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ORIGINAL ARTICLE

Ultrasound-guided ilioinuginal/iliohypogastric block versus caudal block for pediatric inuginal herniotomy

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ABSTRACT

Background: Inguinal hernia is a common pediatric condition ,found nearly in 2% of infant males. One of the commonly used blocks in pediatrics is Ilioinguinal/Iliohypogastric (II/IH) nerve blockade which has been shown to be equally effective compared with caudal blockade for inguinal herniotomy. This study aimed to assess whether ultrasound-guided ilioinguinal/ iliohypogastric nerve blocks with local anesthetic would provide comparable intraoperative and postoperative analgesia to blind technique caudal block with local anesthetic in pediatric unilateral inguinal herniotomy.

Patients and methods: We performed a blind prospective randomized clinical trial on 122 pediatric male patients with unilateral inguinal hernia ,ASA (I,II) ,aged 2 to 7 years old and divided them into 2 groups :group I received ultrasound guided ilioinguinal /iliohypogastric nerve block and group II received blind caudal block .we assessed hemodynamics ,pain score(ChIPPS) ,first call for analgesia and complications .

Results: We found a statistically significant lower heart rate and systolic blood pressure in group I (II/IH group) than group II (caudal group). There was statistically significant lower pain score at four hours and at six hours postoperatively in group I compared with group II. In group I, less systemic analgesics were needed within 12 hours. Group I showed no motor block and no urine retention compared to group II .

Conclusion: Ultrasound-guided ilioinguinal and iliohypogastric nerve block was found to be an ideal intraoperative and postoperative analgesic for unilateral inguinal herniotomy in children.

Keywords: pediatric inguinal herniotomy, regional, ilioinguinal/ iliohypogastric block, caudal block

INTRODUCTION

Inguinal hernia is a common pediatric condition, occurring in approximately 2% of infant males. Inguinal herniotomy is usually performed under general anesthesia with regional anesthesia **(1)**. Regional anesthesia can be provided via the epidural (usually caudal) or spinal routes, or by peripheral nerve blockade (ilioinguinal/iliohypogastric) with local anesthetic agents **(2)**.

The ilioinguinal and iliohypogsatric nerves, arising from the first lumbar spinal root, as well as by the lower intercostal nerves, arising from T11 and T12 will cover the surgical field for inguinal herniotomy **(3)**.

Caudal analgesia is done via injecting the local anesthetic into the caudal canal **(4)**. One of the commonly used peripheral nerve block techniques in pediatric anesthesia is Ilioinguinal/Iliohypogastric (II/IH) nerve blockade which is shown to be equally effective analgesic compared with caudal blockade for inguinal herniotomy **(5)**. The use of ultrasound helps in more accurate placement of injections so improving the sucess,and also allowing the use of lower doses of local anesthetic **(6)**.

This work aimed to assess whether ultrasound-guided ilioinguinal/iliohypogastric nerve block with local anesthetic would provide intraoperative and postoperative analgesia comparable to blind technique caudal block with local anesthetic following pediatric unilateral inguinal herniotomy.

PATIENTS AND METHODS

Written informed concent was obtained from parents of all participants and the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

This is a blind prospective randomized clinical trial including 122 pediatric male patients presented for unilateral inguinal herniotomy in Zagazig University Hospitals operating rooms during the period from June 2017 to March 2019 .

Inclusion criteria:

- American Society of Anesthesiologists class I or II patients.
- Male.
- Age from two to seven years.
- Patients undergoing unilateral inguinal herniotomy.
- Parents accepting the procedure by written consent.

Exclusion criteria:

- Bilateral inguinal hernia.
- Known allergy to amide-type local anesthetics.
- Preexisting coagulopathy.
- Emergency surgery.
- Patients who are unfit for surgery for any reason.
- Parents refusal.

Operative management:

Routine preoperative assessment was done to all patients by careful history taking, clinical examination and laboratory investigations. When patients were brought to the operating room, standard monitors were placed (pulse oximetry, non-invasive blood pressure cuff and ECG). General anesthesia was induced with 4-8% sevoflurane in 100% oxygen via facemask. After establishing a venous access, all children received 0.02 mg/kg atropine as a premedication then a classic disposable Laryngeal Mask Airway (LMA) was placed after the patient was noted to be in adequate plan of anesthesia. Basal readings of monitors were recorded(after induction of general anesthesia and before giving the block). Anesthesia was maintained with at least 1-2% of sevoflurane. Patients were positioned and the block was carried out.

