Correction of the Secondary Bilateral Cleft Lip Deformity Encountered in Guatemala

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left care in Guatemala is not standardized or centralized in distinct cleft centers. Instead, most cleft care is offered through surgical missions by multiple surgical groups likely to have diverse training and expertise. This is particularly true in rural areas of Guatemala. Owing to the lack of locally trained cleft specialists, distance, and cost, patients rarely have the option of presurgical orthopedics. Given these circumstances, the variety and severity of secondary cleft deformities that are encountered are distinctly different from those presently encountered in the United States.

The purpose of this study is to describe the secondary bilateral cleft lip (BCL) deformities encountered in Guatemala during the last 6 years and the surgical techniques that I have used for correction.

Methods. From 2002 through 2007, 11 patients underwent secondary correction of BCL deformities during 6 consecutive annual cleft lip mission trips to Guatemala. Preoperatively, the secondary deformities were classified according to the abnormalities and deficiencies noted in the philtrum, white roll, vermilion, orbicularis oris (OO), and position of the premaxilla. Surgical correction was then based on this classification.

Results. White Lip Deformities. The most common deformity encountered was an excessively wide philtrum (Table and Figure). An excessively wide philtrum was routinely associated with central vermilion and OO deficiency. Surgical repair consisted of excision of the scar and of philtral skin to narrow the philtrum; the central tubercle was recreated with recruitment of vermilion from the lateral lip elements and OO muscular continuity throughout the vertical extent of the upper lip, (3) proper philtrum size and shape, and (4) formation of the median tubercle from lateral labial elements. According to Mulliken, the philtrum is constructed on a small scale because the con-

Catastrophic Deformities. Catastrophic deformities were defined as the results seen after obvious lip dehiscence and secondary wound healing. In 2 cases the lips had healed behind a protruding premaxilla. Correction consisted of excising the scar, designing a philtrum from the unscarred central white lip, and forming the median tubercle from lateral labial elements. Two patients required a premaxillary setback to achieve a tension-free lip closure.

Comment. The principles that guide the primary repair of the BCL deformity include (1) symmetry, (2) primary OO muscular continuity throughout the vertical extent of the upper lip, (3) proper philtrum size and shape, and (4) formation of the median tubercle from the lateral labial elements. According to Mulliken, the philtrum is constructed on a small scale because the con-

<table>
<thead>
<tr>
<th>Patient No./Sex/Age, y</th>
<th>Deformity: White Lip/Median Tubercle</th>
<th>Technique for Correction</th>
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<tr>
<td>1/F/9</td>
<td>Misalignment of white roll, dry vermilion of prolabium preserved (OO without central deficiency)</td>
<td>V to Y advancement of prolabial skin and vermilion</td>
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<td>2/M/6</td>
<td>Wide philtrum, dry vermilion of prolabium preserved, central OO deficiency</td>
<td>Narrowing of philtrum with skin excision, excision of prolabial vermilion, formation of the median tubercle with lateral labial elements (Mulliken-type repair)</td>
</tr>
<tr>
<td>3/F/8</td>
<td>Wide philtrum, CV and OO deficiency</td>
<td>Mulliken-type repair</td>
</tr>
<tr>
<td>4/M/13</td>
<td>Wide philtrum, CV and OO deficiency</td>
<td>Mulliken-type repair</td>
</tr>
<tr>
<td>5/M/14</td>
<td>Wide philtrum, CV and OO deficiency</td>
<td>Mulliken-type repair</td>
</tr>
<tr>
<td>6/M/14</td>
<td>Wide philtrum, CV and OO deficiency</td>
<td>Mulliken-type repair</td>
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<tr>
<td>7/F/2</td>
<td>Lip dehiscence: unilateral lip adhered to premaxilla, contralateral lip with complete dehiscence</td>
<td>Mulliken-type repair</td>
</tr>
<tr>
<td>8/F/17</td>
<td>Partial BLD with severe scarring and OO deficiency</td>
<td>Mulliken-type repair</td>
</tr>
<tr>
<td>9/M/8</td>
<td>BLD with lips adhered to sides of premaxilla</td>
<td>Mulliken-type repair</td>
</tr>
<tr>
<td>10/F/4</td>
<td>BLD with lips adhered behind the premaxilla</td>
<td>Mulliken-type repair with premaxillary setback</td>
</tr>
<tr>
<td>11/F/7</td>
<td>BLD with lips adhered behind the premaxilla</td>
<td>Mulliken-type repair with premaxillary setback</td>
</tr>
</tbody>
</table>

Abbreviations: BLD, bilateral lip dehiscence; CV, central vermilion; OO, orbicularis deficiency.
structed philtrum widens remarkably and has considerable vertical growth. Because the prolabium is deficient in both central vermilion and mucosa and often lacks a distinct white roll, prolabial vermilion and mucosa should not be preserved. Following these principles, Mulliken observed that the primary and secondary problems that are now encountered in specialized cleft lip centers are mainly only extra mucosa in the lateral labial elements and minor vertical deficiencies of the median tubercle.

Many of the secondary BCL deformities that were encountered in Guatemala were similar to those deformities that could be described as the traditional bilateral cleft stigmata. The common stigmata that I have observed are an excessively wide philtrum, a preservation of the prolabial vermilion and mucosa, and a median tubercle with a deficiency of dry vermilion and OO muscle. To repair these deformities, I have relied on the principles outlined herein.

