

Caudal vs. ilioinguinal/iliohypogastric block plus ketorolac during hernia repair in children

Blocco caudale vs. ileoinguinale/ileoipogastrico più ketorolac per l'ernioraffia nei bambini

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Key words

Anaesthesia: Caudal • Ilioinguinal • Local anaesthetics:
Ropivacaine • Analgesics: Nonsteroidal anti-inflammatory drugs • Ketorolac.

Parole chiave

Anestesia: Caudale • Ileoinguinale • Anestetici locali:
Ropivacaina • Analgesici: Antiinfiammatori non steroidei
• Ketorolac

Summary

Background

Regional anaesthesia techniques combined with general anaesthesia are routinely used in paediatric practice.

Aims

To compare intra and postoperative pain relief provided by caudal block or ilioinguinal/iliohypogastric block plus ketorolac, integrated with general anaesthesia, during inguinal hernia repair in children.

Patients

60 male patients, ASA I, between the ages of 1-10 years, listed for unilateral herniorrhaphy, were randomly allocated to two groups.

Methods

After general anaesthesia in the «C» Group a caudal block was performed using ropivacaine 0.2% at the dose of 0.7 ml·kg⁻¹. In the «I» Group ketorolac (0.5 mg·kg⁻¹) was intravenously administered and an ilioinguinal block was performed using 0.5 ml·kg⁻¹ of ropivacaine 0.2%. No differences were observed in demographic data. The duration of surgery was shorter in the ilioinguinal group. Paracetamol was administered, during the first 12 hours, in 3/28 and in 4/28 patients in Group C and Group I respectively. CHEOPS score was recorded in the two groups. The analysis of this data showed no evidence of statistical differences.

Conclusions

Ilioinguinal block given with ketorolac should be considered a good choice for unilateral inguinal hernia repair.

Riassunto

Premessa

Le tecniche di anestesia locoregionale sono di comune impiego in anestesia pediatrica.

Scopo

Paragonare la qualità dell'analgesia intra e postoperatoria fornita dal blocco ileoinguinale/ileoipogastrico associato ad anestesia generale nei bambini.

Pazienti

60 pazienti, ASA I, di età compresa tra 1 e 10 anni, da sottoporre a intervento di ernia inguinale monolaterale, sono stati collocati in due gruppi, con metodo randomizzato.

Metodi

Dopo anestesia generale, nel gruppo «C» è stato eseguito un blocco caudale con ropivacaina 0,2% alla dose di 0,7 ml·kg⁻¹. Nel gruppo «I» è stato somministrato ketorolac (0,5 mg·kg⁻¹) endovena ed è stato eseguito un blocco ileoinguinale utilizzando la ropivacaina 0,2% alla dose di 0,5 ml·kg⁻¹.

Risultati

Non sono state osservate differenze tra i due gruppi nei dati demografici. La durata dell'intervento chirurgico è stato più breve nel gruppo «I».

Il paracetamolo è stato somministrato, durante le prime 12 ore, in 3/28 e in 4/28 pazienti rispettivamente nel gruppo C e nel gruppo I. I punteggi CHEOPS sono stati registrati nei due gruppi. L'analisi statistica di questi dati non ha mostrato evidenza di differenza statistica.

Conclusioni

Il blocco ileoinguinale più il ketorolac può essere considerato una valida alternativa al blocco caudale per l'ernioraffia monolaterale nei bambini.

Introduction

Regional anaesthesia techniques combined with general anaesthesia are routinely used in paediatric practice. The aim is to obtain good intra and postoperative analgesia. This allows sedative analgesics to be avoided and an early discharge. The choice between a central block and a peripheral block depends on the kind of surgery. Caudal epidural blockade is most commonly used for urologic and lower abdominal surgery. It is a relatively simple technique, but its success and safety depend on the experience of the anaesthetist¹⁻³.

Ilioinguinal/iliohypogastric nerve blockade is a peripheral block that provides analgesia for hernia and orchidopexy repair. It is very easy to perform with few complications.

Long-acting local anaesthetics are usually used to prolong analgesia over the time of surgery, and to provide postoperative pain relief.

The report of several cases of systemic toxicity reactions has prompted the consideration of using local anaesthetics with low toxicity, and of deciding for each case the appropriate techniques⁴⁻⁶.

Ropivacaine is a long-acting aminoamide local anaesthetic⁷. It provides longer analgesia than other anaesthetics, with less cardiac and neurologic toxicity and a greater separation of sensory and motor effects. Concomitant use of Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) improves analgesia provided by regional techniques and avoids the need for higher doses⁸.

Ketorolac is a NSAID used for moderate pain control; it has a very rapid onset time, when given intravenously⁹.

The present Authors designed a comparative clinical study of caudal and ilioinguinal block with ropivacaine. The ilioinguinal block was always associated with intravenous ketorolac. The aim of the trial was to evaluate the haemodynamic effects and the intra and postoperative analgesia of the two techniques.

