International trends in the treatment of cleft lip and palate

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Of all the procedures that fall under the umbrella of plastic surgery, the goal of restoration of form as well as function is perhaps most germane to cleft lip and palate surgery. Satisfactory results depend on cleft type, the technique used for repair, the experience of the surgeon, and the timing of the repair. Extensive knowledge of the pathologic and normal nasal and oral anatomy, scar formation, and facial development is mandatory. Despite the long history of cleft surgery and the significant psychosocial and aesthetic impact of cleft repair, no standard protocols for surgical management of the cleft patient exist. Recently, surveys evaluating the type of care delivered to cleft patients have been published. These serve as enlightening views on the contemporary state of the art of cleft lip and palate surgery. This article presents the results of an international survey created to evaluate trends in cleft surgery. It compares the data with those of a similar survey by the senior author that was published 6 years ago and with a more recent study evaluating the European cleft experience, in an attempt to identify trends in cleft care [1,2].

International trends

Survey

To gauge international trends in cleft lip and palate surgery, a one-page anonymous survey was mailed to 224 cleft centers in the United States and 34 international cleft centers recognized by the Cleft Lip and Palate Society. All studies were completed in the year 2004. The questions focused primarily on surgical timing and techniques used. The survey response rate was 54.5% (Table 1). Collectively, the centers represented in the survey account for the care of 6432 new patients each year. The survey revealed both considerable variety and several areas of significant consensus with regard to timing and technique in various aspects of cleft care. These differences and similarities in treatment are illustrated in the category-specific survey discussion that follows.

Preoperative orthopedic appliances

Fifty-seven percent of the centers routinely use presurgical appliances (Table 2). Many centers reported using only the passive nasoalveolar molding (NAM) or active Latham-type appliances [3,4]. NAM is employed by 60.8% of the surgeons, and the Latham type of active appliance is used by 24.3% of the surgeons. Eight percent of the centers employed passive and active appliances in their practice, but not necessarily in the same patient.

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Lip adhesion

Although a significant number of centers (43%) report the use of lip adhesion in their practice (Table 3), the total number of patients treated with this modality is probably low; 74% of those who use lip adhesion reported using it in fewer than 10% of their patients. The use of presurgical appliances in the center did not translate into an absence of lip adhesion in the treatment armamentarium. Many centers that used appliances also performed lip adhesion for select cases. The most common reasons for performing lip adhesion include the presence of a wide cleft (48.2%), poor compliance with an appliance or lack of appliance availability (14.3% and 7.1%, respectively), and presence of a bilateral cleft or a bilateral cleft with a prominent premaxilla (10.7% each).

Unilateral cleft lip

In the care of patients with unilateral cleft lips, 33.3% of the centers perform the definitive lip procedure before 3 months of age, 65.9% between 3 and 6 months, and 0.7% at an age greater than 6 months (Table 4). The majority of the centers (84.2%) rely on the Millard rotation-advancement method or some modification of it for lip repair [5,6]. The remaining 14.4% of the surgeons report using the triangular flap or straight-line techniques for primary repair of unilateral cleft lips.

Bilateral cleft lip

The age distribution for the repair of bilateral cleft lips is similar to that for unilateral cleft lip repair.

Table 1
Survey statistics

<table>
<thead>
<tr>
<th>Survey response rate</th>
<th>54.6%</th>
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</thead>
<tbody>
<tr>
<td>Number of centers represented</td>
<td>141</td>
</tr>
<tr>
<td>New patients treated each year</td>
<td>6432</td>
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Table 2
Presurgical orthopedics

| Centers using presurgical appliance (%) | 57.4 |
| NAM (%) | 60.8 |
| Latham (%) | 24.3 |
| NAM and/or Latham (%) | 8.1 |
| Nonspecified (%) | 6.7 |

Table 3
Lip adhesion

| Centers employing lip adhesion (%) | 43.3 |
| Indication for lip adhesion (%) |  |
| Wide cleft | 48.2 |
| Poor compliance with appliance | 14.3 |
| Prominent premaxilla | 10.7 |
| Bilateral cleft | 10.7 |
| No appliance available | 7.1 |
| Other | 8.9 |
| Patients per center with lip adhesion (%) |  |
| <10 % | 74 |
| 11–80 % | 14 |
| 81–100 % | 12 |

Only 23.1% of the centers perform the closure on patients less than 3 months of age (Table 5). Seventy-six percent of the centers perform the lip repair between 3 and 6 months, and a nominal number undertake repair after 6 months of life. The most frequent method of repair is the rotation advancement (72%) [7]. Triangular flap or straight-line repair was performed as a primary procedure in 28% of the programs.

