

Early Maxillary Orthopedics: A Sequence of Events

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The final success of any treatment plan can depend as much on the timing and sequence of the individual procedures as on the effectiveness of the procedures themselves. Such is the case in combining early maxillary orthopedics with cleft palate surgery.

Objectives of early cleft palate treatment have involved, mainly, ideals of arch alignment with attempted prevention of later cross-bite development. There was also anticipation of better tongue function, easier feeding, and prevention of aberrant muscular activities as a result of early obturating of the palatal cleft. Many of these objectives have been realized, but goals have been raised, and additional objectives sought.

There has been a considerable amount of dialogue in the literature in recent years (1-7, 13, 14, 16, 19) regarding surgical and orthopedic procedures for cleft lip and palate, specifically with regard to timing of treatment. In general, a rationale of treatment in these cases is very much dependent upon an understanding of the problems as they exist initially, and as they are projected to the future. If the permanent dentition and its functional and esthetic alignment in a stable environment are the final criteria of orthodontic endeavor, and if these criteria cannot be manifest prior to the eruption of the permanent teeth, then treatment can be delayed, and with some justification, until the more conventional and time-honored treatment period (12, 15). On the other hand, if better results can be achieved with early treatment, that possibility needs consideration. Some clinicians, not content to wait until the child presents as an adolescent, attempt orthodontic treatment as soon as the child is manageable. This has meant treating the problems in the deciduous or early mixed dentition. At no time, however, prior

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to the publication of McNeil's thesis (8, 9), was the concept of true segment movement and alignment really appreciated or understood.

In our judgment, we, as orthodontists, working in consort with others in cleft palate rehabilitation, cannot be satisfied fully with our treatment goals as defined and attained in the past. Even the so-called sophisticated multi-band techniques in the patient with complete clefts of the lip, ridge, and palate can be very limited and inadequate. There seem to be two major reasons for this inadequacy. First, there is a lack of bony base over which teeth may be positioned. Ideally, integrity of the maxillary arch should be established to the point where teeth can later erupt into or be moved into the cleft area. Second, there is the needless time and effort expended to correct a situation of segment malalignment, which need not have occurred in the first place.

It would seem that, at present, one approach to these two shortcomings would be consideration of maxillary orthopedics and bony segment stabilization through autogenous bone grafting, in logical sequence.

It is most difficult, at best, to be 'objective' about this combined surgical and orthopedic endeavor, for techniques and thoughts on approach are in a constant state of change. As an example, in 1963 (18), one of us (SWR) reported on an early approach at the Cleft Lip and Palate Institute at Northwestern University, and Children's Memorial Hospital. At that time, seventeen children were fitted with maxillary orthopedic appliances, some as described by McNeil, and others modified from that procedure. At that time, autogenous grafting was not considered. These seventeen children now have early mixed dentition, and the results, over-all, can certainly be considered adequate and more ideal than if nothing had been done, as was the case on all infants seen previously to that time. The original seventeen cases were divided into nine Veau Class III complete unilateral, and eight Veau Class IV complete bilateral. Of the nine Class III patients, we have managed to follow the development of eight, none of whom developed an anterior cross-bite. Three of the eight have buccal segment cross-bites as severe, we feel, as if nothing had been attempted, one has a buccal cross-bite considered to be very slight, and four have no buccal segment cross-bite at all. Of that group of eight Veau Class IV patients we have, again, lost contact with one child. When last seen, this patient exhibited neither anterior or posterior cross-bites. Of the remaining seven Class IV cases, one has a slight anterior cross-bite, one has a slight posterior cross-bite, and five have neither anterior or posterior cross-bites.

