Оригінальна стаття / *Original article*

Том 9, № 3–4 • 2024

PainMedicine Journal

Медицина Болю // Медицина Боли

www. painmedicine.org.ua

Міждисциплінарний • Науково-практичний журнал

DOI: 10.31636/pmjua.v9i3–4.5

Comparative study of bupivacaine and bupivacaine plus dexamethasone under ultrasound guidance for sacral erector plane block in pediatric urological surgeries

Esmat Mundrawala, Usha Badole, Poornima Sonkamble, Sukriti Atram

Medical College and Sir J.J Group of Hospitals, Mumbai, India

Abstract

Background. *Sacral erector spinae plane block is a relatively new and safe interfascial plane block for paediatric urogenital surgeries. We aimed at comparing the intraoperative and postoperative analgesic efficacy of Bupivacaine alone and Bupivacaine plus Dexamethasone in ultrasonography guided single shot sacral erector spinae plane block for urogenital surgeries in paediatric patients under general anaesthesia.*

Methods. *30 patients, ASA 1 / 2, 12 months — 12 years undergoing urogenital surgeries were randomly divided into 2 groups. Under general anaesthesia, in prone position, with linear ultrasound probe placed longitudinally in the midline; 25 G, 90 mm spinal needle was advanced craniocaudally until its tip reached the 4th sacral crest and prepared drug was injected. Group A received 1ml/kg of 0.25 % Bupivacaine with 2ml saline. Group B received 1 ml/kg of 0.25 % Bupivacaine with 0.2mg/kg Dexamethasone in saline to make total volume of 2 ml.*

Results. *All patients remained haemodynamically stable intraoperatively in both groups with comparable duration of analgesia postoperatively. Also, the difference in mean FLACC R score upto 24 hours postoperatively was not significant between the two groups and no side effects were reported.*

Conclusion. *The addition of Dexamethasone to Bupivacaine in ultrasonography guided single shot sacral erector spinae plane block for urogenital surgeries in paediatric patients under general anaesthesia neither modified the analgesic efficacy of Bupivacaine intraoperatively nor did it significantly prolong the duration of analgesia postoperatively.*

Key words. *Sacral erector spinae plane block, fascial plane block, ultrasonography, bupivacaine, dexamethasone.*

Introduction

Perioperative analgesia has improved in recent years due to the wide application of regional anaesthesia techniques including the more safer interfascial plane blocks.

ISSN 2414–3812

The erector spinae plane block (ESPB) is a novel paraspinal plane block first described by Forero in 2016 to relieve thoracic pain [1]. Tulgar et al. were the first to describe the sacral ESPB as a means to provide analgesia to sacral dermatomes for a pilonidal sinus surgery [2]. The sacral ESPB has since been described to provide pain control for paediatric hypospadias repair and lower extremity radicular pain [3, 4]. It is easy to perform, reduces the requirement of inhaled and intra venous anaesthetic agents, attenuates the stress response to surgery, facilitates rapid and smooth recovery and provides reliable analgesia in the immediate postoperative period. Also, it can be used as a viable alternative to opiods, neuraxial, caudal blocks and peripheral nerve blocks (pudendal nerve block) thus overcoming their limitations such as nausea, vomiting, respiratory depression, hypotension, hematoma, etc. however, the duration of analgesia is limited by duration of action of local anaesthetics [5].

Bupivacaine is widely used in regional analgesia techniques in children because of its long duration of action and beneficial ratio of sensory to motor block [6].

Prolongation of analgesia has been achieved by the addition of various adjuvants, such as fentanyl, clonidine, dexmeditomedine, neostigmine, ketamine, midazolam [7].

Dexamethasone is a long acting corticosteroid. When used along with local anaesthetics in sacral erector spinae plane block, it decreases postoperative rescue analgesia consumption following paediatric genitourinary and feminizing/ masculinising genitoplasty surgerie [6, 7, 8].

This study was designed to evaluate the intraoperative and postoperative analgesic efficacy of 0.25 % bupivacaine 1 ml/kg and 0.25 % bupivacaine 1 ml/kg plus 0.2 mg/kg dexamethasone in ultrasonography guided single shot sacral erector spinae plane block for urogenital surgeries in paediatric patients under general anaesthesia.

