



ERECTOR SPINAE PLANE BLOCK (ESPB)

Surgical Specialty:	Pediatric Pain/Regional
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Background:

- General Considerations
 - The erector spinae muscles are a group of muscles that run bilaterally from the skull to the pelvis between the spinous and transverse processes.
 - **Broad dermatomal coverage:** ESPB provides analgesia for the majority of thoracic and upper to mid-abdominal surgeries, although the full indications of this technique are not yet fully understood¹
 - **Safety profile:** Bilateral ESPB can be an excellent alternative to neuraxial anesthesia for patients who have coagulopathy or who require anticoagulation in the perioperative period due to lower bleeding risk and development of spinal hematoma. This is because local anesthetic is injected into a fascial plane located superficial to the transverse processes, further away from major blood vessels and the spinal cord compared to traditional neuraxial techniques.
 - ESPB is also technically easier to place, and has a lower risk for devastating neurological deficits
 - This is a versatile block that can be performed via a single-shot block or peripheral nerve catheters for continuous analgesia.

Anesthetic Planning:

- Pre-Anesthetic Evaluation
 - History and physical focused on neurologic and dermatologic exam of the spine and the back
 - Discussions to have with the surgeon/family
 - Surgeon—discuss laterality and level of incision
 - Surgeon and family—risks/benefits/alternatives (epidural vs. patient-controlled analgesia vs. alternative block such as paravertebral catheter) and post-operative multimodal analgesia plan
 - Typically performed for truncal procedures (e.g., thoracotomy, sternotomy, laparotomy, or pancreatectomy) that require anticoagulation intraoperatively or postoperatively.
 - Could consider a single-shot ESPB for patients who will not require an epidural for post-operative pain control or anticipate a short hospital stay

- Specific or Unique Room Set-Up Requirements
 - Drugs/Infusions
 - Local anesthetics
 - Ropivacaine and Bupivacaine are most commonly used
 - ESPB is a fascial plane block, which means the block is volume-dependent, and it is important to adjust the volume according to the patient's weight
 - Dosage
 - Typical single-shot dosing includes Ropivacaine 0.1% or Bupivacaine 0.1%, 0.5-1.5 mL/kg^{2, 3}
 - For continuous infusions, Ropivacaine 0.1% at 0.1-0.15 mL/kg/hr⁴ is used, especially if considering bilateral catheter infusions.
 - Consider programmed-intermittent bolusing (PIB) if the hospital allows for adolescent patients over 40 kg. For bilateral catheters, this is typically run with Ropivacaine 0.1% at 0.2mL/kg/hr in one catheter as one bolus, alternating with the same dosing every 2 hours, so there is staggered bolusing every hour.
 - Can include adjuncts to extend the duration of a single-shot block
 - Dexamethasone 1-2 mcg/kg
 - Dexmedetomidine 1-2 mcg/kg⁵
 - May cause mild bradycardia or hypotension
 - Monitors
 - Standard American Society of Anesthesiologists monitors
 - Block supplies
 - Sterile gloves
 - ChloraPrep
 - Ultrasound probe cover
 - Sterile drape
 - Ultrasound
 - Short bevel and insulated stimulating needle for single-shot blocks
 - If continuous analgesia is preferred post-operatively, a Touhy needle and an epidural catheter or other preferred peripheral nerve kit are recommended

Regional Technique Considerations:

- General
 - Typically performed with ultrasound guidance under general anesthesia in pediatric patients.
- Positioning
 - Lateral decubitus position (most common) or prone. For ease of bilateral block placement, a patient should be in the right lateral position for a right-handed provider and vice versa.
 - Sterile prep (ChlorPrep) and drape
- Ultrasound approach¹
 - At the target vertebral level, the ultrasound probe is placed in a sagittal orientation approximately 1-2 cm lateral from the spinous process.
 - The transverse process should appear like a flat, squared hyperechoic line
 - If the probe is too medial, the laminae appear as flat hyperechoic lines
 - If the probe is too lateral, the ribs appear as rounded hyperechoic lines, and lung sliding may be seen

- Once the transverse process is identified, using an in-plane technique, insert the needle cephalad to caudad until the tip of the needle touches the transverse process
- Injection of medication should not meet resistance, and a “lifting” of the muscles off the transverse process should be seen with injection (see Figures 1 and 2)
- Aspirate before local anesthetic injection to avoid potential intravascular injection. For catheter placement, normal saline can be used to open up the fascial plane prior to using local anesthetic
- Repeat every 5 mL or every time the needle position changes to minimize intravascular injection
- If catheters are required for continuous analgesia, thread the catheter to leave 3 cm of length within the space
- Secure catheters with Mastisol and Tegaderm

Figure 1. Anatomy of ESPB and ultrasound placement for an in-plane approach.

