Original Article

Pediatric Groin Surgeries: A Comparison of Analgesic Effects of Caudal Block and Inguinal Field Block Using Plain Bupivacaine

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Abstract

Introduction: There is a paucity of studies in the West African sub-region which have compared both the intraoperative and postoperative analgesic effects of caudal block and inguinal field block using plain bupivacaine in groin surgeries in children. The study aimed to compare the duration of analgesia and complications of caudal block and inguinal field block in pediatric groin surgeries. **Patients and Methods:** This was a prospective, double-blind randomized study conducted at a tertiary health institution in North Central, Nigeria, over a period of 6 months. A total of 74 children scheduled for day case groin surgeries for inguinal hernia, hydrocoele and palpable undescended testis were recruited into the study. The effectiveness of the analgesic effect was assessed by measuring serum cortisol levels before surgery (i.e. baseline at 8am), 5minutes after caudal block or inguinal field block, and 1-hour after surgery. Post-operative pain was determined using FLACC score (Face, Legs, Activity, Crying and Consolability) every 15 minutes till 6 hours after surgery when the patients were discharged home and the caregivers measured the patients' pain scores using the FLACC score every 1 hour to a maximum duration of 10 hours after surgery. Data obtained from the study was entered into the study proforma and analysed using IBM SPSS version 21.0. The P value was considered statistically significant at <0.05. **Results:** A total of 74 patients were recruited for this study, with 68 males (91.9%) and 6 females (8.1%). The children's age range was 6 months to 7 years, with a mean age of 3.35 ± 1.90 years. The mean basal serum cortisol levels of the caudal block group and inguinal block group were 11.15 ± 5.38 µg/dL and 10.79 ± 4.92µg/d respectively (p-value = 0.767). Five minutes after caudal block, the mean serum cortisol level was 10.50 ± 5.39µg/dL while inguinal field block was 10.63 ± 4.68µg/dL (p-value = 0.288). The mean serum cortisol level obtained one hour after each procedure was 9.34 ± 4.05 µg/dL for the caudal block group and 10.00 ± 3.56 µg/dL in the inguinal field block group with p-value = 0.275.

Using the FLACC score, the mean duration of analgesia in caudal block group was 372.00 ± 71.55 minutes and was inguinal field block group was 387.43 ± 62.65 minutes with a p-value = 0.116.

There was no anaesthetic technique related complications that was recorded in both caudal block group and inguinal group during the study period. **Conclusion:** This study demonstrated that caudal block and inguinal field block using plain bupivacaine provided comparable duration of analgesia in paediatric groin surgeries. Therefore, caudal block or inguinal field block using plain bupivacaine should be recommended for both intraoperative and postoperative analgesia in elective paediatric groin surgeries.

Keywords: *Caudal block, inguinal field block, pain control, paediatric groin surgeries, serum cortisol*

Introduction

In current surgical practice, adequate pain control has been described as a 'basic human right' irrespective of age, medical condition, treatment, or medical institution.[1] Therefore, effective pain management is the right of all patients (irrespective of their age) and the responsibility of all surgeons.[1] Uncontrolled or poor pain management causes disturbances in behavioural, haemodynamic and neuroendocrine stress responses in surgical patients in children.[1] Faponle and Usang observed that in 100 paediatric daycase surgeries, post-operative pain constituted 72% of the concerns noted by parents at home, while post-operative nausea and vomiting (16%), difficulty with walking (7%), dizziness (2%), tiredness (2%) and headache (1%) were the remaining complications reported by parents at home.[2]

In daycase procedures such as paediatric groin surgeries, opioids are often administered with caution because of the

How to cite this article: Kalu UA, Odi TO, Taiwo JO, Abdur-Rahman LO, Oyewole EO, Ibiyeye TT. Pediatric groin surgeries: A comparison of analgesic effects of caudal block and inguinal field block using plain bupivacaine. J West Afr Coll Surg 2022;12:96-103.

