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The impact of thoracic paravertebral block over post-operative evolution in open lobectomy

AIM: The thoracic paravertebral block (PVB), a technique of post-thoracotomy analgesia of similar effectiveness as continuous epidural analgesia (CEA) but with a better safety profile, is underutilized in current practice. This study compares the outcome of post-lobectomy patients in relation to the analgesic method used: parenteral analgesia (PA) vs. PVB + PA, and provides justification for the routine use of PVB in all patients where CEA is contraindicated.

METHODS: We randomized 213 consecutive patients undergoing open lobectomy to benefit from two different protocols of postoperative analgesia: PA vs. PVB + PA. We compared the frequency of cardiac hemodynamic, respiratory, pleural or surgical-related complications.

RESULTS: After lobectomy, the PVB patients (72/213) were found to have a significantly lower frequency of congestive heart failure (7.1%vs.0.0%)($p=0.049$), ischemic cardiomyopathy (10.6%vs.0.0%)($p=0.010$), pulmonary atelectasis (35%vs.1.1%)($p<0.001$), residual pleural space (29.8%vs.15.3%)($p=0.032$) and residual intrapleural blood clots (14.9%vs.1.4%)($p=0.005$). Other postoperative complications, Intensive Care stay, total hospital stay and mortality rate were less frequent in the PVB group but without reaching statistical significance.

CONCLUSION: The use of SPVB is associated with significant less postoperative complications than PA only. This study suggests that the SPVB might be the ideal choice in post-thoracotomy pain management when CEA cannot be used.

KEY WORDS: Open lobectomy, Post-lobectomy, Thoracic paravertebral block

Introduction

Thoracotomy is usually followed by intense or moderate pain which may lead to severe postoperative complications such as atelectasis, pneumonia, exacerbations of chronic obstructive bronchopulmonary disease (COPD) and chronic bronchitis¹. Uncontrolled postoperative pain

is a cause of increased morbidity, mortality, duration of hospitalization and costs². Of all surgical incisions, thoracotomy causes the most intense postoperative pain³. The pathophysiological chain initiated by pain includes impaired coughing, ineffective inspiration, retention of secretions and alveolar hypoventilation. The delayed postoperative mobilization will predispose to respiratory complications, while severe immediate pain, if uncontrolled through medication, may lead in time to chronic pain, which occurs in half of the patients after thoracotomy^{4,5}. Regional analgesia may decrease the rate of chronic post-thoracotomy pain⁶. Several therapeutic methods are available for post-thoracotomy pain⁵. Parenteral analgesia (PA) is usually chosen, combined with a technique of regional analgesia. PA can be associated with continuous epidural analgesia (CEA) or thoracic paravertebral block (PVB).

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None of the regional anesthetic techniques, which can be associated to PA, is ideal, and there are advantages and disadvantages to all of these. CEA has been for a long time considered the "gold standard" in post-thoracotomy analgesia^{7,8}. Further studies have shown, however, that PVB may serve as an alternative comparable to CEA^{9,10} and that it provides similar effectiveness to CEA in controlling post-thoracotomy pain but with less side effects¹¹⁻¹³. PVB is a regional anesthesia technique performed by the Intensive Care specialist and involves blocking the intercostal nerves emerging from spine. The block is performed by percutaneously inserting a catheter in the paravertebral area under ultrasonographic guidance. The result is a segmental block involving the region supplied by the blocked nerves. The PVB technique requires a learning curve, a certain amount of time and may incur potential complications and rate of failure. Its advantage lies in the possibility of inserting the catheter on the day prior to surgery.

Based on the same pathophysiological principle as the PVB, a variant of the technique, "under direct vision", can be performed by the surgeon who inserts the catheter in the paravertebral area, before closing the thoracotomy¹⁴⁻²⁰. This technique will be named in this article surgical thoracic paravertebral block (SPVB) and involves the blunt dissection in the extrapleural plane, creating a paravertebral pouch in which is placed transcutaneously, under direct vision, the catheter used to infuse the anesthetic either continuously or in boluses.

