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A Comparison Between Caudal Epidural Analgesia and Paracetamol Suppository in Relieving Pain after Inguinal Hernia Repair in Pediatric Age Group

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Abstract

Background: the control of postoperative pain is important in children, and poor pain control leads to organ dysfunction and behavioral problem.

Aim of study: we compare the analgesic effect of bupivacaine by caudal block root and acetaminophen suppository on postoperative pain in pediatric inguinal hernial repair surgery.

Patient and Methods: A prospective, randomized, controlled trail of 40 children, aged between (1-7 years), ASA grade I-II, scheduled for elective day case unilateral inguinal surgery. For all the patients included in this study, a standardized controlled anesthetic protocol was used. Preoperatively the patients were randomized into two groups according to the operation waiting lists. group 1 included (18) patients who received single - shot caudal block with (1ml/kg) of 25% bupivacaine preoperatively after induction of anesthesia by the anesthetist, group 2 included (22) patients who received (15-20 mg/kg) acetaminophen suppository.

Results: The number of patients (who had first three hours free of pain); was significantly higher in the Caudal group than those of the other group. Patients of the Caudal group; needed significantly a longer duration of time for the first analgesic drug. Patients of the Caudal group; had significantly a lower (Face, Legs, Activity, Cry, Consolability scale) in (1/2, 1, and 2 hours) time intervals of the study.

Conclusion: Caudal anesthesia with bupivacaine has better painless period postoperatively.

Keywords: Bupivacaine, Anesthesia, Caudal, Analgesia, Acetaminophen Suppository.

Introduction

The inguinoscrotal region is the most common site for surgical conditions in childhood[(1)]. Children suffer from postoperative pain at least to the same extent as their adult counterparts, yet they often receive less analgesia[(2,3)].

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Pain may trigger biochemical and physiologic stress responses and leads to impairments in pulmonary, cardiovascular, neuroendocrinal, gastrointestinal, immunological, and metabolic function even in children and newborns[4]. Optimal postoperative pain relief minimizes the metabolic rate for oxygen, reduces cardiorespiratory demands, promotes early ambulation, and speeds recovery. In addition, postoperative emotional disturbance is reduced if pain is well controlled[5].

In pediatrics, acute postoperative pain is commonly treated with simple analgesics that often are not very effective and frequently are used at doses lower than would be optimal[4]. Effective pain therapies to block or modify the physiologic responses to pain and stress have become an essential component of modern pediatric anesthesia and surgical practice[4]. Pain is a complex interaction that involves sensory, emotional and behavioural factors, and so its definition and treatment must include all of these aspects[6].

Pain assessment tools can be categorized into five broad categories:

- self-report (using diagrams or pictures).
- Observational (behavioral)
- Physiologic (physiological parameters.)
- neurophysiologic
- hormonal-metabolic (changes in stress hormones such as epinephrine, nor epinephrine, or cortisol)[7,8].

Table 1: (Faces, Legs, Activity, Cry, Consolability (FLACC) scale) [5,9,10]

Categories	Scoring		
	0	1	2
Face	No particular expression or smile	Occasional grimace or frown, withdrawn, disinterested	Frequent to constant quivering chin, clenched jaw
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking, or legs deawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, or legs drawn up
Cry	No cry (awake or asleep)	Moans or whimpers; occasional complaint	Crying steadily, screeams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging or being talked to, distractable	Difficult to console or comfort

Management of postoperative PAIN:

1. Systemic Analgesic Drugs
2. Inhalational analgesia[11].
3. Regional Analgesia for Postoperative Pain[5,12].
4. Local nerve blocks.[6,12,13,14]
5. Local Infiltration[15,16,17].
6. Regional blocks(spinal, epidural(caudal)):

Caudal Block

The caudal block is very useful in infants and children; it provides good postoperative analgesia after abdominal, lower limb, or perineal surgery[5]. Caudal route can be used as a single-shot access point for postoperative analgesia during sub-umbilical surgery in children. Dose: 0.5–1.0mL/kg 0.25% bupivacaine depending on the height of the block required and on agent used. Epidural blockade is

accompanied by minimal changes in blood pressure or cardiac output in children <6 years[5,12].

