Original Article

Peri Ilioinguinal Nerve Block Versus Subcutaneous Infiltration with Bupivacaine in Pediatric Below Umbilical Surgery – Randomized Control Trial

Compare Periilioinguinal Nerve Block with Subcutaneous Wound Infiltration

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ABSTRACT

Objective: To compare periilioinguinal nerve block with subcutaneous wound infiltration in below umbilical surgeries in pediatric surgical patients.

Study Design: Randomised control trial study

Place and Duration of Study: This study was conducted at the department of Anaesthesiology, ICU and Pain medicine at Mohiuddin Islamic Medical College teaching hospital, Mirpur, AJK from 12th May till November, 2025.

Methods: This study included fifty ASA I and II elective surgical pediatric patients in a teaching tertiary care hospital. Patients were randomized into group P (Periilioinguinal block) and group S (Subcutaneous infiltration). Endotracheal tube was inserted after general anesthesia induction with ketamine and propofol.

Results: Fifty elective surgery patients were randomly assigned in two groups, group P (Periilioinguinal) and group S (Subcutaneous infiltration). The minimum age in group P and S was 10 months and maximum in group P is 9 years and group S is 8 years. There were 24 males in group P and 21 males in group S while 1 females in group P and 4 females in group S. Using FLACC score, no pain noted in thirteen patients in P group vs 5 in S group which was statistically significant at 1st hour postoperatively ($p<0.005$). Using NRS score, no pain noted in 13 patients in P group while 5 in S group which was statistically significant at 1st hour postoperatively ($p<0.005$). At 6th and 12 hours, more pain noted in S than P group but not statistically significant. (p 0.345).

Conclusion: Periilioinguinal nerve block improves the pain management of pediatric surgical patients compared to subcutaneous wound infiltration with bupivavaine technique making it a valuable choice in multimodal analgesia in low income countries for elective and emergency surgeries pediatric anaesthesia.

Key Words: Periilioinguinal, subcutaneous, pain, complications.

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INTRODUCTION

In low income countries (LIC's), we always strive for an anesthesia management plan that is cost effective with fast recovery. Ultrasound becomes a gold standard for pain blocks but cost involved is still a burden difficult to bear. Different ultrasound techniques used to make it spot on for best clinical outcomes.

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No one anesthesia technique can be fit for all patients but different approaches like opioid free and opioid sparing moved forward for better anesthesia and surgical outcomes. A multimodal opioid sparing technique remains ideal. In opioid free anesthesia often five to six different adjuvants polypharmacy used make increasing risks of errors also made attaining desirable balanced anesthesia depth challenging.

Paediatric surgeries always an enormous challenges for surgeons and anaesthetists globally. Pain management is the backbone of balanced anesthesia for pediatric surgeries whch have increased globally[1]. Below umbilical surgeries mainly make ilioinguinal and iliohypogastric target nerves in most cases. Every innovation related with pain management studied in this area signified the same target nerves[2]. Target nerve blocks with local anesthetics proven useful for providing analgesia for inguinal hernia repair, orchidopexy, hydrocoele repair and varicocoele surgery. Land mark techniques are associated with failures as high as 40%, gut injuries, hematoma

formation and transient femoral nerve blocks.[3] Pre emptive analgesia to multi modal analgesia, opioid free to opioid sparing analgesia, new and latest equipments for delivery of analgesia, use of nociception and BIS monitoring for gauging analgesia and anesthesia all strive forward for a balanced analgesia and anaesthesia technique. Use of targeted nerve blocks help in reducing the use of opioids and reduction of complications. Enhanced recovery after surgery is incomplete without use of local anaesthetics for pain management. Nerve stimulators and ultrasound revolutionalised the field of pain medicine. Optimal dose of local anaesthetics with minimal concentration helps in maximum analgesia and fewer adverse effects. Anatomical variations in inguinal region in children is mainly because of it's small size and thin abdominal tissue wall. This makes the patients prone to injury to visceras in abdomen by needle as distance is too small between puncture point to the target nerves .[4] Supine position anatomical variations also makes it challenging for non routine users.[5] Even with ultrasound expert hands required to overcome the challenges in technique and anatomical variations .[6,7] Even variable positions in placement of ultrasound probe been tested for an accurate position of ilioinguinal and iliohypogastric nerves path between internal oblique and transversus abdominis muscles for preventing the localization mistakes [8,9] with variable clinical effects in search for reducing injury complications[10].