Methodology

In this prospective, randomized (Sealed envelope method), double blind study, after obtaining approval from institutional ethical committee (iec no./pharm/RP/98/May/23) and written informed consent from parents of the participants, this study was started including 30 patients between age 12 months to 12 years with ASA grade 1 and 2 scheduled for urogenital surgeries in the department of Anaesthesiology, on the patients posted for elective surgery with the cooperation of the paediatric surgery department at tertiary care centre over a period of 6 months.

Preanaesthetic evaluation was done and patients were randomly allocated into two groups. Randomization was done using sealed envelope technique. Routine investigations like CBC, blood sugar, blood urea, ECG were assessed. Children were randomly divided into two groups of 15 patients each:

1. Group A received bupivacaine 0.25 % 1 ml/kg plus 2 ml NS.
2. Group B received bupivacaine 0.25 % 1ml/kg plus dexamethasone 0.2mg/kg in NS to make volume of 2 ml.

Patients were kept nil per oral for 6 hours before surgery. Patients were shifted to the operation theatre and pulse oximeter, non invasive blood pressure and ECG monitors were connected. All children received inj. Glycopyrrolate 0.004 mg/kg and inj. Fentanyl 1mcg/kg as premedication. Either inhalational induction of anaesthesia using 100 % oxygen and sevoflurane 8 % or intravenous induction using 2–3 mg/kg of propofol was done depending upon the age of the patient and presence of an insitu intravenous line. Endotracheal intubation was carried out after full muscle relaxation with inj. Atracurium 0.5 mg/kg. Maintainence of anaesthesia was done with 50 % O2:50 %N2O mixture and sevoflurane 1 %. All children were turned to prone position for administration of sacral ESP block. Following painting and draping the block area, linear ultrasound probe (Sonosite, S-ICU, 8–13 MHZ) was placed longitudinally in the midline just above the sacrum. Median sacral crests and erector spinae muscles were identified.

A 25G, 90 mm spinal needle was inserted from the edge of the probe using in-plane technique. The needle was advanced in a cranial to caudal direction until its tip touched to the top of the 4th median sacral crest. Following negative aspiration, the prepared drug was injected for block application. Children in group A received 1 ml/kg of 0.25 % bupivacaine with 2ml saline while children in group B received 1 ml/kg of 0.25 % bupivacaine with 0.2 mg/kg dexamethasone in saline to make total volume of 2 ml.

The drugs for administration in sacral ESP block were prepared by an anaesthesiologist not participating in the study. The sacral ESP block was given by another anaesthesiologist who was blinded to the drug injected. Then the patient was turned to supine position and surgery started. The patients were observed for any increase in heart rate or mean arterial pressure by 15 % more than the baseline values and presence of any of these parameters was considered a failed sacral ESP block. These

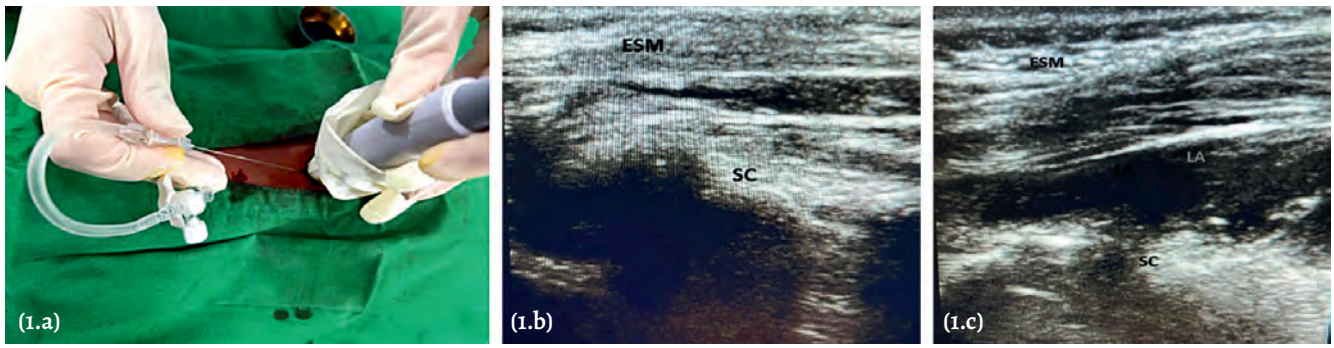

Figure 1: Application of sacral ESP block. (1.a) probe position, (1.b) sonoanatomy showing sacral crests and sacral ES muscle, (1.c) linear spread of local anaesthetic. ESM — erector spinae muscle, SC — sacral crests, LA — local anaesthetic

