

Orthodontics in Cleft Palate Children: A Continuing Process

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One of the most important objectives in the orthodontic management of orofacial deformities is a good and permanent result. In treating children with cleft lip and palate, problems of growth and development of skeletal and dento-alveolar processes of the maxilla and the extent of maxillary involvement in orofacial defects makes a permanent result difficult to achieve during any particular stage of physical development. Such a result comes only from the accumulative effects of many orthodontic procedures performed during critical periods of growth observed for the variably involved palato-dental structures. Thus, the question regarding permanency of results, even with the aid of bone grafting and retainers, still remains unanswered.

The role of the orthodontist in cleft palate rehabilitation and the need for early intervention to unlock impacted palatal segments and to permit normal alveolar growth has been reported (3, 6). It has also been stated that several periods of treatment are necessary, beginning with deciduous teeth, extending to include succedaneous teeth, and followed by long periods of retention, which are inevitable (4, 7).

To unite and to create a stable homogenous upper jaw bone, grafting procedures have been added to the practice of employing fixed and removable appliances for retention. The advocates of bone grafting (1) maintain that results cannot be regarded as definitive until a permanent bite has fully developed. Skoog (5) states that the bone graft should not be looked upon as a buried splint which will act as a passive support but that when incorporated, it will be rebuilt according to environmental conditions in which mechanical and nutritional factors are decisive.

Matthews and Grossman (2) have reported that "the bony gaps opened up by aligning the segments are filled with bone grafts which are additional to the grafts inserted to close the main clefts".

Thus we see general agreement concerning the management of the cleft palate problem through orthodontics and surgery and the need for periodic assessment of therapeutic procedures.

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There are three basic reasons for orthodontic treatment to be pursued on a continuing basis from infancy to childhood. First is the need to correctly align distorted and constricted palatal segments of the maxilla. Second is the importance of freeing up impacted palatal shelves tending to affect normal growth expression at the bony margins of the cleft. Third, and probably the most important, is the urgency to maintain gains made in palato-dental corrections and in palatal growth.

The purpose of this report is to document on a longitudinal basis, through photographs and radiographs of three patients, the need for orthodontics on a continuing schedule to achieve the objectives outlined above.

Distorted and Constricted Maxillary Palatal Segments

Early orthodontic procedures are essential if we hope to position deformed and constricted palatal segments so that arch form and dental alignment more closely approximate normal.

Patient R.J., a male, was 3½ years of age at initial visit, with a repaired complete bilateral cleft lip and palate. Presently, he is 9 years of age and has been under orthodontic observation and treatment for the past 5½ years. Photographs in Figure 1, top row (left to right), show the adverse impact the constricted maxilla has upon the occlusion in the deciduous dentition and the subsequent improvement in arch form and occlusion following early orthodontic therapy. Upper half of middle row illustrates the severity of the problem from a palatal view while the occlusal radiograph and the sketch to the far right further document the marked constriction and distortion of the maxillary palatal and premaxillary segments. Figure 2 shows the progression from 3½ years of age to 8 years in the area of palato-dental irregularities and in skeletal and soft tissue profiles. Because of the improvement in the position of the premaxilla after orthodontics, plastic surgery procedures for lip and nose revision were instituted.

To further illustrate the problem and variations observed in this primary area, we present patient #2, a young male, 7 years of age, who had a history of a repaired complete left unilateral cleft of lip and palate. Figure 3, top row, shows the occlusion in the mixed dentition with marked constriction, unilaterally, of the palato-dental segments. The accompanying crossbite, unilaterally, can be easily noted, and to further document the severity of the constriction, Figure 4, top row, shows the palatal view with adjacent occlusal radiograph and schematic drawing of palate clearly documenting the involvement of the skeletal components of the palate. The third patient, R.L., who also had a complete unilateral cleft of lip and palate, in Figure 5, top row, shows not only a constriction of the cleft segment, but a unilateral and anterior crossbite with severe rotation of hypoplastic central incisor. The accompanying occlusal radiograph affords a more detailed palatal view of the problem. Here again, note the constriction and distortion of the maxilla during the mixed dentition stage.