Patients were randomly allocated to one of two groups by a computer-generated table of random numbers:

Group I: 61 children received ultrasound-guided ilioinguinal/iliohypogastric nerve blocks with 0.2 ml/kg of 0.25% bupivacaine (7) (maximum volume, 10 ml). The patients were in supine position , we used SonoSite M-turbo ultrasound (USA) and a linear multi-frequency 13-6 MHz transducer .After aseptic preparation of both the puncture site and the ultrasound probe, the probe was placed on the anterior abdominal wall along the line joining the Anterior Superior Iliac Spine (ASIS) and the umbilicus. Position the probe such that the bony shadow of ASIS was visible on one side of the image. Identifying the peritoneum, transverses abdominis muscle and internal oblique muscle. The ilioinguinal and iliohypogsatric nerves were seen in close proximity to one another as two small round hypoechoic structures with a hyperechoic border. They lie in the plane between the internal oblique muscle and the transversus abdominis muscle close to ASIS **(8)**. Under direct visualization of the tip of the needle which was placed lateral to the nerve structures, negative aspiration was done . Then, 0.2 ml/kg bupivacaine 0.25% was injected. The distribution of LA was monitored under real-time ultrasonography.

Group II: 61 children received a blind technique caudal blockade with 0.7 ml/kg of 0.25% bupivacaine (maximum volume, 25 ml). The patients were placed in the left lateral position. The block site, which was mainly at the sacral hiatus, was sterilized with betadine, and the sacral hiatus between the sacral conru was palpated. Then, a 23-G short needle injection was used to puncture the sacral surface at a 45-degree angle. When the

sacrococcygeal ligament seems to have punctured, the needle was tilted more toward the skin surface and the needle was inserted 2-3-mm deeper. The needle was aspired to check for blood and cerebral spinal fluid extravasations. The loss of resistance was confirmed with air-infusion or saline. Then, 0.25% bupivacaine 0.7 ml/kg was injected **(9**).

The sucess of block was assessed after 15 minutes by painful stimulation at inguinal region ,movement of lower limbs or patient withdrawal or localization of the stimulation site indicates failed block and patient was excluded from the study and completed the operation under conventional general anesthesia.At any time during operation if the heart rate and/or arterial blood pressure increased by more than 20% of basal readings, intravenous fentanyl (1 microgram/kg) was given. Monitoring of heart rate ,(Spo2) using pulse oximetry , systolic and diastolic blood pressure and end-tidal CO2 and recorded every 5 minutes. At the end of surgery , sevoflorane was discontinued and LMA was removed and patients were transferred to the recovery room.

Data assembling:

Different types of data were collected as follows:

- Cardiopulmonary parameters (blood pressure, heart rate and oxygen saturation).
- Intraoperative opioids requirements.
- First call for supplemental systemic analgesics (it is the time from the end of block performance till the first patient complain of pain postoperatively) (we gave paracetamol 15 mg/kg (first rescue analgesia), if still complaining oral ibuprofen 10 mg/kg should be given (second rescue analgesia).
- Pain score (Children, Infants, Postoperative Pain Scale, ChIIPPS) **(10)** (table 1 suppl) reported postoperatively every 30 minutes for 3 hours and every one hour for 12 hours and if this score is more than 3, give 15 mg/kg rectal paracetamol.
- Total amount of analgesic consumption for 12 hours(paracetamol +/- ibuprofen)
- Postoperative nausea and vomiting :using Baxter Retching Faces Scale (BARF**)(11)** for nausea in children **(figure 1 suppl)** and determining number of vomiting attacks .
- Parents and surgeon satisfaction.
- Complications.

Postoperative management:

Monitoring of pulse oximetry, blood pressure and pain intensity using ChIPPS score every 30 minutes for 3 hours, then every one hour till 12 hours postoperatively and if the ChIPPS score was more than 3,, 15 mg/kg rectal paracetamol was given. We recorded postoperative nausea and vomiting and parents and surgeon satisfaction.

