Surgical Repositioning of the Premaxilla in Complete Bilateral Cleft Lip and Palate

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Patients with complete bilateral cleft lip and palate are considered to be among the most difficult regarding surgical correction and require a certain amount of delicacy in treatment to achieve the desired results.

Different surgical approaches were both suggested and tried on these cleft patients and, of course, each school of thought advocates its own procedure.

LITERATURE REVIEW

Brophy in the introduction of his text[1] put the following order for his procedure in the treatment of cleft lip and palate:

First Stage: If the cleft of the palate is complete, if the bones are separated, bone surgery is essential to establish normality, preferably done before the fifth month.

Second Stage: Two months or later after the union of the bones, the lip is united.

Third Stage: The soft palate is closed from the sixteenth to the twenty-second month, just before the child begins to talk.

By proceeding in this way, the tissues can be best manipulated and anatomical normality most nearly approached.

Protruding premaxillae in complete bilateral cleft lip and palate cases in Brophy's opinion should neither be excised nor be forced back without securing bony union with the maxillae. He used wire sutures and lead plates to immobilize the premaxilla. The child should not be less than three months at the time of the operation to prevent displacement of the teeth in the still unossified bone. An oblique incision was made through the vomer and the premaxilla was moved back (Fig. 1).

When bony union occurred, lip surgery was performed.

Unfortunately there are no cephalometric records available to us on the effect of this procedure on the growth of the craniofacial complex.

Padgett and Stephenson[6] outlined two general methods for handling protruding premaxillae in complete bilateral cleft lip and palate. One involves surgery on the nasal septum and

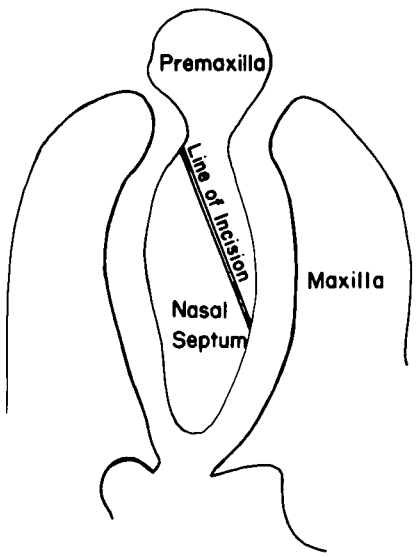

Fig. 1 Brophy's technique to move the premaxilla back using an oblique incision.

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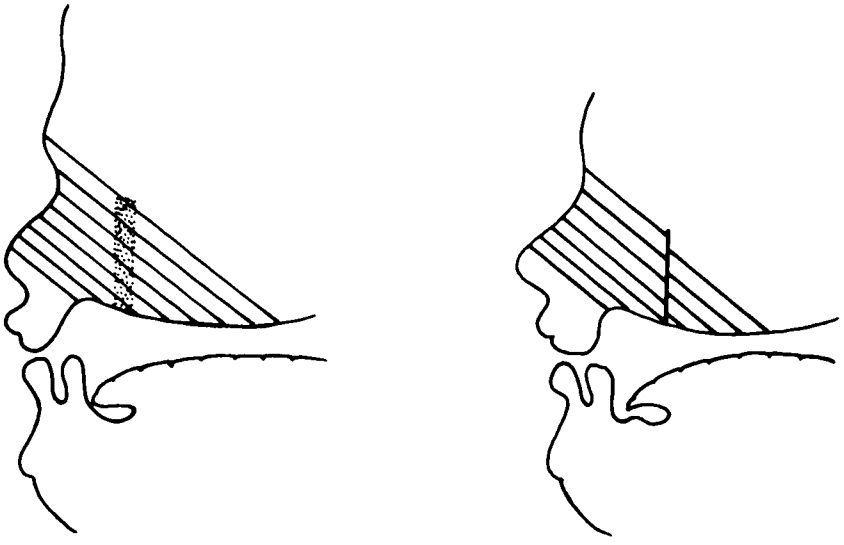

Fig. 2 Surgical removal of part of the nasal septum.

in the other there is no surgical manipulation of the nasal septum or the protruding premaxilla at the time of lip repair. They advocated the latter method.

