Postoperative Behavioral Changes in Children After Adenoidectomy

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Background: Pain is a common complaint after adenoidectomy. Behavioral changes after adenoidectomy in children have been reported, and it has been concluded that postoperative pain significantly affects the occurrence of behavioral changes. Behavioral changes, when a proactive pain treatment has been used, have not been systematically studied.

Objective: To assess postoperative behavioral changes in children who have undergone day-case adenoidectomy with proactive pain treatment.

Design: Prospective, longitudinal, randomized clinical trial.

Settings: Ambulatory Care Unit, Department of Otorhinolaryngology, Kuopio University Hospital, Kuopio, Finland.

Patients: Three hundred consecutive children, aged 1 to 10 years, who underwent day-case adenoidectomy during 1999 through 2000.

Intervention: In the hospital, 213 children received the first dose of ketoprofen before surgery and 87 children received the first dose at discharge. For pain treatment after discharge, patients were given ketoprofen tablets or suppositories on a regular basis for 72 hours.

Main Outcome Measures: The number of postoperative behavioral changes were evaluated with 3 consecutive questionnaires, at baseline before surgery, 1 week after surgery, and 3 weeks after surgery.

Results: A total of 294 questionnaires (98%) were returned after 1 week and 255 questionnaires (85%) after 3 weeks. Most children (91%) had pain after discharge and the mean for pain cessation was 3 days (range, 0-8 days). The mean of ketoprofen doses after discharge was 6 (range, 1-24 doses). Most of the children showed no or only trivial postoperative behavioral changes, and, furthermore, at 3 weeks, more positive than negative changes were reported. The child's age was a significant factor in affecting behavioral changes for all domains. Other significant factors were the worst pain at rest (P < .05) and during swallowing (P = .02) for daytime function disturbances, and fear of separation from parents (P = .03) for sleep disturbances.

Conclusion: Day-case adenoidectomy with proactive pain treatment seems to result in a negligible incidence of behavioral troubles in children.


DURING EARLY childhood, ear, nose, and throat procedures are the most common surgical operations, accounting, for example, in France, for up to two thirds of operations in children younger than 4 years. In many countries, adenoidectomy is the most common day-case ear, nose, and throat procedure. In the Kuopio University Hospital, Kuopio, Finland, approximately 500 day-case adenoidectomies are performed annually in children aged 1 to 7 years.

High-quality ambulatory surgery is a challenge for health care providers. The criteria for successful day-case service are minimal postoperative morbidity, a low inpatient admission rate, and high parental and child satisfaction. Achievement of these goals enables a calm recovery period with minimal need for contacting primary health care providers. Children respond psychologically to the prospect of surgery in a variable and age-dependent manner. Nonetheless, the surgical procedure and anesthesia have postoperative emotional sequelae on children, and may therefore result in a number of postoperative behavioral problems.

A recent study indicates that postoperative pain significantly affects the occurrence of behavioral changes in children. Pain is a common complaint after

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The present prospective clinical trial was to evaluate the incidence and severity of short-term postoperative behavioral changes in children aged 1 to 10 years who were given ketoprofen for proactive pain treatment after day-case adenoidectomy. We compared the magnitude of positive and negative behavioral changes at home 1 and 3 weeks after surgery with the findings before surgery.

**PARTICIPANTS AND METHODS**

The study was approved by the Ethics Committee of Kuopio University Hospital and was conducted in accordance with the latest revision of the Declaration of Helsinki. The National Agency for Medicines (Helsinki, Finland) was notified of the use of ketoprofen in children younger than 12 years. Both the parents and children old enough were informed, and written consent was obtained. This report is a part of a larger trial, and some other results of which have already been published. Our study comprised 300 consecutive children (179 boys and 121 girls) aged 1 to 10 years (mean age, 3.8 years), American Society of Anesthesiologists’ physical status 1, undergoing day-case adenoidectomy during 1999 through 2000 in the Ambulatory Care Unit of Kuopio University Hospital. Patients were excluded if they had a known allergy to ketoprofen or other nonsteroidal anti-inflammatory drugs, asthma, hemorrhagic diathesis, kidney or liver dysfunction, or had any other known contraindication for nonsteroidal anti-inflammatory drugs.

During the hospital stay, none of the children had any signs of an acute respiratory infection.