Received: 04-Jul-2022
Accepted: 21-Aug-2022
Published: 06-Oct-2022

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Access this article online

Website: www.jwacs-jcoac.com

DOI: 10.4103/jwas.jwas_146_22

Quick Response Code:

potential side effects such as nausea, vomiting, sedation and respiratory depression which may delay recovery from surgery and discharge from hospital.[2,3] These potential side effects of opioids have made the administration of local anaesthetic agent like bupivacaine for intraoperative and postoperative analgesia.[3]

In order to improve the quality of care and acceptability of day case groin surgeries among the parents/caregivers in our environment, there is a need to determine an effective and simple means of administering a prolonged form of analgesia in paediatric groin surgeries with little or no complications.[4] A correctly performed caudal block or inguinal field block using plain bupivacaine serve as an effective mode of analgesia in both intraoperative and prolonged post-operative period during paediatric day case surgeries.[4] A search of the literatures did not show any available local study that has compared caudal block (CB) and inguinal field block (INFB) using plain bupivacaine for intraoperative and post-operative analgesia in groin surgeries in children.

This study aimed to compare the duration of analgesia and complication(s) of CB and INFB using plain bupivacaine in paediatric groin surgeries in order to determine which of the two techniques gives a better prolonged pain control and less complications for day case groin surgeries.

Patients and Methods

This was a prospective, randomized-controlled single-blind longitudinal study from September 2020 to March 2021. Patient aged 6 months to 7 years patients with unilateral surgical groin conditions such as inguinal hernia or hydrocoele or palpable undescended testis fulfilling the inclusion criteria scheduled for elective groin surgery were recruited for this study while patients with bilateral groin conditions, obstructed hernia or recurrent groin surgical conditions or non palpable undescended testes were excluded from the study. Ethical clearance was obtained from the Ethics and Research Committee of our hospital and parental consents for both the operation and the study were also obtained.

Recruited participants were randomized into two study groups (caudal block and inguinal field block) using the simple randomization method. Numerics 1 to 74 (corresponding to the calculated sample size) were generated on 4 cm x 4 cm square ballot papers. The papers were rolled up and kept in an envelope. The ballot papers were shuffled and parents were asked to pick a paper from the envelope. The ballot papers were re-shuffled after each pick. The odd numbers were randomized into the CB group, while even numbers were randomized into the INFB group on arrival to the theatre.

Sample size determination: The sample size for this study was calculated using the statistical formula for comparison of two means.[5]

Using the formula: $n = 2SD2\left(\frac{Z\alpha}{2} + Z\beta\right)2/d2$

The variables used to calculate the sample size were obtained from a study by Bhattarai *et al*[6,7] in which the difference in mean duration of analgesia for caudal block was 33.6 minutes and the standard deviation of mean duration of analgesic effect of caudal block was 48.4.

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Where:

n = the sample size required in each group

$Z\frac{\alpha}{2}$: standard deviation of confidence interval set at 95% = 1.96

zβ: standard deviation of power set at 80% = 0.84

SD: standard deviation from a previous study =48.4

d: difference between mean value (253.2-219.6 =33.6minutes)

Inserting the required information into the formula:-

$$n = \frac{2\times(48.8)^2\times(1.96+0.84)^2}{(33.6)^2}$$

n = 33

Sample size for the two techniques = 33 x 2=66

Attrition rate set at 10% = 6.6.

The overall sample size for the study = 72.6 ≈ 73 patients. However, 74 patients were recruited and studied in this work to have equal number (37) in each anaesthetic technique.

