Med. J. Cairo Univ., Vol. 91, No. 2, June: 795-804, 2023
www.medicaljournalofcairouniversity.net

A Comparison between Ultrasound Guided Erector Spinae Block Using Bupivacaine Versus Parasternal Nerve Block in Pediatric Patients Undergoing Cardiac Surgery for Post-Operative Pain Management after Median Sternotomy: A Randomized Controlled Double-Blinded Study

HAITHAM A. ABOUZEID ALI, M.D.*; SALWA EL HEFNAWY, M.D.*,**;
FADI N.G. NESSIM, M.Sc.* and AHMED KARIM MOHAMMED, M.D.*,**

The Department of Anesthesia, Surgical Intensive Care and Pain, Faculty of Medicine, MUST University and Faculty of Medicine, Cairo University***

Abstract

Background: Children of all ages experience pain. An explosion in pain research over the last decade has elucidated more clearly our understanding of pain mechanisms, appropriate pain assessment, and the safe applicaton of innovatve pharmacologic and non-pharmacologic strategies to treat pain in adults and children. In additon, we now understand that the negatve consequences of untreated pain may have profound efects on physiologic homeostasis, and in the case of the postoperatve patent, morbidity and mortality may be adversely afected, especially in the pediatric populaton undergoing major surgeries such as cardiothoracic surgeries.

Aim of Study: The aim of this study was to compare the efficacy of Parasternal nerve vs Erector Spinae Plane Block in comparison with the control group.

Patients and Methods: The study was conducted between June 2022 and January 2023 and was carried at the Cardiothoracic Surgery Department operation theater. Patients scheduled for elective cardiac surgery for non cyanotic ASD & VSD repair were recruited in this randomized research.

3 Groups were assigned in this research:

- Group A: Received Erector spinea plane ESP block, a total 20mL of 0.25% bupivacaine was given.
- Group B: Received Parasternal plane PSI block, a total 20mL of 0.25% bupivacaine was given.
- Group C: Was the control group which was managed with intraoperatve fentanyl for analgesia and Morphine for postoperatve pain control.

- FLACC score was recorded in each group every 4 hours postoperative after extubation at 4,8,12 hrs respectively and at a maximum of 24 hrs post operative and if score was =>3, analgesia was given (Morphine 0.05-0. 1 mg/kg).

- Total Postoperative 12 hours morphine consumption was recorded in each group and compared with the control group.

Results: 72 patients in total participated in this study, there were no statistical significant differences between the study groups regarding demographic and operation characteristics; age, gender, weight, operation duration and intervention. Patients in group A, showed lower FLACC scores and the need for rescue analgesia was lower than that of group B and group C.

Conclusion: Our study has shown that, Erector Spinae block using Bupivacaine (0.25%) was superior in efficacy and duration to Parasternal nerve block using bupivacaine (0.25%), and both were superior to the control group for controlling peri-operative pain in pediatric patients undergoing cardiac surgery.

Key Words: *Ultrasound guided Erector Spinea plane block and parasternal plane block – FLACC score – 12 hrs post operative morphine consumption.*

Correspondence to: Dr. Fadi N.G. Nessim,
E-Mail: fadi.nessim.guirguis@gmail.com

Introduction

ONE of the latest modalites in pain control afer median sternotomy in pediatric patents is the Parasternal and erector spinae plane blocks. These later are considered highly efectve and have showed promising results in reducing post operatve pain. In this review, we will compare the efcacy of both blocks when either of them is done separately, and which of them is actually beter in providing good postoperatve analgesia.

In the view of this artcle, we will discuss the latest advancements in pain management techniques using ultrasound guided nerve blocks, in order to alleviate the pain threshold following median sternotomy incision and allow for early extubatng and fast track cardiac anesthesia, therefore, reducing the period of postoperatve stay and minimizing opioid usage **[1]**.

Each spinal nerve receives a grey ramus from the sympathetc chain. The nerves T2-T12 supply the skin and muscles of the trunk sequentally. The other nerves are arranged into the cervical, brachial, lumbar and sacral plexuses. The anteromedial chest wall (the area between the midclavicular line and the sternum) comprises skin, subcutaneous fat, pectoralis major muscle, internal intercostal and transversus thoracis muscles, ribs and sternum. Its innervaton is derived from the T2-6 intercostal nerves, which travel in the intercostal space bounded by internal and innermost intercostal muscles.

Forero et al., frst reported the use of an ultrasound-guided ESP block, an interfascial plane block that successfully treats severe thoracic neuropathic pain [2]. For ESPB, local anesthetcs are administered to the erector spinae muscles away from the spinal cord and nerve roots compared with epidural anesthesia and are unlikely to cause complicatons [3]. Previous reports show that ESPB is safely performed in patents receiving antthrombotc drugs. ESPB was safely performed and useful for postoperatve analgesic management of sternum closure using the latssimus dorsi muscle fap for mediastnits afer coronary artery bypass grafing (CABG) [4].

