Randomized Controlled Trial

Pediatric Postoperative Pain Control With Quadratus Lumborum Block and Dexamethasone in Two Routes With Bupivacaine: A Prospective Randomized Controlled Clinical Trial

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Disclaimer: This study was approved by the local ethical committee in Tanta University Hospital, Egypt with decision number 34737/ 6/21.The trial is registered at clinical trials.gov ID (NCT 04963816).

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Background: Ultrasound-guided Quadratus Lumborum block (QLB) is a regional analgesia approach that has been reported to provide effective post-operative pain relief for both abdominal and retroperitoneal surgery. Bupivacaine is the most often used and well documented local anesthetic medication in children. Dexamethasone is a systemic glucocorticoid that is often used to minimize postoperative nausea, vomiting, and pain to improve recovery quality after surgery.

Objectives: To evaluate postoperative analgesia of QLB in pediatric patients undergoing renal surgeries by the addition of dexamethasone to bupivacaine compared to intravenous administration.

Study Design: A prospective, randomized, controlled clinical trial.

Setting: Pediatric surgery unit in a university hospital.

Methods: One hundred and five patients (6-12 years old) scheduled for renal surgeries were randomly allocated into 3 groups, with 35 patients in each group. Randomization was based on computer-generated codes. The groups were DEX1 (QLB with IV dexamethasone group), DEX2 (QLB dexamethasone group), and QLB CONTROL (QLB alone). The 1st time for rescue analgesia request, total morphine consumption, Pediatric Objective Pain Scale (POPS), and parents' satisfaction score were measured in 24 hours follow-up to evaluate postoperative pain control.

Results: The time to 1st rescue analgesics request (hours), total morphine consumption (mg), and the parents' satisfaction scores were much better in groups DEX1 and DEX2 as compared to group CONTROL with statistical significance. However, group DEX2 was better than DEX1 in the previous outcomes but without statistical significance. In respect, the pediatric objective pain scale was much lower with a significant difference in groups DEX1and DEX2 in comparison with group CONTROL up to 18 hours postoperatively.

Limitations: Difficult to assess the block as all children were sedated, plus this was a unilateral surgical procedure with limited surgical incision, so the effect of QLB needed to be studied when there is a bilateral surgical procedure.

Conclusions: Dexamethasone may be more effective when added to bupivacaine than when given systemically in analgesic effects without any impact on the other secondary pain-related outcomes. Dexamethasone as an adjuvant to bupivacaine has a marked hand on prolongation of the postoperative duration of analgesia, less request for rescue analgesia, and fewer side effects as compared to bupivacaine if used as a sole agent in QLB.

Key words: Quadratus lumborum block, pediatric analgesia, ultrasound-guided, dexamethasone, bupivacaine, local anesthetic

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Pain is an annoying sensory and psychological perception related to actual or possible injury as per The International Association for the Pain Study (1). Acute pain is a frequent unfavorable reaction in children caused by trauma, illness, and surgical procedures (2). Chronic physical and emotional complications develop if a child's pain is not treated effectively (3). Long-term complications may involve stress on subsequent surgeries, increased need for analgesics, and decreased analgesics efficacy (4).

Children are not given adequate analgesia due to many misbeliefs. Some include that a pediatric patient does not sense pain (5) or children perceive pain less than adults. Additionally, it is difficult to evaluate pain in pediatric patients, as infants and young children cannot express pain vocally (6). Even preterm infants can sense pain in a way like older children. If managed rapidly and effectively, faster recoveries and fewer side effects occur (7).

A risk-benefit assessment before giving analgesia to pediatrics should be done, evaluating the analgesic efficacy against side effects, costs, and the course of recovery. Unfortunately, these analgesics are not without side effects like nausea, vomiting, urinary retention, respiratory depression, and sedation (8). A multimodal approach should be introduced in children.

Quadratus lumborum block (QLB) is a trunk block that can be done by ultrasound guidance (US) which was introduced by Blanco for the first time posing to have a prolonged block time, with possible relief of visceral pain (9). The block provides a unilateral blockade, which may extend from T6 to L1 (10,11). There have been reports of analgesic effectiveness of QLB for abdominal surgeries but rarely reported in children (12,13).

Bupivacaine is the local anesthetic (LA) drug of choice in children (14) but has a limited analgesia time (15). Peripheral catheters have been successfully used for more periods of analgesia (16,17). Nevertheless, nerve catheters are expensive and not practical in the outpatient surgical setting (18,19).

Dexamethasone is a glucocorticoid commonly given perioperatively for the prophylaxis of nausea and vomiting, and to improve postoperative recovery (20,21). Dexamethasone inhibits the action on nociceptive C-fibers mediated by potassium channels (22,23). Furthermore, decreasing the prostaglandin synthesis with hyperalgesia reduction (24). Many researchers have recently investigated the perineural dexamethasone effect in the length of regional blocks and its safety. On the other hand, additional studies are required (25).

Dexamethasone has a minimal risk if only a single dose is given. Most studies have illustrated that a perioperative single-dose has no marked rise in the adverse effects in both adults and children either given intravenously or perineurally (26,27). Additionally, we did not find reports of complications from a single dose of intravenous administration during pediatric surgery like significant high blood sugars (28,29). Therefore, we suggested that dexamethasone both intravenously and perineurally is an effective adjuvant analgesic method for relieving pediatric postoperative pain and is safe if only one dose is administered. Furthermore, dexamethasone is inexpensive, making it a good option for routine use. This study intended to study the analgesic effect of dexamethasone postoperatively either systemically or in combination with bupivacaine in QLB as proved by the timing of request of 1st rescue analgesia in pediatric renal surgeries.