children were excluded from the study. Intra operative monitoring included heart rate, respiratory rate, non-invasive blood pressure, pulse oximetry and frequency of muscle relaxant top ups. The parameters were documented every 10 min intraoperatively till awakening. Any side effects like breath holding / apnoea, hypotension, involuntary movement and nausea / vomiting were noted. All children were extubated after complete reversal of neuromuscular blockade with inj. Neostigmine 0.05 mg/kg and inj. Glycopyrrolate 0.008 mg/kg. After extubation, pain score was assessed using face, Legs, Activity, Cry, Consolobility Revised (FLACC-R) scale on emergence and 1, 2, 4, 6, 12, 24 h until the first dose rescue analgesia was given in the form of IV PCM 15 mg/kg when FLACC score ≥ 4. The duration of analgesia was defined from the time period between administration of block until FLACC-R score reached ≥ 4.

The sample size was calculated as 15 subjects per group. To detect a difference in the duration of analgesia with an alpha error of 0.05 and beta error of 0.09, 30 children within the age group of 12 months to 12 years coming for urogenital surgeries were enrolled in the study analysis. The observed variables were expressed as mean and standard deviation or numbers and percentage. Continu-

Table 1. Demographic and intraoperative data

PARAMETERS	GROUP A (n = 15)	GROUP B (n = 15)	P VALUE
Gender (M/F)	14/1	14/1	1.000
Mean age (years)	5.80 ± 3.05	4.70 ± 3.18	0.341
Mean weight (kgs)	16.68 ± 5.52	14.85 ± 5.55	0.372
Mean duration of surgery (mins)	132.67 ± 33.27	132.67 ± 31.95	1.000
Mean intraop HR (/min)			
Baseline	111.60 ± 20.83	121.60 ± 15.23	0.145
At 10 mins (incision)	100.00 ± 16.81	104.47 ± 12.65	0.418
Mean intraop SBP (mm hg)			
Baseline	107.80 ± 8.37	106.67 ± 7.99	0.707
At 10 mins (incision)	98.53 ± 7.07	96.80 ± 6.45	0.489
MR top ups			
Required	4 patients (26.7%)	3 patients (20%)	0.33
Not required	11 patients (73.3%)	12 patients (80%)	

Values are expressed in terms of mean ± SD. No significant differences were found between the two groups. (P > 0.05), SD = Standard deviation.

Table 2. Post-operative data

Parameters	Group A (n = 15)	Group B (n = 15)	P value
Mean postop HR (/min)			
Baseline	109.20 ± 9.00	116.20 ± 13.80	0.227
At 12 hours	92.20 ± 10.34	94.53 ± 10.60	0.525
Mean postop SBP (/min)			
Baseline	109.20 ± 9.00	108.80 ± 7.24	0.894
At 12 hours	103.33 ± 6.58	102.80 ± 6.67	0.827
Mean FLACC R score			
90 mins	0.00 ± 0.00	0.00 ± 0.00	
24 hours	2.33 ± 1.23	2.20 ± 1.15	0.761
Duration of analgesia			
8 to 16 hours	1 patient (6.7 %)	—	
16 to 24 hours	2 patients (13.3 %)	1 patient (13.3 %)	0.595
More than 24 hours	12 patients (80 %)	13 patients (86.7 %)	

Values are expressed in terms of mean±SD. No significant differences were found between the two groups. (P > 0.05), SD = Standard deviation.

ous covariates were compared using analysis of variance. The comparision was studied using the Chi-square test or Fisher's exact test or independent t-test as appropriate, with the P value reported at the 95 % confidence interval. P < 0.05 was considered statistically significant.

