

Caudal Bupivacaine versus Systemic Nalbuphine for Post-Operative Pain Management in Children undergoing Inguinal Hernia Repair

Mostafa Kamel Reyad, Ahmed Mohamed Elhennawy, Wael Sayed Ahmed Abdelghafar, Mohamed Fathy Abdelmotagly

Anesthesia, Intensive Care & Pain Management Department, Faculty of Medicine, Ain Shams University
Corresponding Author: Mohamed Fathy Abdelmotagly, E-mail: dr.mohamed_fathy90@yahoo.com, Phone: 01114560525

ABSTRACT

Background: it's considered that post-operative pain management in children is essential as it reduce the pain as well as anxiety of the parents regarding post-operative pain. There are some options which are found and being used currently by pediatric anesthetists. However there is no consensus over a single best method. Post-operative pain management had always been a major concern of parents as well as pediatric anesthetists. Contrary to the ancient notion that children don't feel pain, many studies have focused on the importance of good pain management in children. According to the studies, children in surgical ward feel more pain than children in medical ward and prevalence was found to be 44% and 13% respectively and it was found that about 64% of pediatric patients after surgery experience moderate to severe pain while 29% experience mild pain.

Objectives: the aim of this study was to compare pain scores in patients undergoing inguinal herniotomy after caudal block and intravenous nalbuphine.

Patients and Methods: this comparative double blind study was conducted at Paediatric Surgery Department. We included patients with age range of 3-12 years. The children were randomly divided into two groups. Group C included Caudal Block; and Group N included patients who received Nalbuphine. In group C patients, after herniotomy and before extubating the patient, caudal block was introduced by giving Bupivacaine 0.25% according to body weight. In patients in group N, immediately after herniotomy, nalbuphine was given intravenously 0.18 mg/kg according to body weight. Patients were shifted to post-operative ICU where pain scores were measured at 0,1,2,4 and 8 hours. Also any side effect of the drugs was noted and taken care of. For pain measurement Faces Pain scale was used. If any patient developed pain score 8 or more, patient was given paracetamol 10 mg/kg.

Results: we have used FACES pain scale in our study which is a verified scale for pain assessment in children with the age range of 3-12 years. There was no significant difference between the two study groups as regard side effects, as 14.8% of group 2 (Caudal Group) cases had side effects compared to 3.6% for group 1 (Nalbuphine cases)($p=0.052$). As regard the need for rescue analgesia, no significant difference was found between the two study groups. Regarding our study, there was no significant difference between the two study groups as regard pain scale at 1 hour. However, a highly significant difference was found between the two study groups as regard pain score at 2, 4, and 8 hours with higher pain among caudal block group.

Conclusion: nalbuphine is better than caudal block for post-operative pain management after inguinal herniotomy in children.

Keywords: Caudal Bupivacaine, Systemic Nalbuphine, Inguinal Hernia Repair, Inguinal Herniotomy

INTRODUCTION

It's considered that post-operative pain management in children is essential as it reduce the pain as well as anxiety of the parents regarding post-operative pain. There are some options which are found and being used currently by pediatric anesthetists. However there is no consensus over a single best method ⁽¹⁾.

Post-operative pain management had always been a major concern of parents as well as pediatric anesthetists. Contrary to the ancient notion that children don't feel pain, many studies have focused on the importance of good pain management in children ⁽²⁾.

According to the studies, children in surgical ward feel more pain than children in medical ward and prevalence was found to be 44% and 13% respectively ⁽¹⁾. And it was found that about 64% of pediatric patients after surgery experience moderate to severe pain while 29% experience mild pain ⁽²⁾.

Studies have suggested that painful experiences and events during childhood even during infancy, may lead to long term psychological effects ⁽³⁾. Therefore pediatric anesthetists, surgeons and pharmacologists had been in a continuous search to locate a safe and effective analgesic for children.

Regarding Nalbuphine, it is a synthetic opioid agonist-antagonist analgesic derivative of the phenanthrene group, and its structure is similar to those of oxymorphone and naloxone. It acts as an agonist of mu opioid receptors (MORs) and kappa opioid receptors (KORs), thus providing sedation as well as analgesia and it protects against receptor blockade-dependent respiratory failure. Nalbuphine is used for managing mild and moderate pain. It is characterized by ceiling effect, once its maximum plasma concentration has been reached, incremental doses do not potentiate its analgesic effects or increase the risk of respiratory failure⁽⁴⁾.