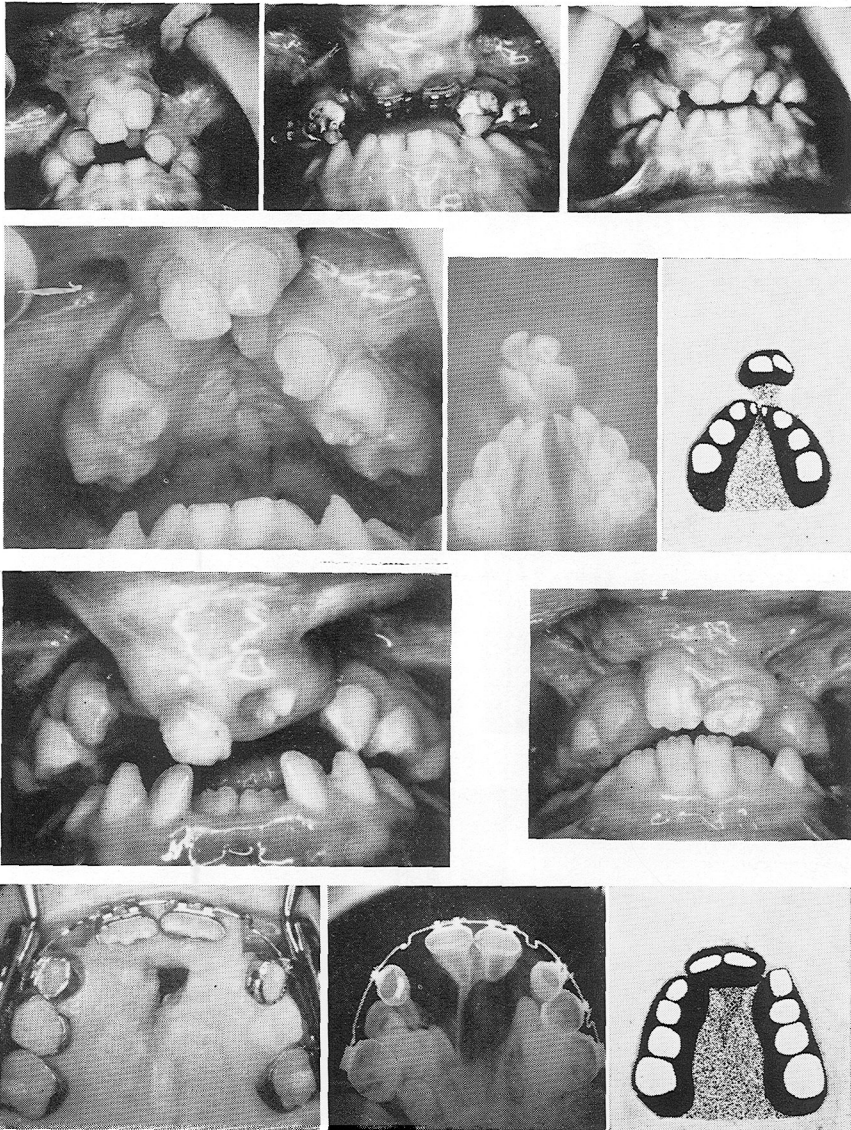


FIGURE 1. Patient R. J. Top row: views of occlusion (from left to right), before, during, and after orthodontic treatment in deciduous dentition when patient was 3½ years of age. Middle row: upper half, palatal views showing marked constriction of palatal segments; and lower half, status of occlusion in the transition from deciduous to mixed dentition stage. Bottom row: photographs of results of treatment procedures on palate in mixed dentition stage, showing extent of palatal expansion and problems of maintenance.