The aim of the study was to compare the postoperative course of thoracotomy patients according to the chosen type of analgesia. The techniques compared in the study are SPVB + PA vs. PA. The foreseeable result would involve a better outcome of the SPVB + PA group. The aim of this study is to confirm this hypothesis and to statistically quantify the difference between the two approaches. Another objective is to assess the place and role of SPVB in decreasing post-thoracotomy complications, as a direct consequence of the more effective control of post-thoracotomy pain.

Patients and Method

We included in the study all consecutive patients with lateral thoracotomy for the same type of surgical intervention (i.e. open-lobectomy), performed by the same surgical/anesthesia team, between January 2008-December 2015. The study was carried out in a regional thoracic surgery department. We chose to include only lobectomy patients in order to limit the potential influence of the type of surgical intervention on the postoperative outcome.

The exclusion criteria were: pleural empyema, paravertebral abscesses, vertebral tumors, fibrothorax and severe local pachypleuritis. The surgical indication for regional parietal pleurectomy and the accidental pleural tear pre-

cluded the use of SPVB. Other exclusion criteria were set due to the potential complications or the technical impossibility of performing SPVB.

Patients were also excluded if they did not consent to the procedure or they were unable to communicate in order to have their pain assessed using the visual analogue pain scale (VAS).

The patients were assigned in different groups according to the type of postoperative analgesia: 1. Patients with combined SPVB + PA analgesia (the SPVB group) and 2. Patients with only PA (the PA group).

The thoracic surgeon and the anesthesiologist selected the patients that received SPVB, with preference for patients with lower cardio-pulmonary function and multiple comorbidities.

In the SPVB group the same surgical team, before closing the thorax, placed percutaneously an extrapleural paravertebral catheter, using the Seldinger method. Initially, by instrumental dissection under direct vision, we created an extrapleural space, between the parietal pleura and the costovertebral groove, space which contains the anterior and posterior branches of the intercostal nerves and the sympathetic branches. This extrapleural pouch extends from the apex until 2 or 3 intercostal spaces below the thoracotomy incision and is relatively sealed, except at the site of the pleural incision during thoracotomy. The extrapleural analgesia catheter is inserted under direct vision in this pouch; this space can, at need, be enlarged using hydraulic dissection by injecting 20-40 ml 1% Lidocaine or 0.5% Marcaine under pressure.

POSTOPERATIVE ANALGESIA PROTOCOL

In both groups we used a non-opioid analgesic (NOA) component consisting of acetaminophen, metamizole, nefopam hydrochloride and ketoprofen; the anti-inflammatory drug was maintained for 3-5 days. Furthermore, in both groups, the opioid analgesics were initiated when pain quantified as Visual Analog Pain Scale (VAS) >4 persisted despite SPVB and/or maximal NOA.

The postoperative analgesia protocol for the two groups (SPVB +PA vs. PA) is presented in Table I. The mobilization of patients was initiated on day 1 after surgery, alongside respiratory physiotherapy and physical therapy. Double pleural drainage was used.

Study design: we performed a clinical, prospective, interventional study.

The outcome of patients with or without SPVB was assessed taking into account postoperative complications, length of Intensive Care Unit (ICU) stay and total hospital stay and 30-day mortality.

Postoperative complications were divided into 4 categories: cardiovascular, respiratory, surgical complications including pleural morbidity and other complications.

The cardiovascular complications monitored after surgery

were: congestive heart failure (CHF), acute right ventricular failure (ARVF), acute pulmonary edema (APE) and ischemic cardiomyopathy (ICM), including angina, ST segment depression and atrial fibrillation with postoperative onset.

The respiratory complications were: pulmonary atelectasis, pneumonia, acute bronchitis or infectious exacerbations of COPD, ventilatory support necessary immediately after surgery, air leaks for more than 7 days, ALI/ARDS, need for reintubation and mechanical ventilation.

