Perioperative anxiety in children

MICHELLE A. FORTIER PhD*,†, ANTONIO M. DEL ROSARIO BS‡, SARAH R. MARTIN MA* AND ZEEV N. KAIN MD, MBA*

*Department of Anesthesiology and Perioperative Care, University of California-Irvine, †Department of Pediatric Psychology, Children’s Hospital of Orange County,‡ Indiana University School of Medicine and §Department of Pediatrics, Children’s Hospital of Orange County, Orange, CA, USA

Section Editor: Per-Arne Lonnqvist

Summary

Objectives & Aim: The purpose of this investigation was to examine children’s anxiety across the perioperative setting.

Background: Although several studies have examined preoperative anxiety in children, few researchers have illustrated perioperative anxiety; that is, anxiety in children throughout the pre and postoperative continuum.

Methods: Participants were 261 children ages 2–12. Anxiety was rated prior to surgery, immediately after surgery, and for 2 weeks at home following surgery.

Results: Low child sociability and high parent anxiety predicted perioperative anxiety. Perioperative anxiety was related to postoperative pain and negative postoperative behavioral change.

Conclusions: Identification and prevention of anxiety in children can help prevent negative outcomes following surgery.

Keywords: perioperative anxiety; children; surgery; pediatric anesthesia

Introduction

Previous studies have reported the incidence of and risk factors for preoperative anxiety in children undergoing surgery (1,2). In contrast, very few examinations have described the incidence of perioperative anxiety (anxiety throughout the pre and postoperative continuum) in children. This is of importance as increased perioperative anxiety may be associated with adverse outcomes such as increased pain and new onset negative postoperative behavioral changes (3,4). Two recent papers outside of the United States included assessments of anxiety across the perioperative continuum (5,6); yet to our knowledge, no researchers in the US have examined the incidence of and risk factors for children’s perioperative anxiety. Thus, the purpose of this brief report was both to describe perioperative anxiety in children and to identify risk factors for increased anxiety throughout the perioperative period.

Methods

A total of 261 children ages 2–12 undergoing general anesthesia for outpatient tonsillectomy and adenoidectomy participated in this study. Exclusion criteria were American Society of Anesthesiology physical status higher than II, diagnosed mood disorder or psychiatric medication, prematurity, or developmental delay. An institutional review board
approved this study; parents provided written consent and children over age 7 provided assent. Data collected were part of a trial funded by the National Institutes of Child Health and Disease (R01HD37007-01) that examined perioperative distress and postoperative outcomes in children. Results of that trial have been presented elsewhere (3). All data and analyses reported here, however, have not been previously presented.

**Measures**

*Modified yale preoperative anxiety scale (mYPAS).* This is a structured, observational measure of preoperative anxiety in children that has been validated and has demonstrated good to excellent inter- and intraobserver reliability (7,8).

*Visual analog scale (VAS).* The VAS is a 100-mm horizontal line that has been widely used to measure state anxiety (9–11).

*Numeric rating scale (NRS).* The NRS is a widely used 0–10 scale for overall child anxiety (12–14).

*Parents’ Postoperative pain measure (PPPM).* The PPMP is a well-validated (15,16) observational checklist for children ages 2–12 years reflecting behavioral changes that correspond to pain (17).

*EASI instrument of child temperament (EASI).* The EASI is a widely used parent-report measure of a child’s temperament with regard to emotionality (e.g. child is easily upset/frightened), activity (e.g. child fidgets or cannot sit still long), sociability (e.g. child makes friends easily), and impulsivity (e.g. child has difficulty with self-control) (18) that has good validity and test–retest reliability (19).

*Child behavior checklist (CBCL).* The CBCL is an 113-item parent-report measure that identifies internalizing and externalizing problems in children with good test–retest reliability and validity (20).

*Post hospitalization behavioral questionnaire (PHBQ).* The PHBQ is a questionnaire measuring posthospitalization behavioral changes in children (21). The PHBQ has acceptable validity and test–retest reliability (22).

*State-trait anxiety inventory (STAI).* The STAI is a self-report measure of parental situational (state) and general (trait) anxiety that has been well validated (23).