In the hospital, the trial, as a whole, was conducted in 3 stages differing in the administration routes of ketoprofen. Previously published parts of the study were prospective, randomized, double-blind, and double-dummy with a placebo control. In the present study, a total of 213 children received the first dose of ketoprofen before surgery and 87 children at discharge.

A similar endotracheal anesthesia was used for all children. Eutectic mixture of local anesthetics (EMLA) cream (Astra, Södertälje, Sweden) was used at the venous puncture site. Each child was premedicated with diazepam, 1 µg/kg of fentanyl citrate was given intravenously, and anesthesia was induced with thiopental sodium, intravenously. To facilitate tracheal intubation, cisatracurium besylate was given intravenously. Anesthesia was maintained with sevoflurane in nitrous oxide in oxygen with intermittent positive pressure ventilation. On completion of the procedure, muscle relaxation was reversed with administration of neostigmine bromide and glycopyrrolate.

The adenoids were removed using a curette technique under visual control. Hemostasis was controlled with temporary nasoparyngeal packs and suction electrocautery, if needed.

After the operation, children were transferred to the postanesthesia care unit for continuous monitoring of vital signs and assessment of pain. In the postanesthesia care unit, if the child was in pain (a pain score at rest ≥3, on a 0-10 pain scale), fentanyl was given for rescue analgesia. No other analgesic medication was used during the 3-hour stay in the postanesthesia care unit.

Patients were discharged when they were awake, able to walk unaided, had stable vital signs for at least 1 hour, had no pain or only mild pain, had not vomited for 1 hour, were able to tolerate clear fluid by mouth, and had no bleeding. At discharge, all children were given 1 mg/kg of ketoprofen, intravenously.

At discharge, parents were instructed about the postoperative care of their child and pain management at home. A proactive pain treatment protocol was used at home with 5 mg/kg of ketoprofen per day, divided into 2 or 3 doses as tablets or suppositories. Medication was obtained by parents at discharge; parents were enforced to give the children ketoprofen on a regular basis for at least 72 hours after surgery and thereafter if needed. Parents were also given hospital contact telephone numbers in case of problems at home. All verbal information was reinforced with written instructions.

To evaluate the changes in the child’s postoperative behavior, the caregivers completed a questionnaire containing 24 items adapted from the Posthospital Behavioral Questionnaire modified by Kotiniemi et al. Data concerning the behavioral changes at home were collected at 3 consecutive times: on the day of operation before surgery, 1 week after the surgery, and 3 weeks after the surgery. The first questionnaire was a retrospective evaluation of children’s behavior for a 1-month period before the operation. It also contained baseline data regarding demographics (eg, age, sex, weight, and height), disease status, family status, and family disease status.

The items in the 3 questionnaires were divided into 4 domains: emotional distress, physical symptoms, daytime function disturbances, and sleep disturbances. In each of the 3 questionnaires, the caregivers rated the items on a 4-point scale (1=never, 2=occasionally, 3=weekly, or 4=daily). In the second and third questionnaires, parents were asked to compare each item with those for the previous data collection date (1=much less, 2=slightly less, 3=the same, 4=slightly more, or 5=much more). Thus, a higher score indicated a poorer outcome in both scales.

The baseline score for the 4 domains was calculated as a mean of the item scores, and the follow-up scores were similarly determined for the latter 2 questionnaires. Thus, a change score was calculated by subtracting the follow-up score from the score obtained at baseline (negative values reflect improved behavioral changes).

The second questionnaire, 1 week after surgery, consisted of questions about the intensity and duration of the pain experienced by the child at home, and about medication requirements and any adverse events. At home, pain intensity was
assessed using a 4-point verbal rating scale (1 = no pain, 2 = mild pain, 3 = moderate pain, or 4 = severe pain).

A reminder letter was sent if either of the 2 latter questionnaires had not been returned in 6 weeks.

All statistical analyses were made using a statistical program (SPSS 9.0; SPSS Inc, Chicago, Ill). Change scores after surgery (1 week and 3 weeks) for each domain were compared with the scores obtained at baseline using repeated-measures analysis of variance. The internal consistency of the survey was assessed to determine reliability. The calculation of Cronbach’s was used for the instrument as a whole and with removal of each domain. The reliability coefficient greater than .70 was considered to be evidence of good reliability. The measure of agreement between 2 different rating methods was used to measure the change in postoperative behavior consecutively after 1 week and 3 weeks. Each domain was assessed by the Spearman rank correlation test and the Κ test. A P value of less than .05 was considered to be statistically significant.

