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Erector Spinae Block a safe, simple and effective analgesic technique for major hepatobiliary surgery with thrombocytopenia

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ABSTRACT

Hepatobiliary surgeries are associated with severe pain, and coagulopathy. Adequate pain control is vital and difficult to achieve for these patients. Epidural analgesia is considered the routine standard technique for the management of both somatic and visceral pain from major abdominal surgeries until now. However, it is invasive, blind and carries the risk of dural or vascular puncture. Coagulopathy found in patients posted for hepatobiliary surgery further increases the concerns. We found ultrasound guided erector spinae plane block as a safe, simple yet an effective alternative to epidural analgesia for postoperative pain management of hepatobiliary surgeries.

1. Introduction

Hepatobiliary surgeries are associated with trauma, severe pain, and coagulopathy [1,2]. Adequate pain control is therefore vital and difficult to achieve in these patients. This has traditionally been managed with high doses of intravenous opioids or neuroaxial anaesthesia. Both of these approaches have their own concerns, risks and complications. Recently, erector spinae plane (ESP) block a safe, simple and effective interfascial plane block has been described for thoracic [3,4] and minor abdominal surgery [5,6]. We present our experience of two patients with thrombocytopenia, who underwent major hepatobiliary surgery and managed with continuous ESP block. Written informed consents were taken from the patients for scientific publication.

2. Case 1

A 48-year-old female weighing 58 kg was admitted with a diagnosis of a benign tumour left lobe of the liver. Surgeons planned a left hepatic resection through a right subcostal incision for her. Her preoperative investigation revealed thrombocytopenia (platelet count-70,000/μl) and an international normalised ratio of 1.4. We planned for a continuous ESP block after general anaesthesia. After induction of general anaesthesia and tracheal intubation, we secured a 20G radial arterial line, 16G intravenous cannula and ultrasound (US) guided 7F central line in the right internal jugular vein. The patient was positioned in left lateral position with full flexion at hip and neck joint. We located the 12th rib, easily recognised with ultrasound and followed it to identify transverse process of the 12th thoracic vertebra using a low-frequency linear transducer (6–13 MHz, SonoSite M-Turbo. Bothell, WA, USA) in a craniocaudal direction. The transverse process of the thoracic vertebra (T7) was further located counting upwards (Fig. 1). An 18G epidural Tuohy needle direction was inserted, 2.5–3 cm from the midline in an in-plane approach, from caudal to the cephalic direction. The whole shaft of the needle was visualised and inserted below erector spinae muscle on to the transverse process. Plane between erector spine muscle and transverse process was further ascertained after hydrodissection with 3 ml normal saline (Fig. 2). Following a bolus injection of 20 ml 0.375% ropivacaine a 20G catheter was advanced 4 cm into the space. A scan of the transverse processes below T7 confirmed the spread of drug to at least T12 level (Fig. 3). A 0.375% ropivacaine infusion was started at 5 ml/h, 1 h after bolus injection. She received a total of 300 μg fentanyl as intermittent boluses and 1gm acetaminophen during the surgery. The surgery lasted for 8 h with a total blood loss of about 3 L. Fluids, blood and blood products were used to maintain the haemodynamics. It was decided to electively ventilate the patient overnight in view of massive blood loss and prolonged surgery. The patient was transferred to intensive care with catheter and infusion of ropivacaine and intravenous midazolam for sedation. She was extubated early next day morning. Her Visual Analogue Scale (VAS) score was less than 2/10 post-extubation. We continued her ropivacaine infusion for two more postoperative days. Her VAS score throughout this postoperative phase was never above 4/10, nor did she require any opioids for the

