Supraglottoplasty Outcomes in Neurologically Affected and Syndromic Children

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IMPORTANCE Supraglottoplasty (SGP) failure is frequently attributed to coexistent medical comorbidities, but studies specifically evaluating outcomes in these populations are lacking.

OBJECTIVE To assess SGP outcomes in patients with neurologic and syndromic comorbidities and severe laryngomalacia (LM).

DESIGN, SETTING, AND PARTICIPANTS Case series with retrospective review of medical records of 54 patients with neurologic and/or syndromic comorbidity and severe LM who underwent SGP between 2004 and 2012 at a tertiary care pediatric institution.

INTERVENTIONS Patients presented with severe LM that required SGP. Supraglottoplasty failure necessitated revision SGP, tracheostomy, or gastrostomy tube insertion, or LM and obstructive sleep apnea that required assisted ventilation (continuous positive airway pressure and bilevel positive airway pressure).

MAIN OUTCOMES AND MEASURES Medical records were reviewed with a focus on patient factors, surgical timing, complications, and surgical and dysphagia outcomes. Patients were grouped based on their age at the time of SGP as infants (aged ≤12 months) and children (aged >12 months). Statistical comparisons were performed with SGP outcomes of infants with LM and no comorbidities.

RESULTS Fifty-four patients met the inclusion criteria. Thirty-one (13 infants, 18 children) had a neurologic condition and 23 (15 infants, 8 children) had syndromes. The overall success rate of SGP was 67% (36 of 54) in these populations. Neurologic (P = .003) and syndromic (P < .001) comorbidities were associated with significant reduction in SGP success rates vs no comorbidities. Among SGP failures (18 of 54 [33%]), 13% (7 of 54) required tracheostomy. 9% (5 of 54) needed assisted ventilation, 7% (4 of 54) required a postoperative gastrostomy tube, and 4% (2 of 54) required revision SGP. In the neurologic comorbidities group, patients with cerebral palsy had significantly higher tracheostomy rates compared with those who had other neurologic pathologies constituting comorbidities (2 of 11 [18%] vs 0 of 20; P = .049). In infants, acute airway obstruction was the most common indication for SGP in the neurologically comorbidity and syndrome populations (success rates, 69% and 67%, respectively). In children, obstructive sleep apnea was the most common indication for SGP in the neurologic comorbidity and syndrome populations (success rates, 78% and 50%, respectively).

CONCLUSIONS AND RELEVANCE Supraglottoplasty remains useful and outcomes were better in patients with neurologic comorbidity than in patients with syndromic comorbidity.
Congenital laryngomalacia (LM) presents within the first 2 to 6 weeks of life and, if left untreated, gradually resolves by age 18 to 24 months. Laryngomalacia is characterized by shortened aryepiglottic folds, redundant suprathyroid mucosa, and dynamic inspiratory collapse of these supraglottic structures. The resultant upper airway obstruction may be mild and managed with reflux precautions, acid suppression, watchful expectancy, and thickened feeds if associated dysphagia is present. In 20% of the cases, increasing severity, demonstrated by symptoms of respiratory distress with hypoxia, cyanosis, apnea, obstructive sleep apnea (OSA), and failure to thrive, may necessitate surgical management with supraglottoplasty (SGP).2

Although successful SGP relieves obstructive airway symptoms, mild stridor and feeding issues with microaspiration often resolve more slowly. Failure of SGP associated with persistent or recurrent airway symptoms may require a revision SGP and, in severe obstruction, may necessitate a tracheostomy. Reported3 failure rates of SGP have ranged from 7% to 31%. Failures usually are attributed to comorbidities including syndromes, neurologic disorders, or chronic cardiorespiratory conditions. Thus, multiple medical comorbidities contribute to the severity of LM and potential failure of SGP.2,3

Studies4-7 specifically examining the success rates of SGP in patients with comorbidities have not attempted to do so in great detail.

Day and colleagues8 used multivariate analysis in a retrospective outcome study on SGP and failed to demonstrate a risk of failure in the presence of syndromic or neurologic defects. They opined that prematurity was the only independent risk factor and that failure of SGP in cases with comorbidity can be explained by a high incidence of prematurity. A systematic review9 of SGP outcomes, attempting to determine the relative risk of surgical failure in children with LM, commented on the lack of sufficient data to study each comorbidity separately. Thus, the investigators arranged the data of LM patients with all comorbidities in one group and found that LM patients with a coexistent comorbidity carry a relative risk of 7.14 for SGP failure compared with LM patients without coexistent comorbidity.