Procedure:

For postoperative analgesia, the block should be performed after general anesthesia has been induced but before the surgery commences. The child is placed in the lateral decubitus position with the knees and hips well flexed. The landmarks are then identified. The sacral hiatus is at the midpoint between the sacral cornua, which can be palpated ~5 cm above the tip of the coccyx[5,18].

These lie at the apex of an inverted equilateral triangle, the base of which is a line drawn between the posterior superior iliac spines. The child is prepared and draped, and the operator wears sterile gloves and a mask. The skin over the sacral hiatus is nicked with an 18-gauge needle (to avoid tracking epidermal tissues into the caudal canal), after which an IV catheter (22 gauge for children <2 years, 20 gauge for those >2 years) is advanced cephalad at an angle of 45° to the skin with the bevel facing anteriorly.

A distinctive sudden "give" is felt as the needle passes through the sacrococcygeal ligament. At this point, the angle of the needle is reduced and the catheter is advanced off the needle into the caudal canal The needle is then withdrawn, leaving the intravenous catheter in the caudal/epidural space. The catheter should be observed for passive reflux of blood or CSF. the local anesthetic is injected in incremental doses (there should be no resistance to injection; if there is resistance, then the catheter is either kinked or misplaced) while the electrocardiogram is observed. A finger should be placed over the sacrum to detect inadvertent subcutaneous injection. The use of ultrasound has been advocated by some to improve success rates [5].

Bupivacaine:

Widely used for peripheral and epidural blocks, a long-acting local anesthetic, amide type, a mean duration of effect of 3–6 h can be assumed, It is characterized by a slower onset of effect and by a long duration of effect. it is indicated particularly for regional anesthesia in the surgical field, in postoperative analgesia, and in therapy for various pain conditions, it is suitable for infiltration anesthesia, peripheral nerve block, ganglion block and plexus block, as well as all forms of neuraxial anesthesia, It has the disadvantage that overdosing or accidental intravascular injection may lead to severe myocardial depression that may be prolonged and difficult to reverse[5,19]. other side effects of bupivacaine are allergic reaction, seizure (convulsions), nausea, vomiting, chills or shivering, headache and back pain[12].

Patients and Methods

A prospective, randomized, controlled trail of 40 children, was conducted at Baghdad Teaching Hospital, Medical City, and Al-Kadhemia Teaching Hospital, Baghdad, Iraq, which started at 1st of January 2020 to 20th of September 2020. aged between (1-7 years), ASA grade I-II, scheduled for elective day case unilateral inguinal surgery.

After approval of the scientific council of the iraqi board of medical specializations, The study was performed after obtaining a written informed consent from the participants parents. Age, gender, weight, anesthesia and surgery periods, severity of pain for the patients were recorded in a special data form.

Exclusion criteria were:

1. parent refusal.
2. skin infection at site of puncture.
3. anatomical malformation at site of puncture.
4. hypersensitivity to local anesthetics or paracetamol.
5. history of seizures.
6. neuromuscular or neurological disorders.
7. age < 1 year and > 7 years.

For all the patients included in this study, After securing an intravenous access, a standardized controlled anesthetic protocol was used, induction with Ketamine (1mg/kg), Propofol (1.5-2mg/kg), rocuronium (0.6mg/kg), and maintenance with sevoflurane (2-2.5%) in O2 or isoflurane (1.2-1.5%) in O2. Laryngeal mask airway was applied appropriately to their age.

Anesthetic management consisted of positive pressure ventilation, anesthesia was maintained with a titrated dose of inhalational anesthetics in 100%

Oxygen and iv bolus of rocuronium was repeated intermittently to maintain muscle relaxation.