Patients and methods

Ethical approval and written informal parental consent was obtained. Sixty male patients, ASA I, between the ages of 1-10 years, listed for unilateral herniorrhaphy, were randomly (MS-EX-CELL) allocated to two groups (29 patients in caudal group; 31 patients in ilioinguinal group). Premedication in all cases consisted of 0.3

mg·kg⁻¹ of midazolam given orally 30 minutes before surgery. Gaseous induction with 8% Sevoflurane and a mixture of oxygen and air (FiO₂ 50%) was performed. Intravenous access was established and regional anaesthesia performed. Anaesthesia was maintained with 2-2.5% of Sevoflurane and oxygen and air. Patients were allowed to breathe spontaneously via a face mask.

In the «C» group, a caudal block with the patient in the left lateral position was performed using ropivacaine 0.2% at the dose of 0.7 ml·kg⁻¹, through a 20 or 22 gauge intravenous cannula.

In the «I» group, ketorolac (0.5 mg·kg⁻¹) was intravenously administered an intravenous line, after induction of anaesthesia. The ilioinguinal block was performed using 0.5 ml·kg⁻¹ of ropivacaine 0.2% (maximum dose 10 ml) through a 23-gauge needle.

During anaesthesia standard monitors were used in both groups. NIBP, heart rate, oxygen saturation, end-tidal-CO₂, and respiratory rate were recorded every 5 min. If movement, tachycardia or tachypnea occurred during surgery, fentanyl (1 mcg·kg⁻¹) was administered, but subsequently the patient was excluded from the study considering the block unsuccessful.

The patients were transferred after surgery to a postanesthesia room (PACU) and 1 hour later back to the ward.

Postoperative pain was assessed using both a three point scale (1 point = no pain; 2 points = moderate pain; 3 points = severe pain), performed by the parent of the child, and the Children's Hospital Eastern Ontario Pain Scale (CHEOPS), (score range 4-13) performed hourly by a blindfolded anaesthetist for a period of 12 hours after operation. Points 2 and 3 of the three-point scale and 9-13 of CHEOPS were considered unsatisfactory; if this occurred, rectal paracetamol (40 mg·kg⁻¹) was permitted.

Any adverse event, considered of clinical importance, was recorded.

STATISTICAL ANALYSIS

Demographic data are presented as means (standard deviation). The duration of surgery and haemodynamic data (Figs. 1 and 2) were tested with Student's t-test. The need for paracetamol postoperatively was analysed using a chi-square test or Fisher exact test. Postoperative analgesia was assessed using the CHEOPS score. A score of 4-8 was considered to be satisfactory, a score of 9-13 was considered to be unsatisfactory. The data was examined for the early postoperative

Fig. 1. Mean (95% CI) changes in mean arterial pressure (BP) (measured every 5 min for a period of 90 min) in both caudal (series 1) and ilioinguinal (series 2) group. $P > 0.05$. *Variazioni della pressione arteriosa media (BP) (misurata ogni 5 min. per una durata di 90 min.) nel gruppo caudale (serie 1) e in quello ileoinguinale (serie 2). $P > 0,005$.*

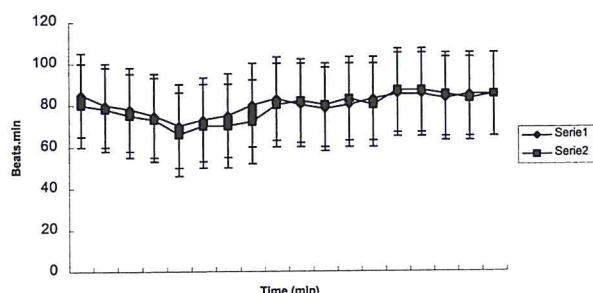
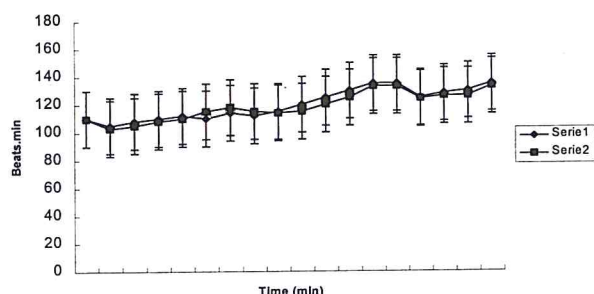


Fig. 2. Mean (95% CI) changes in heart rate (HR) (measured every 5 min for a period of 90 min) in both caudal (series 1) and ilioinguinal (series 2) group. $P > 0.05$. *Variazioni (95%) del battito del cuore medio (HR) (misurato ogni 5 min. per una durata di 90 min.) nel gruppo caudale (serie 1) e in quello ileoinguinale (serie 2). $P > 0,05$.*



period (30 minutes to 3 hours) and late postoperative period (4 hours to 12 hours). The duration of analgesia, as the time from the performance of the block to the first analgesic administration, and the CHEOPS score were recorded. Analysis consisted of the chi-square test or Fisher exact test as appropriate. $P < 0.05$ was considered statistically significant.

