essential to the normal positioning of the maxillary buccal teeth during treatment and for successful retention. This correction is quite easily accomplished through the use of the double width molar bracket which has one rotation arm. The terminal end of the rotation arm is a fulcrum and, when the starting round archwire is ligated into the bracket, correction of the rotation is easily accomplished. The mesiobuccal cusp is pulled bucally and the distobuccal cusp pushed lingually, Fig. 8. When the correction is completed, the molar can never rotate adversely as long as the bracket is ligated to the archwire.

Another important feature of the rotation arms should be mentioned. It has to do with the temporary reduction or bending away of one arm on the prominent edge of a rotated tooth so that a starting archwire will not be too prominent on extremely rotated maxillary incisors when ligated.

This bending away of the rotation arm is done at the time the starting round archwire is first placed and

makes bracket engagement much simpler at this first appointment. After initial tooth movement has taken place, the rotation arm is gradually bent out again. The ability to reduce or increase the prominence of either rotation arm further increases the use, flexibility and the efficiency of this bracket.

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