Three blood samples collection for serum cortisol assay

The recruited patients parents or caregivers were informed about the fasting guidelines of 6 hours before surgery for food and 2 hours of clear fluids before surgery. The patients were admitted into the paediatric surgery ward on the morning of surgery as daycase. Eutectic Mixture of Local Anaesthetics (EMLA) cream (ASTRA, Sodertalge, Sweden), containing 2.5% lidocaine and 2.5% prilocaine was applied topically at the dorsum of the child's hands and feet and occlusive dressings applied to cover and keep the cream in place for forty-five (45) minutes so as to assist in the absorption of the cream into the skin for numbness and also to prevent the child from ingesting the cream. Forty-five (45) minutes after the EMLA cream was applied, it was removed and intravenous (IV) access secured. The first 2 mL of venous blood sample was collected in an EDTA bottle before induction of anaesthesia at 8am for (baseline) pre-

operative serum cortisol level collected. The second 2 mL of venous blood sample was similarly collected 5-minutes after the CB or INFB and the third 2 mL of venous blood sample was collected 1 hour after surgery in each group.

General anaesthesia

All the patients had the same general anaesthesia technique. The patients were pre-oxygenated with 100% oxygen for 5 minutes using appropriate sized face mask. The induction of anaesthesia was performed with 2% halothane in 100% oxygen, thereafter; the patients were maintained on 1% halothane in oxygen air mixture (50:50) via appropriate sized face mask. There was no intra-operative analgesia that was administered apart from either the caudal block or inguinal field block. The CB or INFB was done before any surgical skin incision was made.

Caudal block

A single Consultant Anaesthetist administered the CB. Each patient was placed in left lateral position with knees flexed at 90º (the lateral position is efficacious in paediatrics because it permits easy access to the airway as inhalational anaesthesia is being administered prior to performing the caudal block).[6] Five percent (5%) povidone iodine solution was used to cleanse the skin over the lumbo-sacral region. Sterile drapes were used to isolate the sacral region. Sacral hiatus was identified along an imaginary line between the two posterior superior iliac spines and the sacral cornu. A 23G needle was inserted at 90^0 then angulated to 45º, the epidural space was identified by loss of resistance as the needle penetrates the sacro-coccygeal ligament. After needle insertion and negative aspiration for blood or cerebrospinal fluid, plain bupivacaine (Duracaine; MyungmoonPharm. Co Ltd, South Korea) (0.25% at 0.5ml/kg) was injected into the caudal epidural space and the patient returned to the supine position after a small elastoplast dressing was applied over the sacral hiatus. Skin incision was made five minutes after performing the caudal block.

Inguinal field block

Patients were placed in supine position; skin preparation with 5% povidone iodine was done extending from the umbilicus to the mid-thigh. Sterile drapes were applied to isolate the groin bearing the pathology. A 23G needle was inserted about patient's middle finger breadth medial to the anterior superior iliac crest. The needle was advanced until a resistance is felt. Half of the dose of plain bupivacaine (0.25% at 0.5ml/kg) was administered in a fan-like pattern. The remaining half of plain bupivacaine was injected as the needle is withdrawn. The skin incision was made five minutes after the inguinal nerve block.

Intra-operative pain assessment

All the patients had same pre-operative, intra-operative and post-operative monitoring using a multi-parameter patient's monitor (MEDELA PM 400 modular monitor, GE Medical systems, Information Technology Inc. 8200w Tower Ave, Milwaukee, USA) that monitored the blood pressure (systolic blood pressure [SBP], diastolic blood pressure [DBP], heart rate (HR) and oxygen saturation (SPO_2). The recordings from the patients' multi-haemodynamic parameters monitoring were documented in the anaesthetic charts and the study proforma by the anaesthetist nurse on duty. An increasing heart rates and blood pressure were assessed as surgical pain stimulus to the patients intra-operatively.

