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Case Series

Erector spinae block in diverse surgical procedures: A case series on optimizing post operative pain management

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ABSTRACT

Erector spinae block (ESB) is an innovative regional anaesthesia technique that has gained popularity for managing postoperative pain, particularly following thoracic and abdominal surgeries. This case series demonstrates five patients who received Erector spinae block as part of their pain management protocol during diverse surgical procedures, including mastectomy, open cholecystectomy, video assisted thoracoscopic surgery (VATS), total abdominal hysterectomy and right radical nephrectomy. This case series signifies the efficacy of Erector spinae block in optimizing pain management and providing opioid free analgesia across various surgical contexts, highlighting the need for further research to expand its clinical applications. The postoperative pain scores in all the cases was low, patients reported pain scores averaging between 2 and 3. This helped in reduced opioid consumption post operatively with minimal side effects and in turn facilitated quicker recovery and discharge.

1. Introduction

After introduction of ultrasound technology in regional anaesthesia and pain management routines, interfascial plane blocks popularity has increased. Initially it was used for abdominal blocks such as transversus abdominal block, ilioinguinal hypogastric block and rectus sheath blocks but now the range of blocks has increased to anterior and lateral thoracic wall blocks to peri and para vertebral blocks.[1–4] Even though erector spinae block (ESB) is a recently defined block.[5] it has emerged as a significant advancement in regional anaesthesia and gained popularity because of its ease of application and safety profile.[6,7] Erector spinae block can be used to provide opioid sparing analgesia for various thoracic and abdominal surgeries unlike other regional anaesthesia methods. Traditional methods of pain management in thoracic and abdominal surgeries often rely heavily on opioid analgesics, which can lead to side effects such as nausea, vomiting, sedation, and respiratory depression. The Erector spinae block offers a precious alternative by providing targeted analgesia with very minimal systemic side effects.

Erector spinae block is a interfascial block, anatomical similarities exist for block performed at different levels, sonoanatomic and application-specific differences are significant at different levels. The erector spinae muscles are back muscles that aid in keeping the body upright and are also known as Autochthonous back muscles.[8] The Erector spinae muscle extends from the cervical to sacral levels. In the thoracic area, they exist as the spinalis, longissimus, and iliocostalis muscles from medial to lateral. Erector spinae block is can be performed by superficial or deep needle approach. In superficial needle approach technique, drug is injected between rhomboid major muscle and erector spinae muscle, whereas in the deep needle approach, drug is injected below erector spinae muscle.(Figure 1) It has been

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recommended to use the deep needle approach as drug is deposited closer to costotransverse foramina and origin of dorsal and ventral rami.[9] It is supposed to work at the origin of spinal nerves, based on cadaveric and contrast studies.[9,10] The patient is positioned either sitting or in a lateral decubitus position, and the needle is inserted in an in-plane approach to target the paravertebral space, allowing for effective pain relief. This regional anaesthesia technique has increasingly gained recognition for its benefits over other techniques like thoracic epidural or intercostal nerve blocks, it also helps in reduced opioid consumption, improved pain management and enhanced postoperative recovery.

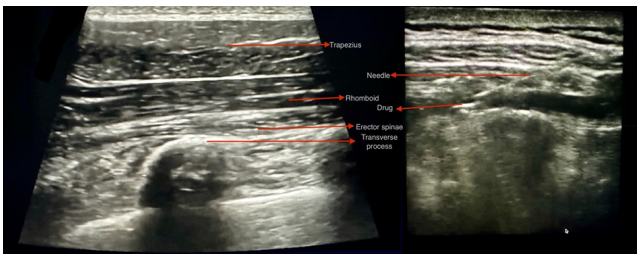

Figure 1: Schematic ultrasound images of erector spinae block. A needle was inserted into the interfascial plane between the erector spinae muscle and transverse process of the vertebra and drug was injected

2. Methods and Descriptions

Using a local anaesthetic drug such as ropivacaine, in conjunction with an adjuvant like dexmedetomidine (alpha-2 adrenergic agonist), can significantly enhance the efficacy of the block.[3] Dexmedetomidine not only prolongs the duration of analgesia but also contributes to sedative and anxiolytic effects, potentially improving overall patient comfort. This case series is an explorative approach for the application of Erector spinae block in combination with ropivacaine and dexmedetomidine in five different surgical procedures. By documenting the detailed process of block administration, monitoring, and anaesthesia management we aim to illustrate the effectiveness and versatility of the Erector spinae block technique. Each case presents unique patient profiles and surgical scenarios allowing for a comprehensive evaluation of the Erector spinae block impact on pain management and postoperative recovery.