The newest techniques recently described are the ultrasound parasternal blocks (US-PSB) which provide analgesia to the anteromedial chest wall. In partcular, the antero-medial chest wall blocks are performed to provide analgesia and anesthesia in several and diferent surgeries such as median sternotomy, breast surgery, implantable cardioverter-defbrillator implantaton and in the management of acute and chronic pain. The nervous target for these blocks is represented by the anterior branches of the intercostal nerves which enter the intercostal (ICM) and pectoralis major (PMM) muscles innervatng the antero-medial region of chest wall, the main cause of post sternotomy pain.

Inclusion criteria:

- Patent age between 1-5 years.
- Patents scheduled for electve cardiac surgery AS and VSS repair.
- Vitally stable patents: Blood pressure (not less than 90/60 and not on any cardiac supports), Heart rate (not less than 110bpm), Respiratory Rate (not more than 25), body temperature (not more than 37.5°C).
- Surgery via median sternotomy in electve open-heart surgery for AS and VSS.

Exclusion criteria:

- Known allergy to local anesthetcs.
- Surgical Site infecton.
- Redo-sternotomy or delayed sternal closure as in suspected prolonged surgical operaton tme in more complicated AS and VSS cardiac surgery cases.
- Patents with Heart Failure or hemodynamic instability: Blood pressure (less than 90/60 or on any cardiac supports), Heart rate (less than 110 bpm), Respiratory Rate (more than 25), body temperature (more than 37.5 °C).

Patients and Methods

The study was carried out at the Cardiothoracic Department operation theatre at Souad Kafafi Teaching Hospital.

72 patients, age 1-5 years old scheduled for elective ASD & VSD repair surgeries, after receiving approval from the the department of research ethical committee.

After receiving an informed written consent from their caregivers about the advantages of these blocks and the potential drawbacks that might arise and how they will be handled, patients were divided randomly into 3 groups using the disguised closed envelope method into:

- Group A: Which received Erector spinea plane block using a total of 20ml (10ml 0.5% Bupivicaine, 10ml 0.9% normal saline).
- Group B: Which received Parasternal plane block using a total of 20ml (10ml 0.5% Bupivicaine and 10ml 0.9% normal saline).
- Group C: Didn't receive any block and was managed with intraoperative fentanyl and postoperative morphine for pain control.

Operating room preparation & equipment:

- Upon arrival to the operating room, the standard monitoring was applied which included pulse oximeter, noninvasive blood pressure and six-lead electrocardiogram (ECG).
- General anesthesia was induced using: Propofol 1-2mg/kg, fentanyl 1-2µg/kg and atracurium 0.5mg/kg. After the initial bolus dose, atracurium will be administered as a continuous infusion at rates of 0.3mg/kg/hour.
- After induction, invasive arterial line was inserted for continuous blood pressure monitoring, a temperature probe was inserted. A Central venous catheter also was inserted under complete aseptic conditions to monitor the fluid balance of the patient intra and postoperative.

- The Erector Spinae Block was done after induction of GA as follows:

- Patient was put in prone position and using an aseptic technique and a high frequency (10-14 MHz) linear-array transducer (Mindray – Model DC-N2- China). Ultrasonography probe was placed in a longitudinal para-sagittal orientation approximately 3cm from the midline and the plane between the tip of the T5 transverse process and the overlying erector spinae muscle was identified.

- A 22-gauge, echogenic needle was inserted in-plane to the ultrasound beam and in a cranial-to-caudal direction to contact the tip of the T5 trans-verse process. Correct needle tip position was confirmed with hydrolocation after negative aspiration of blood or air and then local anesthetic was slowly injected to lift the erector spinae muscle off the transverse process. The same procedure was repeated on the opposite side at the 5^{th} level and a total 20mL of 0.25% bupivacaine was divided equally (10ml on each side) **[5]**.

- As for the parasternal plane block group, the transducer was covered with a sterile sleeve and placed transversely to the costal cartilage, parallel to the sternum. An 18-gauge 5-cm Tuohy needle was inserted 2cm lateral to the midline and oriented between the pectoral major and external intercostal muscles in the 3rd parasternal intercostal space. The prepared solution (0.25% Bupivacaine) was injected after withdrawing the needle without blood collection, and the spread of the injected solution and separation of the pectoralis major muscle from the rib and the external intercostal muscle confirmed the accuracy of the needle tip position.

Postoperative: FLACC score was recorded postoperatively in both block groups and was compared with the control group. Morphine was given if FLACC score was =>3 in a dose of 0.05-0.1 mg/kg.

Measurements tool:

- FLACC score and postoperative HR and BP was recorded in all 3 groups.
- 12 hrs postoperative morphine consumption was also recorded.

Statistical analysis:

Sample size was estimated based on a pilot study done on 5 patients in each group using the software nMaster 2.0 using the following equation where a is the selected level of significance and $Z_{1-a/2}$ is the value from the standard normal distribution holding 1- a/2 below it.

Postoperative morphine consumption was used as the primary outcome resulting in 0.05, 0.08 and 0.5mg/kg in ESP block, parasternal block and control groups respectively with alpha error of 0.05 and power of 80% the sample size was calculated to be 72 patients, 24 in each group with the addition of dropouts. Data was presented as mean ± SD (if numerical and normally distributed) and with median (range) (if not normally distributed). Categorical data was presented as number and frequency. Student *t*-test was used to compare data if normally distributed. Mann-Whitney test was used if the data are not normally distributed.

