Pre-Surgical Orthopedics and Bone Grafting for Infants with Cleft Lip and Palate: A Dissent

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It is not a simple or a lightly assumed task to write a brief challenging the rationale for pre-surgical orthopedics and bone grafting for infants with cleft lip and palate. The advocates are numerous and international. They are a growing army of eminent surgeons buttressed by sedulous camp-followers that include orthodontists and prosthodontists. Their battle cry is a cabalistic mumbo-jumbo invoking the mystic of embryology and growth and development. Their proposal to make things right and whole as early as possible seems sensible and has emotional appeal. Regrettably, and despite all these enthusiasms, what has been offered so far is a prolonged and costly manipulation and a surgery that is needless and sometimes barbaric.

The procedures advocated might be defended on the basis that continuous exploration for new and better methods is warranted and deserves support. While such research may be justified, despite the costs incurred, it is incumbent upon the investigator to document his results in a scientific manner. Instead, we have been fed opinion, anecdotal pap, wishful thinking, and empirical trivia.

What is the basis for a dissenting opinion? First, and foremost, it evolved from a longitudinal growth study of children with cleft lip and palate initiated in 1949 (*9, 23–29*). This continuing study includes casts and roentgencephalometric, laminagraphic (*36*), and other measures on more than 1000 children from birth. As a result, an unparalleled opportunity has become available to study the post-natal development of a variety of clefts. In reporting on this study, there is no motivation to support or find fault with any given philosophy or method of therapy. The only objective is to report the facts as they are. If these facts give reason to challenge the premises upon which pre-surgical orthopedics and bone grafting are based, then it becomes our responsibility to point this out.

A second basis for dissent resides in the theoretical arguments mustered in favor of the orthopedic-surgical procedures under discussion. These

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theories will be re-examined in the light of our previously cited studies and the results obtained by others.

Finally, certain developments of recent history pertinent to the issues under examination will be reviewed as object lessons that false premises can lead to wrong conclusions and therapeutic folly.

Pre-Surgical Maxillary Orthopedics: The McNeil School

In 1954, C. Kerr McNeil, of the University of Glasgow, published a book in which he advocated two novel technics for the treatment of clefts (*18*). By one method, he proposed to stimulate the growth of tissues to obtain closure of palatal defects without surgical intervention. Since this technic is not germane to this paper, no further mention will be made of it except to note that, apart from the academic curiosity aroused by the tissue response elicited (*11*), it has failed to win widespread or lasting popularity among clinicians.

The second procedure developed by McNeil was designed to control the alignment of the cleft dental arch in infancy. He employed a variety of intra and extraoral appliances to realign the maxillary segments in unilateral cleft lip and palate and to retroposition the premaxilla in complete bilateral clefts prior to cheiloplasty. Beyond a description in a short chapter of nine pages, and two other brief reports (*17, 19*), McNeil seems to have written no more on the subject.

He has, however, found active disciples in England, in Sweden, on the Continent, and more recently, in the United States. The most eminent spokesman for the McNeil method is Burston of Liverpool. Apparently, he has had longer and greater experience with this procedure than anyone else. With the blessing and support of the National Health Service, he maintains two wards for inpatient care, including a special mother-baby unit, as well as providing for treatment on a domiciliary and outpatient basis. Judging from our conversations in Liverpool in 1961, the cost-accounting of the protracted inpatient service was not a matter of primary concern. (That an American visitor should express anxiety about costs was a puzzlement to my hosts in England and Sweden.)

Theoretical Considerations

In the main, the literature on the subject is preoccupied with methodology rather than with the critical examination of biological mechanisms. Some of the more recent articles by surgeons in the American literature read like detailed prosthetic manuals—a trend that might even lead to jurisdictional disputes with the prosthodontists. In any event, the theoretical basis for pre-surgical maxillary orthopedics seems to rest on the following:

ARGUMENT 1. The principal growth center for the maxilla is in the cartilaginous septum as cited by Brauer, Cronin, and Reaves (*5*) quoting J. H. Scott (*30, 31*). Growth of the septum is at a height throughout the first six

months of post-natal life. Therefore, treatment should be undertaken to restrain the precocity of the central stem particularly in the bilateral conditions (*7*).

The supposition is that the maxillary shelves, separated from the nasal septum by the cleft, are thereby deprived by the growth-stimulating impulse from the growth pacemaker in the septum. Consequently, the detached maxillae are relatively underdeveloped in the vertical and anteroposterior dimensions (*7, 8*).

Although this anticipates the discussion of bone grafting which shall be dealt with separately, it is noteworthy that Brauer, Cronin, and Reaves (*5*) carry this argument one step further by claiming that

> ... any deficiency which could occur because the affected segment was not attached to the premaxilla would now be corrected by fixation of the two maxillary segments. If the normal segment goes forward, it should carry the other. (p. 628)

ARGUMENT 2. "First establish a sound dental arch and secondly close the cleft," says McNeil (*17*). In support of this thesis, Burston writes (*7*),

> In the absence of preliminary orthopaedic correction, surgery will tend to perpetuate the malrelation of the segments, particularly surgery of the palate. ... Once this collapse has been established, the teeth, particularly the canines on the affected sides, will erupt into incorrect occlusion. (p. 30)

It is also argued that pre-surgical manipulation of the maxillary components facilitates repair of the lip, especially in the case of the markedly protrusive premaxilla and deficient prolabial mass. The establishment of symmetry of arch form at an early age also aids in the symmetrical reconstruction of the alar cartilages.

ARGUMENT 3. The intraoral prosthesis employed in pre-surgical orthopedics improves feeding and deglutition (*4, 10, 12*).

ARGUMENT 4. It retards growth of the premaxilla and promotes growth of the maxillary segments (*17*).

ARGUMENT 5. The procedure has psychological advantages for the parents (*10, 32*).

ARGUMENT 6. The procedure improves speech function (*12, 32*).

The Rebuttal

The first and second arguments are vulnerable on three counts: insufficient evidence to support the thesis, the presence of facts that do not jibe with the argument, and the omission of other evidence that throws a different light on the problem.

ROLE OF MUSCULATURE. The nasal septum does not grow in a vacuum. It develops in a dynamic milieu of muscle forces which contain and mold the osseous elements of the middle face. The muscles innervated by the trigeminal and facial nerve are among the first to show signs of contractile activity during early intrauterine life (*14, 15*). The significance of this

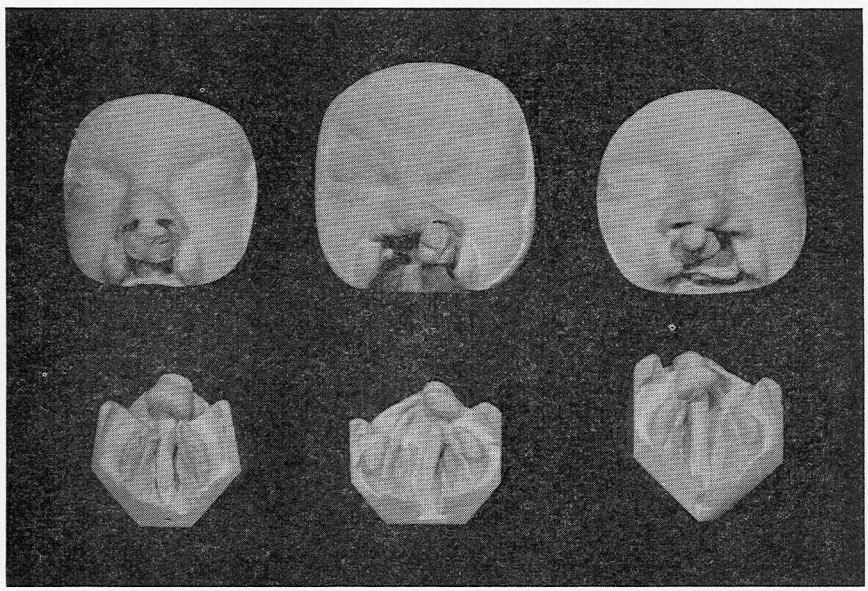

FIGURE 1. Facial masks and casts of palates of three cases of unoperated incomplete bilateral cleft lip and complete bilateral cleft palate. Left, small Simmonart's band attaching premaxilla to left palatal shelf. Center, incomplete cleft of lip on left side. Right, incomplete cleft lip on right side.

aspect of organogenesis to problems of the cleft lip and palate has generaly been overlooked.