Results

The current study showed no significant differences in demographic data that included age, gender, weight and also with regards to type and duration of surgery.

There were no significant side effects like hypotension, bradycardia, nausea, vomiting, shivering in any of the groups both intraoperatively and postoperatively.

Discussion

The innervation of external genitalia is mainly by pudendal nerve which arises from S2-S4 levels and accompany the pudendal vessels. Two more nerves ilioinguinal (L1) and genital branch of genitofemoral nerve (L1–L2) arise from lumbar plexus to innervate regions of external genitalia. Sacral ESPB is a fascial plane block that provides somatic and visceral analgesia by blocking the dorsal and ventral rami of spinal nerves [9]. Sacral ESPB block can potentially block pudendal nerve (S2–S4), and may also block part of lumbar plexus via cephalad spread. There is no other individual nerve block besides neuraxial block that can cover both perineum and genitalia. The sacral ESPB offers a practical alternative to neuraxial block or caudal block to provide analgesia for such urogenital procedures.

Tulgar et al [2] first described the analgesic effect of sacral ESP block in 2019 in a 28 year old patient posted for pilonidal cyst excision under general anaesthesia and reported effective analgesia for the first 13 hours without any additional analgesic requirement. Aksu et al [10] reported postop FLACC-R score of 0 to 1 for entire 24 hours using the modification to sacral ESP block with longitudinal midline approach in a 6 month old infant posted for distal hypospadias repair. Mahajan et al [11] described ultrasound-guided sacral erector spinae plane block for analgesia following excision of sacrococcygeal teratoma in two neonates and reported an FLACC score zero and one respectively in the immediate postoperative period. Oksuz et al [12] reported FLACC score of 0 in a 7 month old boy posted for anoplasty during 24 hours post surgery. Bansal et al [13] in a RCT on USG guided sacral ESP block observed that postop mean FLACC score and analgesic requirement was less in the sacral ESP group as compared to the control group.

Kukreja et al [9] studied the effect of ropivacaine in sacral ESP block using the midline approach described by aksu et al. in a 39 yr old transwomen posted for gender reassignment surgery and found that sacral ESP bock is a viable alternative to neuraxial, caudal and pu-

dendal nerve blocks for gender reassignment surgeries. Kilicastan et al [8] studied the effect of bilateral bilevel sacral ESP block in the treatment of perianal chronic intermittent pain in a 62 year old ASA 3 patient, o/c/o anorectal surgery due to rectal adenocarcinoma with Numeric Rating Scale score 8–9/10 and found that no rescue analgesics were needed upto 24 hours. Duarte et al [14] reported effective analgesia with no need for rescue analgesia in a 48 year old ASA 2 patient with sacral fracture posted for posterior arthrodesis from L3 to ileum under general anaesthesia who was administered sacral ESPB. Sawyer, et al [15] sought to review complications sacral erector spinae plane block as an adjunct for pain control in the perioperative period in 13 patients undergoing robotic-assisted penile inversion vaginoplasty under sedation and reported that there were no complications either in the immediate post-block period or after surgery related to the block.

In our study we found out that patient remained hemodynamically stable throughout the procedure in both the groups. The mean duration of analgesia was more than 24 hours and was comparable in both groups.

When the FLACC R score was compared between the two groups postoperatively, it was observed that the mean FLACC R pain score was < 4 upto 24 hours post operatively and the difference was not significant between the two groups. There were no significant side effects like hypotension, bradycardia, nausea, vomiting, shivering, motor blockade, urinary retention in any of the groups. The limitations of our study is relatively small sample size and lack of follow up beyond 24 hours postoperatively

Conclusion

Thus, in conclusion, this study **«A Comparative study between bupivacaine and bupivacaine plus dexamethasone in ultrasonography guided sacral erector spinae plane block for urogenital surgeries in paediatric patients»** shows the following effects.

The addition of 0.2 mg/kg dexamethasone to 0.25 % bupivacaine 1 ml/kg in ultrasonography guided single shot sacral erector spinae plane block for urogenital surgeries in paediatric patients under general anaesthesia neither modified the analgesic efficacy of 0.25 % bupivacaine 1 ml/kg alone intraoperatively nor did it significantly prolong the duration of analgesia postoperatively as compared to the use of 0.25 % bupivacaine 1 ml/kg alone.

