Comparative Study between Costotransverse Block and Erector Spinae Plane Block for Postoperative Analgesia in Patients Undergoing Thoracotomy: Review Article

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ABSTRACT

Background: Despite the initial belief that epidural analgesia was the most effective way to treat pain after a thoracotomy, due to the significant risk of dural puncture, nerve lesions, epidural hematoma, and hypotension, it is not advised for pain management following thoracotomy surgery. Following thoracic procedures including thoracotomy and mastectomy, well-established and well-recognized methods for postoperative analgesia include thoracic paravertebral block (TPVB) and intercostal nerve block (ICB). They can provide equivalent analgesic effectiveness and fewer side effects, making them a legitimate substitute for epidural blocks. However, because the injection site's borders are still near important organs, they need to be handled with more skill to ensure safety. It has been shown that erector spinae plane block (ESPB) is a successful postoperative analgesic method for a variety of procedures. According to reports, it was anticipated that local anesthetics (LA) in ESPB would act on the dorsal and ventral rami of the spinal neurons and spread to the paravertebral region.

Objective: This article aimed to compare the analgesic efficacy of costotransverse block (CTB) and ESPB for postoperative analgesia in patients undergoing thoracotomy as a primary outcome.

Methods: We searched PubMed, Google Scholar, and Science Direct for Costotransverse Block, ESPB, Postoperative Analgesia and Thoracotomy. Only the most recent or thorough investigation, from 2018 to 2024, was taken into account. The writers evaluated relevant literature references as well. Documents written in languages other than English have been ignored. Papers that were not regarded as significant scientific research included dissertations, oral presentations, conference abstracts, and unpublished manuscripts were excluded.

Conclusions: Acute postoperative pain following thoracic surgery increases the risk of chronic postsurgical pain (PSP) and lowers quality of life. Regional anesthesia, when used as part of multimodal analgesia, can effectively manage pain, reduce the need for anesthetic and perioperative analgesic medications, decrease postoperative nausea and vomiting, decrease the risk of chronic pain, postoperative respiratory complications, shorten hospital stays, and improve patient satisfaction. As part of a multimodal analgesic regimen for various operations, TPVB and ESPB can be utilized to address acute PSP. As a reliable technique for postoperative analgesia in thoracic surgeries, thoracic PVB is advised by the improved recovery after surgery protocol.

Keywords: Costotransverse Block, ESPB, Postoperative Analgesia, Thoracotomy.

INTRODUCTION

Although it includes the dissection and damage of big muscles, thoracotomy has historically been chosen over minimally invasive surgery (MIS) because it is a proven technique with better access and visualization and increased patient safety, especially in the early phases of surgical training. Thoracotomy pain is quite intense and is likely the worst pain that a patient may feel following surgery. It is particularly distinct because this pain state has several consequences, such as respiratory failure from splinting, pneumonia from ineffective coughing, and stimulation of the PTPS, a chronic pain that is frequently incapacitating. Thoracic epidural analgesia (TEA) has been regarded as the "gold standard" for pain management following thoracotomy and has significantly reduced the feeling of pain and its aftereffects [(1)]. As of right now, the first-line methods for managing pain following a thoracotomy are TEA and TPVB. They do have a high failure rate (up to 15% in TEA), though, and can be technically difficult to execute [(2)]. A recently developed method for treating post-thoracotomy pain, the erector spinae plane (ESP) block has several benefits that make it a desirable substitute.

The first report of an US-guided ESP block appeared in 2016. A local anesthetic is injected by the ESP block around the erector spinae muscle, roughly at the T5 level. It could have the ability to inhibit the thoracic spinal neurons' dorsal and ventral rami. In 2016, the block was utilized to treat thoracic neuropathic pain in a patient who had rib fractures and metastatic illness of the ribs. This was the first documented effective application of the treatment. According to reports, the block has now been effectively utilized in a wide range of surgeries, such as lumbar fusions, thoracotomies, percutaneous nephrolithotomies, ventral hernia repairs, and the Nuss surgery [(3)].

Shibata *et al.* [(4)] have published the first description of a unique procedure known as the costotransverse foramen block. The ability of a solution injected directly into the costotransverse foramen to reliably disseminate to the paravertebral region was proven by cadaveric and case investigations. Research contrasting the costotransverse foramen block with the TPVB or ESPB for patients having video-assisted thoracic surgery hasn't been published [(5)].

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PAIN

As the most prevalent sign of any disease, pain is described as "an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage" by the International Association for the Study of Pain (IASP). A complicated experience, pain involves aspects of the body, senses, emotions, cognition, and action. The interplay of physical, psychological, cultural, and spiritual elements influences how people perceive the severity of their suffering [(6)].