Preoperatively the patients were randomized into two groups according to the operation waiting lists:

For group 1:- (18 patients)

The child placed in the lateral decubitus position and after identifying the sacral cornua and hiatus 23G needle is inserted into the sacral epidural space and by loss of resistance technique with saline, children received bupivacaine 0.25% (1ml/kg).

For group 2:- (22 patients)

Paracetamol suppository was given to the patients in a dose (15-20mg/kg) after induction of anesthesia.

At the end of the surgery, inhalational anesthetic was discontinued and residual neuromuscular block was antagonized by a combination of neostigmine 0.05 mg/ kg and atropine 0.02 mg/kg.

Postoperative the pain was measured by using FLACC scale at 30 minutes after discharge from the theater and then every hour during the next 3 hours of postoperative period by senior house officer.

The FLACC scale is scored in a range of 0-10, with 0 representing no pain, relaxed and comfortable, 1-3 mild discomfort, 4-6 moderate pain, 7-10 severe discomfort or pain. All the patients were observed in the surgical ward for development of any adverse effects or complications.

The patient considered for home discharge when:-

1. conscious.
2. vitally stable.
3. tolerating oral intake.
4. Absence of vomiting and other side effect.

Twenty –four hours after surgery, reports on delayed side-effects and demands for rescue paracetamol suppository and time of first urination and walking were gathered.

Statistical analysis:

Data were first entered in an excel file, transported later into statistical SPSS –software (package for social sciences file version 24) (SPSS v24) for data analysis. Continuous variables presented as means and discrete variables presented as numbers and percentages.

Chi-square test for independence used to test the significance of association between discrete variables. ANOVA test used to test the significance of difference in means between independent samples. Level of significance was set at P value equal or less than 0.05.

Results

Table 2: comparison between the two study groups in no. of patients who had three hours free of pain.

Variable		Group		p-value
		Caudal	P.supp.	
Pain free for the first three hours	Yes [No.] (%)	8 (44.4%)	2 (9.1%)	0.013
	No [No.] (%)	10 (55.6%)	20 (90.9%)	

The number of patients (who had first three hours free of pain); was significantly higher in the Caudal group than those of the other group.

Table 3: Comparison between the two study groups in time for the first analgesic, and time for the first walking.

Variable	Group	Mean	S. D.	p-value
Time for the first analgesic (hours)	Caudal	8.75	1.69	0.003
	P.supp.	7	1.71	
Time for the first walking (hours)	Caudal	11.22	5.46	0.096
	P.supp.	8.61	4.2	

Patients of the Caudal group; needed significantly a longer duration of time for the first analgesic, and non-significantly longer duration for the first walking.

Table 4: comparison between the two study groups in FLACC score in different time intervals of the study.

Time intervals	Group	Mean Score	S. D.	p-value
1/2 hour FLACC scale	Caudal	0.66	1.41	0.0001
	P. supp.	5.72	2.79	
1 hour FLACC scale	Caudal	1.11	1.87	0.001
	P. supp.	4.59	2.26	
2 hours FLACC scale	Caudal	0.72	0.95	0.025
	P. supp.	1.54	1.22	
3 hours FLACC scale	Caudal	0.55	0.78	0.598
	P. supp.	0.68	0.71	

Patients of the Caudal group; had significantly a lower FLACC score in (1/2, 1, and 2 hours) time intervals of the study, and non-significantly lower score in 3 hrs. time interval.

Table 5: comparison in general characteristics between the two study groups.

Group	N	Mean age (years)	S. D.	Std. Error Mean	p-value
Caudal	18	3.88	2.04	0.48	0.08
Paracetamol supp.	22	2.81	1.72	0.36	
Caudal	Gender	Male No. (%)	12(66.7%)		0.464
		Female No. (%)	6(33.3%)		
Paracetamol supp.		Male No. (%)	18(81.8%)		
		Female No. (%)	4(18.2%)		

Non-significant differences were found in comparing the two groups in age, and gender distribution.

Table 6: Comparison in operative details between the two study groups.