Landmark techniques, nerve stimulators and different ultrasound probe techniques all for avoiding opioid induced adverse effects and a perfect pain management plan so we performed a periilioinguinal technique with no special equipment or additional costs but surgeons employing it under vision with precision.[11]

METHODS

The study was conducted after approval from ethical review committee of Mohiuddin Islamic Medical College , Mirpur, Azad Kashmir . Informed written consent taken from all study participants. Fifty consecutive patients meeting the inclusion criteria divided into two groups, group P (Peri ilioinguinal group) and group S (Subcutaneous infiltration group) each with twenty five patients. . Randomisation was conducted using a computer-generated randomisation sequence to ensure allocation concealment. Group assignments were placed in sealed opaque envelopes that were opened sequentially by medical officers immediately before administering the allocated intervention. This ensured strict adherence to the randomisation protocol and prevented selection bias. All patients had a running intravenous cannula and standard monitors (non invasive blood pressure, pulse oximeter and ECG) before starting. A baseline heart rate and blood pressure taken. Ringer's lactate using 4:2:1 weight based formula for intravenous fluids. All patients in group P received intravenous 1 mg/kg ketamine over 30 seconds. Atracurium 0.5 mg/kg given intravenously. The endotracheal tube inserted after loss of consciousness and eye lash reflex. In case , eye lash reflex is still intact further boluses of 0.5mg/kg ketamine intravenously will be used. In group S , patient received intravenous 1mg/kg Propofol over 30 seconds. Nalbuphine 0.1 mg/kg given. The endotracheal tube was inserted after loss of consciousness and eye lash reflex. In case , eye lash reflex is still intact further boluses of 0.5mg/kg propofol intravenously given. All endotracheal tube insertions was done by consultant anaesthetist. After the surgeon disinfected and laid the drapes, the operation began. Heart rate, blood pressure, and SpO2 were recorded before and after skin incision and during peritoneal traction. Group P also received periilioinguinal block with intravenous dexamethasone 0.1mg/kg while group S will receive subcutaneous nerve infiltration at incision site by the operating surgeon. Bupivacaine 0.25% in a safe dose of 1mg/kg given in both groups. After confirming the periilioinguinal plane by surgeon, 0.4 mL/kg of local anesthetic solution was injected. The body movement situation that affected the surgical process during the operation was recorded. The occurrence of SpO2 < 90% in the child during the operation was recorded. The vital signs and surgical incision pain of the child were recorded.

RESULTS

Data entry and analysis was done by using SPSS version 27. This study included fifty elective pediatric surgical patients divided into two groups. Group P consisted of 24 males and 1 female and with a minimum age was 10 months and maximum 9 years. Group S consisted of 21 males and 4 females with minimum age of 10 months and maximum 8 years.

Table No. 1: General demographics of the study

Category	Periilioinguinal nerve block group	Subcutaneous infiltration group	P value
Age	10 Months 9 Years	10 Months 8 Years	
Gender	Male 24 Female 1	Male 21 Female 4	
Weight	Male: 6.7 KG Female: 34 KG	Male: 4.5 KG Female: 37 KG	P= 0.782
ASA	I 9 II 16	I 8 II 17	P= 0.785
Propofol		1.9 MG/KG MEAN	
Ketamine	1.7 MG/KG MEAN		

