Original Article

Access this article online
Website: www.afrjpaedsurg.org
DOI: 10.4103/0189-6725.132821
Quick Response Code:

Comparing the analgesic effect of caudal and ilioinguinal iliohypogastric nerve blockade using bupivacaine-clonidine in inguinal surgeries in children 2-7 years old

Mahin Seyedhejazi, Daryoush Sheikhzadeh, Zahra Adrang, Fahime Kazemi Rashed[1]

ABSTRACT

Background: We compared the analgesic effects of caudal and ilioinguinal-iliohypogastric nerve block using bupivacaine-clonidine performed in children undergoing inguinal hernia repair. The ilioinguinal-iliohypogastric nerve block provides excellent pain relief for operations on the inguinal region, including emergency procedures (e.g. strangulated inguinal hernia with intestinal obstruction). It should be preferred to caudal block for these procedures. **Materials and Methods:** After local ethics committee approval and written parental consent, 67 ASA class I - II patients aged between 2-7 years old scheduled for elective inguinal hernia repair were allocated randomly into two groups after general anesthesia with same drugs in both groups. Group C received caudal block with 1 ml/kg bupivacaine 0.25% combined with 1 μg/kg clonidine, and group I received ilioinguinal- iliohypogastric nerve block with 0.3 ml /kg bupivacaine 0.25% combined with 1 μg/kg clonidine. Blood pressure and heart rate were documented every 5 minutes. Post-operative analgesia, analgesic use and side-effects were assessed during first 24 hours. **Results:** In group C, 7 / 34 and in group I, 12/33 patients required post-operative analgesia (P = 0.174). Five patients (15.5%) in group I and one patient (2.94%) in group C had severe pain after operation. Systolic and diastolic blood pressure decreased during operation, but the differences between two groups were not significant (P = 0.176, P = 0.111). Heart rate changes between two groups were insignificant (P = 0.182). **Conclusion:** It seems that in children, caudal epidural block and ilioinguinal – iliohypogastric nerve block using bupivacaine-clonidine have comparable effects on analgesia, severity of pain and hemodynamic changes during and after surgery on inguinal region.

Departments of Anaesthesia, [1]Paediatric Urology, Tabriz Children Hospital, Sheshkelan st, Tabriz University of Medical Sciences, Tabriz, Iran

Address for correspondence:
Mrs. Mahin Seyedhejazi,
Department of Anaesthesia, Tabriz Children Hospital, Sheshkelan st, Tabriz University of Medical Sciences, Tabriz, Iran.
E-mail: seidhejazie@yahoo.com

Key words: Bupivacaine, caudal anaesthesia, children, clonidine, ilioinguinal-iliohypogastric nerve block

INTRODUCTION

Control of post-operative pain is important in paediatric patients because poor pain control may result in increased morbidity or mortality.[1] Epidemiological data suggest that infants are at an increased risk of complications associated with general anaesthesia as compared with older children and adults. A technique that avoids the use of general anaesthesia in this group of high-risk patients could, therefore, have important safety advantages.[2] Caudal epidural block may be used as the sole anaesthetic technique in conscious premature newborns and infants undergoing lower abdominal surgery.[3] Regional anaesthesia produces excellent post-operative analgesia and attenuation of the stress responses in infants and children.[4] Caudal anaesthesia is the oldest and still most commonly used technique of epidural blockade in children. Caudal anaesthesia is recommended for most surgical procedures of the lower part of the body (mainly below the umbilicus), including inguinal hernia repair, urinary and digestive tract surgeries, and orthopaedic procedures on the pelvic girdle and lower extremities.[1]

The most common indication for ilioinguinal-iliohypogastric nerve block is unilateral inguinal hernia repair. The ilioinguinal-iliohypogastric nerve block provides excellent pain relief for operations on the inguinal region (e.g. herniorrhaphy, orchidopexy, hydrocelectomy), including emergency procedures (e.g. strangulated hernia with intestinal obstruction), and it should be preferred to caudal anaesthesia for these procedures.[1]

It is the authors' practice to use ilioinguinal-iliohypogastric nerve block in children above 25 kg, because it is difficult to reach a mid-thoracic level of anaesthesia by a caudal injection in these patients. Ilioinguinal-iliohypogastric nerve block, however, is a technically more demanding procedure and may have a higher failure rate and noxious stimuli perception, e.g. by traction on the peritoneal sac.[5] Complications of caudal anaesthesia are infrequent and usually minor when adequate devices are used. Delayed post-operative voiding was an issue years ago when pre-operative fasting was excessively prolonged, but this should not be an issue anymore, and true urinary retention is very rare. Block failure is not unusual (3-5 percent), especially in children older than 7 years of age, but even in younger patients, the failure rate can be rather high.[1] The ilioinguinal-iliohypogastric nerve block is easy to perform and virtually free of true complications. Undesired nerve blocks (especially femoral nerve block) are occasionally observed, especially when too much local anaesthetic is injected. The only problem with this undesired effect is that it can delay the discharge of the patient by a few hours.[1]