Nalbuphine has been used by adults as well as pediatric anesthetists for post-operative pain control from a long time as it has offered excellent post-operative pain control⁽⁵⁾. However in children, it is certainly associated with some side effects, the most dangerous being respiratory depression. This side effect limits its usage in pediatric age groups⁽⁶⁾. In day care procedures, like hernia repair in children, even caudal block may be used as it can reduce the pain of the pediatric patient in an effective way⁽⁷⁻⁸⁾.

In pediatric patients, caudal anesthesia is an effective and safe method of anesthesia. It can be used alone as an anesthetic agent or combined with general anesthesia to reduce both intraoperative and postoperative anesthetic need for additional analgesia⁽⁸⁾.

AIM OF THE WORK

The aim of this study is to compare pain scores in patients undergoing inguinal herniotomy after caudal block and intravenous nalbuphine.

PATIENTS AND METHODS

This comparative double blind study was conducted at Paediatric Surgery Department, El-Demrdash Hospital and El-Andalusia Hospital, Cairo. The total duration of the study was 4 Months from April 2018 to July 2018. All the patients undergoing herniotomy with age of 3-12 years were included in the study. **The study was approved by the Ethics Board of Ain Shams University and an informed written consent was taken from each participant in the study.**

Our exclusion criteria included: patients having respiratory and neurological disorders; mentally retarded, patients already on analgesics; and patients with known allergies to these drugs.

The children were randomly divided into two groups. Group C included Caudal Block; and Group N included patients who received Nalbuphine. In group C patients, after herniotomy and before extubating the patient, caudal block was introduced by giving Bupivacaine 0.25% according to body weight. In patients in group N, immediately after herniotomy, nalbuphine was given intravenously 0.18 mg/kg according to body weight. Patients were shifted to post-operative ICU where pain scores were measured at 0,1,2,4 and 8 hours. Also any side effect of the drugs was noted and taken care of.

For pain measurement Faces Pain scale was used. If any patient developed pain score 8 or more, patient was given paracetamol 10 mg/kg.

The Wong-Baker Faces Pain Rating Scale (styled Wong-Baker FACES Pain Rating Scale) is a pain scale that was developed by Donna Wong and Connie Baker. The scale shows a series of faces ranging from a happy face at 0 which represents "no hurt" to a crying face at 10 which represents "hurts worst". Based on the faces and descriptions, the patient chooses the face that best describes their level of pain.

The Wong-Baker Faces Pain Rating Scale is based on a numeric pain rating scale from 0-10, with zero being no pain and 10 being the worst pain imaginable. The scale includes numbers, faces (visual representation), and written descriptions. There are 6 faces in the Wong-Baker Pain Scale. The first face represents a pain score of 0 and indicates "no hurt." The second face represents a pain score of 2 and indicates "hurts a little bit." The third face represents a pain score of 4 and indicates "hurts a little more". The fourth face represents a pain score of 6 and indicates "hurts even more." The fifth face represents a pain score of 8 and indicates "hurts a whole lot" and the sixth face represents a pain score of 10 and indicates "hurts worst". This pain scale was originally developed for children, however it can be used for all ages and children as young as 3 years old. It is a useful pain scale for children because many children may not understand rating their pain on a scale of 0-10, but are able to

understand the cartoon faces and the emotions they represent and point to the one that best matches their level of pain. This pain scale is also appropriate for patients who do not know how to count and those who may have impaired brain function. Cultural sensitivity of the scale was also assessed to determine its applicability and acceptance across different cultures and "research supports cultural sensitivity of FACES for Caucasian, African-American, Hispanic, Thai, Chinese, and Japanese children".

Statistical analysis:

The collected data was revised, coded, tabulated and introduced to a PC using Statistical package for Social Science (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp). Data was presented and suitable analysis was done according to the type of data obtained for each parameter.

RESULTS

Table (1): Description of side effect and need for rescue analgesia among study group 2 (nalbuphine)

		N	%
Side effects	No	46	85.2%
	Yes	8	14.8%
Rescue Analgesia	No	55	100.0%
	Yes	0	.0%

Among study group 2, about 15% had side effects (vomiting), and 0% required rescue analgesia.