In essence, the literature suggests that the presence of comorbidities in children with LM may increase the risk of surgical failure, but studies dedicated to outcomes in these populations have not been performed. The present study was undertaken to assess the outcomes of SGP in patients with LM and neurologic and syndromic comorbidities. To improve the clarity of outcomes for each group, arbitrary categorization by age and comorbidities was performed.

### Methods

After approval by the University of Arkansas Medical Sciences institutional review board, a retrospective analysis of 325 consecutive patients with severe LM who underwent SGP at Arkansas Children’s Hospital, Little Rock, from January 1, 2004, to June 30, 2012, was performed. Only patients with neurologic or syndrome comorbidities were selected. The medical records of these patients were reviewed to evaluate preoperative symptoms, timing of surgery, need for further surgical treatment, complications, surgical and dysphagia outcomes, and follow-up.

All patients underwent SGP by either the cold-steel technique or carbon dioxide laser. Symptom resolution was considered a successful outcome and treatment was considered a failure if patients required revision SGP, tracheostomy, gastrostomy tube (GT) insertion, or assisted ventilation (continuous positive airflow pressure and bilevel positive airflow pressure [CPAP, BiPAP]).

The patients were divided into neurologic or syndrome groups. To understand the pathologic of LM and outcomes better, each group was further divided based on the patient’s age at the time of SGP into infants (aged ≤12 months) and children (aged >12 months). Those with identifiable chromosomal abnormalities were included in the syndrome group.

All patients with a history of choking or recurrent pneumonia, receiving thickened feeding, or having objective evidence of aspiration on videofluoroscopic swallow study were categorized as having dysphagia. Those with persistent symptoms 6 months after SGP were included within the postoperative dysphagia group.

### Results

Of 325 patients who underwent SGP, 54 patients (17%) met the inclusion criteria for this study. Thirty-one (10% [13 infants, 18 children]) were diagnosed with a neurologic condition as a comorbidity and 23 (7% [15 infants, 8 children]) with syndromic comorbidity. Specific diagnoses and the number of patients with each included comorbidity are listed in Table 1. The demographics of each population separated into age groups are demonstrated in Table 2.

These groups were compared with full-term infants with LM but no other comorbidity who underwent SGP during the same time period. The data on these 136 infants (81 males, 55 females), including the SGP success rate (93% [126]) and incidence of synchronous airway lesions (35% [47]), have been reported.10 A comparison (Table 3) found no statistically significant difference in sex and incidence of synchronous airway lesions between the groups.

The SGP success rates in infants with neurologic and syndromic comorbidities were compared with those of the infants without comorbidities (Table 4). The overall success rate in the 31 patients with neurologic comorbidities was significantly lower than that of the 136 infants without comorbidities (74% vs 93%; P = .003). The patients with neurologic comorbidities were further divided into those with cerebral palsy (n = 11) and those with other neurologic abnormalities or pathologies that constituted a comorbidity (n = 20). The success rate of patients with cerebral palsy was significantly lower, whereas the group with other neurologic comorbidities failed to show significant reduction in the success rate compared with the group without comorbidities.

The overall success rate of SGP in the 23 patients in the syndrome group (56%; P < .001) was significantly lower that of the
group without comorbidities. The syndrome group was further subdivided into syndrome only (n = 15) and syndrome and neurologic comorbidity (n = 8). A significant reduction in the success rate was noted in both groups indicating that the syndrome alone significantly lowers the SGP success rate (Table 4).

The overall SGP success rate was 67% and was significantly lower than that in patients without comorbidities. Patients with a single comorbidity had an SGP success rate of 82%, and those with multiple comorbidities had an SGP success rate of 47%, indicating a possible synergistic effect of these coexisting comorbidities. Among SGP failures (18 of 54 [33%]), 13% (7 of 54) of the patients required tracheostomy, 9% (5 of 54) needed assisted ventilation, 7% (4 of 54) required a postoperative gastrostomy tube, and 4% (2 of 54) required revision SGP. The specific outcomes in each group are further outlined below.

### Neurologic Comorbidity

Thirty-one patients with neurologic comorbidities were included in the study (mean age at SGP, 19.1 months). Cerebral palsy was the most common diagnosis (11 [35%]). Prematurity (gestation age, <37 weeks) was present in 11 patients (35%) (7 infants and 4 children). No coexistent cardiac anomalies were noted, although surgical correction of patent ductus arteriosus (not considered a comorbidity because of its association with prematurity) was required in 3 infants who were born prematurely.

