Headgear - Modifications And Admonitions

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The extensive application of cervically and occipitally derived forces as treatment entities and as adjuncts enjoys wide acceptance. As so often occurs, the proponents of a particular methodology are cautious to stress limitations in usage and are guarded in their summations relative to advantages, whereas many of the "follow-up" clinicians may be initially inclined toward extravagance of result claims, less than prudent in outlining treatment limits and finally, denunciatory in disavowing failures that originally should not have been considered amenable to this treatment form.

Extraoral force, when properly employed, can approach a physiological degree of tissue tolerance, can certainly act intermittently if this manner of timing is desired and can be selective enough in its area of operation to eliminate unwanted alterations of existing or established anchorage values.

Those clinicians considering the use of headgear as a means of relieving them of many of the more exacting disciplines dictated by multiple banding and arch formation should well note the degree of selectivity requisite, the subtle manner of controlling intensity and direction of force and the limitations imposed by this mode of treatment. All A-B discrepancy cases are not manageable by headgear, nor is this implement an antidote to an inevitable extraction problem.

The extent of selectivity, based on the nature of the irregularity, the timing of treatment to coincide with growth spurts, the temperament of the patient and an awareness of the multiplicity of uses to which headgear can be adapted, as well as its limitations, have been expressed by several authors.

Graber[1] cites the following manifestations: 1) excessive distal tipping of maxillary first molars, 2) possible excessive lingual tipping of maxillary incisors, 3) possible unilateral response in correction of Class II relationship, 4) difficulty in the control of excessive overbite and 5) possible impaction of second and third molars, although apparently impacted maxillary second molars often erupt after the first molars usually upright themselves[2]. However, second molars seem more likely to erupt in buccal crossbite.

Gould[3] has indicated that when cervical apparatus is hung on an upper edgewise arch, the extrusive force from this anchorage would tend to make a close bite worse. Nelson[4] observed headgear program attainments consisting of: 1) an increase or decrease in arch length, 2) change in the mesiodistal relationship of upper and lower teeth, 3) an auxiliary force to intraoral anchorage, 4) a means of retention after tooth movement and 5) a means of applying gentle intermittent force.

Fischer[5] considers the use of intramaxillary or intermaxillary force as being confined to operations requiring the reciprocal movement of teeth, whereas occipital force should be used in all instances requiring the selective application of force to the teeth to be moved in order to prevent any undesirable reciprocal tooth movement. He

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believes it has proven itself in the role of neutralizing intermaxillary elastic pull and further states that supportive headgear management presents a new area of individualized and sectional tooth movement. Newcomb[6] has stated that perhaps the best use of extraoral force is in conjunction with other appliances.

Herein will be considered additional unfavorable responses incidental to headgear programming and controls for these contingencies along with design and use modifications in the capacity as adjunct to other appliance forms. In fact, it is in the area of supplemental employment rather than as an independent treatment instrument that I wish to concentrate. It is here too that the imaginative clinician can find a range of expression but will quickly realize that his diversions must be predicted on firm biological, physical and orthodontic concepts in order to produce the intended effect. The application of headgear in its better known plus its modified forms in a supportive capacity can be exceedingly versatile.

Modifications

The sliding split tube described by Fischer can be placed at any point on a round or edgewise arch and made to act against stops or brackets. When acting in a distal direction against stops, it can hold or move an archwire. When placed mesial to a bracket, it can direct a tooth distally as occipital or cervical force is applied.