Table (2): Comparison between both study groups as regard personal and medical data

		Group				P	Sig
		Caudal Block		Nalbuphine			
		Mean	±SD	Mean	±SD		
Age		4.86	1.95	5.14	1.73	0.427 [‡]	NS
Weight		18.56	3.71	19.22	3.43	0.339 [‡]	NS
		N	%	N	%		
Sex	Male	30	54.5%	39	70.9%	0.076*	NS
	Female	25	45.5%	16	29.1%		
Residency	Cairo	29	52.7%	33	60.0%	0.155**	NS
	Giza	20	36.4%	21	38.2%		
	Alexandria	4	7.3%	0	.0%		
	BaniSeyouf	2	3.6%	0	.0%		
	Aswan	0	.0%	1	1.8%		
Side of Hernia	Right	35	63.6%	25	45.5%	0.056*	NS
	Left	20	36.4%	30	54.5%		

‡Student t test; *Chi-Square Tests; **fisher exact test

The above table shows that there was no significant difference between the two study groups as regard age, weight, sex, residency and side of hernia

Table (3): Comparison between both study groups as regard pain scale

	Group						P	Sig
	Caudal Block			Nalbuphine				
	Mean	±SD	Median (IQR)	Mean	±SD	Median (IQR)		
Pain scale 0 hour	.00	.00	0(0-0)	.00	.00	0(0-0)	----	---
Pain scale 1 hour	.07	.38	0(0-0)	.07	.38	0(0-0)	1.0*	NS
Pain scale 2 hour	1.67	1.32	2(0-4)	.84	1.13	0(0-2)	0.001*	HS
Pain scale 4 hour	3.64	1.39	4(2-4)	2.40	1.41	2(2-4)	0.001*	HS
Pain scale 8 hour	6.15	2.21	6(4-8)	4.22	2.20	4(2-6)	0.001*	HS

*Mann Whitney test

The above table shows that there was no significant difference between the two study groups as regard pain scale at 1 hour. However, a highly significant difference was found between the two study groups as regard pain score at 2, 4, and 8 hours with higher pain among caudal block group.

Table (4): Comparison between both study groups as regard side effects and need for rescue analgesia

		Caudal Block		Nalbuphine		P	Sig
		N	%	N	%		
Side effects	No	53	96.4%	46	85.2%	0.052*	NS
	Yes	2	3.6%	8	14.8%		
Rescue Analgesia	No	51	92.7%	55	100.0%	0.118*	NS
	Yes	4	7.3%	0	.0%		

Fisher's Exact Test

The above table shows that there was no significant difference between the two study groups as regard side effects, as 14.8% of group 2 cases had side effects compared to 3.6% for group 1 cases(p=0.052). As regard the need for rescue analgesia, no significant difference was found between the two study groups.

DISCUSSION

Inguinal herniotomy is one of the most commonly electively done procedures in children. The estimated prevalence in preterm and full term infants is 10% and 1-5% respectively. It is usually done as a daycare procedure; however most of the pediatric surgeons now recommend admission of the child for overnight if age is less than 6 months⁽⁷⁾. As it is a clean case, so usually patient is kept on 'nothing per oral' status for a short time. Oral pain killers are allowed immediately after allowing feed in post-operative period. So the main problem of pain control in these patients is in the immediate 4-6 hours post-operative period. Therefore we

planned this study and compared pain control of two regimens for 8 hours post-operatively ⁽⁹⁾.

In this study we found the gender ratio was 1.5:1 for male and females respectively. It was probably due to smaller sample size in the current study. In most of the larger series, the reported ratio varies from 3:1 to 10:1 ^(8,9). In this study we found that the mean scores at all occasions was less in Nalbuphine group than caudal group.

In a meta-analysis by Schnabel et al, it was found that most of the studies conducted at nalbuphine were low grade studies and authors were unable to draw any conclusion regarding superiority of nalbuphine over other treatment methods ⁽¹³⁾.

Assessment of post-operative pain in children is difficult as children are unable to explain their feelings in infantile age particularly.

Therefore in children, no scale is considered as universal, rather many scales are prevailing and being used in literature ⁽¹⁰⁾.

We have used FACES pain scale in our study which is a verified scale for pain assessment in children with the age range of 3-12 years ^(11, 12). That's why we had included only patients with age range of 3-12 years in our study.

There was no significant difference between the two study groups as regard side effects, as 14.8% of group 2 (Caudal Group) cases had side effects compared to 3.6% for group 1 (Nalbuphine cases ($p=0.052$)). As regard the need for rescue analgesia, no significant difference was found between the two study groups.

Regarding our study, there was no significant difference between the two study groups as regard pain scale at 1 hour. However, a highly significant difference was found between the two study groups as regard pain score at 2, 4, and 8 hours with higher pain among caudal block group.