We recorded complications as urine retention or motor block. Also, we record first call for supplemental analgesics and total dose of systemic analgesia within 12 hours.

Statistical analysis

By comparing mean and standard deviation of both techniques ,pain score reported was 1.18+/-1.31 in group I and 1.92+/-1.59 in group II .so the sample size was calculated to be (122 Patients),61 in each group using open Epi program ,at confidence interval of 95%and power of test 80%.

All data were collected, tabulated and statistically analyzed using SPSS 20.0 for windows (SPSS Inc., Chicago, IL, USA 2011). Quantitative data were expressed as the mean ± SD and qualitative data were expressed as absolute frequencies (number)& relative frequencies (percentage). Continuous data were checked for normality by using Shapiro Walk test. Independent samples Student's t-test was used to compare between two groups of normally distributed variables. Percent of categorical variables were compared using Chi-square test.. All tests were two sided. p-value < 0.05 was considered statistically significant (S), and p-value ≥ 0.05 was considered statistically insignificant (NS).

RESULTS

The patient characteristics including age,weight,ASA grade and duration of surgery did not show any statistically significant difference between the two groups (table 2 suppl)

As regard heart rate(HR), there was statistically significant lower HR at 2, 4 and 6 hours postoperatively in group I (II/IH group) , while non significant at other times (Table1)

Regarging systolic blood pressure ,group I(II/IH group) showed statistically significant lower readings at 4 and 6 hours postoperatively (Table 2) , while the difference was insignificant at other times .while there was no significant difference regarding diastolic blood pressure between the 2 groups (Table 3).

Also, there was no statistically significant difference between the two groups regarding oxygen saturation(Spo2) and end-tidal CO2(Et co2) .(Table 4).

There was no need for extra analgesia intra-operatively (in the form of fentanyl) among all patients in the two groups.

There was statistically significant difference between the two groups regarding pain score (ChIPPS) at four hour and at six hours post – operatively ($p<0.05$), as the number of patients has lower ChIPPS score was more in group I (II/IH group) but the difference was insignificant at other times (Table 5).

First call for analgesia in hours was 5.2+/-1.5 in group I(II/IH group) , and 4+/-1.3 in group II (caudal group) which is statistically difference . By comparing the analgesic consumption ,group I(II/IH group) showed less doses of analgesics needed and the total amount of analgesics used also was statistically lower in group I(II/IH group) (Table 6). Also, There was statistically significant difference between the two groups regarding urine retention and motor block, as there was no patient in group I (II/IH group) complained of urine retention or motor block, while 6 patients of group II (caudal group) complained of urine retention and 12 patients of caudal group complained of motor block for 2-3.5 hours (Table 6).

Regarding surgeon satisfaction , there was no statistically significant difference between the two groups. But it was significant as regard post –operative parents satisfaction (Table 7) .

Table (1): Comparison between Ultrasound-guided ilioinguinal /iliohypogastric group(group I) and Caudal group(group II) at different time as regard heart rate (beat/min)

time	*Heart rate*	Group I (n=61)	Group II (n=61)	*T*	*p*
Basal	**Basal** mean± SD	**112±11**	**113±11.4**	**0.56**	**0.58**
At skin incision	**At skin incision** mean± SD	**94±8**	**95±10**	**0.96**	**0.34(NS)**
intraoperative	**At 10 min** mean± SD	**95±8**	**94±9**	**1**	**0.32**
	At 25 min mean± SD	**93.5±6**	**94.5±7**	**0.87**	**0.38**
Post operative	**At 2 hours** mean± SD	**91±5 ***	**94±8**	**2.5**	**0.01(S)**
	At 4 hours mean± SD	**95±8 ***	**105±12**	**5**	**0.0001(S)**
	At 6 hours mean± SD	**93.5±5.7 ***	**96±8**	**2.1**	**0.035(S)**
	At 12 hours mean± SD	**93±5**	**94.5±7**	**1.02**	**0.3(NS)**

Data were expressed as Mean ± standard deviation
*statistically significant lower compared to other group
S= significant

