Ultra-Sound Guided Rhomboid Intercostal Blockade Versus Thoracic Paravertebral Blockade in Pediatric Thoracoscopic Sympathectomy

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ABSTRACT

Background: Iipsilateral somatosensory and sympathetic nerve block are effective for analgesia and treatment of pain of unilateral originating from the chest and abdomen. Rhomboid intercostal block (RIB) is a plane block utilized to achieve post-operative analgesia following video-assisted thoracoscopic surgery (VATS).

Objective: This randomized study was to done assess the total dose of post-operative morphine consumption and to compare the post-operative pain score (CHEOPS score) in the first post-operative 24 h, time to first rescue analgesia and intraoperative haemodynamic response to surgical stimuli.

Methods: This was a prospective, randomized, double-blind controlled study aimed at comparison the post-operative analgesia with ultrasound guided- thoracic paravertebral block (TPVB) versus with ultrasound guided-RIB in children undergoing thoracoscopic sympathectomy. The study was conducted on 2 groups of children undergoing laparoscopic sympathectomy where 70 children were divided into two groups (each is 35 patients).

Results: Duration of procedure demonstrated insignificant differences among both groups. Both groups demonstrated insignificant differences as regards heart rate and MAP either at baseline or at all intra-operative follow-up periods. Both groups demonstrated insignificant differences as regards all follow up periods of CHEOPS score. Both groups showed insignificant differences regarding analgesic requirement, 1st request of analgesia and morphine consumption.

Conclusion: In the context of pediatric thoracoscopic sympathectomy, Ultra-sound guided rhomboid intercostal blockade could be considered as a promising approach which doesn't affect hemodynamics with comparable analgesic efficiency to thoracic paravertebral blockade.

Keywords: Paravertebral Blockade, Thoracoscopic Sympathectomy, Rhomboid Intercostal Blockade

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INTRODUCTION

Surgery on the chest wall in pediatrics is not uncommon and usually associated with significant postoperative discomfort and pain **[1].** Post thoracotomy pain is usually moderate to severe and this pain management is challenging because it causes acute side effects in the postoperative period as influencing respiratory mechanics, with associated morbidity and mortality. In its acute phase, poor control of thoracotomy-related pain may also result in the development of a chronic pain syndrome **[2].**

VATS is a minimally invasive surgical technique allowing direct examination of the interior of thoracic cavity with no necessity for a large incision and thus avoid significant chest wall damage. VATS has the advantages of a smaller incision, less invasiveness, less post-operative pain, faster postoperative recovery, better cosmesis and less hospital stay in comparison to thoracotomy, therefore it is commonly used nowadays **[3].**

Recently, VATS is increasingly utilized in children because of refinements in the procedure, improved instrumentation, and advancements in pediatric anaesthesia **[4]**.

Postoperative pain management after paediatric operations is an important task aiming at increasing the quality of recovery, satisfaction of parents, and operative success. The use opioids in paediatric analgesia has several drawbacks, including post-operative emesis, rash, depression of respiration, and sedation **[5].**

The introduction of anatomy-based ultrasound (US) to facilitate nerve localization is an important advance in the field of paediatric regional anaesthesia. This is because regional anesthesia techniques are challenging to perform in children as a result of close proximity to critical structures, the necessity for sedation or even general anaesthesia which will mask potential warning signs as paresthesia, and the potential hazards of local anesthetic toxicity due to overdose **[6].**

The sensory innervation of anterolateral chest wall is via the lateral and anterior cutaneous branches of thoracic intercostal nerves (T2–T12) **[7].** TPVB achieves a definite analgesic effect for

somatic and visceral pain **[8].** Some authors believe that rhomboid intercostal block has same analgesic effect of other planes block **[9].**

Aim of Work

This study was done to assess the total dose of post-operative morphine consumption and to compare postoperative pain score (CHEOPS score) in the initial post-operative 24 h, time to first rescue analgesia and intraoperative hemodynamic stress response to surgical stimuli.