Methods

This was a controlled double-blind clinical study that was conducted prospectively in Tanta University Hospitals. After getting the local ethics committee permission with decision number 34737/ 6/21 and doing clinical trials.gov ID (NCT 04963816), and getting written informed consent from parents or guardians, 105 patients (6-12 years old) with the American Society of Anaesthesiology (ASA) physical status I-II of both genders scheduled for renal surgeries by the same surgical team from July 2021 to December 2021 were enrolled. While those having a contraindication to studied medication, children who had any contraindication for regional techniques, cases with ASA III-IV physical status, preoperative intake of corticosteroids, failed QLB, or parents' refusal to share in the study were all ruled out of the research.

Randomization was by a computer-generated random sequence concealed in closed opaque envelopes, and a blinded nurse randomly chose the envelope that determined the group of assignments. Patients were divided into 3 groups (35 each) with a 1:1:1 ratio and underwent one of the following before surgery. Patients and investigators were unaware of the study and drugs.

QLB and Dexamethasone IV Group (DEX1)

IV dexamethasone 0.1 mg/kg with a maximum dose of 10 mg added to 5 mL normal saline and QLB.

QLB Dexamethasone Group (DEX2)

0.1 mg/kg dexamethasone in combination with bupivacaine in QLB and 5 mL normal saline IV.

Control Group

QLB and 5 mL normal saline IV.

QLB was performed in all groups by the same anesthesiologist with 0.5 mL/kg 0.25% of bupivacaine with a dosage not exceeding 2.5 mg/kg (30).

Anesthetic Technique

A preoperative check-up was done the day before surgery. A complete history was taken from parents, and complete laboratory investigations were done, ensuring complete fasting for at least 4-6 hours preoperatively. All children were given oral midazolam 0.5mg/kg in 5 mL clear apple juice an hour before surgery. In the operating theatre, basic monitoring included pulse oximetry and ECG electrode; a suitable-sized cuff for blood pressure monitoring was applied.

Inhalational induction with sevoflurane was followed by insertion of an IV cannula, then fentanyl (1 mcg/kg) and cisatracurium (0.1 mg/kg) were given to facilitate intubation. Anesthesia was maintained with 2% sevoflurane concentration and cisatracurium (0.05 mg/kg/dose). Lactated ringer was administered intravenously as per local hospital policy. Monitoring of heart rate, non-invasive blood pressure, oxygen saturation, temperature, and end-tidal CO_2 was done continuously. For all patients, 10 mg/kg paracetamol was infused for maintenance of analgesia. In all patients' groups, anesthesia depth was monitored using bispectral index (BIS) monitor and maintained at 40-60.

QLB was done on all patients before the surgical incision. A linear multi-frequency 6-13 MHz transducer probe wrapped with a sterilized sheath of Mindray enterprise 8000 was utilized for ultrasound-guided QLB. The child was lying lateral position. The probe was placed above the iliac crest where external, internal oblique, and transversus abdominis muscles could be seen; the probe was then advanced posteriorly till the quadratus lunborum (QL) muscle was seen deep within the latismus dorsi. After that, a 22 gauge, 60 mm length SonoPlex echogenic needle was advanced in-plane from an anterior to posterior direction until the needle tip was positioned between the anterior border of QL and its fascia. In addition, 1.5 mL saline was injected to confirm the needle tip's position followed by injection of bupivacaine.

After finishing the procedure, anesthesia was discontinued, and the patient was extubated after the muscle relaxant was reversed with neostigmine (50 ug/kg) and atropine (0.02 mg/kg). A new anesthesiologist with no previous idea about the study monitored the children in the recovery unit. Then patients were transferred to the ward after achieving the standard discharge criteria. Children were given intravenous acetaminophen 15 mg/kg every 6 hours for postoperative pain relief. Morphine 0.05 mg/kg IV as rescue analgesia was given by a physician who was blinded to the study followed by close monitoring to exclude narcotic adverse effects; a 2nd morphine dose was not allowed until 2 hours after the previous dose. However, paracetamol 15 mg/kg was given in case of analgesia request during this period.

Study Outcomes

Primary Outcome

Time to 1st request of rescue analgesics measured from the time of extubation till rescue analgesia was requested when the Pediatric Objective Pain Score (POPS) ≥ 5.

Secondary outcome

1. Analgesic efficacy was evaluated postoperatively using the POPS at 1st, 2nd, 4th, 8th, 12th, 16th, 18th and 24th hour postoperatively (31), composed of 5 observations (Table 1), with each score ranging from 0 to 2 and a total rating ranging from 0 to 10 with excellent analgesia indicated by a score of < 5.
2. The total morphine consumption dose throughout the postoperative 24 hours.
3. Postoperative side effects in the form of hypotension, bradycardia, nausea, and vomiting for 24 hours after surgery.
4. Children´s comfort and activity levels were evaluated by parents who were blinded to the study and presented as parents' satisfaction: unsatisfied = 1, satisfied (good) = 2, and satisfied (excellent) = 3.