Post-operative pain assessment

A single resident doctor in Paediatric Surgery Unit and the caregivers (mostly mothers) were trained on the use of the FLACC score in assessing postoperative pain. The resident doctor that assessed the patients' pain scores was excused from the operating room during the period the caudal block or inguinal field block was administered. It was only the trained resident doctor that determined all the patients' pain scores every 15minutes from immediate postoperative period till the patients were discharged home. This was to prevent an inter-observer bias in the pain assessment. The caregivers' (mostly mothers) proficiency in assessing the pain score using the FLACC score was tested on the ward to be sure they can use the FLACC score sheet to assess the pain before the patients were discharged home. The caregivers assessed the pain scores at home using the FLACC score every hour for a maximum duration of 4 hours at home. The pain scores were documented in the FLACC score sheet of the study proforma. The trained resident doctor and the patients caregivers were double blinded to the type of the anaesthetic technique (CB or INFB) used intra-operatively.

Intravenous paracetamol at 15 mg/kg/dose was given as first dose analgesia to a patient with a FLACC score ≥4 within the first 6 hours after surgery in the hospital while the parents gave oral paracetamol at 15 mg/kg/dose if the FLACC score was ≥4 at home. Thereafter, the oral paracetamol was continued 6 hourly for 72 hours.[8] The researcher contacted the parents/caregivers 6 hours after discharged from hospital via mobile phone to know the pain scores and time the first dose of analgesia was administered to the patients at home. The parents/caregivers were duly informed to record the pain scores in the FLACC score sheet and they brought the FLACC score sheet to the outpatient clinic. The time the first dose of paracetamol was given when the FLACC score was ≥4 was documented in the study proforma and that time was the total duration of analgesia of the CB or INFB administered.

Follow-up

The care-givers were given verbal and written instructions on post-operative care of the patients. They were asked to re-present to the hospital as soon as possible if there were complications such as urinary retention, lower

limb weakness, undue swelling (hematoma) from site of anaesthesia block or operation site. The patients were seen in out-patient clinic one week after the surgery to examine the surgical wound and the sites of CB and INFB.

Cortisol assay

The three venous blood samples for cortisol measurement were centrifuged in the Biochemistry Laboratory within 1 hour of collection using Rotofix 32A Hettich Centrifuge (Germany) at 1500 g for 3 minutes. The samples were stored at -20°C until assayed by a Consultant Chemical Pathologist. The chemical pathology laboratory has an uninterrupted power supply. The cortisol concentrations were measured by florescence polarization immunoassay technology (TDxFlx system) using reagent CE cortisol ELISA microwells Acu-bind Kit Manufactured by the Monobind Inc, Lake Forest Ca 92 630 USA.

Outcome measures

(a) Primary outcome measures

The mean duration of analgesia of patients in each anaesthetic technique: this was measured in minutes. The duration of analgesia was defined as the time after the administration of CB or INFB till the time a patient's FLACC score is ≥4.

Table 1: Age interval and gender distribution of the total patients

Variables		Frequency (Percentage)
Age interval	<12months	11 (14.9%)
	1–4 years	45 (60.8%)
	5–7 years	18 (24.3%)
Gender	Males	68 (91.9%)
	Females	6 (8.1%)

Frequency distribution table

(b) Secondary outcome measures

1. The preoperative, intra-operative and post-operative mean serum cortisol level of patients in each anaesthetic technique.
2. Haemodynamic changes of patients (heart rate and blood pressure) in each anaesthetic technique.
3. Incidence of complications related to each anaesthetic technique.

Data analysis

Data were analysed using IBM SPSS® version 21 (Statistical Package for Social Science [SPSS] Inc., Chicago, IL, USA) to derive frequencies, means and standard deviation. Results were presented using tables and figures.

Results

A total of 74 patients aged 6 months to 7 years were recruited for this study with 37 patients in each group. Neither the recruited patients nor their caregivers defaulted throughout the period of this study. The mean age of the patients was 3.35 ± 1.90 years. Majority of the patients were aged 1–4 years. There were 68 male patients (91.9%) and 6 female patients (8.1%) with male to female ratio of 11:1. The mean weight was 13.96 ± 4.60kg (range 6.0–26.0kg). The age intervals and gender distribution are as highlighted in Table 1.

