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Original Article

Preemptive Analgesia with Ibuprofen and Acetaminophen in Pediatric Lower Abdominal Surgery

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ABSTRACT

Background: Postoperative pain is a significant problem in pediatrics. Preemptive administration of analgesics has recently emerged as a method to enhance pain management associated with surgery. The objective of this study was to compare the analgesic efficacy of a single-dose of preoperative oral ibuprofen versus acetaminophen in preventing pain after lower abdominal surgery in pediatrics.

Methods: In this randomized, double-blind study, following lower abdominal surgery, 75 children, aging 3 to 12 years, were assigned to receive either ibuprofen 20 mg /kg (n=25) or acetaminophen 35 mg/kg (n=25) or placebo (n=25) 2 hours before surgery. Agitation in recovery was measured and postoperative pain was quantified 3 and 24 hours after surgery by Oucher's scale. The amount of postoperative analgesic needed in the ward was also assessed.

Results: It was found that preoperative administration of ibuprofen and acetaminophen can reduce agitation in recovery but there was no difference in the agitation score between ibuprofen and acetaminophen groups (P=0.145). Agitation score was significantly lower in ibuprofen group compared to placebo (P>0.005). Similarly, patients in the acetaminophen group were considerably less agitated than those in the placebo group (P=0.002). No significant difference was observed in pain intensity 3 and 24 hours after operation between the three groups [(P=0.495) and (P=0.582) respectively]. The amount of postoperative analgesic needed during ward hospitalization was not significantly different among the three groups (P>0.005).

Conclusion: These results provide evidence that preemptive acetaminophen and ibuprofen may reduce agitation during recovery but they neither improve the postoperative pain nor reduce analgesics consumption in ward

Key words: Postoperative analgesia, Acetaminophen, Ibuprofen, Preemptive analgesia

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Management of acute postoperative pain is usually not satisfactory enough. Up to 80% of patients report moderate to extreme pain following surgery [1,2,3,4]. Preemptive analgesia (PA) is effective in animal models but its clinical effectiveness remains contraversial[5]. Adequate analgesia is important postoperatively and is particulary important in children. A combination of opioids, NSAIDs, and local anesthetic agents is said to provide a favorable pain relief [6, 7]. Although opioids provide effective pain relief, they are associated with known side effects[8].

Side-effects of opioids, such as emesis, excessive sedation and risk of respiratory depression, can lead to insufficient amounts of these drugs administered to patient [9].

The analgesic effect and lack of opioid-like adverse effects of NSAIDs have rendered their administration increasingly popular in the treatment of postoperative pain [10]. Ibuprofen is a member of NSAIDs group with potent analgesic and anti-inflammatory properties[11].

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Acetaminophen is the most commonly used analgesic for pain management in children[12]. Some of previous studies indicated that, in children, ibuprofen and acetaminophen were safe and effective analgesic. Lower abdominal surgeries such as inguinal herniorrhaphy, rectal prolapse, hypospadias repair and orchiopexy are the most commonly performed pediatric surgeries[13]. Despite increasing demands for postoperative well-being, recent studies showed that treatment of pain after such surgeries were often inadequate[9]. Similar studies with NSAIDs and acetaminophen were already done on children undergoing otolaryngologic operations [9, 12, 16]. However, In the face of expanding number of operations in children, optimal postoperative pain management becomes increasingly important as a medicoeconomic and public health concern[10]. In spite of a sound theoretical base and encouraging animal studies, the clinical value of preemptive analgesia remains to be fully evaluated because there are controversies in the results of previous studies. Regarding the higher prevalence of lower abdominal surgeries in children, we decided to assess the preemptive analgesic effectiveness of NSAIDs and acetaminophen in this group of patients.

Subjects and Methods

The study was conducted at Al-Zahra University hospital, Isfahan, Iran, during autumn and winter 2003. The trial was randomized, double blinded and placebo-controlled. All patients were in groups ASA (American Society of Anesthesiologists) 1 and 2, aged 3 to 12 years, with the following inclusion critreica: ASA 1-2, No history of GI bleeding, Asthma, chronic analgesic use and contraindication for use of NSAIDs or acetaminophen.

The patients were excluded from the study if duration of surgery was prolonged, or complications occurred during surgery.

A total of 75 patients undergoing elective lower abdominal operations such as inguninal herniorrhaphy, rectal prolapse, hypospadias repair and orchiopexy were randomly assigned into one of the three groups (25 patients in each group). They were randomly divided into 3 groups (random numbers list). Then a specific code was given to each group (as A, B and C). The nurse who completed the questionnaire was not aware of the code mentioned.

Patients in groups A, B and C received ibuprofen suspension (20mg /kg), acetaminophen syrup (35mg/kg) and water respectively 2 hours before surgery. The patients were not aware of the kind of the drug. Before induction all the patients were given 10 ml/kg of dextrose-saline solution intravenously.

Standard general anesthesia procedure was applied to all patients. Induction was done with fentanyl: 0.002mg/kg, thiopental: 5mg/kg, Atracourium: 0.5 mg/kg and anesthesia was performed with halothane: 1%, O_2-N_2O (in 50% ratio). For perioperative analgesia morphine 0.1 mg/kg was injected intravenously.