Results

The collected data were coded, tabulated, and statistically analyzed using IBM SPSS statistics (Statistical Package for Social Sciences) software version 28.0, IBM Corp., Chicago, USA, 2021.

Quantitative data tested for normality using Shapiro-Wilk test, then described as mean ± SD (standard deviation) as well as minimum and maximum of the range, and then compared using ANOVA test.

Qualitative data described as number and percentage and then compared using Chi square test. Log rank test was used to compare rate od need to rescue analgesia. Bonferoni test used for post hoc comparisons. The level of significance was taken at p-value <0.050 was significant, otherwise was non-significant.

Table (1) showed that: No statistical significant differences between the study groups regarding demographic and operation characteristics; age, gender, weight, operation duration and intervention.

Table (2) and Fig. (1) showed that: No statistical significant differences between the study groups regarding heart rate at time point 1. At time point 2, heart rate became significantly highest in control group with no significant difference between erector spinae block and parasternal block groups. At time points 3 and 4, heart rate became highest in control group followed by parasternal block group and lowest in erector spinae block group with significant differences between all groups.

Table (3) and Fig. (2) showed that: No statistical signifcant diferences between the study groups regarding systolic blood pressure at time points 0, 1, 2 and 3. Systolic blood pressure at time point 4 became signifcantly lowest in erector spinae block group with no signifcant diference between parasternal block and control groups.

Table (4) and Fig. (3) showed that: No statistical significant diferences between the study groups regarding diastolic blood pressure at time points 0, 1, 2, 3 and 4.

Table (5) and Fig. (4) showed that: FLACC score was highest in control group followed by parasternal block group and lowest in erector spinae block group with signifcant diferences between all groups.

Table (6) and Fig. (5) showed that: Need to rescue analgesia was most frequent in control group, followed by parasternal block group and least frequent in erector spinae block group, the diferences were signifcant only in erector spinae block group with no signifcant diference between parasternal block and control groups.

Table (7) and Fig. (6) showed that: Time to frst rescue analgesia was shortest in control group followed by parasternal block group and longest in erector spinae block group with signifcant diferences between all groups.

Fig. (7) showed that: Rate of need to frst rescue analgesia was highest in control group followed by parasternal block group and lowest in erector spinae block group with signifcant diferences between all groups.

Table (8) and Fig. (8) showed that: Time to frst rescue analgesia was highest in control group followed by parasternal block group and lowest in erector spinae block group with signifcant diferences between all groups.

Table (1): Demographic and operation characteristics among the study groups.

Variables	Measures	Erector spinae block (Total=24)	Parasternal block (Total=24)	Control (Total=24)	*p*-value
Age (years)	Mean ± SD Range	2.6±1.3 1.0-5.0	2.8±1.6 1.0-5.0	3.0±1.4 1.0-5.0	^0.716
Gender (n,%)	Male Female	12 (50.0%) 12 (50.0%)	13 (54.2%) 11 (45.8%)	13 (54.2%) 11 (45.8%)	#0.946
Weight (kg)	Mean ± SD Range	12.9±4.5 6.5-23.0	14.1±4.5 7.0-23.0	14.5±5.0 8.0-25.0	^0.455
Operation duration (minutes)	Mean ± SD Range	108.9±18.6 80.0-140.0	106.8±19.3 80.0-150.0	108.7±17.6 80.0-140.0	^0.915
Intervention (n,%)	ASD VSD	11 (45.8%) 13 (54.2%)	12 (50.0%) 12 (50.0%)	12 (50.0%) 12 (50.0%)	#0.946

^ANOVA test. #Chi square test.

Table (2): Heart rate among the study groups.

Time points	Measures	Erector spinae block (Total=24)	Parasternal block (Total=24)	Control (Total=24)	*p*-value
		Heart rate (beat/minute)			
Point-0	Mean ± SD Range	158.4±12.6 140.0-180.0	155.5±12.6 135.0-180.0	153.3±14.7 135.0-183.0	^0.419
Point-1	Mean ± SD Range	132.3±9.5a 110.0-152.0	132.2±8.7a 120.0-155.0	161.2±11.8b 140.0-185.0	<0.001 *
Point-2	Mean ± SD Range	114.9±11.8a 100.0-143.0	131.5±12.5b 110.0-160.0	160.3±12.3c 140.0-182.0	<0.001 *
Point-3	Mean ± SD Range	97.3±6.7a 88.0-112.0	113.0±6.1b 100.0-120.0	132.4±8.1c 118.0-145.0	<0.001 *
Point-4	Mean ± SD Range	92.8±5.0a 85.0-100.0	116.4±5.1b 108.0-125.0	129.3±10.4c 110.0-150.0	<0.001 *

^ANOVA test. *Significant. Homogenous groups had the same symbol “a,b,c” based on post hoc Bonferroni test.

