Ultrasound Guided parascabular sub iliocostalis plane block versus thoracic epidural for postoperative Analgesia in Thoracotomy operations

Abstract

Background : The aim of this study is to assess and compare between the efficacy of continuous Para scapular sub iliocostalis plane block and epidural catheter in adult patients scheduled for elective thoracotomy surgery in order to decrease the incidence of post thoracotomy pain syndrome.

Methods: We conducted a single-center prospective interventional comparative study involving patient undergoing thoracotomy operation. The patients were divided into two groups, thoracic epidural group and par scapular sub iliocostalis group, then they were evaluated postoperatively for 48 hrs for pain severity(VAS) , hemodynamics and need for supplemental analgesia.

Results: In this study 62 patients were screened for eligibility, 10 patients of them were excluded from the study. Regarding VAS scores (VAS), have been in both groups at 0 time (on arrival to ICU), then every 6 hours for 48 hours postoperative, we found that there was no significant difference between both groups. Regarding incidence of hemodynamic changes due to the block, there was significant difference between both groups. We recorded hypotension (systolic pressure <90 mmHg) in 14 patients in thoracic epidural group and 0 patients in the PSIP group .

Conclusions: The use of parascapular subiliocoslis block as a new approach for analgesia for thoracotomies achieved patient satisfaction regarding pain severity and also not associated with hemodynamic instability compared with epidural.

Introduction

Thoracotomy operations involve cutting between the ribs . Post-thoracotomy pain is considered one of the worst types of post operative pain which results from pleural , muscular damage, costovertebral joint disruption and intercostal nerve damage during surgery**. [1]**

Poor pain relief can interfere with patient physical activity, ineffective breathing and clearing of secretions, resulting in increased incidence of lung infections and collapse .The incidence of lung complications is reported to be between 15% and 32.5%. **[2]**

Acute pain is an important factor that not only prolongs hospital stay but also increases postoperative morbidity. If not treated adequately, it can cause chronic pain that can last for months. Post thoracotomy pain syndrome (PTPS) affects approximately 25–47% of patients following thoracotomy. Pain intensity is moderate-to-severe in more than a quarter of these patients, particularly with activity ;and the majority experience impairment of sleep, activities of daily living and overall quality of life as a result**. [3]**

Thoracic epidural blockade (TEB) using local anaesthetic and opioid agents has been widely regarded as the gold standard for analgesia and the reduction of associated complications following thoracotomy. Good analgesia from an epidural can result in early extubation, better ventilatory mechanics and gas exchange and reducing risk of lung collapse, pneumonia and pain**. [3]**

However, the technique requires highly trained medical staff not only for insertion and removal of the epidural catheter but also for the management of the continuous infusion of bupivacaine and opioid. Also, the risks associated with insertion of the epidural include accidental dural puncture, inadvertent high block, local anesthetic toxicity and total spinal an aesthesia (inadvertent spinal injection of a high epidural dose of local anaesthetic leading to local anesthetic depression of the cervical spinal cord and the brainstem). Nerve injury, epidural haematoma and abscess are rare but serious complications**. [4]**

A thoracic epidural blocks nerves bilaterally and sympathetic nerve block can result in hypotension due to both vasodilatation and cardiac depression. Also ,failure rates have been described as from 14% to 30% and can be influenced by the skills of the practitioner**. [4]**

An epidural is not a suitable technique for all patients and is contraindicated in patients with local infection, previous spinal surgery, disorders of blood clotting and in those taking anticoagulant and anti-platelet therapy**. [5]**

Recently, there has been a great focus in using myo-fascial plane blocks as erector spine plane block and serratus plane blocks for postoperative analgesia for thoracotomies. **[5]**

Theoretically, at thoracic level, ESP block may provide good analgesic quality, but they may also cause several undesirable effects at this level, particularly in bilateral techniques, such as central sympathetic blockade, weakness of the chest wall, and risk

of fall during ambulation, because thoracic ESP block may spread easily toward the paravertebral space (PVS), through the costo-transverse foramina**.[6]**

Continuous bilateral Parascapular Sub-iliocostalis Plane (PSIP) block that has been recently described for posterior rib fractures - for thoracic spine surgery, due to its safer profile.**[6]**

In the PSIP (para scapular sub iliocostalis plane block) , the LA will spread mostly medially because the costal insertions of the iliocostalis muscle (ILCM) will limit the lateral dispersion of the LA, as they are often a barrier for the dispersion of rhomboid intercostal block**. [7]**

