Preemptive Ilioinguinal– Iliohypogastric Nerve Block versus Intravenous Morphine for Postoperative Pain Control after Unilateral Inguinal Herniotomy in Children: A Comparative Study

Khaled R. Al-Zaben,[1] Ibraheem Y. Qudaisat,* [1] *Abdelkarim S. Al-Oweidi*[1]

Abstract

Background: Inguinal hernia repair in children is one of the commonest surgical procedures. As a day-case procedure, it requires adequate post-operative pain control. A prospective randomized double-blinded study was designed to compare the effectiveness of postoperative pain control and incidence of complications between combined ilioinguinal/iliohypogastric nerve block and intravenous morphine.

Methods: Sixty patients aged 2-12 years were randomly allocated to two groups of thirty. One group received intravenous morphine 100 microgram/kg before skin incision and the other had an ilioinguinal and iliohypogastric nerve block with 0.5% bupivacaine (0.25 ml/kg) also before skin incision. All patients have received standardized anaesthesia. Pain was assessed using 0- 10 scale at 0.30 minutes and 1, 2, 3 and 4 hours postoperative. Time to first analgesia, number of paracetamol doses and the incidence of respiratory depression, vomiting and itching were assessed during the first 24 hours.

Results: During the first four postoperative hours, the two groups had identical pain scores. Time to first analgesia and number of doses of the rescue drug for residual pain during the first 24 postoperative hours was equal for the two groups. None of the 60 patients had respiratory depression but the morphine group patients were found to have more episodes of vomiting ($P<0.05$), no significant differences in itching (p=NS).

Conclusion: We concluded that both intravenous morphine (100 microgram/kg) and ilioinguinal-iliohypogastric nerve block have the same analgesic effect for postherniorrhaphy pain in children with higher incidence of vomiting in morphine treated patients.

Keywords: Morphine, Nerve block, Hernia repair, Pain.

(J Med J 2011; Vol. 45 (3):255- 261)

Received	***Accepted***
October 11, 2010	*December 30, 2010*

Introduction

Inguinal hernia repair is one of the most frequent surgical repairs in early childhood. [1] Prevention and treatment of postoperative pain is essential and includes several modalities such as administration of opioids, nonopioid analgesics, and regional nerve block techniques. [2, 3] Preoperative ilio-inguinal and iliohypogastric nerve blocks have been widely used to provide analgesia in children undergoing inguinal herniorrhaphy. [4] These nerve blocks are simple and quick procedures without serious side-effects. [5] Administration of analgesics before the surgical stimulus may prevent or attenuate postoperative pain. [6]

1. Department of Anaesthesia and Intensive Care, Faculty of Medicine, University of Jordan, Amman, Jordan.
**** Correspondence should be addressed to:***
Dr. Khaled Al-Zaben
E-mail: kalzaben@yahoo.com

Opioid analgesics, especially morphine, are the commonest pharmacological choice for treating postoperative pain in children. [7] Although morphine is generally considered safe to use in paediatric patients, [8] physicians often hesitate to prescribe opioids to children because of the risk of undesirable side effects [7] that may delay the patient's discharge from the hospital.

The aim of our study is to compare the effect of pre-incisional ilioinguinal and iliohypogastric nerve block using bupivacaine 0.5% (0.25 ml/kg) with 100 mic/kg intravenous morphine on postoperative pain after unilateral inguinal herniorrhaphy in children and the incidence of complications and side effects.

Methods

This prospective randomized double-blinded study was conducted at Jordan University Hospital between February 2010 and September 2010. After obtaining scientific and Institutional Review Board committee approval, all children of consenting parents admitted to the day surgery unit for unilateral hernia repair were enrolled in the study with a target sample number (N) of 60. (N) was determined using the sample size formula ($N= Z^2 Pq/sigma^{2)}$, where Z=1.96, P=20, q=1-P, sigma ^{2} = the precision), and it was found to be 52. We increased the sample size to reach 60 to magnify the power of the study.

All children were of ASA-1anesthesia risk class. Patients who had bilateral inguinal hernia repair or had respiratory, neurological, blood clotting disorder or had a known allergy to the study drugs were excluded from the study. On the day of operation the study purpose and details were explained to the parents of the children in the reception area. They were also instructed on how to monitor their children for the next 24 hours after surgery for possible complications such as itching, vomiting or respiratory depression. A signed informed consent was then obtained for each patient.