Table (2): Comparison between Ultrasound-guided ilioinguinal /iliohypogastric group(group I) and Caudal group(group II) at different time as regard systolic blood pressure (mmhg)

time	*Systolic blood pressure*	Group I (n=61)	Group II (n=61)	*t*	*p*
Basal	**Basal** mean± SD	***104±12***	***103.6±10***	***0.3***	***0.77***
At skin incision	**At skin incision** mean± SD	***97.6±8***	***95±8***	***1.4***	***0.1(NS)***
intraoperative	**At 10 min** mean± SD	***98±8***	***97±7***	***0.8***	***0.4***
	At 25 min mean± SD	***99.6±9***	***98±8***	***0.95***	***0.34***
Post operative	**At 2 hours** mean± SD	***98.4±9***	***97.7±9***	***0.4***	***0.7***
	At 4 hours mean± SD	***98.7±9****	***103±11***	***2.4***	***0.02(S)***
	At 6 hours mean± SD	***97±7.6****	***100±7.8***	***2***	***0.048(S)***
	At 12 hours mean± SD	96±7	98±8	***1.5***	***0.14(NS)***

Data were expressed as Mean ± standard deviation
*statistically significant lower compared to other group
S= significant

Table (3): Comparison between Ultrasound-guided ilioinguinal /iliohypogastric group(group I) and Caudal group(group II) at different time as regard diastolic blood pressure (mmhg)

Time	*Diastolic blood pressure*	Group I (n=61)	Group II (n=61)	*t*	*p*
Basal	**Basal** mean± SD	53±6	55±7	1.48	0.14
At skin incision	**At skin incision** mean± SD	50±5	51±6	0.6	0.68
intraoperative	**At 10 min** mean± SD	49±4	50±4	0.42	0.68
	At 25 min mean± SD	51±4	50±3	1.4	0.16
Post operative	**At 2 hours** mean± SD	49.4±5	49±3.5	0.2	0.83
	At 4 hours mean± SD	53±6	54±6	0.96	0.33
	At 6 hours mean± SD	50±6	51±5	0.6	0.55
	At 12hours mean± SD	50.3± 4	51.7±4.7	1.8	0.08

Data were expressed as Mean ± standard deviation

Table (4): Comparison between Ultrasound-guided ilioinguinal /iliohypogastric group(group I) and Caudal group(group II) at different time as regard peripheral O2 saturation (%) and end-tidal CO2(mmhg) .

		Group I (n=61)	Group II (n=61)	*t*	*p*
blood oxygen saturation (SpO_2)					
Basal	**Basal** mean± SD	98.79±0.61	98.7±0.59	0.9	0.36
At skin incision	**At skin incision** mean± SD	98.8±0.6	98.7±0.58	0.77	0.44
intraoperative	**At 10 min** mean± SD	98.82±0.39	98.7±0.46	1.5	0.14
	At 25 min mean± SD	98.8±0.4	98.9±0.5	0.8	0.43
Post operative	**At 2 hours** mean± SD	98.77±0.46	98.7±0.6	1	0.31
	At 4 hours mean± SD	98.7±0.73	98.75±0.43	0.15	0.88
	At 6 hours mean± SD	99±0.3	99±0.43	0.49	0.63
	At 12 hours mean± SD	99±0.3	99.1±0.37	0.27	0.8
$EtCo_2$					
At skin incision	**At skin incision** mean± SD	***34.3±1***	***34.4±0.8***	***0.46***	***0.64***
intraoperative	**At 10 min** mean± SD	***34.1±1***	***34.2±0.8***	***0.33***	***0.74***
	At 25 min mean± SD	***34±0.8***	***33.9±0.8***	***1.2***	***0.22***

Data were expressed as Mean ± standard deviation
EtCo2 means end-tidal Co2

Table (5): Post –operative ChIPPS score of Ultrasound-guided ilioinguinal /iliohypogastric group (group I) and caudal group (group II) at different times.