PATIENTS AND METHODS

This prospective double blinded controlled randomized study was performed at Mansoura University Children Hospital after being approved by Mansoura Faculty of Medicine Institutional Research Board. Informed written consents were taken from the patient's guardian. The study was performed from July 2021 to November 2022. This study was conducted on 70 children of both sexes undergoing thoracoscopic sympathectomy. Children were of American Society of Anesthesiologists (ASA) physical status I–II and their ages were between 6 and 18 years. We excluded patients when their guardians refused the procedure, or with previous surgery which would preclude the performance of needle puncture, with local infection of the skin and subcutaneous tissue at the puncture site, or with allergy to local anaesthetics and blood clotting disorders.

Randomization and Blindness

The physician who collected the intraoperative and postoperative data and the patient guardians were unaware of the given drugs and group distribution. The participate children underwent random allocation by a computer-generated randomization table, with group assignments were hidden in sealed envelopes into 2 equal groups (each=35 patients). First group (T group) included 35 patients whom had Thoracic paravertebral block and received 0.4 ml/kg bupivacaine 0.25% that was injected bilaterally into thoracic paravertebral space (0.2 ml/kg on each side). Second group (R group) included 35 patients whom had Rhomboid intercostal block and received 0.4 ml/kg bupivacaine 0.25% that was bilaterally injected on the upper intercostal muscles beneath the rhomboid major muscle (0.2 ml/kg on each side).

Methods

All patients were preoperatively clinically and radiologically assessed and appropriate laboratory tests were performed which included complete blood count (CBC), electrolytes, arterial blood gases, urinalysis, coagulation profile, blood sugar level and liver and kidney function tests. All were revised during the preoperative visit.

All children were kept fasting 6-8 h before the procedure. Patients were premedicated with intramuscular 0.1 mg/Kg midazolam 15 minutes before inducing general anesthesia. An intravenous line was inserted and secured. Standard monitoring with electrocardiogram (ECG), non-invasive blood pressure monitoring (NIBP) and pulse oximeter was done. Induction of anaesthesia was performed using sevoflurane 2%, fentanyl (1μg/kg i.v) and rocuronium (0.9 mg/kg I.V) was used to ease tracheal intubation. After induction of anesthesia, mechanical ventilation started by pressure-controlled mode (PCV) to maintain an end-tidal CO_2 at 30-35 mmHg. Anaesthesia was maintained using 40% oxygen in air and inhalational sevoflurane (1%-3%) and increments of rocuronium as required. Blood pressure measurements and pulse rates were maintained within 80% of their baseline value. Intravenous fluids were administered per body weight and according to intraoperative loss. We aimed to maintain hemoglobin around 10 gm% in the peri-operative period.

Thoracic Paravertebral Block Technique

The patient was positioned in either the lateral, or prone position. Following proper site clearance, patients were scanned via the linear high-frequency probe placed in sagittal orientation at the medial scapular line and moved caudally. Once the imaging of the 12th rib emerged, T12 tracing of the spinous process was done by medial sliding the probe and then marked. After that, probe was traced cranially for location of the T10-T11 vertebral. The probe was moved 3–5 cm laterally with rotation75 degrees anti-clock wise to recognize the paravertebral space as the target injection site. Following probe rotation into transverse orientation, a 22- gauge nerve block (80 mm) US-visible peripheral nerve block needle (Quincke Sono Plex Pajunk, Geisingen, Germany) using the in-plane technique was inserted at 90° to the skin, approximately 1-2 cm lateral to spine's midline. Once the needle arrived the paravertebral space, the study drug was injected. Successful injection was identified by the appearance of pleura displacement sign and hypoechoic ellipsoid matter in paravertebral space by US. This was repeated on the other side.