This approach raised our goals at the time and made us seek additional objectives. Because grafting had not been considered, these cases, of necessity, required the constant presence of a palatal appliance to maintain a favorable alignment, once established. Also because no grafting was done, the void is still present between segments, and the segments themselves are in danger of collapse at any time. We feel that this

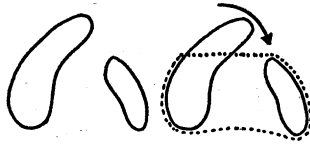


FIGURE 1. Indication for passive maxillary orthopedic appliance.

is a shortcoming. In addition, we are still limited as to how far we may move teeth because of the lack of absolute bone base. At present, we have developed a somewhat different approach in an attempt to circumvent these problems. In the following paragraphs, a sequence of events in the treatment of complete clefts of the lip, ridge, and palate is presented.

Unilateral Cleft Lip and Palate

Generally, when the larger maxillary segment initially shows the classic upward and outward rotation, and the smaller segment shows little or no lateral displacement, a *passive* maxillary orthopedic appliance is needed (Figure 1, left). Clinicians have long been aware of the dramatic moulding of the arch segments of the maxilla following lip closure, with resultant reduction of the bony void. However, the use of a passive maxillary orthopedic appliance at this stage is most important to *maintain* the lateral maxillary dimension. It is essential that reduction of the bony void is *not* accomplished by a medial collapse of the arch segments, but by 'bending' of the larger segment (Figure 1, right). In this manner, the lateral width of the upper arch changes very little, if at all, and very acceptable arch form can be achieved. This, then, is the correct use of the passive appliance. Impressions are taken early, and the appliance is placed at the time of lip closure.

The original appliance can be worn for months, with only occasional removal for cleaning. Secondary benefits through its use have been mentioned in a previous article (6). One shortcoming alluded to by some writers has failed to materialize, namely, an attenuation of growth laterally. Over a period of months, these infants seem to show growth away from the lateral borders of the appliance in the ridge areas. Thus, the appliance, when passively placed, does nothing more than to prevent collapse of an incomplete segment of the arch to the midline in an abnormal manner.

A situation may also arise when the appliance is not placed passively initially. Here the infant may not be first seen until after several months of age, the lip has not been closed, and still there is collapse, or at least insufficient lateral dimension of the maxillary segments (Figure 2, left). The appliance is split, and placed at this time with the imbedded jack-screw activated to move the smaller segment laterally into good alignment (Figure 2, right). Experience indicates that this needed pro-

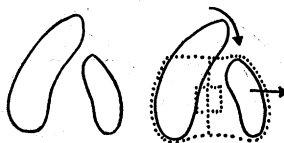


FIGURE 2. Indication for active maxillary orthopedic appliance.



FIGURE 3. Initial arch form which does not require placement of maxillary orthopedic appliance.

cedure can use up valuable time prior to lip closure, so that often the lip is closed while this segment alignment is in progress. However, even if the lip is closed before the segment alignment, the stabilization of these segments by means of the bone graft *must not* be attempted until segment alignment is as good as it possibly can be, and certainly not in the collapsed state.

On rare occasion, the appliance is contraindicated in the newborn. In such cases, the larger segment may not be rotated upward and anteriorly immediately post-partum (Figure 3). In addition, the smaller segment may have sufficient size and placement laterally so as to allow visualization of the eventual alignment of the segments favorably and without collapse after lip closure.

When the alignment does occur and the bony void has been reduced, many times with a 'butting' of the tissue (Figure 4), the next logical procedure seems to be the stabilizing of these hard tissue segments through autogenous bone graft. It may be that this ideal segment alignment and 'butting' may not be attainable for every patient, due in part to an actual lack of tissue, but it does serve as the goal toward which early orthopedic procedures are aimed. A stabilization of the bony segments by bone graft is *definitely contraindicated* when the segments are in the overlapped relationship (Figure 5).

The concept of early grafting as a separate procedure usually falls somewhere between surgery for the lip and surgery for the palate. We have seen moulding effects which were so dramatic and so rapid that some of these cases are in excellent alignment and so, theoretically, are ready for stabilization as early as two or three months after lip closure.