The substitution of a Lasher fork in place of a split tube allows for ease of positioning on the archwire in those instances of extremely limited interbracket space along the arch inasmuch as the fork is approximately 1/32 inch thick compared with the 1/8 to 3/16 inch length of a split tube. The prongs of the Lasher fork (Figure 1) are reduced approximately one third of their

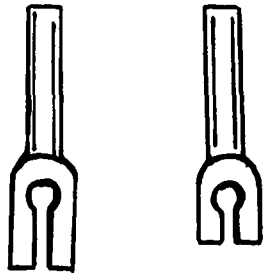

Fig. 1

original length and the shaft is soldered lengthwise along the distal end of each side of the .045 inner wire so that the flat plane of the forked end is parallel to the buccal surfaces of the molars (Figure 2). The forked ends project beyond the .045 wire, hence allowance must be made in sizing the arch to maintain proper length although it will be in advance of the labial surfaces of the incisors. After soldering the shaft to the archwire the prongs should be bent lingually to form an obtuse angle to the .045 wire and conveniently engage the rectangular or round arch tied to the brackets and inserted within the lumen of the buccal tubes (Figure 3). A conventional facebow, attached to the E arch at midpoint, and cervical strap can act as the power source; however, I prefer placing intermaxillary hooks at

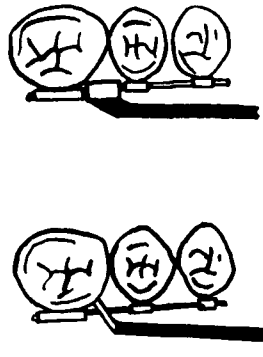

Fig. 2 Upper portion illustrates a split tube in place on the archwire; lower portion shows a Lasher fork in position.

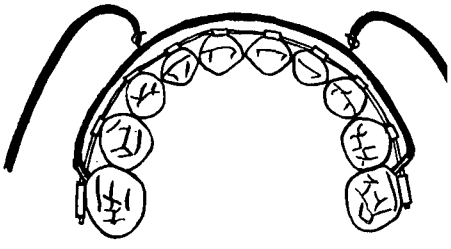

Fig. 3

the lateral incisor - canine area on the archwire and employing an occipital gear with a straight or slightly high pull. It appears to maintain the wire and Lasher forks in a more secure relationship.

The use of intermaxillary hooks and the associated facebow of the types recommended by Lewis, Steiner and others is less vulnerable to deformation during night use and does not seem to produce as much strain upon molar bands. Of course, there are indications and contraindications for these types or the Kloehn type in particular situations.

A sliding facebow can be applied against a molar stop as a means of backing up anchorage in either arch. It is most effective, however, in its capacity as an agent for moving teeth along an arch in a distal direction. Molars can be included in this effort by simply eliminating stops mesial to the buccal tubes. Control in the buccolingual plane is maintained much more easily than with conventional headgear with only molars banded. Spaces can be closed along the arch in this manner, incisors can be tipped lingually, canines or premolars moved d i s t a l l y. Non-corresponding teeth on either side can be moved simultaneously, such as a first bicuspid on one side and a second bicuspid on the opposite. Canine retraction following extraction is well handled in this manner, with stops mesial to buccal tubes and second bicuspids laced back to molars.

Extraction of a first bicuspid as a preliminary to correct positioning of a high canine necessitates the preservation of the preextraction position of molars and second bicuspids while the canine is allowed to erupt and drift naturally until it can be controlled by a finger spring or banding and incorporation in the arch; this also applies to the maintenance of molar position in second bicuspid extractions.

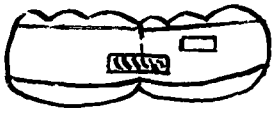

Fig. 4

Renfroe[7] has described a method of bolstering anchorage that is well suited, with modifications, to this situation. Bands are fitted on first and second molars, if the latter are sufficiently erupted. An impression can be taken with the bands seated followed by a stone model poured with the bands placed in the impression. The molar bands are then joined by soldering. A rectangular buccal tube may be placed in its regular position on the first molar for future use and an .045 round tube positioned midway between the bands over their juncture as seen in Figure 4. A Kloehn type facebow and E arch can then be applied to maintain these units against mesial tipping; the second bicuspid should also be banded and laced back to a staple on the molar. In the absence of a sufficiently erupted second molar the second bicuspid and first molar bands can be joined and headgear utilized in the same manner. It has proven effective in both upper and lower extraction cases in general, and in those particular instances where a lingual holding arch or palatal button cannot be well tolerated. This modification has been valuable as a preventive to second molar rotation in cases where second

molars erupt and can be banded prior to the exfoliation of deciduous second molars.