Ilioinguinal-iliohypogastric nerve block is superior to infiltration of surgical wound, especially in the first two hours after the surgery. Caudal epidural block, ilioinguinal-iliohypogastric nerve block and infiltration of surgical wound can be safely and effectively used to control postoperative pain in inguinal herniorrhaphy in children.[6] Both caudal epidural and ilioinguinal-iliohypogastric nerve blocks have been used to provide effective intra-operative and post-operative analgesia. Caudal epidural blocks, using either bupivacaine alone or in combination with opioids, ketamine or clonidine, has been demonstrated to be an effective analgesic technique following lower abdominal and urogenital surgery in children.[7] The addition of an ultrasound–guided ilioinguinal block to a single shot caudal block decreases the severity of pain experiences by paediatric groin surgery patients The decrease in pain severity were particularly pronounced in inguinal hernia repair patients.[8] We, therefore, designed a randomized, double-blind controlled study to compare the effects of caudal and ilioinguinal-iliohypogastric nerve block using bupivacaine-clonidine on post-operative analgesia.

MATERIALS AND METHODS

After approval of the local ethics committee and obtaining written parental consent, 67 ASA class I or II patients aged 2-7 years old, who were candidate for elective inguinal hernia repair, orchiopexy and hydrocelectomy, were enrolled in this double-blind, randomized trial. They evenly assigned into groups C (caudal) and I (ilioinguinal). All health care personnel providing direct patient care, the patients and the parents were blinded to the type of block.

Exclusion criteria were contraindication to caudal epidural and ilioinguinal/iliohypogastric nerve block, failed blocks and a known allergy to any of the drugs used in the study. Before induction of anaesthesia, vital signs including HR (heart rate)- SBP, DBP (Systolic and diastolic blood pressures), SPO2 (Saturation percent of O2), RR (respiratory rate) were documented. After premedication with 0.03 mg/kg intravenous midazolam, general anaesthesia was induced with 1 μg/kg fentanyl, 1 mg/kg lidocain and 3-5 mg/kg propofol.

Anaesthesia was maintained with 1-1.5% isofluran in O2/N2O. In all patients, spontaneous breathing was permitted via a laryngeal mask airway (LMA) of appropriate size. After induction of anaesthesia, infusion of 2.5% dextrose in Ringer (10 mL/kg/h) was commenced. The caudal block was performed with the child in the left lateral decubitus position. After insertion of a 23 gauge needle into caudal epidural space and negative aspiration for blood and cerebrospinal fluid, 1 ml/kg of 0.25% bupivacaine, (Marcaine 100 mg/20 ml, MERK, France) combined with 1 μg/kg of clonidine (Catapressan 150 mg/1 ml, Boehringel-Ingelheim, Frankfurt, Germany) was injected.

The ilioinguinal/iliohypogastric nerve block was performed by insertion of a short bevelled needle at the junction of lateral 1/4 and medial 3/4 on the line drawn between anterior superior iliac spine and umbilicus. The needle was initially inserted perpendicular to the skin, then declined to 45-60° directed to the middle of the inguinal ligament, then slowly advanced until the aponeurosis of the external oblique muscle was traversed, after which the drug was injected. Local anaesthetic solution was 0.3 ml/kg of 0.25% bupivacaine combined with 1 μg/kg clonidine. Heart rate, non-invasive blood pressure and peripheral oxygen saturation (Spo2) were recorded after induction of anaesthesia, every 5 minutes intra-operatively and every 5 minutes in recovery room for one hour. An intra-operative increase in baseline blood pressure or heart rate of more than 10% was defined as insufficient analgesia and was treated with 1 μg/kg of fentanyl. After the surgery, the patients were transferred to the recovery room when they were sufficiently awake and capable of maintaining an open airway.

In the recovery room and the ward, the children were under constant supervision by experienced paediatric nurses. Any pain experienced by the patients was treated with 20 mg/kg of rectal acetaminophen. The duration of post-operative analgesia was defined as the time interval between the block and the first dose of acetaminophen. Post-operative analgesia was assessed by Wong and Backer scale, and intensity of pain was scored between 0 and 5. When patients' pain score was above 2, they received rectal acetaminophen. (Pain score: 0-1 = low, 2-3 = moderate, 4-5 = severe).