Results are presented as number (percentage) of cases, or mean (SD or range), as appropriate.

RESULTS

A total of 294 questionnaires were returned after 1 week (response rate, 98%) and 255 questionnaires after 3 weeks (response rate, 85%). The demographics of the patients are presented in Table 1.

<table>
<thead>
<tr>
<th>Table 1. Patient Demographics*</th>
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</thead>
<tbody>
<tr>
<td>Demographics</td>
</tr>
<tr>
<td>Sex, male/female</td>
</tr>
<tr>
<td>Age, mean (range), mo</td>
</tr>
<tr>
<td>Height, mean (range), cm</td>
</tr>
<tr>
<td>Weight, mean (range), kg</td>
</tr>
</tbody>
</table>

*Data represent number of cases or mean (10th and 90th percentiles).

Pain after discharge was common, with 268 patients (91%) having pain at home. Most children had just mild or moderate pain; severe pain was reported in only 109 children (37%). The most intense pain occurred on the first postoperative day. The mean time for pain cessation was 3 days (range, 0-8 days). A total of 285 children (97%) received ketoprofen at home, the mean number of doses was 6 (range, 1-24 doses). There was no difference between the children who received ketoprofen before or after surgery in time for pain cessation, number of analgesic doses administered, or the intensity of pain at home.

The study demonstrated significant consistency, with a Cronbach’s greater than .70 for all domains. Emotional distress and daytime function disturbances were the domains of greatest impact, followed by sleep disturbances and physical symptoms. The mean baseline survey responses and internal consistency with a Cronbach’s for each domain are shown in Table 2.

The extent of behavioral problems at baseline is shown in Table 3. None of the children had any developmental disabilities or mental disorders. Overall, some minor behavioral disturbances were noted, but those are considered to be normal during childhood.

The change in postoperative behavior in the children was measured by subtraction of scores of consecutive questionnaires with the score obtained at baseline. One week after surgery, most children did not show any postoperative behavioral changes, and when changes were observed, they were equal in regard to improvements or worsening in any domain (1%-18%). Only a few children showed significant improvement or worsening in behavior after surgery. As expected, the largest degree of changes occurred in physical symptoms (ie, headache and stomachache) (Figure 2 and Table 4).

At 3 weeks after surgery, more positive than negative behavioral changes compared with the baseline were

Table 2. Mean Baseline Domain Scores and Cronbach’s for Each Domain

<table>
<thead>
<tr>
<th>Domain</th>
<th>Domain Content</th>
<th>Response Score, Mean (SD)*</th>
<th>Cronbach α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional distress</td>
<td>Attention seeking, temper tantrums, excitement, fighting and crawling, discipline problems, teasing other children, other children teasing, crying</td>
<td>2.2 (0.5)</td>
<td>.88</td>
</tr>
<tr>
<td>Physical symptoms</td>
<td>Headache, stomachache</td>
<td>1.5 (0.5)</td>
<td>.74</td>
</tr>
<tr>
<td>Day function disturbances</td>
<td>Day wetting, fear of being left alone or of new things, interest in new things, courage, fear of strange people, independence, speechless and silent</td>
<td>2.1 (0.4)</td>
<td>.90</td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td>Problems when going to bed, night wetting, waking up at night, nightmares, sleepwalking, fear of darkness</td>
<td>1.7 (0.4)</td>
<td>.89</td>
</tr>
</tbody>
</table>

*1 = never, 2 = occasionally, 3 = weekly, or 4 = daily (N = 300).

Table 3. Degree of Problem at Baseline for Domains in the Proactive Pain Management Survey*

<table>
<thead>
<tr>
<th>No. (%) of Cases</th>
<th>Domain</th>
<th>None</th>
<th>Sometimes</th>
<th>Weekly</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional distress</td>
<td></td>
<td>34 (11)</td>
<td>176 (59)</td>
<td>85 (29)</td>
<td>3 (1)</td>
</tr>
<tr>
<td>Physical symptoms</td>
<td></td>
<td>202 (72)</td>
<td>67 (24)</td>
<td>11 (4)</td>
<td>2 (1)</td>
</tr>
<tr>
<td>Day function disturbances</td>
<td></td>
<td>15 (5)</td>
<td>241 (81)</td>
<td>41 (14)</td>
<td></td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td></td>
<td>141 (47)</td>
<td>141 (47)</td>
<td>14 (5)</td>
<td>1 (&lt;1)</td>
</tr>
</tbody>
</table>

*N = 300.
noticed, and only 1% to 4% of the children showed large worsening in any behavioral domain. However, most children did not show any behavioral changes (Figure 3 and Table 5).