Postoperative pain management in patients undergoing thoracotomy:

Generally speaking, thoracotomy is one of the most painful surgical operations, and the pain that follows is frequently excruciating and hard to control. Because of the anatomical distribution, the patient's pain is complex and has to be managed with a variety of therapeutic approaches. For the patient to breathe, cough, and mobilize properly during surgery, pain management is essential, especially when pre-emptive analgesia is taken into account. Infection, poor healing, and respiratory failure can result from inadequate pain management. Another crucial factor in lowering the prevalence of chronic post-thoracotomy pain syndrome (PTPS) is effective pain management. To manage post-thoracotomy pain, a variety of techniques are used [(7)]. Interventional methods, such as regional blocks and neuraxial injections, and conservative measures, such as NSAIDs, acetaminophen, gabapentinoids, and narcotic drugs, as well as additional adjunctive therapies, such as massage therapy, transcutaneous electrical nerve stimulation (TENS), respiratory therapy, and physical therapy, are examples of management strategies [(8)].

❖ **Interventional techniques**

Thoracic epidural analgesia: Thoracotomy pain is managed with TEA. Because of the way that drug spreads, TEA is usually injected in the center of the incision's dermatomal distribution and is frequently used with moderate to large incisions or bilateral procedure. A single injection or catheter implantation and patient-controlled epidural analgesia (PCEA) device infusion are the two methods used to provide epidural analgesia during the perioperative phase [(9)]. The epidural catheter's location and effectiveness can be evaluated by placing it before general anesthesia. Pre-emptive analgesia is the practice of starting analgesia before to surgery in order to stop pain signals from being sent during the procedure. Preoperative epidural analgesia has been demonstrated to enhance postoperative pain management and reduce the prevalence of chronic pain. LA, opioids, epinephrine, or a mix of these drugs, depending on the patient's characteristics, are commonly used in epidural infusions [(10)].

Intrathecal analgesia (ITA): Another popular method for treating pain related to thoracotomies is ITA. If an epidural is not appropriate, ITA is frequently used in conjunction with paravertebral catheters or as a second line during thoracotomy. In ITA, opioids are usually administered straight into the cerebrospinal fluid (CSF), which enables the drug to attach to opioid receptors in the spinal cord. The lipophilicity of the drug being given determines how quickly, how much, and where this spread occurs [(11)]. Although fentanyl and hydromorphone are also used as opioids, preservative-free morphine (PFM) is the most often used. With comparable short-term effectiveness, ITA can be given as a single injection or by the implantation of a catheter. There are a number of potential side effects from intrathecal catheter implantation, such as infection risk, CSF leakage, and neurological damage. Because PFM has a short half-life, patients undergoing single injection ITA usually need multimodal or combination analgesia with parenteral opioids or regional block [(12)].

Paravertebral block (PVB): PVB has been more well-known as a different tactic to deal with thoracotomy discomfort in recent years. The spinal nerves travel from the intervertebral foramen to the intercostal space via the paravertebral space, which is created by the costotransverse ligament posteriorly and the parietal pleura anterolateraly. PVB entails giving an anesthetic agent in a single injection or catheter infusion into this space. According to studies, depending on the anesthetic drug and amount given, dermatomal spread can reach up to 10 dermatomes with preferred caudal distribution; nevertheless, some individuals may need more than one injection [(13)]. While PVB is usually thought of as a unilateral block, a tiny proportion of patients may experience bilateral analgesia or sympathetic blockade as a result of epidural dissemination. The majority of medical professionals will utilize LA with or without epinephrine. In general, PVB is seen to be safer and simpler than TEA. It is frequently used for unilateral thoracotomies, however bilateral PVB is also possible. The treatment has some drawbacks, such as the need for opioid supplementation, inconsistent anesthetic dissemination, anesthetic leakage out of the space, and physician unfamiliarity with the procedure [(14)].

Serratus anterior plane block (SAPB): Additionally, the SAPB has gained popularity recently as a post-thoracotomy analgesic alternative. By applying a LA to the possible gap between the serratus muscle and the intercostal nerves at the T4-T5 level, this US-guided block produces unilateral anterior thoracic analgesia that may extend from T2 to T9. These blocks can reduce the need for opioids after surgery and have been demonstrated to be successful in controlling postthoracotomy pain. However, PVB is more effective than SAPB for postthoracotomy analgesia, particularly 12 hours after surgery [(15)].

Erector spinae plane block (ESB): Analgesia is produced by injecting LA between the transverse process and erector spinae fascia during an ESB, a US-guided peripheral nerve block, which causes the drug to diffuse to the paravertebral region. Research on both live patients and cadavers has revealed multidermatomal level distribution up to seven levels caudally and cranially. Among the many side effects of ESB include block failure, nerve damage, intestinal damage, pneumothorax, and LA systemic toxicity (LAST). Pooled studies have demonstrated that ESB, when used in conjunction with a multimodal analgesic regimen, is a useful treatment for postthoracotomy pain. ESB has demonstrated comparable pain management to TEA and PVB when compared to conventional analgesia techniques, with fewer cases of bradycardia and hypotension but greater rates of analgesic failure [(16)].

