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Influence of preoperative oral ibuprofen on postoperative pain and normal activities in children after ambulatory genito-urinary surgery

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Abstract

Introduction: To investigate the possible advantage of administration of preoperative oral ibuprofen in children on the experience of postoperative pain and resumption of normal activities such as normal sleep and play activity.

Material and methods: A prospective, randomized, double blind study in 54 children (0–14 years) who underwent an ambulatory urological operation was performed. The children of the experimental group received 1 h prior to surgery, 10 mg/kg oral ibuprofen together with their usual premedication, whereas the children of the control group received only the usual premedication. Anesthesia was conducted with sevoflurane inhalation and either a locoregional caudal block (children <30 kg) or local analgesia (children >30 kg). Immediate postoperative pain was assessed using the Faces Pain Scale and the Children's Hospital of Eastern Ontario Pain Scale (CHEOPS behavioral scale). Vomiting and nausea were also assessed. On the first and second postoperative day, the same variables were evaluated, as well as quality of sleep, play and need for pain medication.

Results: After performing subanalysis, it was the older children (10–14 year) from the experimental group who experienced more pain. No significant differences were found regarding vomiting and nausea in the hospital or at home ($P > 0.05$). The assessments of the parents, children as well as the investigators' were concordant throughout the study.

Conclusions: Older children (10–14 years) who underwent ambulatory genito-urinary surgery under local anesthesia with sedation required more analgesia than was provided by this regimen. The older children who received preoperative oral ibuprofen (10 mg/kg) demonstrated significantly more pain early postoperative and on the first day at home. This study did not show a difference in postoperative pain, nausea and vomiting, or sleep and play quality up to 2 days after surgery that could be attributed to preoperative oral ibuprofen; however, the number of patients studied may have been too few to detect a difference. The children's and parents' assessments of pain using the face scale and the investigators' assessments using the CHEOPS scale were comparable.

Keywords: Ibuprofen; Pre-emptive analgesia; Pain assessment in children; Postoperative pain; Ambulatory genito-urinary surgery

1. Introduction

Surgery causes both pain and inflammation. In pediatric surgery, more and more elective operations are being performed on an ambulatory basis. Ambulatory pediatric surgery can only be successful if pain can be well managed and if the children are able to resume daily activities fairly quickly [1]. Furthermore, the pain experienced by the child in hospital after surgery predicts the behavioural problems and pain at home after discharge.

Recently, more attention is focused on pre-emptive analgesia. In adult patients, this phenomenon has been observed, but not in children [2,3]. It has been suggested that pre-emptive administration of analgesia might reduce postoperative pain to a greater extent than postoperative administration [3]. For children aged 5–12 years, after different types of surgery, ibuprofen has been shown to be effective for postoperative pain relief administered either rectally or orally as a liquid

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[4]. It provides analgesia, whilst it does not have respiratory depressant or sedative effects [4].

Therefore, this study assessed the possible positive effects of administering preoperative ibuprofen in children undergoing urological ambulatory surgery, by analyzing their postoperative pain and discomfort, nausea and vomiting, and resumption of daily activities.

2. Materials and methods

We conducted a randomized, prospective, double blind study at the outpatient surgery unit of the University Hospital Gasthuisberg Leuven in Belgium. The protocol and consent forms were approved by the institutional Ethics Committee. Informed consent was obtained from the parents and if possible by the children.

Inclusion criteria for this study were healthy boys, age between 0 and 14 years, Dutch speaking, scheduled to undergo genito-urinary surgery (circumcision, hydrocele, cryptochidism, hypospadias repair, antegrade sclerotherapy for varicocele). The boys were divided into two groups on a random basis: the experimental group (n = 28) and the control group (n = 26). The children in the experimental group were given preoperative ibuprofen (10 mg/kg) and the normal premedication alprazolam (>8 year) 0.5–1.0 mg or midazolam (<8 year) 0.25–0.5 mg/kg. The children in the control group received in addition to the usual premedication a placebo liquid. The examinor and dedicated postoperative observor did receive the key of the randomization group after collecting the entire data. The measurements in the experimental group as well as in the control group were compared with each other at the defined points in time.