In a meta-analysis by **Shanthanna et al.** ⁽¹⁴⁾, caudal block showed fewer requirements for rescue analgesic than non-caudal techniques in children during post-operative period. The reason for this contradiction to our results may be that the authors had not found any trial comparing two techniques ⁽¹³⁾.

In randomized control trial by **Shanthanna** ⁽¹⁴⁾ in which 100 patients included to compare the effect of intravenous Nalbuphine and Caudal for

postoperative pain management in pediatrics. The mean pain scores were less in nalbuphine group at 0,1,2 and 4 hours, however it was significant at 0 and 1 hour. The requirement of rescue analgesia was less in Nalbuphinegroup than Caudal group (14% vs 34%, $p <0.05$). The only side effect was observed was vomiting in 12% of patients in Nalbuphinegroup while in none of patient in Caudalgroup.

CONCLUSION

Nalbuphine is better than caudal block for post-operative pain management after inguinal herniotomy in children.

REFERENCES

1. **Groenewald CB, Rabbitts JA, Schroeder DR, Harrison TE (2012):** Prevalence of moderate-severe pain in hospitalized children. *Paediatric Anaesthesia*, 22:661-68.
2. **Romsing J and Walther-Larsen S (1996):** Postoperative pain in children: a survey of parents' expectations and perceptions of their children's experiences. *Paediatric Anaesthesia*, 6:215- 18.
3. **Larsson BA (2001):** Pain and pain relief during the neonatal period. Early pain experiences can result in negative late-effects. *Lakartidningen*, 98:1656-62.
4. **Camagay IT and Gomez QJ (1982):** Balanced anesthesia with nalbuphine hydrochloride in pediatric patients: preliminary study. *Philippine Journal of Anaesthesiology*, 6: 10-19.
5. **Moyao-Garcia D, Hernandez-Palacios JC, Ramirez-Mora JC, Nava-Ocampo AA (2009):** A pilot study of nalbuphine versus tramadol administered through continuous intravenous infusion for postoperative pain control in children. *Acta Biomed.*, 80:124-30.
6. **Schnabel A, Reichl SU, Zahn PK, Pogatzki-Zahn E (2014):** Nalbuphine for postoperative pain treatment in children. *Cochrane Database Syst Rev.*, 7:CD009583.
7. **Cheon JK, Park CH, Hwang KT, Choi BY (2011):** A comparison between caudal block versus splash block for postoperative analgesia following inguinal herniorrhaphy in children. *Korean J Anesthesiol.*, 60:255-59.

8. **Wang LZ, Hu XX, Zhang YF, Chang XY (2013):** A randomized comparison of caudal block by sacral hiatus injection under ultrasound guidance with traditional sacral canal injection in children. *Paediatric Anaesthesia.*, 23:395-400.
9. **7. Nazem M, Dastgerdi MMH, Sirousfard M (2016):** Outcomes of pediatric inguinal hernia repair with or without opening the external oblique muscle fascia. *Journal of Research in Medical Sciences*, 20:221-230.
10. **Blacoe D, Cunning E, Bell G (2008):** Paediatric day.case surgery: an audit of unplanned hospital admission Royal Hospital for Sick Children, Glasgow*. *Anaesthesia*, 63:610-15.
11. **Muha T Latif NL, Ahmed E, Dar SH (2015):** Is contralateral inguinal exploration justified in a child presenting with unilateral inguinal hernia. *PJMHS.*, 9:176-78.
12. **Ein SH, Njere I, Ein A (2006):** Six thousand three hundred sixty-one pediatric inguinal hernias: a 35-year review. *Journal of Pediatric Surgery*, 41:980-86.
13. **Babl FE, Crellin D, Cheng J, Sullivan TP, O'Sullivan R, Hutchinson A (2012):** The use of the faces, legs, activity, cry and consolability scale to assess procedural pain and distress in young children. *Pediatr Emerg Care*, 28:1281- 96.
14. **Wood C, von Baeyer CL, Falinower S, Moyse D, Annequin D, Legout V (2011):** Electronic and paper versions of a faces pain intensity scale: concordance and preference in hospitalized children. *BMC Pediatrics*, 11:87.
15. **Savino F, Vagliano L, Ceratto S, Viviani F, Miniero R, Ricceri F (2013):** Pain assessment in children undergoing venipuncture: the Wong-Baker faces scale versus skin conductance fluctuations. *Peer J.*, 1:e37.
16. **Shanthanna H, Singh B, Guyatt G (2014):** A systematic review and meta-analysis of caudal block as compared to noncaudal regional techniques for inguinal surgeries in children. *Biomed Res Int.*, 2014:890626.