The efficacy of the PSIP block may potentially depend on different mechanisms of action: (1) direct action by craniocaudal myofascial spread underneath the erector spinae muscle (ESM); (2) spread to deep layers to reach the proximal intercostal nerves; (3) further medial spread through deeper layers to the midline to block the posterior and ventral spinal nerves; (4) medial spread below the ESM, to reach the posterior spinal nerves (more reliably than rhomboid intercostal / sub-serratus [RISS] block); and (5) lateral spread in the sub-serratus (SS) plane to reach the lateral cutaneous branches of the intercostal nerves; while avoiding significant negative hemodynamic effects associated with techniques such as the paravertebral block (PVB), erector spinae plane (ESP) block or its variations, or thoracic epidural analgesia (TEA). **[7]**

Methodology

Ethical consideration :

After the approval of the institutional review board and the Ethics Committee of Benha University and written informed consent from patients scheduled for elective thoracotomy that obtained after being explained about the purpose of the study and ensured strict confidentiality. They were been given the option of not participating in the study if they did not want to.

Type and design of study:

Study population :

The study was conducted at Benha University Hospital starting from April 2022 to April 2024 on adult patients (age: 18-70 years old) scheduled for thoracotomy.

Study design :

- ***Study type***: Interventional (clinical trial) , prospective and comparative study.
- ***Estimated Enrollment***: patients who were scheduled for thoracotomy operations in benha university hospital from April 2022 to April 2024.
- ***Allocation***: Randomized.
- ***Intervention Model:*** Two parallel arms. One group was received para scapular subiliocostalis plane block, and the other was received thoracic epidural catheter.

- ***Masking***: Single blinded (Outcomes Assessor).

- ***Masking Description***: The practitioner and the patient were not blinded. The outcomes assessor knew which group each patient is in.

Eligibility Criteria :

-Ages Eligible for Study: > 18 years (Adult, Older Adult)

-Sexes Eligible for Study: all.

-Accepts Healthy Volunteers: no.

Inclusion Criteria :

Patients aged >18 years, and American Society of Anesthesiologists Physical Status I, II and III scheduled for elective thoracotomy (lung resection , decortication ,minimal invasive ASD repair ,rib fracture for fixation and bilateral hydatid cyst repair .

Exclusion Criteria:

Refusal of the patient to provide written consent , history of relevant drug allergy , age less than 18 , obesity BMI > 40 kg/m2 , infection of the skin at the site of needle puncture area , coagulopathy , Pregnant females.

Randomization and Blinding:

Patients were randomly chosen to receive either Para scapular sub iliocostalis catheter plus conventional opioid analgesics (Group A) or receive thoracic epidural catheter plus the conventional opioid analgesics (Group B) by a random sequence number generated by the computer kept in sealed envelopes. The sealed envelopes have been opened on the day of surgery when the patient in operation room, and participants received either PSIP block or epidural as per the envelope. The observer anesthesiologist postoperative was blinded to which group the patient belong.

Anesthetic technique:

- ***Preoperative preparation*** :

History taking, physical examination and investigations have been done according to the local protocol designed to evaluate the patients. Which includes complete blood count, blood sugar level, serum urea and creatinine, liver function tests, coagulation profile and electrocardiogram (ECG), ABG and respiratory function tests if needed.

Before surgery, the participants received education about the VAS pain score (0–100 mm) (where0=no pain and 100 = worst comprehendible pain) as shown in **Fig: (1)** and the details of the nerve block procedures. After a 6 h fast, the patients have been taken into the operation theatre.