Induction of anesthesia was performed by inhalation of sevoflurane. The patients received an intravenous line and a laryngeal mask was placed. If the patients were under 30 kg a locoregional caudal block was performed. The patients were turned in a lateral position and 0.5 mL/kg bodyweight of 0.25% levobupivacaine for procedures at the penis and 1 mL/kg bodyweight of 0.25% for procedures in the groin or the scrotum was injected in the sacral canal. If the patients weighed more than 30 kg, local anesthesia was given by the pediatric urologist during the procedure using 10 mL 0.25% levobupivacaine. Within the first 2 h of recovery, all children received paracetamol 20 mg/kg either orally, intravenously or rectally and oral ibuprofen 10 mg/kg.

Pain assessment in children relies on a combination of observed and behavioral changes that accompany painful stimuli and self-report by the patient [5]. To measure pain, we used the Faces Pain Scale (see Fig. 1). This is a self-report scale that can be used by children as well as by adults. A child's self-report is to be considered the 'gold standard' for pain assessment despite limitations [6]. In addition, pain is a highly individualized and subjective event and in infants it is complicated by their inadequacy to communicate pain and the variability of the infant's physiological and behavioral

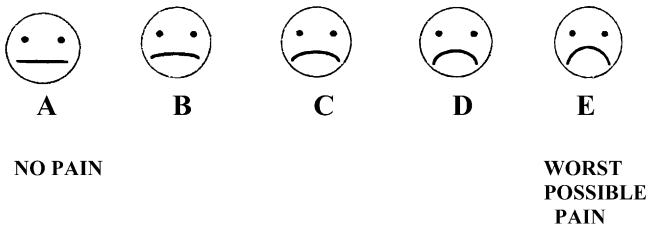

Fig. 1. Faces Pain Scale as used by the children and the parents.

responses [5–7]. We also included a second measurement tool, the Children's Hospital of Eastern Ontario's Pain Scale (CHEOPS behavioral scale). This scale identifies six groups of behavior patterns among 1–5-year-old children experiencing postoperative pain. They were: cry, facial expression, verbalizing, movements of torso and legs, and touching of the wound [8–11].

The data-collection was divided in two phases. The first phase was the measurements of pain in the hospital. During the first and second postoperative hour, the investigator asked the parents and their children to assess pain using the Faces Pain Scale, and vomiting and nausea as a dichotomous variable. Of the children who were too young to assess their pain themselves, only assessments of the parents were collected. The investigator used a behavioral descriptor scale: the CHEOPS scale to assess the children's pain behavior. This measurement was performed as a control measure of the data provided by the parents and children.

The second phase of the study was the follow-up on the first and second day home. On the first and second postoperative day, the parents were contacted by phone. Together with the investigator, they went over a questionnaire that asked for assessment of pain of the child by the parents and the children, vomiting and nausea, use of analgesia, quality of sleep and play of that same day. The quality of play and sleep was assessed using an ordinal scale with five possibilities, ranging from very good (=0) to very bad (=4).

This telephone contact was always at night between 6:30 p.m. and 8:30 p.m.

A probability level of 0.05 was used to determine statistical significance. Non-parametric calculations were performed with the Mann–Whitney U-test. Parametric calculations were performed with Student's t-test. The chi-squared test was used where applicable. All analyses were two-tailed and were performed using the SPSS software. t-Test was conducted to compare ages in the experimental and the control groups. The Mann–Whitney test was used to compare the difference in postoperative pain intensity between the experimental and the control group. No power analysis was done.

3. Results

In the duration of 4 months of this study (half of November 2000 to the end of February 2001), 61 boys underwent such an operation of whom 54 completed the study. The seven

children who were excluded had either incomplete data due to loss of contact at the first and/or second postoperative day (2/7) or insufficient analgesia from the locoregional caudal block (>30% increase of heart rate within the first 2 min after surgical incision). The distribution of age was: 22 children (41%) were 0–4 years old, 13 children (24%) were 5–9 years old and 19 children (35%) were 10–14 years old. The mean age in the treatment groups did not differ significantly (t = l.25; d.f. = 52; P = 0.218).