Patients' characteristics in the two study groups

The mean age, weight and gender distributions of patients in the two studied groups were comparable with p-values of 0.946, 0.870 and 0.092 respectively as shown in Table 2.

Comparison of types of groin surgeries performed in the two groups

Table 3 highlighted the distribution of surgeries performed in the two study groups. There were twenty-four herniotomies

Table 2: Distribution of patients' characteristics in the two study groups

Patients characteristics		CB (*n* = 37)	INFB(*n* = 37)	P-value
Mean±SD (Age in years)		3.05 ± 1.87	3.64 ± 1.89	0.946
Mean± SD (Weight in kg)		13.52 ± 4.54	14.40 ± 4.67	0.870
Gender	Males	35	33	0.092
	Females	2	4	

Pearson Chi-Square, SD=Standard Deviation

Table 3: Types of groin surgeries performed in the two study groups

Type of procedures	CB n (%)	INFB n (%)	P-value
Unilateral Herniotomy (inguinal hernia)	24(64.9%)	22 (59.5%)	
Unilateral Herniotomy (hydrocoele)	9 (24.3%)	11 (29.7%)	0.739
Unilateral Orchidopexy (palpable undescended testis)	4 (10.8%)	4 (10.8%)	
Total	37 (100%)	37(100%)	

Pearson Chi-Square

for unilateral inguinal in the CB group and 22 herniotomies in the INFB. The two groups were comparable with p-value = 0.739.

Comparison of duration of procedure in the two study groups

The mean duration of procedure for caudal block group was 33.37 ± 8.23 minutes while that of inguinal field block group was 33.50 ± 6.40 minutes with a p-value of 0.150 as shown in Table 4.

Table 4: Mean duration of procedures performed in the two study groups

Group	Mean (Minutes)	Std. Deviation	P-value
CB (*n* = 37)	33.37	8.23	0.150
INFB (*n* = 37)	33.50	6.40	

Independent sample t-test

Table 5: Mean serum cortisol level in the two study groups

Serum Cortisol(µg/dL)	CB (*n* = 37) Mean±SD	INFB (*n* = 37) Mean±SD	P-value
Basal	11.15 ± 5.38	10.79 ± 4.92	0.767
5-Minute after block	10.50 ± 5.39	10.63 ± 4.68	0.288
1-Hour after procedure	9.34 ± 4.05	10.00 ± 3.56	0.275

Independent sample t-test, SD=Standard Deviation

Table 6: Heart rate and blood pressure in the two study groups

	CB (n=37) Mean±SD	INFB (n=37) Mean±SD	P-value
Heart rate			
Basal	100.60 ± 13.15	100.97 ± 14.54	0.861
15 mins	100.05 ± 12.87	100.25 ± 14.54	0.514
30mins	98.17 ± 11.52	98.94 ± 12.42	0.594
45 mins	97.80 ± 8.31	102.00 ± 5.88	0.450
60 mins	98.50 ± 4.24	100.10 ± 6.23	0.612
Systolic blood pressure			
Basal	97.28 ± 9.64	99.91 ± 9.42	0.896
15 mins	96.82 ± 10.71	98.82 ± 8.74	0.186
30 mins	96.14 ± 9.89	97.28 ± 8.67	0.613
45 mins	96.16 ± 8.43	97.60 ± 4.77	0.184
60 mins	95.41 ± 7.31	98.20 ± 5.11	0.237
Diastolic blood pressure			
Basal	66.00 ± 6.01	64.08 ± 6.87	0.516
15 mins	55.80 ± 6.72	57.14 ± 7.73	0.602
30 mins	56.05 ± 6.18	56.05 ± 5.16	0.721
45 mins	60.67 ± 4.96	57.20 ± 6.57	0.628
60 mins	60.32 ± 3.13	57.10 ± 4.21	0.521

Independent sample t-test
SD=Standard Deviation

Comparison of patients mean serum cortisol levels in the two study groups

The mean basal serum cortisol levels of patients in CB group was 11.15 ± 5.38 µg/dL while that of patients in INFB group was 10.79 ± 4.92µg/dL with a p-value = 0.767. There is no statistical difference in the mean serum cortisol levels of patients in the 2 groups at 5-minutes and 1 hour after the procedures as shown in Table 5.