On arrival to the operating room, standard patient monitoring was established which included ECG, noninvasive blood pressure, pulse oximetry and capnography. For all patients, general anaesthesia was induced by inhalation of nitrous oxide 50% and sevoflurane in oxygen. After securing the intravenous line, propofol (1mg/kg) and fentanyl (1 mic/kg) were administered to facilitate laryngeal mask insertion. Anesthesia was maintained through spontaneous breathing of 2-3% sevoflurane and nitrous oxide 50% in oxygen. Intraoperative fluid management was provided by the administration of Ringer's lactate solution for necessary deficit volumes and maintenance rates.

Patients were randomly assigned to two groups of analgesia modalities. The first group (Group B) included patients who received a pre-incisional ilioinguinal-iliohypogastric nerve block. The second group received intravenous morphine analgesia (Group M).

Ilioinguinal and iliohypogastric nerve blocks in Group B were performed by the anaesthetist immediately after a laryngeal mask insertion. 0.25 ml/kg of 0.5% bupivacaine was administered using a short- beveled 23 G, 1.5 inch-long needle. Surgery was allowed to start at an average time of 10 minutes after the block. Group M had morphine (0.10 mg /kg) which was administered intravenously and surgical incision was allowed after 10 minutes. All the cases enrolled in the study had their surgery done by the same surgeon and none of the operations lasted more than 45 minutes.

At the end of surgery, patients were transferred to the post anaesthesia care unit (PACU) where they were monitored for 4 hours before discharge. Pain scores were recorded by a qualified nurse unaware of the patient's group assignment. Six pain scorings were recorded: on admission and at 30 minute, 1 hour, 2 hour, 3hour and 4 hour observation periods using an objective pain score (OPS), which uses five criteria: localization of pain, movement, crying, agitation and posture. [9] Each criterion is given a score between 0 and 2, with 2 being the worst, giving a total score between 0 and 10. OPS pain scores of more than 4 were managed with rectal paracetamol (30 mg/kg).

Postoperative complications such as vomiting, itching, and respiratory depression were recorded by the same nurse. Vomiting was treated with iv ondansetron 0.15 mg/kg.

After 4 hours of PACU, the child was assessed by an anesthesiologist and discharged home if the patient was having an Aldrete discharge score of 9 or 10. [10] Parents were asked to keep an eye on their children's pain status at home and acetaminophen syrup at a dose of 15 mg/kg, PRN was prescribed for postoperative pain relief but not more frequently than 4 hourly dosing limits.

After 24 hours, parents were interviewed over the telephone by an anesthesiologist who was unaware of their child's group of assignment in the study. In this interview, the time to the first rescue analgesic dose, the number of paracetamol doses given over 24 hours and any complications (vomiting, itching, and respiratory depression) were recorded.

Statistical Analysis

Statistical analysis was carried out using stat graphics centurion XV version 15.1.02 (statpoint Inc, USA). Values are expressed as either mean and standard deviations or number of observations and percentages. The chi square test was used to compare the means of age, weight, duration of surgery, pain scores, time to first analgesia and number of paracetamol doses between the two study groups. Fisher's exact test was used to compare the frequency of occurrence of vomiting and itching between the two study groups. A *P* value of ≤ 0.05 was considered to be statistically significant.

Results

A total of sixty patients (48 males and 12 females, aged 2– 12 years) were enrolled in the study in two groups of 30 each. The two groups were identical for age, weight and duration of surgery *(P* > 0.05) (Table 1). There was no significant differences in pain scores between the two groups on admission to the post-anesthesia care unit, and in the following 4 hour period of PACU stay (P>0.05) ((Table 2).

None of the sixty patients experienced respiratory depression, but significantly more patients in the morphine group experienced vomiting compared with the nerve block group (26.4% vs. 3.33%, respectively) (p < 0.05). There was no significant difference between the two groups in the incidence of itching (Table 3).

The use of oral paracetamol as a rescue analgesic drug in the first 24 hours after discharge from the PACU showed no difference between the two study groups. There was no significant differences in the time to the first required postoperative paracetamol dose (P=0.652) and in the number of paracetamol doses received over 24 hours between the two groups (*p* = 0.339) (Table 4).

Table (1): Demographic data.*

	Group B (N=30)	***Group M (N=30)***	***P value(chi-square)***
Age (years)	*5.08 ±3.57*	*5.47 ± 3.07*	*0.22*
Weight (kg)	*19.90 ± 11.50*	*19.60 ± 9.50*	*0.07*
Duration of surgery (minutes)	*40.50± 6.8*	*40.50±7.1*	*0.9*

****Data are presented as mean ± SD, Group B: Nerve block group, Group M: morphine group***
P<0.05 is considered significant

Table (2): Pain scores over 4 hours in postanaesthesia care unit in both groups.