Rhomboid Intercostal Block Technique

The patient was positioned in either the lateral or prone position. After proper site clearance, the linear US probe was placed in a sagittal position medial to the medial scapular border on the lower medial area, defined as the auscultation triangle, in a cranio-caudal direction. The rhomboid major muscle was identified at T6 and T7 vertebrae, underneath the trapezius. The plane between rhomboid major and intercostal muscles was recognized. After the location was confirmed, the study drug was injected on the upper intercostal muscles under the rhomboid major by the 22-gauge nerve block (80 mm) US-visible peripheral nerve block needle utilizing the in-plane technique. Successful drug injection was identified by the

appearance of hypoechoic ellipsoid matter in the plane between rhomboid major and intercostal muscles under ultrasonic view. This was repeated on the other side.

At End of the surgical technique

Reversal of residual muscle relaxation was done using IV neostigmine 35 mcg/kg and atropine 15 mcg/kg. The patients were extubated after fulfilling the criteria of extubation, and transported to post-anaesthesia care unit (PACU).

Data Collection

The primary outcome measures included total dose of morphine requirements and secondary outcome measures included heart rate [HR] and mean arterial pressure [MAP] that were recorded prior to inducing anaesthesia (basal values), following inducing of anaesthesia, after skin incision, every 30 minutes and after skin closure and Post-operative pain was evaluated based on CHEOPS score at 0, 1, 6, 12, 18, 24 h after surgical technique. A patient with modified CHEOPS score >3 administered i.v. 0.05mg/kg morphine for analgesia.

Children's Hospital of Eastern Ontario Pain Scale (CHEOPS) [10]:

Score	0	1	2
Cry	No cry	Crying, moaning	Scream
Facial	Smiling	Composed	Grimace
Verbal	Positive	None or other complaints	Pain complaint
Torso	Neutral	Shifting, tense, upright	Restrained
Legs	Neutral	Kicks, squirm, drawn up	Restrained

Statistical Analysis

Data were analysed by Statistical package for social science (SPSS) software, v25 for Windows (SPSS Inc., Chicago, iL, US). Categorical data was described as frequencies and percents and was analyzed by chi-square test, or Fisher's exact test if the number of subjects in any contingency table cell is expected to be < five. Continuous data was tested for normality via Shapiro-Wilk test. Normally distributed data was described as mean and standard deviation (SD) and was analysed by unpaired student t-test. Non-normally distributed data was described as median (interquartile ranges) and was analysed by Mann Whitney U test. P-value ≤ 0.05 was considered significant.

RESULTS

The study was conducted on 2 groups of children undergoing laparoscopic sympathectomy, 74 children were assigned for eligibility, 4 children were ruled out and 70 children were randomized into 2 groups (each group: 35 patients). As regards demographic characteristics of the studied groups, no significant difference was found between both groups, regarding the duration of procedure in the study groups, there was no significant difference between the 2 groups as shown in table **1**. Regarding heart rate and intra-operative follow-up of the studied groups, both groups demonstrated insignificant differences as regards heart rate either at baseline or all intra-operative follow-up periods as shown in table **2**.

Table (1): Demographics and Duration of procedure in the study groups:

		T group	**R group**	**95% CI**	**P**
Age (years)		14.11 ± 2.998	14.23 ± 2.474	-1.4, 1.2	0.862
Gender	**Males**	21 (60.0%)	18 (51.4%)	-	0.470
	Females	14 (40.0%)	17 (48.6%)		
Weight (kg)		51.43 ± 10.054	51.49 ± 9.338	-4.7, 4.6	0.980
Duration of procedure (minutes) (Mean±SD)		55.14 ± 8.785	55.14 ± 9.194	-4.3, 4.3	1
Data are described as means and SDs or as percents and frequencies. 95% CI: 95% confidence interval of the mean difference among the 2 groups. P is significant if < 0.05.					