	Group I (n=61)		Group II (n=61)		χ^2	p
	No	%	No	%		
ChIPPS at 2 hours						
.00	43	70.5	41	67.2		
1.00	2	3.3	-	-	3.4	0.33
2.00	14	23.0	15	24.6		(NS)
3.00	2	3.3	5	8.2		
ChIPPS at 4 hours						
.00	4	6.6	-	-		
1.00	11	18	1	1.6		
2.00	17	27.9	5	8.2	16	0.002 (S)
3.00	19	31.1	21	34.4		
4.00	10	16.4	19	31.1		
5.00	0	0	10	16.4		
6.00	0	0	5	8.2		
ChIPPS at 6 hours						

.00	10	16.4	10	16.4		
1.00	5	8.2	3	4.9	10.4	0.03(S)
2.00	41	67.2	30	49.2		
3.00	5	8.2	14	23.0		
4.00	0	0	4	6.6		
ChIPPS at 12 hours						
4.00	44	72.1	37	60.6	1.8	0.18
5. 00	17	27.9	13	39.4		(NS)

Data were expressed as number and percentage .
NS= non-significant , S= significant.
χ^2= Chi square test

Table (6): Post –operative analgesic dose,first call for analgesia,total amount of analgesics in 12 hours ,complication and motor block for Ultrasound-guided ilioinguinal/iliohypogastric group(group I) and caudal group(group II) .

	Group I (n=61)		Group II (n=61)		χ^2	P
	No	%	No	%		
Analgesic dose One	9	15	0	0		
Two	52	85	49	80.3	21	0.0003(S)
Three	0	0	12	19.7		
First time for call for analgesic in hours mean± SD	5.2±1.5*		4±1.3		4.7	0.00001(S)
Total amount of paracetamol /mg in 12 hours mean± SD minimum-maximum	210±40** (150-270)		240±45 (165-285)		3.9	0.0001(S)
Post-operative nausea & vomiting						
No	32	52.5	26	42.6		
One time	27	44.3	30	49.2	2.1	0.35
Two time	2	3.3	5	8.2		
Complication urinary retention						
0 Present	61*** -	100.0 -	55 6	90.2 9.8	t test	0.03(S)
Motor block						
0	61***	100	49	80.3	13.3	0.0002(S)
Present	-	-	12	19.7		
Mean ± SD per hours Minimum - maximum			3±0.5 (2 :3.5)			

- Data were expressed as number and percentage or mean ± standard deviation
- (*) statistically significant longer compared to other group.
- (**) statistically significant less compared to other group.
- (***) statistically significant more compared to other group.
- S= significant , χ^2 = Chi square test.

Table (7): Post –operative parents and surgeon satisfaction of Ultrasound-guided ilioinguinal/iliohypogastric group (group I) and caudal group (group II)

	Group I (n=61)		Group II (n=61)		χ^2	P
	No	%	No	%		
Parents satisfaction						
Good	5	8.2	17	28	08	0.005(s)
Very good	56*	91.8	44	72		
Surgeon satisfaction						
Good	6	9.8	5	8.2	0.1	0.75
Very good	55	90.2	56	91.8		

Data are expressed as number and percentage .
S= significant , χ^2 = Chi square test.
*statistically significant more compared to other group.

DISCUSSION

Pain is an unpleasant subjective sensation which can only be experienced and not expressed, especially in children. Postoperative analgesics usage in children should be with cautious because of their side effects like respiratory depression from narcotics ,fear of vomiting and aspiration,and the objection to the needles in parenterally administered analgesics **(12)**.

Acute postoperative pain still appears to be undermanaged Despite the advances of perioperative pain management .So the focus is using regional anesthesia for inguinal herniotomy via different approaches and blocks **(13)**.

The use of Caudal block is effective but it is usually for short duration and also with undesired motor blockade. Other complications may occur as accidental dural or bone marrow puncture, intestinal damage, intravascular injection and systemic toxicity, infection and epidural abscess formation and epidural hematoma. Contraindications like central nervous disorders, spinal deformities, inflammation at site of the block and coagulopathy make us to search for an alternative method **(14)**.

In children most nerves are relatively superficial allowing high resolution imaging through the ultrasound. Direct visualization of the nerve or neuroaxial structures, vessels, tendons and bones helps in optimal placement of the local anesthetic and thus reduces the risk of intraneuronal, intravascular or intraperitoneal injection.

Direct ultrasonographic visualization of ilioinguinal and iliohypogastric nerves improves the quality of the block and decreases the risk of complications **(15)**.

We performed a blind prospective randomized clinical trial on 122 pediatric male patients with unilateral inguinal hernia. Aimed to assess if ultrasound-guided ilioinguinal/ iliohypogastric nerve blocks with local anesthetic would provide comparable intraoperative and postoperative analgesia to blind technique caudal block with local anesthetic in pediatric unilateral inguinal herniotomy.