Comparison of haemodynamic parameters in the two groups

Table 6 shows the preoperative and intraoperative heart rate, systolic blood pressure and diastolic blood pressure of the patients in both study groups.

Comparison of mean FLACC scores in the two study groups

Table 7 highlights the mean FLACC scores at various time intervals in the two groups. There was no statistically significant difference in the mean FLACC scores at various

Table 7: Mean FLACC scores at various time intervals in the two study groups

Time	CB(n=37) Mean±SD	INFB (n=37) Mean±SD	P- value
0 mins	0.17 ± 0.43	0.14 ± 0.35	0.497
15 mins	0.66 ± 0.80	0.57 ± 0.65	0.297
30 mins	0.77 ± 0.65	0.80 ± 0.67	0.827
45mins	1.08 ± 0.56	1.02 ± 0.71	0.827
60 mins	1.14 ± 0.63	0.97 ± 0.75	0.370
75 mins	1.26 ± 0.56	1.09 ± 0.61	0.589
90 mins	1.23 ± 0.54	1.26 ± 0.62	0.326
105 mins	1.23 ± 0.69	1.29 ± 0.62	0.697
120 mins	1.54 ± 0.66	1.29 ± 0.57	0.126
135 mins	1.54 ± 0.70	1.34 ± 0.64	0.401
150 mins	1.40 ± 0.69	1.29 ± 0.62	0.159
165 mins	1.31 ± 0.78	1.28 ± 0.57	0.084
180 mins	1.62 ± 0.73	1.45 ± 0.56	0.117
195 mins	1.45 ± 0.65	1.34 ± 0.59	0.307
210 mins	1.54 ± 0.61	1.62 ± 0.73	0.303
225 mins	1.42 ± 0.69	1.62 ± 0.59	0.353
240 mins	1.71 ± 1.12	1.91 ± 1.12	0.533
255 mins	1.73 ± 1.05	1.71 ± 0.85	0.451
270 mins	1.72 ± 0.76	1.74 ± 0.89	0.976
285 mins	2.00 ± 0.66	1.58 ± 0.78	0.085
300 mins	2.09 ± 1.01	1.89 ± 1.34	0.398
315 mins	2.35 ± 1.37	1.76 ± 1.06	0.136
330 mins	2.30 ± 1.15	1.76 ± 0.92	0.489
345 mins	2.70 ± 1.42	2.58 ± 1.74	0.604
360 mins	3.02 ± 1.76	2.47 ± 1.21	0.157
420 mins	4.08 ± 1.24	3.31 ± 1.44	0.524
480 mins	4.16 ± 1.31	3.35 ± 1.65	0.342
540 mins	4.25 ± 1.50	3.77 ± 1.39	0.142
600 mins	4.50 ± 1.57	4.30 ± 1.87	0.265