Results

There were no statistical differences in the demographic (Tab. I) and haemodynamic (Figs. 1, 2) data. A statistical difference was noted in the duration of surgery, with a shorter time in the ilioinguinal group ($P = 0.03$) (Tab. I).

One patient in Group C and three patients in Group I received fentanyl intraoperatively and were excluded from the study. The analysis of this data was not considered of statistical significance. (Tab. II).

Early postoperative analgesia was considered satisfactory in 26/28 and in 24/28 patients in the caudal group and ilioinguinal group respectively. Late postoperative analgesia was considered satisfactory in 27/28 patients in the caudal group and in 25/28 patients in the ilioinguinal group. Paracetamol was administered, during the first 12 hours, in 3/28 and in 4/28 patients in Group C and Group I respectively, with similar duration of analgesia in the two groups (Tab. II). Lastly,

Tab. I. Clinical data. (Mean SD). *Dati clinici. Valori medi (DS).*

	Group C	Statistical significance	Group I
Age (months)	71.5 (25.1)	NS	70.9 (31.2)
Weight (kg)	22.6 (8.0)	NS	22.1 (9.6)
Gender (M)	29	NS	31
Duration of surg. (min)	23.8 (5.5)	$P = 0.03$	21.1 (4.0)

Tab. II. Analgesia. *Analgesia.*

	Group C	Statistical significance	Group I
Fentanyl	1/29	NS	3/31
Early pain Satisfactory	26/28	NS	24/28
Late pain Satisfactory	27/28	NS	25/28
Paracetamol	3/28	NS	4/28
Duration of analg. (min)	256.2 (45.8)	NS	215.3 (52.3)

Tab. III. CHEOPS pain score. *Scala del dolore*.

	Group C	Statistical significance	Group I
After 1h	6.5 (0.8)	NS	6.3 (0.7)
After 2h	7.2 (1.0)	NS	7.1 (1.1)
After 3h	7.0 (1.2)	NS	7.2 (1.5)
After 5h	7.3 (0.9)	NS	6.9 (1.0)
After 8h	6.9 (0.8)	NS	6.5 (0.7)

the CHEOPS score was recorded in the two groups and the analysis of this data showed no evidence of statistical differences (Tab. III). No adverse effects were recorded.

Discussion

Caudal block is the most commonly used regional technique in paediatric anaesthesia. It provides good control of intra and postoperative pain for a large variety of surgical procedures. Some recent studies confirm that ropivacaine is a good local anaesthetic for both the caudal and epidural routes¹⁰⁻¹⁴. It is an effective, long acting local anaesthetic, with a shorter duration of motor block than bupivacaine at the same dose¹⁰⁻¹³. Ropivacaine also has a good safety profile, so that accidental intravenous injection should result in a lower incidence of complications.

In adults it has been shown that the toxic venous plasma concentration of ropivacaine is higher than bupivacaine⁶. No data are available for children concerning toxic plasma concentration, but there are recent studies about the pharmacokinetics^{15 16}.

The success and safety of caudal block are not only related to the pharmacokinetic profile of the local anaesthetic, but also to the experience of the anaesthetist. Thus, the choice of the regional anaesthesia should always be appropriate for the kind of surgery.

Ilioinguinal block has few related complications. It is very easy to do and it provides good analgesia for inguinal hernia repair. Ilioinguinal block may provide effective intra and postoperative analgesia and avoid possible adverse effects associated with a central block¹⁷⁻¹⁹.

The use of NSAIDs has been demonstrated to prolong pain relief in children⁸. When NSAIDs are given rectally, the therapeutic plasma level is obtained in 30 minutes²⁰⁻²³. The advantage of ketorolac is a very rapid onset when given intravenously. Ketorolac is not commonly used in children because of fear of increased bleeding⁸. The Authors did not see any increase of bleeding and surgical times were in fact shorter in the ketorolac group. The possible explanation may be related to various factors, the most important of which is experience of the surgeon. Lastly, some Authors use ketorolac in children and the analgesic effect is comparable to morphine, with a normal postoperative bleeding and renal function^{24 25}.

In conclusion, the pain relief offered by the two techniques appears broadly similar. In terms of statistical analysis there was no evidence of difference in analgesia between the two techniques. Caudal block remains the most used in children, giving flexible use in many different surgical procedures. Ilioinguinal block given with a NSAID, such as ketorolac, should be considered a good alternative for unilateral inguinal hernia repair.

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■ Acknowledgements: The author is greatly indebted for the assistance of Dr. D. Lord, Dr. D.N. Robinson, Consultant Paediatric Anaesthetists, and Mr. A. Morabito, Paediatric Surgeon, at Royal Manchester Children's Hospital, in proof reading this article.

■ This paper was presented at the 3rd Sarnepi Congress (S. Giovanni Rotondo, Italy, 21-23 October, 1999).

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