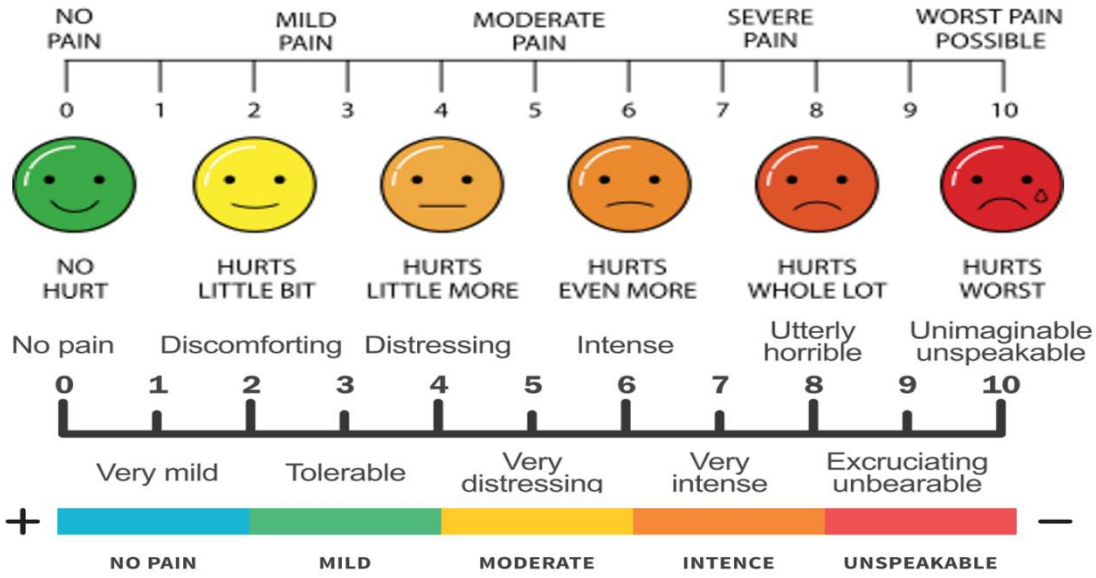


Fig: (1) Visual analogue scale

At the preoperative room:

• The patient lied in the semi sitting position (30 degree to 45 degree).

• Venous access: Wide bore I.V line (14-16 gauges) was inserted

• Light premedication in the form of midazolam (0.01:0.02) mg /kg was given to the patient.

• O2 supplementation (2-3) L/min via nasal cannula to avoid hypoxemia after pre-medication.

• Pulse oximeter and non-invasive blood pressure cuff connected to the patient.

• Arterial line insertion: (according to the surgery and patient condition) (usually the radial artery was of choice) we assess the adequacy of the collateral circulation and the absence of proximal obstructions before cannulation of the radial artery for monitoring purposes by doing **Allen's test**.

► **At the operation room**:

Monitoring:

- A 5-Lead ECG
- Arterial Blood Pressure monitoring:

▪ Non Invasive Blood Pressure monitoring.

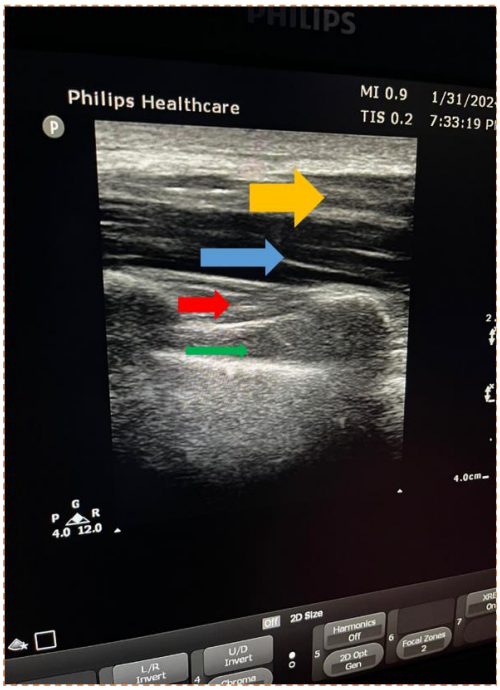
▪ Invasive Blood Pressure monitoring: (according to the surgery and patient condition) was applied by conducting the arterial line to the pressure -tubing-transducer system which was flushed by heparinized saline (0.5-1 unit of heparin per ml of saline).

- Pulse oximeter was placed over the finger of the patient.

For group A :

The PSIP block was performed with the patient in a sitting position with her arms along the body. A high frequency linear ultrasound probe was placed in a parasagittal plane orientation to 2 cm from the medial scapular border at the level of the edge of the scapula spine under complete aseptic condition (fourth rib level). The trapezius, rhomboid major, iliocostalis, and intercostal muscles were visualized from the superficial to deep muscular layers.

An A sonovisible 100 mm 18 G needle (Contiplex S ultra; B. Braun, Melsungen, Germany) was inserted with a cranial to caudal orientation using an in-plane technique and advanced in the iliocostal-intercostal myofascial plane in the vicinity of the fourth rib .The needle location was confirmed with a 2 ml saline solution, then a catheter was then inserted 6 cm beyond the needle tip and tunneled under the skin and at the end of the operation, 15 ml of 0.25% bupivacaine was administered. Then. An elastomeric infusion 0.125% bupivacaine was initiated with rate 5 ml /Hr. Through the PSIP catheter and maintained for 48 hrs. post-operative.



Fig; (2) US of PSIP block yellow arrow for trapezius MS ,blue arrow for rhomboid MS ,red arrow for iliocostalis MS and green arrow for intercostal MS

For group B **:**

Thoracic epidural (TEA); in the preoperative holding area just before surgery a thoracic epidural catheters inserted using the loss of resistance to air technique and epidural catheter inserted 3-4 cm into the T6/T7 space. A test dose of 3 ml of 1.5% preservative free lidocaine with 1:200,000 epinephrine was administered in the catheter or directly in the needle to exclude intravascular and/or intrathecal catheter insertion.