Because the first signs of the buccal dentition can be observed in the period from 12 to 15 months of age, the retention of the appliance after this time becomes a problem, but not an insurmountable one. Therefore, from an orthodontic standpoint, one would prefer to stabilize no later than that same age so that the appliance can be discontinued without undue fear of collapse. It is imperative that the palatal appliance be

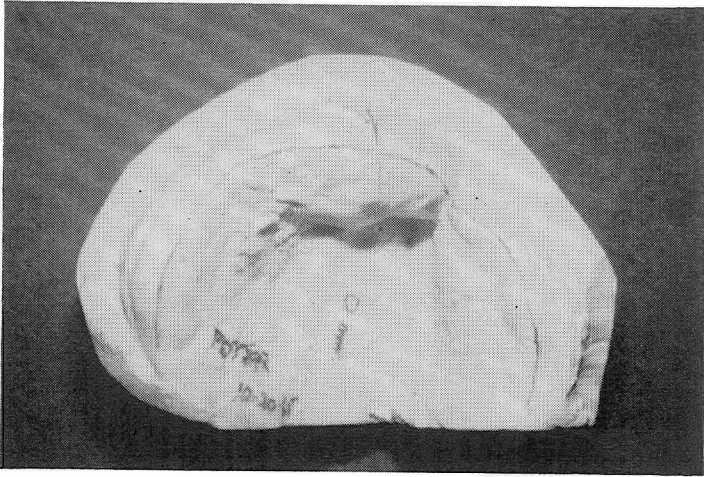


FIGURE 4. Study model showing good alignment of maxillary segments, with complete reduction of the bony void.

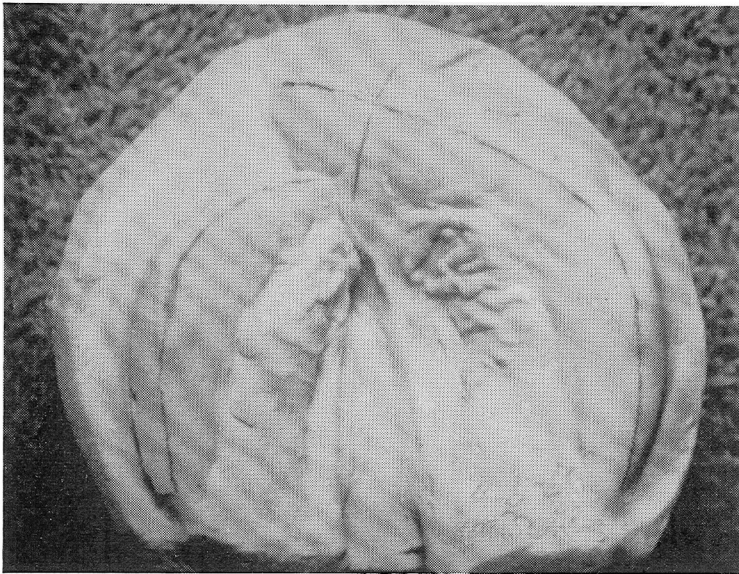


FIGURE 5. Study model showing position of maxillary segments in which bone graft is definitely contraindicated.

worn for at least six months after the graft procedure to allow for stabilization of the segments during the demineralization of the graft material and initial vascularization from the host bone.

Lynch and associates (7) have reported on early grafting procedures, up to two years of age, on 51 cases. Their sequence of procedures is lip closure, maxillary orthopedics, then grafting at a later date. They have

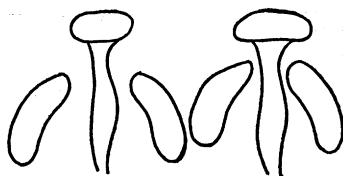


FIGURE 6. Left, premaxilla positioned far anteriorly by growth. Right, lateral width of premaxilla exceeding the anterior space between the lateral maxillary segments.

not formally evaluated the success or failure of these procedures; however, it is their impression that the overall degree of maxillary collapse is minimized by grafting performed in infancy.