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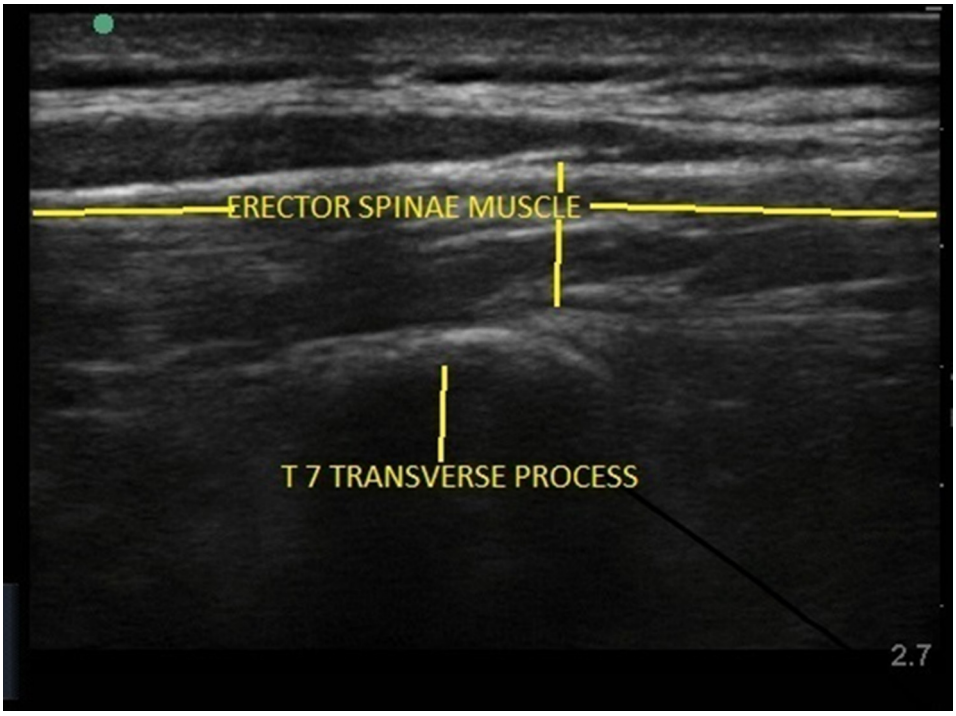

Fig. 1. Normal sonoanatomy at T7 for ESP block.

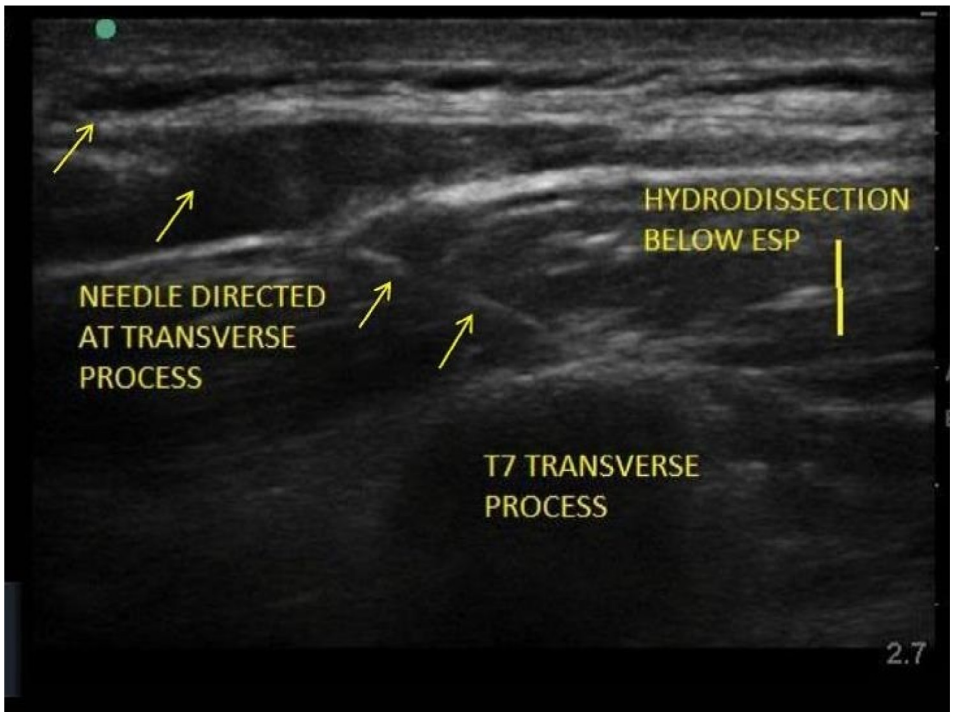

Fig. 2. Insertion of drug for ESP BLOCK.

pain.