A loading dose of 15 ml of 0.25% bupivacaine was gradually administered into the thoracic epidural catheter at the end of operation under continuous monitoring of blood pressure and heart rate during injection. Then 5 ml/hr. of 0.125% bupivacaine infusion started and maintained for 48 hrs post-operative.

All patients were received pre-oxygenation with O2 100% for 3 min. Anesthesia induced by using fentanyl 1μg/kg, propofol 1.5-2 mg/kg and atracurium 0.5 mg/kg be for muscle relaxation. Anesthesia was maintained by controlled ventilation with oxygen and air (50:50) with target of EtCo2≈ 35-40 mmHg, isoflurane 1:1.5 minimum alveolar concentration (MAC) and 0.5μg/kg fentanyl was given intraoperative when either heart rate or NIBP report an increase by more than 20% of the basal records. Anesthesia discontinued and tracheal extubation was done once the patient fulfilled the extubation criteria.

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► Postoperative care

Patients were transferred to post-anesthetic care unit (PACU) for 2 hours after anesthesia emergence. The patients will be discharged from the PACU after fulfilling the discharge criteria based on the modified Aldrete score > 9.

Patients received analgesic according to local institutional protocol as the following (paracetamol 1 gm IV infusion/8 hrs, ketorolac 30 mg IM/12hrs) as 2 components of multimodal anesthesia regimen for postoperative pain control.

A postoperative rescue analgesia with intravenous morphine per a titration protocol (3 mg morphine sulfate IV as a bolus dose that could be repeated every 5 minutes with a maximum dose of 15mg per 4 hours or 45mg per 24 hours) was employed if visual analog pain scale (VAS) > 4.

The morphine titration protocol was suspended with Oxygen saturation < 95%; Respiratory rate < 10 / min; the development of sedation (Ramsay sedation scale >2); development of acute adverse effects (allergy, marked itching, excessive vomiting, and hypotension with systolic blood pressure ↓ by 20% of baseline values); or attaining adequate level of analgesia.

Outcome Measures:

- Visual analogue pain score (VAS): VAS score was the primary outcome; it is a horizontal 10-cm line with zero on the left end indicating no pain and 10 cm on the right end indicating the worst imaginable pain. **Fig: (1**). VAS measured as soon as the patient is alert enough to report pain, at rest, deep breath and coughing every 6 hrs. postoperative, Scale from zero (no pain) to ten (unbearable pain) all patients will receive regular Paracetamol 1 gm./8 hours. Rescue analgesia will be provided as morphine IV (0.1 mg/kg) then titration of 1mg/15min as required to keep the VAS scores less than 3.

- Hemodynamic parameters: Postoperative heart rate and MAP recorded at 0, 15 min, 30 min, 1 hr. and then every 2 hours for 48 hours and hypotension treated by IV ephedrine 5-25 mg.

- Pain rescue analgesia consumption in the first 48 hrs.

- Complications: nausea, vomiting, urine retention, itching, hypotension and bradycardia.

- Duration of hospital stay from the first day postoperative until discharge.

- Duration of ICU stay.

- **Demographic characteristics:** age, weight, height, BMI and operation time will be recorded.

Statistical analysis:

Results of the two groups were compared using Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) version 20. Parametric normally distributed numerical data have been presented as (mean ± SD) and differences between groups were compared using Student's t-tests, non-parametric data was presented as (median and interquartile range) and differences between groups have been compared using Mann-Whitney U-test, categorical data was presented as number and percentage and intergroup comparison were performed using Chi-Square test and Fisher exact test . We considered the results as significant if the p value is less than 0.05 and level of confidence interval is 95%.

Results

This study was conducted at Benha University hospital on 52 patients between April 2022, and April 2024.

In this study 62 patients were screened for eligibility, 10 patients of them were excluded from the study, 6 of them had not met the inclusion criteria and 4 of them declined to participate. The remaining 52 patients were allocated equally into two groups:

I. PSIP (study) group: which receive para scapular subiliocostalis plane block.

II. Thoracic epidural group: which receive thoracic epidural block.

Finally, this study was conducted on 52 patients >18 years old undergoing elective thoracotomy surgery.