Intercostal block (ICB): ICB is a straightforward and easy way to give pain relief. LA is usually administered straight up to five intercostal nerves, which correspond to the dermatomes that the incision affects. These are sometimes limited by a brief period of action and frequently require to repeat injections, although they can be carried out by the surgeon with direct vision in the multiple or by the anesthesiologist percutaneously. It has been demonstrated that ICB reduces the need for opioids after surgery. For post-thoracotomy analgesia, however, ICB has been demonstrated to be less effective than TEA. Pneumothorax, LAST, hemorrhage, nerve damage, and block failure are among the complications of ICB [(17)].

Cryoablation: Cryoablation, a technique similar to ICB, involves freezing intercostal nerves to -60°C in order to damage the myelin sheath while maintaining the integrity of the nerve axon, hence stopping pain signals. Compared to parenteral opioids or ICB, cryoablation has been shown to enhance pain management, reduce the need for opioids, and reduce pulmonary consequences. Nerve injury is the main cause of procedure-related complications, and there is some evidence linking cryoablation to a higher incidence of PTPS and persistent pain months following ablation. Cryoablation produced poorer pain management and needed more narcotics than epidural analgesia [(18)].

Interpleural block: LA is injected between the lung's parietal and visceral pleurae in order to provide interpleural analgesia. There is no much proof that this method of analgesia works well for thoracotomy pain. It is thought that systemic absorption of the medicine and postoperative blood in the pleural cavity reduce the procedure's efficiency. Numerous trials have demonstrated the lack of efficacy, and this method is not advised for post-thoracotomy discomfort [(16)].

Shoulder pain and interscalene block: Patients may have Kehr's Sign, or referred shoulder discomfort associated with thoracotomy or chest tube installation, even after a well-executed block. The phrenic nerve (C3-5) mediates this referred pain, which is typically not addressed by any of the analgesic methods discussed in this section. An interscalene brachial plexus block may be used to treat this discomfort since the supraclavicular nerves share nerve roots with the phrenic nerve. It has been demonstrated that interscalene block can lessen shoulder discomfort during thoracotomy without compromising pulmonary function [(17)].

❖ **Conservative techniques**

Medications: A multimodal approach to post-thoracotomy analgesia is crucial because of the intricate etiology of post-thoracotomy pain, as previously stated. Regional and interventional analgesia combined with systemic drugs should be part of this approach. The most often utilized medications are acetaminophen, NSAIDs, opioids, and more recently, gabapentinoids. Ketamine as a component of a multimodal analgesic strategy has some recent data. Owing to the large dosages needed when using opioids alone, they are usually used in combination with non-opioid analgesics and localized methods to give sufficient analgesia and prevent postoperative problems from uncontrolled pain. A number of opioids are utilized, such as tramadol, methadone, hydromorphone, fentanyl, and morphine. Postoperative pain ratings have been demonstrated to improve and opioid doses to be reduced when methadone is included to a multimodal analgesia regimen. By using on-demand dosage or patient-controlled analgesia (PCA), opioids can be given parenterally or orally. It has been demonstrated that intravenous opioid PCA produces superior analgesia with a lower total dose than on-demand parenteral opioids [(19)]. In cases when regional anesthetic procedures are not appropriate, there is evidence that a combination of parenteral opioids and non-opioid medicines can effectively reduce pain. Although opioids generally work well to reduce pain, this has to be weighed against the possibility of respiratory depression, drowsiness, itching, nausea, vomiting, constipation, ileus, and urine retention as adverse effects [(20)].

Recently, ketamine infusion has been investigated as a perioperative supplementary analgesic drug. Without causing noticeably harsher side effects, ketamine can be administered to opioids to successfully reduce postoperative pain and opioid needs. Because they reduce pain and inflammation at the same time, NSAIDS are frequently used after surgery. NSAIDs have been demonstrated to reduce overall opioid usage and enhance pain ratings as part of a multimodal approach to pain management. Because they have a decreased risk of bleeding and gastrointestinal adverse effects, selective cyclooxygenase-2 (COX-2) inhibitors are occasionally chosen over nonselective NSAIDs. Acetaminophen can be given parenterally, rectally, or orally, and is a common analgesic for mild to moderate pain [(21)]. Acetaminophen used intravenously offers the advantage of a quicker analgesic onset and no first-pass metabolism as compared to oral medication; nevertheless, the hazards and high expense of intravenous delivery must be taken into account. When used with other analgesics, acetaminophen can have an additive effect. Both acetaminophen and NSAIDs can be used to treat ipsilateral referred shoulder discomfort [(22)].