The 2 different approaches in the questionnaires in measuring the changes in postoperative behavior—the 4-point incidence-rating and the comparable rating with baseline evaluation—were assessed by the Spearman rank correlation and the κ tests. The 2 tests demonstrated a good correlation for each domain at both 1 and 3 weeks after surgery (P < .05 for each domain).

A general linear model test was used to evaluate factors affecting behavioral changes in the postoperative period. The age of the child was a significant factor (P < .05) for all domains. Although differences were statistically significant, the actual changes in each domain during the follow-up period were rather minimal. Other significant factors affecting behavioral changes were the worst pain at rest (P = .04) and during swallowing (P = .02) observed in the postanaesthesia care unit for daytime function disturbances. Fear of separation from parents (P = .03) was a significant factor implicating sleep disturbances. The sex of the child had no effect on the results.

**COMMENT**

Behavioral changes are reported to be common after surgery in children, severe pain being one of the most significant factors. However, pain can be substantially reduced by appropriate management. It seems that the proactive pain treatment with ketoprofen performed well in the present study. Although many of the children had pain at home after adenoidectomy, it was mostly mild. Moreover, most of the children showed no or only trivial changes in their behavior postoperatively. Hence, we believe that an appropriate pain treatment regimen will help parents feel able to take responsibility for their children’s care after surgery, with a corresponding lower need for further contact with health care providers.

The present study was prospective and longitudinal but the results are observational because pain treat-

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**Table 4. Magnitude of Behavioral Changes in 294 Patients 1 Week After Surgery**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Large Improvement</th>
<th>Moderate Improvement</th>
<th>No Change</th>
<th>Moderate Worsening</th>
<th>Large Worsening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional distress</td>
<td>4 (1)</td>
<td>36 (13)</td>
<td>183 (64)</td>
<td>48 (17)</td>
<td>13 (5)</td>
</tr>
<tr>
<td>Physical symptoms</td>
<td>27 (10)</td>
<td>47 (18)</td>
<td>124 (47)</td>
<td>39 (15)</td>
<td>26 (10)</td>
</tr>
<tr>
<td>Day function disturbances</td>
<td>2 (1)</td>
<td>27 (9)</td>
<td>241 (85)</td>
<td>10 (4)</td>
<td>3 (1)</td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td>4 (1)</td>
<td>23 (8)</td>
<td>223 (79)</td>
<td>23 (8)</td>
<td>11 (4)</td>
</tr>
</tbody>
</table>
surgery. Fear and excitement are known triggers for both headaches and stomachaches. Moreover, stomachaches and headaches are common during childhood; it has been found that half of the children in Finland have experienced a headache by the age of 7 years.19

In conclusion, pain in children after day-case adenoidectomy is common. Proactive pain treatment is advisable. The incidence of significant behavioral problems is rare.

Accepted for publication March 11, 2002.

This study was supported by the Erityisvaltionosuus grant (5551805) from Kuopio University Hospital, Kuopio, Finland.

The study was conducted in collaboration with the University Hospital of Kuopio and the University of Kuopio.

Table 5. Magnitude of Behavioral Changes in 255 Patients 3 Weeks After Surgery

<table>
<thead>
<tr>
<th>Domain</th>
<th>Large Improvement</th>
<th>Moderate Improvement</th>
<th>No Change</th>
<th>Moderate Worsening</th>
<th>Large Worsening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional distress</td>
<td>3 (1)</td>
<td>30 (12)</td>
<td>184 (73)</td>
<td>29 (10)</td>
<td>9 (4)</td>
</tr>
<tr>
<td>Physical symptoms</td>
<td>31 (13)</td>
<td>45 (20)</td>
<td>122 (53)</td>
<td>26 (11)</td>
<td>7 (3)</td>
</tr>
<tr>
<td>Day function disturbances</td>
<td>2 (1)</td>
<td>21 (8)</td>
<td>214 (85)</td>
<td>14 (5)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td>1 (1)</td>
<td>21 (8)</td>
<td>195 (77)</td>
<td>32 (13)</td>
<td>3 (1)</td>
</tr>
</tbody>
</table>

Table continued...
REFERENCES