Table (2): Baseline heart rate and intra-operative follow-up of the studied groups

Heart rate (Mean±SD)	**T group**	**R group**	**95% CI**	**P**
Baseline	105.69 ± 7.533	97.46 ± 8.876	-0.7, 7.2	0.105
Induction	94.09 ± 7.064	90.91 ± 9.369	-0.8, 7.1	0.114
Incision	95.94 ± 7.174	92.83 ± 9.799	-1.0, 7.2	0.134
15 minutes	96.51 ± 7.233	93.06 ± 9.659	-0.6, 7.5	0.095

30 minutes	96.60 ± 7.208	92.77 ± 9.580	-0.2, 7.9	0.063
45 minutes	96.80 ± 7.020	93.00 ± 9.923	-0.3, 7.9	0.069
60 minutes	96.51 ± 6.921	92.54 ± 10.257	-0.2, 8.1	0.062
75 minutes	96.94 ± 7.071	93.17 ± 10.142	-0.4, 7.9	0.076
90 minutes	96.97 ± 7.266	93.31 ± 10.163	-0.6, 7.9	0.088
Skin closure	97.09 ± 7.609	93.29 ± 10.607	-0.6, 8.2	0.090
Data are described as means and SDs. 95% CI: 95% confidence interval of the mean difference among the 2 groups. P is significant if < 0.05.				

As regards intra-group comparison of baseline heart rate and intra-operative follow-up of the two groups, both groups showed statistically significant difference as regards heart rate recordings between baseline and all intra-operative follow-up periods as demonstrated in table **3**.

Table (3): Within group comparison of Baseline heart rate and intraoperative follow-up of the studied groups

Heart rate (Mean±SD)	**T group**		**R group**	
	Mean ± SD	**P**	**Mean ± SD**	**P**
Baseline	105.69 ± 7.533	-	97.46 ± 8.876	-
Induction	94.09 ± 7.064	**< 0.001**	90.91 ± 9.369	**< 0.001**
Incision	95.94 ± 7.174	**< 0.001**	92.83 ± 9.799	**< 0.001**
15 minutes	96.51 ± 7.233	**< 0.001**	93.06 ± 9.659	**< 0.001**
30 minutes	96.60 ± 7.208	**< 0.001**	92.77 ± 9.580	**< 0.001**
45 minutes	96.80 ± 7.020	**< 0.001**	93.00 ± 9.923	**< 0.001**
60 minutes	96.51 ± 6.921	**< 0.001**	92.54 ± 10.257	**< 0.001**
75 minutes	96.94 ± 7.071	**< 0.001**	93.17 ± 10.142	**< 0.001**
90 minutes	96.97 ± 7.266	**< 0.001**	93.31 ± 10.163	**< 0.001**
Skin closure	97.09 ± 7.609	**< 0.001**	93.29 ± 10.607	**< 0.001**
Data are described as means and SDs. P is significant if < 0.05.				

Regarding MAP and intra-operative follow-up of the studied groups, both groups demonstrated insignificant differences as regards MAP either at baseline or all intra-operative follow-up periods, as regards CHEOPS score follow-up in the studied groups, both groups demonstrated insignificant differences as regards all follow up periods as shown in table **4**. Regarding intra-group comparison of CHEOPS score and follow-up in the studied groups, both groups demonstrated statistically significant differences as demonstrated in table **5**. Regarding intra-group comparison of baseline MAP and intra-operative follow-up of the studied groups, both groups showed statistically significant difference as regards MAP recordings between baseline and all intra-operative follow-up periods as shown in table **6**. Regarding postoperative analgesic profile of the study groups, there was no statistically significant difference between the 2 groups as demonstrated in table **7**.