3. Case 2

This was the case of a 60-year-old female weighing 48kgs diagnosed as having extrahepatic portal venous obstruction with portal hypertension and hepato-splenomegaly for lienorenal shunt surgery. She had pancytopenia with severe thrombocytopenia (platelet count-25,000/μl), mild anaemia (haemoglobin-9.8 g/dl) and a leucocyte count of 4600 cells/mm^3 due to hypersplenism. We decided on a plan of general anaesthesia followed by continuous ESP block. The procedure with its due benefits and risks was explained to the patient. After induction and intubation, sonography guided invasive lines were secured for monitoring and management during surgery.

The patient was later positioned in left lateral position for ESP block. The transverse process of the 7th thoracic vertebra was located by placing a high-frequency linear transducer in a craniocaudal direction. We directed an 18G touhy needle below erector spinae over the

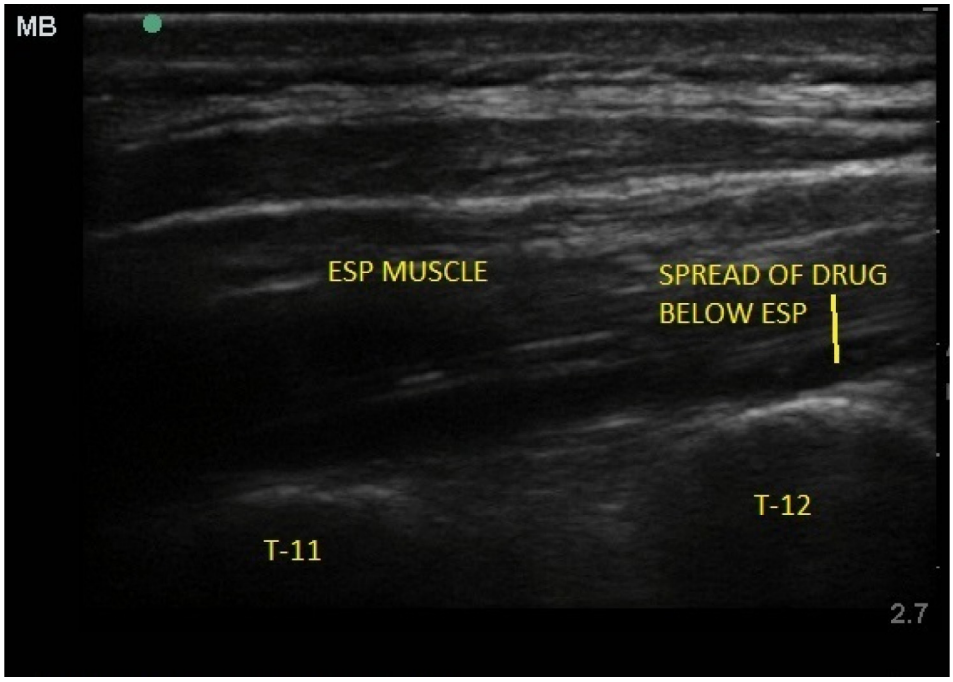

Fig. 3. Spread of drug after bolus injection.

transverse process and ascertained the space after hydro-dissecting it with normal saline. A catheter was inserted and fixed after tunnelling. A bolus of 20 ml 0.375% ropivacaine was given and started a perioperative infusion of 5 ml 0.375% ropivacaine. Post-procedure scan revealed the spread of the bolus drug up to the 1st lumbar vertebra. The patient remained stable despite a blood loss of 1.5 L, managed with blood and blood products. The patient received a total of intravenous 250 μg fentanyl as intermittent boluses and 1gm acetaminophen during surgery. The patient's trachea was extubated and she was transferred to the recovery with ropivacaine infusion. Her VAS score after extubation was less than 3/10. The infusion continued for two postoperative days. She didn't have any breakthrough pain and only complained of discomfort during the change of position or dressing of the wound during these two days.

4. Discussion

The spinal nerve at each dermatome splits into ventral and dorsal rami. Dorsal rami go through costotransverse foramen and give medial and lateral branches to innervate the posterior back. Ventral rami go further in the intercostal spaces and give anterior and lateral cutaneous branches which supply anterior and lateral chest and abdominal wall.

The erector spinae is a group of muscles extending in a craniocaudal direction from occiput down to the pelvis along the whole length of the spine. This plane below the muscle thus produces extensive spread along the spine of any drug injected into it.

