RESEARCH ARTICLE

Effects of Prophylactic Rectal versus Oral Acetaminophen on Postoperative Conditions in Pediatric Adenotonsillectomy Patients: A Randomized Clinical Trial

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Background: The role of premedication with acetaminophen on postoperative conditions in pediatric patients is not well known. We aimed to assess the effects of prophylactic oral versus rectal acetaminophen on postoperative conditions in pediatric adenotonsillectomy patients.

Methods: In a double-blinded randomized clinical trial, 127 children undergoing adenotonsillectomies were randomized to receive either acetaminophen syrup 15 mg/kg (PO group) half an hour before surgery, or acetaminophen suppository 15 mg/kg (PR group) at anesthesia induction. Both groups received dexamethasone 0.1 mg/kg before surgery as an antiemetic and underwent the same general anesthesia management. Postoperative pain was evaluated using the face, legs, activity, cry, consolability (FLACC) scale every 30 min during the first 2 h and every 1 h until 4 h after surgery. Child with a FLACC scale > 3 received rescue medication of acetaminophen syrup 5 mg/kg orally.

Results: The two groups were not significantly different with respect to patients' demographics and anesthesia duration. FLACC scales in each time points were similar to each other between the studied groups. Although total postoperative acetaminophen syrup consumption and percentage of nausea or vomiting were lower in the PR group, the differences were not statistically different. The oral feeding starting time was significantly lower in the PR group in comparison with the PO group ($p< 0.01$).

Conclusion: We conclude that prophylactic rectal administration of acetaminophen at anesthesia induction has several beneficial impacts on postoperative conditions in children undergoing adenotonsillectomies.

Keywords: acetaminophen; postoperative pain; adenotonsillectomy

Acetaminophen is one of the most widely used drugs in the pediatric wards as an analgesic agent either in the form of oral or suppository preparation. It is assumed that postoperative pain is not well controlled in one half of all surgeries leading to other postoperative unwanted conditions [1]. Considering the frequency of adenotonsillectomy among all otorhinolaryngological operations in children [2-3], finding an efficient approach to reduce postoperative complications is still an ongoing challenge.

Several attempts were focused on comparing the effectiveness of postoperative oral or rectal acetaminophen for pain management in pediatric patients with controversial results [3-8], while the literature lacks in evaluating the prophylactic effect of these two forms of acetaminophen on postoperative conditions. To our knowledge, this study is among the few ones which aims to assess the effectiveness of oral versus rectal acetaminophen for premedication of pediatric adenotonsillectomy patients in a double-blinded randomized clinical trial.

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Received: 6 April 2015, Revised: 30 April 2015, Accepted: 18 May 2015
The authors declare no conflicts of interest.
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Methods

After institutional ethics committee approval and obtaining written informed consent from patients' parents, 127 ASA I-II patients undergoing tonsillectomy with adenoidectomy were enrolled in this prospective randomized clinical trial. Patients with known hypersensitivity to the drugs under study, known history of active and severe renal, hepatic, respiratory, or cardiac disease, history of neurological or neuromuscular disorders, history of chronic pain or analgesic drug use, and those who underwent emergency surgery were excluded from the study. Patients were randomly allocated by computer-assisted block randomization to two groups. Patients in the PO group (n = 58) received acetaminophen syrup 15 mg/kg orally. Patients in the PR group (n = 69) received acetaminophen suppository 15 mg/kg rectally. Drug administration and assessment of results were carried out by a trained anesthesia technician who was blinded to group assignment as well as all the authors.

All children received dexamethasone 0.1 mg/kg before

surgery as an antiemetic. Surgery was performed by surgeons who used similar surgical techniques. Patients in PO group received acetaminophen syrup 15 mg/kg half an hour before surgery. Premedication was done by intravenous midazolam 0.05 mg/kg plus fentanyl 2 µg/kg in the operating room. Both groups received the same general anesthesia management. In summary, it included induction with sodium thiopental 5 mg/kg and atracurium 0.6 mg/kg followed by orotracheal intubation. After induction, patients in the PR group received acetaminophen suppository 15 mg/kg. Blood pressure, heart rate, respiratory rate, and oxygen saturation were monitored continuously. Neostigmine 70µg/kg and atropine 20µg/kg were given for reversal of muscle paralysis. Mechanical ventilation was continued until the commencement of spontaneous respiration. Pharynx was suctioned and extubation was performed while patients were awake.