Cleft nose

The lower lateral cartilage is repositioned at the time of the initial lip repair in 88.3% of the centers (Table 6). When the lower lateral cartilage is not repaired at the same time as the definitive lip repair, the most frequent ages reported for repositioning were 4 years (45.4%) and 5 years (27.3%). Very few centers waited beyond 6 years for alar repositioning (9%). The surgeons were asked for their opinion regarding the age of septal maturity in cleft patients [8]. The average male age reported was 14.4 years (range = 7–20 years), and the average female age reported was 13.4 years (range = 7–19 years).

Table 4
Unilateral cleft lip management

| Age of definitive repair (%) |  |
| < 3 mo | 33.3 |
| 3–6 mo | 65.9 |
| > 6 mo | 0.7 |
| Technique (%) |  |
| Rotation advancement | 84.2 |
| Straight line/Triangle flap | 15.4 |
Cleft palate

A single-stage cleft palate repair is used in 97% of the centers (Table 7). Furlow Z-plasty (34.8%), pushback palatoplasty (30.3%), and intravelar veloplasty (20.4%) were the most commonly used single-stage techniques. Thirteen percent of the surgeons employed a two-stage repair in at least some cases in their practices. When a two-stage repair is employed, the vomer flap is most frequently used in the first stage (53.8%) and an intravelar veloplasty in the second stage (50%).

Forty percent of the centers reported performing Furlow Z-plasty for treatment of submucous clefts before the age of 2 years, whereas 35% of the respondents stated that they would wait until the patient was more mature (see Table 7). After the age of 2 years, the most frequent procedure employed for repair was Z-plasty (60.4%). Alternative procedures include intravelar veloplasty (17.9%) and pharyngeal flaps (12.3%).

Velopharyngeal incompetence

Speech therapy is started at an average age of 23.7 months (Table 8). The two methods for diagnosing velopharyngeal incompetence (VPI) were video nasopharyngoscopy (79.4%) and videofluoroscopy (20.6%). Eighty-one percent of the surgeons reported that lateral pharyngeal wall motion was the single most important determinant with regard to surgical planning. Palatal motion and the size of the defect were reported by the respondents as secondary determinants. The minimum age for surgical correction is reported as 4.1 years. Palatoplasty was used most frequently to address VPI (65.5%); pharyngeal flaps were employed by 34.5%.

Miscellaneous

Pressure equalization (PE) tubes are inserted at less than 3 months of age in 12.5% of the cleft centers, between 3 and 6 months in 54.2% of the centers,
and between 7 and 12 months in 31.7% of the centers (Table 9). Very few patients receive PE tubes after the age of 1 year. These data suggest that a fair number of patients are getting PE tubes at the time of their initial lip repair (3–6 months). Seventy-four percent of the surgeons state that the Pierre Robin Sequence affects the timing of their cleft surgery. Sixty-three percent of the surgeons note that cleft patients have upper-aerodigestive-tract motor abnormalities that manifest as swallowing difficulties.

Discussion

The majority of the centers that responded to this study report using presurgical appliances. Most of these centers use the nasoalveolar passive molding approach. The percentage of centers reporting the use of NAM remains virtually the same in comparison with the results from the past survey (62%, 6 years ago) and represents an increase over the 48.3% usage reported in the Eurocleft Project. A cautionary note is in order with regard to comparison of the authors’ data with those of the Eurocleft Project. The authors’ percentages represent a proportion of the centers responding to the study, whereas the Eurocleft Project percentages represent a proportion of the individual patients included in the study project. Nonetheless, in broad terms, the comparisons help place the authors’ results in the context of others’ findings.

The present survey reflects a significant use of the Latham appliance by cleft centers and reflects an increase in reported usage over the past survey (5% usage, 6 years ago). The current survey unfortunately does not provide additional information that might help explain this dramatic change.

