Long-term Changes in Quality of Life After Surgery for Pediatric Obstructive Sleep Apnea

Ron B. Mitchell, MD; James Kelly, PhD; Ellen Call, MS, CFNP; Naomi Yao, BA

Objective: To study long-term changes in quality of life in children after adenotonsillectomy for obstructive sleep apnea (OSA) documented by polysomnography.

Design and Setting: Prospective study of children with OSA at the University of New Mexico Children’s Hospital, Albuquerque.

Methods: Children who met inclusion criteria underwent adenotonsillectomy. Caregivers were asked to complete the OSA-18 quality of life survey prior to surgery (survey 1), within 7 months after surgery (short-term) (survey 2), and between 9 and 24 months after surgery (long-term) (survey 3). Scores from the preoperative and postoperative surveys were compared using the paired t test.

Results: The study population included 34 children, 27 (79%) of whom were male. The mean age of the children at the time of inclusion in the study was 6.7 years (range, 3.0-16.8 years). The mean total score for survey 1 (76.7) was significantly higher (P<.001) than the mean total score for survey 2 (32.0) or for survey 3 (40.9). However, the domains of sleep disturbance and physical suffering were significantly lower (P≤.005) in survey 2 than in survey 3. The differences in the domains of emotional distress, daytime problems, and caregiver concerns between survey 2 and survey 3 were not statistically significant.

Conclusions: Caregivers perceive a long-term improvement in quality of life after adenotonsillectomy for OSA although these improvements are more pronounced in the short-term than in the long-term and are not uniform across all domains of the OSA-18 survey.

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OVER THE LAST 20 YEARS there has been growing awareness of the effects of sleep-disordered breathing on behavior, school performance, and quality of life in children. Sleep-disordered breathing comprises a spectrum of airway disorders that ranges from simple snoring to obstructive sleep apnea (OSA). Full-night polysomnography is the “gold standard” for distinguishing OSA from milder forms of sleep-disordered breathing such as simple snoring. The estimated prevalence of OSA in 4-year-old children is 1% to 3%, but the overall prevalence of other forms of sleep-disordered breathing is much higher.

Quality of life instruments such as the OSA-18 survey have been used increasingly as measures of outcome after adenotonsillectomy for pediatric OSA. Previous studies have shown short-term improvements in the total score and in each domain of the OSA-18 after adenotonsillectomy. The present study examines long-term improvements in quality of life after surgical therapy for OSA in children.

METHODS

Approval for this study was obtained from the institutional review board of the University of New Mexico School of Medicine, Albuquerque. Children who were referred to the Pediatric Otolaryngology Service with a sleep disturbance and shown to have OSA by polysomnography were included in the study. Exclusion criteria included (1) children younger than 3 years or older than 18 years; (2) children who previously had an adenotonsillectomy or polysomnography; and (3) children with craniofacial syndromes, neuromuscular disease, developmental delay, or psychiatric disorders.

The effectiveness of adenotonsillectomy for the relief of OSA was evaluated using the OSA-18 survey. The survey comprises 18 items in 5 domains of sleep disturbance, physical suffering, emotional distress, daytime problems, and caregiver concerns. The domains of emotional distress and daytime problems con-
**RESULTS**

The study population comprised 60 children. The caregivers for 26 of these children did not complete at least 1 of the postoperative OSA-18 surveys. As a consequence, the study population included 34 children, 27 (79%) of whom were male. The mean age of the children at the time of inclusion in the study was 6.7 years (range, 3.0-16.8 years). Seventeen children (50%) were Hispanic or Latino; 12 children (35%) were white (non-Hispanic or non-Latino); and 3 children (9%) were Native American. Ethnicity was not identified in 2 children.

The mean RDI was 33.4 (range, 6.5-110.5 [95% confidence interval, 24.2-42.7]). Seventeen children (50%) were morbidly obese as evidenced by an age-and gender-corrected body mass index in the 95th percentile or above.

The mean intervals were 2.1 months (range, 0.6-6.8 months) between survey 1 and surgery; 4.2 months (range, 1.3-6.8 months) between surgery and survey 2; 16.4 months (range, 6.9-29.2 months) between surgery and survey 3; and 12.4 months (range, 4.1-24.6 months) between survey 2 and survey 3.