Table (4): Baseline MAP and intra-operative and CHEOPS score follow-up of the studied groups

	T group	**R group**	**95% CI**	**P**
MAP(mmHg) (Mean±SD)				
Baseline	82.63 ± 8.398	82.89 ± 8.292	-4.2, 3.7	0.898
Induction	77.71 ± 8.830	77.69 ± 7.623	-3.9, 4.0	0.988
Incision	79.83 ± 9.005	79.69 ± 8.014	-3.9, 4.2	0.944
15 minutes	80.06 ± 8.983	79.77 ± 7.900	-3.7, 4.3	0.888
30 minutes	79.89 ± 8.963	79.43 ± 8.008	-3.6, 4.5	0.823
45 minutes	80.20 ± 9.051	79.54 ± 8.212	-3.5, 4.8	0.751
60 minutes	79.97 ± 9.240	79.14 ± 8.472	-3.4, 5.1	0.697
75 minutes	80.26 ± 9.332	79.46 ± 8.368	-3.4, 5.0	0.707
90 minutes	80.06 ± 9.576	79.29 ± 8.418	-3.5, 5.1	0.721
Skin closure	80.43 ± 9.915	79.29 ± 8.556	-3.3, 5.6	0.607
CHEOPS				
PACU	0.57 ± 0.502	0.43 ± 0.502	-0.1, 0.4	0.235
1 hour	1.51 ± 0.562	1.34 ± 0.482	0.0, 0.6	0.133
6 hours	3.03 ± 0.707	2.80 ± 0.868	0.0, 0.8	0.156
12 hours	3.63 ± 0.808	3.31 ± 0.867	0.0, 0.9	0.098
18 hours	3.11 ± 0.676	2.97 ± 0.857	-0.2, 0.5	0.463

24 hours	3.11 ± 0.932	2.77 ± 1.003	-0.1, 0.8	0.130
Data are described as means and SDs. 95% CI: 95% confidence interval of the mean difference among the 2 groups. P is significant if < 0.05.				

Table (5): Within group comparison of CHEOPS score follow-up in the studied groups

CHEOPS	**T group**		**R group**	
	Mean ± SD	**P**	**Mean ± SD**	**P**
PACU	0.57 ± 0.502	-	0.43 ± 0.502	-
1 hour	1.51 ± 0.562	**< 0.001**	1.34 ± 0.482	**< 0.001**
6 hours	3.03 ± 0.707	**< 0.001**	2.80 ± 0.868	**< 0.001**
12 hours	3.63 ± 0.808	**< 0.001**	3.31 ± 0.867	**< 0.001**
18 hours	3.11 ± 0.676	**< 0.001**	2.97 ± 0.857	**< 0.001**
24 hours	3.11 ± 0.932	**< 0.001**	2.77 ± 1.003	**< 0.001**
Data is described as means and SDs. P is significant if < 0.05.				

Table (6): Within group comparison of Baseline MAP and intra-operative follow-up of the study groups

MAP (mmHg) (Mean±SD)	**TP group**		**R group**	
	Mean ± SD	**P**	**Mean ± SD**	**P**
Baseline	82.63 ± 8.398	-	82.89 ± 8.292	-
Induction	77.71 ± 8.830	**< 0.001**	77.69 ± 7.623	**< 0.001**
Incision	79.83 ± 9.005	**< 0.001**	79.69 ± 8.014	**< 0.001**
15 minutes	80.06 ± 8.983	**< 0.001**	79.77 ± 7.900	**< 0.001**
30 minutes	79.89 ± 8.963	**< 0.001**	79.43 ± 8.008	**< 0.001**
45 minutes	80.20 ± 9.051	**< 0.001**	79.54 ± 8.212	**< 0.001**
60 minutes	79.97 ± 9.240	**< 0.001**	79.14 ± 8.472	**< 0.001**
75 minutes	80.26 ± 9.332	**< 0.001**	79.46 ± 8.368	**< 0.001**
90 minutes	80.06 ± 9.576	**< 0.001**	79.29 ± 8.418	**< 0.001**
Skin closure	80.43 ± 9.915	**< 0.001**	79.29 ± 8.556	**< 0.001**
Data is described as means and SDs. P is significant if < 0.05.				

