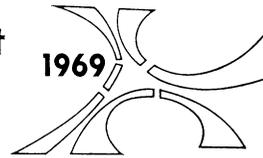


Observations on the Treatment of Unilateral Cleft Lip and Palate



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I wish to examine one of the many aspects of the complex therapeutic problem of cleft lip and palate; namely, the orthodontic treatment indicated for various forms of unilateral cleft lip in the light of surgical criteria. In such cases the surgical treatment is considered essential for early morphological repair, although subject, of necessity, to modifications in the maxillary growth.

Leaving aside the pathogenic viewpoint given to the various forms of cleft lip and palate, from a clinical point of view, it would be interesting to give particular care in the case of unilateral clefts to the form and appearance of the labial and maxillary stumps in relation to the width of the cleft.

Pfeifer (3) observed that it is very important to consider the different contours of the vermilion ridge, adjacent to the cleft, in the various forms of unilateral cheilognathopalatoschisis, as this is in direct connection to the forming process of the cleft.

According to the same author, a wide unilateral schisis can be recognized, as the contour of the labial ridge extends on both sides up to the nasal orifice while the underlying maxillary processes appear widely separated. Pfeifer (3) deduces that the nasal processes in these subjects have probably not come into contact and, for this reason, has labelled them as primary cleft formation; other unilateral forms should be considered as of secondary cleft formation. That is particularly true for those unilateral complete clefts in which the cleft appears to be rather small in width with well-developed labial and alveolar stumps and in which the vermilion is extended into the high middle of the cleft, as this will have developed after the forming of the cupid's bow contour.

It has been demonstrated that, in the primary clefts, the contour of the cupid's bow and the vessels follow a direction which is parallel to the muscular bundle of the labial stumps. The muscular bundles have an arched design, which increases during contraction. In the secondary cleft formation on the contrary, the cupid's bow contour and the muscular

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bundles are interrupted on the cleft. Therefore, in these cases the muscular activity of the lip is similar to the drawing of a curtain.

In the partial unilateral cleft lip, however, in which the cupid's bow contour continues beyond the skin edge underlying the naris, the reduced muscular bundles have an arched direction from one side to the other of the labial margin.

From a morphological point of view, the bone malformation consequent to the cleft is in direct connection to the width of the cleft, which will have a negative influence on the development of the dental edge at this point.

Pfeifer (3) states specifically that the width of the cleft cannot be attributed to intrauterine muscular activity, but he presumes that there is a direct connection to the encephalic growth within the 5th to 10th weeks of embryonic life. In fact, the form of the cleft, the nostril, and the dental edge are consequent to the deviation caused by the skeletal growth to the middle third of the face, and the increase of the alveolar stumps, as well as the orientation of the tooth buds opposite the cleft.

If the mesoderm tissue is poor or absent, the tooth buds develop only to a certain extent or not at all, in which case the evolutive impulse for the bony growth is missing. There may be a relationship then between width of the cleft and the more or less accentuated tooth disorder at the margin of the cleft.

The formation of the palate has been related to the irregular building of the nasal floor. The palatal vault is almost complete when the fetus is 30 mm in length. Therefore, if the width of the cleft really does depend on the time of its formation, the nonclosure of the palate should of necessity be present and frequently observed.

Morphological elements in support of this concept are the infrequent finding of a lateral incisor tooth bud on the edge of very wide unilateral clefts and a marked alveolar process, besides which the medial maxillary process is diverted outwards. The lateral has, however, a tendency to rotate inwards, in a position usually called "collapse", while the maxillary omolateral tuber is deviated in the opposite direction to the outside.

According to Petit and Psaume (2), in the cleft lip and palate with a cleft which is not too wide, it should be possible to distinguish cases presenting hypertrophia of the alveolar process from those cases with a collapse of the maxillary segments. In addition, I think the muscular action of the tongue on the palate cleft should be considered, as well as the interferences caused by the occlusal bite, which sometimes moves in a centrifugal direction. Orthodontic treatment has, in recent years, assumed an important role in the therapy of cleft lip and palate and now a strict collaboration with the orthodontist has been sought by the plastic surgeon: a) presurgical orthopedic treatment of the alveolar segments can be carried out in order to create favorable conditions for

the surgical operation; and b) later orthodontic treatment, which would correct either crossbite of the maxillary dental arch or any dental malposition.