Huffman and Lierle[2] and Monroe et al.[5] advocated the setting backward of the premaxilla "after removal of a portion of the overly developed nasal septum" (Fig. 2). This was done to avoid endangering the suture line by the "extreme tension" if the lips are closed over a protruding premaxilla. The surgery was done in three stages: Stage I—positioning of the premaxilla and repair of the hard palate defect; Stage II—repair of one side of the cleft lip; and Stage III—repair of the remaining lip cleft.

Fortunately we have the cephalometric records of these patients which will be reported in this study.

In the mid-50's a new technique involving primary bone grafting was advocated for the stabilization of the premaxilla. This bone grafting procedure was originated in Europe and today many of the surgeons who advocated primary bone grafting have abandoned this procedure.[3,4]

Stark[7] concluded that the union by bone of the premaxilla to the maxillae must still be considered experimental.

Purpose of the Study

The purpose of this study was to evaluate cephalometrically the effects of surgical manipulation of the protruding premaxilla in patients with complete bilateral cleft lip and palate either prior to or at the time of lip surgery, and cephalometrically compare it with a matched sample in which the premaxilla and the nasal septum were not surgically manipulated at the time of lip surgery.

Materials and Methods

The subjects for this study consisted of two groups—A and B. Both groups had complete bilateral cleft lip and palate with protruding premaxillae. All subjects were Caucasians and were matched as closely as possible for sex, age, and type of palatal surgery. The main difference between the two groups is that the subjects of Group A, born in 1946 and 1947, had their protruding

premaxillae either moved back and wired to the maxillae at the time of lip surgery or the premaxillae were recessed surgically by removing a wedge from the lower part of the nasal septum, allowing the displacement of the premaxilla backwards (Fig. 2). The age range at which lip surgery was performed varied from 1 to 6 months. In Group B subjects, born in 1952 and 1953, the premaxillae were left intact at the time of lip surgery which ranged from 1 to 7 months. Alveolar clefts were corrected at the time of palatal surgery.

The technique used for palatal surgery for all subjects was the Von Langenbeck operation; the mean age at which this procedure was performed was 4.7 years and ranged from 2.5 years to 14.6 years for Group A. The mean age of palatal surgery in Group B was 3.8 years with a range from 3.0 to 4.7 years.

In Group A, eight out of ten patients had both lips operated at the same time. Lip surgery was performed at a mean age of 2.5 months with a range from 1 to 6 months. In Group B, six out of ten patients had lip surgery on each side separately. On these six patients the first lip surgery was performed at a mean age of 2.5 with a range from 1 to 4 months. The mean age of the second lip surgery was 5 months with a range from 2.5 to 6 months.

Other surgical procedures were performed on both groups; these procedures ranged from myringotomies to pharyngeal flaps. Group A patients were subjected on the average to 5.8 operations while Group B was subjected on the average to 6.7 operations.

Ten subjects from each group were used in this study. Group A included six males and four females ranging in age from 18.2 to 19.5 years with a mean age of 18.6 years. Group B included six males and four females ranging in age from 16.5 to 18.0 years with a mean of 17.2 years. The age range for both groups made it possible to assume that most of the facial growth potential had been achieved.

Lateral cephalograms were taken on all subjects using a Picker x-ray unit. The heads of all subjects were positioned in a cephalostat and oriented to Frankfort horizontal plane with the teeth in centric occlusion.

Two duplicates were made of each cephalogram, each was independently pin-pricked by a different investigator, angular measurements were doubly determined and mean readings were calculated from the four measurements obtained from the two duplicates.

When bilateral structures were not superimposed, as frequently happens with gonion, the landmark was bilaterally located and a midpoint pricked.