Lip adhesion is employed by just under half of the centers responding, but the overwhelming majority report using it in very few patients. Although the presence of a wide cleft is the primary reason given for the use of lip adhesion, both poor compliance with the appliance and the inability to obtain an appliance were also provided as frequent reasons for the procedure, suggesting that many centers view lip adhesion as a second-line therapy for the wide cleft. It should be noted that a few centers reported the use of lip adhesion in all patients; centers that reported the universal use of lip adhesion did so generally for bilateral cleft patients.

Taken together, the data from the present study suggest that lip adhesion is certainly not a frequent procedure on a patient-by-patient basis. This result is consistent with those of the Eurocleft Project, which found that lip adhesion is used as a primary procedure in only 4% of patients. Compared with the past survey, this one appears to reveal a sizable decrement in the number of patients undergoing lip adhesion: 6 years ago, 89% of centers reported addressing the wide unilateral cleft with lip adhesion followed by rotation advancement.

The present study demonstrates that the majority of unilateral and bilateral cleft lips are repaired by a rotation-advancement method. This finding is consistent with the previous survey and the Eurocleft Project, which report usage rates between 50% and 89% and 50% and 62.2%, respectively. Many of the respondents in the authors’ study specifically reported the use of the Millard rotation-advancement technique, but what is even more interesting is that a significant number of respondents reported using later adaptations of the original Millard technique, such as the Mulliken technique. This development is most evident in the responses regarding the repair of bilateral clefts and suggests a possible evolution in the approach to cleft care.

The present study sought significantly more information about the treatment of cleft nose deformity than did the previous survey or the Eurocleft Project, rendering a meaningful comparison impossible. Nonetheless, it should be pointed out once more that the overwhelming majority of centers do some type of alar repositioning at the time of the definitive lip repair. If alar repositioning is not performed initially, it is most frequently performed at 4 or 5 years of age; these ages are consistent with the previous study.

Unfortunately, the design of the survey does not permit discussion of the timing of palatal repair or of the number of centers that combine the repair of palatal components with the lip repair. An overwhelming majority of the centers perform a one-stage palatal repair. This figure represents a possible difference from the Eurocleft findings, which show that roughly half (51.3%) of the patients undergo one-stage soft and hard palate repair at various times, either in isolation or in combination with lip procedures. Another notable finding in the present study is the shift to the Furlow technique as the most

<table>
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<th>Table 9</th>
<th>Miscellaneous</th>
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<tr>
<td>Age at PE tubes (%)</td>
<td></td>
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<tr>
<td>&lt;3 mo</td>
<td>12.5</td>
</tr>
<tr>
<td>3 – 6 mo</td>
<td>54.2</td>
</tr>
<tr>
<td>7–12 mo</td>
<td>31.7</td>
</tr>
<tr>
<td>&gt;12 mo</td>
<td>1.6</td>
</tr>
<tr>
<td>Pierre Robin affects treatment</td>
<td>74.5%</td>
</tr>
<tr>
<td>Swallowing difficulty observed</td>
<td>63.8%</td>
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frequently used procedure for palatal closure in a single stage. The Furlow technique is still not used in the majority of patients, as a wide variety of procedures was reported in the current study. Nonetheless, there appears to be a shift away from push-back-type techniques, which were reported as the most commonly used method in the survey 6 years ago. The rise in prominence of the Furlow techniques is also demonstrated in the results pertaining to the care of the submucous cleft. When a two-stage procedure is indicated, the most frequent sequence is a vomer flap followed by intervelar veloplasty.

The diagnosis of VPI continues to be confirmed with video nasopharyngoscopy and videofluoroscopy. Lateral wall motion, followed by palatal motion, is the most significant determinant for management.

Summary

The present study presents a contemporary (2004) survey of the methods and timing used in the care of cleft patients. The results are compared, when possible, with those of a similar study published by the lead author in 1998 and with those of the Eurocleft Project that took place from 1996 to 2000. Although very little uniformity is seen in the care of cleft patients, this comparison demonstrates a significant degree of agreement on many aspects of cleft care. The use of presurgical orthopedic appliances, generally of the NAM type, is predominant. The use of rotation advancement maintains its predominance in the repair of the cleft lip and is generally accompanied by alar repositioning. The area of greatest variation and diversity is the care of the palate, where the Furlow technique has become a frequently used procedure. Comparison of the results of this study with the findings of the previous two demonstrates a continuing process of adaptation and evolution in the field of cleft lip and palate surgery.

References