After surgery, patients were transferred to the recovery room. Blood pressure, heart rate, respiratory rate, and oxygen saturation were monitored continuously and the Aldrete score was recorded every 10 min until a score of 8 was achieved. Postoperative pain was evaluated using the face, legs, activity, cry, consolability (FLACC) scale every 30 min during the first 2 h and every 1 h until 4 h after surgery in both groups. Children were evaluated more frequently if any member of the staff or parents suggested that the child might be in pain. After discharge from the recovery room, any child with a FLACC scale > 3 received rescue medication of acetaminophen syrup 5 mg/kg orally.

Data were analyzed using SPSS version 14.0 (SPSS Inc., Chicago, IL, USA). The chi-square and Student's t test were used for comparisons between the two groups. A p value < 0.05 was considered statistically significant.

Results

The two groups were not significantly different with respect to age, sex, weight, and anesthesia duration (Table 1). FLACC scales in each time points were similar to each other between the studied groups. Although total postoperative acetaminophen syrup consumption and percentage of nausea or vomiting were lower in the PR group, the differences were not significantly different compared with the PO group. The oral feeding starting time was significantly lower in the PR group in comparison with the PO group (p< 0.01). The detailed results are shown in Table 1.

Discussion

This study was carried out in two closely similar groups with respect to age, gender, weight, and surgical conditions. Postoperative conditions' variables were not statistically different between the two studied groups; except oral feeding starting time which was significantly lower in the PR group.

Efficacy of prophylactic rectal acetaminophen for postoperative pain is conflicting [8]. It has been shown that premedication with rectal acetaminophen 20 mg/kg and 40 mg/kg failed to adequately treat postoperative pain in up to 46% and 90% of adenotonsillectomy patients, respectively [9-10]. In contrast to these results, Korpela et al. showed that prophylactic rectal acetaminophen significantly reduced postoperative pain in children undergoing outpatient surgery in a dose-dependent way [4].

Although we had homogenous groups with respect to patients' demographics and surgical conditions which might be a reason for these conflicting results, we failed to show a beneficial impact on postoperative pain scores in both groups, which we believe was due to our selected acetaminophen dosage (15 mg/kg).

Postoperative pain seems to be a clear predictor of nausea and vomiting in children [11], which may influence the child's ability to tolerate oral feeding. In our study, oral feeding starting time was significantly lower in the PR group when compared with the PO group; probably due to an indirect effect of lower postoperative pain in the PR group as a predictor of lower percentage of nausea or vomiting in this group (8% versus 11%). By considering the potential adverse effects of acetaminophen, e.g., accidental overdose [12-13], hepatotoxicity [12-14], and nephrotoxicity [15], lower postoperative acetaminophen syrup consumption in the PR group (even not statistically) is another proof for beneficial effect of rectally-administered acetaminophen at anesthesia induction.

Moreover, children generally dislike being given suppositories when awake [16-17]; suggesting again that premedication with rectal acetaminophen at anesthesia induction is a reasonable way to control postoperative mal conditions. One limitation with our study was the lack of plasma concentration of acetaminophen monitoring data for a more precise evaluation. Based on our results, we concluded that prophylactic rectal administration of acetaminophen at anesthesia induction even in the low dose studied (15 mg/kg) has several beneficial impacts on postoperative conditions in children undergoing adenotonsillectomies. Future studies can be focused on exploration of the role of nonpharmacologic pain management techniques such as distraction, guided imagery, music, and the use of ice collars conjunction with other analgesic therapies [18-19].

Table 1- Demographic data and postoperative conditions in both groups

	PO (n = 58)	PR (n = 69)	p value
Age (yrs)	6 ± 1.01	6 ± 1.52	0.30
Males (%)	37 (63.8)	44 (63.8)	1.00
Weight (kg)	19 ± 3.45	20 ± 2.62	0.82
Anesthesia duration (min)	60 ± 10.64	60 ± 12.32	0.77
FLACC scale			
30 min	4 (2-5)	4 (3-6)	0.07
60 min	3 (3-5)	4 (3-5)	0.82
90 min	3 (3-5)	3 (2-5)	0.35
120 min	3 (2-5)	3 (2-5)	0.32
180 min	2 (1-3)	2 (1-3)	0.49
240 min	1 (1-2)	1 (1-2)	0.51
Total postoperative acetaminophen syrup consumption (mg)	150 ± 51.22	125 ± 75.49	0.57
Postoperative nausea or vomiting (%)	11 (19.0)	8 (11.6)	0.32
Oral feeding starting time (min)	75 ± 35.49	45 ± 10.68	< 0.01

FLACC scale = face, legs, activity, cry, consolability scale

Acknowledgement

The study was supported by a research grant from Tehran University of Medical Sciences under the license number of 88-01-48-8664.

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