University Hospitals of Derby and Burton NHS Foundation Trust

Erector Spinae Block and Catheter Insertion - Full Clinical Guideline

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Contents:

Introduction

The Erector Spinae Plane (ESP) block is a regional anaesthetic technique that has been demonstrated to be effective in the management of rib fractures [2,3,4]. This provides an alternative to epidural analgesia in patients requiring an advanced analgesic technique. The ESP block can particularly be of benefit in patients when an epidural is contra-indicated or has failed.

Aim and Purpose

The aims of this guideline are as follows:

- To identify the patient population in whom an ESP block and catheter is indicated
- To identify which staff should be performing the technique
- To provide guidance on appropriate dosing of local anaesthetic
- To describe where and how patients with Erector Spinae Catheters should be subsequently managed

Abreviations

ESP – Erector Spinae Plane
ESC – Erector Spinae Catheter
ICU / HDU – Intensive Care Unit / High Dependency Unit
SDU – Step Down Unit
NSAIDs – Non-steroidal anti-inflammatory drugs
ANTT – Aseptic non-touch technique

Definitions

Erector Spinae Plane: The ESP is the potential space that lies deep to the erector spinae muscles (above the transverse process of the vertebra).

Erector Spinae Catheter: A catheter can be inserted into the ESP to allow either intermittent injection or continuous infusion of local anaesthetic into the plane.

How it works:

The ESP is larger than then epidural space as the erector spinae muscles run along the length of the thoracolumbar spine. This allows extensive craniocaudal spread from the point of local anaesthetic injection. Cadaveric models suggest potential spread between T2 cranially and L3 caudally.

The analgesic effect seems to be primarily due to the local anaesthetic action at the dorsal rami of the spinal nerves, with potential spread into the paravertebral space and the ventral rami.

Patient Population

ESP blocks and catheters are potentially indicated in adult patients with rib fractures where:

1. Pain is not controlled with routine analgesia
2. The patient is unable to take a deep breath because of pain
3. The patient is unable to cough because of pain

All patients with rib fractures should be assessed in accordance with the Chest Wall Trauma (Blunt) clinical guideline, with appropriate input from the acute pain team and on call anaesthetic team or SDU consultant.

Lidocaine Patches, ESP Catheters or Epidurals

Lidocaine patches are the least invasive option for administering local anaesthetic to fractured ribs, however the evidence of meaningful amounts of local reaching the source of pain is limited. ESP Catheters provide a more direct route for local anaesthetic to reach the nerves on their anatomical journey to the chest wall, and can be used in anticoagulated patients when epidurals are contraindicated. However, they are primarily only for use in patients with **unilateral rib fractures** (but can be considered in bilateral fractures **if** the patient only has severe pain on one side.) Inserting bilateral ESP catheters carries a significantly increased risk of causing local anaesthetic toxicity, and should only be considered in specific cases where the risks of an epidural are considered too high.

Epidurals may be the most effective form of providing analgesia for significant rib fractures, however they also carry the most clinical risk. Please see the trust guideline “Epidural – non-obstetric – clinical guideline” for more information.

If either an ESP catheter or epidural is inserted but fails to provide sufficient analgesia then changing to the alternative technique should be considered.

Patient Location:

Patients with ESP catheters can be managed on SAU or any standard surgical ward, and do not need to be admitted to SDU specifically for this reason. Rib fracture patients with ESP catheters **may** still need to be nursed on SDU if they are felt to be at significant risk of clinical deterioration (either due to the extent of their injuries or their comorbidities). This decision should normally be made by the anaesthetic consultant (or registrar) covering SDU.

Ideally all rib fracture patients not requiring SDU or HDU should be cohorted onto one surgical ward. This is not currently the case (November 2022) but this may change as future surgical ward re-structurings occur.

ESP Catheter Insertion:

Erector Spinae Catheters should only be inserted by anaesthetic consultants, registrars staff grades, that have had appropriate experience of ultrasound guided regional techniques.

The following steps should be taken in placing the ESC:

- Consent should be obtained from all patients who have capacity following an explanation of the risks (failure/discomfort on insertion, local anaesthetic toxicity, localised bleeding) and benefits (analgesia, improved respiratory function).
- Catheters should be placed under full aseptic conditions.
- Dedicated nerve block catheters (Pajunk e-catheter / B Braun set) or a standard epidural catheter may be used.
- A transparent dressing should be used to ensure the entry site is visible.
- 30-40ml 0.25% Levobupivacaine should be used to load the ESP space (this may be split between the needle and catheter.) Particular caution should be used in patients less than 50kg to ensure a safe dose of local anaesthetic is given.
- If the patient is to remain on a normal surgical ward then the ESP catheter should be connected to a standard dosifuser containing 0.25% Bupivacaine. This will deliver an infusion at a rate of 5.2mls/hr. The operator who has inserted the ESP catheter should ensure that the total 4 hourly dose of Bupivacaine (incorporating the dosifuser and loading dose) does not exceed 2mg/kg ideal body weight (see appendix 1). It may be appropriate to delay starting the dosifuser in lower body weight patients to stay within safe limits.
- Alternatively, a local anaesthetic (0.125% Levobupivacaine) infusion may be obtained from pharmacy and set up through a dedicated infusion pump (CME bodyguard). The infusion line should be labelled. This should be prescribed at a rate of 5-15ml (as per the rib fracture order set) and started at 10ml in most patients. This option would normally be reserved for SDU patients as more intensive nursing management is needed for the infusion pump.