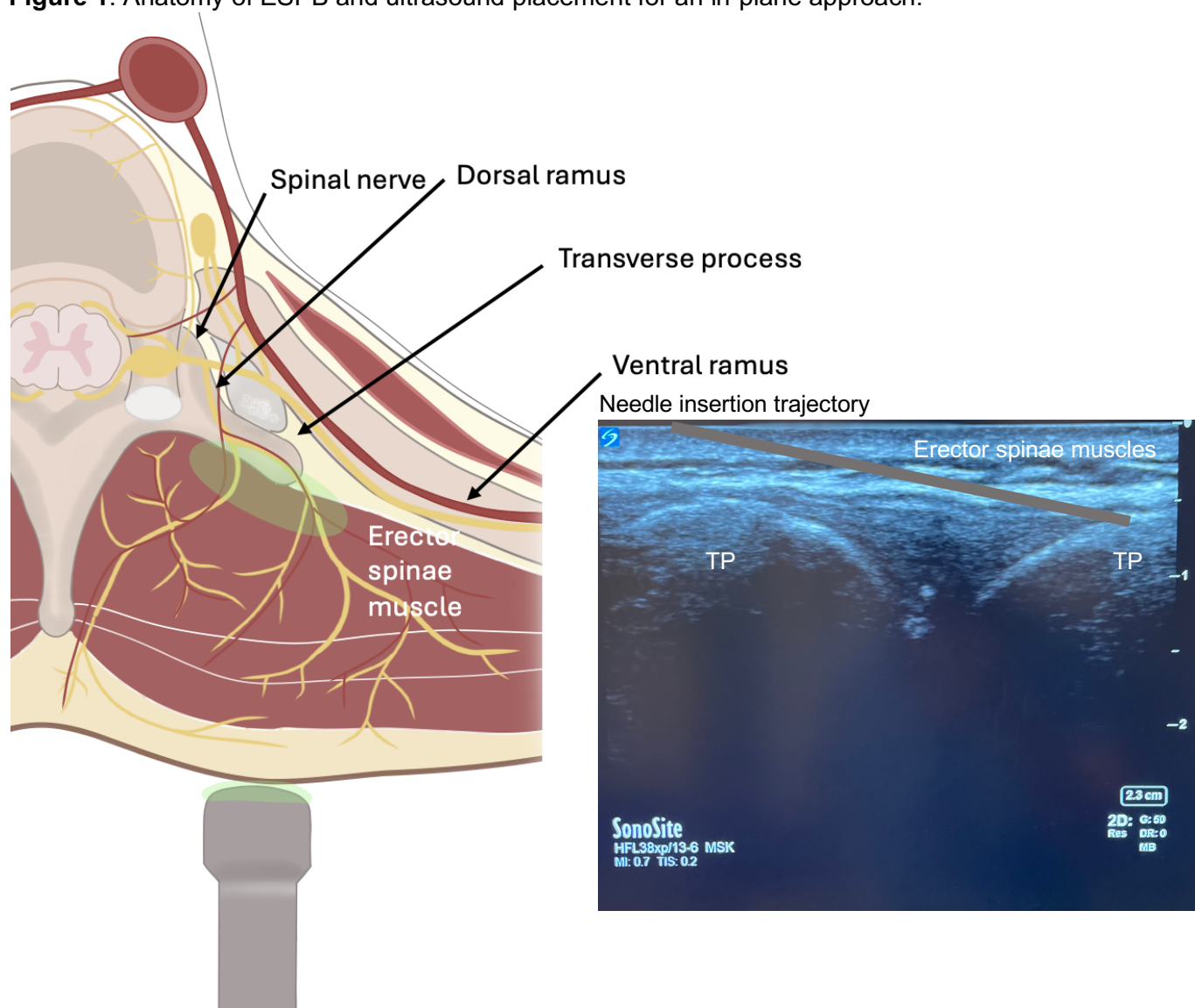
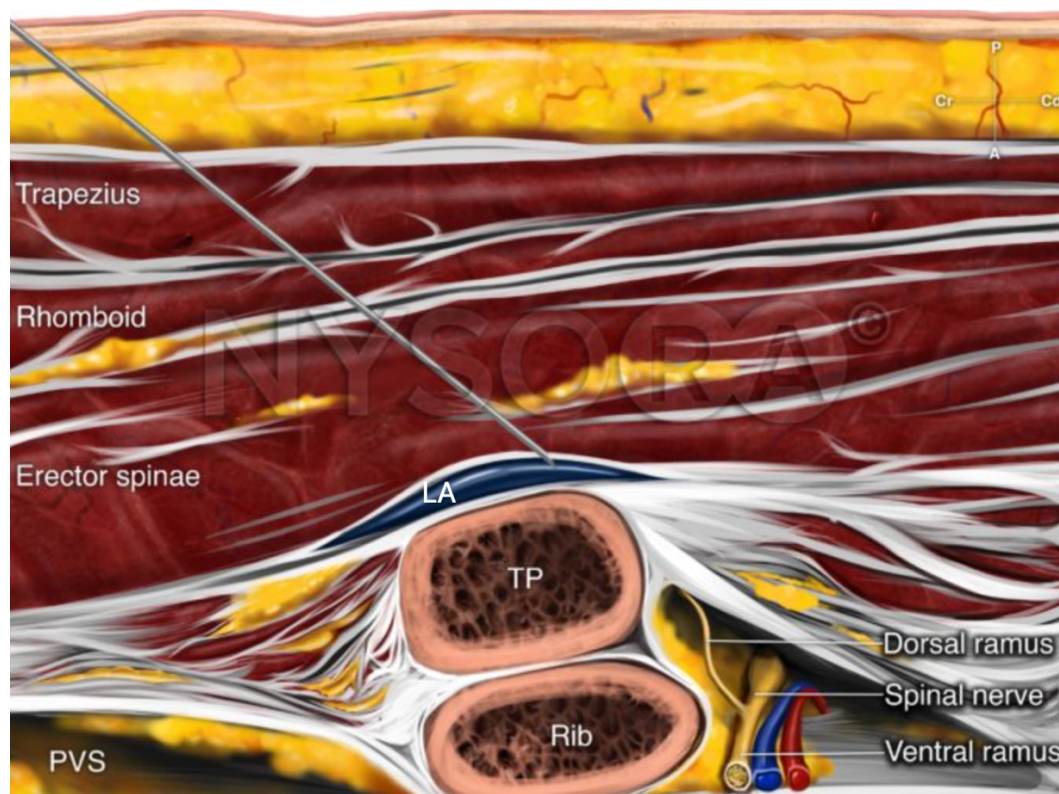


Figure 2. Illustration of a local anesthetic injected into the ESP facial plane.¹ LA: local anesthetic, TP: transverse process, PVS: paravertebral space



- Post-Operative Care
 - Postoperative monitoring for adequacy of analgesia
 - Monitoring of the integrity of catheter dressings and the catheter insertion site
 - Close communication with the surgical team regarding the anticoagulation plan

Case Specific Complications/Pitfalls

- Block failure
- Catheter dislodgment
 - Most common complication
- Intravascular Injection/Local Anesthetic Systemic Toxicity (LAST)
 - During injection, if the patient is under general anesthesia, monitor for ST-segment changes on ECG, an increase in heart rate, respiratory depression, and hemodynamic instability
 - Have LAST kit/intralipid nearby in the event that patient resuscitation is required
- Bleeding/hematoma
 - Stop the procedure, apply firm pressure at the injection site, and monitor vitals and any new neurological symptoms.
- Infection
 - Low likelihood if skin is disinfected properly and sterile technique is followed
- Pneumothorax
 - Increased risk due to thinner muscle layers and sliding fascial planes in the pediatric population

References

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Created: 08/24/22; Last revised: 07/26/25