Regarding the former, some authors prefer to initiate orthodontic treatment before the lip repair, while others suggest orthodontic treatment immediately after the surgical correction. In the complete unilateral cleft, I think this latter therapeutic procedure is indicated when there is collapse or an overlay of maxillary segments, as well as in the case of those rather ample forms involving either total or partial outward rotation of the stumps. In all other cases I do not think the orthodontic treatment is very advantageous.

Orthodontic treatment following the lip repair has been seen to resemble a stimulus to the bone growth on the edge of the cleft. The explanation for this is twofold: a) the tongue may have simply been removed from the margins of the cleft, thus eliminating a negative stimulus; b) a further active stimulus may have been given by removable jaw plates.

In the light of present therapeutic treatment of the unilateral complete cleft, Reichenbach and Taatz (5) are of the opinion that presurgical treatment is generally no longer justified in these cases.

Ritter (6) once emphasized that it is always the muscular layer of the lip which provides for a normal repositioning of the alveolar segments. Thus, he confirms the validity of this opinion regarding the wide unilateral complete cleft lip and palate treated with primary osteoplasty, where the reconstruction of the lip is considered the determining factor for the incorporation of a bone graft. This fact, in accordance with the primary osteoplasty, would tend to discourage early orthodontic treatment, which should be necessary only during the mixed dentition period to obtain a better occlusion in the distortion of normal tooth development.

Regarding the control of development in children with unilateral complete cleft lip and palate which had never been treated, either by early orthodontic treatment or with primary bone graft, but only by conventional surgical treatment, Pruzansky and Aduss (4) concluded that the original width of the alveolar cleft should not be taken into account in connection with the dental arch after lip repair. This confirms what I have often observed; namely, that a wide alveolar cleft does not necessarily require a greater amount of tissue in the lip, since less tissue does not necessarily result in a transversal tension which, coupled with scar contraction, causes a collapse of the maxillary arch.

The detrimental effects of a contraction of the lip scar with a resultant collapse have been observed by these authors in 39.5% of their cases, while in 42.4%, there was only a close approach of the alveolar segments with formation of a symmetric arch. In 18.1% an approach without contact has been observed. The detrimental effects of surgical correction of a cleft palate could result in an approach of the maxillary segments

or an asymmetric overlay. Regarding the occlusion of the deciduous teeth, in one-third of the cases, no crossbite is observed. In the other cases, a crossbite of the maxillary deciduous canine tooth appears, while only in the remaining 30% is there a crossbite with palatal displacement of teeth on the anterior and lateral sides.

Therefore, from their experience, Pruzansky and Aduss (4) conclude that the prevention of maxillary collapse before the surgical correction of a cleft palate in the majority of the cases is not necessary. In this they are not in accord with those authors who maintain that there is a necessity for early presurgical orthodontic treatment or primary bone graft.

In the orthodontic treatment of many cleft palate children undertaken in collaboration with the Plastic Surgery Department of the University of Milan, I have noted how the unilateral cleft lip and palate, although always treated with the same surgical technique, and always in the same sequence, (lip repair, surgical restoration of the posterior cleft palate, and surgical restoration of the anterior cleft palate) can vary from individual to individual, independent of primary or secondary type, according to Pfeifer's definition, with variations in growth and very different maxillofacial increments. In fact, while some subjects show a remarkable maxillary width, others have a conspicuous lack of maxillary growth.

In the first type, the maxillary arch is very wide in respect to the mandible and the occlusion is characterized by a deep bite. This has been observed in children already treated for lip repair but with the palate not yet reconstructed or in whom posterior or anterior surgical repair has also been performed. In fact, this remarkable width of the maxilla (with regard to the mandible), already present in the neonatal period, has the tendency to persist also after the first treatment on the lip, and is reduced only a little after subsequent treatments of the posterior and anterior palate (Figures 1 and 2).