Interexaminer reliability was determined using student t-tests between the readings on the two duplicates and no significant differences were found at both the 0.01 and 0.05 levels of confidence.

Intraexaminer variability was predetermined at 0.25° for angular measurements and 0.2 mm for linear measurements.

Magnification and blurring factors were calculated for the cephalometric machine used and all linear measurements were reduced to actual sizes before being presented in the table.

The commonly-used cephalometric landmarks were utilized and also projected ANS', located by dropping a perpendicular from ANS on the nasion-menton line (Fig. 3). ANS' is used in measuring the upper facial height (N-ANS') therefore minimizing the effect of variations in the anteroposterior position of ANS in different individuals.[8]

The following angular measurements

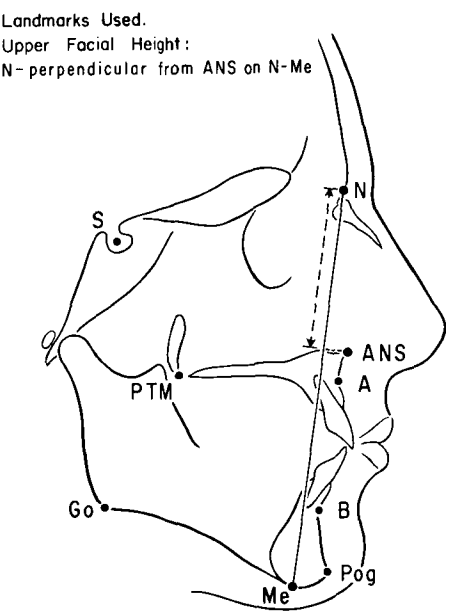

Fig. 3 Landmarks used.

were collected from the lateral cephalograms: SNA, SNB, ANB, SN-Pog, NA-Pog, SN-ANS, NS-Gn, MP to SN, and $\overline{1}$ to MP. Linear measurements were N-ANS' and N-Me. The ratio between upper and total face heights was calculated.

Means and standard deviations were calculated for each cleft group and student t-tests were performed between the corresponding measurements. Significance was predetermined at the 1% and 5% levels of confidence.

Findings

The detailed cephalometric findings of this investigation are presented in Table I.

SNA angle was found to be significantly smaller in Group A (72.9 ± 3.7°) than in Group B (80.8 ± 5.6); angle SN-ANS followed the same pattern.

All patients in Group A in which the premaxilla was surgically manipulated early in life, i.e., at the time of lip surgery, showed a negative ANB angle (—3.0 ± 2.5°) which indicates that the anteroposterior relations of points A and B were reversed, i.e., point A of the maxilla was posteriorly related to point B of the mandible. In Group B, on the other hand, the ANB angle remained positive in all cases (3.8 ± 2.8°) indicating a normal anteroposterior relation between points A and B.

The angle of convexity (NAPog) showed similar tendencies; in Group A the mean angle was —12.2 ± 4.4°. This indicates a concave skeletal facial profile while in Group B the angle was 7.1 ± 5.3° indicating a convex skeletal facial profile.

The lower incisor inclination to the mandibular plane was found to be signicantly smaller in Group A.

Measurements comparing mandibular position and facial heights in both groups were not found to be significantly different.

Discussion

The present comparative analysis shows that an "early" surgical manipulation of the premaxilla whether by removing a wedge from the nasal septum or wiring the premaxilla posteriorly to the maxilla will definitely affect the ultimate growth of the premaxilla in an anteroposterior direction.

As a result of our observation, we urge a more conservative approach to surgical treatment of patients with complete bilateral cleft lip and palate and a protruding premaxilla. Our observations show that the protruding premaxilla tends to be molded back and to align itself with the maxillary segments after completion of lip surgery without an attempt at surgical repositioning provided there is sufficient space for the premaxilla between the two maxillae. If there is insufficient space, this can be recognized early and the maxillary segments can be expanded to obtain the required space.