The dominant effect of muscle and connective tissue continuity in dictating arch form is evident from the natural experiments provided by the multiform incomplete bilateral clefts of the lip and palate (Figures 1, 2, and 3). Out of such observations it is possible to develop an alternate argument which states: first, restore muscle continuity and normal vectors of muscle pull and second, deal with the problem of arch symmetry. This argument holds that by restoring continuity of the labial musculature across the midline a new environment is created to mold and guide bone growth. Considering the duration of abnormal vectors of muscle tension during the intrauterine and immediate post-natal period, one should not demand a rapid resolution of the architectural derangement. Our longitudinal records give ample evidence that spontaneous improvement over the longer term does occur without resorting to pre-surgical orthopedic manipulation (Figures 4 and 5).

No pretense is made that this concept of muscle molding is new. Webster (*38*), in his scholarly review of the cleft palate literature, reported on the gamut of concepts dealing with the operative management of the premaxillary bones. He cited Wolff who in 1896 was the first among many to recognize that the pressure of the repaired lip generally sufficed to retro-

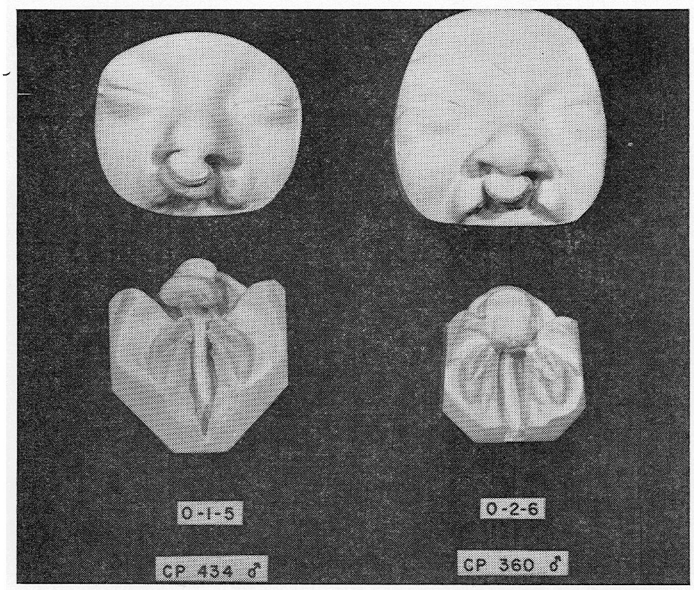

FIGURE 2. Two cases of unoperated bilateral cleft lip and palate. Case ⁂434, complete cleft of the lip, age 1 month, 5 days. Case ⁂360, symmetrically incomplete cleft lip, age 2 months, 6 days; note containment of the premaxilla within the maxillary arch.

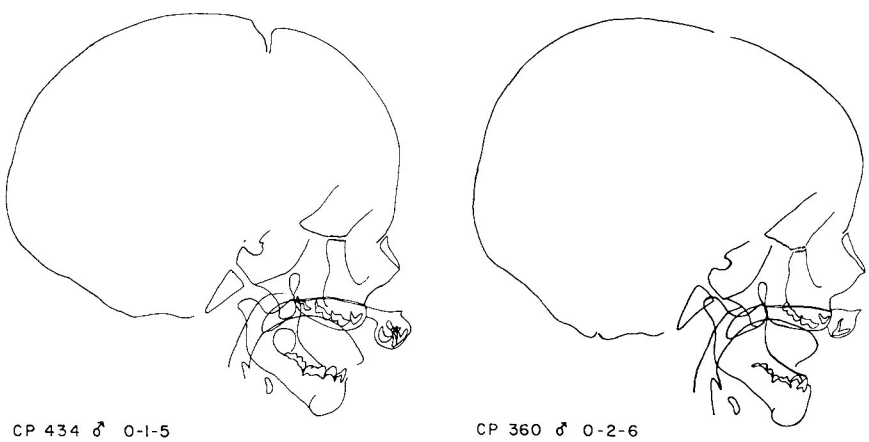

FIGURE 3. Tracings of lateral cephalometric x rays of cases shown in Figure 2. Note variance in convexity of facial profile produced by projection of premaxilla in the complete bilateral cleft lip, case ⁂434, demonstrated in Figure 2.

position the premaxilla (Figure 6). For this reason, many cautioned against promiscuous sectioning of the vomer.

In view of the spontaneous retropositioning of the premaxilla that follows lip repair, there is reason to question the necessity of pre-surgical orthopedic manipulation. Perhaps the McNeil School would counter by

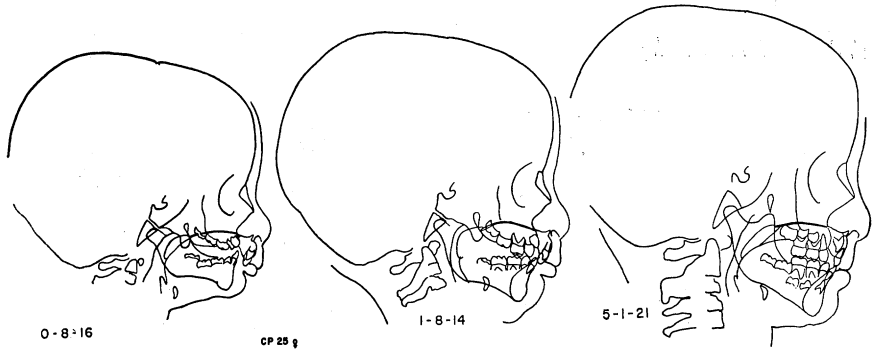

FIGURE 4. Tracings of lateral cephalometric x rays of a complete bilateral cleft lip and palate. Tracing of left, age 8 months and 16 days, obtained several months following repair of the lip. No other surgery was undertaken between 8 months and the tracing shown at the right, at age 5 years. Note the striking and spontaneous improvement in the skeletal profile.