Sample Size Calculation

Our primary outcome variable was the time request of first rescue analgesia. Supported by previous study results (32). The analgesia period in the quadratus group was 8 ± 5.29 h. Sample size calculation suggested 29 patients in each group achieve a minimum difference of 4 hours in the time to first request of rescue analgesia at α error of 0.05, the standard deviation of

Table 1. *Pediatric Objective Pain Scale (29).*

Observation	Criteria	Points
Systolic blood pressure	BP < 20 % Preoperative	0
	BP 20-30 % Preoperative	1
	BP > 30 % Preoperative	2
Crying	Not crying	0
	Crying but responds to tender loving care (TLC)	1
	Crying and does not respond to tender loving care (TLC)	2
Posture	No special posture	0
	Flexing leg and thighs	1
	Holding scrotum or groin	2
Movement	None	0
	Restless	1
	Thrashing (moving widely)	2
Agitation	Patient asleep or calm	0
	Mild	1
	Hysterical	2

5.29, and 80% power. So, we enrolled 35 patients in each group to compensate for dropouts.

Statistical Analysis

The full detailed form is SPSS version 22 (IBM Corporation, Armonk, NY). Quantitative data were expressed as mean ± standard deviation (SD). A one-way analysis of variance (ANOVA) when comparing more than 2 means. The post hoc test was used for multiple comparisons between different variables. Qualitative data were expressed as frequency and percentage. Chi-square (X^2) test of significance was utilized to compare proportions between 2 qualitative parameters. *P* value < 0.05 was reflected statistically significant, with P1: comparison between groups DEX1 & DEX2, P2: between groups DEX1 & CONTROL, and P3: between groups DEX2 & CONTROL.

Results

In total, 120 patients were booked. A total of 105 were included and allocated to 3 groups (35 each) randomly as shown in Fig. 1 because 10 patients did not match our criteria and 5 patients declined to participate in the study.

Patients age (in years), gender, weight (in kg), surgery duration (in minutes), and ASA status were similar statistically in all groups (*P* = 0.598, 0.621, 0.816, 0.300, 0.760, respectively as in Table 2).

The difference among the 3 groups in the requested time of the first rescue analgesics was significant (hours) (*P* = 0.001). However, the DEX2 group was non statistically longer than DEX1 group (P1 = 0.070). DEX1 and DEX2 groups were longer significantly than those in group CONTROL (P2 = 0.029; P3 = 0.001) (Table 3, Fig. 2).

Total morphine consumption (mg) was significantly lower in groups DEX1 and DEX2 than that in CONTROL (*P* = 0.001; P2 = 0.001). Further, group DEX2 was much lower significantly in consumption than in DEX1 (P1 = 0.001) (Table 3, Fig. 2).

Parents' satisfaction was much better significantly in groups DEX1 and DEX2 in comparison to group CONTR0L (*P* = 0.001, P2 = 0.001, P3 = 0.001). Additionally, group DEX2 was much higher statistically as compared to group DEX1 (P1 = 0.001). Parents in group DEX2 who were unsatisfied, good satisfied, satisfied (excellent) were 0, 4, 31, respectively, and were 5, 23, 7, respectively, in DEX1. Furthermore, the number of unsatisfied, good satisfied, satisfied (excellent) were 25, 8, 2, respectively, in group CONTROL (Table 4, Fig. 3).

There were no recorded hypotensive cases postoperatively in groups DEX1 and DEX2 while there were 5 hypotensive patients recorded in group CONTROL with a significant statistical difference in all groups (*P* = 0.005). No patients were represented with bradycardia in group DEX2 as compared to the other 2 groups. However, there were 5 patients in group DEX1 and 5 in group CONTROL (*P* = 0.063). There were no reports of nausea and vomiting in group DEX1, but one case in each of DEX2 and CONTROL, indicating a meaningful difference between the 3 groups (*P* = 0.024) (Table 5, Fig. 4).

For POPS, it was excellent evidenced by a score < 5 during the first 4 hours postoperatively as compared to subsequent hours (from 6 h to 24 h), with a comparable difference among all groups in the first hour postoperative (*P* = 0.881). However, during the 2nd, 4th, 6th, 12th, and 18th hours, there was a significant difference among all groups, but not significant between groups DEX1 and DEX2 (P1 = 0.860, P1 = 0.298, P1 = 0.083, P1 = 0.528, P1 = 0.192, respectively). However, POPS were significantly low in DEX1 and DEX2 groups as compared to group CONTROL at 2nd, 4th, 6th, 12th and 18th hours postoperatively (P2 = 0.001, P2 = 0.001, P2 = 0.001, P2 = 0.001, P2 = 0.001, respectively), (P3 = 0.001, P3 = 0.001, P3 = 0.001, P3 = 0.001, P3 = 0.001, respectively). The effect of QLB began to fade in the remaining 6 hours of the tested period, so no significant differences in POPS between the groups during this period (*P* = 0.480) (Table 6, Fig. 5).

