The Prevention of Maxillary Collapse in Congenital Lip and Palate Cases

CHARLES E. HORTON, M.D.
HUGH H. CRAWFORD, M.D.
JEROME E. ADAMSON, M.D.
SAMUEL BUXTON, D.D.S.
REUBEN COOPER, M.S.
JACK KANTER, D.D.S.
Norfolk, Virginia

Although many new techniques to repair cleft lips have recently been eagerly adopted by the modern plastic surgeon, several problems concerning maxillary configuration and the unstable protruding premaxilla still exist. These unsolved problems lead directly to malocclusion of the dental arches, poor speech, and to an unsatisfactory cosmetic appearance.

The simple incomplete cleft lip, with intact alveolar ridges and palate is easily repaired with pleasing results; however, most plastic surgeons will freely admit that the severe double cleft lip and palate problem seldom can be reconstructed to a completely satisfactory appearance and function.

We feel that before an acceptable repair of the soft tissues of the lip and nose can be produced, it is desirable to stabilize the bony foundation on which these structures rest. The stabilization appears necessary in order to allow controlled symmetrical growth to occur. The lips and nose drape over the maxilla and the alveolar ridges. If these bony ridges are asymmetrical, the soft lips and nasal floor will also appear mis-shapen.

Since a cleft lip or palate is formed in utero, many dynamic forces which normally mold facial contours are altered. When the muscular restraining action of the intact lip is destroyed by a lip cleft, the underlying bones may attempt to over-expand slightly into the cleft, and in the case of the protruding premaxilla in the double cleft, the bones overgrow markedly in length on the vomerine stalk.

Maxillary collapse, while equally disconcerting, does not seem to occur frequently in the new born but occurs later after surgical reconstruction of of the lip and palate. Certain investigators have used cephalometric studies to show that cleft palate surgery and scar tissue formation may cause maxillary collapse. This may be true in certain types of cleft palate repairs where bone compression is necessary. Less commonly recognized is the fact that an early lip closure producing a tight lip sphincter mechanism with constant muscular compression will cause the relatively un-

Presented to the 1963 Convention of the American Cleft Palate Association, Washington, D. C.

stable clefted maxillary arches to move into and toward the palatal defect, and in effect, result in the collapse of those arches following the surgical repair of the lip.

Only rarely at birth does one see what appears to be a partial collapse, particularly in cleft palate cases with intact lips. These normal lips have apparently exerted muscular pull on the movable palatal and maxillary structures while in utero. In unilateral cleft cases the usual deformity develops after surgery as the short cleft side falls behind the larger anterior alveolar ridge segment (although occasionally the short side may lock laterally). In bilateral cleft lips the lateral alveolar ridges usually collapse behind the premaxilla, leaving this central segment anterior to the alveolar ridge line.

It is difficult not to recognize the dynamic pull of the muscular lip when one considers the obvious rotation and movement of the premaxilla toward the first reconstructed side when a bilateral cleft lip is repaired in stages. The maxillary skeleton is cartilaginous until approximately six months of age. These structures are much more easily molded prior to calcification; however, even following ossification of facial structures it is well known that muscular pull can change bony and soft tissues contours. For this reason we have attempted to mold and to hold palatal contours into a normal position with palatal prostheses, and bone grafts.

Beginning in 1957, we have performed approximately 63 bone grafts in bilateral and unilateral cleft lip and cleft palate cases. Although some preliminary bone grafting work had previously been accomplished in Germany and Sweden, the operation to place bone in a cleft palate was relatively unaccepted in 1957.

General Technique

Our grafts were first done in older patients with the thought that orthodontic care could restore symmetry, even if partial collapse had occurred. Total correction by orthodontic means of a complete, irregular, and deformed bony alveolar ridge proved to be difficult if not impossible. We found by experience that it was preferable to: a) use a preliminary prosthesis immediately after birth to retard collapse and guide occlusion as much as possible; b) graft bone at approximately six months of age; and c) follow later with orthodontic care to perfect the remaining smaller discrepancies. If maxillary collapse has occurred when a new patient is first seen, we recommend that the collapse be corrected either by expanding a prosthesis or by orthodontic therapy in older children prior to bone grafting.