Table (7): Postoperative analgesic profile of the studied groups

		T group	**R group**	**95% CI**	**P**
Patients who required rescue analgesia (%)		24 (68.6%)	19 (54.3%)	-	0.220
1st Request of analgesia		11.50 ± 5.572	12.32 ± 6.473	-4.5, 2.9	0.659
Time of 1st Request of analgesia	**< 12 hours**	9 (37.5%)	8 (42.1%)	-	0.759
	≥ 12 hours	15 (62.5%)	11 (57.9%)		
Total morphine consumption (mg)		7.83 ± 2.408	7.42 ± 2.652	-1.1, 2.0	0.597
Data are described as means and SDs or as percents and frequencies. 95% CI: 95% confidence interval of the mean difference among the 2 groups. P is significant if < 0.05.					

DISCUSSION

TPVB is the technique of injecting local anaesthetic alongside the thoracic vertebra lateral to where spinal nerves emerge from the intervertebral foramina. It achieves ipsilateral somatosensory and sympathetic nerve block effective for anaesthesia and controlling pain of unilateral origin from patient's chest and abdomen **[11].** RIB is a type of plane block utilized to achieve post-operative analgesia after VATS **[12]. Elsharkawy and his colleagues [13]** found that after local anaesthetic injection in the interfascial plane between the rhomboid major and intercostal muscles, RIB achieves analgesia between T2 and T9 dermatomes.

This study compared the effectiveness of post-operative analgesia by US-TPVB versus US-RIB in pediatric patients undergoing thoracoscopic sympathectomy. We demonstrated that US-RIB could provide effective post-operative analgesia as US-TPVB. Our study aimed at assessing total dose of post-operative morphine consumption and to compare the post-operative pain score in the first post-operative 24 h, time to first rescue analgesia and intraoperative hemodynamic stress response to surgical stimuli. To the best of our knowledge, this was the first study to compare the effectiveness of post-operative analgesia by US-TPVB versus US-RIB in children undergoing thoracoscopic sympathectomy.

Regarding demographic characteristics of the studied groups, no significant difference was found between both groups. Thus, the two groups were comparable, and such characteristics did not affect the results of our study. With regard to duration of procedure in the studied groups, the present work showed that no significant difference was found between both groups regarding duration of procedure (55.14 ± 8.785 versus 55.14 ± 9.194). Regarding hemodynamics, the present study revealed that; both groups demonstrated insignificant differences as regards MAP and HR either at baseline or all intra-operative follow-up periods. Likewise, **Deng et al. [14]** have demonstrated that no significant differences were recorded between baseline and all follow up periods.

Regarding CHEOPS score follow-up, the present study demonstrated that; the two groups demonstrated insignificant differences as regards all follow up periods (PACU, 1h, 6h, 12h, 18h and 24h) ($P>0.05$). Ninety adult patients scheduled for VATS were divided into 3 groups. In group C, no block was carried out. Group A received US-RIB while group B received US-RIB and serratus plane block (SAB). All patients received i.v. sufentanil on arrival to the recovery room. Post-operative sufentanil consumption and pain scores were compared between study groups **[14].** The doses sufentanil consumption at 24 hours post-operatively in RIB group was significantly lower compared with group C ($p < 0.001$), the post-operative Numerical Rating Scale (NRS) scores in RIB group at 0.5, 1, 3, 6, 12, 18, and 24 hours post-operatively when patients were at rest or active were significantly lower compared with group C **[14].**

In their experiment, they found that after RIB, the NRS score was < 3 within the post-operative 12 hours, and no rescue analgesia was needed. However, within 12–24 hours post-operatively, the analgesic effect of the RIB was reduced, with a mean NRS score was of 4 **[14]. Altıparmak et al. [15]** carried out US-RIB in 2 cases for post-operative analgesia following thoracoscopic surgery. NRS scores of both cases were < 3/10 and no rescue analgesia was needed in the initial 12 hours. The pin-prick test showed a sensorial block between T3 and T10 at 60th minute postoperatively.