❖ **Adjunctive treatments**

There is some evidence that adjuvant therapy approaches, in addition to regional anesthetic procedures and medication, can be helpful. One comprehensive study found that massage treatment reduced post-thoracotomy pain ratings. TENS has been demonstrated to reduce pain and analgesic intake when used in conjunction with conventional post-thoracotomy analgesia, without causing serious adverse effects or extending hospital stays. These advantages, meanwhile, appear to be temporary and only continue as long as the TENS is being used. In a similar vein, ice packs used as cold therapy can reduce inflammation and discomfort around incisions while lowering the need for opioids. An essential component of thoracotomy rehabilitation is respiratory and physical therapy. Consideration should be given to patient placement, and early upright sitting and walking can enhance lung function and healing. Restoring normal functioning will be facilitated by thoracic mobilization, shoulder and scapula mobilization, and posture correction. Breath control, coughing, puffing, deep breathing, and incentive spirometry are examples of lung expansion and clearing strategies that can enhance functional recovery, reduce atelectasis, and lessen postoperative consequences [(8)].

Erector spinae plane block (ESPB): The ESPB is a member of the fascial plane block family, which involves injecting LA into a plane between two fascial layers and then allowing it to disseminate to nearby tissue compartments or neurons inside that plane. The LA is injected underneath the erector spinae muscle and superficial to the terminals of the vertebral transverse processes (TPs), indicating that it is a paraspinal block [(23)].

Anatomic features of ESPB: In anatomy, the phrase "erector spinae" refers to a composite group of three muscles: the spinalis thoracis, longissimus thoracis, and iliocostalis lumborum. These muscles attach to the ilium and sacrum after emerging from the ribs, thoracic, and lumbar TPs. Overlaying the bony vertebral laminae and TPs, the erector spinae muscle forms a paraspinal muscular column together with the more medial transverse-spinalis group of muscles directly next to the spinous processes. Stretching from the sacrum to the base of the skull, the muscles are encased in a complex sheet of aponeuroses and fasciae called the retinaculum; the lowest part of this retinaculum is known as the thoracolumbar fascia. One of the special features of the deep ESPB is that fluid injected in it can disseminate from a single injection site in a cranial-caudal direction thanks to its columnar fascial sheath [(24)]. As soon as the thoracolumbar spinal nerves emerge from the intervertebral foramen, they split into dorsal and ventral rami. Laterally, the dorsal rami split into medial and lateral branches, innervating the back's tissues. The T1–T12 ventral rami passes between the internal and innermost intercostal muscles in the intercostal space, running along the inside part of the rib. At the rib angle, they produce lateral cutaneous branches, many muscle branches, and anterior cutaneous branches (Figure (**1**) [(24)].

