Postoperative Behavioral Changes in Children After Adenoidectomy

Henri Tuomilehto, MD; Hannu Kokki, MD; Riitta Ahonen, PhD; Juhani Nuutinen, MD

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 (P<.05) in affecting behavioral changes for all domains. Other significant factors were the worst pain at rest (P=.04) 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.

trol. In the present study, a total of 213 children received
ized, double-blind, and double-dummy with a placebo con-
viously published parts of the study were prospective, random-
contraindication for nonsteroidal anti-inflammatory drugs.
nonsteroidal anti-inflammatory drugs, asthma, hemorrhagic di-
excluded if they had a known allergy to ketoprofen or other
surgery. Patients were
for all children aged 1 to 10 years
who were given ketoprofen for pro-active pain treatment af-
ter 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.

![Questionnaire on Behavioral Problems 1 mo Before Adenoidectomy (N = 300)](image1)
![Pain Treatment at Home With Ketoprofen, 5 mg/kg per Day](image2)
![Questionnaire on Behavioral Changes 1 wk After Adenoidectomy (n = 294)](image3)
![Questionnaire on Behavioral Changes 3 wk After Adenoidectomy (n = 255)](image4)

**Figure 1.** Flowchart of the present study.

The aim of the present prospective clinical trial was to
evaluate the incidence and severity of short-term post-
operative behavioral changes in children aged 1 to 10 years
who were given ketoprofen for pro-active pain treatment af-
ter 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 presented.

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 Ambu-
laratory 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 di-
thesis, 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. Pre-
viously published parts of the study were prospective, random-
ized, double-blind, and double-dummy with a placebo con-
trol. 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 chil-
dren. 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 intrave-
nously. Anesthesia was maintained with sevoflurane in
nitrous oxide in oxygen with intermittent positive pressure
ventilation. On completion of the procedure, muscle relax-
lation was reversed with administration of neostigmine bro-
mide and glycopyrrolate.

The adenoids were removed using a curette tech-
tique under visual control. Hemostasis was controlled with tem-
porary nasopharyngeal packs and suction electrocautery, if
needed.

After the operation, children were transferred to the post-
anesthesia 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 med-
ication 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, in-
travenously.

At discharge, parents were instructed about the postop-
erative care of their child and pain management at home. A pro-
active 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 dis-
charge; parents were enforced to give the children ketoprofen
on a regular basis for at least 72 hours after surgery and there-
after if needed. Parents were also given hospital contact tele-
phone numbers in case of problems at home. All verbal infor-
mation was reinforced with written instructions.

To evaluate the changes in the child’s postoperative be-
havior, the caregivers completed a questionnaire containing
24 items adapted from the Posthospital Behavioral Question-
naire modified by Kotiniemi et al. Data concerning the behav-
ioral changes at home were collected at 3 consecutive times:
on the day of operation before surgery, 1 week after the sur-
gery, and 3 weeks after the surgery (Figure 1). The first ques-
tionnaire was a retrospective evaluation of children’s behav-
ior for a 1-month period before the operation. It also con-
tained 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 func-
tion disturbances, and sleep disturbances. In each of the 3 ques-
tionnaires, the caregivers rated the items on a 4-point scale
(1 = never, 2 = occasionally, 3 = weekly, or 4 = daily). In the sec-
ond 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 out-
come 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 simi-
larly 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 im-
proved behavioral changes).

The second questionnaire, 1 week after surgery, con-
sisted of questions about the intensity and duration of the pain
experienced by the child at home, and about medication re-
quirements 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 α 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 χ² 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 1. Patient Demographics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Patients (N = 300)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, male/female</td>
<td>179/121</td>
</tr>
<tr>
<td>Age, mean (range), mo</td>
<td>45 (16-86)</td>
</tr>
<tr>
<td>Height, mean (range), cm</td>
<td>101 (80-128)</td>
</tr>
<tr>
<td>Weight, mean (range), kg</td>
<td>18 (11-28)</td>
</tr>
</tbody>
</table>

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

### Table 2. Mean Baseline Domain Scores and Cronbach α 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 crying, 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>Domain</th>
<th>None</th>
<th>Sometimes</th>
<th>Weekly</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotional distress</td>
<td>34 (11)</td>
<td>176 (59)</td>
<td>85 (29)</td>
<td>3 (1)</td>
</tr>
<tr>
<td>Physical symptoms</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>15 (5)</td>
<td>241 (81)</td>
<td>41 (14)</td>
<td>0</td>
</tr>
<tr>
<td>Sleep disturbances</td>
<td>141 (47)</td>
<td>141 (47)</td>
<td>14 (5)</td>
<td>1 (&lt;1)</td>
</tr>
</tbody>
</table>

*N = 300.

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 α 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 α 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...
noted, 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-

![Figure 2. The incidence of improvement and worsening in behavioral changes for each item 1 week after surgery.](image)

![Figure 3. The incidence of improvement and worsening of behavioral changes for each item 3 weeks after surgery.](image)

<table>
<thead>
<tr>
<th>Table 4. Magnitude of Behavioral Changes in 294 Patients 1 Week After Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Domain</strong></td>
</tr>
<tr>
<td>Emotional distress</td>
</tr>
<tr>
<td>Physical symptoms</td>
</tr>
<tr>
<td>Day function disturbances</td>
</tr>
<tr>
<td>Sleep disturbances</td>
</tr>
</tbody>
</table>
Fear and excitement are known triggers for both headaches and stomachaches were the most common complaints. The significant factors predicting problematic behavioral changes after surgery were severity of postoperative pain, age of child (more negative changes were observed among children < 3 years), and a previous bad experience with health care. In the study by Kotiniemi et al.5 the incidence of problematic changes decreased from 47% to 9% during a 4-week follow-up, but at the same time, the frequency of beneficial changes decreased from 17% to 9%. In our study, where we used a proactive pain treatment, the incidence of worsening in behavioral domains was lower and the incidence of improvements was higher than reported by Kotiniemi et al.

Parents' guidance is essential in children's pain management at home. Giving appropriate and clear instructions to caregivers improves the quality of pain management at home.20 We believe that the approach used in the present study, where parents were instructed about proactive pain treatment and where all verbal information was reinforced with written instructions, supported the parents in using pain medication in a regular and proper manner. An adequate postoperative pain treatment is a part of the quality program of the Department of Anaesthesia and Intensive Care and Department of Otorhinolaryngology. In this respect, a constant quality control of the pain management directory is essential.

Four of 5 children experience pain at home after adenoidectomy, and significant pain lasts for 2 to 3 days.21 Because the worst pain after adenoidectomy occurs on the first postoperative day, parents should be instructed to continue regular pain medication on arrival at home to avoid an unwanted breakthrough of pain.

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.
Corresponding author and reprints: Henri Tuomilehto, MD, Department of Otorhinolaryngology, Kuopio University Hospital, PO Box 1777, FIN-70211 Kuopio, Finland (e-mail: henri.tuomilehto@kuh.fi).

REFERENCES