Indications for SGP in patients with neurologic comorbidity were categorized by age at the time of SGP (Table 5). Most (18 of 31 [58%]) of these patients underwent SGP after infancy. Acute airway obstruction causing cyanosis, apnea, shortness of breath, and acute life-threatening events (6 [46%]), as well as failure to thrive (6 [46%]), were the most common reasons for infants (<12 months) to undergo SGP. Obstructive sleep apnea (10 [56%]) was the leading indication for SGP in children with a neurologic comorbidity (>12 months).

Outcomes are described in Table 6. Eleven infants (85%) and 14 children (78%) had preoperative dysphagia based on symptomatic and clinical assessment. Aspiration, as identified by a videofluoroscopic swallow study or functional endoscopic evaluation of swallow, was observed preoperatively in 8 of 8 infants (100%) and 6 of 14 children (43%) without GT. Five infants (38%) and 4 children (22%) presented preoperatively with a GT. All patients underwent microlaryngobronchoscopy and SGP. Synchronous airway lesions (SAL) were seen in 7 infants (54%) and 8 children (44%), with an overall incidence of 48%. Twenty-four (77%) patients underwent cold-steel SGP and 7 (23%) underwent carbon dioxide laser SGP. Supraglottoplasty was successful with improvement of airway symptoms in 69% of infants (9 of 13) and 78% of children (14 of 18) with neurologic conditions. Multilevel obstruction was present before, during, or after SGP, necessitating additional nonlaryngeal upper airway surgical interventions during the course of management. In children with neurologic comorbidities who had OSA, 70% (7 of 10) also required adenotonsillectomy and 20% (2 of 10) required uvulopalatopharyngoplasty.

Total failure of SGP occurred in 8 patients (26%) with neurologic comorbidities. Of the 4 infants in whom SGP failed, 2 required tracheostomy: 1 for ventilator-dependent respiratory failure and the other for aspiration and recurrent pneumonia. Two infants with persistent aspiration needed GT insertion. Supraglottoplasty failures were noted in 4 children (>1 year at SGP). Two children with persistent aspiration needed assisted ventilation (CPAP) and 1 needed revision SGP. One patient with persistent and severe aspiration required GT insertion. In the follow-up period dysphagia was still an issue in 12 of 31 patients (39%) with neurologic comorbidities. Seven of these patients (54%) were infants (mean follow-up, 33.5 months; range, 9-84 months) and 5 (28%) were children (mean follow-up, 15.6 months; range, 8-30 months).

### Cerebral Palsy vs Other Neurologic Abnormalities

A comparison was made between patients with cerebral palsy and those with other neurologic comorbidities (Table 7). There
were 11 patients with cerebral palsy in the neurologic comorbidity group and 4 in the syndrome group. The group with other neurologic abnormalities other than cerebral palsy included 20 patients within the neurologic comorbidity group and 24 patients overall. Table 7 reports significantly high tracheostomy rates in the cerebral palsy group, although the success rates of SGP were similar, indicating that cerebral palsy increases the risk of tracheostomy in patients with LM undergoing SGP.

Patients With Syndromic Comorbidities
Twenty-three patients had a syndrome or a noted chromosomal anomaly (mean age, 13.4 months) (Table 1). Seven patients (30%) were premature, including 4 infants and 3 children. Cardiac comorbidities were present in 9 patients (39%; 7 infants [1 had patent ductus arteriosus]) and 2 children. Coexistent neurologic comorbidities were noted in 8 patients (35%; 3 infants and 5 children). The presence of a neurologic comorbidity did not significantly increase the failure of SGP in patients with a syndrome (Table 4).

Indications for SGP in patients with a syndrome, specific to each age group, are described in Table 5. Acute airway obstruction was the most common indication in infants (10 [67%]) and OSA (7 [88%]) was the most common indication in children.

Surgeons outcomes in the syndrome group are described in Table 6. Preoperative dysphagia, as assessed by symptoms and clinical examination, was observed in 12 infants (80%) and 6 children (75%). Aspiration, identified by videofluoroscopic swallow study or functional endoscopic evaluation of swallow, and was noted preoperatively in 3 of 6 infants (50%) and 1 of 3 children (33%) without a GT. Gastrostomy tubes were present before surgery in 9 of 60% infants and 5 (62%) children. All syndromic children (aged >12 months at SGP) with a GT had an associated neurologic comorbidity. Microlaryngobronchoscopy with SGP was performed in all patients with syndromes. Synchronous airway lesions were seen in 4 (27%) infants and 3 (38%) children, with an overall incidence of 30%. Cold steel SGP was performed in 14 patients (61%) and carbon dioxide las-
ser SGP was performed in 9 patients (39%). The success rate of SGP in patients with a syndrome was 60% in infants and 50% in children.