Freeing-up Impacted Palatal Shelves

As a result of early orthodontic treatment procedures, favorable growth is apparent in malpositioned palatal segments that were initially con-

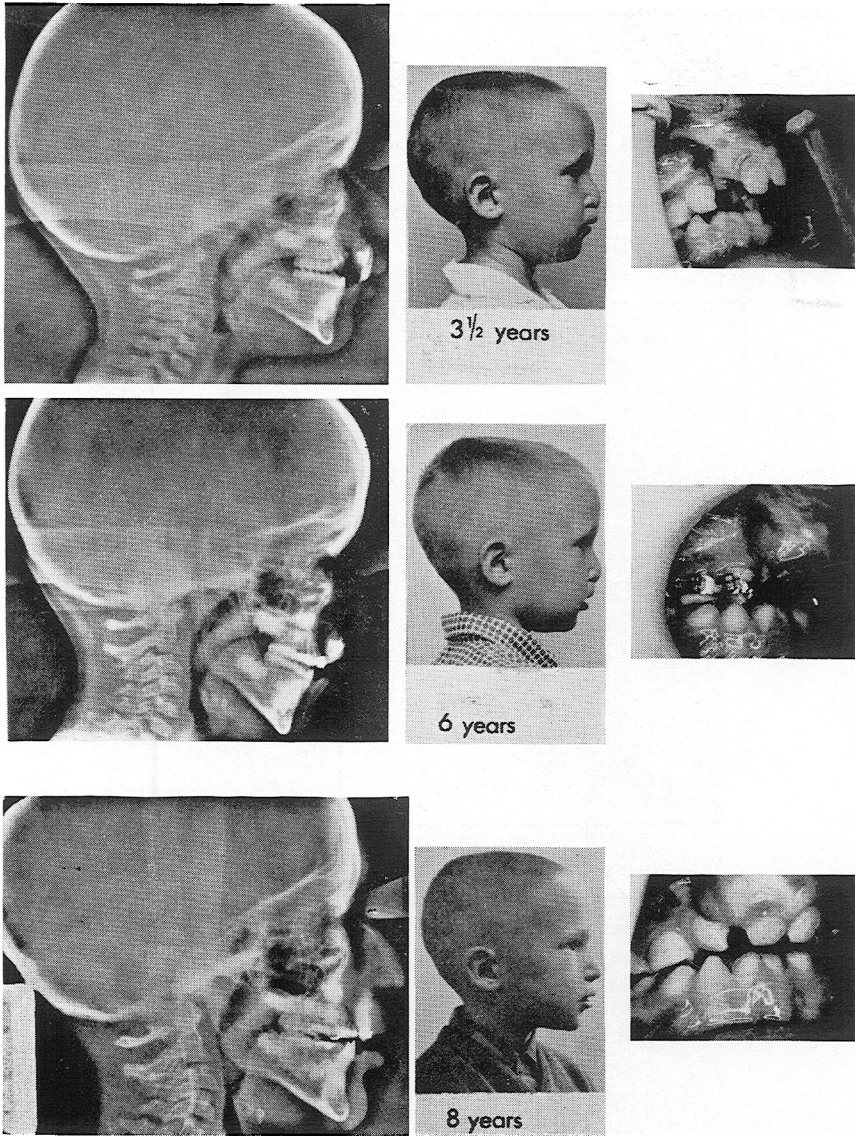


FIGURE 2. Patient R. J. From left to right, photographs of skeletal and soft tissue profiles and accompanying lateral views of dental occlusion before, during, and after orthodontic therapy in deciduous dentition.

stricted and impacted. Once freed from their "blocked out" state, the segments are satisfactorily positioned to re-establish a more normal appearing dental arch. In addition, the alveolar and palatal surfaces of the maxilla bordering on the cleft manifest a potential growth expression due to the new and favorable position of the segments. Changes in maxillary