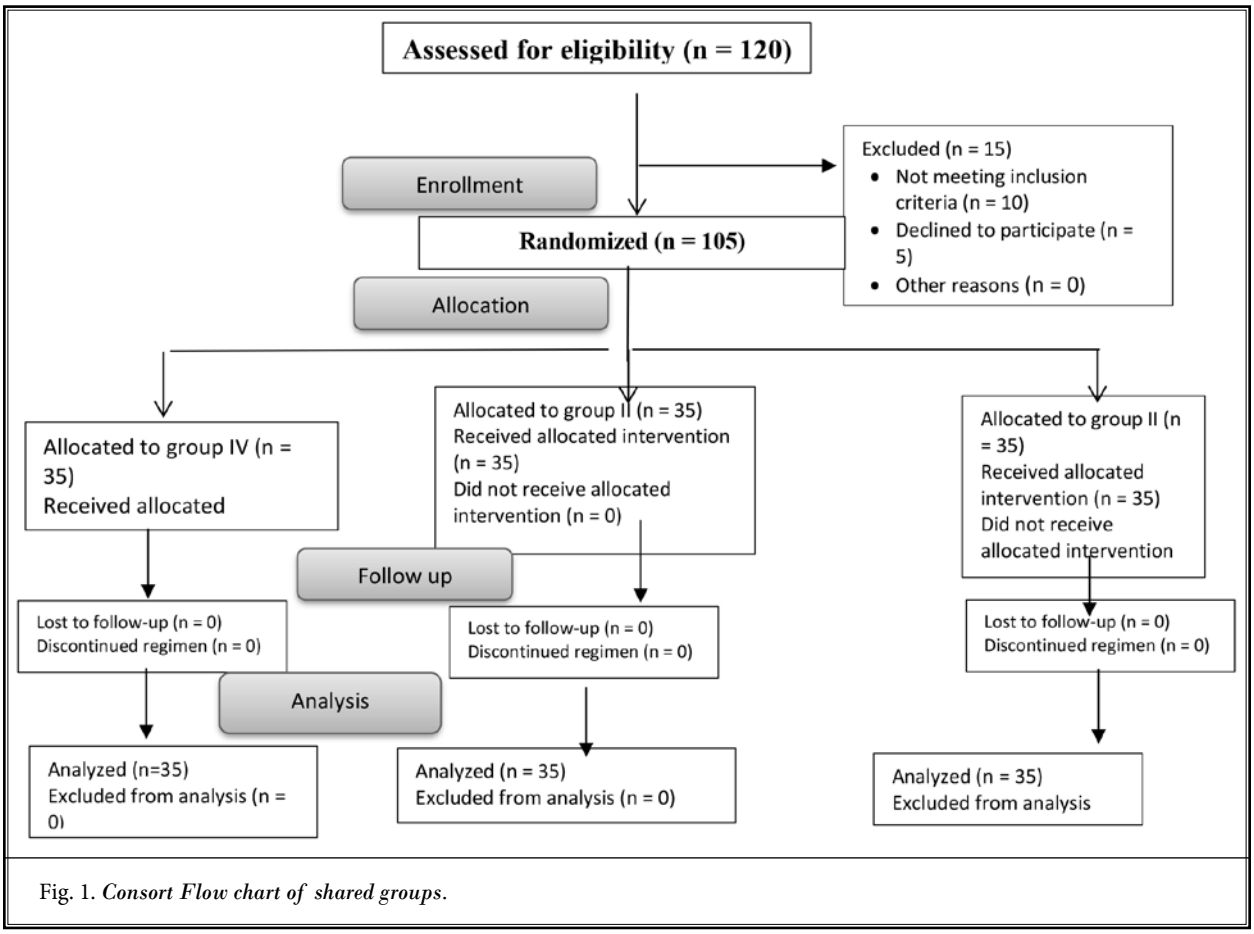

Fig. 1. *Consort Flow chart of shared groups.*

Table 2. *Baseline data of included patients.*

		Group DEX1	Group DEX2	Group CONTROL	Test	*P* value
Age (years)	Range	6 – 12	6.5 – 12	6 – 11.5	F: 0.517	0.598
	Mean ± SD	9.14 ± 1.71	8.77 ± 1.48	8.92 ± 1.41		
Gender	Male (%)	21 (60%)	23 (65.7%)	19 (54.3%)	X^2: 0.952	0.621
	Female (%)	14 (40%)	12 (34.3%)	16 (45.7%)		
ASA	I (%)	19 (54.3%)	20 (57.1%)	22 (62.9%)	X^2: 0.548	0.760
	II (%)	16 (45.7%)	15 (42.9%)	13 (37.1%)		
Weight (kg)	Mean ± SD	31.2 ± 2.6	30 ± 2.7	29.8 ± 2.9	F: 0.204	0.300
Duration of surgery(min)	Range	40 – 118	45 – 120	45 – 112	F: 0.204	0.816
	Mean ± SD	76.66 ± 23.92	79.94 ± 22.16	78.29 ± 18.06		

Data presented as mean ± SD. P presented the comparison among the 3 groups. P1 presented the comparison between DEX1 and DEX2. P2 presented the comparison between DEX1 and group CONTROL. P3 presented the comparison between group DEX2 and group CONTROL.*Denoted statistically significant difference ($P < 0.05$).

Discussion

The effectiveness of dexamethasone as combined with bupivacaine in QLB versus QLB with IV dexamethasone or QLB alone was studied in this clinical trial. We could not find previous clinical trials that compared the analgesic efficacy of systemic route versus local dexamethasone in QLB block in paediatric renal surgeries.

The results revealed that dexamethasone has a significant impact in the analgesia periods presented by the time until the first rescue analgesia request,

Table 3. *Time to 1st request of rescue analgesics (hours) and total morphine consumption (mg).*

		Group DEX1	Group DEX2	Group CONTROL	Test	*P* value	P1	P2	P3
Time to 1st request of rescue analgesics (hours)	Range	5.1 – 8.5	5.6 – 9	4.5 – 8.3	F: 8.190	0.001*	0.070	0.029*	0.001*
	Mean ± SD	6.61 ± 1.06	7.08 ± 0.97	6.04 ± 1.19					
Total morphine consumption (mg)	Range	3 – 8	1 – 4	8 – 15	F: 266.543	0.001*	0.001*	0.001*	0.001*
	Mean ± SD	5.51 ± 1.54	2.09 ± 1.04	11.34 ± 2.27					

Data presented as mean ± SD. P presented the comparison among the 3 groups. P1 presented the comparison between group DEX1 and group DEX2. P2 presented the comparison between group DEX1 and group CONTROL. P3 presented the comparison between group DEX2 and group CONTROL.*Denoted statistically significant difference ($P < 0.05$).