The size of the philtrum flap depends on race and age. In North American white individuals aged 1 to 18 years, Farkas et al documented normal growth of the nasolabial features. All of the labial landmarks grew rapidly, approaching approximately 90% of adult proportions by 5 years of age. Only columnellar length and nasal tip projection were slow growing (ie, attaining less than two-thirds of adult size by 5 years of age). In expectations of fast growth in the labial elements, Mulliken recommended designing the philtrum during the primary repair on a small scale. Fast-growing features may become too long or too wide. Expanding these recommendations to what I have encountered at the time of secondary cleft lip repair, I have designed the dimensions of the philtrum flap based mainly on age. Thus, patients who were 5 years or older (most of the patients) had a constructed philtrum that was designed on a normal scale. Younger patients had their secondary philtrum designed on a slightly reduced scale.

Five of the 11 patients (45%) had partial or complete lip dehiscence after primary BCL repair. One likely reason for this high incidence of lip dehiscence after primary BCL repair. One likely reason for this high incidence of lip dehiscence after primary BCL repair. One likely reason for this high incidence of lip dehiscence after primary BCL repair. One likely reason for this high incidence of lip dehiscence after primary BCL repair. One likely reason for this high incidence of lip dehiscence after primary BCL repair.

The Figure. Secondary bilateral cleft lip deformities. A, Patient 1, showing misalignment of Cupid’s bow. The prolabial vermilion was preserved for the central vermilion at the time of primary bilateral lip repair. B, Patient 2, showing wide philtrum, misalignment of the Cupid’s bow, and orbicularis deficiency (OO). The prolabial vermilion was also used for the central vermilion reconstruction at the time of the primary bilateral lip repair. C, Patient 5, showing a wide philtrum with central vermilion and OO deficiency. D, Patient 10, showing a catastrophic deformity. The primary lip repair has completely dehisced with secondary healing behind the premaxilla. E, Patient 10, basal view. F, Patient 11, showing a catastrophic deformity and dehisced lips with severe scarring and the need for a premaxillary setback.
tion thus consists of 2 possibilities: (1) a planned lip adhesion with a definitive repair staged at a later date or (2) surgical setback of the premaxilla. Because of the lack of long-term follow-up, it is doubtful that surgeons on cleft lip mission trips routinely plan a 2-staged lip repair with initial adhesion. Surgical excision of the premaxilla is not advocated because the premaxilla is recognized as the keystone of the maxillary arch. Premaxillectomy in an infant causes flattening or concavity of the midface, loss of support for the upper lip, and failure of forward growth of the nose. The risk of premaxillary necrosis is real when the premaxillary setback is performed with the labial repair. However, in my 2 patients, the premaxilla remained pink and bleeding after the setback.

Surgical setback of the premaxilla is indicated only as a final option. As demonstrated by Friede and Pruzansky, the premaxillary-vomer suture is the likely growth center affecting midface, nose, and maxillary arch development. Surgical setback of the premaxilla, if performed before the completion of midface growth, likely places a patient at risk for midface retrusion and a concave profile. However, various authors have also suggested that a protrusive premaxilla can be set back after 6 to 8 years of age without deleterious effects on midfacial growth.

Malnutrition is endemic in Guatemala and presents another risk for poor wound healing and potential lip dehiscence. For example, nearly 50% of children in Guatemala younger than 5 years have low height for their age. Inadequate dietary intakes and high rates of infections are believed to be the principal postnatal biological factors that limit children’s growth. A previous analysis of Guatemalan infants’ dietary data indicated low intake of several micronutrients, especially iron and zinc, vitamin B₁₂, and protein.

In conclusion, patients encountered in the developing world often represent a reconstructive challenge not encountered in the United States. Most of these secondary deformities can reliably be repaired with scar excision, a Mulliken-type repair, and, if necessary, a premaxillary setback.

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An Objective Comparison of 35-mm Film and Digital Camera Image Quality: A New Gold Standard

Many facial plastic surgeons have abandoned film for standardized patient photography because of the lower recurring costs and easier workflow of digital imaging. Because of these advantages, many authors recommend digital image capture but caution that film is still the gold standard for clinical photography owing to its superior image quality. Although there is a consensus that film provides a better image than digital imaging, there is some disagreement about the resolution of 35-mm slide film. Ratner et al stated that slide film has a resolution of 4096 × 2736 pixels, yielding an 11.2-million-pixel image. Other authors disagree, saying that film has a resolution of 15 to 100 million pixels. Several studies have directly compared the image quality of 35-mm slide film with that of digital cameras. Universally, they have confirmed that 35-mm slide film is the practical benchmark for image quality in standardized patient photography. However, these comparisons had considerable limitations. In each study, the methods used to compare the cameras were not standardized—the cameras used different lenses, the digital cameras had sensor sizes different from that of a frame of 35-mm film, the camera-to-subject distance varied between the digital and 35-mm film cameras, and the images compared were of patients instead of standardized test targets. Also important is that the measurement was subjective—study participants rated varying aspects of image quality (that were never defined) using an ordinal numeric scale. Because so many variables were uncontrolled, it is difficult to draw a meaningful conclusion from these comparisons, and it is impossible to repeat and validate the results. In contrast, this study uses objective measurements of image quality to compare digital and 35-mm film images of a standardized test target. The objective of this study was to objectively compare the image quality of 35-mm slide film and a digital camera.

Methods. Images were captured of an International Organization for Standardization (ISO) 12233 standardized test target, a validated instrument for measuring cam-