The complications related to surgery and pleural morbidity included: postoperative bleeding, pleural drainage needed for more than 5 days, residual pleural space at discharge, residual intrapleural blood clot and wound complications.

The other complications encountered were acute renal failure and cerebrovascular conditions. The radiology images at discharge were declared normal or borderline (some lung condensation, pleural effusion or air collections post-lobectomy) but the imaging workup did not impede the patient's discharge. Ours Ethics Committee approved the study.

The statistical analysis was performed using the IBM SPSS Statistics 20 software.

We included in the analysis the 25 above-mentioned postoperative variables, 23 categorical and 2 continuous, in order to identify some possible correlations between the postoperative outcome and the type of analgesia used. The categorical variables were compared using the χ^2 or Fischer test when necessary. For the continuous variables we identified the normally or abnormally distributed variables, expressed them as means or medians and tested them using the Student's and Mann-Whitney tests.

Using the univariate analysis, we identified which of the factors of postoperative outcome were influenced by the type of analgesia, with statistical significance ($p < 0.05$).

Results

We enrolled 217 patients with lateral thoracotomy for lobectomy. In the first stage we excluded 4 patients because of catheter dysfunction, with 213 patients remaining. Of these, 72 patients (33.80%) benefited from SPVB plus PA, while the remaining 141 patients (66.20%) were treated only with PA. Patient and surgical characteristics of the two groups are displayed in Table II, with statistically significant differences for restriction (FVC), hypoxemia (PaO_2), hypercapnia (PaCO_2) and cardiac status (EF), $p=0.009$, $p<0.001$, $p=0.021$ and $p<0.001$ respectively.

The influence of SPVB + PA analgesia on cardiovascular complications is displayed in Table III. We noted the significantly lower incidence of CHF and ICM in the SPVB + PA group compared to the PA group.

We recorded fewer respiratory complications in patients benefiting from SPVB than in the PA group, with statistical significance only for pulmonary atelectasis. The results are displayed in Table IV.

The complications related to surgery and pleural morbidity episodes are displayed in Table V. In the SPVB group we found significantly fewer cases of residual pleural space, hemothorax and wound complications than in the PA group. Renal failure and cerebrovascular complications occurred in a small proportion of patients and only in the group without SPVB (Table VI).

Abnormal X-ray findings at discharge were recorded in 54 (25.4%) patients; of these, 42 (29.8%) were from the PA-only group, while only 12 (16.7%) had received SPVB, a difference tending towards statistical significance ($p= 0.055$). The ICU length of stay, the total hospital stay, and mortality rate was lower in the SPVB group, but without reaching statistical significance (Table VII). The surgical technique included a double (anterior and posterior) pleural drainage. We recorded a similar dura-

TABLE I - The postoperative analgesia protocol for the two groups

Postop. day	SPVB +PA group	PA group
Day 0	Continuous 0.25% Bupi 8-12 ml/hour Bupi 10-20 ml bolus on demand if VAS >4 IV Morphine 3 mg if VAS > 4 NOA	Continuous Morphine (1mg/ml) 2-3 ml/hour (increased at VAS >7) Morphine 2-3 ml bolus if VAS > 4 NOA
D1-2	0.25% Bupi 20 ml, in bolus every 4 hours 0.25% Bupi 20 ml, bolus on demand, VAS >4 Tramadol 50 – 100 mg IV on demand if VAS >4 Pethidine 50 -100 mg IV on demand if VAS > 7 NOA	Pethidine bolus every 6 hours Pethidine bolus on demand for VAS > 4 Plus NOA
D 3-5	0.25% Bupi 20 ml bolus on demand VAS >4 Tramadol on demand VAS > 4 NOA	Tramadol on demand for VAS >4 Pethidine on demand for VAS > 7 Plus NOA