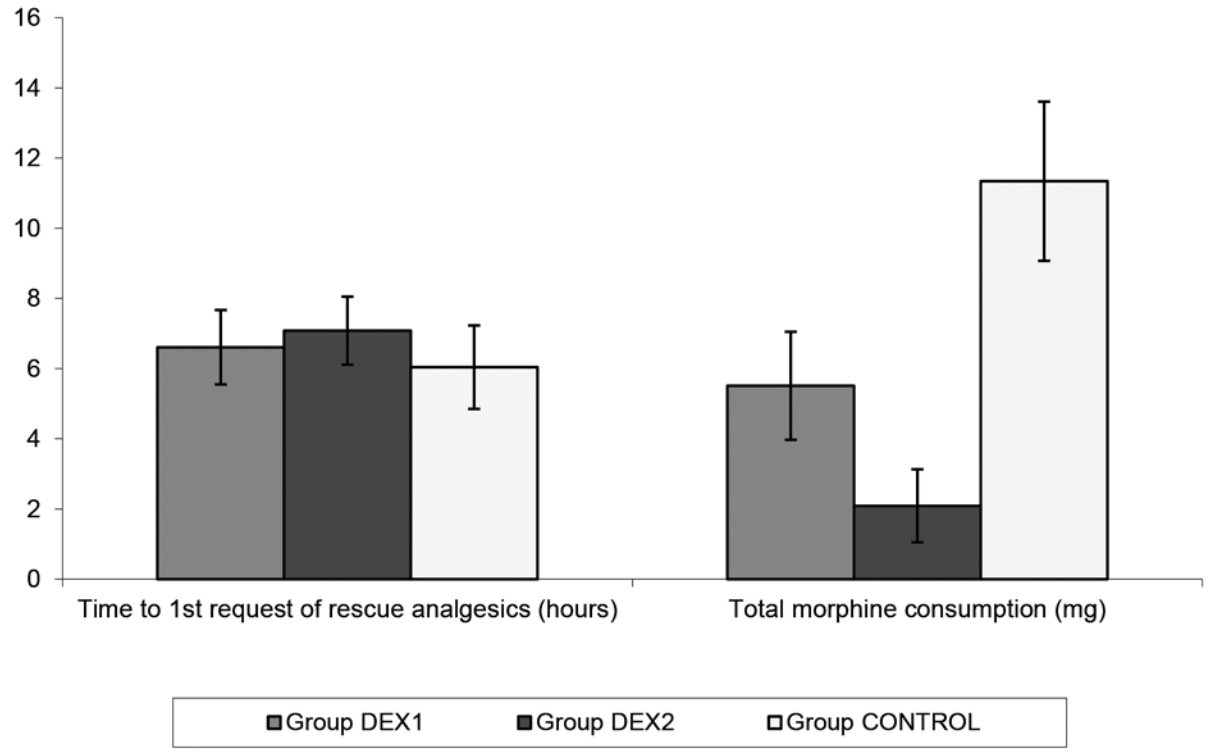

Fig. 2. *Time to first rescue analgesia in hours, total morphine consumption in mg, and duration of analgesia in hours in 3 groups. Data presented as mean ± SD.*

Table 4. *Parent satisfaction scores.*

Parent satisfaction scores	Group DEX1		Group DEX2		Group C0NTROL		X^2	*P* value	P1	P2	P3
	N	%	N	%	N	%					
Unsatisfied	5	14.3	0	0	25	94.3	141.616	0.001*	0.001*	0.001*	0.001*
Satisfied (good)	23	80	4	11.4	8	5.7					
Satisfied (excellent)	7	5.7	31	88.6	2	0					
Total	35	100	35	100	35	100					

Data presented as number and percentage of patients. P presented the comparison between the 3 groups. P1 presented the comparison between group DEX1 and group DEX2. P2 presented the comparison between group DEX1 and group CONTROL. P3 presented the comparison between group DEX2 and group CONTROL.*Denoted statistically significant difference ($P < 0.05$).