However, due to paucity of studies in the paediatric population, there is still scope for further study in the future using different adjuvants and local anaesthetic agents in varied dosage strengths.

References

1. Forero M, Adhikary SD, Lopez H, Tsui C, Chin KJ. The Erector Spinae Plane Block: A Novel Analgesic Technique in Thoracic Neuropathic Pain. Reg Anesth Pain Med [Internet]. 2016 Sep-Oct;41(5):621-7. Available from: https://rapm.bmj.com/content/41/5/621.
2. Tulgar S, Senturk O, Thomas DT, Deveci U, Ozer Z. A new technique for sensory blockage of posterior branches of sacral nerves: Ultrasound guided sacral erector spinae plane block. J Clin Anesth [Internet]. 2019 Nov; 57:129-130. Available from: https://pubmed.ncbi.nlm.nih.gov/30999197/.
3. Canner JK, Harfouch O, Kodadek LM, Pelaez D, Coon D, Offodile AC 2nd, Haider AH, Lau BD. Temporal Trends in Gender-Affirming Surgery Among Transgender Patients in the United States. JAMA Surg [Internet]. 2018 Jul 1;153(7):609-616. Available from: https://pubmed.ncbi.nlm.nih.gov/29490365/.
4. Piraccini E, Antioco M, Maitan S. Ultrasound guided sacral erector spinae plane block: A useful tool for radicular pain treatment. J Clin Anesth [Internet]. 2020 Feb;59:11-12. Available from: https://pubmed.ncbi.nlm.nih.gov/31176955/.
5. Vinson-Bonnet B, Higuero T, Faucheron JL, Senejoux A, Pigot F, Siproudhis L. Ambulatory haemorrhoidal surgery: systematic literature review and qualitative analysis. Int J Colorectal Dis [Internet]. 2015 Apr;30(4):437-45. Available from: https://pubmed.ncbi.nlm.nih.gov/25427629/.
6. Suresh S, Ecoffey C, Bosenberg A, Lonnqvist PA, de Oliveira GS Jr, de Leon Casasola O, de Andrés J, Ivani G. The European Society of Regional Anaesthesia and Pain Therapy/American Society of Regional Anesthesia and Pain Medicine Recommendations on Local Anesthetics and Adjuvants Dosage in Pediatric Regional Anesthesia. Reg Anesth Pain Med [Internet]. 2018 Feb;43(2):211–216. Available from: https://rapm.bmj.com/content/47/Suppl_1/A43.3.
7. Gupta R, Nasar N. Comparison of dexamethasone and dexmedetomidine as adjuvant to 0.375% ropivacaine in erector spinae plane block for lumbar spine surgery: A randomized, double blind, placebo control trial. International Journal of Medical Anesthesiology [Internet]. 2021 Oct 1;4(4):30–3. Available from: http://dx.doi.org/10.33545/26643766.2021.v4.i4a.320.
8. Kilicaslan A, Goger E, Karakus F, Reisli R. Bilevel-Bi-