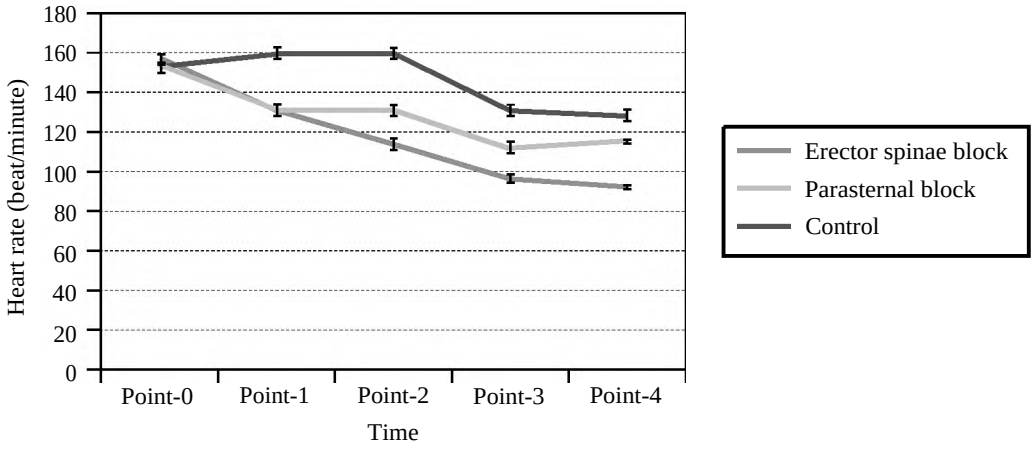

Fig. (1): Heart rate among the study groups.

Table (3): Systolic blood pressure among the study groups.

Time points	Measures	Erector spinae block (Total=24)	Parasternal block (Total=24)	Control (Total=24)	*p*-value
		Systolic blood pressure (mmHg)			
Point-0	Mean ± SD Range	104.8±4.3 97.0-110.0	104.8±4.3 97.0-110.0	105.6±4.7 90.0-110.0	^0.758
Point-1	Mean ± SD Range	97.6±5.8 87.0-110.0	97.6±5.8 87.0-110.0	98.2±7.0 87.0-110.0	^0.932
Point-2	Mean ± SD Range	94.8±8.7 77.0-109.0	94.8±8.7 77.0-109.0	97.6±5.9 85.0-108.0	^0.372
Point-3	Mean ± SD Range	97.3±5.4 88.0-108.0	98.3±4.8 88.0-108.0	97.6±6.1 88.0-109.0	^0.838
Point-4	Mean ± SD Range	93.0±3.9a 87.0-99.0	98.4±5.9b 90.0-109.0	98.3±7.1 b 77.0-110.0	^0.002*

^ANOVSA test. *Signifcant. Homogenous groups had the same symbol “a, b” based on post hoc Bonferroni test.

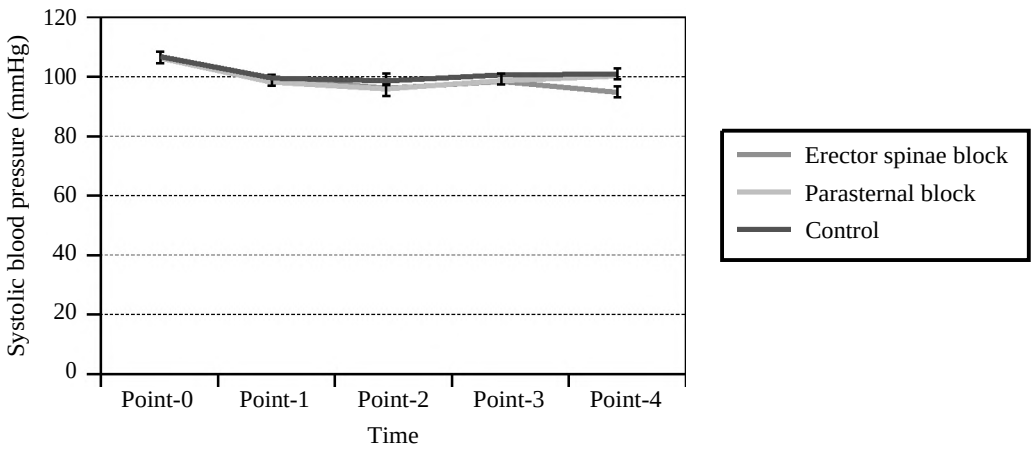

Fig. (2): Systolic blood pressure among the study groups.

Table (4): Diastolic blood pressure among the study groups.

Time points	Measures	Erector spinae block (Total=24)	Parasternal block (Total=24)	Control (Total=24)	*p*-value
		Diastolic blood pressure (mmHg)			
Point-0	Mean ± SD Range	68.3±10.6 50.0-80.0	68.3±10.6 50.0-80.0	63.2±10.1 40.0-80.0	^0.164
Point-1	Mean ± SD Range	61.0±8.8 44.0-80.0	61.0±8.8 44.0-80.0	56.6±11.2 40.0-80.0	^0.196
Point-2	Mean ± SD Range	57.2±11.4 40.0-80.0	57.2±11.4 40.0-80.0	63.4±11.2 40.0-80.0	^0.100
Point-3	Mean ± SD Range	60.7±8.6 44.0-77.0	62.3±9.3 44.0-80.0	62.0±10.3 35.0-80.0	^0.807
Point-4	Mean ± SD Range	58.4±7.6 50.0-77.0	64.1±11.1 50.0-80.0	62.5±10.3 50.0-80.0	^0.125

^ANOVSA test.