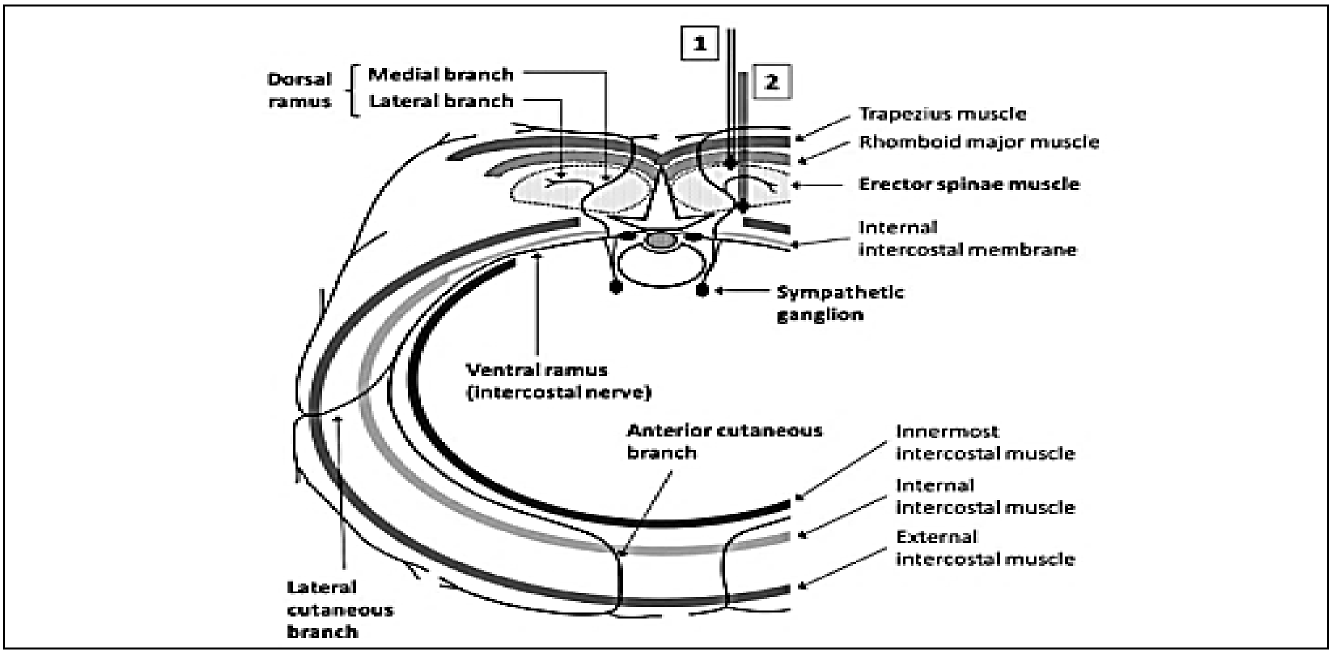

Figure (1): Anatomy of ESP [(24)] **.**

- **Mechanism of action of ESPB:** ESP injection of LA may now result in analgesia through three plausible pathways [24].

Firstly, LA enters the paravertebral (PV) and epidural space, which includes the dorsal and ventral rami and spinal nerves, anteriorly by fenestrations in the connective tissues that bridge neighboring TPs and ribs. The superior costotransverse ligament, intertransverse and costotransverse ligaments, as well as the levator costarum and rotator costarum muscles, are some of the elements that make up this "intertransverse tissue complex." This barrier is crossed by the dorsal rami and associated arteries, which give the injectate at least one route to enter the PV space anteriorly. From there, it can extend laterally into the intercostal space and medially into the epidural region. Both living patients and fresh cadavers have been shown to exhibit this in magnetic resonance imaging [25].

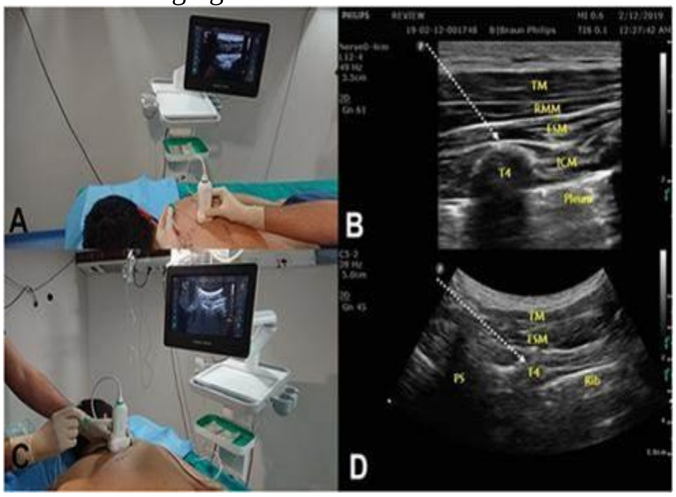

Figure (2): Approach of ESPB (A): Position and orientation of the ultrasound transducer during a parasagittal scan of the upper thoracic region with the patient in the prone position .(B) Parasagittal ultrasound image of upper thoracic ESPB.(C) Position and orientation of the ultrasound transducer during a transverse scan of the upper thoracic region with the subject in the prone position .(D) Transverse ultrasound image of upper thoracic ESPB. White arrow indicates needle. T4, thoracic 4 vertebrae transverse process; TM, trapezius muscle; RMM, rhomboid major muscle; ESM, erector spinae muscle; ICM, intercostal muscle [25].

The second, the ESPB blocks the dorsal rami as they climb through the Lake of LA [26].

The third, laterally expanding LA within this plane may be able to reach and anesthetize lateral cutaneous nerve branches since the ESPB is continuous laterally with the plane superficial to the ribs and intercostal muscles and deep to the serratus anterior muscle. Also, the ESPB is contiguous with the plane between the quadratus lumborum and the erector spinae muscle at low thoracic and lumbar levels, suggesting that it may have a similar mode of action to the posterior quadratus lumborum block [27].

- **ESP block in the management of PTPS**

About 25–47% of people who had a thoracotomy or video-assisted thoracoscopic procedure develop PTPS. More than 25% of these patients have moderate-to-severe pain, especially when they are active. As a result, most of them have trouble sleeping, performing everyday tasks, and generally enjoying their lives. The first line of treatment often consists of topical LA, NSAIDs, opioids, and neuropathic drugs. ICBs, TPVBs, epidural steroid injections, thoracic sympathetic blocks, pulsed radiofrequency ablation of the dorsal ganglion, and spinal cord stimulation are among the many interventional techniques that have been documented for the treatment of refractory pain. A recently developed method for treating thoracic discomfort, the ESP block has a number of benefits that make it a desirable substitute for these more intrusive operations. According to a publication, the ESP block demonstrated its therapeutic potential in a cohort of seven PTPS patients [28].