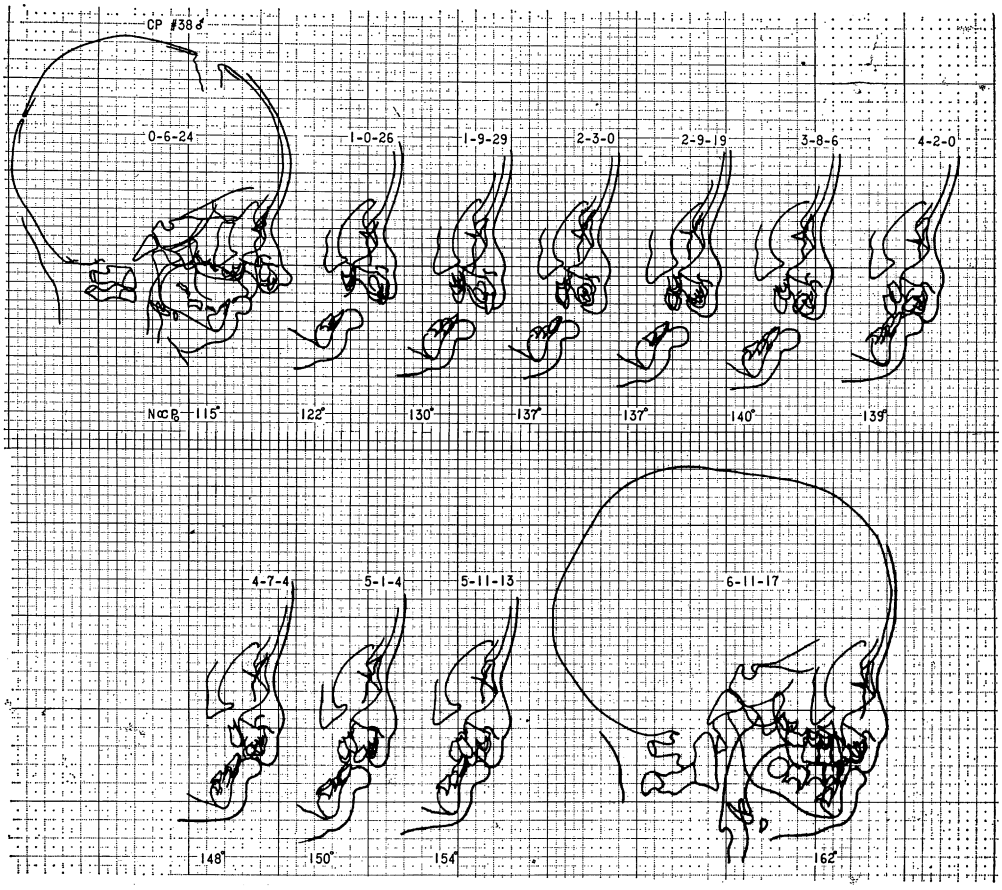

FIGURE 5. Serial tracings of cephalometric x rays on a complete bilateral cleft lip and palate. For various reasons, cheiloplasty was delayed until after the age of 7 months. The angle of convexity (nasion to alpha, most anterior point on the premaxilla, to pogonion) increased from 115 degrees, prior to lip repair, to 162 degrees at age 7. No manipulation or sectioning of the premaxilla or vomer were attempted. (From S. Berkowitz, M. S. thesis Univ. of Illinois, 1959. Part of a larger study on the bilateral cleft in preparation by Berkowitz, Pruzansky, and Rubin.)

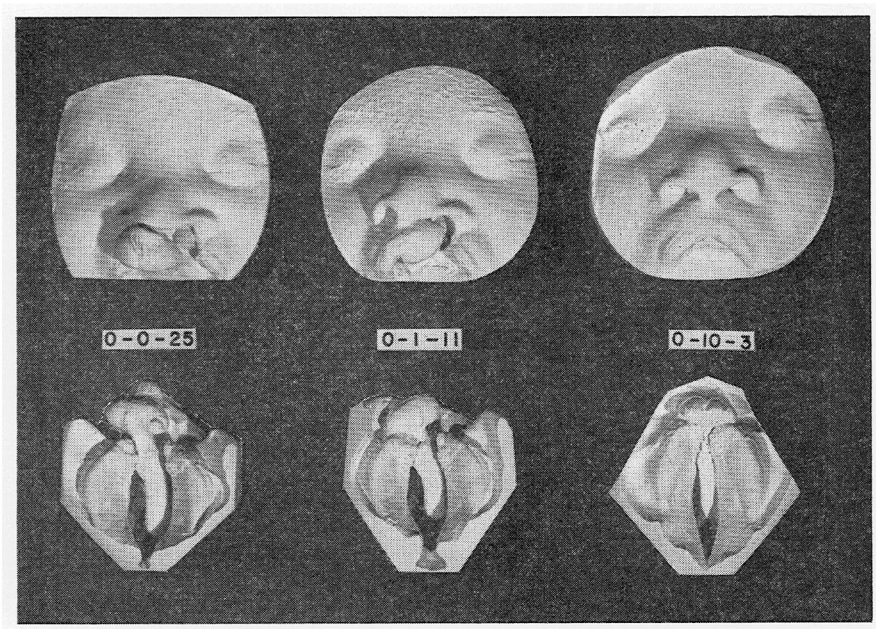

FIGURE 6. Serial casts illustrating the changes in arch form consequent to two-stage cheiloplasty without pre-surgical manipulation of the palate, or section of the vomer.

insisting that they can control or hasten the process. Indeed, McNeil writes (*17*),

> . . . there is more tendency for the premaxilla to move distally as a whole into a position which satisfies anatomical requirements to a greater degree. (p. 194)

Presumably, he is able to achieve bodily movement without tilting the premaxilla. But how is this possible?

Several mechanisms exist by which orthopedic movement could move the premaxilla backward without tilting. First, by resorption of bone; second, by sliding the premaxilla along the premaxillary-vomerine suture, or else, by bending the septum itself and foreshortening the projection of the premaxilla. McNeil doesn't tell us how this takes place. Deus ex machina!

Roentgencephalometric studies in our clinic have provided insights as to the mechanism by which the premaxilla may be 'fitted' into the arch. It is largely by a process of flexion of the premaxilla upon the vomer with the premaxillary-vomerine suture serving as the zone for such accommodation. To supplement these investigations and to provide added insights, metallic implants are being inserted on either side of the premaxillary-vomerine suture according to the method of Bjork (*3*).

Inspection of the casts and dentition of patients subjected to the McNeil method has led this writer to conclude that no bodily movement of the

premaxilla takes place but only a tilting of the bone much as occurs following lip repair.

Since the McNeil School argues for a regulated molding of the maxillary components and the dissent favors a laissez-faire approach, the former may cry foul and accuse us of showing the exceptions to the rule and not demonstrating the cases that have gone sour. Particularly the bilateral clefts in which the premaxilla continues to project far forward of the facial profile when the child has reached school age.

In the interests of fair play, let it be noted that not all of our patients end up as models of perfection. In fact, we make no claim that our end results are better or even as good. The reasons for success or failure are multifactorial and not always related to the surgeon or to the surgical procedure employed. What does concern us here are the biological mechanisms by which success or failure are achieved. Only as we come to understand these mechanisms shall we be able to prescribe treatment on an individual basis, with greater assurance of success and without falling prey to the fashions of the moment.

The successful cases from our study are by no means exceptions to the rule. But even if they were exceptions, they would merit attention. The history of science is replete with examples of fundamental discoveries simply because someone did not ignore the exception.

Why is it that some premaxillae continue to project following lip repair and others do not? Two cases, operated upon by similar methods have been selected to illustrate the influence of variables beyond the control of the surgeon (Figures 7, 8, and 9). It will be noted that the integrated growth of the entire face is important in a resoultion of the profilar deformity. In the instance where the end result was unfavorable, the premaxilla grew more, the body of the maxilla grew less, and the forward projection of the mandible which could have contributed to a reduction in facial convexity was less than the other case. All of these variables are beyond the surgeon's influence. Would McNeil's method have succeeded under such disadvantageous circumstances?

Underdeveloped Maxillary Shelves. The supposition was made that the maxillary shelves were underdeveloped, but no proof was offered in behalf of this contention (*7, 8*). How can this theoretical supposition be recogciled with the documented evidence to the contrary? About 20 years ago Peyton (*20, 21*) reported on measurements of casts obtained on 91 normal children and 57 children with congenital clefts of the lip and palate. He concluded that

> ... cleft palate consists not of an underdevelopment of tissue but of an abnormal displacement of the fully developed parts of the palate. It was also demonstrated that there is no tendency for the deformity to increase after birth. (*20*, p. 1046)