In such cases there is no validity to the usual arguments regarding the rigidity of the muscular layer of the orbicular and the detrimental effects of the contracting scar at the level of the soft palate and the hard palate. Neither in the lateral head cephalometric roentgenogram nor in the profile view has there been observed the marked disproportionment of the middle of the face which, if present in cleft lip and palate children, is to be considered a typical underdevelopment of the maxilla with pseudo-progeny. On the contrary, the growth of the skeletal structure in this area seems to follow normal evolution.

From a therapeutic, and especially an orthodontic, point of view, the purpose is not so much to expand or contain the maxilla, as to adjust the proportions of the inferior arch in a sagittal and transversal direction.

In other patients with unilateral cleft lip and palate, one finds however

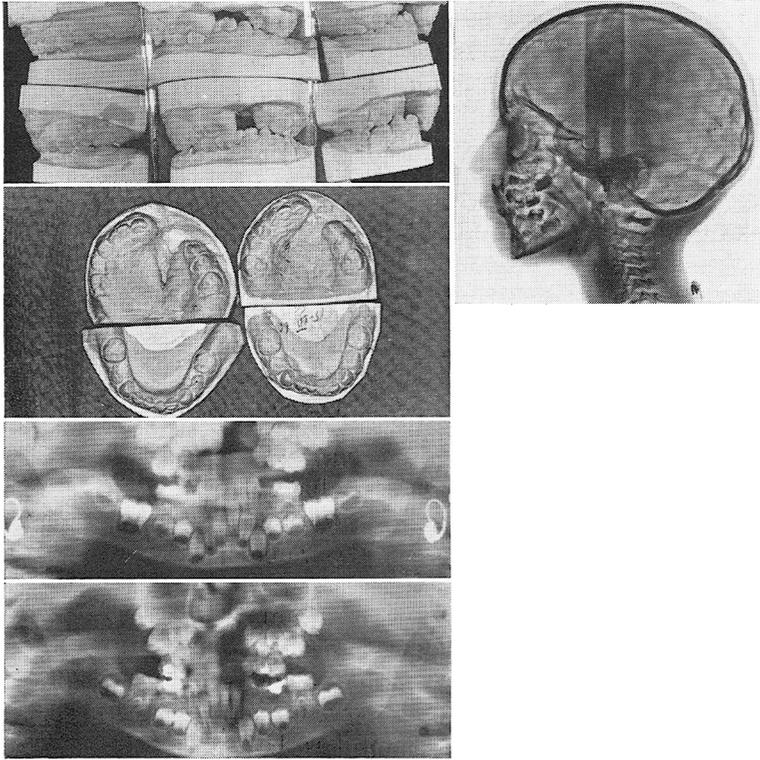


FIGURE 1. Unilateral left cleft lip and palate. The width of the maxilla is revealed by a rotation of the right side of the maxilla outward. The telerradiography performed at the beginning of the orthodontic treatment does not reveal a maxillary underdevelopment, but only a deep bite of the mandible in the second class, which causes, further, an asymmetry of the mandibular arch. By means of the panoramic radiographies performed during the controls, it was possible to study the development of the dentition, particularly at the margin of the cleft, which is always present, despite the sagittal development of the maxilla.

a relatively marked amount of sagittal underdevelopment, with transversal narrowness of the maxillary diameters and evident pseudo-prognathism of the structure of the middle third of the facial skeleton revealed by profile views and, more efficiently, by a tracing of the cephalometric roentgenogram (Figures 3 and 4).

The therapeutic treatment of these cases should be to create a maxillary expansion by orthodontic means, and resorting, if indicated, also to the "serial extraction" at the lateral sides of the mandible. In this connection, the deciduous teeth are extracted to attain a delay in development of the alveolar process and later the permanent teeth are also extracted as does Korkhaus (1), which improves the intermaxillary occlusion without influencing mandibular growth.