Because it is necessary to have very small trays for impression material in newborn infants our prosthodontist constructs his individual trays from clearisil. The material used is a low heat dental impression compound. The prostheses are constructed of acrylic, and in some instances, an expansion

screw is mounted in the mid-portion to expand a split prosthesis and produce lateral pressure. Other prostheses are made in one piece, and adjusted periodically with growth.

It has been found that the usual child can eat more comfortably with the prosthesis, and in fact, many children become so accustomed to the obturator that they cry when it is removed for cleaning. The prosthesis appears to allow for more normal oral gratification by stimulating the muscles of the tongue and lip in sucking and deglutition. The prosthesis is worn at all times, has rarely caused difficulty in dropping out, and has never obstructed the airway. We conclude that there is no contradindication to the use of a prosthesis in an infant.

We have tried extraoral orthodontic appliances with elastic traction for the protruding premaxilla of the bilateral cleft, but have yet to produce a satisfactory product which can appreciably reposition the premaxilla.

Bilateral Clefts. In bilateral cases our present policy is to keep the lateral palatal arches expanded, to repair the lip as early as possible so that the lip construction will press on a cartilaginous rather than an ossified vomerine stem, and to fix the premaxilla with bone when it appears to reach the best possible position in relation to the lateral segments. It is recognized that this occasionally leaves the premaxilla in an anterior position, for many vomerine stems will not allow adequate regression or retardation of growth. It is also recognized that abnormal twisting and curvatures may occur in the septum when the premaxilla is held backward. This may obstruct breathing later in life and may be quite undesirable. We have considered these factors carefully and will report soon on further experimental work regarding operative recession of the premaxilla in conjunction with bone grafts.

Unilateral Clefts. The unilateral palatal cleft has not been a particular problem since the prosthesis will in most instances prevent collapse until the bone graft has been done at six months of age. The prosthesis is worn post-operatively for approximately three months. At that time, the arch should be solid enough to resist collapse. We have not felt it necessary to graft posteriorly in the cleft. (We have done three cases in which a bone graft and a primary lip repair were completed simultaneously. These repairs were done before six weeks of age; however, the procedure needs more evaluation before an opinion about its desirability can be ventured.) In early infancy the operation is, of course, somewhat longer than that of the lip repair alone and must add increased risk to the procedure. We do not feel it is worth delaying a lip repair for six months in order to do both procedures safely and simultaneously.

Routinely our patients are seen by a speech pathologist, a prosthodontist, and an orthodontist. In general, we do not feel that much can be accomplished by the speech pathologist before the child is three years of age and that the orthodontist can't do much until the child is four, at which time cephalometric studies are done.

Bone Graft Technique

Our operative technique for the bone graft consists of taking autogenous bone from the rib, tibia, ulna, or iliac crest. The upper rim of the ilium is cartilaginous in the infant, and our current preference for a donor area is the cage. We have been using the tibial area less than previously since one patient sustained a fall post-operatively and broke his tibia two weeks after a graft had been obtained from the area. The anterior tibial scar is also less desirable than scars in the other suggested donor areas. Preserved bone was used in two of our cases. This bone did not survive and we will not make further use of this material in this technique.

The bone is first obtained from the desired area, and the donor site closed. An incision is then usually made on the buccal side of the alveolar ridge along each side of the cleft, from the apex of the ridge to the top of the oral nasal groove or fistula. The mucosa is undermined and the flaps rotated lingually to form the posterior and superior lining for the grafts. The alveolar ridge bone exposed is partially removed on each side of the cleft taking care not to injure tooth buds in this field. The nasal floor should be carefully preserved to form the roof for the graft.

The bone graft is then wedged between the alveolar ridges, bridging the cleft. A few bone chips can be added to fill the defect if the primary bone wedge is not adequate. A flap from the inside of the upper lip provides adequate buccal cover for the graft, or a large flap rotated from the adjacent alveolar ridge can be utilized. This flap is similar to the flap ordinarily used to close oro-nasal fistulae when no bone graft is done. Vomerine flaps also offer adequate coverage for wider defects of the anterior aveolar ridge and have been most successful in double clefts where a large space must be bridged. Bilateral simultaneous bone grafts offer no special problem and are routinely completed in one stage.