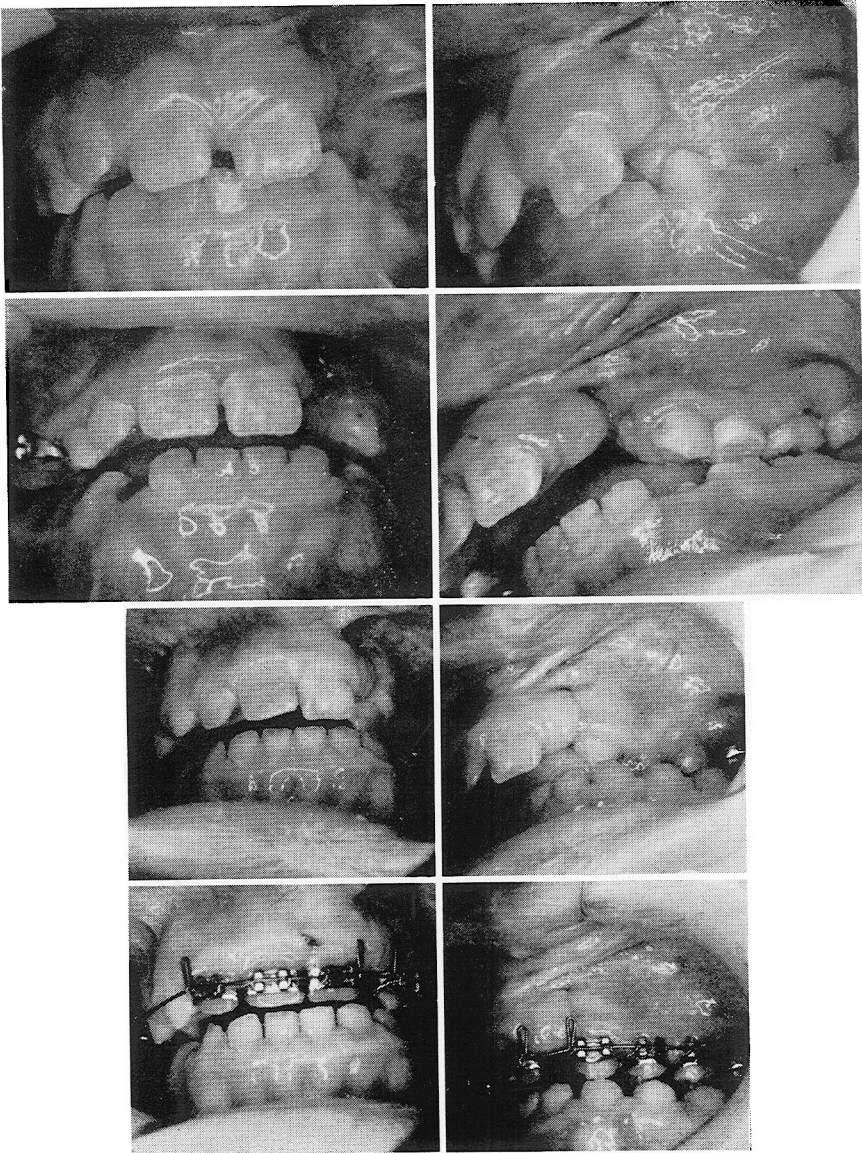


FIGURE 3. Patient J. T. Top row: frontal and lateral views of dental occlusion before early orthodontic therapy. Middle row: upper half, frontal and lateral views of dental occlusion after early orthodontic therapy, and with bone graft in place; and lower half, frontal and lateral views of dental occlusion, showing collapse and re-occurrence of crossbite, in spite of the presence of bone graft and a removable retainer. Bottom row: frontal and lateral views of occlusion after a return to orthodontic treatment showing changes in occlusion and position of palatal segments.