For all patients, scores of agitation in recovery and pain at 3 and 24 hours after surgery and the amount of analgesic required at ward were recorded.

Agitation in recovery was assessd according to the following scale:

0: Calm, 1: Crying, 2: Irritated vigorously,
3: Controllable

Pain intensity was quantified by oucher's scale. Oucher's scale classifies the pain into three levels (severe, moderate, mild) based on child grimace. The staff were thoroughly familiarized with the above scales.

Finally, the collected data were statistically analyzed with chi- square test using SPSS 9 package.

Results

There was difference neither between average of age nor between sex, duration and kind of surgery among the groups. The average of age was 4.9+1.12y in ibuprofen group, 4.7+1.14y in acetaminophen group and 4.6+1.11y in the placebo group (P>0.05).

There was no difference in the agitation score between the ibuprofen group

(score=1.36) and the acetaminophen group (score=1.4) (X^2 =5.39, P= 0.145). Agitaton in recovery was significantly lower in patients who received ibuprofen (score 1.36) compared to patients who received placebo (score 2.56). (X^2=21.66, P<0005). Additionally, agitation score is lower in patients receiving acetaminophen (Score 1.4) compared to placebo (Score 2.56) (X^2=14.89, P=0.002) (Table 1). No significant difference was observed in postoperative pain intensity at the 3rd hour between the three groups (X^2=3.38, P=0.495) (group A score=1.88, group B score=1.6, group C score=1.52) (Table 2)

No significant difference was found in postoperative pain intensity in 24 hours between the three groups [(X^2=2.872,P=0.582), group A score=1.36, group B score=1.52, group C score=1.48)] (Table 3).

The amount of postoperative analgesic administered to patients at ward was not significantly different among the groups (X^2=0.461, P=0.794) Analgesic was needed in 80%, 76% and76% of A, B and C groups respectively.

Table1. Agitation score in recovery. Data are frequency and percentage

score	0	1	2	3
group A	7(28%)	6(21%)	8(32%)	4(16%)
group B	4(16%)	10(40%)	8(32%)	3(12%)
group C	3(12%)	2(8%)	11(44%)	9(36%)
total	4	18	27	16

Agitation score was significantly lower in acetaminophen group compared to placebo. (P<0.05)

Table 2. Pain intensity at 3rd hour. Data are frquency and percentage

Pain intensity	mild	moderate	severe
group A	10(40%)	8(32%)	7(28%)
group B	15(60%)	5(20%)	5(20%)
group C	16(64%)	5(20%)	4(16%)
total	41	18	16

No significant difference was observed between the three groups (p>0.05)

Table 3. Pain at 24th hour. Data are frequency and percentage

Pain intensity	mild	moderate	severe
group A	18(72%)	5(20%)	2(8%)
group B	16(64%)	5(20%)	4(16%)
group C	16(64%)	5(24%)	3(12%)
total	50	16	9

No significant difference was observed between the three groups (p>0.05)

Discussion

The results of our study showed that preemptive acetaminophen and ibuprofen reduced agitation during recovery period in pediatric patients undergoing lower abdominal surgery, but it neither improved postoperative pain nor decreased analgesic consumption in ward.

Hannu kokki et al reported that ketoprofen (an NSAID) was ineffective to control the pain when administered before and after tonsillectomy in children [9].

In a study on adult patients, preemptive ketoprofen helped a less painful recovery following tonsillectomy compared to the placebo group [16]

Jeffrey jian Hong Muary et al reported that preemptive oral administration of NSAIDs was associated with improved pain tolerance in the late recovery period (6,10) but this study did not demonstrate a reduction in the pain score or morphine requirement with preoperative administration of a single-dose of oral refecoxib (cox II inhibitor) [6].

J. Romsing et al compared diclofenac and acetaminophen for analgesia in pediatric tonsillectomy. They reported that neither diclofenac nor acetaminophen at the doses given were effective to provide sufficient analgesia after tonsillectomy [12].

These results may be explained in many ways. First, inadequate plasma level of drugs and the second, severity of pain depending on the type of surgery [12].

NSAIDs reduce pain after surgery by inhibiting synthesis and release of prostaglandins (PGs) at the site of surgical trauma. PGs may play a role in inflammation-evoked central synthesis of spinal cord neurons. Therefore, achieving NSAID plasma levels, enough to inhibit PG synthesis before tissue injury may significantly reduce their initial production after surgery and contribute to the prevention of central nociceptive sensation [10,14].

On the other hand, NSAIDs can also inhibit platelet aggregation [9, 11].

The increasing preoperative use of NSAIDs has raised concerns among some surgeons regarding complications caused by impaired hemostasis [10].

It is likely that lack of pain improvement with NSAIDs, and acetaminophen was due to low plasma levels. In other words, the efficacy of NSAIDs depends on the type of surgery. Pain following our operations was significantly severe [14] and acetaminophen and ibuprofen in recommended doses were found insufficient to contain postoperative pain in the patients [12].

We conclude that administration of ibuprofen (20 mg/kg) and acetaminophen (35 mg/kg) 2 hours before surgery proved beneficial in children during recovery but they were no more effective than placebo for analgesia in patients following lower abdominal surgery.

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