Urban[8], Tweed[9] and Fischer have described clinical approaches to Class II, Division I mixed dentition treatment employing bands on permanent incisors, deciduous and permanent molars along with Class II intermaxillary elastics and specified headgear support. Parker[10] has discussed initial treatment of extreme protrusion and spacing of incisors in the mixed dentition by eliminating stops on the inner wire and directing the force upon the anterior teeth as the wire slides distally through the buccal tubes.

The description herein represents nothing particularly original, simply a somewhat different format of a combination of auxiliaries introduced by others. If single arch mixed dentition treatment is considered in a Class II, Division I or subdivision characterized by spaced and procumbent permanent incisors, the following is suggested. Bands, carrying wide edgewise brackets, are placed on the four maxillary incisors with rectangular buccal tubes on the first permanent molar bands. An .0215 x .025 archwire, with stops distal to and approximating the lateral incisor brackets, is inserted. These stops prevent the archwire from sliding out of either buccal tube since there are no molar stops or tiebacks; it is desirable to initiate a reduction of arch length at this point without repositioning molars. After incisors have been tipped lingually part of the way, distal action will begin on the molars. The archwire is slightly reduced on each side distal to the canine areas. Intermaxillary hooks are fixed to the archwire at the canine region, open coil springs are placed on the archwire distal to the intermaxillary hooks and extended to within three-thirty seconds of an inch mesial to the buccal tubes. Torque must be incorporated in the wire to properly control incisor root position. The appliance is activated by headgear attached to the intermaxillary hooks; as the incisors are tipped lingually, arch length is decreased until the coil springs contact the molar tubes. It is at this point that distal action is initiated on the molars simultaneously with that on the incisors (Figure 5).

A further modification in which action is limited to the molars, to the exclusion of tipping force on the incisors, calls for the use of sliding intermaxillary hooks moving distally against open coil springs which extend passively from the hooks to the buccal tubes. Headgear activation upon the hooks will initiate action against the molars. A loop of ligature can easily fix the open coil to the sliding hook to prevent the coil from sliding off the archwire, should the latter become disengaged from the buccal tubes. Although the wire is tied in the incisor brackets and these, in turn, are laced together, there will be no distal tipping action on these teeth. With this latter design, a degree of unilateral control can be effected by the simple expedient of doubling up on the headgear elastics on one side. An acrylic palate will act to stabilize the anterior teeth and still allow uninhibited distal movement of molar crowns on

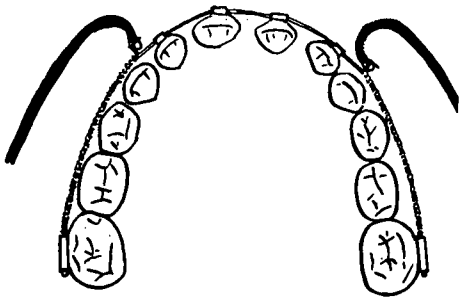

Fig. 5 This shows headgear application and incisor retraction at the point where the coil spring contacts the molar tubes and distal force is being transmitted via the springs to the molars simultaneously with that on the incisors.

that side if the lingually festooned portion of the acrylic approximating the molars is reduced.

In those cases where a tendency toward or a condition of deep overbite exists, medium high-pull occipital headgear attached to intermaxillary hooks is recommended in preference to a straight pull type of cervical anchorage. The eruption of an upper bicuspid in a buccal crossbite relative to its mandibular antagonist can be corrected with Kloehn type gear by placing a lingual setback in the bicuspid area of the E arch. The buccal tipping of the bicuspid is usually accompanied by or is a resultant of mesial drifting of the proximal permanent molar. Therefore the headgear, with its lingual adaptation, can serve a dual function, uprighting the molar and tipping the bicuspid. If the bicuspid is fully erupted, a bite plate is indicated to facilitate the action.