Time (minute)	***Group B***	***Group M***	***p value (chi-square)***
0	*0.40±1.329*	*0.20±1.095*	*0.558*
30	*0.47±1.358*	*0.60±1.303*	*0.516*
60	*0.67±1.422*	*0.73±1.337*	*0.568*
120	*0.93±1.461*	*1.33±1.213*	*0.181*
180	*2.00±1.661*	*2.07±1.230*	*0.431*
240	*2.47±1.717*	*2.53±1.570*	*0.838*

****Data are presented as mean ± SD P<0.05 is considered significant***

Table (3): Frequency of complications observed during the first 24 hours postoperative. *

Complication	Group B	Group M	P value (Fisher's exact test)
Vomiting number (%)	*1 (3.33%)*	*8 (26.4%)*	*0.025*
Itching number (%)	*1 (3.3%)*	*6 (19.8%)*	*0.102*

***Data are presented as mean ± SD**
***P <0.05 is considered significant**

Table (4): Time to first postoperative analgesic and number of paracetamol doses over 24 hours.*

	Group B	Group M	P-value (chi-square)
Time to first analgesia (minutes)	*376 ±156*	*430 ±264*	*0.652*
Number of paracetamol doses over 24 hours	*1.53±1.4*	*1.03 ± 1.01*	*0.339*

***Data are presented as mean ± SD**
***P <0.05 is considered significant**

Discussion

The importance of peri-operative pain control especially in day-case surgery and particularly in pediatric patients can't be exaggerated. In fact, adequate post-operative pain control is one of the major factors that determines when the patient can be safely discharged from the post anaesthesia care unit. The ideal peri-operative analgesic technique should be effective and safe, have minimal side effects and provide adequate analgesia after discharge.

Our study showed that both the pre-incisional administration of 100 mic/kg intravenous morphine or ilioinguinal-iliohypogastric nerve block with bupivacaine is effective and comparable in their post-operative analgesic effect after unilateral inguinal hernia repair in children. Both analgesia modalities spared the need for rescue analgesia for a time period that exceeded the PACU stay, (376min ± 156 in Group B) vs. (430min ± 264 in Group M). The number of doses of the rescue analgesic drug in the first 24 hours post-operatively was also comparable (1.53 ± 1.4 in Group B vs. 1.03 ± 1.01in Group M). Our study results are consistent with the results of many studies which showed that the ilioinguinal- iliohypogastric nerve block with a local anaesthetic produced effective postoperative analgesia after inguinal hernia repair in children with little need for postoperative opioids. [3, 4] However, there was no credit in our study to the nerve block technique over the intravenous morphine in terms of the amount of postoperative analgesia required.

Opioids provide good postoperative pain relief but their use is restricted because of the potential side effects which can lead to a delay in discharging patients from the outpatient facility. The use of nerve block techniques with local anesthetic agents may avoid many of the side effects related to the use of opioids. [11]

Respiratory depression is a serious known complication of narcotics use. It is particularly of concern to outpatient anesthetists working in developing countries with limited paramedical facilities and in children suffering from obstructive sleep apnea or other airway related problems. [12] However, in a retrospective study involving 110 paediatric patients that had intravenous morphine infusion, the incidence of respiratory depression was found to be 0%. [13] Also in our study, none of the 30 patients who had iv morphine experienced postoperative respiratory depression.

Nausea and vomiting are well-known complications of opioids. In a systematic review done by Duedhal et al. [14] about the use of morphine treatment in children with postoperative pain, they reported that morphine alone is not the most suitable analgesic for postoperative pain in paediatric patients, as it does not have a superior analgesic effect and it has a higher incidence of side effects which was mostly nausea and vomiting, when compared with active control interventions. While Weinstein et al. in another study [15] concluded that the administration of a single dose of 0.1 mg/kg morphine after induction of anesthesia in children

undergoing inguinal surgery will decrease the need for postoperative analgesics, the incidence of emesis was 56% in the morphine group versus 25% in the control group. In our study, the incidence of vomiting was lower than the one reported by Weinstein et al., but it still was higher in the morphine group (26.4%) than the nerve block one (3.3%).