Which shall we accept, conjecture or fact? And are we willing to impose

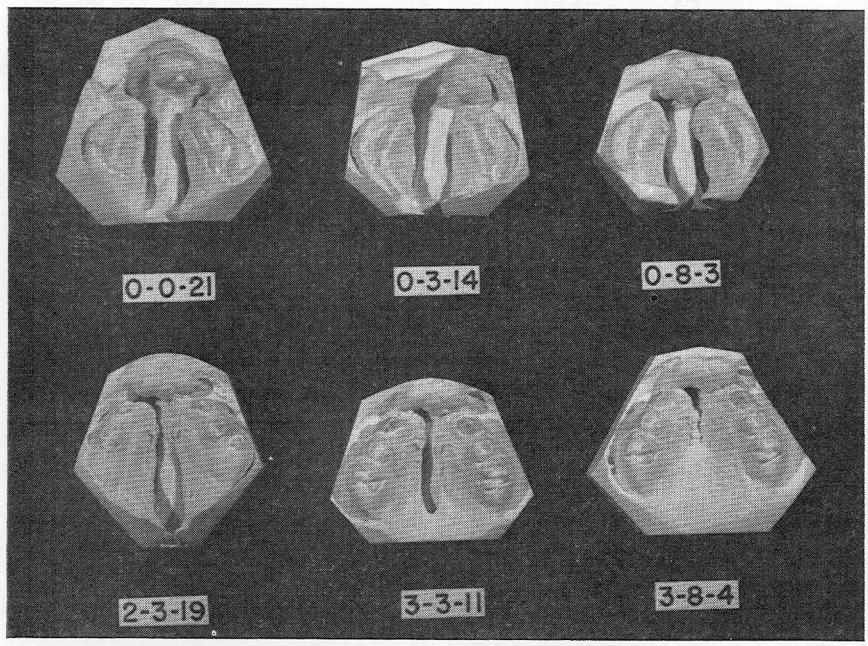

FIGURE 7. Serial casts of complete bilateral cleft lip and palate illustrating two-stage lip repair and two-stage repair of soft and hard palate, from age 21 days to age 3 years, 8 months and 4 days.

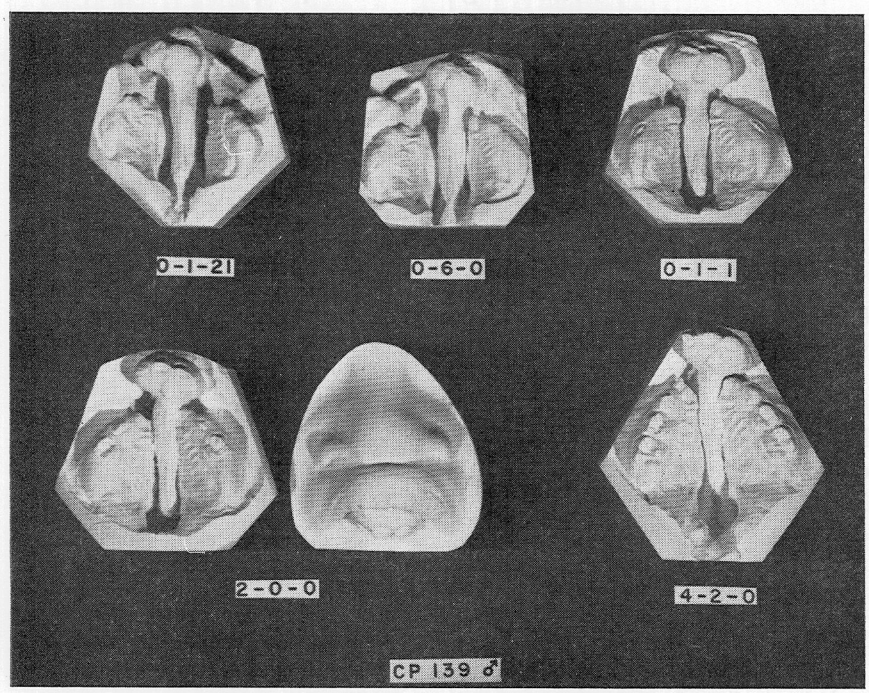

FIGURE 8. Serial casts of complete bilateral cleft lip and palate illustrating two-stage lip repair. Compare arch form with that of patient illustrated in Figure 7. Note disfigurement of upper lip and nose revealed in facial mask obtained at age 2.

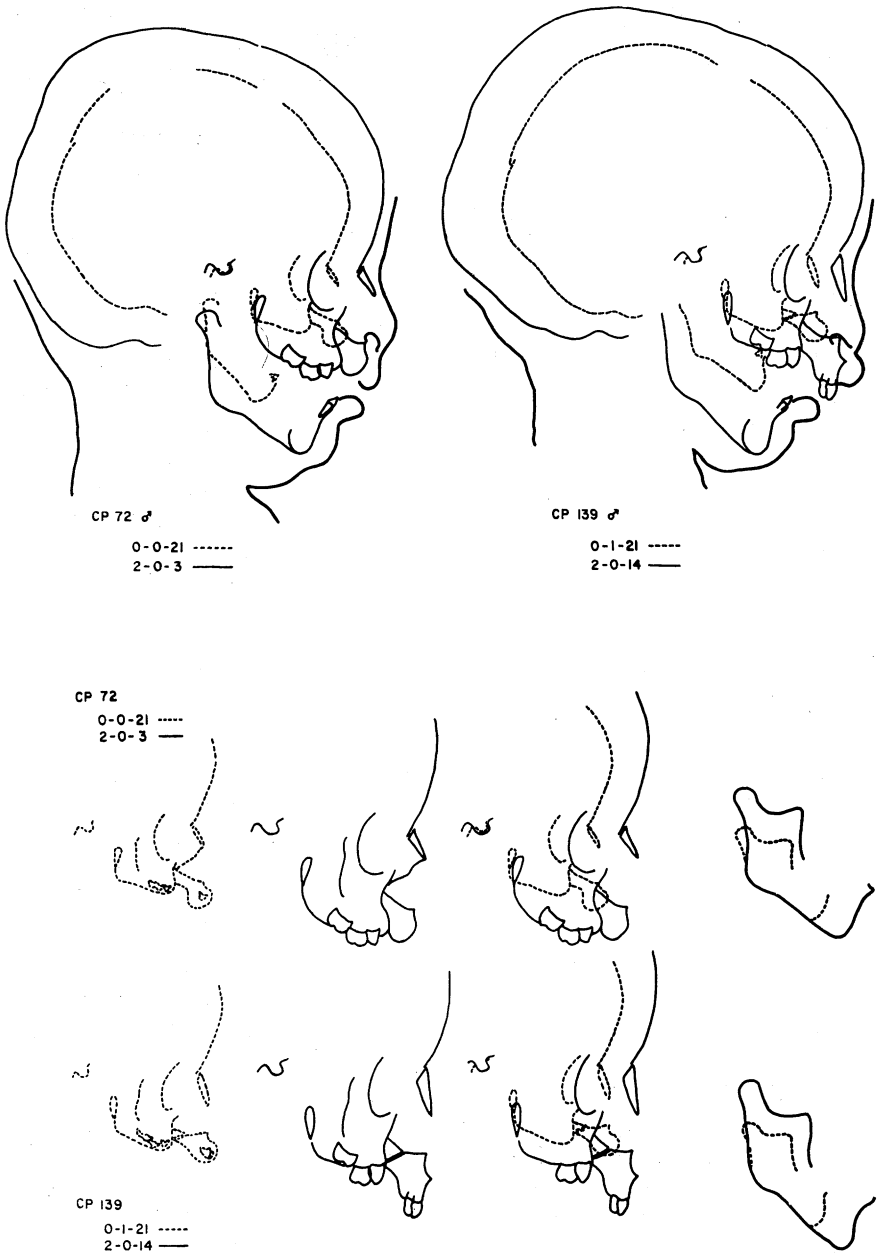

FIGURE 9. Roentgencephalometric analysis of the cases illustrated in Figures 7 and 8. Upper, superimposed tracings of headplates obtained at 1 month and 2 years of age. Lower, separated tracings of maxilla and mandible. In contrast to case ℵ72, case ℵ139 showed more growth in the premaxilla, less growth in the body of the maxilla, and less forward growth of the mandible. The overall pattern of facial growth minimized the deformity in case ℵ72, but aggravated the problem in case ℵ139.

a time-consuming and expensive procedure on conjecture when the facts point in an opposite direction?