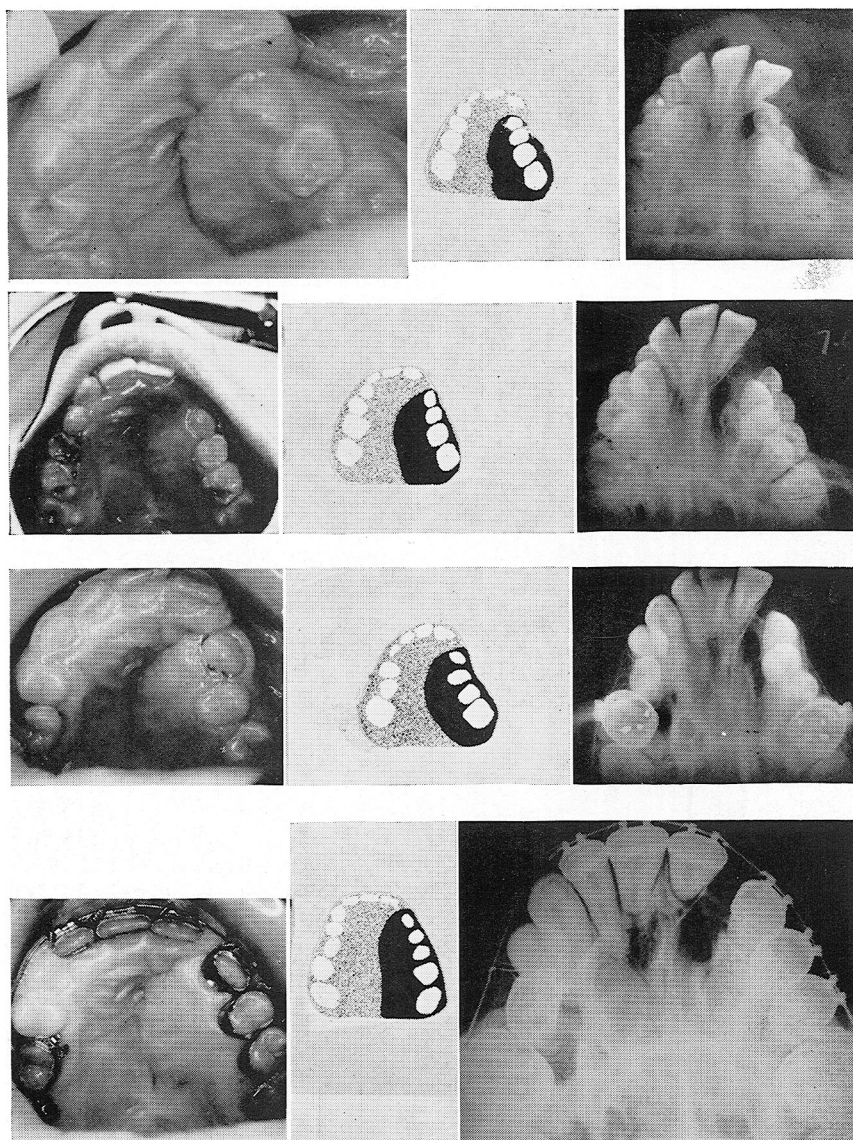


FIGURE 4. Patient J. T., occlusal view. Top row: before treatment. Middle row: upper half, after early orthodontic therapy and insertion of bone graft; and lower half, shows changes in dental arch form and dental alignment noted after using a removable retainer and with bone graft one year postoperative. Bottom row: improvement in dental arch form and palatal alignment after a new period of orthodontic therapy. Radiograph shows bone graft two years postoperative.

dental arch form and in morphology of alveolar process in the region of the cleft are related directly to orthodontic procedures instituted early.

In Figure 1 for patient R.J., photographs, radiographs and drawing of the palate seen in upper half of the middle row and in the bottom row