3.1. Postoperative pain

3.1.1. First hour postoperative

There was no significant difference in pain-intensity between the experimental group and the control group overall. However, after sub-analysis of the group of children between 10 and 14 years of age, there was a significant difference between the experimental group and the control group. This was seen in both the assessments of the parents (P = 0.03; z = −2.16) and the children (P = 0.024; z = −2.53) using the Faces Scale, as well as in the assessment of the investigator with the CHEOPS scale (P = 0.04; z = −1.985).

3.1.2. Second hour postoperative

On the second postoperative hour, there were significant differences between the experimental group and the control group. Significantly more children in de experimental group complained of pain (parents: P = 0.03; z = −2.14; children: P = 0.015; z = −2.47; investigator: P = 0.014; z = −2.47) (see Fig. 2). After sub-analysis, in the group of children of 10–14 years of age, the experimental group scored significantly higher on the pain scale (parents: P = 0.03; z = −2.95; children: P = 0.03; z = −2.95) and behavioral scale (P = 0.01; z = −2.57) than the control group.

3.1.3. First day at home

On the first postoperative day, the children of the experimental group scored more pain than the control group (P = 0.018; z = −2.37). Again, in the age group of 10–14 years this difference was significant (P = 0.001; z = −3.347). In the age groups of 0–4 and 5–9, no significant difference was found between the EC and the control group. Of all the children, 53% did not have any pain. Seventy percent of the children who were pain free belonged to the control group.

