Midface Position After Le Fort III Advancement: A Long-Term Follow-up Study

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In 1983, we evaluated the stability of midface position after Le Fort III advancement for midface hypoplasia secondary to Crouzon’s or Apert’s syndromes. The patients were operated upon from 1972 to 1980, and mean follow-up was 5.8 years (Kaban et al, 1984). In this study, we present an additional 3½ year follow-up of these patients to look at what happens to midface position after Le Fort III osteotomy in growing and nongrowing patients.

MATERIALS AND METHODS

The patients were operated upon early in our craniofacial surgery experience, and the indications for surgery were: (1) protection of the eyes, (2) improvement of airway, (3) problems with psychosocial integration, and (4) improvement of the occlusion.

Thirty patients had midface advancements during this period. Twenty-three (11 with Crouzon’s syndrome and 12 with Apert’s syndrome) had the following data available and could be included in this study: (1) preoperative, (2) immediately postoperative (in fixation), (3) immediately postfixation release, (4) 3-month follow-up, (5) 6-month follow-up, (6) 1-year follow-up, (7) 1- to 3-year follow-up, (8) greater than 3 year postoperative cephalograms. The age range at time of operation was 2.0 to 25 years, with a mean of 9.75.

Operation and Follow-up

The patients all had subcranial Le Fort III osteotomies. We used a standard coronal incision and subperiosteal dissection to expose the midface. Until 1978, we used supplementary infraciliary, infraorbital, or conjunctival incisions to expose the infraorbital rims, and intraoral buccal sulcus incisions to expose the maxillary tuberosity (N=13).

From 1978 to 1980, the entire operation was done through the coronal incision (N=10). The pterygoid bone blocks were placed from above.

The midface was stabilized in its forward position with bone grafts at 7 locations: nasofrontal suture, posterior lateral orbital walls (2), zygomatic arches (2), between maxillary tuberosity and pterygoid plates (2). All patients were placed in intermaxillary fixation, which was maintained for 6 weeks in all cases.

Eight of the 23 patients had begun orthodontic treatment preoperatively. Fourteen of the 23 patients had postoperative orthodontic treatment. All patients in the study were followed for at least 5 years, with a mean follow-up of 7.8 years.

Cephalometric Method

The lateral cephalograms were in all cases obtained on the same cephalostat. The x-rays were oriented in the natural head position, as determined from the photographs. We elected to use sella turcica and the vascular markings of the anterior cranial base for superimposition (Fig. 1A). All superimposed comparisons of radiographs were done on this plane, which was not altered by the subcranial midface advancement.

Orbitale was located as the most inferior point on the infraorbital rim. Location of this landmark was occasionally difficult, but in general not a problem. Point A was located easily as the greatest concavity on the anterior maxilla. Ad-
mittedly, there was some remodeling during orthodontic treatment in the region of A point but the landmark could be readily identified in most instances. When right and left orbitale were visible we used the midpoint between the two.

The preoperative tracing was superimposed on each successive cephalogram with the best fit on the cranial base plane. Orbitale and point A were then located and marked on the tracing (Fig. 1B). The original landmarks (points) and each successive set of landmarks (points) were digitized into a grid matrix on a digitizing tablet and entered into an IBM computer. All distances and movements were then calculated in relation to x and y coordinates by the computer, using a custom software program for cephalometric analysis.

Crouzon's syndrome patients. The occlusal movement did not always correspond to the planned movement on the models and was between 9 and 10 mm at the molars. The movement cephalometrically had vertical and horizontal components, and the composite movement had an oblique vector (Fig. 2A). The horizontal movement at point A cephalometrically corresponded to the amount of horizontal movement clinically at the molars and canines. These immediate postoperative data are the same as those in the original follow-up study published in 1984 (Kaban et al., 1984).

Using the immediate postoperative midface position as zero, we then followed the patients cephalometrically over the next 14 years. At the end of the follow-up, 19 of 23 patients demonstrated midface position at or anterior (forward) and inferior (downward) to the position of the immediate postoperative cephalogram (Fig. 2B). Four of 23 patients had posterior or superior movement of the midface (representing 10 percent or less of the original movement). One of the 23 patients required a subsequent operation to readvance the midface in the orbital region. Twenty-two of 23 patients had satisfactory long-term advancement of the upper midface (i.e., orbital segment).

In patients who were operated on during growth (8 to 12 years of age) there was a transient relapse of midface position immediately upon release of intermaxillary fixation (IMF). However, 6 to 12 months postoperatively these patients all regained the midface position, and at end of follow-up the midface was anterior and inferior to immediate postoperative position.

All patients operated upon at or near completion of growth showed stable occlusion as well as stable midface position. They maintained their class I occlusion throughout the follow-up period.

**DISCUSSION**

An additional 3½ years of study have allowed us to follow 15 of 23 patients to the completion of growth. Patients who were not growing at the time of Le Fort III osteotomy had stable class I occlusion postoperatively (5 of 5 patients). Patients who were growing at the time of operation had a 50 percent incidence of recurrent class III occlusion, if they were done in the late mixed dentition or early adult dentition (4 of 8 patients, ages 10 to 14 years). Patients who had Le Fort III osteotomy while in the deciduous dentition (age 2 to 5 years) or early mixed dentition (age 6 to 8 years) had at least a 60 percent chance of developing a recurrent class III occlusion (6 of 10 patients). Based on growth predictions for the re-
Recurrent class III occlusion was always secondary to mandibular growth not relapse of midface position. The mandible grew down and forward an average of 15 mm during the study period as demonstrated by posterior and superior movement of the condyle in superimposed mandibular tracings (Fig. 3). Only one patient required a secondary advancement of the upper midface (orbital) segment for recurrent exorbitism.

**CONCLUSIONS**

Midface advancement by Le Fort III osteotomy is a stable correction. We recommend deferring operation until growth is completed, if possible, in order to avoid the need for Le Fort I osteotomy. However, if for psychosocial or other reasons early operation is indicated, it can be done safely. The family can be told that the upper midface correction will remain stable and that a Le Fort I osteotomy will probably be required during adolescence.

**REFERENCES**