After selecting the level at which the block should be given, place the transducer in a paramedian sagittal orientation approximately 2cm away from the midline and try to visualize the transverse process. At higher thoracic levels that is above T5- trapezius, rhomboid major and erector spinae muscles can be identified as three layers superficial to the transverse processes. In the lower and mid-thoracic levels only the trapezius and erector spinae muscles can be seen. The block was administered in all the cases by in-plane technique using 22G spinal needle. In all the cases needle was advanced through the muscular layers to gently contact transverse process. Needle placement was confirmed by hydro dissection by injecting 2–3 ml of normal saline. On injecting 20 ml of 0.2% ropivacaine with 15 mcg dexmedetomidine on each side into interfascial plane deep to erector spinae, a visible linear pattern was visualized lifting the muscle. Ultrasound technique and needle Guage selection for the block were standardized across all cases.

Post operative pain scores were recorded using visual analogue scale (VAS), with 0 being no pain and 10 being the worst possible pain. Rescue analgesia was given once the patient complained of moderate pain which is 4 or 5 according to visual analogue scale. Rescue analgesic drugs were paracetamol and diclofenac in all the cases, but were given only if pain score exceeded 4 out of 10. (Figure 2)

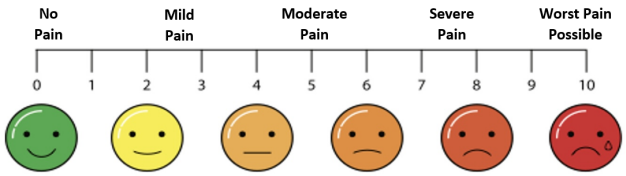

Figure 2: Visual analogue scale (VAS)

3. Case Reports

3.1. Case 1

A 58-year-old woman with Stage II invasive ductal carcinoma underwent a bilateral mastectomy. Her medical history included well-managed hypertension and a resolved deep vein thrombosis (DVT). On the day of surgery, she received 150 mg of propofol and 100 mcg of fentanyl for induction, followed by cisatracurium for neuromuscular blockade and intubation was done. She was initially placed supine for the surgery and after the surgery she was repositioned laterally for the purpose of erector spinae block. Prior to extubation an ultrasound-guided bilateral erector spinae block was performed using a 22G spinal needle, a total of 40 ml of ropivacaine 0.2% with 30 mcg of dexmedetomidine was given bilaterally at the T4 level, that is 20 ml on each side. After extubation the sensory blockade was from dermatome T2 - T8 level as shown in Figure 3.

In the Post Anaesthesia Care Unit (PACU), she reported an average pain score of 2 out of 10 for first 12 hrs, followed by average pain score of 3 out of 10 for next 12 hrs indicating excellent pain control. Rescue medications advised were 1 gm of paracetamol and 100 mg of diclofenac, but as the patient was comfortable the rescue medications were avoided for her. Her recovery was smooth, and she was transferred to the surgical ward 24 hrs post-surgery with minimal discomfort and stable vitals.