In our study, there was statistically non significant difference regarding the patient characteristics and duration of surgery between the two groups (p>0.05). **Ravi et al. (16)** (agreed with our study)also found statistically insignificant difference between ultrasound guided ilioinguinal / iliohypogastric nerve block group and caudal block group regarding the mean age. He assessed post-operative analgesia in 60 ASA grade I and II children, aged 3 years to 12 years, undergoing unilateral groin surgery randomly divided into two groups (30 each).

The current study agree with the study of **Abdellatif (17)** who found no statistically significant difference between the 2 groups regarding patients characteristics ,type of surgery and duration of surgery.

In our study, the heart rate(HR) at basal, skin incision, intraoperatively and at 12 hours postoperaively were nearly the same in the

two groups but the HR at 2, 4 and 6 hours postoperatively showed statistically significant lower HR in group I (II/IH group) **Abdellatif (17)** found insignificant difference in heart rates in both groups. This may be because his study sample size was 50 patients; less than our study sample size, and he used less dose of bupivacaine for ultrasound ilioinguinal/iliohypogastric block (0.1 ml/kg of 0.25% versus 0.2 ml/kg of 0.25% bupivacaine in our study).

Geze et al. (18) reported that caudal block and ultrasound ilioinguinal/iliohypogastric nerve blocks were generally well tolerated intraoperatively and all patients maintained pulse and heart rate within normal ranges(agree with our study).

In our study, Regarging systolic blood pressure ,group I (II/IH group) showed statistically significant lower readings at 4 and 6 hours postoperatively , while the difference was insignificant at other times.while there was no significant difference regarding diastolic blood pressure between the 2 groups**.**

Khedkar et al. (15) showed that mean basal values of systolic blood pressure (SBP) in both groups were comparable throughout the study except at 10th min. After block, where the difference in the SBP was statistically significant, but clinically not of much importance. The diastolic blood pressure (DBP) showed non-significant difference in both the groups throughout (agree with our study) .

Jagannathan et al. (12) have conducted a study "unilateral groin surgeries in children: addition of ultrasound guided ilioinguinal nerve block enhance the duration of analgesia of single shot caudal block" and recorded intra-operative hemodynamics and found that there was no significant difference in mean arterial pressure in both groups.

Ravi et al. (16) found that " At 5, 10, 20, 30 min after skin incision the MAP(mean arterial pressure) values are slightly higher in caudal group when compared to ilioinguinal group which was statistically not significant. He used less sample size (30 patients in each group) and lesser dose of bupivacaine in ultrasound ilioinguinal/iliohypogastric block (0.1 ml/kg of 0.25% bupivacaine versus 0.2 ml\kg of 0.25% bupivacaine in our study).

Regarding SpO2 (oxygen saturation), there was no statistically significant difference between the two groups throughout . Also, we found statistically insignificant difference in EtCO2(end-tidal Co2) between them. **Geze et al. (18)** showed that oxygen saturation (SpO2) was maintained between 95% and 98%.

In our study, There was statistically significant difference between the two groups regarding pain score (ChIPPS) at four hour and at six hours post – operatively ($p<0.05$), as the number of patients has lower ChIPPS score was more in group I (II/IH group) but the difference was insignificant at other times.

In our study, First call for analgesia in hours was 5.2+/-1.5 in group I(II/IH group) , and 4+/-1.3 in group II (caudal group) which is statistically longer in group I (II/IH group) .

By comparing the analgesic consumption ,group I(II/IH group) showed less doses of analgesics needed and the total amount of analgesics used also was statistically lower in group I (II/IH group). Also, There was statistically significant difference between the two groups regarding urine retention and motor block, as there was no patient in group I(II/IH group) complained of urine retention or motor block, while 6 patients of group II (caudal group) complained of urine retention and 12 patients of caudal group complained of motor block for 2-3.5 hours. But, there was no statistically significant difference between the two groups regarding postoperative nausea and vomiting ($p > 0.05$).

Abdellatif (17) also, found no significant difference between the two groups regarding postoperative nausea and vomiting. **Geze et al. (18)** found no postoperative complications in ultrasound IL/IH block group as urinary retention or respiratory depression. And he discharged all patients after 6 hours in the postanesthesia care unit.