Concerning analgesic requirement, no significant difference was found between the two groups regarding the necessity for rescue analgesia, 1st analgesia request and morphine consumption ($P>0.05$). Similarly, **Zhang et al. [16]** randomly divided 90 patients undergoing VATS into 3 groups experiencing US-SAB erector spinae plane block (ESPB), and RIB respectively. At 0–12 h, sufentanil requirements were significantly lower in RIB and ESPB groups compared with SAB group ($P < 0.001$), and no noticeable diversity in sufentanil requirement was demonstrated among RIB and ESPB groups. At 12–24 h, sufentanil requirements were significantly lower in RIB and ESPB groups compared with SAB group ($P < 0.001$), with no obvious diversity in sufentanil requirement among RIB and ESPB groups. No significant diversity in sufentanil requirement was reported among the three groups at 24–48 h ($P=0.192$). This could be explained by the end of the duration of action of local anasthetics and addsitives. At 6, 12, 18, and 24 h, the post-operative NRS scores were significantly lower in RIB and ESP groups compared with SAB group (($P < 0.05$). There was no significant diversity in the post-operative NRS mark among RIB and ESP groups within 48 h post-operatively ($P < 0.05$).

Thus, they concluded that; sufentanil dose can be effectively decreased by US-RIB and ESPB within 24 h post-operatively, and pain can be effectively improved within 24 h compared to SAB **[16].**

Also, **Deng et al. [12]** conducted their study on 66 adults undergoing VATS. Patients were divided to 2 groups. In group C, patients received i.v. sufentanil for analgesia after surgery. Patients in RIB group received i.v. sufentanil with continuous RIB**.** The post-operative NRS scores in group continuous rhomboid intercostal block at 6, 12, 18, and 24 hours post-operatively, during rest, were

significantly lower compared with group C ($p< 0.05$). The post-operative NRS scores in continuous RIB RIB at 1, 3, 6, 12, 18, 24, and 36 hour after surgery, in active patients, were significantly lower compared with group C ($p< 0.05$). Also, they have found that; in patients continuous RIB was associated with better quality of recovery as well as post-operative analgesia **[12].**

The following reasons could cause post-operative pain after VATS. First, thoracic drainage tube can be associated with intercostal neuralgia and pleural stimulation; second, changing patient's posture and severe cough; third, surgical incision and nerve injury. Opioid drugs are often utilized to control post-operative pain, however with side effects such as nausea, emesis and slow recovery of intestinal function **[14].**

The anatomical relation of serratus anterior to the external intercostal muscle could explain the good analgesic effect of RIB. This allows for their block during the RIB; therefore, reducing rib movement to allow comfort during deep inspiration. However, this does not apply to forced expiration that utilizes the unblocked innermost and internal intercostal muscles which lead to pain during cough **[17].**

In brief, the current study demonstrated that; RIB can be as effective as thoracic paravertebral block.

In accordance, one case record was performed by **Ökmen [9]** has demonstrated that the RIB might be as effective as other blocks carried out on the thoracic region.

The RIB advantages are the fact that there is a relatively high distance between injection site and the incision point, so there is a reduced likelihood that the needle or the catheter becomes advanced to reach the surgical area, block of the lateral cutaneous branch, as well as the absence of long thoracic nerve block **[18].**

CONCLUSION

In the context of pediatric thoracoscopic sympathectomy, Ultra-sound guided rhomboid intercostal blockade could be considered as a promising approach which doesn't affect hemodynamics with comparable analgesic efficiency to thoracic paravertebral blockade.

LIMITATIONS

The present study had some limitations as it has a small sample size, the CHEOPS score was patient dependent which may be deceiving and it was a single-center trial that may limit its universality.

RECOMMENDATIONS

Additional studies are required to be carried out on larger samples. We recommend the utilization of ultra-sound guided rhomboid intercostal blockade in pediatric who will undergo thoracoscopic sympathectomy.

Conflict of interest: None.

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