TABLE II - Patients and surgical characteristics

Parameter	Total patients (213)	Postoperative analgesia		P
		PA 141 (66.2%)	SPVB+PA 72 (33.8%)	
Male sex	157 (73.7%)	109 (77.3%)	48 (66.7%)	0.133
Age	60.00 (52.50;65.00)	60.00 (53.00; 65.00)	59.00 (51.00;65.00)	0.647
Smokers	173 (81.2%)	111 (78.7%)	62 (86.1%)	0.263
VC (%)	77.00 (67.85;89.00)	78.90 (68.30;90.50)	69.00 (66.25;78.80)	0.009
FEV1 (%)	84.52 (+/- 16.41)	86.62 (+/- 16.16)	80.40 (+/-16.22)	0.090
PaO ₂ (mm Hg)	81.50 (74.35;87.65)	82.70 (76.85;88.00)	74.00 (69.00;83.00)	< 0.001
PaCO ₂ (mm Hg)	38.96 (+/- 5.21)	39.54 (+/-4.37)	37.81 (+/- 6.44)	0.021
PAPs (mm Hg)	30.00 (25.00;32.00)	30.00 (25.00;32.00)	30.00 (20.00;32.00)	0.378
EF(%)	55.00 (50.00; 60.00)	57.00 (52.00; 62.00)	53.00 (49.00; 56.00)	< 0.001
Comorbidities >3	36 (16.9%)	22 (15.6%)	14 (19.4%)	0.607
Diagnosis				
Neoplasms	174 (81.7%)	115 (81.6%)	59 (81.9%)	1.000
Suppurations	41 (19.2%)	27 (19.1%)	14 (19.4%)	0.645
Tuberculosis	17 (8.0%)	13 (9.2%)	4 (5.6%)	0.645
Chemotherapy	61 (28.6%)	44 (31.2)	17 (23.6%)	0.318
Radiotherapy	6 (2.8)	4 (2.8)	2 (2.8)	1.000
Surgery				
Lobectomy	193 (90.6%)	130 (92.2%)	63 (87.5%)	0.388
Bilobectomy	20 (9.4%)	11 (7.8%)	9 (12.5%)	0.388
ASA				
I	8 (3.8%)	4 (2.8%)	4 (5.6%)	0.407
II	87 (40.8%)	54 (38.3%)	33 (45.8%)	
III	117 (54.9%)	82 (58.2%)	35 (48.6%)	
IV	1 (7%)	0 (0.0%)	1 (5%)	
TNM stage				
1	49 (23.0%)	22 (15.6%)	27 (37.5%)	0.004
2	78 (36.6%)	55 (39.0%)	23 (31.9%)	
3	37 (17.4%)	25 (17.7%)	12 (16.7%)	
4	4 (1.9%)	4 (2.8%)	0 (0.0%)	

TABLE III - The influence of the type of analgesia on cardiovascular complications

Postoperative complication	Total patient No. (%)	Postoperative analgesia		P
		PA	SPVB+PA	
ARVF	13 (6.1%)	11 (7.8%)	2 (2.8%)	0.252
CHF	10 (4.7%)	10 (7.1%)	0 (0.0%)	0.049
APE	9 (4.2%)	8 (5.7%)	1 (1.4%)	0.267
ICM	15 (7.0%)	15 (10.6%)	0 (0.0%)	0.010

TABLE IV - The influence of SPVB on the development of postoperative respiratory complications

Postoperative parameter	Total patient No. (%)	Postoperative analgesia		P
		PA	SPVB + PA	
VM postop.	3 (1.4%)	3 (2.1%)	0 (0.0%)	0.213
AL > 7 days	42 (19.7%)	30 (21.3%)	12 (16.7%)	0.537
Atelectasis	58 (27.2%)	50 (35.5%)	8 (11.1%)	< 0.001
Pneumonia	26 (12.2%)	21 (14.9%)	5 (6.9%)	0.146
COPD exacerbations	36 (16.9%)	29 (20.6%)	7 (9.7%)	0.071
Bronchopneumonia	17 (8.0%)	14 (9.9%)	3 (4.2%)	0.230
Acute respiratory failure	21 (9.9%)	17 (12.1%)	4 (5.6)	0.207
ARDS	9 (4.2%)	8 (5.7%)	1 (1.4%)	0.267
Reintubation	3 (1.4%)	3 (2.1%)	0 (0%)	0.213