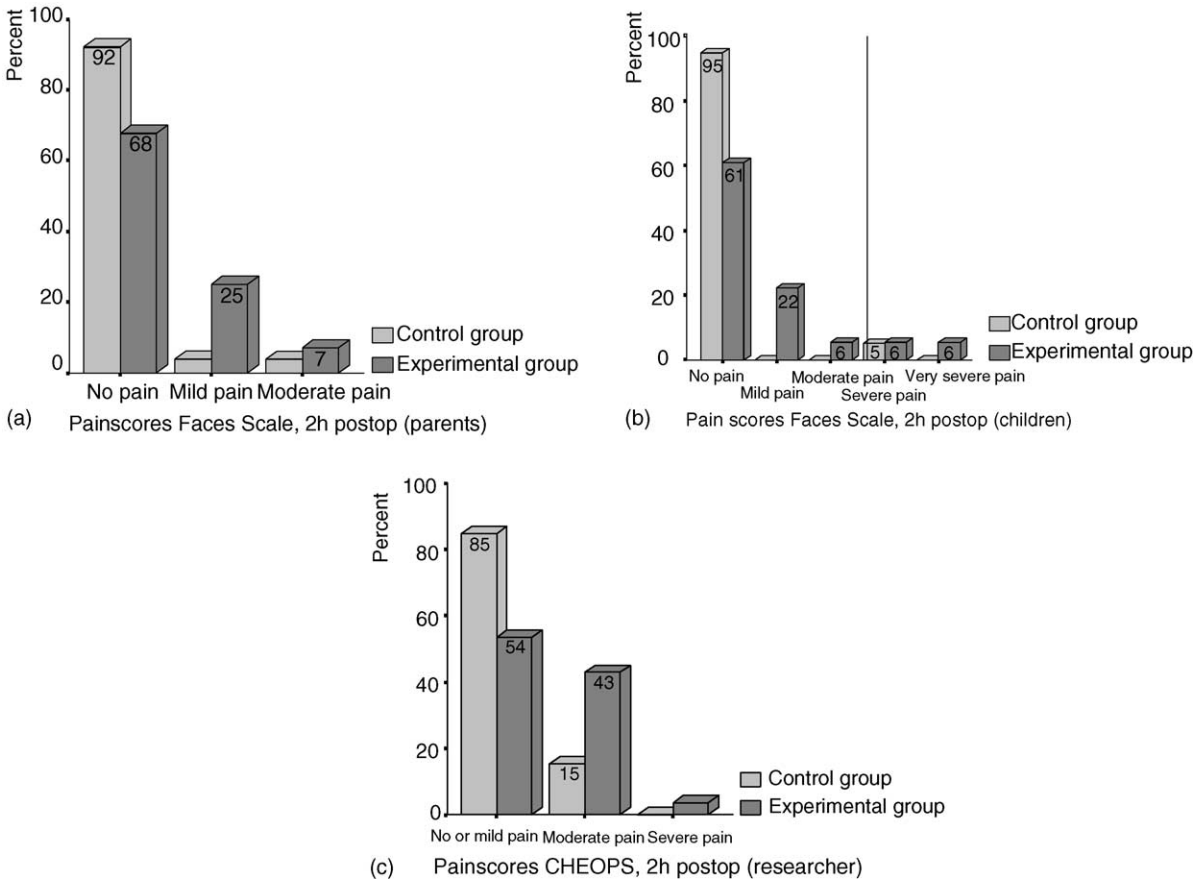

Fig. 2. Histograms of the results of pain assessments, respectively, by the parents, the children and the researcher in the entire group of children on the second postoperative hour.

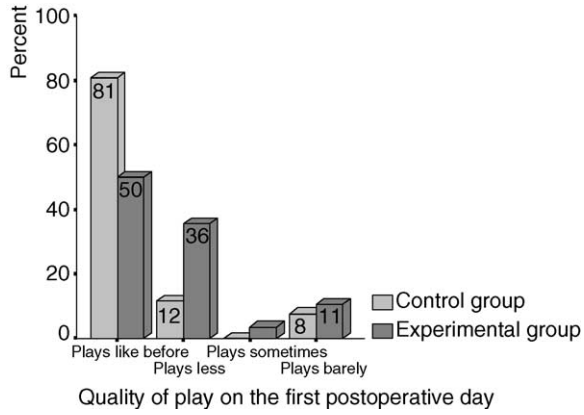

Fig. 3. Histogram of the quality of play on the first postoperative day.

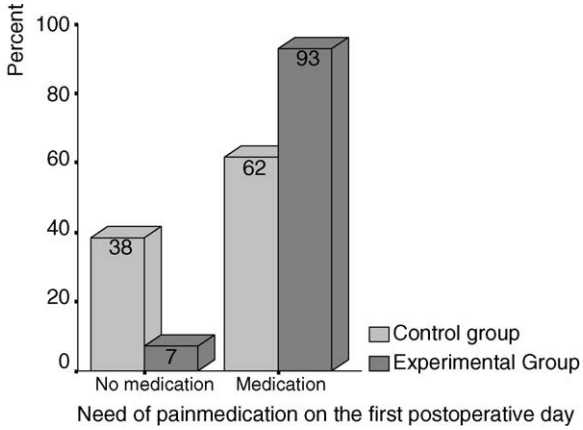

Fig. 4. Use of painmedication at home on the first postoperative day.

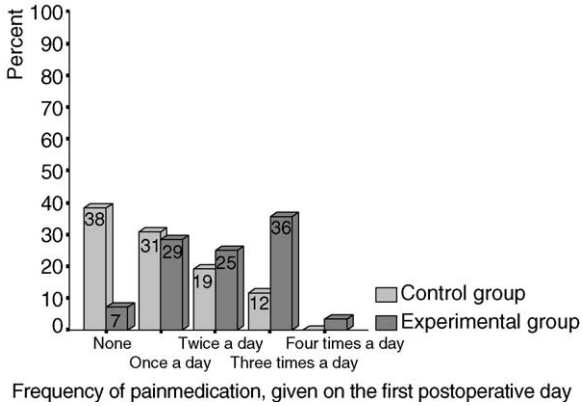

Fig. 5. Frequency of painmedication at home on the first postoperative day.

3.1.4. Second day at home

On the second postoperative day, no more significant differences in the assessments of the experimental group and control group were found.

3.2. Quality of sleep and play

On the first and second day after the procedure, there was no significant difference between the sleep quality of the experimental group and the control group (respectively, P = 0.49 and 0.86).

On the first postoperative day, a significant difference has been found concerning quality of play. The Mann–Whitney test shows that the children in the experimental group had significant worse quality of play than the control group (P = 0.02; $z = -2.193$) (see Fig. 3).