WHERE ARE THE CONTROLS? It is axiomatic that every scientific experiment should provide for controls. Since the McNeil School failed to do so, we shall draw on our own experience to answer three questions: a) In a complete unilateral cleft of the lip and palate, what happens following repair of the lip? b) What are the long term effects on the occlusion and on facial growth? c) Do these findings justify pre-surgical orthopedic manipulation, make them unnecessary, or even detrimental?

In all instances, repair of the lip results in a narrowing of the cleft throughout its antero-posterior length. The greatest amount of narrowing takes place anteriorly at the alveolar processes. Frontal cephalometric x rays have revealed concomitant narrowing of the nasal cavity on the side of the cleft. Coronal laminagraphic sections at the level of the pterygoid plates gave evidence of an appreciable narrowing in the width of the nasopharynx (*36*).

Although all cases demonstrated approximation of the palatal segments, considerable variation in the amount of narrowing was noted. With respect to the alveolar process relationship, three general patterns were noted: overlap, formation of a butt joint, and approximation without contact (Figure 10).

If these same cases are observed over a longer period of time, including palatal repair, the cases demonstrating initial overlap may increase somewhat. Cases demonstrating a butt joint contract may maintain this relationship (Figures 11 and 12) or demonstrate some overlap. Cases failing to contact in the region of the alveolar process may eventually do so, or else succeed in further narrowing the gap with the eruption of the cuspid adjacent to the cleft (Figure 13).

The question basic to the raison d'être for the McNeil method is what percentage of cases react in which way and how can we predict this in advance? For if a butt joint alveolar contact will occur spontaneously, what justification is there for the entire falderal of pre-surgical maxillary orthopedics?

Swoiskin (*37*), reporting on a sample of 28 cases with unilateral clefts and full deciduous dentitions from our clinic, observed complete unilateral buccal crossbites in only five cases. In a larger series of complete unilateral cleft lip and palate currently under review by the author, preliminary findings revealed that 37% of the cases showed no crossbite and 40% experienced complete buccal crossbite on the affected side. The remainder showed varying degrees of incomplete crossbite.

Since a significant number of patients do not develop crossbites at all, is there justification for treating all patients by pre-surgical maxillary orthopedics and bone grafting? In our judgment, there is none. Moreover, the malocclusion present in the preschool child can be readily, quickly, and less expensively treated by simple expansion procedures (Figure 14).

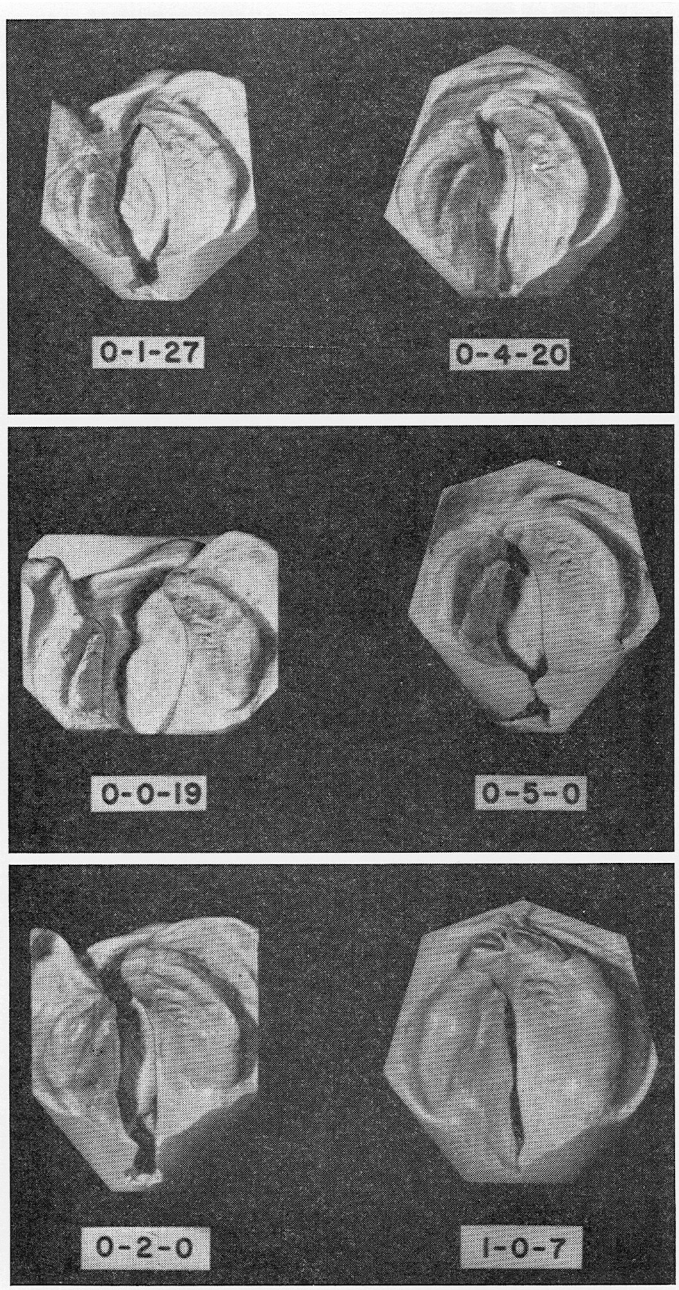

FIGURE 10. Effects of cheiloplasty on arch form of complete unilateral cleft lip and palate. Upper, approximation without contact at alveolar process. Middle, formation of an end-to-end contact. Lower, overlap of segments. In all instances, the cleft was narrowed throughout its antero-posterior length.

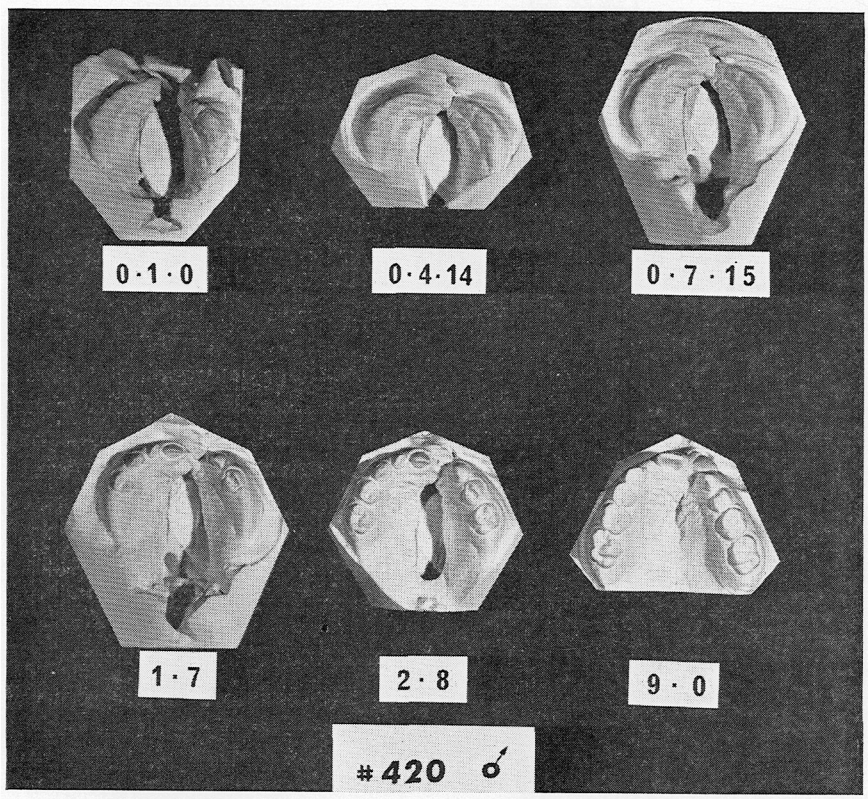

FIGURE 11. Case #420. Complete unilateral clept lip and palate. Initial cast, at age 1 month was obtained prior to lip repair. Serial casts extending to age 9 years, reveal velar closure and subsequent palatal repair. Note symmetry of arch form throughout deciduous dentition. The result simulates that produced by pre-surgical maxillary orthopedics and bone grafting.