Forero et al. [3] recently described an ultrasound-guided interfascial plane block wherein they injected a local anaesthetic below the erector spinae muscles on the transverse process of the 5th thoracic vertebra. This ESP block in their clinical trials produced complete sensory blockade from T2 to T9. They also studied the spread of dye in cadavers and noted the penetration of drug though costotransverse foramen near the origin of ventral and dorsal rami.

Chin and colleagues [5,6] also suggested that ESP block, when given at T7 level, results in the spread of drug from upper thoracic to L2-3 level, so it could provide analgesia for abdominal surgeries. They used this technique successfully to provide analgesia in bariatric surgery and hernia repair as well.

Ours 2 cases were unique in that both patients were thrombocytopenic and undergoing hepatobiliary surgery with an extended unilateral subcostal incision. Surgery also carried a high risk of intraoperative bleeding and hemodynamic instability. Both the patients received continuous ESP block at T7 level to manage postoperative pain and had good pain relief in their postoperative period (Table 1).

This block is considered relatively simple and safe. However, there were few concerns regarding the safety of ESP block in our patients with severe thrombocytopenia [7]. ESP block is given over the bony transverse process and below the erector spinae muscle. This plane is completely devoid of any vascular structures as compared to epidural or paravertebral block [3]. Complete and continuous visualisation of needle with the help of US further decreases the risk of inadvertent vascular puncture. Further, concept of rebalanced haemostasis in patients with chronic liver disease and portal hypertension encouraged us to use ESP block in these patients [8–11]. They have with increased von willebrand factor [8], markers of platelet activation [9], normal thromboelastogram [10] and rarely recommended platelet transfusion for thrombocytopenia in cases of bleeding [11]. However no previous studies and cases have been reported regarding the safety of this block in patients with thrombocytopenia.

Epidural analgesia has been the standard for managing such cases in

Table 1
VAS scores and analgesic consumption of both the patients over 48 h.

	Surgery	Analgesics		VAS Score					
		Opoids Fentanyl	NSAIDS Acetaminophen	0 h	4 h	8 h	12 h	24 h	48 h
CASE 1	Left Hepatectomy	300	1 gm	2	2	3	2	2	2
CASE 2	Lienorenal shunt	250	1 gm	3	3	3	2	2	2

our institute; unfortunately, it is not entirely risk-free. Inserting a thoracic epidural is blind, more invasive, difficult technique and can result in intraoperative hemodynamic instability, dural or vascular puncture. Moreover, perioperative coagulopathy found commonly in patients with liver disease contradicts the use of epidural analgesia.

Rhomboid intercostal block also works similarly as ESP, but maximal spread with this approach is only between T2-T9 [12]. Quadratus Lumborum (QL) block with catheters is also an effective alternative. It provides for both somatic and visceral pain relief. However, it is technically more difficult, invasive and may even result in motor weakness [13]. We could have also used tranversus abdominus plane block with catheters. However, it only provides for somatic analgesia and extent of the block is also limited if given at one point. The proximal placement of this catheter to surgical field further precludes this technique [14].

There has been some controversies [15] related to site and mechanism of action of these block. Close vicinity and clinical spectrum same as of paravertebral block raise the query of its distinctiveness from the same. Anatomy of paraspinal muscles, erector sheath and spread of drug also raises questions of this block as erector sheath block and not as a muscle plane block [16].

Erector Spinae Block holds promise as a safe, simple yet effective approach for providing postoperative analgesia for the patient undergoing upper abdominal surgeries. However, there are still issues about the site, mechanism of action and the dearth of studies for this block. Further, despite the absence of any vascular structures in the vicinity, merely two cases don't establishes the safety of ESP block in the patients with coagulopathy. Thus, anatomical, clinical research and more studies are needed to ensure the safety, efficacy, mechanism and spectrum of its usefulness.

5. Conflicts of interest

None.

6. Source of funding

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7. Author's contributions

Arshad Ayub (corresponding author) – Writing the article and editing the article.

Rakesh Kumar – Acquisition and collection of data.

Praveen Talawar – Critical revision of the article.

Debesh Bhoi – Guidance and Final approval of the version to be published.

Ajay Yadav – spelling, grammar and language check of the article and figures editing.

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