The Minimal Cleft Lip Revisited: Clinical and Anatomic Correlations

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Minimal cleft lip has been defined as a cleft which does not extend past the vermillion. A study was undertaken to delineate more clearly several features of this entity within the overall cleft spectrum. Eight patients with minimal cleft lip were studied.

Despite the minimal nature of the lip cleft, all patients had some degree of dental and nasal deformity. Serial microscopic sections of tissue taken from the cleft region were studied and a comparison made between the degree of muscle pathology and the varying degrees of clinical deformity in each patient.

Varying proportions of orbicularis muscle fibers were directed cephalically along the potential cleft line, as is seen in more complete clefts. Patients with greater amounts of muscle fiber misdirection in the intact lip segments also showed more severe nasal deformities and formed vertical furrows on pursing the lips.

Findings suggest that the patients exhibiting the clinical triad of minimal cleft lip, obvious nasal deformity, and linear lip furrow on puckering can be presumed to have greater underlying muscle abnormalities. Patients showing these findings therefore require definitive orbicularis muscle reconstruction during surgical repair in order to assure dynamic as well as static rehabilitation of the lip.

The term “minimal cleft lip” is used in this paper to describe a congenital lip cleft extending into but not past the vermillion. Other features said to be regularly found with minimal cleft lip include: (1) a minor defect in the mucocutaneous border, (2) either a narrow ridge of tissue or a depressed groove extending from vermillion to nostril, and (3) a nostril deformity (Lehman and Artz, 1976) (Figure 1). A variety of of other names have been given to this entity in the past including vermilion notch, rudimentary cleft, microform cleft lip, and congenital lip scar. We present clinical and histologic observations gleaned from studying eight patients with this congenital deformity and offer recommendations for a selective approach to the surgical management of this problem.

Materials and Methods

Eight patients ranging in age from seven months to 37 years were studied. Each patient had a minimal cleft lip as defined above, and all clefts were unilateral.

Each patient was evaluated by a plastic surgeon and an orthodontist, and a specific search was made for the presence or absence of cleft palate, alveolar ridge and dental abnormalities, and cleft lip nasal deformity. Note was also made of the presence or absence of a vertical furrow or groove extending along the philtral column line from the vermillion to the nostril floor, formed upon puckering or pursing the lips (a finding previously described by Stenström, 1965). A simple scale was used to grade the severity of the dentoalveolar and nasal deformity, with each being scored minimal, moderate, or marked.

Each patient underwent rotation-advance ment cleft lip repair. A single full thickness section of upper lip extending over the entire vertical height of the lip was removed during the procedure (Figure 2). The width of this excised tissue varied according to the age of the patient and corresponded to tissue usually...
Heckler et al., minimal cleft lip

FIGURE 1A & B. Patient with minimal cleft lip, demonstrating (1) vermilion notch, (2) minor defect in muco-cutaneous border, (3) narrow ridge of tissue extending from vermilion to nostril (this may also appear as a depressed groove), and (4) nostril deformity.

FIGURE 2. A full thickness section of upper lip was removed and serially sectioned. The tissue removed was tissue usually excised and discarded during lip repair.

excised and discarded during the repair. The biopsies were carefully oriented and fixed, sectioned serially, stained with hematoxylin and eosin, and then examined for muscle fiber quantity, orientation, and direction. Approximately 50 sections of each specimen were examined. The histologic specimens were graded according to their degree of variation from the normal, regular, parallel arrangement of orbicularis muscle fibers in the upper lip. Comparisons were then made among the various clinical and histologic parameters to see if any useful correlations could be found.

Results (Table 1)

All eight patients with minimal cleft lip had some degree of dental deformity demonstrated clinically or by x-ray (Table 2). The youngest patient (7 months) did not have sufficient dentition for evaluation at the time of lip surgery and was evaluated at late followup. The severity of the dento-alveolar deformity did not seem to have any correlation with the severity of the nasal deformity or the amount of vermilion notching.

All of the patients also showed evidence of cleft lip nasal deformity regardless of how minimal the vermilion abnormality (Figure 3). The configurations of the nasal deformities generally demonstrated the classical features of the cleft lip nasal deformity as described by Huffman and Lierle (1949). The area of the nostril sill and nasal floor seemed to have the greatest abnormalities, with less severe changes in the alar base, caudal septum, columella, and alar cartilage. Only one patient had a cleft palate, and this was limited to the soft palate.

Results of Histologic Examinations

In all patients, there was continuity of orbicularis muscle fibers across the cleft locus. Some muscle fibers ran in the normal horizontal plane across the lip, and some fibers turned in a cephalic direction as they approached the cleft locus (Figure 4). The histologic picture was one of muscle fiber disarray at the potential cleft line with absence of the usual homogeneous pattern of fiber orientation (Figure 5). The nostril sill and
TABLE 1. Clinical and histologic findings on minimal cleft lip patients.

<table>
<thead>
<tr>
<th>pt.</th>
<th>muscle abnormality</th>
<th>lip furrow on puckering</th>
<th>nasal deformity</th>
<th>dental abnormality</th>
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<tbody>
<tr>
<td>1</td>
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<td>No</td>
<td>Minimal</td>
<td>Supernumerary deciduous incisor</td>
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<tr>
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<td>Incomplete erupted, hypoplastic</td>
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<td></td>
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<td>between central and lateral incisor</td>
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</tr>
<tr>
<td>4</td>
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<td>Marked</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>delayed eruption central incisor</td>
</tr>
<tr>
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<td>Minimal</td>
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<tr>
<td>6</td>
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<td>Moderate</td>
<td>Hypoplastic pits on lateral permanent incisor, incomplete eruption central incisor</td>
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<td>Malformed lateral incisor</td>
</tr>
<tr>
<td>8</td>
<td>Moderate</td>
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<td>Moderate</td>
<td>Lateral incisor rotated, hiatus be-</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>tween lateral incisor and canine</td>
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</table>

TABLE 2. Dental anomalies associated with cleft lip.