► Demographic characteristics of the enrolled participants

Regarding age, weight and ASA status of enrolled patients, this study showed no significant statistical differences between both groups with *P*-value > 0.05. **(Table 1)**

Table 1: Demographic characteristics

	Group I	Group II	*p*-value
Age (yrs.)	39.85±15.040	39.08±13.419	0.847

Weight (kg)		87.2308±12.14021	85.6923±7.86267	0.590
Sex	♂	18(69.23%)	10(38.46%)	
	♀	8(30.77%)	16(61.54%)	
ASA	**I**	10(38.46%)	14(53.85%)	
	II	14(53.85%)	12(46.15%)	
	III	2(7.69%)	0	

► Surgery type

By comparing the two groups in regarding the type of surgery, there is no statistically significant differences between both groups (p=0.8). **(Table: 2)**

Table 2 : Indication of surgery in both groups

		Group I	**Group II**
Diagnosis	**Lung resection**	16 (61.53%)	12 (46.15%)
	Decortication	8 (30.77%)	4(15.38%)
	ASD repair	2 (7.69%)	0
	Diaphragmatic hernia repair	0	2 (7.69%)
	Bilateral lung hydatid cyst	0	2 (7.69%)
	Mediastinal mass resection	0	4 (15.38%)
	Rib fixation	0	2 (7.69%)

► pain rescue analgesia

By calculating the total morphine consumption in mg in the first 48 hours postoperatively, we found that there is high significant difference between both groups in favor of the thoracic epidural group as demonstrated in **Table 3** and **Fig.3.**

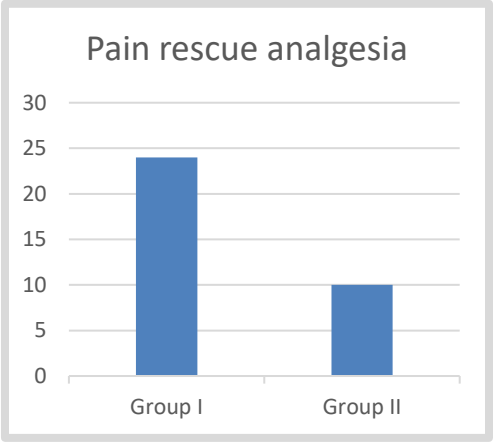

Fig: (3) Pain rescue analgesia

► Hospital stay and ICU stay duration

When both groups were compared regarding duration of ICU in days, there was high significant differences in favor of the PSIP group with *p*-value <0.001.**Table : (3), Fig: (4) and Fig: (5) .**

Table : (3) Comparison between both groups regarding hospital and ICU stay and supplementation of pain rescue analgesia

	Group I	Group II	
Hospital stays duration (Day)	4.54±1.174	4.23±0.710	0.258
ICU duration (Day)	1.31±0.618	2.00±0.693	<0.001
Pain rescue analgesia	24(92.31%)	10((38.46%)	

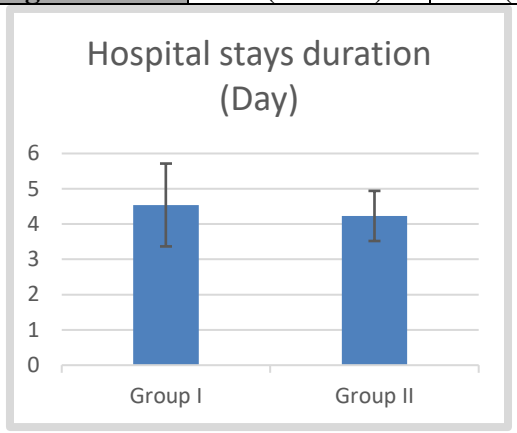

Fig: (4) Hospital stay duration

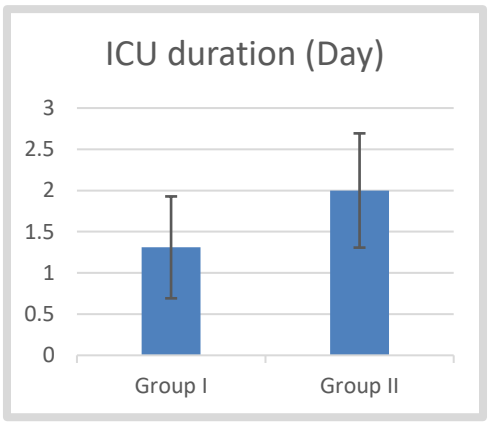

Fig: (5) ICU stay duration

► VAS score

Regarding VAS scores obtained (VAS) in both groups which monitored at 0 time (on arrival to ICU), then every 6 hours for 48 hour postoperative, we found that there was no significant differences between two groups with slight decrease in VAS for epidural group P value >0.01 . This is shown in **Fig: (6) and Table: (4)**.