In addition to SGP, adenotonsillectomy was required in 5 of 8 (62%) children with OSA. These surgeries were performed to relieve multilevel airway obstruction, either during the course of management or during follow-up after SGP.

Failure of SGP occurred in 10 patients (43% [6 infants, 4 children]). One infant had a neurologic comorbidity and another infant had a cardiac comorbidity. Three infants with airway issues required tracheostomy, 1 needed revision SGP, 1 infant with persistent aspiration needed a GT, and 1 infant with OSA required CPAP. An infant with VATER syndrome (vertebral anomalies, anal atresia, cardiac defects, tracheoesophageal fistula and/or esophageal atresia, renal and radial anomalies, and limb defects) and developmental delay, a patient with CHARGE syndrome (coloboma, heart defect, atresia choanae, retarded growth and development, genital abnormality, and ear abnormality) and micrognathia, and a patient with Marshall-Smith syndrome required a tracheostomy.

Supraglottoplasty failures were noted in 4 children (50%). Three of these children had coexistent neurologic comorbidity. Two children with an extra Y chromosome and overlying cerebral palsy required a tracheostomy. A child with Down syn-

<table>
<thead>
<tr>
<th>Table 5. Indication for SGP in Patients With LM and Comorbidities</th>
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<tr>
<td><strong>Group</strong></td>
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<tr>
<td>Neurologic comorbidity</td>
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<tr>
<td>Acute airway obstruction*</td>
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<tr>
<td>OSA</td>
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<tr>
<td>Aspiration</td>
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<tr>
<td>Failure to thrive</td>
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<tr>
<td>Syndromic comorbidity</td>
</tr>
<tr>
<td>Acute airway obstruction*</td>
</tr>
<tr>
<td>OSA</td>
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<tr>
<td>Aspiration</td>
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<td>Failure to thrive</td>
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Abbreviations: LM, laryngomalacia; OSA, obstructive sleep apnea; SGP, supraglottoplasty.

* Obstruction resulted in episodes such as cyanosis, apnea, and acute life-threatening events.

<table>
<thead>
<tr>
<th>Table 6. Incidence of Outcomes in Each Study Group</th>
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<tr>
<td><strong>Outcome</strong></td>
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<tr>
<td></td>
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<tr>
<td>Preoperative dysphagia</td>
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<tr>
<td>Preoperative aspiration*</td>
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<tr>
<td>Preoperative GT</td>
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<tr>
<td>SAL</td>
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<tr>
<td>Success rate of SGP</td>
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<tr>
<td>Follow-up dysphagia</td>
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| **Groups** | **No. (%)** |
| **Infants, Syndromic Comorbidity (n = 15)** | **Children, Syndromic Comorbidity (n = 8)** | **Overall (n = 23)** |
| Preoperative dysphagia | 12 (80) | 6 (75) | 18 (78) |
| Preoperative aspiration* | 3/6 (50) | 1/3 (33) | 4/9 (44) |
| Preoperative GT | 9 (60) | 5 (62) | 14 (61) |
| SAL | 4 (27) | 3 (38) | 7 (30) |
| Success rate | 9 (60) | 4 (50) | 13 (57) |
| Follow-up dysphagia | 1 (7) | 0 | 1 (4) |

Abbreviations: GT, gastrostomy tube; LM, laryngomalacia; SAL, synchronous airway lesion; SGP, supraglottoplasty.

* Dysphagia means patient on thickener or aspiration as documented on videofluoroscopic swallow study/functional endoscopic evaluation of swallow or presence of GT.