Pain assessment – it can take 30-60 minutes for the local anaesthetic loading to have its analgesic effect. Pain should be assessed using a 0-10 pain score both at rest and through functional assessment (e.g. deep breathing, coughing, moving.)

Boluses for breakthrough pain:

While some patients may get sufficient analgesic effect from the ESC infusion, current experience suggests intermittent boluses are more effective. For patients experiencing breakthrough pain, boluses of 10-20mls of 0.25% levobupivacaine may be given up to every 6 hours by medical or nursing staff trained in the management of ESCs.

Care should be taken to ensure that the total 4-hourly dose of (Levo)bupivacaine does not exceed 2mg/kg ideal body weight. For lower body weight patients it may be necessary to reduce the bolus dose or delay restarting the infusion.

Intermittent boluses should be prescribed on the ePMA system (as per the rib fracture order set.) Boluses should be signed for on the system when given. The technique for administering bolus doses to ESCs is as follows:

- Prepare a 10ml syringe of 0.25% levobupivacaine using standard ANTT.
- Disconnect and cap off the infusion from the ESC filter connection.
- Clean the filter connection with a standard clinell (2% chlorhexidine in 70% alcohol) swab.
- Attach the 10ml syringe of 0.25% levobupivacaine to the ESC connection.
- Aspirate to check the catheter has not migrated into a blood vessel.
- Inject all 10mls into the catheter and then reconnect the infusion.
- Monitor HR, BP, RR, Sats and consciousness level every 15 minutes for the next 30 minutes.
- If there is insufficient analgesia after 15 minutes repeat the procedure.
- Insufficient analgesia 30 minutes after the second dose should prompt a review of the ESC and consideration of alternative techniques.

Multimodal Analgesia:

All patients with ESCs should have regular systemic analgesics prescribed in line with the rib fracture order set (including NSAIDS unless contraindicated). PRN opiates may still be needed and can be given while the ESC infusion is running.

Lidocaine plasters should NOT be used on patients with ESCs or epidurals.

Care and Monitoring:

- Post insertion monitoring: standard parameters (heart rate, BP, oxygen saturations, respiratory rate) should be recorded every 15 minutes for the 1st hour after the initial loading dose. These should then be recorded hourly until 4 hours post loading, and every 4 hours after that.
- Symptoms of local anaesthetic toxicity (tingling around the mouth / ringing in the ears) should be specifically asked about at 30 and 60 minutes post loading dose. (See Appendix 2 for severe signs and symptoms of local anaesthetic toxicity.)
- The injection site should be checked daily for signs of redness, swelling, dislodgement or leakage.
- Accidental disconnection of the catheter should be managed in the same way as epidural catheters that are accidentally disconnected – see appendix 2 for details.
- ESCs can normally remain in situ up to 5 days. This may be extended if there is an on-going need for regional analgesia. This should be reviewed daily, along with close monitoring of the catheter site for signs of infection.
- Removal of the line should be performed as a nursing sterile dressing procedure.
- On removal of the catheter ensure the radio-opaque or blue tip is seen. This should be documented.

Troubleshooting:

Poor pain relief:

- Assess pain severity and location
- Assess area blocked by loss of cold touch perception
- Check for catheter migration / dislodgement
- Consider top up bolus – patient observation should be recorded every 15 minutes for the hour following this.
- Oral or subcutaneous analgesics should also be administered for breakthrough pain
- If no pain relief noted from top up bolus then consider removing the catheter and using alternative analgesic options.

Appendix 1: Body weight calculations for safe levels of administration of local anaesthetic

These numbers and calculations are advisory only. It is feasible for patients to experience local anaesthetic toxicity at lower levels (e.g. if some of the medication is delivered intravenously). Equally patients have been given significantly higher doses than these quoted below with no ill effects.