**Protocol**

Participants were recruited 7–10 days before surgery during a preoperative preparation visit involving a tour of the hospital. Demographic and baseline data (STAI-Trait, EASI, and CBCL) were collected at this visit. On the day of surgery, children’s anxiety was measured by a trained research assistant via VAS and mYPAS in preoperative holding, at separation from parents, upon operating room (OR) entrance, and during introduction of the anesthesia mask. For this study, midazolam was not administered and parents were not invited to attend anesthetic induction. Parental state anxiety was measured in the preoperative holding area and at separation from their child. Anesthesia was induced via inhalation and maintained using a standardized protocol for all children. Following surgery, children remained in the postanesthesia care unit for approximately 2 h before admission to a general clinical research center (GCRC) for a 24-h observation period. Children’s immediate postoperative anxiety was measured by a nurse via VAS at arrival and at 6-h intervals thereafter. Pain management was standardized, and children were assessed via faces pain scale (FPS) (24) by nurses and administered acetaminophen 10 mg·kg⁻¹ + codeine 1 mg·kg⁻¹ at 4-h intervals for pain ratings of 3 or higher. Following discharge, child anxiety was measured by parent-completed NRS on postoperative days 2, 3, 7, and 14. For pain management at home, parents were instructed to administer acetaminophen 10 mg·kg⁻¹ + codeine 1 mg·kg⁻¹ every 4–6 h for scores of 3 or higher on the FPS. Parents also measured postoperative pain via NRS and the PPPM (17) on postoperative days 2, 3, 7, and 14.

Repeated measures ANOVA was used to examine the trend in perioperative anxiety. All VAS scores were converted to NRS scores and summed to calculate a total perioperative anxiety score. Children scoring one standard deviation above the mean total score (i.e. high anxiety) were compared with children scoring one standard deviation below the mean (i.e. low anxiety) using t-tests or chi-squared
tests as appropriate to identify predictors of perioperative anxiety. Blockwise logistic regression was then used to examine independence of identified predictors. Statistical significance was accepted at $P < 0.05$, and all analyses were performed using Statistical Package for the Social Sciences Version 17.0 (SPSS Inc, Chicago, IL, USA).

Results

Baseline data are presented in Table 1, and perioperative anxiety is illustrated in Figure 1. Child anxiety increased significantly prior to surgery ($F(1, 223) = 382.47, P < 0.001$), peaked at mask introduction, and decreased in the immediate postoperative setting ($F(1, 184) = 534.81, P < 0.001$) and over the 2 weeks at home ($F(1, 188) = 183.54, P < 0.001$).

Perioperative anxiety was significantly and positively correlated with pain within the first 24 h after surgery ($r = 0.26, P = 0.004$) and new onset-negative behavioral change in the 2 weeks following surgery ($r = 0.25, P = 0.006$).

The following child predictors of perioperative anxiety were examined: age, gender, previous surgeries or hospitalizations, EASI, and CBCL; parent factors were also compared: age, income, and STAI. Low child sociability ($P = 0.03$) and high parent anxiety at separation ($P = 0.009$) were significant predictors of perioperative anxiety (Table 2). Using logistic regression to control for child sociability (odds ratio = 0.56, $P = 0.007$), high parent anxiety at separation (odds ratio = 1.18, $P = 0.003$) remained a significant predictor of high perioperative anxiety (Table 3).

Discussion

Although there is substantial literature describing children’s preoperative anxiety, there is a lack of data regarding children’s perioperative anxiety. In this study, we demonstrated that children’s perioperative anxiety peaked upon introduction of the mask.

Table 1
Study population demographics and baseline characteristics

<table>
<thead>
<tr>
<th>Child data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ($N = 261$; mean ± SD, years)</td>
<td>6.23 ± 2.40</td>
</tr>
<tr>
<td>Gender (male/female)</td>
<td>50%/50%</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td>Caucasian (%)</td>
<td>80.50</td>
</tr>
<tr>
<td>African American (%)</td>
<td>10.20</td>
</tr>
<tr>
<td>Asian (%)</td>
<td>0.40</td>
</tr>
<tr>
<td>Hispanic/Latino (%)</td>
<td>3.30</td>
</tr>
<tr>
<td>Other (%)</td>
<td>5.70</td>
</tr>
<tr>
<td>Previous surgeries (%)</td>
<td>21.80</td>
</tr>
<tr>
<td>Temperament (mean ± SD, EASI)</td>
<td></td>
</tr>
<tr>
<td>Emotionality</td>
<td>11.77 ± 4.42</td>
</tr>
<tr>
<td>Activity</td>
<td>15.08 ± 4.04</td>
</tr>
<tr>
<td>Sociability</td>
<td>18.22 ± 3.00</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>12.31 ± 3.83</td>
</tr>
<tr>
<td>Parent data</td>
<td></td>
</tr>
<tr>
<td>Mother’s age ($N = 238$; mean ± SD, years)</td>
<td>35.96 ± 6.39</td>
</tr>
<tr>
<td>Father’s age ($N = 228$; mean ± SD, years)</td>
<td>38.00 ± 6.73</td>
</tr>
<tr>
<td>Anxiety (mean ± SD, STAI)</td>
<td></td>
</tr>
<tr>
<td>Trait anxiety</td>
<td>39.88 ± 6.59</td>
</tr>
<tr>
<td>State anxiety: holding area</td>
<td>43.81 ± 11.02</td>
</tr>
<tr>
<td>State anxiety: separation from child</td>
<td>46.61 ± 11.66</td>
</tr>
</tbody>
</table>