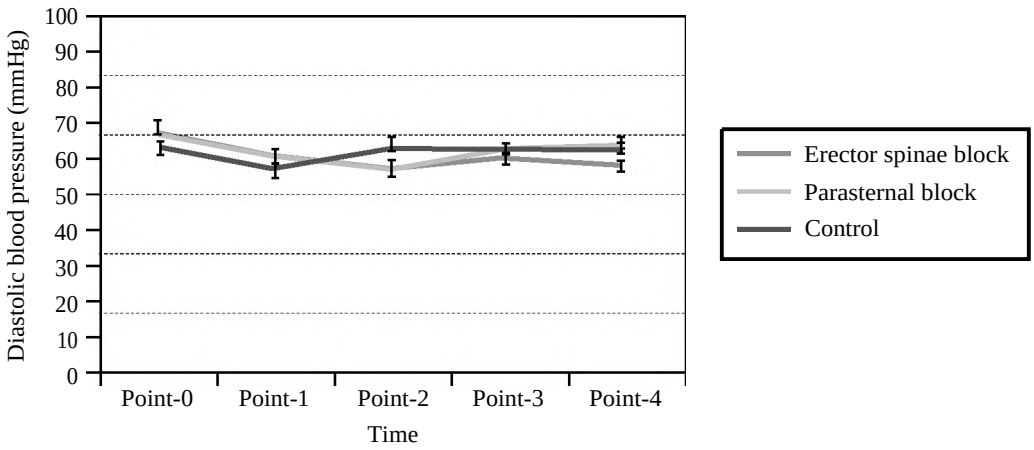

Fig. (3): Diastolic blood pressure among the study groups.

Table (5): FLACC score among the study groups.

Variables	Measures	Erector spinae block (Total=24)	Parasternal block (Total=24)	Control (Total=24)	*p*-value
FLACC score	Mean ± SD Range	3.2±1.2a 2.0-5.0	6.3±1.9b 2.0-10.0	8.6±1.1c 6.0-10.0	^<0.001 *

^ANOVSA test. *Signifcant. Homogenous groups had the same symbol “a, b, c” based on post hoc Bonferroni test

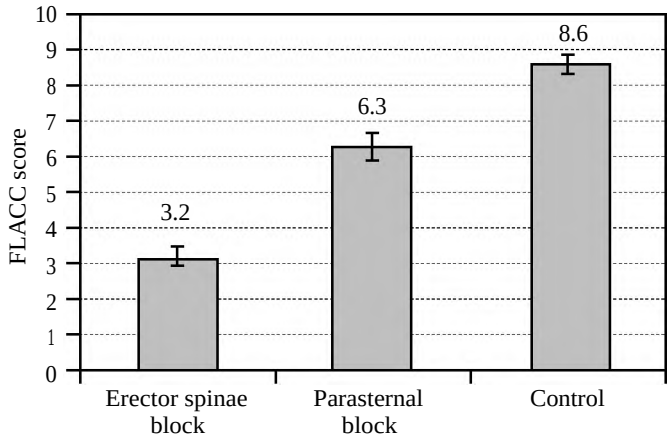

Fig. (4): FLACC score among the study groups.

Table (6): Need to rescue analgesia among the study groups.

Variables	Measures	Erector spinae block (Total=24)	Parasternal block (Total=24)	Control (Total=24)	*p*-value
Need to rescue analgesia	Needed	12 (50.0%)a	20 (83.3%)b	24 (100.0%)b	^<0.001 *
	Not	12 (50.0%)	4 (16.7%)	0 (0.0%)	

#Chi square test. *Signifcant. Homogenous groups had the same symbol “a, b, c” based on post hoc Bonferroni test.

Table (7): Time to frst rescue analgesia among the study groups.

Variables	Measures	Erector spinae block (Total=12)	Parasternal block (Total=20)	Control (Total=24)	*p*-value
Time (hours)	Mean ± SD	7.4±1.3a	3.5±1.1b	1.4±0.5c	^<0.001 *
	Range	4.5-9.0	1.0-5.5	1.0-2.5	

#Chi square test. *Signifcant. Homogenous groups had the same symbol “a, b, c” based on post hoc Bonferroni test.

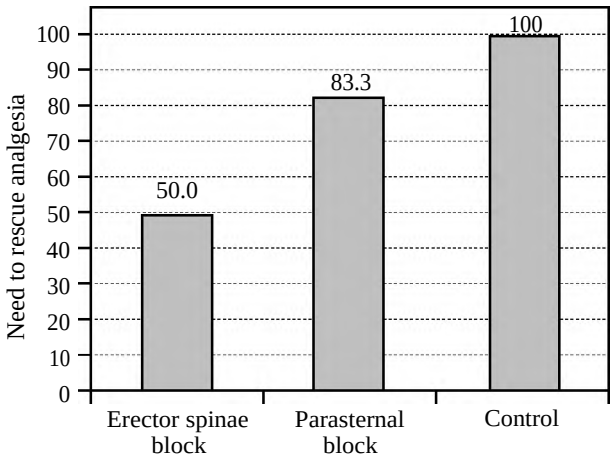

Fig. (5): Need to rescue analgesia among the study groups.