TABLE V - The influence of SPVB on complications related to surgery and pleural morbidity

Postoperative analgesia Postoperative parameter	Total patients	PA	SPVB + PA	P
Hemorrhage	26 (12.2%)	21 (14.9%)	5 (6.9%)	0.146
Bronchial fistula	6 (2.8%)	4 (2.8%)	2 (2.8%)	1.000
PPD	59 (27.7%)	34 (24.1%)	25 (34.7%)	0.140
Residual pleural space	53 (24.9%)	42 (29.8%)	11 (15.3%)	0.032
Coagulated hemothorax	22 (10.3%)	21 (14.9%)	1 (1.4%)	0.005
Wound complications	18 (8.5%)	17 (12.1%)	1 (1.4%)	0.017

TABLE VI - The impact of SPVB on renal and cerebro-vascular complications

Postoperative complication	Total patients	PA	Postoperative analgesia SPVB + PA	p
Acute renal failure	3 (1.4%)	3 (2.1%)	0 (0.0%)	0.213
CVC	1 (0.5%)	1 (0.7%)	0 (0.0%)	0.474

TABLE VII - The impact of SPVB on ICU length of stay, total hospital stay and mortality rate

Postoperative parameter	Total patients	PA	Postoperative analgesia SPVB + PA	P
ICU length of stay	3.62+/-8.675	4.16+/-10.605	2.56+/-1.099	0.202
Postop. hospital stay	9.17+/-8.930	9.61+/-10.483	8.31+/-4.477	0.314
Mortality rate	6 (2.8%)	6 (4.3%)	0 (0.0%)	0.181

TABLE VIII - Duration of intervention and of pleural drainage in the two groups

Postoperative parameter	Total patients	PA	Postoperative analgesia SPVB + PA	P
Duration of anterior drainage	3.54 (+/-4.41)	3.28 (+/-4.79)	4.07 (+/-3.54)	0.216
Duration of posterior drainage	5.11 (+/-4.85)	4.91 (+/-5.00)	5.51 (+/-4.55)	0.390
Duration of intervention (hours)	3.12 (+/- 1.11)	3.01 (+/-1.14)	3.32 (+/-1.03)	0.058

tion of all interventions and of the pleural drainage between groups (Table VIII).

Operating time, expressed as mean±SD (standard deviation), was 3.12 ±1.11 hours, greater in patients with SPVB (3.32±1.03 hours) compared with patients without SPVB (3.01±1.14 hours), p=0.058. The required time for inserting the catheter for SPVB was 2-4 minutes.

Discussion

Most of the published studies on the subject compare the various types of post-thoracotomy analgesia based on

the primary outcome variables: pain at rest, in inspiration, VAS-quantified pain at mobilization, opioid requirement and analgesic adverse effects³.

The present study was however focused on secondary outcome variables, such as cardiac hemodynamic, respiratory, renal and neurologic complications as well as other postoperative parameters.

The cardiac hemodynamic complications in SPVB patients were significantly fewer in what concerns coronary ischemia and congestive heart failure compared to patients having received only PA. This difference may result from the higher opioid doses in the PA group and probably more efficient analgesia in the SPVB group.

The opioids cause arterial hypotension, sedation and alveolar hypoventilation²¹. These adverse effects contribute to the decreased coronary perfusion and subsequent hypoxemia, leading to ischemic cardiomyopathy (ICM) and the ensuing congestive heart failure and atrial fibrillation²².

Conversely, the vasoplegic effect of opioids on the pulmonary circulation²³ may explain the lack of statistically significant differences between the two groups in what concerns the occurrence of ARVF and APE.

In the PA only group, we recorded some instances where optimal pain control was not achieved, because of limited dosage due to opioid adverse effects, opioid requirements above toxic levels or patients choosing to endure the pain rather than nausea and vomiting. As a result, the persisting pain may lead to coronary spasm and ischemia, especially on an already ailing heart.