Table : (4) VAS differences between both groups

	Group I	Group II	*p*-value
VAS 0	2.88±0.431	2.69±0.617	0.19
VAS 6 hrs.	2.65±0.689	2.35±0.846	0.15
VAS 12 hrs.	2.53±0.859	2.54±0.905	1
VAS 18 hrs.	2.61±0.697	2.462±0.989	0.51
VAS 24 hrs.	2.57±0.757	2.23±0.908	0.14
VAS 30 hrs.	2.19±0.694	2.15±0.881	0.86
VAS 36 hrs.	2.15±0.784	2±0.848	0.5
VAS 42 hrs.	2.31±0.736	1.92±0.891	0.95
VAS 48 hrs.	2.19±0.694	1.88±0.711	0.12

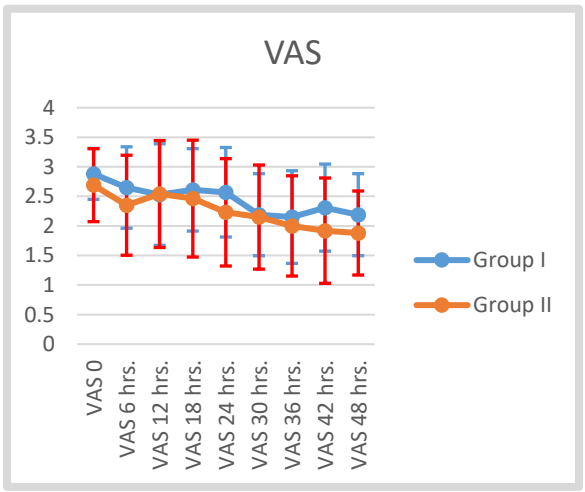

Fig: (6) VAS

► Side effects of opioid usage and block technique

Results of this study showed that there was obvious increase in the incidence of side effects of opioid usage in the PSIP group. For example, there were 4 patients in the PSIP group who suffered from nausea, in contrast, there were 0 patients in thoracic epidural block group.in **Table 5.**

Regarding incidence of hemodynamic changes due to the block, there was significant difference between both groups. We recorded hypotension (systolic pressure <90 mmHg) in 14 patients in thoracic epidural group and 0 patients in the PSIP group **Table 6 and Fig 7**.

As regarding heart rate there were insignificant difference in both groups . **Table: 7** and **Fig: 8**

Table: (5) Side Effects of Opioids and Hypotension

		Group I	Group II	*p*-value
Complications	**No**	22(84.62%)	12(46.15%)	
	N&V	4(15.38%)	0	
	Hypotension	0	14(53.85%)	

Table: (6) MAP values

	Group I	Group II	*p*-value
MAP 0	97.08±14.802	88.69±9.494	0.019
MAP 30 min	96.31±13.353	85.92±11.045	0.004
MAP 2 hrs.	94.69±12.161	82.46±11.486	<0.001
MAP 4 hrs.	93.38±10.782	82.08±10.334	<0.001
MAP 6 hrs.	90.46±9.403	80.23±12.206	0.001
MAP 8 hrs.	90.62±9.604	81.31±8.712	0.001
MAP 10 hrs.	93.15±7.007	79.62±6.992	<0.001
MAP 12 hrs.	91.45±6.370	80.46±1.44	<0.001
MAP 14 hrs.	91.62±8.015	82.46±7.966	<0.001
MAP 16 hrs.	91.85±5.626	82.69±8.730	<0.001
MAP 18 hrs.	91.69±5.643	83.15±6.025	<0.001
MAP 20 hrs.	91.08±4.890	81.15±7.406	<0.001
MAP 22 hrs.	92.77±4.493	82.77±7.570	<0.001
MAP 24 hrs.	89.85±6.195	83.15±6.727	<0.001
MAP 28 hrs.	92.08±5.844	84.46±5.132	<0.001
MAP 32 hrs.	91.77±3.881	85.69±7.304	<0.001
MAP 36 hrs.	92.46±6.819	83.38±6.530	<0.001
MAP 40 hrs.	93.38±6.306	85.46±6.866	<0.001
MAP 44 hrs.	90.77±6.147	87.31±5.548	0.038
MAP 48 hrs.	91.15±3.813	86.85±2.767	<0.001