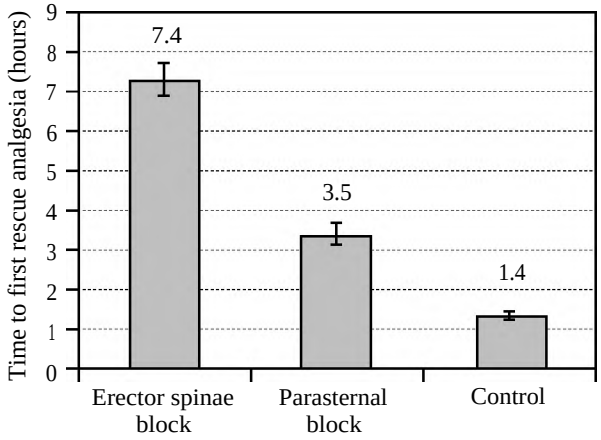

Fig. (6): Time to frst rescue analgesia among the study groups.

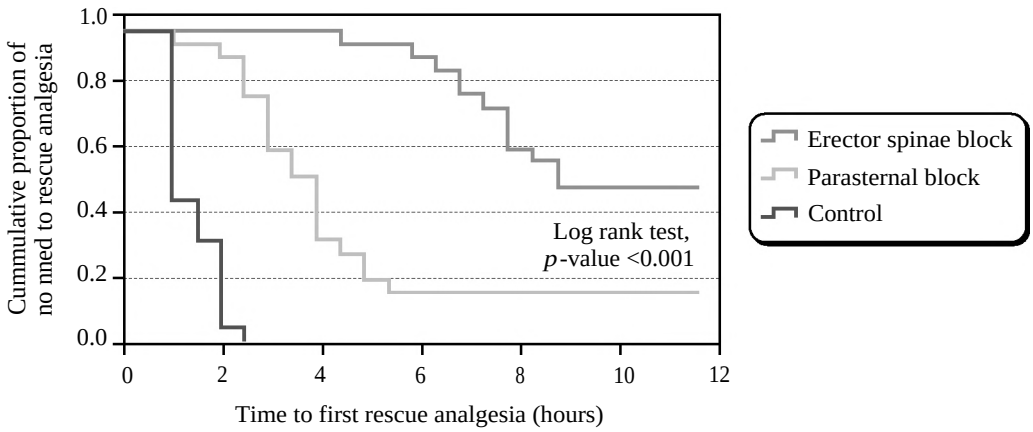

Fig. (7): Kaplan-Meier curve for rate of need to frst rescue analgesia among the study groups.

Table (8): Total 12-hours morphine dose among the study groups.

Variables	Measures	Erector spinae block (Total=12)	Parasternal block (Total=20)	Control (Total=24)	*p*-value
Dose (mg)	Mean ± SD Range	0.8±0.3a 0.5-1.5	1.5±0.6b 0.5-2.5	2.1±0.7c 1.0-3.0	^<0.001 *

#Chi square test. *Signifcant. Homogenous groups had the same symbol "a, b, c" based on post hoc Bonferroni test.

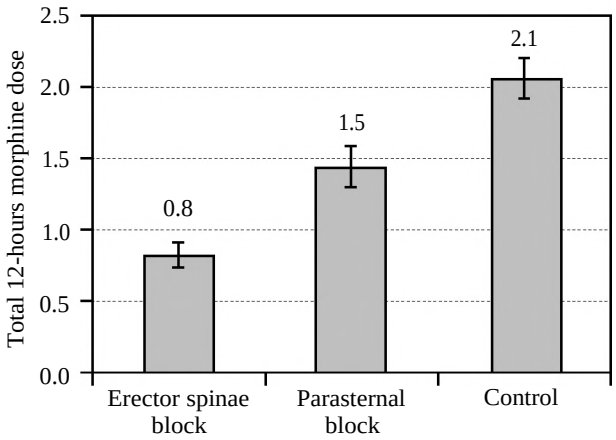

Fig. (8): Total 12-hours morphine dose among the study groups.

Discussion

It was found that controlling pain through multimodal approach (opioids, NSAIDs and regional blocks) has made it more possible to fast track this type of patients ranging from OTE (on table extubation) to fast tracking in the ICU few hours post operatively **[6]**.

Recent advancements in pain management allowed for a better postoperative outcome for these patients, which we discussed earlier in this thesis. Originally regional anesthesia for pediatric cardiac surgery was introduced as neuro-axial blocks (caudal anesthesia). This was followed by the introduction of multiple fascial plane blocks modalities for the thoracic cage covering both the sternotomy and thoracotomy incisions, that can help in alleviating the pain threshold, including the most updated ones which are the erector spinae plane block (ESP) and the parasternal nerve block (PSI).