Mean total and domain scores for the OSA-18 with 95% confidence intervals before and after adenotonsillectomy for OSA are presented in Table 1. The mean total score for survey 1 (76.7) was significantly higher (P<.001) than the mean total score for survey 2 (32.0) or for survey 3 (40.9). However, the domains of sleep disturbance and physical suffering were significantly lower (P≤.005) in survey 2 than in survey 3. The differences in the domains of emotional distress, daytime problems, and caregiver concerns between survey 2 and survey 3 were not statistically significant (Table 1).

The mean difference scores and SRMs are given in Table 2. The mean difference in total score for survey 1 vs survey 2 was 44.7, and the difference score for each domain was positive (range, 4.2-12.8). The SRM for total score was 2.3, and the SRM for the domains ranged from 0.8 to 2.4. The mean difference in total score for survey 1 vs survey 3 was 35.8, and the difference score for each domain was positive (range, 3.9-10.6). The domain with the greatest mean difference score for the comparison between survey 1 vs survey 2 and survey 1 vs survey 3 was “sleep disturbance.” For survey 2 vs survey 3, the mean difference in total score was –8.9, and the difference score for each domain was negative (range –0.3 to –3.1). The SRM was –0.48 for total score and ranged from –0.04 to –0.58 among the domains. The domain with the greatest mean difference score for the comparison between survey 2 vs survey 3 was “physical suffering.”

The change in the OSA-18 survey domains after surgery is illustrated graphically in the Figure. There is a clear decrease in mean score for each domain for both survey 2 and survey 3. The mean scores for the domains of “sleep disturbance” and “physical suffering” are lower for survey 2 vs survey 3 (P≤.005), whereas the domains of “emotional distress,” “daytime problems,” and “caregiver concerns” are not significantly different (P≥.15).

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**Table 1. Mean Scores for Preoperative and Postoperative OSA-18 Surveys**

<table>
<thead>
<tr>
<th></th>
<th>OSA-18 Total Score</th>
<th>Sleep Disturbance</th>
<th>Physical Suffering</th>
<th>Emotional Distress</th>
<th>Daytime Problems</th>
<th>Caregiver Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey 1</td>
<td>76.7 (70.5-83.0)</td>
<td>19.4 (17.9-20.9)</td>
<td>17.3 (15.4-19.2)</td>
<td>10.2 (8.6-11.8)</td>
<td>10.2 (8.6-11.8)</td>
<td>18.6 (16.7-20.4)</td>
</tr>
<tr>
<td>Survey 2</td>
<td>32.0 (28.0-36.2)</td>
<td>6.6 (5.8-7.5)</td>
<td>7.0 (5.9-8.1)</td>
<td>7.0 (5.9-8.1)</td>
<td>5.2 (4.3-6.2)</td>
<td>7.0 (5.6-8.6)</td>
</tr>
<tr>
<td>Survey 3</td>
<td>40.9 (35.4-46.4)</td>
<td>8.9 (7.5-10.2)</td>
<td>10.1 (8.5-11.7)</td>
<td>7.3 (5.9-8.7)</td>
<td>6.3 (5.2-7.4)</td>
<td>8.7 (7.0-10.4)</td>
</tr>
</tbody>
</table>

*P values <.01 for mean total scores of survey 1 vs survey 2 and survey 1 vs survey 3.

Abbreviation: OSA-18, 18-item quality-of-life survey for obstructive sleep apnea.

*Data are mean score (95% confidence interval) unless otherwise specified.

†P values <.001 for mean total scores of survey 1 vs survey 2 and survey 1 vs survey 3.

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COMMENT

The American Academy of Pediatrics9 has highlighted the need to delineate the natural history of OSA in children after adenotonsillectomy. The results of the present study demonstrate a long-term improvement in quality of life after adenotonsillectomy for pediatric OSA. The total score and all domains of the OSA-18 survey showed long-term improvement after surgery as shown by a comparison of survey 1 with survey 3. Two previous studies4,5 have reported short-term improvements in quality of life after surgery for OSA in children using the OSA-18 survey.10 Goldstein et al10 studied 64 children before and 3 months after adenotonsillectomy. The diagnosis of OSA was based on clinical parameters and did not include polysomnography in most children. A highly significant change was seen postoperatively (P<.001) in the mean scores for all items and domains. Mitchell et al5 compared preoperative scores with postoperative scores obtained at a mean interval of 4 months after surgery in children with OSA diagnosed by full-night polysomnography. They also found statistically significant improvements in the total score and in every item and domain of the OSA-18 survey.