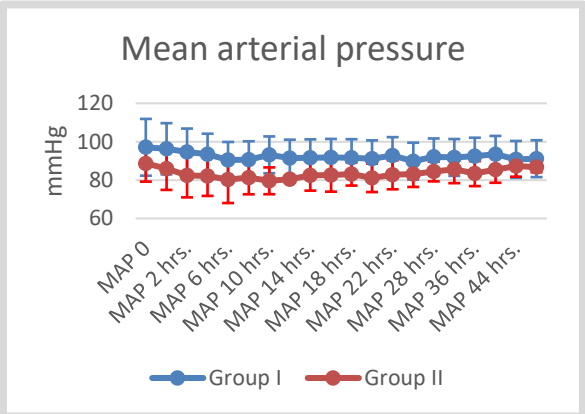

Fig : (7) MAP

Table: (7) Heart rate

	Group I	Group II	*p*-value
HR 0	84.69±13.117	78.54±13.306	0.099
HR 30 min.	83.85±11.291	75.23±13.706	0.017
HR 2 hrs.	81.08±9.247	76.77±9.717	0.108
HR 4 hrs.	80.31±9.452	76.54±8.696	0.141
HR 6 hrs.	75.69±9.570	73.85±9.490	0.488
HR 8 hrs.	76.15±9.649	74.69±8.885	0.572
HR 10 hrs.	76.15±10.851	72.77±7.506	0.197
HR 12 hrs.	73.77±9.210	71.08±9.883	0.314
HR 14 hrs.	74.54±9.188	79.92±9.099	0.039
HR 16 hrs.	72.08±8.270	74.38±6.888	0.280
HR 18 hrs.	73.38±5.900	72.92±6.151	0.784
HR 20 hrs.	74.46±5.132	73.31±6.137	0.466
HR 22 hrs.	73.62±5.940	72.15±5.808	0.374
HR 24 hrs.	72.92±6.046	69.69±6.602	0.072
HR 28 hrs.	72.69±4.371	69.46±5.995	0.031
HR 32 hrs.	71.08±5.477	70.85±5.555	0.881
HR 36 hrs.	73.15±7.309	69.38±4.759	0.032
HR 40 hrs.	74.23±5.294	71.46±3.992	0.038
HR 44 hrs.	74.31±6.479	72.08±6.493	0.221
HR 48 hrs.	72.38±7.060	69.38±4.708	0.077

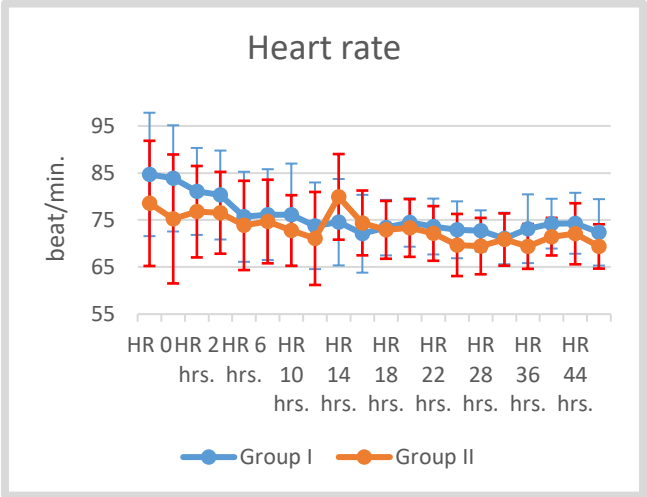

Fig: (8) Heart rate

Discussion

The current work compared TEA as the gold standard thoracic analgesic approach with an innovative, effective, locoregional, thoracic analgesic procedure "PSIP" in controlling acute post thoracotomy pain. It showed that VAS values at both rest and movement were of near results in both group with slight preference toward thoracic epidural group.

For a long time, TEA was considered the gold standard for thoracotomy pain. Yet, TEA problems like a technical failure are high (30%), sympathectomy-associated hemodynamic liability, opioid-induced nausea, vomiting, pruritis, urinary retention, and respiratory depression, besides risks of epidural hematoma or abscesses.

Severe postoperative pain remains a widespread but still underestimated problem. Extensive studies have demonstrated that despite present-day improvements in pain treatment, many patients still suffer from moderate to severe postoperative pain. Severe pain is associated with decreased patient satisfaction, delayed postoperative ambulation, the development of chronic postoperative pain, an increased incidence of pulmonary and cardiac complications, and increased morbidity and mortality. Therefore, it is of great importance that surgical procedures that result in severe pain and optimal analgesic strategies for these procedures can be identified. Treating acute pain after thoracotomy surgery and preventing the development of chronic post-thoracotomy pain syndrome (PTPS) remain significant challenges in this surgical population. While appropriately treated acute thoracotomy pain often resolves, a significant number of patients develop PTPS, with up to 65% of patients experiencing some pain and 10% suffering life-altering, debilitating pain. ***[8]***