Bilateral Cleft Lip and Palate

Bilateral complete cleft palate patients have, to date, offered a great challenge to early maxillary orthopedic procedures. The objective here, again, is good arch form and eventual stabilization, but it is more difficult to obtain. The problem, it would appear, seems to center in two areas. First (Figure 6, left), the premaxilla unattached laterally and, unrestricted in its growth, can often position itself far anteriorly by the time lip closure is considered. Secondly (Figure 6, right), the lateral width of the premaxilla, on occasion, can exceed the anterior space between the lateral maxillary segments. This, in effect, gives one the impression of relative collapse of the buccal segments. A combination of the afore mentioned conditions can also exist, where the premaxilla is very large, and also is placed far anteriorly.

In the first instance, where the size-relation of the premaxilla to lateral maxillary segments is good, but the premaxilla is positioned far forward, the treatment approach depends largely upon the surgeon's judgment and appraisal of the severity of the discrepancy. If not severe, a maxillary orthopedic appliance may be placed passively and the lip surgically closed. The lateral maxillary segments are thus held in position by the appliance while the pressure from the lip can force the premaxilla lingually between the two lateral segments (Figure 7). When the premaxilla has positioned itself between the lateral segments with good arch alignment and close approximation, stabilization of the premaxilla by bone graft can then be considered.

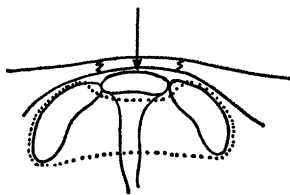


FIGURE 7. Lip positioning premaxilla after closure with passive maxillary orthopedic appliance maintaining lateral width.

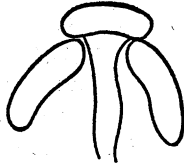


FIGURE 8. Lateral segments trapped when premaxilla prematurely positioned lingually.

When the premaxilla is positioned so far forward that closure of the lip would be difficult, a septum section procedure may be considered to position the premaxilla at the time of lip closure. If the size of the premaxilla laterally is coincident with the bony void between the lateral maxillary segments, no appliance need be placed. After an appropriate period of time, the premaxilla may be stabilized (13, 14, 19).

When definite collapse of the lateral segments is evident, an active appliance may be placed to accomplish expansion. Again, timing of further procedures is extremely important. If the premaxilla is positioned lingually from its original position before expansion is accomplished, either by lip pressure or surgical recession, the lateral segments will be trapped (Figure 8). Expansion of the lateral segments is possible after the premaxilla has been positioned, but it is much more difficult due to the contact of the soft tissues, the friction created, and the loss of considerable anterior undercut for retention of the appliance. This relationship invariably paves the way for the commonly seen bilateral deciduous cross-bite. Thus, if stabilization of the component parts by graft has been done in the constricted position, the resultant cross-bite *cannot* be an indictment against the procedure of stabilization by bone graft. Stabilization of the premaxilla must be performed only when it is *between* the lateral maxillary segments, not in front of them.

Summary

By working closely together and understanding each others goals and aspirations, both surgeon and orthodontist can attain a finer rehabilitative level than ever previously realized.

In complete unilateral cleft lip and palate patients, the sequence most often employed is: 1) lip closure and placement of the passive orthopedic appliance, 2) retention of the appliance until favorable maxillary segment alignment, 3) stabilization of segments through autogenous bone graft, and 4) closure of the palate.

Modifications of this general sequence have been mentioned and discussed. In the bilateral complete cleft lip and palate there is the added problem, on occasion, of alignment of not only the lateral segments but also the excessive forward positioning of the premaxilla as well. A sequence of maxillary surgical and orthopedic procedures, and modifications, has been offered.

Though there is variation in the types of maxillary orthopedic appliances used and techniques of surgery employed, the ultimate objectives of all concerned remain the same: a better functional, esthetic, and stable result with, theoretically, a 'oneness' or completeness to the maxillary ridge, previously unobtainable. Before evaluation of the results can be made however, there must be some semblance of standardization in time and sequence of treatment procedures.

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