Table No. 2: FLACC score in no. of patients in group P & S

Groups	No Pain	Mild Pain	Moderate Pain	Severe Pain	P Value
		FLACC	1ST Hour		
Group P Group S	13 5	11 10	01 10	0 0	0.004
		FLACC	6TH Hour		
Group P Group S	12 8	11 12	2 5	0 0	0.345
		FLACC	12TH Hour		
Group P Group S	20 22	4 2	1 1	0 0	0.683

Table No. 3: NRS Pain score in no. of patients in group P & S

Groups	No Pain	Mild Pain	Moderate Pain	Severe Pain	P Value
		NRS	1ST Hour		
Group P Group S	13 5	10 8	2 12	0 0	0.004
		NRS	6TH Hour		
Group P Group S	12 5	8 11	5 9	0 0	0.105
		NRS	12TH Hour		
Group P Group S	19 17	5 7	1 1	0 0	0.801

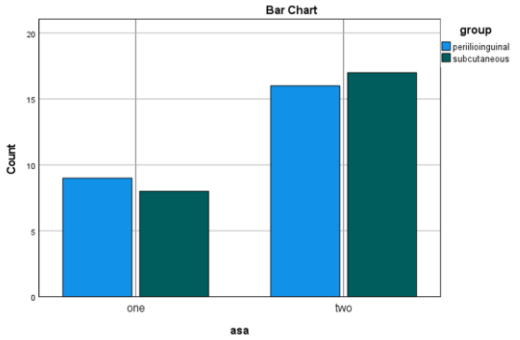

Figure No.1: Bar chart

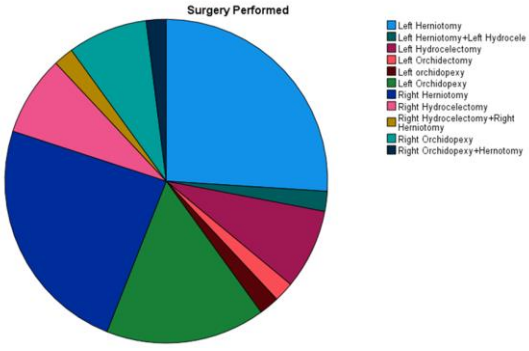

Figure No.2: Surgery performed

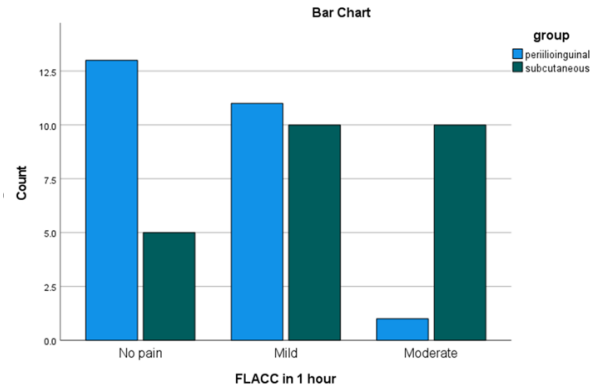

Figure No.3: Bar Chart - FLACC in 1 hour

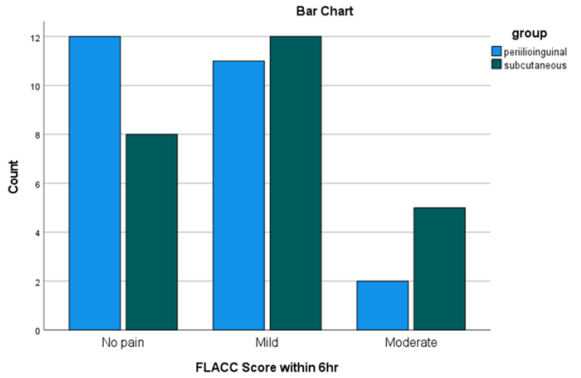

Figure No.4: Bar Chart - FLACC Score within 6hr

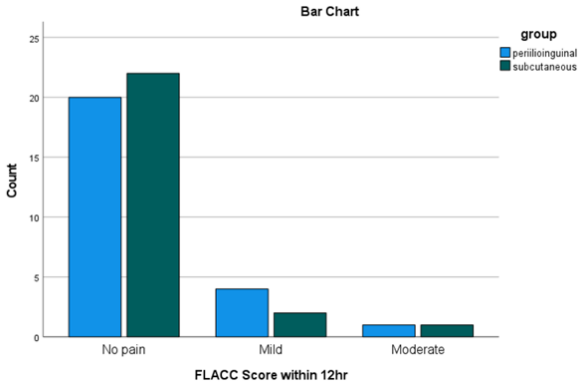

Figure No.5: Bar Chart - FLACC Score within 12hr

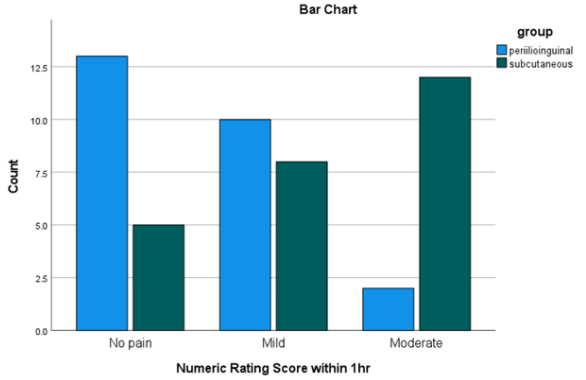