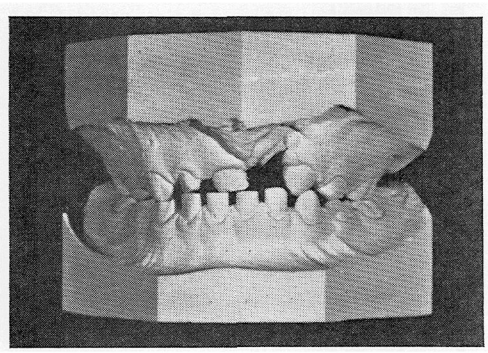

FIGURE 12. Case #420. Occluded casts at age 2 years and 8 months. Note slight cross-bite of deciduous cuspid on affected side.

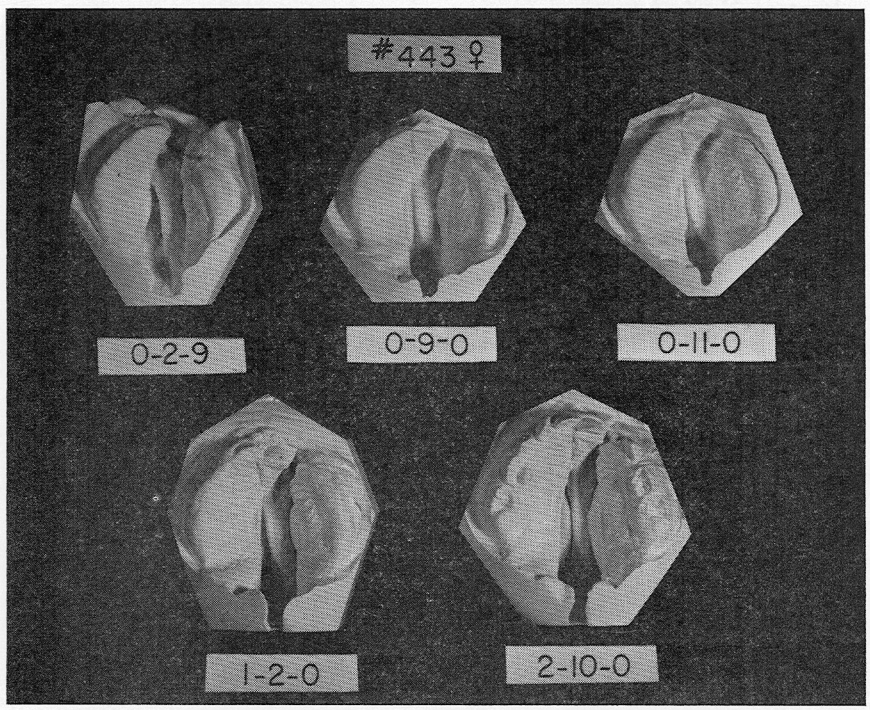

FIGURE 13. Serial casts of complete unilateral cleft lip and palate. Note progressive reduction in the width of the alveolar cleft from age 9 months to 2 years and 10 months. Is the mesodermal deficiency diminishing?

COLLAPSED ARCHES. The anxiety over arch form reflects a peculiar intellectual myopia which makes it impossible for some to see beyond the patient's occlusion.

What are the priorities of surgical care in cleft lip and palate? First, to repair the lip. Second, to produce an effective velopharyngeal valve as early as is possible. The ability to produce such a valve is dependent upon several variables. Without implying that width of the nasopharynx, or length of the velum, or width of the cleft at the level of the tuberosities are the dominating factors, two findings regarding these variables deserve notice.

The skeletal nasopharynx in individuals with unoperated clefts is wider than in normal individuals of similar age (*36*). Unpublished data in our laboratory demonstrate a direct correlation between the width of the arch at the level of the tuberosities, the width of the cleft, and other items, with the width of the bony nasopharynx. It has also been demonstrated that with the medial movement of the maxillary shelves following cheiloplasty, there is a concomitant narrowing of the bony nasopharynx.

Insofar as velopharyngeal valving is concerned, that which is being

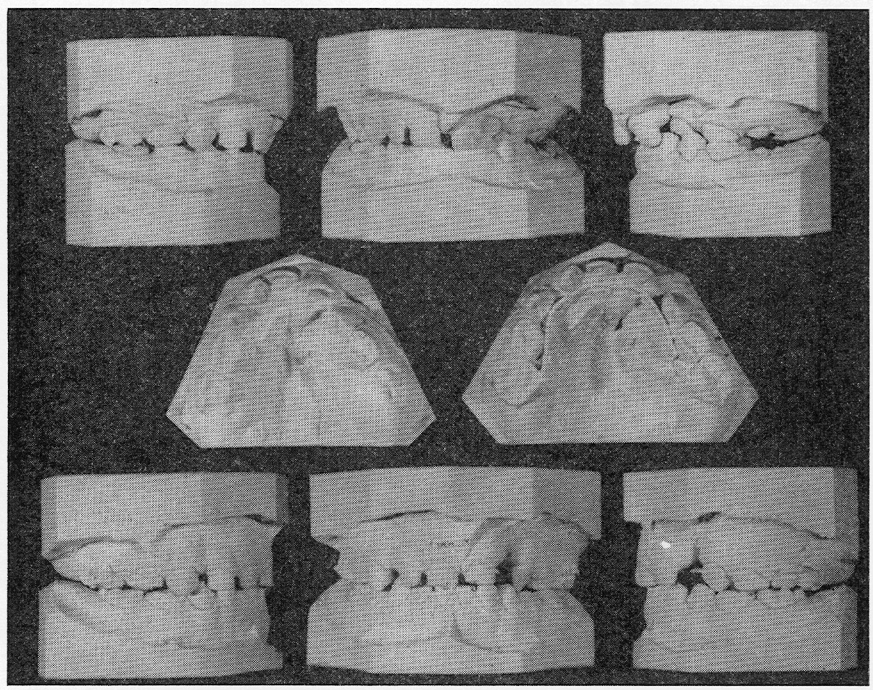

FIGURE 14. Results of orthodontic expansion for correction of unilateral buccal cross-bite in the deciduous dentition of a preschool age child. Upper, series of articulated casts, prior to treatment, demonstrate repaired complete unilateral cleft lip and palate. Middle, palatal view before treatment and following treatment with fixed lingual retainer in position. Lower, articulated casts following treatment. Expansion treatment, such as illustrated, has been achieved in as little as 6 weeks.

lamented by the McNeil School turns out to be a blessing in disguise. If maxillary collapse narrows the cleft, reduces the width across the tuberosities, lengthens the soft palate, and thereby facilitates velopharyngeal reconstruction, why prevent it? To establish normal velopharyngeal valving at an early age by surgical means would mean more to speech development than wearing a dirty piece of plastic that obturates only the cleft in the hard palate. I suspect the former would be more physiologic, too,

But what of the malocclusion produced by the collapsed arches? Isn't that going to take a great deal of time and money to correct? And what of the irreversible damage to the growth process?

Taking the last question first, it has become increasingly clear that the damage to maxillary growth lamented a decade ago was largely the by-product of surgical practices no longer in vogue in the larger centers in this country. The present generation of treated patients does not present the maxillary deformity that was untreatable by conventional orthodontic means. In fact, many of our patients will not require any orthodontic treatment or a minimal amount for the purposes of rotating teeth adjacent to the cleft.

Nor does collapse of the arches preclude rapid, complete, and relatively inexpensive correction of arch form in the deciduous, mixed, or permanent dentition.