In their study about postoperative comfort in paediatric outpatient surgery, Eva et al. [16] studied 200 paediatric day-case patients. They concluded that when regional anesthesia was used alone without narcotics in children undergoing lower abdominal surgeries, it was associated with a lower incidence of postoperative nausea and vomiting. However, the degree of pain at home in these patients was higher when compared to other patients who received other modalities of intra-operative pain control. In our study, we did not did assess the severity of post-operative pain at home due to practical difficulties. As a surrogate home pain indicator, we used the number of doses of rescue analgesic drug consumed. The two groups of patients in our study were not different in their post-operative analgesia requirements at home in the first 24 hours after discharge. However, the higher incidence of vomiting in our morphine group was consistent with study results of Eva et al.

In our trial, only 10% of patients in the block Group B had pain relief for less than 180 minutes. This percentage of short duration blocks was higher (20%) in the study by Bhattarai et al.[17] who used a combination of ilioinguinal–iliohypogastric nerve block and wound infiltration with 0.1 ml/kg of 0.25% bupivacaine at the end of surgery in inguinal herniotomy in children. This difference in the duration of analgesia may be explained by the higher concentration of bupivacaine used in our study (0.5%) or the timing of the nerve block.

Transient femoral nerve palsy [18] and bowel perforation [5,19] have been reported as complications of the ilioinguinal –iliohypogastric nerve block technique. None of our patients had complications related to the block procedure that may affect the reliability of our findings.

In conclusion, our study has shown that pre-emptive ilioinguinal –iliohypogastric nerve block and intravenous morphine are equally effective in reducing pain during the first 24 postoperative hours in paediatric patients undergoing unilateral inguinal hernia repair. Morphine analgesia had a higher incidence of opioid-related side effects. However, further studies are needed to confirm the optimal effective doses of these two procedures for day case surgery.

References

1. Machotta A, Risse A, Bercker S et al.: Comparison between instillation of bupivacaine versus caudal analgesia for postoperative analgesia following inguinal herniotomy in children. Paediatr anaesthes 2003; 13: 397-402.
2. Splinter WM, Reid CW, Robert DJ et al.: Reducing pain after inguinal hernia in children: caudal anesthesia versus ketorolac tromethamine. Anesthesiology 1997; 87:542-546.
3. Khorsavi MB, Khezri S, Azemati S. Tramadol for pain relief in children undergoing herniotomy: a comparison with ilioinguinal and Iliohypogastric blocks. Paediatr anaesthes 2006; 16:54-58.
4. Sasaoka N, Kawaguchi M, Yoshitani K et al.: Evaluation of genitofemoral nerve block, in addition to ilioinguinal and Iliohypogastric nerve block, during inguinal hernia repair in children. Br J anaesth 2005; 94:243-246.
5. Amory C, Mariscal A, Guyot E et al.: Is ilioinguinal /Iliohypogastric nerve block always totally safe in children? Paediatr Anaesth 2003; 13: 164-166.
6. Dahl JB, Kehlet H. The value of preemptive analgesia in the treatment of postoperative pain. Br J Anaesth 1993; 70: 434-439.
7. Tesler MD, Wilkie DJ, Holzemer WL et al.: Postoperative analgesics for children and adolescents: prescription and administration. J pain symptom manage 1994; 9:85-95.
8. Kart T, Christrup LL, Rasmussen M. Recommended use of morphine in neonates, infants and children based on literature review: part 2– clinical use. Paediatric Anaesthesia 1997; 7:93-101.
9. Findlow D, Aldridge LM, Doyle E. Comparison of caudal block using bupivacaine and ketamine with ilioinguinal nerve block for orchidopexy in children. Anaesthesia 1997; 52:1110-1113.

10. Aldrete JA, Kroulik D. A postoperative recovery score. Anesth Analg 1970; 49:924-933.
11. Chung F, Ritchie F, Su J. Postoperative pain in ambulatory surgery. Anesth Analg 1997; 85:808-816.
12. Brown KA, Laferriere A, Lakheeram I, Moss IR. Recurrent hypoxia in children is associated with increased analgesic sensitivity to opiates. Anesthesiology 2006; 105(4):645-647.
13. Esmail Z, Montgomory C, Courtrn C, Hamiton D, Kestle J. Efficacy and complications of morphine infusions in postoperative paediatric patients.Paediatric Anaesthesia 1999;9 :321-327.
14. Duedahl TH and Hansen HE. A qualitative systematic review of morphine treatment in children with postoperative pain. Pediatric Anesthesia 2007; 17:756-774.
15. Weinstein MS, Nicholson SC, Schreiner MS. A single dose of morphine increases the incidence of vomiting after outpatient inguinal surgery in children. Anesthesiology 1994; 81(3):572-577.
16. Kokinsky E, Thornberg E, Ostlund AL, Larsson LE. Postoperative comfort in paediatric outpatient surgery. Paediatric Anaesthesia 1999; 9:243-251.
17. Bhattarai BK, Rahman TR, Sah BP, Tuladhar UR. Analgesia after inguinal herniotomy in children: combination of simplified (single puncture) ilioinguinal and iliohypogastric nerve blocks and wound infiltration vs caudal block with 0.25% bupivacaine. KUMJ 2005; 3(3):208-211.
18. Derrick JL, Aun CS. Transient femoral nerve palsy after ilioinguinal block. Anaesth Intensive care 1996; 24:115.
19. Johr M, Sossai R. Colonic puncture during ilio-inguinal nerve block in a child. Anesth Analg 1999; 88:1051-1052.