Figure No.6: Numeric rating score within 1hr

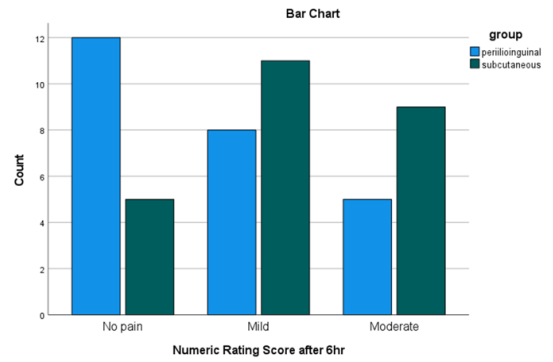

Figure No.7: Numeric rating score within 6hr

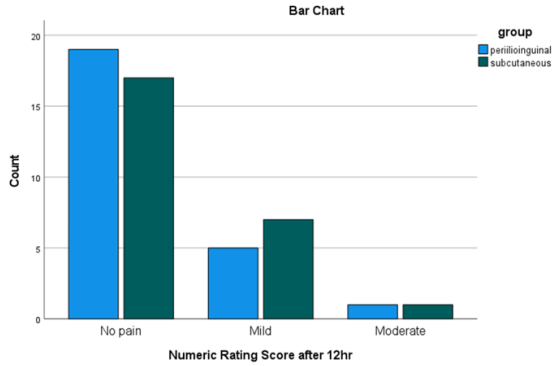

Figure No.8: Numeric rating score within 12hr

ASA I nine patients in group P while eight in group S. ASA II sixteen patients in group P while seventeen in group S. fig. 1. Most surgical patients 28 (56%) included underwent herniotomy as surgical distribution been shown in fig. 2. General demographics, propofol and ketamine mean findings shown in table 1. The primary outcome measure of this study was the incidence of postoperative pain with FLACC and NRS was more at 1st,6th and 12 hours in group S when compared with group P (Table 2, 3 fig. 3,4,5,6,7,8). The secondary outcome measure of abnormal body movements during surgery were only found in two patients in group S. SPO_2 remained stable and more than 95 % in both study group patients intraoperatively and in PACU. The statistically significant difference considered as $p < 0.05$ level.