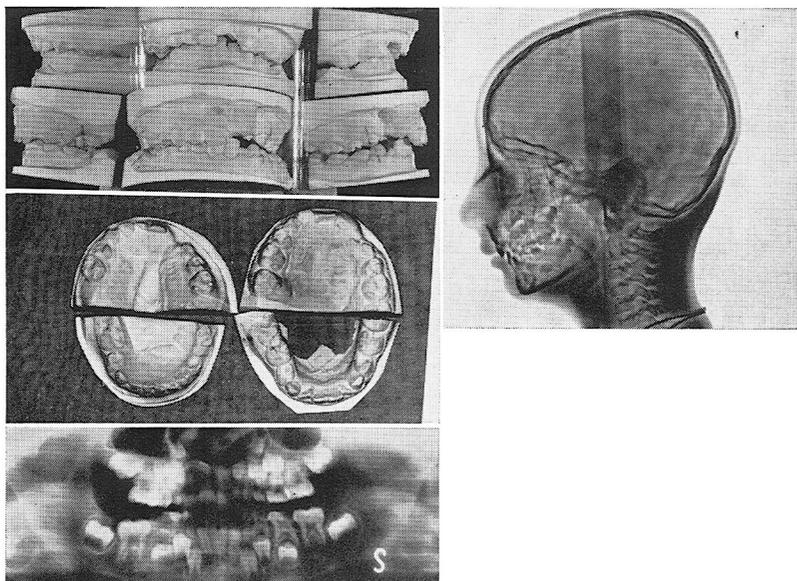


FIGURE 2. Unilateral left cleft lip and palate. At the time of the deciduous dentition the maxilla is very wide and covers the mandible. At the time of the mixed dentition period, this disproportionment is decreased, first as a consequence of scar contraction after surgical restoration of the palate, and second by the growth of the mandible, due to the orthodontic treatment. Teleradiography reveals good development of the maxilla, while the profile of the soft tissues and the occlusion reveal a second class. Panoramic radiography reveals that, as a consequence of the sagittal growth, the margins of the cleft are reduced.

I think that, considering the necessity for "serial extraction", it would be advisable, at the same time, to remove the deciduous tooth and its permanent bud in order to directly delay mandibular development.

The extraction of the first bicuspid teeth must be followed by an orthodontic pushback of the mandibular cuspid and then of the whole frontal group to permit better interlabial connections corresponding to the esthetic and functional requirements.

In cases of more accentuated pseudo-progeny there should at first be an indication, as suggested by Korkhaus (1), of a combined action for contention of the jaw with a "Kinnkappe" and for maxillary elastic tension acting directly on the mandibular bone and indirectly as a growing stimulus on the cranial-maxillary suture. Osteotomy of the vertical or horizontal rami should be taken into consideration after 20 years of age.

If the tongue is too large and disproportionate for the available space in the oral cavity, which presents a reduced width, it will necessarily require surgical reduction by cutting a cuneiform portion which will also give an easier muscular pressure at the mandibular arch.

Therefore, in my opinion, the treatment plan should be as follows.