Independent sample t-test
SD=Standard Deviation

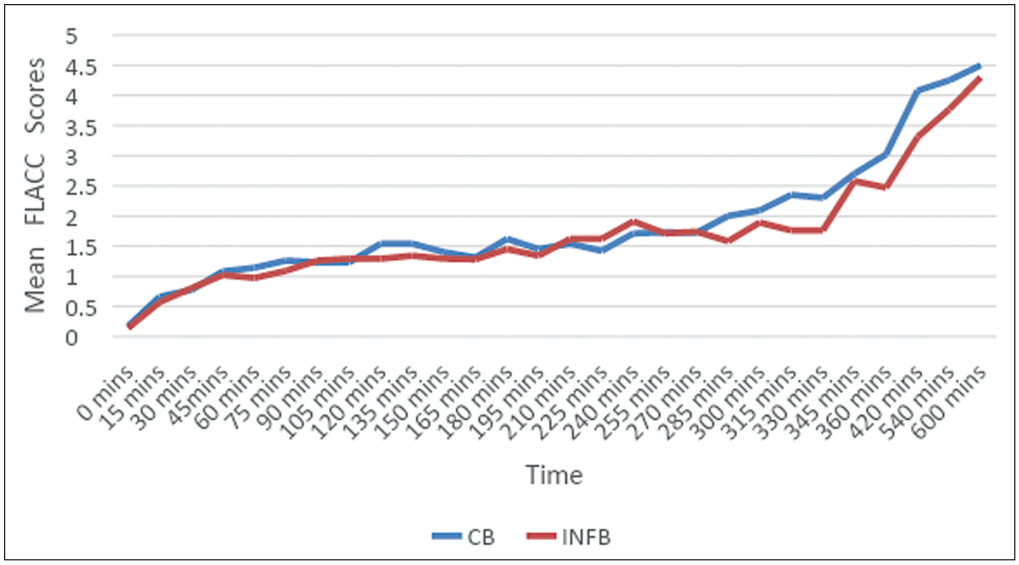

Figure 1: Mean FLACC scores at various time intervals in the two study groups

Table 8: Mean duration of analgesia in the two study groups

Group	Mean (minutes)	Std. Deviation	P-value
CB (n=37)	372.00	71.55	0.116
INFB (n=37)	387.43	62.65	

Independent sample t-test

time intervals during the study. The mean FLACC score before patients were discharge home (360minutes) in CB group and INFB group were 3.02 ± 1.76 and 2.47 ± 1.21 respectively with no statistical difference (p-value=0.157).

Figure 1 showed a line graph of various mean FLACC scores of patients in the caudal and inguinal field block groups over different time intervals.

Comparison of mean duration of analgesia in the two study groups

The mean duration of analgesia in caudal block group was 372.00 ± 71.55 minutes while in inguinal field block group, it was 387.43 ± 62.65 minutes p-value = 0.116 as shown in Table 8.

Comparison of anaesthetic technique related complications in the two study groups

There were no anaesthetic technique complications in CB group-(inadvertent dural puncture with bloody tap, post-operative urinary retention, post-operative limb weakness and local sepsis at site of caudal block); INFB group-(inadvertent vascular injection of bupivacaine and inadvertent bowel trauma) recorded in the two groups during this study.

Discussion

The mean duration of the procedure in patients randomized to the CB group was 33.37 ± 8.23 minutes. There were reduction in the heart rates and blood pressures from the basal level through the intra-operative and the post-operative period in patients in the two study groups. The mean differences in the haemodynamic changes (heart rates and blood pressure) were not statistically significant. This could have been as a result of adequate pain control by both the CB and INFB during the various procedures and the patients' pain control were adequate into the postoperative period in both study groups. Inadequate pain control causes a rise in stress hormones response of surgical patients.[7-9]

This study demonstrated that both CB and INFB significantly decreased the peri-operative serum cortisol level as a result of adequate intraoperative and postoperative analgesia. Patients in caudal block group had lower postoperative serum cortisol level compared to the patients in inguinal field block group, but the difference was not statistically significant. The effects of wound infiltration with ropivacaine on serum cortisol and prolactin responses to postoperative pain after inguinal herniotomy was studied by Sakellaris *et al*[10] in 3 groups of patients comprising of the pre-incision wound infiltration, the post-incision wound infiltration and the no wound infiltration. They reported that patients in the two groups that had ropivacaine wound infiltration had no significant elevation of their postoperative serum cortisol and prolactin levels. There was better attenuation of the stress hormones response to surgical procedures similar to findings in this study. The mean duration of analgesia in CB group was less than that of INFB block group, but the difference was not statistically significant. This may be due to the fact that INFB is more targeted to the nerves supplying the operation field as most groin procedures performed in this study were herniotomies.