DISCUSSION

Pain management is of pivotal importance in post surgical patients. Pain incidence is multifactorial depending on patient, surgical and anesthesia factors. Our study compared the Periilioinguinal block and subcutaneous infiltration of wound with ketamine and propofol induction to strive forward for an anesthesia technique suitable for both elective and emergency pediatric surgeries with minimum resources and less complications. The results found significant reduction in pain at 1st postoperative hour in periilioinguinal block in comparison to subcutaneous infiltration of wound with ketamine induction. The incidence of any intraoperative abnormal patient movements also reduced in periilioinguinal block group in comparison to subcutaneous group.

Surgery and opioids always found a routine as an essential component in general anesthesia [12,13]. It's been linked with any opioid abuse in future life [12,14]. In our study we used ketamine with periilioinguinal block to make it an opioid free technique. In subcutaneous group we used propofol in combination with nalbuphine. It's predicted that if opioid is in plan of pain management in a pediatric surgical patient it increases risk of abuse and dependence later in life of these agents [12,15]. Therefore we successfully avoided any opioid use with ketamine induction and mean dose of ketamine remained lower than propofol during these procedures. The concern regarding dependence on opioids remained a grave concern in pediatric and adult patients [16]. Avoidance or minimal sparing usage techniques been employed using multiple non opioid adjuvants [17]. We used ketorolac in rescue analgesia and it's requirement remained lower in periilioinguinal group during first twelve hours of recovery. All these adjuvants been employed with a simple and single purpose of developing a safe and efficient technique with minimal adverse effects [17,18]. Instead of landmark technique this periilioinguinal block is with more success and less failure mainly because employed under vision by surgeons. Patients outcomes, recovery and minimal or no adverse effects are of prime importance in every anesthesia plan [19]. Analgesic effect of subcutaneous group may be lower initially in 1st hour but improved remarkably during 6th and 12th hour as we proved using multiple pain scales using FLACC and NRS pain system. We considered the FLACC scale for measuring observational pain in infants and children as in comparison with other pain scales assessing pain in children is more convenient and practical in recording pain[20].Combining it with NRS it to improve the validity of our results and management plans.[21]

Limitations: This study has several limitations. Firstly, the sample size was relatively small, which may have introduced a statistical bias. Secondly, majority of patients were males so we need a larger group with more females representation. Third, new novel agents like esketamine and dexmedetomidine needs to compare with ketamine for ideal outcomes in a larger diversified groups.

CONCLUSION

Periilioinguinal nerve block improves the pain management of pediatric surgical patients compared to subcutaneous wound infiltration with bupivavaine technique making it a valuable choice in multimodal analgesia in low income countries for elective and emergency surgeries pediatric anaesthesia.

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Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Muhammad Shazad, Saqib Ismail, Hassan
Drafting or Revising Critically:	Omer Jalil, Aiman Ikram, Daniyal Ghazanfar
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