Undesired unilateral response may be evoked from bilaterally introduced forces. Pillowing habits, eccentric placement of neckband and distortion of facebow may be the offending agents. The very nature of the unintended unilateral response points to the manner in which it may be purposefully produced, namely, by lengthening or by expanding one facebow arm or by increasing elastic pull on one side, as effected by off-center position of the neckband. In this respect occipital harness, in lieu of a cervical strap, is less mobile and can be more readily adapted to an offset pull as created by the use of double elastics on one side which, clinically, does seem to produce greater tension on that side. Of course, care must be taken in contouring the arch to neutralize unwanted molar rotation. A modification in the manner of obtaining unilateral molar repositioning is now presented which entails the incorporation of incisors in the assembly. The maxillary molars carry rectangular buccal tubes and an

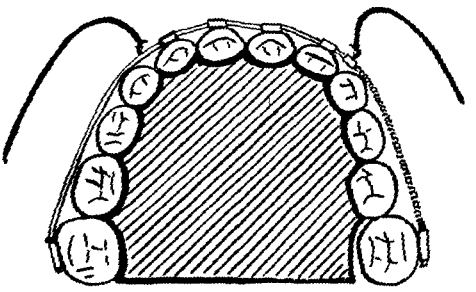

Fig. 6

.0215 x .025 archwire, slightly reduced in the region of the molar to be moved, and carrying intermaxillary hooks, is tied into position. The archwire is stopped on the nonmoving side and the hook on that side is fixed, whereas that on the side to be moved is of the sliding variety distal to which is an open coil spring extending passively to the mesial of the corresponding molar tube (Figure 6). An acrylic palate, carefully scalloped to fit closely on the lingual but reduced on the moving molar side, is worn to maintain the stability of the arch and to hold the molar opposite the side of greater movement. Headgear is then applied which will activate the open coil by the movement of the sliding hook.

Admonitions

Some of the untoward effects resultant from headgear use may be predicted when the inherent anatomy, physiology and mechanics are considered.

Upper first molars can all too easily be moved into a lingual crossbite relation with corresponding mandibular molars. The need for attention to this contingency is obvious when we recognize the decrease in transpalatal width distal to the first molars; thus, the distal movement of an upper first molar into a narrowing portion of the process may be intercepted by a compensatory widening of the inner wire of the headgear. It can be readily recognized that

the E arch form is thus effective in correcting an existent bilateral molar crossbite of a mild degree. In those situations wherein a large, light labial elastic is stretched from gingivally placed hooks in the canine area across the maxillary incisors to tip them lingually, contraction of the arch may occur as a result of the elastic contraction in the canine region of the E arch with a subsequent molar crossbite. Here too, this must be neutralized by arch expansion. Also note that labial elastic use, if intense, can tip incisor roots labially since there is no torque control. Torque can be directed with a rectangular arch inserted in edgewise brackets and the use of high or straight pull extraoral force attached to intermaxillary hooks at the canine - lateral incisor region.

Respect for root integrity must be maintained at all times, but especially when young permanent incisors are being tipped or torqued. While Fischer considers a lower incidence of root resorption prevalent in younger patients and advises treating in the mixed dentition before the roots of the permanent teeth are fully formed[5], we direct attention to possible pulpal injury which might occur in those teeth having open root apices at the time of treatment. Rapid distal crown tipping of maxillary or mandibular molars and attendant increased arch length between deciduous canine and permanent first molar crowns can eliminate proximal contact for erupting bicuspids. When this is evidenced there is an often observed undesirable rotation of newly erupted bicuspids. This seems to be particularly apparent when the deciduous second molar is exfoliated prior to first bicuspid eruption. The nature of the rotations, as observed, appears to be such that the distal of the bicuspid crown is rotated lingually more often than in the opposite direction. This, of course, necessitates additional banding and subsequent regulation. Slow, controlled molar distal tipping, coordinated, if possible, with the rate of bicuspid eruption and supplemented with comparative radiograph measurements of bicuspid crowns checked against available space, may aid in reducing the incidence of these rotations by allowing little or no excess space in this region during eruption. It is at this point that an acrylic palate guide, carefully contoured to closely fit the lingual of all teeth mesial to the molars, can be utilized to maintain the bicuspids against further rotation as they approach their fully erupted positions. The acrylic should be reduced at the lingual of the molars to prevent interference with their movement. Corresponding lingual support can be adapted to the mandibular arch.