Certain studies in literature^{7,9,13,24,25} compare SPVB with CEA and state that SPVB leads to less adverse effects and does not cause significantly different cardiac hemodynamic changes when compared to CEA.

However, we found no studies to compare SPVB to PA in what concerns their impact on postoperative complications.

As far as respiratory complications are concerned, it is relevant to note that insufficiently controlled post thoracotomy pain may lead to alveolar hypoventilation, decreased cough reflex, retention of secretions and atelectasis^{1,26}. The respiratory effects of opioids are synergistic: central respiratory depression and diminished bronchial caliber²⁸. These effects explain the significantly higher incidence ($p < 0.001$) of atelectasis in the group not benefiting from SPVB. COPD exacerbations in the PA-only group were considerably more frequent but without reaching statistical significance (20.6% vs 9.7%, $p = 0.071$).

In patients without SPVB, the higher atelectasis rate leads to a higher rate of pleural complications, with ensuring more frequent residual pleural spaces and pleural blood clots.

To sum up, the use of SPVB was associated with a statistically significant decrease in the incidence of the following postoperative complications: congestive heart failure, coronary arteriopathic disease, pulmonary atelectasis, residual pleural space pleural clots at discharge and wound complications.

When looking into PVB characteristics, we found that its effectiveness was compared to that of CEA, which has been considered the gold standard in post-thoracotomy analgesia. Three recent meta-analysis^{9,25,27} concluded that the two methods are equivalent in analgesic effectiveness, but that PVB has a better safety profile. A single recent study¹³ found CEA better than SPVB, but due to its better safety profile, the latter could be also used in coagulopathies or inflammations at the epidural catheter insertion site, when CEA is contraindicated. The similar effectiveness of the two methods has an anatomi-

cal justification; it has been proven that the paravertebral space communicates with the peridural space in the medullary canal and that the analgesic injected paravertebrally will diffuse in 75% of cases in the epidural space^{28,29}.

The SPVB method, when the catheter is inserted by the surgeon under direct vision at the end of thoracotomy, was described by several authors¹⁴⁻²⁰. The surgeons' interest in SPVB resides in several aspects: less time in the operating theater, a simpler and safer technique (under direct vision) both during surgery as well as during postoperative analgesia when compared to CEA.

In our study, the difference in operating time between the two groups is rather explained by the patients characteristics than by the time needed to insert the SPVB catheter. The operating time might be correlated with postoperative pain.

SPVB should be compared to ultrasound-guided percutaneous PVB. The risk of severe complications and a higher failure rate of PVB probably vote in favor of SPVB. We found no references in literature and can therefore only speculate on the advantages of SPVB compared to PVB. The catheter insertion under direct vision (SPVB) is safer (we found no intraoperative complications), faster (2-4 minutes vs. 15-20 minutes) and easier technique. We recorded only 2 (2.77%) minor postoperative complications of SPVB – 2 cases of Horner syndrome which resolved rapidly by decreasing the analgesic administration rate and placing the patients upright. Another advantage of SPVB is that the anesthetic is administered and then remains in a large paravertebral pleural pouch, extending from the apex to 2-3 intercostal spaces below the thoracotomy. The conditions are therefore in place for efficient analgesia, overriding the effect of interconnections between adjacent intercostal nerves and of pain provoked by other surgical sites, such as the incision for pleural drainage³⁰ PVB is considered to block just one neuromere, with incomplete coverage of all surgical sites³¹.

Several complications are associated with PVB in literature³²: intrapleural puncture/insertion (1.1%), pneumothorax (0.5%), vascular injury (3.8%), inadequate catheter positioning. The systemic absorption of the anesthetic may initially cause confusion progressing to grand mal seizures¹⁹ and increased plasmatic concentration of the anesthetics. Intravascular injection of bupivacaine can have irreversible cardiotoxicity. The most severe complications result however from injury to local vascular and nervous structures, ranging up to paraplegia due to compressive hematoma in the medullary canal, Adamkiewicz artery injury and epidural abscesses². Ultrasound-guided percutaneous PVB has the advantage of being performed in the preoperative stage with preemptive analgesia, which has a controversial impact on decreasing chronic post-thoracotomy pain³³.