The serratus plane block, which has also been recently reported for the management of pain following mastectomy and post-thoracotomy, lacks coverage of the posterolateral chest wall, although this offers a benefit. Additionally, the ESP block could cause a sympathetic block and aid in visceral pain relief. The ESP block is technically possible in an office or clinic setting, but in order to manage the risk of LA systemic toxicity, it is advised to have access to an intravenous line, monitor ECG, noninvasive blood pressure, and pulse oximetry, and have 20% lipid emulsion (Intralipid) available [29].

US-GUIDED COSTOTRANSVERSE BLOCK (CTB):

The "peri-paravertebral" block known as US-guided CTB is a relatively recent development. A single high-volume injection of CTB has been reported to have been effective in the past. According to a recent research, USGCTB is a relatively novel "periparavertebral" block. TPVB is currently more superior to the LA administrative region. The intertransverse tissue complex of the thorax is the injection site. The costotransverse juncture is where the needle is positioned just before it reaches the cranial section of the neck of the underlying rib, and many injections are used [30].

- **USG CTB block:** Initially, one side of the soft cadaver's back is examined to examine the costotransverse fascia (CTF) and its anatomical markers. Skin, muscle, fascia, and subcutaneous tissue were removed while the patient was in a prone posture in order to expose the CTF's border. The CTF is characterized by the thoracic spine's lamina medially, the SCTL laterally, the paravertebral space anteriorly, the base of the transverse process (TP) superiorly, and the neck and tubercle of the rib below caudally. Strong fibrous bands known as the SCTL extend from the upper edge of the rib's neck to the lower portion of the TP of the vertebra above it (Figure 3) [31].

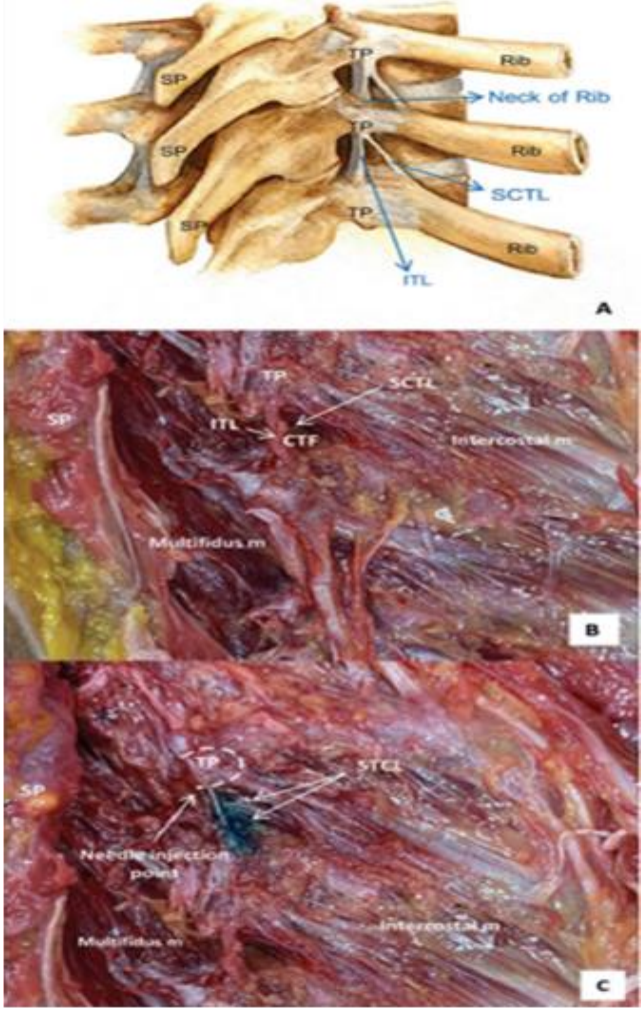

Figure (3): (A, B) Boundaries of CTB [31].

The needle passage and tip best suitable for the CTF block approach are identified by using the inferior aspect of the base of the TP medial to the attachment of an SCTL as a reference bone landmark for US-guidance. Second, all US operations employ a US system and a curved array transducer with a protective plastic sheath. Using ultrasonography, the T4-T5 thoracic spinal level is determined by counting down from the first thoracic TP to the first rib junction in order to perform the CTF injection procedure. The transducer was oriented longitudinally to identify and indicate the locations of the fourth and fifth ribs. The parasagittal plane, which may be seen as a hyperechoic, rounded form with acoustic shadowing below, is where US scanning starts for the fourth and fifth ribs. One could see the straight hyperechoic contact between the ribs, which corresponds to the visceral and parietal pleura, at a deeper level **[32]**.