Forero et al., first reported the use of an ultrasound-guided erector spinae plane (ESP) block, an interfascial plane block that successfully treats severe thoracic neuropathic pain **[7]**. It has since gained significant interest given its technical simplicity and safety profile. As a result, it has been used for spinal, breast and more recently cardiac surgical procedures. In this study, we compared the erector spinae plane (ESP) block with another recent one which is the parasternal nerve (PSI) block which principally blocks anterior cutaneous intercostal nerves and is considered highly effective in patients experiencing sternal wound pain following cardiac surgery **[8]**.

Very few studies compared both blocks together, however, an interesting study of those few ones was that done by Dost B, Kaya C, Turunc E, Dokmeci H, Yucel SM, Karakaya D, which compared the effectiveness of bilateral erector spinae plane (ESP) block and superficial parasternal intercostal plane (S-PIP) + ESP block in acute post-sternotomy pain following cardiac surgery, which concluded that the combination of ESP and S-PIP blocks modestly reduced postoperative morphine use and pain scores in patients undergoing open cardiac surgery **[9]**.

However, the difference in our study is that we compared each block separately with the addition of a control group.

As shown here in Table (1), regarding demographic characteristics in this study, age, sex, weight, operation duration and anesthesia duration, there were no statistical significant differences between the 3 study groups.

We used the FLACC score as shown in Fig. (4), to evaluate the severity of pain in our patients. It was highest in control group reaching a peak of 8.6 total FLACC score, followed by parasternal block group and then hitting a low of 3.2 of total FLACC score in erector spinae block group.

Also, time to first rescue analgesia as shown in Table (7), was shortest in control group, followed by parasternal block group and longest in erector spinae block group, manifested by 1.4 hrs in control group compared to 7.4 hrs in Erector spinae group.

In agreement with our result concerning the ESP block, a study done by Ali Gado A, Alsadek WM, Ali H, Ismail AA, which concluded that the bilateral ESP block decreased the perioperative opioid consumption, prolonged the duration of postoperative analgesia, and improved the 24-hour

postoperative pain score in children that had undergone cardiac surgery **[9]**.

Another opinion was shown by Chen H, Song W, Wang W, Peng Y, Zhai C, Yao L, Xia Z. who conducted a study that showed that ultrasound guided bilateral parasternal intercostal nerve block alone effectively reduced postoperative pain and adjuvant analgesic requirement for post sternotomy procedures **[9]**.

As shown in Fig. (2), no statistical significant differences between the study groups regarding systolic blood pressure at time points 0, 1, 2 and 3, however, systolic blood pressure at time point 4 became significantly lowest in erector spinae block group with no significant difference between parasternal block and control groups.

Concerning total 12 hrs. morphine consumption, the erector spinae group showed the least consumption, as shown in Table (8), achieving a low of 0.8mg of morphine dose compared to a peak morphine dosage of 2.1mg in control group with a *p*-value of ^<0.001.

Conclusion:

Our study has shown that, Erector Spinae block using Bupivacaine (0.25%) was superior in efficacy and duration to Parasternal nerve block using bupivacaine (0.25%), and both were superior to the control group for controlling peri-operative pain in pediatric patients undergoing cardiac surgery.

References

1- ELLIS H.: Anatomy of the spinal nerves and dermatomes. Anaesth. Intensive Care Med., Nov. 1; 7 (11): 405-6, 2006.

2- CASSAI A.D., IEPPARIELLO G. and ORI C.: Erector spinae plane block and dual antplatelet therapy. Minerva Anestesiol., 84: 12301231, 2018.

3- SMITH C.A. and MARTN K.M. Dual antplatelet therapy does not scare away the erector spinae plane block. Korean J. Anesthesiol., 72: 277-278. doi: 10.4097/kja. 19044, 2019.

4- TULGAR S., AHISKALIOGLU A., DE CASSAI A., et al.: Efcacy of bilateral erector spinae plane block in the management of pain: Current insights. Journal of Pain Research, 12: 25 97-2605, 2019.

5- FORERO M., ADHIKARY S.D., LOPEZ H., TSUI C. and CHIN K.J.: The erector Spinae plane block: A novel analgesic technique in thoracic neuropathic pain. Reg. Anesth. Pain Med., 41 (5): 621-7, 2016.

6- MUÑOZ-LEYVA F., EL-BOGHDADLY K. and CHAN V.: Is the minimal clinically important diference (MCI) in acute pain a good measure of analgesic efcacy in regional anesthesiaa Reg. Anesth. Pain Med., 45 (12):1000–1005, 2020.

7- TSUI B.C.H., FONSECA A., MUNSHEY F., MCFADYEN G. and CARUSO T.J.: The erector spinae plane (ESP) block: A pooled review of 242 cases. J. Clin. Anesth., 5 3: 29-34, 2019.

8- DOGAN BAKI E., KAVRUT OZTURK N., AYOGLU R.U., EMMILER M., KARSLI B. and UZEL H.: Efects of parasternal block on acute and chronic pain in patents undergoing coronary artery surgery. Semin Cardiothorac Vasc. Anesth., 20 (3), 2016.

9- CHEN C.H., WU K.H., CHAO Y.H., WENG D.F., CHANG J.S. and LIN C.H.: Clinical manifestaton of pediatric mediastnal tumors, a single center experience. Medicine, 98 (32), 2019.