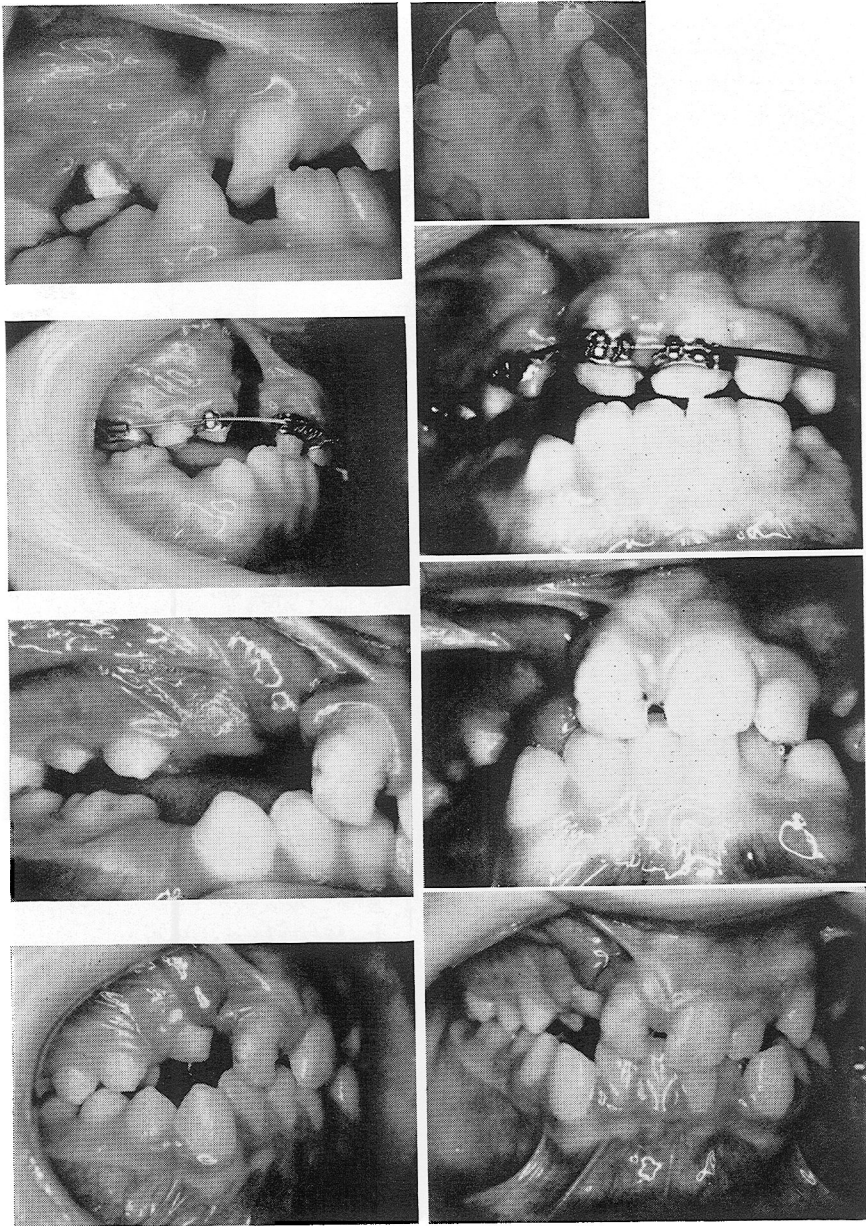


FIGURE 5. Top row: lateral view exhibits lateral and anterior crossbite with evidence of a rotated and hypoplastic central incisor. The adjacent occlusal radiograph depicts the cleft site and the degree of constriction of the palatal segments. Middle row: upper half, lateral and frontal views show extent of palatal expansion and freeing up of impacted palatal segments; and lower half, lateral and frontal views illustrate the changing character of the dental arch form and occlusion in the transition from deciduous to permanent teeth. Bottom row: lateral and frontal views show a relapse in cleft area in presence of removable retainers and bone graft. Arch length-tooth material imbalance has become more manifest with time.