1. Congenitally Missing Teeth
2. Supernumerary teeth
3. Fused teeth and irregularities of tooth size
4. Malformed Teeth
5. Malpositioned teeth
6. Delayed Eruption of Teeth
7. Overeruption of Mandibular Anterior Teeth


The greatest amount of muscle fiber misdirection and disarray was seen in patients who had the most severe cleft lip nasal deformities, and who also formed a furrow from the vermilion to the nasal floor on puckering the lips. No correlation was noted between the degree of orbicularis muscle abnormality and either the severity of the dental defects or the size of the vermilion notch.

Discussion

Several authors have clearly demonstrated that, in cleft lip patients, the orbicularis oris muscle fibers diverge from their normal horizontal pattern and turn in a cephalic direction to parallel the cleft margins (Fara et al; 1965; Fara, 1968; Pennisi et al; 1969) (Figure 7). The functional importance of re-orienting these muscle bundles during cleft lip repair has also been emphasized (Randall, 1974). Our studies demonstrate that, in the minimal cleft lip, varying proportions of orbicularis fibers proceed normally across the cleft area, while other fibers turn in a cephalic direction paralleling the potential cleft line. This chaotic histologic picture is consistent with previous studies (Pennisi et al., 1969).

Of note in our specimens was the relative increase in muscle misdirection and disarray seen in sections from the superior lip and nasal floor areas. Cosman and Crikelair (1965) have hypothesized from clinical observations and measurements that "the locus of the cleft defect is in the floor of the nose, the upper lip, and the alveolar arch, rather than on the free border of the lip." Our histologic findings lend support to their hypothesis. The observation that the degree of muscle fiber disarray varied from minimal cleft lip to minimal cleft lip is consistent with the graded teratological order noted by Karsten et al. (1977).

Cosman and Crikelair (1966) also observed a lack of parallelism in the degree of clinical deformity of the nose as compared to the upper lip area showed more muscle abnormalities than did the vermilion region, with proportionally greater numbers of misdirected muscle fibers, and sometimes a suggestion of a decrease in total muscle mass (Figure 6).
alveolar arch from one minimal cleft lip patient to another. Our patients, too, showed no clear-cut relationship between the size of the vermilion notch and the nasal and dento-alveolar deformities. There was parallelism, however, between the severity of muscle fiber misdirection and disarray, the degree of nasal deformity, and the presence or absence of a vertical lip groove on puckering. Our observations indicate that minimal cleft patients who have more severe nasal deformities and who also form a vertical furrow on pursing the lips can be presumed to have more marked orbicularis muscle abnormalities (Figures 8, 9A, B, C, D, 10A, B, C, D, 10A, B, C, D).

This last observation can be useful in se-
lecting an appropriate surgical approach to minimal cleft lip patients. It is sometimes assumed that patients with vermilion notches should be treated with limited and local surgical techniques designed to align the mucocutaneous junction and fill out the vermilion border, thereby avoiding a lip scar running the full height of the upper lip. This approach may be adequate only in minimal cleft lip
FIGURE 7. Muscle fiber orientation in cleft lips of varying severity.

FIGURE 8. Diagrammatic representation of orbicularis oris fiber orientation in two types of minimal cleft lips. Lip on left has minimal nasal deformity and forms no furrow on puckering. Relatively few fibers turn in cephalic direction. Lip on right has more marked nasal deformity and forms vertical furrow on puckering. Proportionally more muscle fibers are misdirected.

FIGURE 9. A. Patient with minimal cleft lip. B. Minimal nasal deformity with only slight nostril sill deficiency. C. No lip furrow formed on puckering.
patients who do not have marked orbicularis oris abnormalities. Patients who exhibit the triad of a vermilion notch, obvious cleft lip nasal deformity, and a vertical lip crease on puckering, will additionally require muscle reconstruction to achieve dynamic as well as static rehabilitation of the lip.

As our patients demonstrate, the minimal cleft lip might more accurately be termed a minimal cleft of the primary palate, consistently involving all structures derived from this embryologic locus. Like Millard (1976), we have found that adequate correction of all of the pathologic features of the minimal cleft generally requires a full-skin incision on the

FIGURE 9. D. Histologic specimen (Sagittal section) showing quite regular pattern with only a few longitudinally cut, misdirected fibers.

FIGURE 10. D. Histologic specimen shows major muscle fiber bundles cut longitudinally and transversely lying adjacent to each other; an irregular, chaotic microscopic appearance.

FIGURE 10. A. Patient with minimal cleft lip. Vermilion notch is similar in magnitude to that of patient in Figure 9. B. More marked nasal deformity, particularly in the nostril sill area. C. Lip furrow on puckering.
lip. In our hands, the rotation-advancement technique has best allowed simultaneous correction of the lip deformity, nasal deformity, and muscle abnormality. Regardless of which skin incision is chosen, the abnormal segment of muscle underlying the lip crease should be excised. This will allow reconstitution of the dynamic oral sphincter by approximation of the adjacent, normal orbicularis muscle bundles.

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References