The economics of protracted inpatient care by the McNeil method should not be disregarded when there are limited funds and higher priorities for health needs. On an outpatient basis, too many visits to the clinic are required and this restricts the service to residents of larger metropolitan areas. The cost to the family, in terms of baby sitters for other children at home and the loss of a day's wages for the breadwinner required to transport the baby to the clinic, is seldom taken into consideration by the enthusiasts for the McNeil technic. Compared to the above, the costs for orthodontic care provided at a later age on a private practice basis seem cut-rate.

The Challenge for the McNeil Method

The real opportunity for pre-surgical maxillary orthopedics is in producing medial approximation of the exceptionally wide clefts where the maxillary processes are displaced laterally. Most of these rarer cases are restricted to clefts of the secondary palate. This is where a real service might be provided.

Summation of Arguments: Pre-Surgical Orthopedics

FOR. Dominance of the nasal septum as a growth force.

AGAINST. Fails to consider role of musculature in guiding growth.

FOR. Deficient maxillary shelves.

AGAINST. Where is the evidence? Proof to the contrary in Peyton's controlled study.

FOR. Facilitates lip repair and alar reconstruction.

AGAINST. No controls. Excellent results are obtained frequently enough without pre-surgical orthopedics to cast serious doubt on this claim.

FOR. Improves sucking and swallowing.

AGAINST. No documentary proof. No controls. Babies without the McNeil plates seem to prosper quite well, despite the open cleft. Pediatricians have described sucking with the aid of recordings of pressure from the bottle, nipple, and mouth and have analyzed the gross displacements of the hyoid area and thorax. What is needed is more hard work and less bubbling enthusiasm.

FOR. Facilitates speech development.

AGAINST. Easy to claim. Difficult to prove.

FOR. Psychological advantage for the parents.

AGAINST. No documentary proof. No controls. Any gadget which accentuates the baby's structural and functional differences to the parents may be regarded more readily as a psychological disadvantage.

FOR. Excessive medial movement of the maxillary segments ('collapsed arches') is an undesirable side effect of cheiloplasty and therefore should be prevented.

AGAINST. To the contrary, collapse of the arches may be regarded as desirable in that it facilitates velopharyngeal reconstruction. Pre-surgical orthopedics inhibits such collapse and thereby may retard velopharyngeal correction at an early age.

FOR. Minimizes need for orthodontic treatment.

AGAINST. No controls for comparison. Maxillary collapse is fully, quickly, and economically correctable in the deciduous, mixed, or permanent dentitions. The economics of the McNeil method, whether on an inpatient or outpatient basis, pose an added disadvantage except under government subsidy. There is no justification to date for government or private support for such treatment except under the most carefully controlled experimental circumstances.

Bone Grafting

Since a review of the literature on autogenous bone graft for closure of the alveolar cleft has been presented elsewhere (*13*), references will be made only to those papers which relate to the theoretical arguments in behalf of the operation. It is critical that a distinction be made at the outset between bone grafting as a primary procedure as opposed to its utilization as a secondary procedure following orthodontic expansion in the adult dentition. The present discussion is confined to bone grafting as a primary procedure in the infant.

The arguments mobilized in justification of bone grafting parallel those previously cited for pre-surgical maxillary orthopedics. Since the two procedures are frequently used in combination, their separate discussion may be arbitrary even though it facilitates analysis. To avoid excessive duplication, emphasis will be placed only on the theoretical arguments essential to the bone grafters.

THE CONCEPT OF MESODERMAL DEFICIENCY. Brauer, Cronin, and Reaves (*5*) in explaining their enthusiasm for bone grafting wrote "... that the patient with a complete cleft usually has an absence of important bone and soft tissue in the region of the cleft." They cite as their authority the 1954 paper by Stark (*33*) based on a study of six embryos from which he concluded "... it appears that anomalies of harelip and cleft palate involve quantitative deficiencies of mesoderm."

The concept of mesodermal deficiency seems to be the primary theoretical argument for bone grafting to the alveolar region. The same concept has been invoked by Stark and DeHaan (*34*) to justify the addition of a pharyngeal flap to primary palatoplasty.

Since so much is based on this concept of mesodermal deficiency, it deserves critical examination. Stark's conclusions are drawn from a study of six embryos—dead embryos. And as was once said that the skull of a dead child was not necessarily the skull of a healthy growing child, so may it be said that Stark's dead embryos are not necessarily the same as embryos that go on to term—even embryos with clefts.

Although the dissent would not question the presence of mesodermal deficiencies in varying degrees, it does protest the static appraisal that goes with it. Is it not possible that the mesodermal deficiency, in absolute and relative terms, can change as a function of time? This point seems to be totally ignored.

Yet there are many examples drawn from post-natal development to support the contention that deficiencies can diminish with growth. For example, roentgencephalometric measurements have demonstrated a relative and absolute diminution in the size of a congenital defect in the cranium (*27*). And isn't cranium bifidum a mesodermal deficiency? Do hypoplasias of the mandible represent mesodermal deficiencies? Yet note the remarkable capacity for recovery exhibited by so many cases of Pierre Robin Syndrome.

Getting closer to the subject, what about the great number of patients with clefts who have matured with excellent arch form, good occlusion, and good faces, despite the failure to employ the technics under discussion. We are observing an increasing proportion of such cases each year in our clinic and I doubt that we are unique in this respect. Or can it be that surgeons have become so ego-involved in their technics and the desire to amass large number for impressive clinical reports that they refuse to see the facts before them?

Other Arguments. Bone grafting contributes to the continuity of the alveolar arch and prevents transverse compression following cheiloplasty. This aids in development and obviates the need for orthodontic treatment. It facilitates reconstruction of the base of the nose, improves the contour of the lip, and closes off anterior fistulae.

The Rebuttal

Fashions come and go for ladies, scientists, and plastic surgeons, too. There was a time when the Abbé flap was recommended as a primary procedure for bilateral cleft lips. The immediate result was quite attractive. However, anyone with experience in these matters could have guessed the long term result.

But the impulse to make things right and complete as soon as possible, while laudable and understandable, was not always in keeping with the facts of growth and development.

To immobilize the premaxilla or other segments by a bone graft prohibits manipuation of these same segments at a later date. The surgeon cannot be sure that he has placed the infant bones in proper alignment. To produce fixation without reduction is a violation of basic principles in orthopedic surgery. Reduction requires manipulation in three planes of space. This can be achieved only by an orthodontic technic utilizing multiple bands on erupted teeth.

One patient with a complete bilateral cleft lip and palate, out of many similar cases, was selected to illustrate the advantage of being able to