lateral Sacral Erector Spinae Plane Block for Chronic Pain Management: A Case Report and Short Literature Review. Selcuk Tip Dergisi [Internet]. 2020 Mar 1;1(36):65–9. Available from: https://doi.org/10.30733/std.2020.01452.
9. Kukreja P, Deichmann P, Selph JP, Hebbard J, Kalagara H. Sacral Erector Spinae Plane Block for Gender Reassignment Surgery. Cureus [Internet]. 2020 Apr 14; Available from: http://dx.doi.org/10.7759/cureus.7665.
10. Aksu C, Gürkan Y. Sacral Erector Spinae Plane Block with longitudinal midline approach: Could it be the new era for paediatric postoperative analgesia? J Clin Anesth [Internet]. 2020 Feb;59:38–39. Available from: https://pubmed.ncbi.nlm.nih.gov/31203111/.
11. Mahajan R, Gulati S, Gupta K, Jain K, Bloria S, JItendra M. Ultrasound-guided sacral multifidus plane block for analgesia following excision of sacrococcygeal teratoma in two neonates. Anaesth Rep [Internet]. 2021 Apr 27;9(1):81-84. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8077243/
12. Öksüz G, Arslan M, Bilal B, Gişi G, Yavuz C. Ultrasound guided sacral erector spinae block for postoperative analgesia in pediatric anoplasty surgeries. Journal of Clinical Anesthesia [Internet]. 2020 Mar;60:88. Available from: https://doi.org/10.1016/j.jclinane.2019.08.006.
13. Bansal T, Yadav N, Singhal S, Kadian Y, Lal J, Jain M. Evaluation of USG-guided novel sacral erector spinae block for postoperative analgesia in pediatric patients undergoing hypospadias repair: A randomized controlled trial. Journal of Anaesthesiology Clinical Pharmacology [Internet]. 2023 Jul 29;40(2):330–5. Available from: http://dx.doi.org/10.4103/joacp.joacp_418_22.
14. Duarte F, Rodrigues N, Carvalho J B258 Sacral erector spinae plane block: is it real? Regional Anesthesia & Pain Medicine [Internet]. 2022;47:A205. Available from: https://doi.org/10.1136/rapm-2022-ESRA.332.
15. Sawyer K, Ceballos B, Kukreja P, Kalagara H. 180 A Novel Sacral Erector Spinae Block Reduces Opioid Use After Gender-affirming Vaginoplasty. The Journal of Sexual Medicine [Internet]. 2022 Apr 1;19(Supplement_1):S91–S91. Available from: https://doi.org/10.1016/j.jsxm.2022.01.193.

Порівняльне дослідження бупівакаїну та бупівакаїну з дексаметазоном під ультразвуковим контролем для блокади м'яза-випрямляча у крижовій ділянці спини при хірургічних втручаннях на сечостатевих органах у педіатричних пацієнтів

Есмат Мундравала, Уша Бадоле, Пурніма Сонкамбл, Сукріті Атрам

Медичний коледж і лікарняна група Sir J.J, Мумбаї, Індія

Анотація. Актуальність. *Блокада м'яза-випрямляча у крижовій ділянці спини є відносно новим і безпечним методом міжфасціальної блокади для хірургічних втручань на сечостатевих органах у дітей. Мета — порівняти інтра- та післяопераційну знеболюючу ефективність бупівакаїну окремо та в поєднанні з дексаметазоном при однократному введенні під ультразвуковим контролем для блокади м'яза-випрямляча у крижовій ділянці спини під час урогенітальних операцій у педіатричних пацієнтів під загальною анестезією.*

Методи. *30 пацієнтів, віком від 12 місяців до 12 років, зі ступенем ризику ASA I та II, які перенесли операції на сечостатевих органах, були випадковим чином розподілені на 2 групи. Під загальною анестезією в положенні лежачи і з використанням лінійного ультразвукового датчика, розташованого вздовж посередині; спинномозкову голку 25 G, 90 мм, просували краніокаудально до 4-го крижового гребеня і вводили підготовлений розчин. Група А отримувала 1 мл/кг 0,25 % бупівакаїну з 2 мл фізіологічного розчину. Група В отримувала 1 мл/кг 0,25 % бупівакаїну з 0,2 мг/кг дексаметазону у фізіологічному розчині загальним об'ємом 2 мл.*

Результати. *Усі пацієнти залишалися гемодинамічно стабільними під час операції в обох групах із зіставною тривалістю післяопераційного знеболення. Крім того, різниця в середньому показнику FLACC R протягом 24 годин після операції між двома групами була незначущою і побічних ефектів не спостерігалося.*

Висновок. *Додавання дексаметазону до бупівакаїну при однократному введенні під ультразвуковим контролем для блокади м'яза-випрямляча у крижовій ділянці спини під час урогенітальних операцій у педіатричних пацієнтів під загальною анестезією не змінило інтраопераційну знеболюючу ефективність бупівакаїну та не призвело до значного подовження тривалості післяопераційного знеболення.*

Ключові слова: *блокада м'яза-випрямляча у крижовій ділянці спини, блокада фасціальної площини, УЗД, бупівакаїн, дексаметазон*