In all instances of retraction of upper incisors during the mixed dentition guard against blocking out permanent cuspids, especially if the deciduous cuspids have been shed prior to the deciduous first molars; adequate arch length must be maintained from the permanent molar on one side to that on the other. It is suggested that maxillary incisors not be tipped lingually until arch length for unerupted canines, as viewed on a radiograph, is determined.

After the correction of a Class II irregularity with strong relapse tendencies, headgear can be of assistance in retention if bands carrying .045 tubes are placed on upper first molars to receive a Kloehn type facebow worn in conjunction with a Hawley retainer. Nelson has described the use of intramaxillary elastics and lingual spurs from the molar holding an .045 tube to a tooth on the same side of the arch for rotation of the latter tooth. This can be applied to the retention of a corrected rotation of a canine or bicuspid. Incorporation of a facebow in a tooth positioner has been suggested as a retentive support. The merit of this

combination remains conjectural since the semirigidity of the positioner may create adverse forces when the facebow is activated.

Fischer[5] has written, "In the majority of cases treated with occipital force, a corrected molar relationship and overjet is followed by the permanent maxillary canine and first and second bicuspids taking their correct positions in the arch with little further assistance, and a correct occlusion between maxillary and mandibular teeth ensues. In *some* cases, however, the correct interlocking of the permanent successors fails to take place, making necessary a third step in the correction of the occlusion." Interchanging the words, "the majority" with "some" furnishes many of us with a quotation all too applicable to current experience.

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Discussion S. J. Kloehn

You have just heard an excellent review of the literature on the limitations and unfavorable responses to extraoral anchorage treatment and some modifications for its application as an adjunct to other appliances. There is no orthodontic appliance today that does not have limitation. The extent of these limitations is in direct proportion to the skill and judgment of the operator and the favorable or unfavorable growth response of the patient. Most orthodontists have auxiliary additions which have increased the efficiency of any orthodontic appliance for certain movements in unusual circumstances. Good examples are the various auxiliary attachments and methods employed in our own small group for increasing the efficiency for correction of rotated teeth. Each method has its advantages depending upon the problem of each case plus the operator's skill. Extraoral anchorage appliances are no exception and their efficiency is determined by the same factors.

The basic principles for the correction of any malocclusion are a good analysis with an ideal plan of treatment, and a practical plan of treatment dictated by the problems each case presents and the operator's mechanical skill. The ideal plan of treatment for the correction of any Class II malocclusion demands the correction of the mesiodistal relationship of the maxillary and mandibular teeth by either moving the maxillary teeth distally or by moving the mandibular teeth anteriorly or by a combination of both. The method of choice of each case must be determined by the analysis of the malocclusion.

Unfortunately, the majority of Class II malocclusions encountered in daily clinical practice demand distal or posterior movement of the maxillary teeth with little or no forward movement of the mandibular teeth to provide a stable result and the best facial balance. This naturally prohibits the use of the mandibular teeth for anchorage and demands the use of extraoral force.

The extraoral anchorage appliances have become very popular in the past twenty years and have proven to be successful. The literature does contain reports of failures with instances of unfavorable and undesirable responses. Most frequently these failures are the result of abuse and careless manipulation. Excessive distal tipping of first molars can be avoided or corrected by changing the relationship of the arch and face bow. Lingual tipping of maxillary incisors can be avoided by retracting these teeth by means of a rectangular archwire to control torque. The impaction of second molars has not been a problem in our hands, perhaps because we do not tip the first molars excessively and always try to correct the axial inclination before completion of treatment. The incidence of impaction

of third molars can only be assessed by a comparative study of untreated and treated cases. The crossbite of molars is certainly the result of careless mechanical therapy and can be produced with any other appliance when it is not used with good judgment.

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