**Table 7. Comparison of Outcomes Between Patients With Cerebral Palsy and Patients With Other Neurologic Pathologies and Abnormalities Constituting Comorbidities**

<table>
<thead>
<tr>
<th>Patient Group</th>
<th><strong>Cerebral Palsy (n = 11)</strong></th>
<th><strong>Other Neurologic Comorbidity (n = 20)</strong></th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurologic comorbidity*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Success rate of supraglottoplasty</td>
<td>7 (64)</td>
<td>16 (80)</td>
<td>.32</td>
</tr>
<tr>
<td>Tracheostomy</td>
<td>2 (18)</td>
<td>0</td>
<td>.049</td>
</tr>
<tr>
<td>Overall</td>
<td>(n = 15)</td>
<td>(n = 24)</td>
<td></td>
</tr>
<tr>
<td>Success rate of supraglottoplasty</td>
<td>8 (53)</td>
<td>19 (79)</td>
<td>.09</td>
</tr>
<tr>
<td>Tracheostomy</td>
<td>4 (27)</td>
<td>1 (4)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

* The neurologic comorbidity group consisted of 11 patients with cerebral palsy and 20 patients with other neurologic pathologies that constituted comorbidity. By including 8 patients from the syndromic comorbidity group with a coexistent neurologic comorbidity (4 with cerebral palsy, 3 with developmental delay, and 1 with hydrocephalus), the overall patient count increased to 15 patients with cerebral palsy and 24 patients with other neurologic pathologies constituting neurologic comorbidity.
drome who had persistent OSA and glossoptosis and a patient with a chromosomal anomaly (18q−) and cerebral palsy needed CPAP. In the follow-up period dysphagia was persistent only in 1 of 15 infants (7%) at 9 months after SGP and in none of the children.

Complications of SGP
No major complications or stenosis were noted after SGP. One child with a neurologic comorbidity had a reactionary hemorrhage that required surgical control.

Discussion
Supraglottoplasty is indicated in severe LM with presenting symptoms of respiratory distress with hypoxia, cyanosis, apnea, OSA, and failure to thrive. Supraglottoplasty in patients with LM who are otherwise healthy has an excellent success rate with minimal complications; an increased risk of failure occurs in individuals with comorbidities. Denoyelle and colleagues reported an 89% success rate in a population of inpatients has been reported. Asimilar trend of older age in patients with neurologic comorbidities in the present study (mean age, 19.1 months). Asimilar trend in overall management of LM in these patients may also explain late-onset LM seen in patients with a neurologic comorbidity. In the present study, the presence of neurologic ischemic damage (ie, cerebral palsy) significantly increased the failure rate of SGP and incidence of tracheostomy compared with other neurologic pathologies constituting comorbidity (27% vs 4%) (Table 7).

Success rates and postoperative recovery with a return to feeding after SGP in patients with neurologic comorbidities have been reported to be similar to those in infants without neurologic comorbidities. Results in the present study suggest that the outcomes of SGP in patients with LM and neurologic comorbidities, especially the tracheostomy rates, may not be as poor as previously reported, suggesting an improving trend in overall management of LM in these patients.

Syndromic Comorbidities
The success rate of SGP in patients with a syndromic comorbidity or chromosomal anomaly in the present study was 56%. This is similar to the 50%6 and 57%7 success rates reported in other studies of patients with syndromes and congenital anomalies and is significantly lower than the rates in the population without comorbidities.

Micrognathia in Pierre Robin sequence was associated with a poor prognosis. In patients with micrognathia, as in CHARGE syndrome and Pierre Robin sequence, a definitive operation, such as mandibular distraction, tongue base reduction, or epiglottopexy, may help to prevent tracheostomy. In the present series, SGP was successful in only 2 of 4 patients with CHARGE syndrome, with 2 of these patients ultimately requiring tracheostomy.

Existing reports suggest that patients with Down syndrome do well with SGP in the absence of concomitant cardiac or neurologic diseases. Both patients with Down syndrome in the present series had coexistent cardiac anomalies. One of these patients had a successful outcome and the other patient had glossoptosis that complicated LM and required CPAP. An infant with VATER syndrome had undergone prior repair of tracheoesophageal fistula with resultant severe tracheomalacia, and a patient with Marshall-Smith syndrome had severe general body hypotonia; both of these individuals required tracheostomy. Thus, the secondary issues may have contributed to the outcomes.

Reports of 22q11 deletion with oculo-auriculo-vertebral anomalies and LM exist; however, we did not identify any such cases in the present series. Two children (aged >12 months...
at SGP) with an extra Y chromosome and overlying cerebral palsy required tracheostomy, suggesting that coexistent cerebral palsy may have predisposed these patients to tracheostomy. The congenital anomalies or systemic abnormalities seen in patients with syndromic comorbidities may give rise to several complex scenarios that may contribute to failure of SGP. The results in the present study are similar to those reported earlier and lower than those reported in patients with neurologic comorbidity in present study.