There was no significant difference anymore on the second postoperative day.

There was a significant relation between pain-intensity and the negative quality of sleep and play.

3.3. Pain medication

In the *postanesthesia care unit*, more children age 10–14 years in the experimental group received pain medication than the control group (P = 0.04; χ^2 = 3.99) and more frequently (P = 0.03; $z = -2.08$).

On *the first day at home*, significantly more children in the experimental group received oral ibuprofen as pain medication than the control group (P = 0.006; χ^2 = 7.651) and also more frequently (P = 0.002; $z = -3.083$) (see Figs. 4 and 5).

After sub-analysis, we found that in the group of children from 0 to 4 years as well as in the group of 10–14 years old, the experimental group received significantly more frequently pain medication (oral ibuprofen) than the control group (respectively, P = 0.05; $z = -1.936$ and P = 0.01; $z = -2.51$).

On the *second postoperative day*, no more significant differences between the two groups were found.

In order to test whether the scores of the children, parents and investigator were similar and comparable, correlations were performed. Between the scores of the parents and the children, a positive significant correlation was found (ρ = 0.82; P = 0.0001). Also, the assessments of the investigator and the children as well as the parents were positively correlated, respectively, ρ = 0.48; P = 0.0001 and ρ = 0.54; P = 0.0001.

4. Discussion

The children in the experimental group required pain medication more frequently than the control group. These unexpected results were found from the second postoperative hour on. In order to differentiate this observation, the patients were divided into three subgroups according to age. From analysis of the results of these three groups, the children of 10–14 years were found to experience more pain. A possible explanation would be that older children are able to score their perception of pain different than smaller children. Clinical studies have illustrated that age is a predictor for postoperative pain [12,13]. These studies have shown that children in their puberty (10–14 years) who are submitted to an ambu-

latory surgical procedure complain more quickly of severe pain than younger children (0–9 years).

Another explanation could be according to the study of Jamali and Kunz-Dober [14]. They found evidence that pain or trauma, caused by the surgical procedure, results in pathophysiological changes that can lead to less effectiveness of the oral pain medication, with lower and delayed peak drug blood levels. Whether the administration of ibuprofen together with other medications can cause loss of therapeutical activity needs to be further investigated.

The type of anesthesia also might have had an influence on postoperative pain. In this study, a difference in pain experience from the patient groups may be explained by the type of local or locoregional anesthesia. The children under 30 kg of bodyweight received a caudal block by the anesthesiologist. This type of anesthesia is locoregional and therefore more active centrally and complete. The children heavier than 30 kg received local anesthesia by the urologist during the procedure. With the administration of only a local anesthetic, there is more chance that a part of the surgical area is not adequately anaesthetized. Local anesthetics were used in older children and it is necessary to consider this as a possible explanation when interpreting the increased pain seen in the 10–14 year age group. This issue was not anticipated when we started the study.

Another problem for drawing any conclusion from this study is that there no power analysis was done, to sure that enough subjects were included. It was anticipated to find a significant difference between the experimental and the control group because the study was performed by a dedicated observer. However, this was not correct.

The assessments of pain, discomfort, sleep and play quality made by the parents, the children themselves as well as those of the investigator were concordant and were considered therefore as a good tool to assess the influence of medication in the short-term postoperative period. In addition, the investigator as well as the parents and the children were measuring the same phenomenon and therefore we can conclude that the method of measurement was correct. The quality of play and sleep correlated negatively to the intensity of the children's pain.

In conclusion, older children (10–14 years) who undergo ambulatory genito-urinary surgery with local anesthesia required more postoperative analgesia than was provided by this regimen. The older children who received preoperative oral ibuprofen (10 mg/kg) demonstrated significantly more pain early postoperative and on the first day at home. This study did not show a difference in postoperative pain, nausea and vomiting, or sleep and play quality up to 2 days after surgery that could be attributed to preoperative oral ibuprofen; however, this may be related to the few patients studied. The children's and parents' assessments of pain using the face scale and the investigators' assessments using the CHEOPS scale were comparable.

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