Measurement	Group A N=10			Group B N=10			t-test d.f.=18
Angular in Degrees	Mean	Standard Deviation	Range	Mean	Standard Deviation	Range	
SNA	72.9	3.7	65.7 to 77.9	80.8	5.6	70.7 to 90.6	3.6**
SNB	75.2	2.9	71.7 to 80.9	77.0	4.3	67.2 to 82.0	0.6
ANB	-3.0	2.5	-9.3 to -0.1	3.8	2.8	0.5 to 10.0	5.4**
SNPog	78.8	3.2	72.7 to 84.2	79.0	4.9	67.4 to 83.6	0.1
SNANS	77.4	5.2	70.9 to 86.3	84.4	6.0	75.8 to 94.9	2.6*
NAPog	-12.2	4.4	-22.0 to -12.7	7.1	5.3	2.2 to 21.7	8.4**
NSGn	69.5	2.9	65.0 to 74.0	68.8	4.5	60.6 to 75.6	0.4
MP-SN	37.6	5.5	29.8 to 49.0	36.9	5.5	27.5 to 43.0	0.3
$\overline{1}$ - MP	82.6	7.2	70.5 to 95.2	88.7	6.8	76.7 to 96.2	2.5*
Linear: in mm.							
N-ANS'	48.2	2.7	44.2 to 52.5	49.6	3.6	45.1 to 56.5	0.9
N-Me	114.1	9.0	97.0 to 128.4	117.6	6.0	99.2 to 130.6	1.0
Ratio %							
$\frac{\text{N-ANS'}}{\text{N-Me}}$	42.6	4.5	36.4 to 51.0	42.2	3.2	38.1 to 49.4	0.2
Age in years	18.6		18.2 to 19.5	17.2		16.5 to 18.0	

TABLE I

Comparisons between Measurements on Groups A and B.
Group A with Surgically Manipulated Premaxillae at the Time of Lip Surgery
Group B No Surgical Manipulation of the Premaxilla was Attempted at the Time of Lip Surgery

N = Sample Size
d.f.= Degrees of freedom
** = Significant at the 1% level of confidence
* = Significant at the 5% level of confidence