A comparison of the short-term results from survey 2 obtained at a mean interval of 4 months with the long-term results from survey 3 obtained at a mean interval of 16 months after surgery (Figure) shows some important differences. The scores for the domains of sleep disturbance and physical suffering are lower in survey 2 than in survey 3. These domains measure specific problems such as loud snoring, breath-holding spells, mouth breathing, and nasal discharge. It is likely that with time some of these symptoms recur but not to the extent that they were present prior to surgery.

In contrast, the domains of emotional distress, daytime problems, and caregiver concerns are not significantly different in survey 2 and survey 3. These domains measure hyperactive behavior, attention and concentration spans, caregiver concerns about the child’s general health, and frustrations with the child. It is not clear why these domains do not show the changes seen in the domains of sleep disturbance and physical suffering. It may be that the recurrence of mild physical symptoms of sleep disturbance may not be sufficient to evoke changes in the child’s behavior. Equally, the parents may believe that surgical intervention has produced a substantive improvement in the child’s OSA and that occasional symptoms are normal and do not merit further concerns.

There was no control group in the present study, since the standard of care for pediatric OSA is adenotonsillectomy. It is therefore not possible to infer that long-term improvement in quality of life was the result of surgical therapy. There may have been improvements in the underlying disorder as part of the natural history of the condition. Another limitation of the study is the relatively high number of children who were lost to follow-up: 43% of the children who started the study failed to complete it, and the extent of their improvement in quality of life remains unknown. Finally, improvements in quality of life were not compared with physiological measurements as recorded by full-night polysomnography. Indeed, Mitchell et al5 showed that change in RDI is not correlated with change in OSA-18 total score at a mean interval of 4 months after surgery. Therefore, we cannot conclude that long-term changes in quality of life are mirrored by changes in the physiological parameters of sleep.

To our knowledge, this is the first reported study of long-term improvements in quality of life after adenotonsillectomy for OSA in children. However, these improvements are not uniform across all domains of the OSA-18 survey. Although caregivers note some recurrence of physical symptoms after adenotonsillectomy for OSA in children, they nevertheless perceive a long-term improvement in quality of life.

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This study was presented at the annual meeting of the American Society for Pediatric Otolaryngology; May 4, 2003; Nashville, Tenn.

Table 2. Mean Difference Scores and Standardized Response Means for Preoperative and Postoperative OSA-18 Surveys

<table>
<thead>
<tr>
<th></th>
<th>Total Score</th>
<th>Sleep Disturbance</th>
<th>Physical Suffering</th>
<th>Emotional Distress</th>
<th>Daytime Problems</th>
<th>Caregiver Concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey 1 vs 2</td>
<td>44.7 (2.3)</td>
<td>12.8 (2.4)</td>
<td>10.3 (1.7)</td>
<td>4.2 (0.8)</td>
<td>5.0 (0.9)</td>
<td>11.5 (1.9)</td>
</tr>
<tr>
<td>Survey 1 vs 3</td>
<td>35.8 (1.8)</td>
<td>10.6 (2.3)</td>
<td>7.2 (1.5)</td>
<td>3.9 (0.7)</td>
<td>3.9 (0.8)</td>
<td>9.9 (1.4)</td>
</tr>
<tr>
<td>Survey 2 vs 3</td>
<td>−8.9 (−0.48)</td>
<td>−2.2 (−0.48)</td>
<td>−3.1 (−0.58)</td>
<td>−0.3 (−0.04)</td>
<td>−1.0 (−0.23)</td>
<td>−1.6 (−0.22)</td>
</tr>
</tbody>
</table>

Abbreviations: OSA-18, 18-item quality-of-life survey for obstructive sleep apnea; SRM, standardized response mean (difference score divided by the SD of difference score).
References


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