Variable	Group	Mean	S. D.	p-value
Duration of anesthesia (min.)	Caudal	37.77	8.61	0.869
	P. supp.	38.18	6.82	
Duration of surgery (min.)	Caudal	27.22	8.44	0.837
	P. supp.	27.72	7.02	

Patients who received paracetamol suppositories; had non-significantly a longer duration of anesthesia, and a longer duration of surgery.

Discussion

The inguinoscrotal region is the most common site for surgical conditions in childhood[1]. effective pain therapies to block or modify the physiologic responses to pain and stress have become an essential component of modern pediatric anesthesia and surgical practice[4]. Acute postoperative pain is commonly treated with simple analgesics that often are ineffective and frequently used at doses lower than would be optimal[4]. Systemic analgesics and regional anesthetic techniques with various efficacies have been used for pain relief after inguinal surgeries.

In our study the efficacy of caudal block with bupivacaine and paracetamol suppository was

compared in cases of inguinal hernia cases. Because the total spinal blockade sometimes having potential serious complication, awareness of the anatomy in different age groups is important to prevent this from occurring. Anatomical features that contribute to these incidents are the caudal position of the dural sac in infants less than 1year at the level of S3, only a few millimeters from the puncture site[20]. That is why in this study we select patients with ages older than 1 year, while the reason behind restricting the study to maximum age of 7 years is that the sacral fat is usually start to develop at school age children making caudal somewhat difficult and better to be limited to children less than 7 years as stated by Johr et. al.[20].

Because infants and children are usually uncooperative and unlikely to remain calm while awake, caudal blocks and local infiltration are typically performed under general anesthesia[20].

The current study reveals that there is statistically significant difference between analgesia groups caudal group and paracetamol groups regarding pain free patients (FLACC score zero) in the first three hours after recovery. patients who received caudal block exhibit excellent and reliable postoperative pain relief when compared to paracetamol group. The same thing was reported by Hong et al.[21]

The pain intensity at the 1st and 2nd hour post recovery was low in caudal block group while it remains high in the paracetamol suppository group, then at the 3rd hour post recovery, the pain score was not significant among the two groups and intensity of pain was low. This can be attributed to the fact that paracetamol have delayed absorption (The time to peak effect after rectal administration is 60–180 min and rectal bioavailability can be poor)[5,22].

Rectal paracetamol in a dose of 30 to 40 mg/kg may take up to 2 hours to achieve a therapeutic level and so is not effective for treating acute pain[22,23].

There are several studies highlighted the comparative efficacy of different analgesic agents for postoperative pain relief, Jahromi et al.[4] found that there were significant statistical differences between caudal groups and paracetamol suppository group.

Razavi and colleagues compared paracetamol suppository and caudal block in relieving pain after pediatric surgery and concluded that caudal block was more effective than paracetamol suppository[24].

In this study, the mean analgesic duration of caudal block, and paracetamol suppository groups was (8.75, 7) hours respectively and it was significant, like Jahromi et. al.[4] and Razavi, et al. [24] that founded caudal group has longer analgesic effect duration than paracetamol suppository group.

Also we found that there was significant variation among the two analgesia groups regarding the number of patients who needs extra paracetamol suppository, time for first suppository needed. Our study is agreed with Conroy et al [25] who reported that caudal analgesia group need less supplementation with systemic analgesics compared to paracetamol group.

Here in this study we found that there is no significant difference in the mean time for walking between the two groups, while study of Bengisun et al.[26] founded that those patients received caudal block took a longer time to walk.

In this study there was no significant variation among the analgesia groups regarding, gender distribution, the mean age, mean weight, mean time of anesthesia and mean operative time.

Conclusion

Generally, it can be concluded that the children who received caudal Bupivacaine for postoperative analgesia, experienced a better and longer analgesia; yet, if caudal anesthesia is impossible (due to anatomical malformation at the puncture site, cutaneous infections, medication deficiency, etc.), at least a suppository of paracetamol may be beneficial in pain relieving at the first few postoperative hours.

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