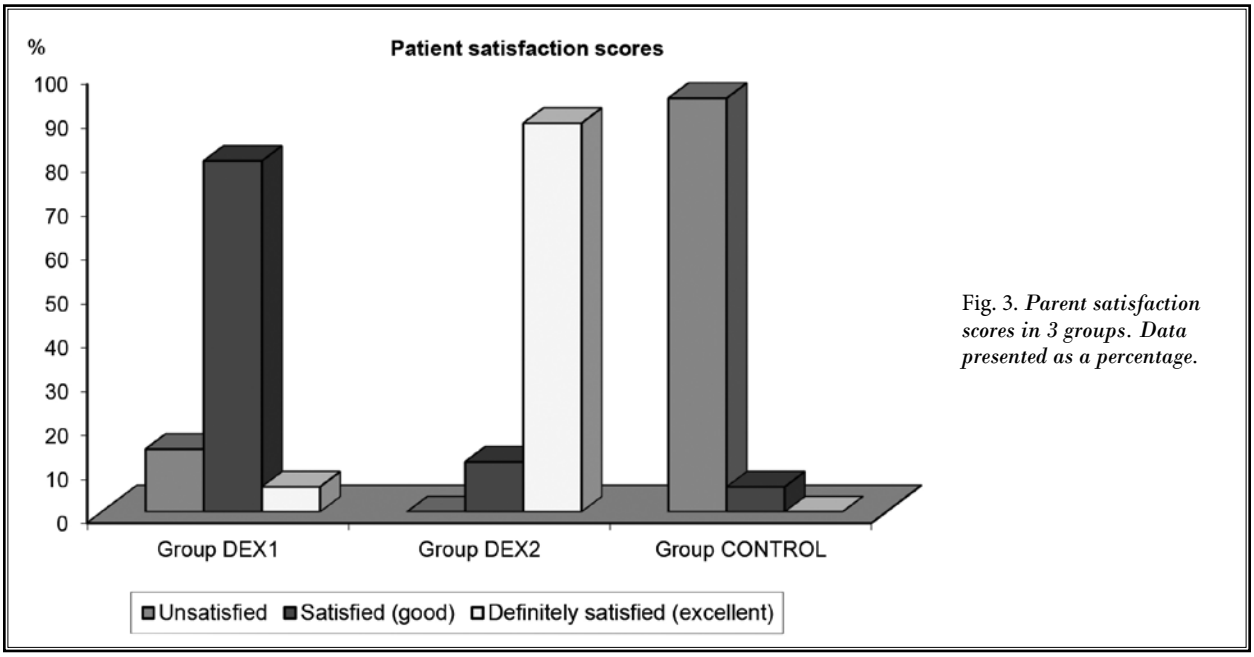

Fig. 3. *Parent satisfaction scores in 3 groups. Data presented as a percentage.*

Table 5. *Complications between groups.*

Complications	Group DEX1		Group DEX2		Group CONTROL		X^2	*P* value
	N	%	N	%	N	%		
Hypotension	0	0	0	0	5	14.3	10.503	0.005*
Bradycardia	5	14.3	0	0	5	14.3	5.532	0.063
PONV	0	0	1	2.9	5	14.3	7.419	0.024*

Data presented as number and percentage of patients. P presented the comparison between the 3 groups. P1 presented the comparison between group DEX1 and group DEX2. P2 presented the comparison between group DEX1 and group CONTROL. P3 presented the comparison between group DEX2 and group CONTROL.*Denoted statistically significant difference ($P < 0.05$).

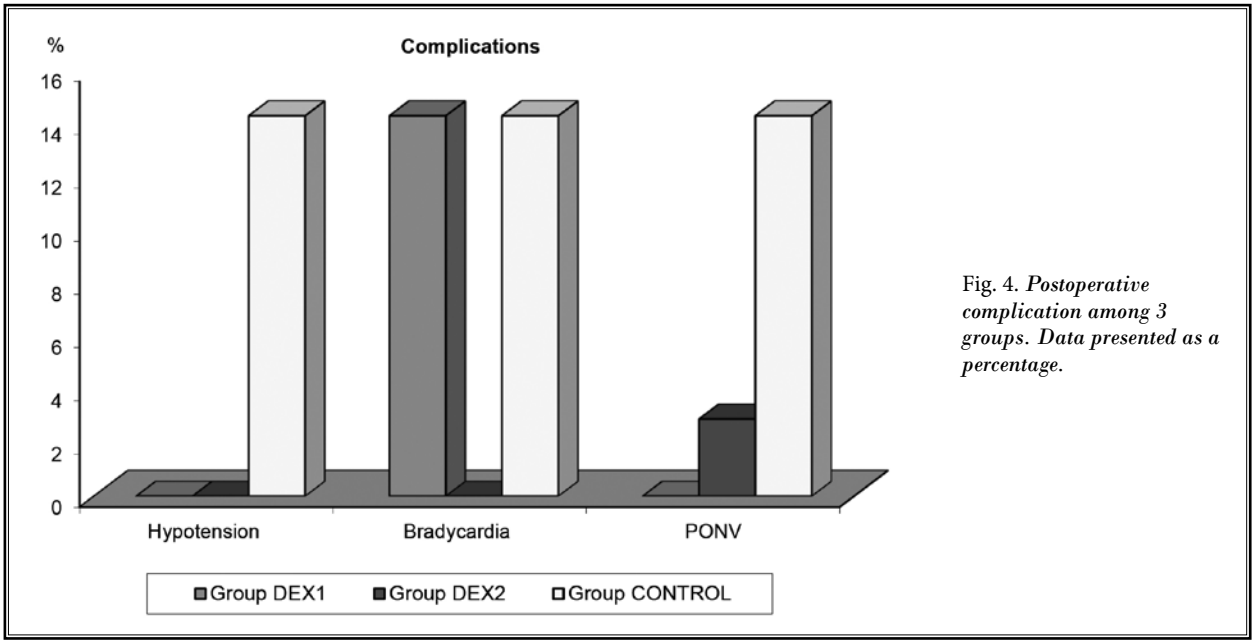

Fig. 4. *Postoperative complication among 3 groups. Data presented as a percentage.*