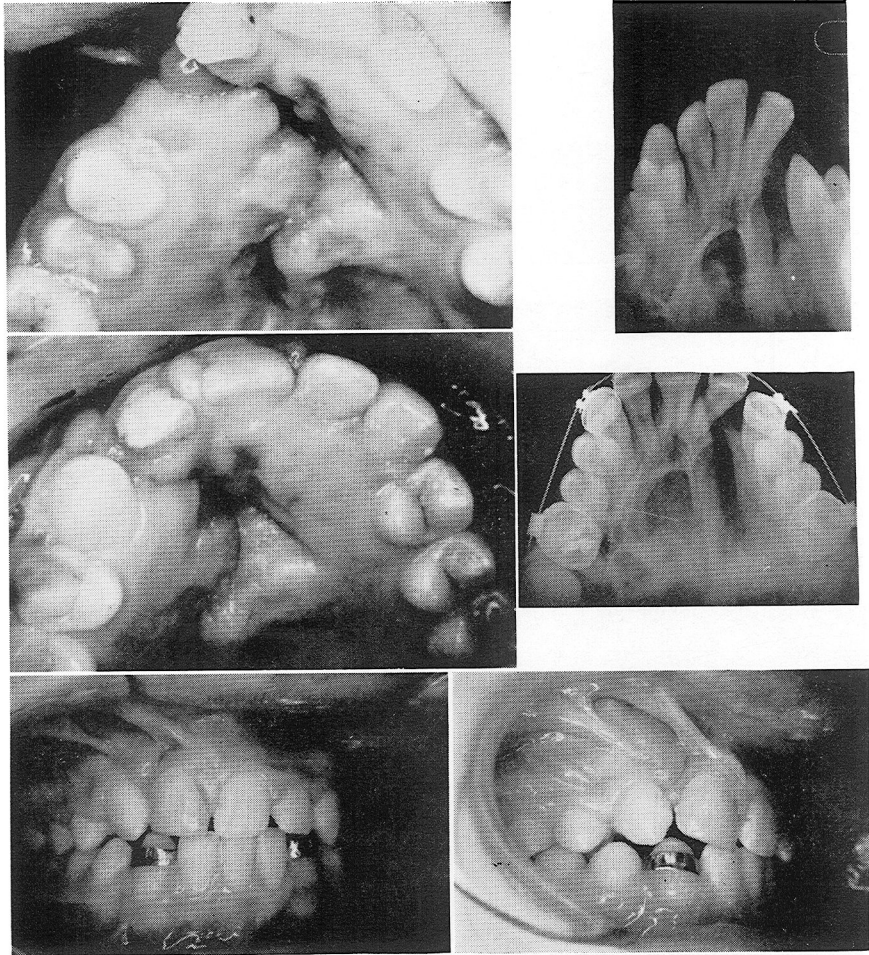


FIGURE 6. Top row: occlusal views exhibiting dental arch collapse and changes in palatal form in presence of bone graft and removable retainers. Middle row: show the results after additional orthodontic procedures were instituted. Bottom row: reflects the present status of the dentition.

depict the status of the palatal shelves before and after orthodontic therapy. It also illustrates the favorable growth noted in association with an improvement in arch form and dental alignment.

Similar observations are recorded in the palate and dental arch for patient J.T. and may be seen in photographs in the top and bottom rows of Figure 4.

The third case, R.L., also reflects the favorable impact orthodontics, on a continuing basis, has on correcting palatal deformity and enhancing palatal growth. Radiographs in Figure 5, top row, and Figure 6, middle row, illustrate status of palatal shelves before and after orthodontic therapy.

Maintenance of Arch Form and Palatal Growth

The third reason for advancing orthodontics on a continuing basis is maintenance of gains made in palato-dental corrections and in palatal growth. This reason becomes all the more important in light of our knowledge that results at an early age need periods of long retention since there is a high tendency for relapse of palatal segment positions.

To maintain the gains made in palatal width and in improved dental arch form, both resulting from early orthodontic expansion procedures, it is essential to use fixed and/or removable retainers. Fixed retainers become obsolete with the progressive loss of deciduous dental units during growth and development and, thus, one must rely increasingly more upon removable appliances in the transition from deciduous to permanent teeth. During this period, it is quite obvious that some adverse changes in palatal width and dental arch form become discernible, all this in spite of removable retainers and, in some cases, bone grafts.

Permanency of such results appears to be difficult even in the presence of removable retainers and/or bone grafts, particularly during the formative years of skeletal and dental development. This may reflect the impact adverse muscular influences have on palatal segments and point up the further justification for continuous orthodontic treatment procedures.

Though it is apparent that palatal and dental changes appear to be inevitable, most of the gains made in correcting palato-dental abnormalities and in growth can be retained, and the slight relapse noted may be recovered by additional orthodontic treatment procedures.