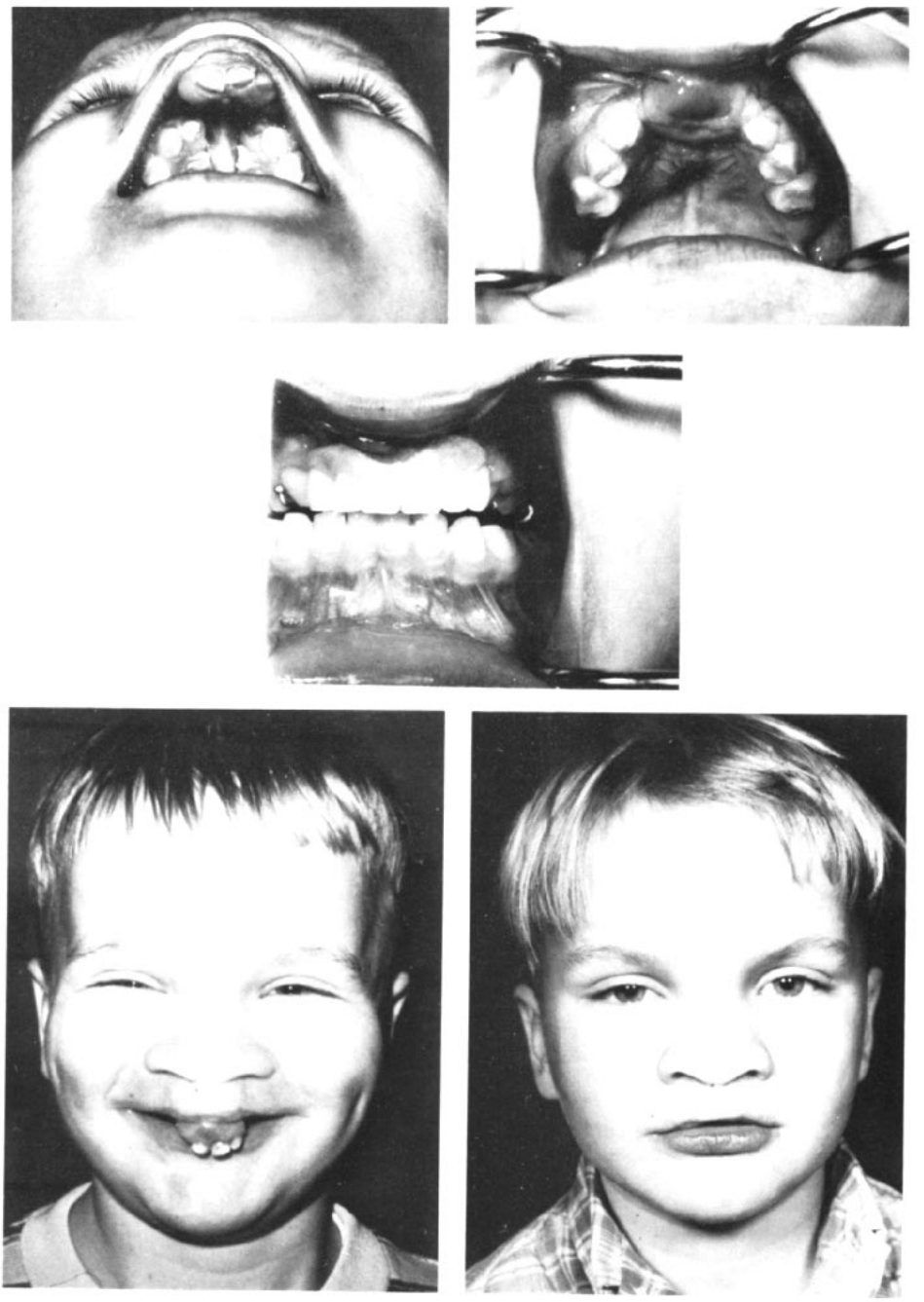

Fig. 4 Surgical resection of the premaxilla for esthetic consideration. (Case AB)