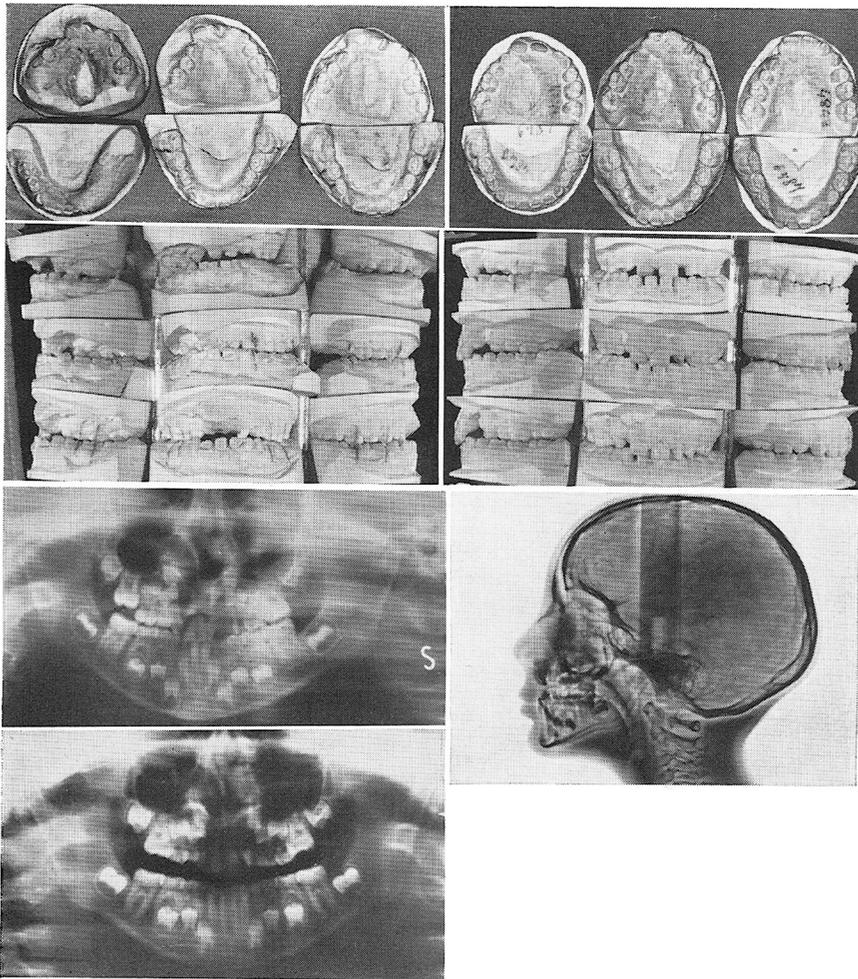


FIGURE 3. Unilateral right cleft lip and palate, with crossbite and underdevelopment of the maxilla, which are evident in the profile radiograph. Orthodontic treatment was begun at the age of 6 years in order to obtain a sagittal and transversal maxillary expansion and terminated in a normal occlusion (lower right). Panoramic radiographs were performed at the beginning of the orthodontic treatment and again after two years. From those films, it is possible to compare the maxillary growth and the development of the permanent dental buds at the margins of the cleft. The width of the cleft appears reduced. Plaster models were made at the ages of 2 years, 6 years, and then annually during the treatment (from top left to bottom right).

In the unilateral cleft lip and palate with abundant or sufficient tissue, surgical correction of the posterior and anterior cleft palate could be effected at the same time without danger of a detrimental effect from the contracting scar. Should such contraction occur, it would be considered favorable to the growth of the maxilla, which follows.

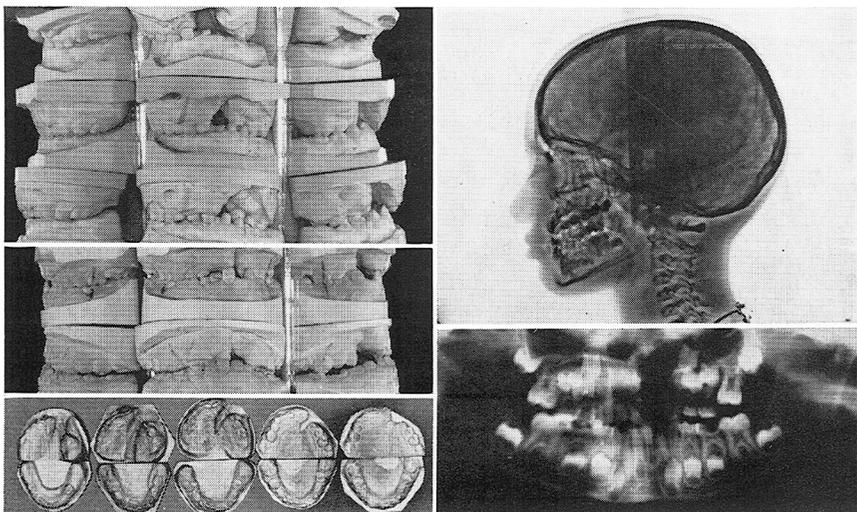


FIGURE 4. Unilateral left cleft lip and palate. Shown is a series of plaster models corresponding to the various stages of surgical and orthodontic treatment. The maxilla with wide cleft presents a normal occlusion on the right side; the left cuspid is in crossbite. Successively, after the surgical correction of posterior and anterior palate, in spite of the maxillary growth in a sagittal direction, a crossbite developed in the front of the maxilla. The teleradiography reveals a marked underdevelopment of the third middle of the facial skeleton, particularly in the front area, due either to dysmorphosis or to scar contraction.