The disadvantage of SPVB lies in the necessity of an intact parietal pleura (which can be compromised by

pleurectomy, infections, tumors or pleural injuries due to the procedure), which is mandatory for the success of the procedure. PVB has a more difficult technique, fraught with more potential incidents, than SPVB.

Another potential disadvantage, common to both PVB and SPVB, is the possible non-functioning catheter. In our study, for the catheters inserted under direct vision, we found a 5.26% (4 of 76 patients) failure rate, lower than the 10%-13% reported in the literature for both PVB and CEA^{16,32}.

Comparing SPVB and CEA we note more technical-related risks for CEA (hematomas in the medullary canal, medullar injuries, CSF fistulas, peridural abscesses) and adverse reactions (pruritus, urinary retention)² while PA without associated regional analgesia may incur the risk of opioid, non-opioid and anti-inflammatory analgesic side effects²⁵.

Our study compared the outcome of SPVB plus PA patients with PA alone, in order to support a possible standard of care for postoperative analgesia, in cases where CEA is contraindicated or cannot be used.

Despite the demonstrated analgesic efficacy of CEA, the reduced use of this method in our department might be explained by the risk profile of CEA (accidents, incidents and adverse reactions), a required learning curve and the prolonged duration in operating room of CEA catheter insertion. In this circumstances, SPVB represented a favorable option, meant to reduce the disadvantages of CEA. This method is safe, fast, and easy to perform by a surgeon. Comparative studies between SPVB and CEA lack of consistency, further larger studies are needed.

The best option in managing the postoperative pain is represented by the use of VATS in favor of the open-lobectomy, which certainly will decrease the postoperative chest pain and use of drugs and hospital stay³⁴.

In our department, VATS is currently used for various indications, but there are some limitations in use of VATS for lobectomy, linked with a difficult learning curve. Current studies focus on different types of mini-invasive surgery³⁵ and associated analgesic techniques.

In such circumstances, the results of our study can be useful in selected cases, where open lobectomy cannot be avoided. For this specific patients, when VATS and CEA cannot be used, the SPVB might be a good option to improve postoperative pain control and postoperative outcome.

Conclusion

SPVB is an effective regional analgesia method, fast and easy to use by the surgeon and with minimal complications. It is most likely a valuable technique but still underutilized by the cardiothoracic surgeons³⁷, educated in the idea of CEA as the golden standard in post-thoracotomy analgesia². SPVB may become the first option of regional analgesia, to the detriment of CEA,

because of the former's similar effectiveness but better safety profile. The results of our study firmly show that, if for any reason CEA is not the chosen method, the optimal alternative is associating SPVB to PA. Further studies are required to compare SPVB performed under direct vision with ultrasound-guided percutaneous PVB, and also with CEA, considering both the effectiveness and the safety profile. The present study has attempted to highlight the importance of SPVB and to provide arguments in favor of an apparently underutilized technique. SPVB had a much lower incidence of postoperative complications when compared to PA alone and can be considered as the first alternative option in post-thoracotomy analgesia when CEA cannot be performed.

Riassunto

Il blocco toracico paravertebrale (PVB), pur essendo una tecnica di analgesia post-toracotomia di efficacia simile a quella di analgesia epidurale continua (CEA) ma con un profilo di sicurezza migliore, è sottoutilizzato nella pratica corrente. Questo studio confronta l'esito dei pazienti post-lobectomia in relazione al metodo analgesico utilizzato: analgesia parenterale (PA) vs PVB + PA e fornisce una giustificazione per l'uso di routine del PVB in tutti i pazienti in cui il CEA è controindicato. Lo studio è stato condotto su 213 pazienti consecutivi sottoposti a lobectomia aperta, e randomizzati rispetto a due diversi protocolli di analgesia postoperatoria: PA vs PVB + PA. Abbiamo confrontato la frequenza delle complicanze emodinamiche cardiache, respiratorie, pleuriche o chirurgiche.