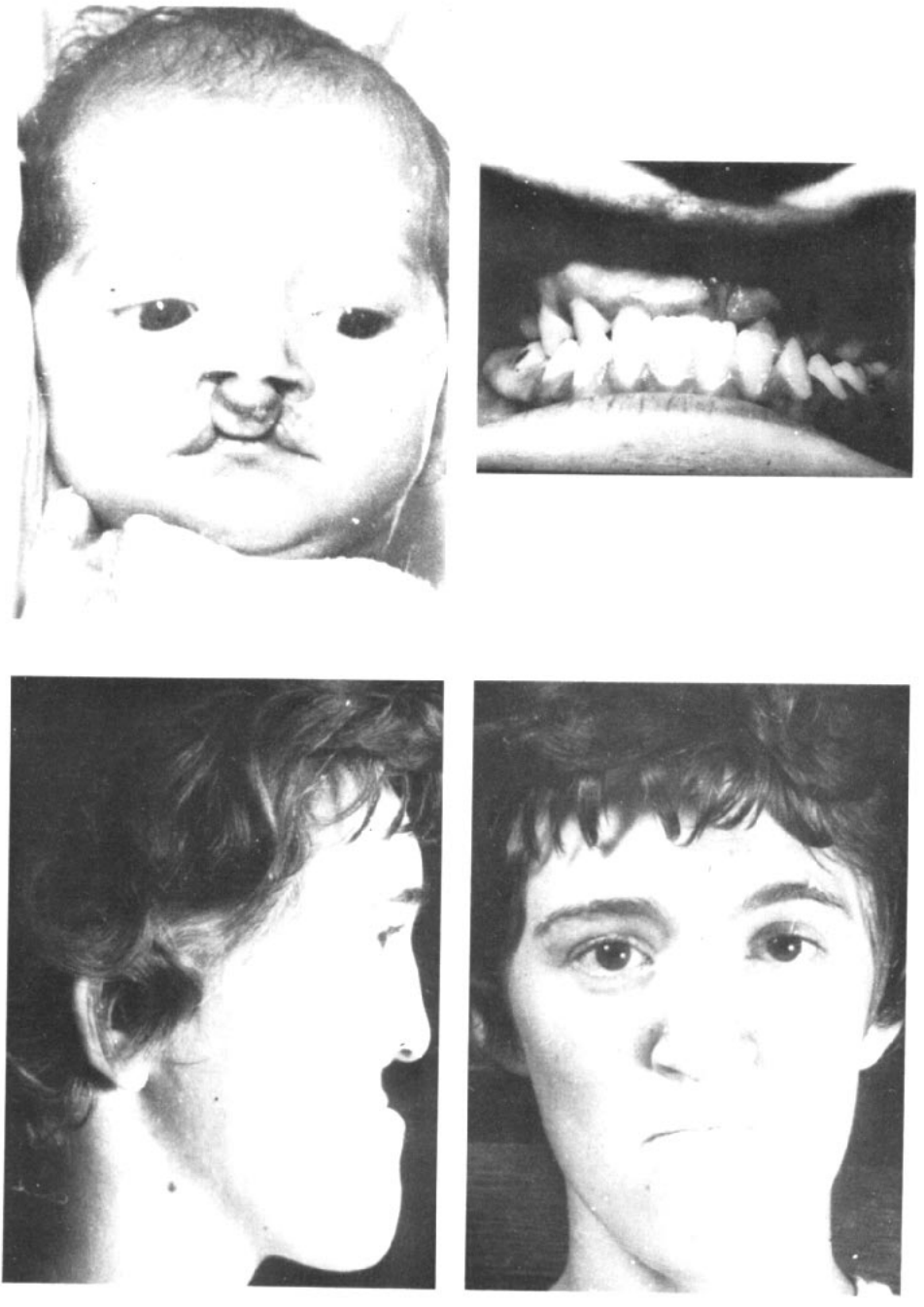

Fig. 5 Effects on growth of early surgical manipulation of the premaxilla (Case RD)