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REFERENCES

1. Yeap E, Pacilli M, Nataraja RM. Inguinal hernias in children. Aust J Gen Pract 2020;49(1-2):38-43.
2. Elahwal L, Elrahwan S, Elbadry AA. llioinguinal and iliohypogastric nerve block for acute and chronic pain relief after caesarean section: a randomized controlled trial. Anesthesia / Pain Med 2022; 12(2):el21837.
3. Amory C, Mariscal A, Guyot E, et al. Is ilioinguinal/iliohypogastric nerve block always totally safe in children?. Pediatric Anesthesia. 2003 Feb;13(2):164-6.
4. Morini F, Dreuning KMA, Janssen Lok MJH, et al. Surgical management of pediatric inguinal hernia: a systematic review and guideline from the European Pediatric Surgeons' Association Evidence and Guideline Committee. Eur J Pediatr Surg 2022;32(3): 219-232.
5. Ojo AK, Olajumoke TO, Kolawole IK, Adetoye AO, Elegbe EO. Analgesic efficacy of bupivacaine with or without magnesium adjunct in bilateral ilioinguinal and iliohypogastric nerve blocks following cesarean section under subarachnoid block: a randomized controlled trial. Saudi J Anaesthesia 2023;17(3):318-326.
6. Singh GP, Kuthiala G, Shrivastava A, Gupta D, Mehta R. The efficacy of ultrasound-guided triple nerve block (ilioinguinal, iliohypogastric, and genitofemoral) versus unilateral subarachnoid block for inguinal hernia surgery in adults: a randomized controlled trial. Anaesthesia/ intensive Ther 2023;55(5):342-348.
7. Omara AF, Elbadry AA, Abo Hagar AM. Quadratus lumborum block against coupled transversus abdominis block and ilioinguinal/ iliohypogastric nerve blocks for postoperative analgesia after total abdominal hysterectomy: a randomized controlled trial. Anesthesia/ Pain Med 2023;13(2): e134845.
8. Samerchua A, Leurcharusmee P, Panichpichate K, et al. A prospective, randomized comparative study between ultrasound-guided posterior quadratus lumborum block and ultrasound-guided ilioinguinal/iliohypogastric nerve block for pediatric inguinal herniotomy. Paediatr Anaesth 2020;(4):498-505.
9. Priyadarshini K, Behera BK, Tripathy BB, Misra S. Ultrasound-guided transverse abdominis plane block, ilioinguinal/iliohypogastric nerve block, and quadratus lumborurn block for elective open inguinal hernia repair in children: a randomized controlled trial. Reg Anesth Pain Med 2024;7 (4):217-221.
10. Chen J, Song D, Zheng G, Luo Y. Systematic review and meta-analysis of the effect of nerve block under ultrasound in ilioinguinal/ iliohypogastric in children. Transl Pediatr 2021;1(I 0):1604-1614.
11. Pan Li, Wen Tang. Efficacy of Ultrasound-Guided lliohypogastric and llioinguinal Nerve Block for Anesthesia in Pediatric Inguinal Surgery, J Pain Res 2025;1891-1899.
12. Glenn E, Steven Z, Singh N, et al. Opioid-free anesthesia for adenotonsillectomy in children. Int J Pediatr Otorhinolaryngol 2021;140:110501.
13. Yazan K. Rizeq BS, Benjamin T. Trends in perioperative opioid and non-opioid utilization during ambulatory surgery in children 2019;166: 172-176.
14. Uysal HY, Takmaz SA, Yaman F, et al. The efficacy of intravenous paracetamol versus tramadol for postoperative analgesia after adenotonsillectomy in children. J Clin Anesthesia 2011;23:53-57.
15. Afman CE, Afman CE, Welge JA. Steroids for post-tonsillectomy pain reduction: meta-analysis of randomized controlled trials Otolaryngology Head Neck Surg 2006;134:181-186.
16. Echevarria et G, Echevarría F, Elgueta C, et al. Nitrous oxide (N2O) reduces postoperative opioid-induced hyperalgesia after remifentanil–propofol anaesthesia in humans. Br J Anaesth 2011;107:959-965.
17. Clarke H, Neilesh S, Dennis T, et al. Rates and risk factors for prolonged opioid use after major surgery: population based cohort study. Br Med J 2014;348:g1251.
18. Harbaugh CM, Jay S, Hsou Mei, et al. Persistent opioid use among pediatric patients after surgery. Pediatr 2018;141(1): 20172439.
19. Bennett KG, Harbaugh CM, Hu HM, Vercler CJ, Buchman SR, Brummett CM, et al. Persistent opioid use among children, adolescents, and young adults after common cleft operations. J Craniofacial Surg 2018;29(7):1697-1701.
20. Peng T, Qu S, Du Z, Chen Z, Xiao T, Chen R. A systematic review of the measurement properties of face, legs, activity, cry and consolability scale for pediatric pain assessment. J Pain Res 2023;12:1185-96.
21. Miró J, Castarlenas E, Huguet A. Evidence for the use of a numerical rating scale to assess the intensity of pediatric pain. Eur J Pain 2009;13: 1089-95.