After that, the transducer is moved from lateral to medial while keeping the parasagittal orientation. This allows the TP to be seen as a square-shaped structure that is closer to the skin than the ribs. This transition is indicated by a change in shape and a slight step-up of a bony structure in the US image. Deeper (anteriorly) and somewhat ahead (superiorly) of the TP, the superior portion of the ribs was seen as a continuous hyperechoic line. In contrast to the rib image, the hyperechoic pleural line between the TP was less distinct and deeper in this US scan. Furthermore, it was possible to see the SCTL above the paravertebral space (**Figure (**4) **[33]**.

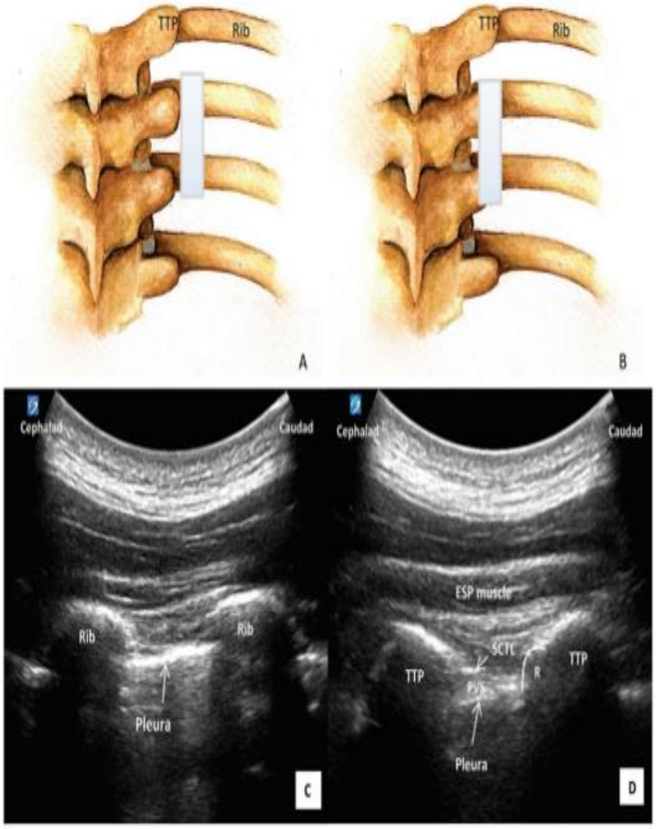

Figure (4): Posterior view of thoracic spines and ribs with ultrasound probe positions (white bar, A and B) and ultrasonographic visualization to identify the ribs and TP in the sagittal plane for the CTF block (C and D). (A, C) The ultrasound transducer was placed between 2 ribs (fourth to fifth), the ribs appear as convex structures, and the pleural line is the horizontal hyperechoic line between the ribs. (B, D) The ultrasound transducer was placed between the 2 TPs (fourth to fifth). The TP is visualized as a square structure, and the fifth rib appears as a step-down of the hyperechoic convex line superior to the fifth TP. The paravertebral space is located between the hyperechoic lines of the superior costotransverse ligament and the pleura. PVS, paravertebral space**[33]**.

The base of the TP, which is a modest step-down from the hyperechoic form of the TP, is identified by moving the transducer medially. Moving progressively deeper and further from the TP allowed for the determination of the pleural anatomy in this image. At this level it was possible to see the rib's neck plainly. To verify the location of the TP's base, the transducer was moved medially until the vertebral laminae—a flat, hyperechoic region with acoustic shadowing underneath it—came into view from the US. Once again, the base of the TP is visible after the transducer has been moved back (Figure 5) **[34]**.