Photographs of oclusal views for patient R.J. as seen in Figure 1, bottom row, illustrate the character of the arch form and dental alignment after a period of orthodontic therapy in the mixed dentition stage. The photograph also reflects a period of retention at this stage of dental development utilizing fixed appliance and a bone graft, which in this photograph is 6 months postoperative. One can see signs of the graft on the right side, but not on the left where it tended to disappear after placement. Photographs also exhibit, rather vividly, the extent of bony deficiency in the premaxillary region of the maxilla. This may or may not have been a contributing factor for the loss of the graft on the left side of a highly mobile premaxilla. Thus for some degree of stability of arch form and dental alignment, an indefinite period of retention appliances are indicated in this patient.

In Figures 3 and 4 there are four views (from above to below) at four different stages; a) before treatment, b) after correction and bone graft in place, c) changes in arch form and dental alignment noted in spite of removable retainers and bone graft, 1 year postoperative, and d) recovery of collapse, previously noted, after a return to orthodontic therapy and bone graft 2 years postoperative. Artist's conception of palatal and dental arch form is seen in drawings in the center of Figure

4. This case represents another example of the need for continuing orthodontics on a time basis, since results are not permanent during the formative years even in the presence of retainers and bone grafts.

Photographic records for patient R.L. record the results of palatal expansion, as seen in upper half of middle row of Figure 5 and subsequent to bone grafting as recorded in photographs of Figure 6, top row. Note the change in dento-alveolar area about the cleft site while going from deciduous to permanent dentition. Some collapse was observed even though removable retainers were employed and a bone grafting procedure performed.

The deterioration of dental alignment can be seen in Figure 5, bottom row, reflecting a marked discrepancy between arch length and tooth material in both arches. Further orthodontic treatment was essential at this time and the results can be noted in Figure 6, middle and bottom rows.

Summary and Conclusion

Three principal reasons were presented for continuing orthodontics in cleft palate habilitation. The problems revolving around palato-dental abnormalities, growth of the palatal process of the maxilla, and maintenance of gains resulting from orthodontics have all been discussed. Three cases of children with cleft lip and palate (one in deciduous dentition and two in mixed dentition stages) were illustrated. All cases were observed and treated for 5 years to assess results of early orthodontic therapy on dentition and palatal structures. Early orthodontic therapy resulted in correcting palato-dental abnormalities and in growth of palatal and alveolar processes bordering on the cleft. Maintenance of such gains was difficult, particularly in transition from deciduous to permanent dentition. This was apparent in each case, even in the presence of removable retainers and/or bone grafts, thus clearly demonstrating the need for orthodontics on a continuing basis. Permanency of results in palatal and dental arch form becomes possible only when the patient reaches a period when all permanent teeth have fully erupted and are relating well intradentally and interdentally. This is a period when the patient's occlusion is more permanently established and may contribute significantly to maintenance of palatal and dental arch form in the presence of adverse environmental influences.

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References

1. JOHANSEN, B., and A. OLSEN, Bone grafting and dental orthopaedics in primary and secondary cases of cleft lip and palate. *Acta Chir. Scand.*, 122, 112, 1961.
2. MATTHEWS, DAVID, and W. GROSSMAN, Restoration of the collapsed maxillary arch by rapid expansion and bone grafting. *Cleft Palate J.*, 1, 430-440, 1964.
3. PRUZANSKY, S., The role of the orthodontist in a cleft palate team. *Plastic reconstr. Surg.*, 14, 10-29, 1954.
4. PRUZANSKY, S., Effects of cheiloplasty on the maxillary arch in newborn infants with complete bilateral cleft lip and cleft palate. *Amer. J. Orthod.*, 39, 712, 1953.
5. SKOOG, TOR, The management of the bilateral cleft of the primary palate (lip and alveolus). *Plastic reconstr. Surg.*, 39, 140-147, 1965.
6. SUBTELNY, J. DANIEL, Importance of early orthodontic treatment in cleft palate planning. *Angle Orthod.*, 27, 148-158, 1957.
7. SUBTELNY, J. DANIEL, The significance of early orthodontia in cleft palate habitative planning. *J. speech hearing Dis.*, 20, 135-147, 1955.