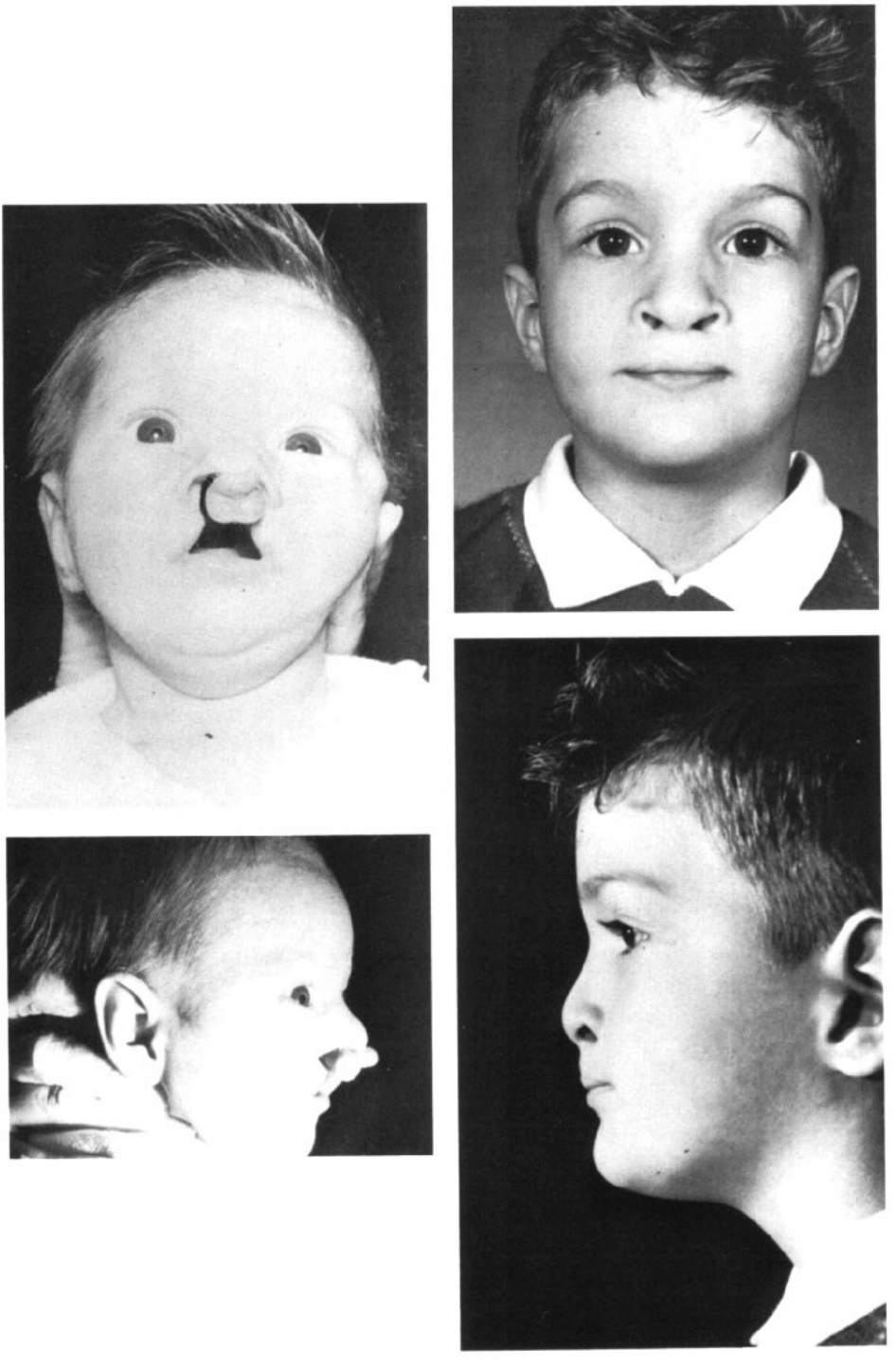

Fig. 6 Results obtained by the advocated procedure (Case BW).

Summary and Conclusions

Cephalometric x-rays of two groups of complete bilateral cleft lips and palates and protruding premaxillae were compared. In one group premaxillae were surgically repositioned at the time of lip surgery (2.5 months) while in the second group early surgical manipulation was avoided. Aside from this difference the two groups were comparable regarding cleft type, sample size, ethnic background, sex, and age.

The findings clearly indicated that early surgical manipulation of the premaxillae significantly affected the anteroposterior positioning of the maxilla, and in every patient of this group both the ANB angle and the angle of convexity showed a negative tendency indicating an abnormally positioned maxilla in relation to the cranial base and to the mandible. In the second group in which the premaxilla was left intact at the time of lip surgery, both the above-mentioned angles indicated a more acceptable anteroposterior relation between the position of point A on the maxilla and point B on the mandible.

Therefore the unescapable conclusion is to avoid early surgical manipulation of the premaxilla and to postpone surgical closure of the alveolar cleft to the age of palatal surgery.

In most cleft centers today the premaxilla is not surgically disturbed at the time of lip surgery. If there is a need to reposition the premaxilla or surgically reduce it, we would recommend waiting as long as possible, i.e., 7 or 8 years of age, to minimize the untoward effects on the growth of the middle third of the face. However, we have had a few patients with severely protruding premaxillae which were surgically reduced, for psychological reasons, just prior to entering school (Fig. 4).

The clinical results for the patient with a bilateral cleft are greatly improved today as a result of the procedure followed in our group B patients; repair of the lip in two stages—stage one at approximately 2 to 3 months, the other stage at approximately 5 to 6 months with no surgical manipulation of the premaxilla. Our orthodontic and prosthetic results are also greatly improved with a more normal growth pattern in the premaxillary area (Figs. 5 and 6).

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