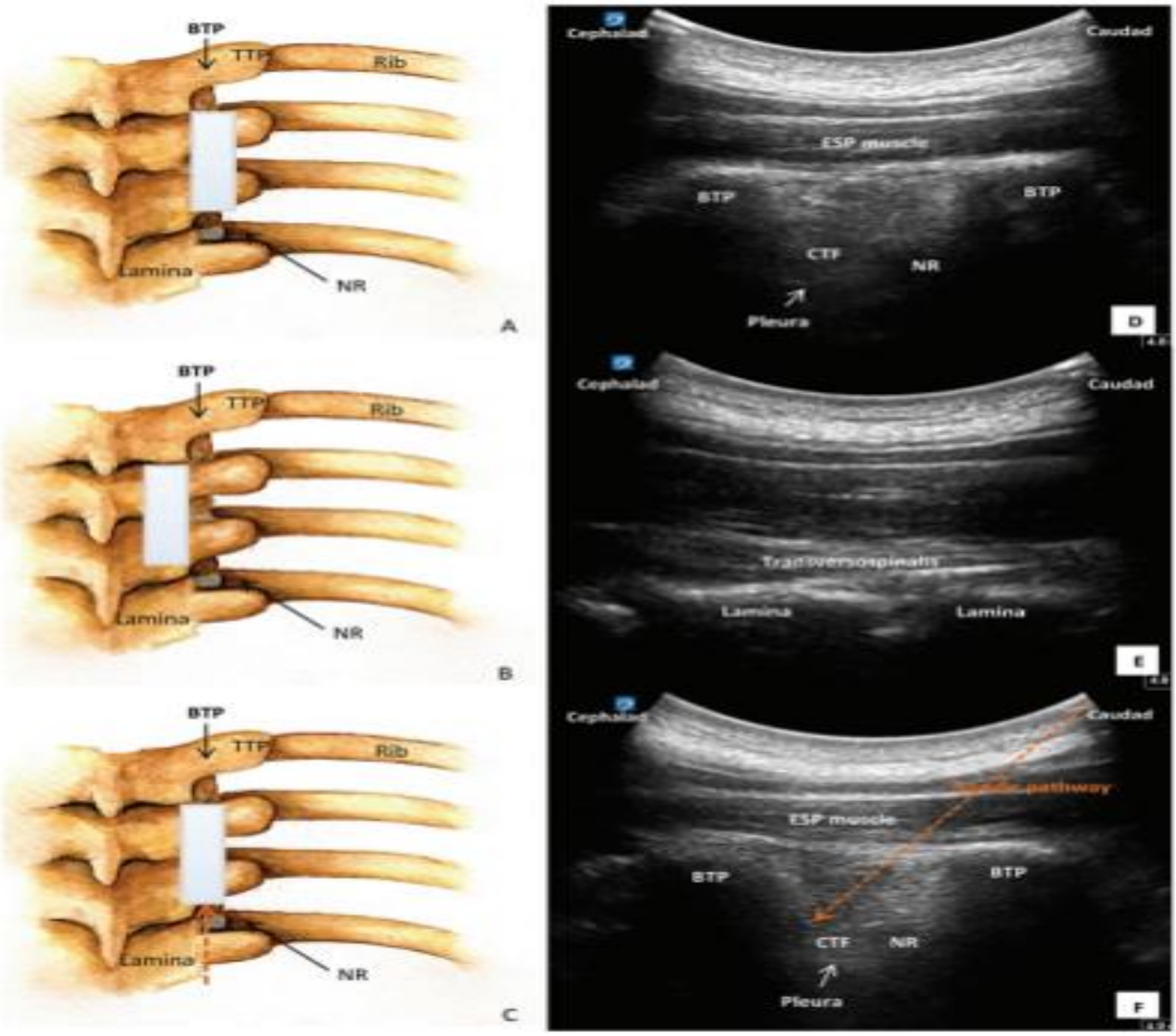

Figure (5): Posterior view of the thoracic spines and ribs from the ultrasound probe position (white bar, A−C) and ultrasonographic visualizations showing the base of the TPs and lamina in the sagittal plane for the CTF block (D−F). (A, D) The ultrasound transducer was placed between the bases of TPs (fourth to fifth). The bases of TPs appear more squared-off than the tip of the TP, which is deeper and close to the more obscure pleural line. The neck of fifth rib appears as a step-down of the hyperechoic convex line Antero superiorly to the fifth TP. (B, E) The ultrasound transducer was placed between laminas 4-5. (D, F) The ultrasound transducer was located at the level of the base of TP (fourth to fifth) using the in-plane needle approach where the needle was inserted from the caudad to cephalad direction into the anteroinferior part of the base of the fourth TP. BTP, base of TP; NR, neck of rib [34]**.**

The injection process is carried out under real-time US direction utilizing an in-plane method. Caudal to cephalad, an 80-mm, 22-gauge block needle is inserted until the tip makes contact with the anteroinferior portion of the T4 TP's base. 0.5 to 2 mL of 0.9% normal saline solution is injected to see the spreading from posterior to anterior, confirming the proper needle tip location. In the event that the injection caused more posterior than anterior spread of injectate, resulting in bulging of the erector spinae muscle or distension of the fascial plane between the back muscle and the TP, the needle was moved off the bone in an anterior direction, and the injection was gradually adjusted until the anterior spreading of injectate fluid was sufficiently visible in the US view [(35)].

CONCLUSION

In addition to decreasing quality of life, acute postoperative pain following thoracic surgery increases the risk of chronic PSP. Regional anesthesia, when used as part of multimodal analgesia, can effectively manage pain, reduce the need for anesthetic and perioperative analgesic medications, decrease postoperative nausea and vomiting, decrease the risk of chronic pain, decrease the incidence of postoperative respiratory complications, shorten hospital stays, and improve patient satisfaction. For the treatment of acute PSP, TPVB and ESPB might be utilized as part of a multimodal analgesic regimen for various operations. For postoperative analgesia in thoracic surgeries, the improved recovery after surgery protocol recommends thoracic PVB as a reliable technique.

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