Abdellatif (17) studied "ultrasound ilioinguinal / iliohypogastric nerve blocks versus caudal block for postoperative analgesia in children undergoing unilateral groin surgery" the following results observed " The average pain scores during hospital stay were 1.82±1.71and 1.52±1.41 for caudal group and II/IH group respectively(agree with

our study). The average time to first rescue analgesia was longer in II/IH group 253±102.6 min as compared to 219.6±48.4 min in caudal group (agree with our study). In recovery room, four patients in caudal group required pain rescue medication compared to two patients in II/IH group. Similarly eight patients in the caudal group and six patients in II/IH group required pain rescue medication at day-stay unit or at home (agree with us).

The current studyensured the effectiveness of both blocks as intraoperative analgesia as there was no need for extra analgesia intaoperatively in the form of fentanyl among all patients. **Paul (19)** found that both caudal and ilioinginal blocks are effective, safe techniques for inguinal hernia repair . As there is no need for routine intravenous opioids , decreasing the side effects of these drugs .

Seyedhejazi et al. (20) compared the postoperative analgesic effects of caudal and ilioinguinal-iliohypogastric nerve block using bupivacaine-clonidine and found that caudal block and ilioinguinal - iliohypogastric nerve block using bupivacaine-clonidine have comparable effects on analgesia, severity of pain and hemodynamic changes during and after groin surgery (we did not add clonidine to bupivacaine).

CONCLUSION

Ultrasound-guided ilioinguinal/iliohypogastric nerve block was found to be an ideal intraoperative and postoperative analgesic for unilateral inguinal herniotomy in children , regarding quality of analgesia with less pain scores and longer duration of analgesia comparable with that of caudal block, with lower volume of local anesthetics and less complications.

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(Table 1 suppl). Children and infants Postoperative Pain Scale (ChIPPS) (Buttner and Finke, 2000):

Item	Score 0	Score 1	Score 2
Crying	None	Moaning	Screaming
Facial expression	Relaxed smiling	Wry mouth	Grimacing
Posture of the trunk	Neutral	Variable	Rear up
Posture of the legs	Neutral	Kicking	Tightened
Motor restlessness	None	Moderate	Restless

Total score indicates how the baby should be managed according to the scale:

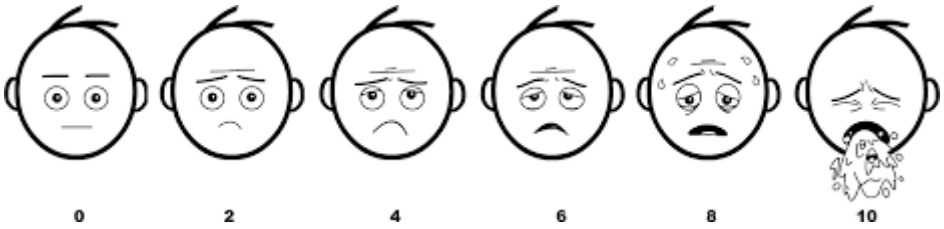
- 0-3: No requirement for treating pain.
- 4-10: Progressively greater need for analgesia.

Behavior scale and/or physiological stress parameter

- **Table (2 suppl): The patient characteristics and duration of surgery and recovery in all study groups:**

	Group I (n= 61)	Group II (n= 61)	P value
Age (years)	4 (± 1.7)	3.8 (± 1.8)	0.54 (NS)
Weight (Kilogram)	15.6 (± 3.5)	16.2 (± 4)	0.38 (NS)
ASA grade	I (100%)	I (100%)	> 0.05 (NS)
Duration of surgery (minutes)	30.1 (± 7.1)	27.9 (±8.3)	0.12 (NS)
Duration of recovery (minutes)	115 (± 14)	113 (± 16)	0.73 (NS)

- Data are expressed as Mean (± standard deviation) or Number (percentage).
- (ASA)= American society of anesthesiologists
- P value <0.05 is significant
- (NS)= not significant



(Figure 1 suppl)

BARF score (the Pictorial Baxter Retching Faces Scale for the Measurement of Postoperative Nausea in Children)(**11).**