RESULTS

Sixty seven male patients were included in this study. One child was excluded from the study because after induction of anaesthesia and performing caudal block, the surgeon decided that the child did not need surgery! All the physical characteristics of the remaining 66 children are demonstrated in [Table 1]. Age, weight, duration of surgery, type of surgery, basic heart rate, systolic and diastolic blood pressures were comparable in two groups. The number of children requiring post-operative analgesic was 7 in the group C and 12 in the group I. By using the fisher exact test, the difference between two groups was not significant (X2 = 1.63, df = 1, $P = 0.05$) [Figure 1].

Three, 4, 5 patients in group I versus 3, 3, 1 patients in group C had mild, moderate and severe pain, respectively. Five, 5, 2 patients in group I versus 4, 1, 2 patients in group C received post-operative analgesics at 1-2 hours, 3-4 hours and 5 hours, respectively. No episodes of clinically significant post-operative respiratory depression, hypotension or bradycardia were observed.

DISCUSSION

This study compared the analgesic effects of caudal epidural block versus ilioinguinal/iliohypogastric nerve block using bupivacaine-clonidine in inguinal surgeries in children 2-7 years old age. We found both techniques effective in reducing pain, and there were no significant differences between two groups statistically. Caetano *et al*. found caudal epidural and ilioinguinal-iliohypogastric nerve blocks comparable in post-operative analgesia in children undergoing inguinal herniorrhaphy.[6] Somri *et al*. investigated the effect of caudal anaesthesia on the peri-operative stress responses and documented the efficacy of caudal anaesthesia to block the pain-induced rise in plasma epinephrine and nor epinephrine in children undergoing minor infraumbilical abdominal surgery.[7]

Ilioinguinal/iliohypogastric nerve block provides analgesia to the inguinal area and provides good peri-operative pain relief for patients undergoing procedures as inguinal hernia repair, orchiopexy and hydrocelectomy. It is simple to perform, free of side-effects such as motor block of the lower limbs and urinary retention.[7] Intraoperatively, however, noxious stimuli may be perceived, e.g. by traction on the peritoneal sac.[5] Fisher *et al*. randomly assigned children who underwent orchiopexy to one of three groups at the end of surgery as follows: Caudal block with bupivacaine and 1:200,000 epinephrine (group I); bupivacaine alone (group II) and ilioinguinal/iliohypogastric nerve block with bupivacaine administered through the wound by the surgeon (group III). They reported no differences in the number of patients without pain for more than 4 hours or those requiring analgesics by 24 hours. Also, the times to micturition did not differ significantly among groups.[9]

In another study, both caudal and ilioinguinal/iliohypogastric nerve blocks have been reported to provide similar post-operative analgesia following inguinal surgery in children.[10] In another study, a significant difference in the duration of post-operative

Table 1: Demographic data

	Mean±SD		*P* value
	C	I	
Weight (kg)	16/41±3/86	15/72±4/81	0/522
Age (year)	4/80±1/83	3/86±1/87	0/88
Sex F/M	7/27	5/28	0/398
Surgery time	28/67±11/10	23/27±8/80	0/22
Basic HR	112/11±21/35	115/45±23/07	0/541
Basic SBP	99/62±11/55	103/18±14/06	0/26
Basic DBP	55/11±00/55	58/72±10/10	0/181

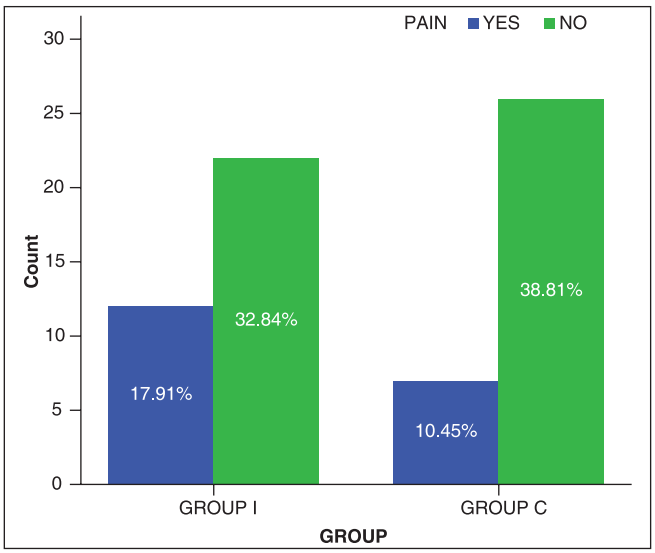


Figure 1: Children requiring postoperative analgesic

analgesia and the requirement for subsequent analgesia was reported between two groups. The requirement for post-operative analgesia was greater in the ilioinguinal-iliohypogastric group ($P = 0.05$).[11] In our study, the duration of post-operative analgesia was not significantly different in two groups ($P = 0.174$).