Ideal Body Weight Calculations:

Men: Height in cm – 100
Women: Height in cm – 105

Ideal Body Weight (kg)	(Levo)bupivacaine Max dose in 4 hrs	Max 4 hourly Volume equivalent at 0.25% concentration
40	80 mg	32 mls
45	90 mg	36 mls
50	100 mg	40 mls
55	110 mg	44 mls
60	120 mg	48 mls
65	130 mg	52 mls
70	140 mg	56 mls
75	150 mg	60 mls
80	160 mg	64 mls
85	170 mg	68 mls
90	180 mg	72 mls

Notes:

- A standard dosifuser runs at 5.2 mls/hr. Using 5mls/hr for calculation purposes, this will deliver 20 mls over a 4 hour period
- In the example of a 50kg patient given a 30ml loading dose – the dosifuser should be connected to the ESP catheter 2 hours after the loading dose is administered. This will then deliver 10mls over the next two hours, giving a 4 hourly dose of 40mls.

Appendix 2: AAGBI LOCAL ANAESTHETIC TOXICITY GUIDELINE

AAGBI Safety Guideline

Management of Severe Local Anaesthetic Toxicity

1 Recognition

Signs of severe toxicity:

- Sudden alteration in mental status, severe agitation or loss of consciousness, with or without tonic-clonic convulsions
- Cardiovascular collapse: sinus bradycardia, conduction blocks, asystole and ventricular tachyarrhythmias may all occur
- Local anaesthetic (LA) toxicity may occur some time after an initial injection

2 Immediate management

- Stop injecting the LA
- Call for help
- Maintain the airway and, if necessary, secure it with a tracheal tube
- Give 100% oxygen and ensure adequate lung ventilation (hyperventilation may help by increasing plasma pH in the presence of metabolic acidosis)
- Confirm or establish intravenous access
- Control seizures: give a benzodiazepine, thiopental or propofol in small incremental doses
- Assess cardiovascular status throughout
- Consider drawing blood for analysis, but do not delay definitive treatment to do this

3 Treatment

IN CIRCULATORY ARREST

- Start cardiopulmonary resuscitation (CPR) using standard protocols
- Manage arrhythmias using the same protocols, recognising that arrhythmias may be very refractory to treatment
- Consider the use of cardiopulmonary bypass if available

GIVE INTRAVENOUS LIPID EMULSION
(following the regimen overleaf)

- Continue CPR throughout treatment with lipid emulsion
- Recovery from LA-induced cardiac arrest may take >1 h
- Propofol is not a suitable substitute for lipid emulsion
- Lidocaine should not be used as an anti-arrhythmic therapy

WITHOUT CIRCULATORY ARREST

Use conventional therapies to treat:

- hypotension,
- bradycardia,
- tachyarrhythmia

CONSIDER INTRAVENOUS LIPID EMULSION
(following the regimen overleaf)

- Propofol is not a suitable substitute for lipid emulsion
- Lidocaine should not be used as an anti-arrhythmic therapy

4 Follow-up

- Arrange safe transfer to a clinical area with appropriate equipment and suitable staff until sustained recovery is achieved
- Exclude pancreatitis by regular clinical review, including daily amylase or lipase assays for two days
- Report cases as follows:
  - in the United Kingdom to the National Patient Safety Agency (via **www.npsa.nhs.uk**)
  - in the Republic of Ireland to the Irish Medicines Board (via **www.imb.ie**)

If Lipid has been given, please also report its use to the international registry at **www.lipidregistry.org.** Details may also be posted at **www.lipidrescue.org**

Your nearest bag of Lipid Emulsion is kept .....

This guideline is not a standard of medical care. The ultimate judgement with regard to a particular clinical procedure or treatment plan must be made by the clinician in the light of the clinical data presented and the diagnostic and treatment options available.

Appendix 3: Management of Catheter Disconnection

Nerve catheter filters are suitable for the duration of the ESC and do not routinely need to be replaced within this time.

A break in the circuit may occur in two places

- Disconnection between the bag and the filter:
  - The filter should be capped off, using a sterile non-injectable bung, and the infusion line and bag replaced.

- Disconnection between the patient and the filter:
  - The procedure to follow will depend on if the event is witnessed or not:

Witnessed Event	Non Witnessed Event
Place both ends in a sterile field	Stop infusion and consult Acute Pain Team / On call Anaesthetist
Clean the catheter using betadine to length of over 10cm	Remove the nerve catheter
Cut 10cm from the end of the catheter using sterile scissors	Consider re-siting depending on the clinical state of the patient
Reconnect to the new filter	

References:

1. https://app.nysora.com/courses/erector-spinae-plane-block/
2. Forero M, Adhikary SD, Lopez H, et al. The erector spinae plane block: a novel analgesic technique in thoracic neuropathic pain. Reg Anesth Pain Med. 2016;41(5):621–627.
3. Hamilton DL, Manickam B. Erector spinae plane block for pain relief in rib fractures. Br J Anaesth. 2017;118(3):474–475.
4. Cruz H, Chinn KJ, Adhikary SD. How I do it: Erector spinae block for rib fractures: The Penn State health experience. ASRA Feb 2018.

Further Advice:

For further advice on Erector Spinae Blocks / Catheters please speak to the acute pain team or SDU consultant in hours, or the anaesthetic SR out of hours.

Document Controls:

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