مقارنة بين تخدير العضلة المنتصبة للعمود الفقرى بواسطة الموجات الفوق الصوتية بإستخدام عقار البوبيفاكين مقابل تخدير نطاق العصب المجاور لعظمة القص لعلاج ألام ما بعد فتح منتصف عظمة القس فى جراحات القلب المفتوح للأطفال : دراسة عشوائية مزدوجة التعمية

ناقشنا فى هذه الدراسة أحدث التطورات فى إدارة الألم من جل تخفيف الألم بعد شق القص المتوسط والسماح بالنزع المبكر للأنبوبة الحنجرية والتخدير القلبى السريع، وبالتالى تقليل فترة الإقامة بعد الجراحة وتقليل استخدام المواد الأفيونية.

واحدة من هذه الأساليب الحديثة فى السيطرة على الألم بعد فتح منتصف عظمة القس هما تخدير العضلة المنتصبة للعمود الفقرى وتخدير نطاق العصب المجاور لعظمة القص بواسطة الموجات الفوق الصوتية باستخدام عقار البوبيفاكين.

\الهدف من العمل : كان الهدف من هذه الدراسة هو مقارنة فعالية تخدير نطاق العصب المجاور لعظمة القص مقابل تخدير العضلة المنتصبة للعمود الفقرى بالمقارنة مع المجموعة الضابطة.

\المنهجية : إجمالى ٧٢ مريضاً تتراوح أعمارهم بين ١–٥ سنوات، المقرر إجراء جراحة القلب المفتوح، ٢٤ مريضاً فى كل مجموعة بالتساوى.

– المجموعة أ : تم تلقى تخدير العضلة المنتصبة للعمود الفقرى بواسطة الموجات الفوق الصوتية باستخدام عقار البوبيفاكين، تم إعطاء إجمالى ٢٠ مل من ٠.٢٥٪ بوبيفاكين.

– المجموعة ب : تلقت تخدير نطاق العصب المجاور لعظمة القص بواسطة الموجات الفوق الصوتية باستخدام عقار البوبيفاكين، تم إعطاء إجمالى ٢٠ مل من ٠.٢٥٪ بوبيفاكين.

– المجموعة ج : كانت المجموعة الضابطة التى تمت إدارتها بإستخدام الفنتانيل أثناء العملية لتسكين الألم والمورفين للتحكم فى الألم ما بعد الجراحة.

عند الوصول إلى غرفة العمليات، تم تطبيق المراقبة القياسية التى تضمنت مقياس تأكسج النبض وضغط الدم غير الغازى وتخطيط القلب (ECG) الكهربائى.

تم إحداث تخدير عام باستخدام ؛ بروبوفول ١–٢ مجم / كجم، فينتانيل ١–٢ ميكروجرام / كجم وأتراكوريوم ٠.٥ مجم / كجم. بعد الجرعة الأولية، تم إعطاء أتراكوريوم كتسريب مستمر بمعدلات ٠.٣ مجم / كجم / ساعة بعد الحث، تم إدخال خط شريانى غازى لمراقبة ضغط الدم باستمرار، تم إدخال مسار درجة الحرارة. تم إدخال قسطرة وريدية مركزية أيضاً تحت ظروف معقمة كاملة لمراقبة توازن السوائل للمريض أثناء الجراحة وبعدها تم تسجيل ضغط الدم وقياس ضربات القلب أثناء الجراحة بعد أى من طرق التخدير التى تم إجراؤها.

تم بعد ذلك نقل المرضى إلى وحدة العناية المركزة للأطفال عن طريق التنبيب وتم تسجيل مراقبة ما بعد الجراحة للعلامات الحيوية بما فى ذلك (ضغط الدم، ضربات القلب) على الفور فى كل مجموعة كل ٤ ساعات بعد الجراحة FLACC تم تسجيل درجة بعد نزع الأنبوب عند ٤،٨،١٢ ساعة على التوالى وبحد أقصى ٢٤ ساعة بعد الجراحة وإذا كانت النتيجة => ٣، تم إ عطاء التسكين (المورفين ٠.٠٠٥–٠.١ مجم / كجم).

تم تسجيل إجمالى استهلاك المورفين بعد العملية الجراحية لمدة ١٢ ساعة فى كل مجموعة ومقارنته مع مجموعة التحكم.

\النتائج : أظهرت دراستنا أن تخدير العضلة المنتصبة للعمود الفقرى بواسطة الموجات الفوق الصوتية باستخدام عقار البوبيفاكين (٠.٢٥٪) كان متفوقاً فى الفعالية والمدة على تخدير نطاق العصب المجاور لعظمة القص بواسطة الموجات الفوق الصوتية باستخدام عقار البوبيفاكين وكلاهما كان متفوقاً على المجموعة الضابطة للتحكم فى الألم بعد شق القص المتوسط فى الأطفال الذين يخضعون لعمليات القلب وإجمالى استهلاك المورفين لمدة ١٢ FLACC المفتوح وأيضاً، كانت نتيجة ساعة أقل بكثير من المجموعة الضابطة.