Traditional regional anesthesia techniques such as thoracic epidural analgesia and thoracic paravertebral blockade are commonly used and considered 1st choice for analgesia due to its effectiveness , but these techniques have many complications such as; complexity of the block, hemodynamic effects and risk of bleeding and hematoma formation**.[9]**

The PSIP block, on the other hand, targets a myofascial plane located between the erector spine muscles (Iliocostalis) and intercostal muscle . The needle does not enter the paravertebral space and remains distant from the neuroaxis, discrete plexi or nerves, and major blood vessels **.[6]**

The need to find a safer and easier block than PVB is coming from that PVB may cause complications as pneumothorax and other neurological side effects and need more skill to learn and perform .Ultrasound-guided PSIP block is a myofascial plane block that provides analgesia for thoracic segmental innervation depending on the level of the injection site***. [6]***

Theoretically, at thoracic level, ESP block may provide good analgesic quality, but they may also cause several undesirable effects at this level, particularly in bilateral techniques, such as central sympathetic blockade, weakness of the chest wall, and risk of fall during ambulation, because thoracic ESP block may spread easily toward the paravertebral space (PVS), through the costotransverse foramina. **[10]**

It has been reported a circumferential epidural spread of LA after an ESP block, which can worsen cardiac condition in high-risk patients. **[11]**

The efficacy of the PSIP block may potentially depend on different mechanisms of action: (1) direct action in the fracture site by craniocaudal myofascial spread underneath the erector spine muscle (ESM); (2) spread to deep layers through tissue disruption caused by trauma, to reach the proximal intercostal nerves; (3) medial spread below the ESM, to reach the posterior spinal nerves; and (4) lateral spread in the sub-serratus (SS) plane to reach the lateral cutaneous branches of the intercostal nerves; while avoiding significant negative hemodynamic effects and other possible complications associated to other techniques leading that the PSIP may be considered an alternative in some clinical scenarios to the erector spine plane block or the paravertebral block.**[7]**

Potentially, the PSIP block would provoke less epidural-like effects compared with the ESP block due to a lateral injection point, which lowers the risk of massive epidural/paravertebral spread or bilateral block. On the other hand, the epidural spread of LA epidurally or the inadvertent dural puncture or direct epidural injection may affect the intracranial pressure when an ESP or PVB are used.**[10]**

In our study we found that thoracic epidural is still considered as the gold standard analgesic for thoracotomy operations but in comparison with it PSIP is considered a good modality for pain control for thoracotomy operations, beside regarding complications due to sympathectomy associated with epidural injection were NIL in PSIP block group and also less duration of ICU stay . Also, The use of pain rescue analgesia like ketolac, paracetamol and morphine was significant in the PSIP group, but complications after injection like hypotension and prolonged ICU stay were significant in thoracic epidural group . When a thoracic epidural is contraindicated, other modes of regional anesthesia such as PSIP should be considered as part of an effective pain-management strategy.

This study has some **limitations.** First, it consisted of a small number of patients, which could have affected the statistical accuracy. Second, this was a non-randomized study performed at a single institute. Third, it was only a single-blinded study, Since patients know, whether, or not they have received an injection for PSIP block, the placebo effect could not be minimized. Forth, No sensory testing was performed for mapping the block area that might determine the exact limits of the analgesic effect of the block. It is unclear whether the analgesic consumption results were related to the systemic effects of LA or the block itself. We think these limitations could and should be considered in future studies. Also, limited available studies for using parascapular subiliocostalis plane block for post-operative analgesia.

Conclusions: PSIP is considered as a good modality for post-operative analgesia in thoracotomy operation comparable to thoracic epidural which considered the gold standard for pain management especially in bilateral thoracotomy operations (in case of bilateral hydatid cysts for bilateral thoracotomies) ,as thoracic epidural has a single puncture and less risk for infection ,less failure rate, decreasing risk of local anesthetic systemic toxicity (single site injection) . in the other hand , due to sympathetic block associated with epidural injection hypotention was significant in this group so, some patients cannot withstand this hemodynamic instability (ischemic heart disease) .so, the use of parascapular subiliocoslis block as a new approach for analgesia for thoracotomies achieved patient satisfaction regarding pain severity and also not associated with hemodynamic instability compared with epidural.

Recommendations

► We recommend the use of PSIP block for thoracotomy surgery, as it can be performed simply and quickly with easily identified ultrasound landmarks especially in patients with contraindications for epidural insertion or cannot withstand hemodynamic instability associated with epidural dosage .

► We recommend further randomized controlled trials on a large number of patients and comparing variable interfacial plane blocks for thoracotomy surgery with each other in the future.

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