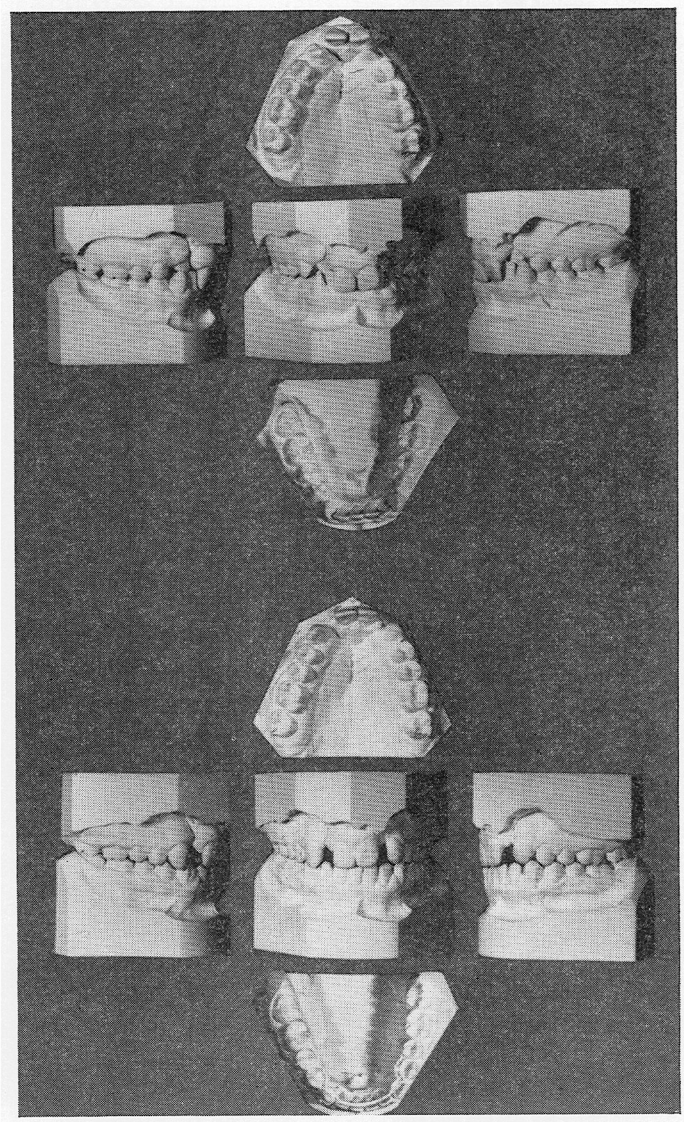

FIGURE 15. Repaired complete bilateral cleft lip and palate with mobile premaxilla. Upper, before orthodontic treatment. Note adequacy of tissue, arch form, and relatively minimal degree of malocclusion. Lower, following removal of appliances. Bodily movement of premaxilla, verified by cephalometric analysis, facilitated reduction of overbite and realignment of segments.

manipulate freely movable segments (Figure 15). Premature fixation would have prohibited bodily movement of bony segments.

The author has observed that the insertion of alveolar bone grafts, especially where expansion preceded grafting, produced and maintained

excessively wide clefts in the posterior region. The possible detrimental effects of such widening has already been discussed.

Finally, the use of autogenous grafts are not without the hazards of pleural puncture when rib is used or pathological fracture or scarring when tibia is employed. The incidence of such accidents and even deaths have not been fully advertised. Are such risks justified for an elective procedure of doubtful merit?

The removal of a rib cannot be regarded as an innocuous procedure as some surgeons argue. Any student of the Old Testament can testify that this operation can be of considerable consequence for man.

Secondary Bone Grafting

When the adult dentition has erupted, and orthodontic treatment is completed at about age 13, then it becomes possible to determine whether that individual is indeed deficient in tissue mass at the alveolar process. In such instances, the author endorses bone grafting. However, such cases seem to be in the minority.

Summation of Arguments: Bone Grafting

FOR. Mesodermal deficiency.

AGAINST. A static concept that does not allow for change as a function of growth and development.

FOR. Prevents malocclusion.

AGAINST. Many cases do not need orthodontic treatment. The majority can be treated by conventional procedures.

FOR. Closes off anterior fistulae. Binds the segments and prohibits their orthodontic manipulation at a later age.

AGAINST. Produces and maintains excessive width of the cleft posteriorly, a disadvantage to velopharyngeal reconstruction. Potentially hazardous operation (pleural puncture, pathological fractures of tibia, scarred leg) not warranted for an elective procedure of dubious merit.

False Premises and Therapeutic Folly

Certain errors of historical interest are pertinent to this discussion because they relate to problems of arch form and the influences of surgery on growth and development of the jaws.

It seems only yesterday that Brophy's methods of jaw-compression by wiring were so roundly condemned. Now the style is jaw-expansion with the fashion for jack-screws and spring-plates. The confounding aspect of it all is that nearly the same reasons invoked by Brophy for jaw-compression now seem perfectly suited to justify jaw-expansion!

In 1923, Brophy (*6*) restated his conviction

> ... that an adult, growing up with a cleft palate, has not the full complement of tissue that forms a perfect palate since this tissue has failed to develop in proportion to other parts, as it has not been subjected to the uses

> for which it was intended. Besides, the tuberosities spread which contributes to the shortening of the palate. Hence, the importance of closing the cleft and putting the palate in use in early infancy. (p. 131)

The principal error of Brophy's reasoning stems from the following erroneous interpretation of the consequences of cheiloplasty in a complete unilateral cleft lip and palate

> ... following closure of the cleft lip, the alveolar borders of the anterior extremity of the cleft, by reason of traction of m. orbicularis oris, gradually approach each other.... The malar bones act as pivots and the posterior processes, the tuberosities, move farther part, and the cleft is widened. (p. 132)

To prevent the abnormal separation of the tuberosities that Brophy incorrectly visualized, he formulated a technic for approximating the separated bones prior to repair of the lip and nose.

In an excellent review of cleft palate growth studies during the past decade, Subtelny (*35*) pointed out that as a result of investigations on a biased sample of mutilated cases which reflected the practice of a past generation, the conclusion was drawn that all palatal surgery was detrimental to the growth process and that surgery had best be delayed pending completion of a major portion of maxillary growth. The author rejected these conclusions when applied to current surgical practice. In fact, it was pointed out that surgery could actually aid and direct natural developmental processes through the re-establishment of more normal muscle forces.

The lessons of history are forgotten too soon and we come full circle once more to stumble in the same darkness.

The Concept of Functional Orthopedics

It may be fruitful to consider certain concepts which prevail in European orthodontic circles and which provide the soil in which pre-surgical maxillary orthopedics and bone grafting can take root and flourish.

One of the elder statesmen of European orthodontics put it quite succinctly in characterizing the difference between German and American orthodontists in their approach to clinical problems. He wrote that German orthodontists attempt to promote growth by profoundly stimulating development.

While it is not within the province of this paper to examine all of the arguments relating to the theoretical basis for functional orthopedics, suffice it to say that its proponents are committed to search for the mechanotherapy that will achieve their purpose of growing bone. For example, Baume, Haupl, and Stellmach (*1*) reported on the histology of the temporomandibular joint in a case of Pierre Robin Syndrome which was treated by a traction device wired to the symphysis of the mandible. Although the authors acknowledged the findings from our clinic that prolific mandibular growth in the Pierre Robin mandible does occur in the ab-

sence of artificial functional stimuli (*2, 28*), they insisted that the orthopedic appliance induced significant transformations in the joint beyond those which would have occurred naturally during this growth stage.

Between the lines in the literature from Europe on the newer treatment debated herein, one can read the influence of the functional orthopedic school of orthodontics. Instead of expending their energies in understanding more about the natural post-natal development of cleft lip and palate, they continue in search of the prosthetic or surgical touchstone that will transform cleft palates into normal palates overnight.

Summary and Conclusion

A review of the literature on pre-surgical maxillary orthopedics and primary bone grafting that has emanated from abroad, and particularly that developing in the United States, has created a profound sense of anxiety that enthusiasms have advanced far beyond the facts available to support the clinical claims. For this reason, an argumentative dissent was undertaken to provoke doubt, engender deliberation and compel documentation.

It was noted at the outset that writing a dissent would be no simple task. The clinician aboard a band wagon cannot be readily halted and made to intellectualize or take scholarly inventory of his position. He has too much at stake. There is the investment in learning a new and difficult technic; perhaps university space and a large research grant are involved. Too many papers are written in haste, or a gerrymandered reputation is now under dispute. Does this paper inpugn the motives of men of good faith? Not necessarily. At worst, it is an angry Jeremiad or a commentary on human foibles. At best, it echoes Alexander Pope's caution, "Be not the first by whom the new are tried, nor yet the last to lay the old aside."

The means for quantitative documentation are available and must be utilized if there is to be meaningful communication among clinical investigators. A new drug cannot be marketed unless it meets certain precautionary tests prescribed by law. The consumer is protected from commercial misrepresentation by the watchdog supervision of many government agencies. Who is to monitor surgical practice? Hopefully, no one but the surgeon. With respect to the practices reviewed in this paper, certain questions have been raised to challenge the unbridled enthusiasm of innocent novices, misguided sheep, and those who should know better.

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