Table 6. *Pediatric Objective Pain Scale between groups.*

Objective Pain Scale		Range			Mean	±	S. D	F. test	*P* value		
1h.	Group DEX1	0	–	3	1.51	±	0.95	0.127	0.881	P1	0.630
	Group DEX2	0	–	3	1.63	±	1.03			P2	0.904
	CONTROL	0	–	3	1.54	±	0.98			P3	0.714
2h.	Group DEX1	0	–	3	2.00	±	0.84	19.443	0.001*	P1	0.860
	Group DEX2	1	–	3	2.03	±	0.75			P2	0.001*
	CONTROL	2	–	3	2.89	±	0.32			P3	0.001*
4h.	Group DEX1	1	–	3	2.46	±	0.70	43.844	0.001*	P1	0.298
	Group DEX2	2	–	3	2.60	±	0.50			P2	0.001*
	CONTROL	3	–	4	3.63	±	0.49			P3	0.001*
6h.	Group DEX1	3	–	6	3.66	±	0.84	69.281	0.001*	P1	0.083
	Group DEX2	2	–	5	3.20	±	1.08			P2	0.001*
	CONTROL	4	–	8	6.06	±	1.30			P3	0.001*
12h.	Group DEX1	3	–	7	3.97	±	1.29	68.676	0.001*	P1	0.528
	Group DEX2	3	–	5	3.80	±	0.83			P2	0.001*
	CONTROL	5	–	8	6.63	±	1.21			P3	0.001*
18h.	Group DEX1	3	–	6	4.43	±	1.01	67.017	0.001*	P1	0.192
	Group DEX2	2	–	6	4.09	±	0.95			P2	0.001*
	CONTROL	5	–	9	6.86	±	1.29			P3	0.001*
24h.	Group DEX1	5	–	8	6.97	±	1.15	0.739	0.480	P1	0.395
	Group DEX2	5	–	9	6.74	±	1.34			P2	0.749
	CONTROL	6	–	8	7.06	±	0.80			P3	0.242

Data presented as mean ± SD. P presented the comparison among the 3 groups. P1 presented the comparison between group DEX1 and group DEX2. P2 presented the comparison between group DEX1 and group CONTROL. P3 presented the comparison between group DEX2 and group CONTROL.* Denoted statistically significant difference ($P < 0.05$).

improve the quality of analgesia proved by total morphine consumption postoperatively, POPS scores and high satisfaction scores when given either systemic or as an adjuvant in QLB. Moreover, has demonstrated a lower incidence of side effects than QLB alone in children scheduled for renal operations.

QLB was described in 2007 by Blanco for the first time as 2 separate forms with an injection to the posterior and anterolateral sides of the QL muscle (33). Many investigators demonstrate dexamethasone's analgesic effectiveness in transversus abdominis plane blocks (TAP) (34). The adjuvant properties of dexamethasone to LA is not fully proofed. However, its anti-inflammatory and antiemetic properties are fully understood, through suppression of phospholipase A2 and the activation of glucocorticoid receptors. When corticosteroids were administered locally, they may exhibit their analgesic action through inhibiting signal transmission of nociceptive C-fibers (35). All previous studies have recommended administering dexamethasone for analgesic purposes, regardless of its mode of action (36,37).

General anaesthesia (GA) is frequently used in open renal surgeries, as it provides better airway management, maintains anaesthesia depth, and with no time limit as in regional routes. However, GA has some drawbacks, like high opioid requirements to maintain effective analgesia which is usually lead to high rates of postsurgical nausea, vomiting, shivering, and pruritus. Also, opioids could cause postoperative hyperalgesia with increased pain severity and subsequent increased opioid consumption (38,39).

The incorporation of US in regional blocks resulted in efficient enhancement in the nerve block quality with fewer complication rates and enhanced parent and patients' satisfaction. New adjuvant drugs have an adequate print in acute pain relief (40). QLB is an effective technique to control post-surgical pain in various renal and abdominal wall incisions as it covers thoracic 7 to lumbar 2 dermatomes by the distribution of LA drugs either into paravertebral space or thoracolumbar plane, through mechanoreceptors, iliohypogastric and ilioinguinal nerves, A and C fibre nociceptor, and a high-density network of lumbar sympathetic fibre (41). This study revealed no differences statistically among the 3 groups regarding age (years), gender, weight, ASA status, and surgery duration (min).

Regarding the time requested for the first rescue analgesia, there was a significant difference between groups DEX1 and DEX2 as compared to group CONTROL ($P = 0.001$), where group DEX2 had a more prolonged time till first rescue analgesia in comparison to group DEX1 insignificantly (P1 = 0.070). These were like those obtained by Geeta et al (42) who reported the effect of adding dexamethasone or buprenorphine to levobupivacaine on control of pain of inguinal hernia repair in the postoperative periods by US-guided TAB.