No attempt at immobilization is made; however, the patients remain on liquids by mouth for two weeks. Solid foods and chewing should not be attempted for four weeks. For infants still on the bottle the sucking activity does not often prove to be troublesome.

X-ray films are taken before and after grafting to confirm growth patterns, and to determine the effects of the grafts on dentition. In two cases the grafts appear to have displaced permanent teeth anteriorly; however, in other cases it can be demonstrated that the teeth appear to be growing through and adjacent to the graft without difficulty. This aspect is under investigation in our laboratory.

Discussion

In addition to preventing alveolar ridge collapse, several other pertinent observations from this study should be mentioned. We do not claim originality; however, we have never seen in published form the answer to the question of why the nasal columella and septum always deviate to the non-

cleft side of the lip cleft. We believe this is again due to the unopposed lip pull which is exerted on the columella and septum by the larger segment of lip lateral to the cleft. This may be seen also in bilateral cleft lip repairs where pre-operatively the columella is centrally located, and then following a closure of one side only, the nose deviates to the repaired side.

We have also noted that the alveolar ridge defect is minimized when a bone graft is successful in the area. This has allowed teeth to erupt in more normal locations, and in certain instances, through the graft itself. Our orthodontist feels that teeth which may previously have erupted laterally or posteriorly on the palate, can now be repositioned more normally with less effort. Tooth bud grafting has also been considered, and so the later use of a prosthesis to replace alveolar ridge and missing teeth may become less likely.

The cosmetic improvement which occurs with bone grafts cannot be underestimated. It is not uncommon to hear parents explain how symmetrical the lip looks following the graft, and how much the "lop-sided" depressed nose and lip on the cleft side has been improved.

The fact that many repairs of incomplete palatal clefts produce poor speech results while patients with complete clefts may have good post-operative speech has been a subject for discussion at many meetings. While this is not universally true, it occurs often enough to deserve comment. Complete clefts of the palate can collapse, while incomplete soft tissue clefts cannot. If in fact there is a relative insufficiency of tissue in a cleft palate, and if by allowing maxillary collapse to occur there is a smaller space to be filled with palatal tissue, then the result may give better speech and the use of bone grafts to prevent collapse can be questioned.

Whether bone grafting will prove to be an adjunct in cleft lip and palate surgery will not be decided for several years. It is well known that many nongrafted cases do well even with partial palatal collapse and/or a floating premaxilla. The questions of retardation of growth, of permanent tooth damage, of retarded orthodontic treatment, of impaired speaking ability, and even of unnecessary surgery must be answered by evaluations over long periods of time. Our orthodontist states that it is not ordinarily difficult to move dental structures of bone or in bone. If these structures are held in a new position by soft tissue only, little retention can normally be expected. On the other hand, if these structures are anchored by bone, it is expected that normal retention will be obtained. This has been substantiated in clinical practice.

Questions of other types of bone grafts, grafting in younger patients, and extending the graft to the posterior palate are under investigation. We are confident that improved techniques will produce even more benefits in cleft palate surgery, and we believe strongly that cleft palate repairs with older standards and techniques occasionally leave much to be desired in the total care of these patients. Currently, it is our feeling that the tech-

nique of palatal prostheses and bone grafts has seemed to improve our results and we have concluded that until other results are demonstrated, the type of care is beneficial and will be continued on all our cases.

Summary

Maxillary collapse and irregularity is common in cleft lip and palate cases. Since there is no restraint by muscular pull to the bilateral cleft lip premaxilla, overgrowth in length of the vomer and septum is common. Surgical repair of cleft lips produces muscular pressure on the maxilla and may cause maxillary collapse. Palatal prostheses in infants are useful in preventing maxillary collapse and should be used prior to lip surgery and prior to bone grafting. Bone grafts to the cleft of the alveolar ridge can be performed successfully and appear to help prevent maxillary collapse. Bone grafts aid in the development of teeth adjacent to the graft, help fill out the alveolar ridge contour, and improve the cosmetic appearance of the lip and nose. Further study and evaluation of this technique is warranted.

603 Medical Tower
Norfolk, Virginia