Figure 1
Children’s anxiety before and after surgery (mean ± SE).

Table 2
Significant predictors of perioperative anxiety

<table>
<thead>
<tr>
<th>1 SD below mean</th>
<th>1 SD above mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>perioperative anxiety score</td>
<td>perioperative anxiety score</td>
</tr>
<tr>
<td>P-value</td>
<td>P-value</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Child factors</th>
<th></th>
<th>Parent factors</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperance (mean ± SD, EASI)</td>
<td></td>
<td>Anxiety (mean ± SD, STAI)</td>
<td></td>
</tr>
<tr>
<td>Sociability</td>
<td>19.58 ± 2.06</td>
<td>18.09 ± 2.56</td>
<td>0.03</td>
</tr>
<tr>
<td>State anxiety: separation from child</td>
<td>43.44 ± 10.41</td>
<td>51.55 ± 8.97</td>
<td>0.009</td>
</tr>
</tbody>
</table>

EASI, EASI instrument of child temperament; STAI, state-trait anxiety inventory.
anesthesia mask and decreased significantly in the immediate postoperative setting and over the next 2 weeks at home. Despite the overall decline in postsurgical anxiety, it is interesting to note each a change in location of the child (OR to GCRC to home) was associated with an increase in anxiety; however, this change in location also corresponded with a change in rater (trained observer to nurse to parent), which could account for the increase in ratings. Furthermore, for some children, anxiety may persist up to 2 weeks following surgery. Moreover, high perioperative anxiety was associated with postoperative pain and new onset maladaptive behavior changes in children.

In terms of predictors of anxiety, both child temperament and parental anxiety appear to be risk factors for high levels of child anxiety across the perioperative setting, from the preoperative holding area to the 2 weeks following surgery. The finding that parental anxiety continued to be a significant predictor of perioperative anxiety has implications for treatment. Specifically, parental anxiety is a potentially modifiable target, whereas children’s temperament is not. Finally, reduction in children’s perioperative anxiety has implications for improving postoperative pain and behavioral recovery.

Although this study has merit, it is not without limitations. Specifically, midazolam and parental presence at induction of anesthesia were not offered to children in this study. Given that these are commonly used modalities for the treatment of preoperative anxiety in children, our findings may not be representative of those found in the general population. Nonetheless, comparison of mYPAS scores with children treated with midazolam reveals similar levels of anxiety in children in this study. In addition, because children were hospitalized for 24 h following surgery, the prolonged hospital stay may have influenced anxiety ratings. Finally, there is positive relationship between children’s pain and anxiety in the perioperative setting (3); consequently, children’s postoperative anxiety ratings may have been confounded with pain ratings.

In terms of recommendations for practice, these findings indicate that parental anxiety is an important target in the preoperative setting. That is, ameliorating parental anxiety may, in turn, have a positive impact on children’s perioperative anxiety. In addition, those children that tend to be less sociable by nature may show the highest levels of anxiety across the perioperative period, including up to 2 weeks at home after surgery. Although children’s temperament is not considered modifiable, identification of such children at risk for increased anxiety may provide an opportunity to inform parents to expect increased anxiety levels at home. In addition, those children who are most anxious may require more aggressive efforts to manage pain, as high preoperative anxiety was related to increased postoperative pain. Continued efforts are clearly needed to decrease children’s anxiety across the perioperative setting, with attention to anxiety both preoperatively and postoperatively.

Conflict of interest
None.

Acknowledgement
Grant support: supported by the National Institutes of Child and Health Disease (NICHD) (R01HD37007-01) (Bethesda, MD).

References


*Accepted 7 December 2009*