Contrary to the result of this study, Kataria *et al*[11] found a significant higher duration of analgesia in the patients that had INFB (680 ± 120.9minutes) compared to those in CB (372 ± 87.4 minutes) using 0.2% ropivacaine+

dexmedetomidine. This was because a nerve locator (Locoplex needle) was used in their study to identify the ilioinguinal/iliohypogastric nerve for accurate deposition of the local anaesthetic agents around the nerves. This would have resulted in a better nerve block and longer duration of analgesia when compared to the anatomical landmark of INFB that was done in this study. Potential complications of INFB include mechanical nerve damage, small bowel and colonic puncture, injection site haematoma, injection site infection and abscess formation. Amory *et al*[12] reported small bowel injury requiring bowel resection and anastomosis in a child who had INFB for inguinal herniotomy. Johr *et al*[13] also reported colonic puncture in a child who had INFB for groin surgery.

Abdellatif1,[14] Ravi *et al*,[15]and Willschke *et al*[16] used lower doses of plain bupivacaine for ultrasound-guided INFB against CB and reported no significant difference in the duration of analgesia among the patients in the two groups. The lower doses of the plain bupivacaine used in the ultrasound-guided INFB was as a result of the direct instillation of plain bupivacaine around the ilioinguinal/iliohypogastric nerve. The non-availability of portable ultrasound machine prevented its use in this study to locate the ilioinguinal/iliohypogastric nerves in the block. However, the use of 0.5ml/kg 0.25% in performing the landmark inguinal field block could have accounted for the good adequate analgesia that was reported in this study.

There could be anaesthetic technique related complications in patients that had either CB or INFB.[17,18] Splinter *et al*[18] reported four patients with delayed ambulation after caudal block in their study. Amory *et al*[12] reported small bowel injury requiring bowel resection and anastomosis in a child who had INFB for inguinal herniotomy.

There was no anaesthetic technique related complications recorded in the two groups during this study. Other similar studies[17-19] also reported no complications related to CB and INFB. The absence of complications following the CB and INFB seen in this study may be due to lower number of patients studied and also due to the fact that a Consultant Anaesthetist performed the CB while the operating surgeon performed the INFB.

Limitation of the study

The non-use of ultra-sonography to delineate the structures during CB and INFB may affect exact deposition of the plain bupivacaine around the nerve fibres. There was no functional portable mobile ultrasonography machine in the study centre during the period of this study. Possible variations in pain assessment despite training the parents/caregivers at home, future studies using domiciliary nurses will help to eliminate this.

Conclusion

This study demonstrated that caudal block and inguinal field block using plain bupivacaine provided similar adequate intraoperative and postoperative pain relief during paediatric groin surgeries. The caudal block and inguinal field block equally and effectively attenuated the patients' intraoperative and post-operative serum cortisol levels from the preoperative baseline. There was no complication related to caudal block or inguinal field block during this study.

Research and clinical implication

It is therefore recommended that CB or INFB using plain bupivacaine be used effectively for adequate intraoperative and postoperative analgesia in elective paediatric groin surgeries. A multicenter study with a larger number of patients is also recommended to corroborate the findings from this study.

Acknowledgement

We acknowledged all patients and their caregivers who participated in this study.

Financial support and sponsorship

We did not receive any external funding for this research.

Conflicts of interest

There are no conflicts of interest.

Authors' contributions

UAK designed the study, preformed 70% of the groin surgeries, collected data and drafted the manuscript.
EOO performed the caudal block for the participants and reviewed the manuscript

TOO, JOT, LOA and ITT performed the remaining 30% of the groin surgeries, supervised the study and reviewed the manuscript.

All authors reviewed and approved the final draft of the manuscript.

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