RISULTATI: Dopo la lobectomia, i pazienti PVB (72/213) hanno mostrato una incidenza significativamente più bassa di insufficienza cardiaca congestizia (7,1% vs.0,0%) ($p = 0,049$), di cardiomiopatia ischemica (10,6% vs.0,0%) ($p = 0,010$), di atelettasia polmonare (35% vs.1,1%) ($p < 0,001$), di spazio pleurico residuo (29,8% vs.15,3%) ($p = 0,032$) e di coaguli ematici intrapleurici residui (14,9% vs.1,4%) ($p = 0,005$). Altre complicanze postoperatorie, degenza intensiva, degenza ospedaliera totale e mortalità sono state meno frequenti nel gruppo PVB ma senza raggiungere un significato statistico.

CONCLUSIONE: L'uso di SPVB è associato a complicanze postoperatorie importanti significativamente inferiori alla sola PA. Questo studio suggerisce che l'SPVB potrebbe essere la scelta ideale nella gestione del dolore post-toracotomia quando non è possibile utilizzare il CEA.

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Commento e Commentary

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L'articolo di Popovivi et al. ¹ dimostra che l'uso del blocco paravertebrale toracico chirurgico (SPVB) comporta meno complicanze postoperatorie significative rispetto all'analgesia parenterale in pazienti sottoposti a toracotomia postero-laterale per resezione polmonare. Lo studio suggerisce che l'SPVB potrebbe essere la scelta ideale nella gestione del dolore post-toracotomia quando non è possibile utilizzare l'analgesia epidurale continua (CEA). Sebbene non vi siano prove che confermino che la durata del tempo operatorio potrebbe essere correlata al dolore postoperatorio, concordo con gli autori sul fatto che potrebbe aggiungere falsi risultati negativi. Come affermato dagli autori, l'IVA è attualmente utilizzata per varie indicazioni, ma vorrei aggiungere che, cosa ancora più importante, l'IVA sta diventando la pratica standard per il trattamento del carcinoma polmonare in stadio I e II ². Gli studi attuali si concentrano su diversi tipi di chirurgia mini-invasiva e relative tecniche analgesiche ³ e i dubbi sull'uso dell'IVA per le fasi iniziali sono quasi nulli. Tuttavia ci sono circostanze in cui è necessaria una toracotomia postero-laterale, e quindi i risultati dello studio di Popovivi et al dimostrano che il blocco chirurgico del paravertebrale toracico potrebbe essere una buona opzione per migliorare il controllo del dolore postoperatorio e l'esito postoperatorio. Ulteriori studi controllati randomizzati sono obbligatori

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The article of Popovivi et al. ¹ demonstrates that the use of surgical thoracic paravertebral block (SPVB) is associated with significant less postoperative complications than parenteral analgesia in patients who underwent postero-lateral thoracotomy for lung resection. The study suggests that the SPVB might be the ideal choice in post-thoracotomy pain management when continuous epidural analgesia (CEA) cannot be used. Although there is no trial confirming that the duration of operating time might be correlated with postoperative pain, I agree with the authors that it could add false negative results. As the authors stated VATS is now currently used for various indications, but I would like to add that, more importantly, VATS is becoming the standard practice to treat stage I and II lung cancer ². Current studies focus on different types of mini-invasive surgery and associated analgesic techniques ³ and doubts about the use of VATS for early stage are almost nil. Nevertheless there are circumstances when a postero-lateral thoracotomy is necessary, and therefore the results of the study of Popovivi et al demonstrate that surgical thoracic paravertebral block might be a good option to improve postoperative pain control and postoperative outcome. Further randomized controlled studies are mandatory to confirm the effectiveness and the safety of the SPVB.

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