**Age at Presentation**

The mean age of patients at the time of SGP is usually 12 months or younger. Late-onset variant LM has been described in older patients. We therefore stratified patients based on age to evaluate the patterns of presentation of LM. Age-based stratification was attempted by Hoff and colleagues, who reported that patients younger than 2 months may have a higher incidence of SGP failure, even in the absence of comorbidities.

Infants in both groups mainly presented with acute airway obstruction. Most patients (58%) with a neurologic comorbidity underwent SGP after infancy (aged >12 months). Furthermore, 62% of the patients with syndromes who received SGP after infancy had an associated neurologic comorbidity; this may have contributed to a later onset of LM symptoms. Thus, late presentation of LM is more likely to be associated with a neurologic comorbidity. Children (aged >12 months at the time of SGP) mainly presented with OSA and required CPAP or surgery for resolution of multilevel airway obstruction. Considering the late presentation in patients with neurologic comorbidity, it may not be entirely accurate to consider this to be congenital LM. Rather, LM in these patients may represent a manifestation of decreased airway tone and control from hypotonia and pharyngomalacia in the setting of an immature or underdeveloped nervous system.

**Dysphagia**

Dysphagia in LM is associated with compromised laryngeal protective reflex and reduced supraglottic mucosal sensitivity. Laryngeal sensitivity improves after SGP, thus reducing the aspiration postoperatively in patients with congenital LM. The reported dysphagia rate among otherwise healthy infants with LM before SGP was 58.2% in full-term infants with no comorbidities and 72.5% in preterm infants with no comorbidities. The follow-up incidence of dysphagia after SGP was only 6.6% in full-term infants but was significantly higher in preterm infants at 32.5%.

In the present study, aspiration and dysphagia were common in the neurologic comorbidities group both preoperatively and at follow-up, highlighting a more global issue with the loss of vagal tone and immaturity of the central nervous system in this subgroup, which in turn reduces the laryngopharyngeal tone. Reports suggest that any patient, with or without neurologic problems, who has persistent dysphagia after SGP may need to receive magnetic resonance imaging to rule out Chiari I malformation. Reports also exist suggesting that decompression of Chiari I malformation, but not Chiari II malformation, may prevent the need for SGP in patients with LM. Chiari I malformation was noticed in 10% of the patients within the neurologic comorbidity cohort.

Most infants (60%) with LM and syndromic comorbidity required GT. All 5 children with syndromic comorbidity (aged >12 months at SGP) with a GT (62%) also had a neurologic comorbidity. This highlights the feeding difficulties in this group during infancy that seem to improve with increasing age. The associated neurologic comorbidity may have compounded the feeding issue in children who also had a syndrome. Eighty percent of the infants with syndromic comorbidity had feeding issues that improved with age, suggesting that feeding difficulties in this population are possibly secondary to associated congenital anomalies and improved with age, with only 4% exhibiting follow-up dysphagia as opposed to a more persistent dysphagia in patients with a neurologic comorbidity (39%).

**Conclusions**

Herein we report specifically on outcomes of SGP in patients with LM and comorbidities, especially neurologic disorders and syndromes. To our knowledge, such a study has not been reported before. The tracheostomy rates were significantly high in patients with cerebral palsy; however, the overall rates were much lower than previously reported. This is a very encouraging finding. Our institutional policy of staged management of multilevel airway obstruction, with or without the use of ventilator support with CPAP or BiPAP, may have contributed to this low rate. Despite lower success rates of SGP for treatment of severe LM in patients with comorbidities compared with those in otherwise healthy infants, SGP remains a useful procedure and may avoid tracheostomy in patients with comorbidities.

To our knowledge, this is the first dedicated study on the outcomes of SGP in patients with comorbidities and LM. Outcomes were better in patients with a neurologic comorbidity than in those with a syndrome. Aspiration and dysphagia are major concerns in the pediatric population with neurologic comorbidities, with 39% of patients showing evidence of swallowing problems in follow-up. Tracheostomy rates in the present study were not as high as those previously reported. Supraglottoplasty remains a useful procedure in patients with LM and comorbidities.
Supraglottoplasty Outcomes in Children

Original Investigation Research

Supraglottoplasty Outcomes in Children

Administrative, technical, or material support: Bower, Richter.

Study supervision: Bower.

Conflict of Interest Disclosures: None reported.

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Correction: The PDF of this article was corrected on August 18, 2014, for editorial changes.

REFERENCES