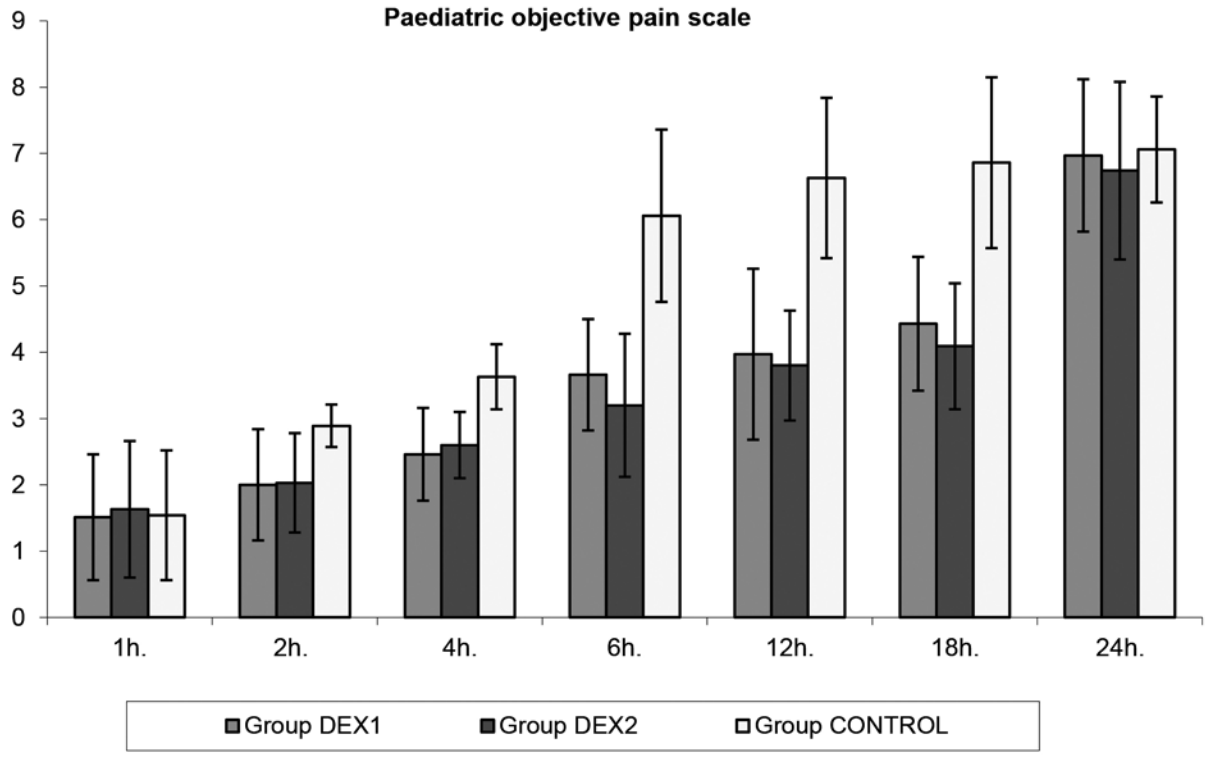

Fig. 5. *Pediatric objective pain scale among 3 groups. Data presented as mean ± SD.*

Additionally, M. Baeriswyl et al (43) found slightly longer analgesia periods in the perineural than systemic dexamethasone group over a meta-analysis compared the analgesic efficiency of both routes of dexamethasone. Moreover, Veena G et al (44) studied the impacts of perineural versus systemic dexamethasone in upper limb surgery and reported a significant increase in the time requested for first rescue analgesia in the perineural route as compared with the systemic group. Whereas that conducted by Paul G. McHardy et al (45) showed perineural dexamethasone effects was slightly shorter than systemic dexamethasone on prolongation of the analgesia total time and first rescue analgesia timing but without any significant difference ($P = 0.78$).

Despite the effective action of bupivacaine, it has a limited analgesic period, hence adjuvants to LAs are required in the nerve blocks or the use of alternative analgesic administration for breakthrough surgical site pain when the block wears off. Various adjuvants have been utilized and studied to improve the effect and time of LA action in different peripheral nerves and regional block techniques (46). Dexamethasone has been used to prolong pain-free periods, decrease rescue opioid utilization, more patient satisfaction and lesser rates of nausea and vomiting when given in combination with LA (47-49). A similar outcome was noted in this study.

Regarding the incidence of nausea and vomiting in the postoperative 24 hours, the DEX1 and DEX2 groups showed less incidence of vomiting in comparison to group CONTROL. This is parallel to Sangeeta et al study (50) which demonstrated that the group receiving dexamethasone had a lower incidence of nausea and vomiting than the group having only QLB block without dexamethasone. This can be attributed to both lower consumption of opioids and the antiemetic role of dexamethasone.

The antiemetic mechanism of dexamethasone was suggested by Chu CC et al (51) due to its anti-inflammatory effect, effect on the solitary tract centrally, interaction with serotonin, and alpha-adrenaline Also, another study coincides with the effect of dexamethasone on postoperative vomiting that parallels the current study; the study conducted by Ammar et al (52) denoted lower rates of nausea and vomiting in groups that receive dexamethasone.

On spotting patient satisfaction, this study revealed that patients were more satisfied in groups DEX1 and DEX2 compared to group CONTROL which receive the QLB only. And this coincides with the study conducted by Sangeeta et al (50). The patient´s parent, who was called via phone cell at home denoted that the patient used no analgesic syrup, did not develop nausea and vomiting, and his family was fully satisfied with the general status and painless status.

This study found that QLB provided effective postoperative analgesia and reduced the need for morphine for both the DEX1 and DEX2 groups which was in line with many other studies that found the same efficacy in children following kidney surgery (53). While Rahangdale R et al (54) stated that adding dexamethasone perineural or IV did not improve narcotic intake for lower limb surgeries after sciatic nerve block.

Concerning the pediatric objective pain scale; it was lower with excellent analgesic scores up to the first 4 hours in all groups and gradually increased stepwise till the 24 hours period and better significantly in groups DEX1 and DEX2 as compared to group CONTROL after the first hour postoperatively. Moreover, POPS was better in group DEX2 than in group DEX1 without significant differences between these 2 groups. This is like Paul G. McHardy et al (45) who reported better pain scores in the perineural group than the IV dexamethasone group without significant difference.

Limitations

Since all of the children were sedated postoperatively affecting pain evaluation and as a result, only unilateral surgical operations with a small surgical incision were included, the impact of QLB had to be evaluated when a bilateral surgical procedure was performed.

Conclusions

Dexamethasone has a marked hand on prolongation of the postoperative analgesia time as evidenced by less time to rescue analgesia request, fewer complications and less morphine consumption when added to bupivacaine in QLB as compared to QLB alone in unilateral surgical operations with a small surgical incision. The current study suggested that perineural use may be more effective than systemic administration in terms of analgesic effects observed in the time for 1st rescue analgesic, total morphine consumption during the 24 hours follow-up and POPS scores during the first 18 hours postoperative without any impact on the other pain-related outcomes.

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