Another study showed a significant difference in the duration of post-operative analgesia and the requirement for subsequent analgesia between two techniques. Subjects in group I (ilioinguinal/iliohypogastric) required greater doses of post-operative analgesia than those in group C (caudal) ($P < 0.05$).[12] In contrast, in our study, there was no significant difference in the duration of post-operative analgesia between two groups ($P = 0 .174$). Gaitini and co-workers showed that caudal epidural block was more effective than ilioinguinal/iliohypogastric block in suppressing the stress responses (as reflected by epinephrine and norepinphrine blood levels) in orchiopexy patients.[7] In our study, both blocks were successful in reducing stress responses as showed by systolic and diastolic blood pressures level and heart rate changes.

In this study, ilioinguinal/iliohypogastric nerve block was as effective as caudal regarding the quality and duration of post-operative analgesia. This result is also supported by previous reports that compared the effectiveness of these blocks in providing post-operative analgesia in patients undergoing inguinal surgery and concluded that both ilioinguinal/iliohypogastric and caudal blocks provide useful post-operative analgesia for children following inguinal surgeries.[13-15]

REFERENCES

1. Miller RD, Erikson LI, Fleisher LA, Jeanine P, Kronish W, Young WL. Miller's Anesthesia. 7th ed. Churchill Livingstone; 2010. p. 1691-92, 2519-57 and 2757-81.
2. Williams RK, Adams DC, Aladjem EV, Kreutz JM, Sartorelli KH, Vane DW, *et al*. The safety and efficacy of spinal anesthesia for surgery in infants: The Vermont Infant Spinal Registry. Anesth Analg 2006;102:67-71.
3. Seyedhejazi M, Zarrintan S. Evaluation of caudal anesthesia performed in conscious infants for lower abdominal surgeries. Neurosciences (Riyadh) 2008;13:46-8.
4. Lönnqvist PA, Morton NS. Postoperative analgesia in infants and children. Br J Anaesth 2005;1:59-68.
5. Johr M. Regional techniques for pediatric day surgery. Pediatric Blocks 2000;4:38-44.
6. Caetano AM, Falbo GH, Lima LC. Comparison among three techniques of postoperative regional analgesia with ropivacaine in children. Rev Bras Anestesiol 2006;56:561-70.
7. Somri M, Gaitini LA, Vaida SJ, Yanovski B, Sabo E, Levy N, *et al*. Effect of ilioinguinal nerve block on the catecholamine plasma levels in orchidopexy: Comparison with caudal epidural block. Paediatr Anaesth 2002;12:791-7.
8. Jagannathan N, Sohn L, Sawardekar A, Ambrosy A, Hagerty J, Chin A, *et al*. Unilateral groin surgery in children: Will the addition of an ultrasound-guided ilioinguinal nerve block enhance the duration of analgesia of a single-shot caudal block? Paediatr Anaesth 2009;19:892-8.
9. Fisher QA, McComiskey CM, Hill JL, Spurrier EA, Voigt RE, Savarese AM, *et al*. Postoperative voiding interval and duration of analgesia following peripheral or caudal nerve blocks in children. Anesth Analg 1993;75:173-7.
10. Ivani G, Conio A, De Negri P, Eksborg S, Lönnqvist PA. Spinal versus peripheral effects of adjunct clonidine: Comparison of the analgesic effect of a ropivacaine-clonidine mixture when administered as a caudal or ilioinguinal-iliohypogastric nerve blockade for inguinal surgery in children. Pediatr Anaesth 2002;12:680-4.
11. Findlow D, Aldridge LM, Doyle E. Comparison of caudal block using bupivacaine and ketamine with ilioinguinal nerve block for orchidopexy in children. Anaesthesia 1997;52:1110-3.
12. Jöhr M, Sossai R. Colonic puncture during ilioinguinal nerve block in a child. Anesth Analg 1999;88:1051-2.
13. Samarkaandi AH. The combination of caudal bupivacaine and nerve block prolongs postoperative analgesia after inguinal herniotomy in children. Eng J Anaesth 2004;20:385-90.
14. Seyedhejazi M, Azerfarin R, Kazemi F, Amiri M. Comparing caudal and penile nerve blockade using bupivacaine in hypospadias repair surgeries in children. Afr J Paediatr Surg 2011;8:294-7.
15. Seyedhejazi M, Daemi OR, Taheri R, Ghojazadeh M. Success rate of two different methods of ilioinguinal-iliohypogastric nerve block in children inguinal surgery. Afr J Paediatr Surg 2013;10:255-8.

Cite this article as: Seyedhejazi M, Sheikhzadeh D, Adrang Z, Rashed FK. Comparing the analgesic effect of caudal and ilioinguinal iliohypogastric nerve blockade using bupivacaine-clonidine in inguinal surgeries in children 2-7 years old. Afr J Paediatr Surg 2014;11:166-9.

Source of Support: Nil. **Conflict of Interest:** Nil.