مبادرة إحصار العصب الحرقفي (الاربي) – الخثلي مقابل المورفين الوريدي لعلاج الألم في عملية إصلاح الفتق وحيدة الجانب عند الأطفال

خالد الزبن، إبراهيم قديسات، عبد الكريم العويدي

قسم التخدير والعناية الحثيثة، كلية الطب، الجامعة الأردنية، مستشفى الجامعة الأردنية، عمان، الأردن

الملخص

الهدف: ان عمليه اصلاح الفتق الأربي من اكثر العمليات الجراحيه شيوعا عند الاطفال، وبما أنها تجرى عادةً في وحدة العمليات النهارية فإن السيطرة على الا لم بعد العمليه بشكل كاف يعتبر أمراً ضرورياً .

ان موضوع هذه الدراسة هو مقارنة فعاليه حقن 100 ميكروغرام/ كلغ مورفين عن طريق الوريد مع فعالية احصار العصب الاربي– الخثلي كطرق متبعة للسيطرة على الا لم في عمليات اصلاح الفتق الأربي وحيدة الجانب عند الاطفال مع مقارنه الاعراض الجانبيه لكلتا الطريقتين.

الطرق: لقد تمت دراسة ستين (60) مريضاً تتراوح أعمارهم من 2 – 12 سنه حيث تم ضمهم في دراسة مستقبلية– عشوائية بالتعمية. وقد تم تقسيم المرضى لمجموعتين: أعطي المرضى في الاولى (مجموعة م) وعددهم ثلاثون مريضا عقار مورفين 100 ميكروغرام /كلغ قبل بدء الجراحة، واجري لمرضى المجموعة الاخرى (ب) وعددهم ثلاثون مريضا إحصار العصب الاربي –الخثلي باستخدام عقار ببفاكين 0.5% بجرعة 0.25 مل/ كلغم قبل بدء الجراحة كذلك.

وقد تم تقييم درجة الا لم من(0–10) في الدقيقة الأولى والدقيقة 30 وعند تمام الساعة الأولى والثانية والثالثة والرابعة بعد انتهاء الجراحة. كذلك تم تسجيل وقت اعطاء اول جرعة لمسكن الألم (عقار البارسيتامول) وعدد الجرعات التي استخدمت منه. كما تم تسجيل حدوث المضاعفات الجانبية عند جميع المرضى من اقياء وحكة خلال 24 ساعة من إجراء العملية. وقد تم اعتبار القيمة ($p < 0.05$) ذات دلاله إحصائية مهمة.

النتائج: خلال الاربع ساعات الاولى بعد العملية الجراحية، كانت كلتا المجموعتين متماثلتين من حيث شدة الا لم، وفيما يخص الوقت المنقضي قبل الحاجة للجرعة الاولى من مسكن الا لم وعدد جرعات المسكن التي استُخدمت في ال24 ساعه الاولى بعد إجراء العملية فإن كلتا المجموعتين كانتا متماثلتين كذلك. ولم يحصل لاحد المرضى من المجموعتين هبوط في التنفس وكانت نسبه حدوث القيء اكثر في المجموعة التي أعطيت عقار المورفين (م).

الخاتمة: نستطيع الاستنتاج بان اعطاء المورفين 100 ميكروغرام /كلغ واعطاء احصار العصب الحرقفي (الاربي) –الخثلي لهما نفس الفعالية من حيث السيطرة على آلام ما بعد العملية لعمليات اصلاح الفتق وحيد الجانب عند الاطفال، ولكن نسبة حدوث الاقياء تزيد مع استعمال المورفين.

الكلمات الدالة: المورفين، إحصار العصب، عملية اصلاح الفتق، الا لم.