On the other hand, orthodontic treatment should be undertaken with prudence in order to avoid creating a more marked malocclusion. One could even say that this is unadvisable, if the treatment is intended to expand the superior arch.

In the unilateral cleft lip and palate with a rather marked maxillary contraction, one may find a contracting scar on the orbicular muscle which certainly has a negative influence on the essential growth centers and on the suture of the middle third of the facial skeleton. In such cases, the greatest possible delay is suggested before surgical closure of the anterior palate in order to avoid later collapse of the maxillary segments.

Orthodontic treatment, on the contrary, should be planned and effected as quickly as possible on the lateral as well as the anterior side in order to bring the superior arch into a normal occlusion and also to stimulate the development of the periosteal bone at the edge of the cleft.

With this therapeutic plan, which does not exclude a primary bone graft, the orthodontic treatment should be delayed until preschool age.

In my opinion, there is no plausible reason for early orthodontic treatment on the still totally or partially edentate alveolar edges. On the contrary, a periodic check-up of children is both necessary and more useful for better control, particularly of the somatic growth of the middle third and lower part of the face.

The partial mobility of the maxillary stumps and the instability of

their position are not conducive to maintaining the results obtained with early orthodontic expansion during the postsurgical period even though limited to a very few days. Therefore, owing to the easy and possible establishment of maxillary expansion during the preschool and school ages, that is, when lip repair and surgical restoration of the posterior palate have already been made, orthodontic treatment should be performed when the cooperation of the children can be more certain.

Conclusions

Judging from all the cases of unilateral cleft lip and palate treated by the same surgical plan, it has been observed that some cases show a remarkable width as a result of deviated postnatal development of the maxillaries. In other cases, on the contrary, a more or less marked underdevelopment of the maxilla, with pseudo-progeny, is observed. However, considering the various clinical forms of the cleft, the first observation has been made also on children still to be treated for lip repair and surgical correction of cleft palate. The remarkable width of the maxilla in relation to the mandible is already evident at birth, persists after primary surgical treatment on the lip, and sometimes after surgical closure of the posterior and anterior palate. In these cases the repaired orbicular muscle does not seem to exert a detrimental effect on the growing maxilla nor does it seem to accentuate the contracting scar of the palatal suture. In these cases neither telerradiography nor lateral view shows evident disharmony of the middle third of the face. Therefore, all surgical treatment on the palate could be performed at the same time without danger of an accentuated transversal maxillary reduction. Should this occur, however, it should be considered as favorable with regard to the width of the maxilla. Orthodontic expansion is not advisable as the maxillary arch would be too wide in relation to the mandibular.

In the unilateral cleft lip and palate with underdevelopment of the maxilla, the profile of the child is typically pseudo-progenic. The repaired muscle layer of the orbicular appears as a small resilient scar which certainly has a detrimental effect on the sagittal and transversal development of the middle third of the face. In those cases, it is advisable to delay as long as possible surgical closure of the anterior palate. Orthodontic treatment should be begun as early as possible, both on the lateral maxillary segments as well as on the incisive area. This will bring about a normal occlusion, despite the presence of the cleft. It will also stimulate, both directly and indirectly, the periosteal bony development on the edges of the cleft with removable plates.

Summary

In the various clinical forms of unilateral complete cleft lip and palate which have been operated on in successive periods, the author has observed some patients with a somewhat accentuated maxillary underde-

velopment and pseudo-progeny and others with a considerable maxillary width. In the latter cases, successive surgical operations do not seem to exercise a negative influence upon maxillary development, and early orthodontic treatment does not appear to be indicated. In the former, however, it is prudent to delay surgical closure of the anterior palate. Orthodontic therapeutics must be initiated as soon as possible, however, in order to stimulate the maxillary development.

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