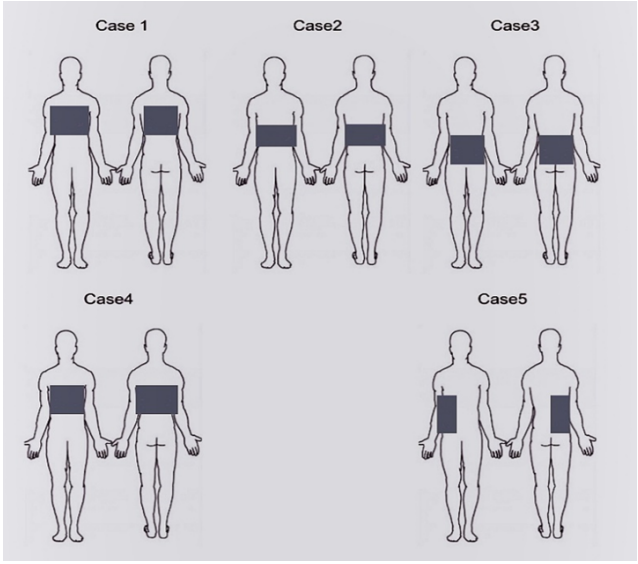

Figure 3: Dermatomes covered by Erector Spinae block in our case series

3.2. Case 2

A 64-year-old man with symptomatic cholelithiasis was undergoing lap cholecystectomy surgery which was later converted to open cholecystectomy. His medical background included hypertension, type 2 diabetes mellitus, and gastroesophageal reflux disease (GERD). On the surgical day, he was given 150 mg of propofol and 100 mcg of fentanyl for induction, followed by neuromuscular blockade with cisatracurium for intubation. Initially patient positioned supine for the surgery and after the surgery he was positioned to left lateral side for the purpose of erector spinae block. Before extubation an ultrasound-guided bilateral erector spinae block (ESB) was performed using a 22G spinal needle, a total of 40 ml of ropivacaine 0.2% with 30 mcg of dexmedetomidine was given bilaterally at the T7 level, 20 ml on each side. After extubation the sensory blockade was from dermatome T6 - T12 level as shown in Figure 3.

In the post anaesthesia care unit, the patient reported an average pain score of 2 out of 10 for first 10 hrs followed by 3 out of 10 for next 8hrs and then he complained pain of 4 out of 10 at 18^{th} hour for which rescue analgesic dose of 1 gm of paracetamol and 100 mg of tramadol was given and after that the pain score was 2 out of 10 for next 6 hrs. Suggesting effective pain management in spite of the large incision which was given. His recovery was uncomplicated, and he was moved to the surgical ward 24 hrs post-surgery with minimal discomfort and stable vitals.

3.3. Case 3

A 45-year-old woman with symptomatic uterine fibroid underwent a total abdominal hysterectomy. Her medical history included well-controlled asthma managed with inhalers. On the day of surgery, she received 150 mg of propofol and 100 mcg of fentanyl for general anaesthesia, followed by vecuronium for neuromuscular blockade and intubation was done. After the hysterectomy surgery was completed and before extubating the patient, she was placed in left lateral position and an ultrasound-guided bilateral erector spinae block (ESB) was performed with a 22G spinal needle, a total of 40 ml of ropivacaine 0.2% with 30 mcg of dexmedetomidine was given bilaterally at the T10 level, with 20 ml on each side. After extubation the sensory blockade was from dermatome T8 – L2 level as shown in Figure 3.

In the post anaesthesia care unit, she reported an average pain score of 2 out of 10 for first 12 hrs followed by 3 out of 10 for next 10 hrs and then she complained pain of 4 out of 10 at 22^{rd} hour for which rescue analgesic dose of 1 gm of paracetamol and 100 mg of tramadol was given and pain score reduced and was to 2 out of 10 at the end of 24^{th} hour, indicating effective pain control. Her recovery was uneventful, and she was transferred to the surgical ward 24 hrs post-surgery with negligible discomfort and stable vitals.

3.4. Case 4

A 52-year-old man with a history of smoking and mild chronic obstructive pulmonary disease (COPD) was scheduled for video-assisted thoracoscopic surgery (VATS) to resect a emphysematous upper lobe on the left side. He even had indistinct spine anatomical landmarks. His COPD was being managed with inhalers and bronchodilators. On the day of surgery, he received 150 mg of propofol and 100 mcg of fentanyl for general anaesthesia, followed by rocuronium for neuromuscular blockade and intubation was done. Initially patient was placed in supine position and arterial line was secured for monitoring the arterial blood pressure and a 16G cannula was placed in anticipation of any sudden blood loss intraoperatively at the time of dissection of the lung. He was later repositioned to right lateral position for optimal access to the thoracic cavity on the left side. After the procedure an ultrasound-guided bilateral erector spinae block (ESB) was performed using a 22G spinal needle, a total of 40 ml of ropivacaine 0.2% with 30 mcg of dexmedetomidine was injected at the T5 level, with 20 ml on each side. After extubation the sensory blockade was from dermatome T3 – T9 level as shown in Figure 3.

In the post anaesthesia care unit, the patient reported an average pain score of 2 out of 10 for first 12 hrs followed by a pain score of 3 out of 10 for next 12 hrs. Indicating

that the block had good analgesic control. Rescue analgesics advised for him were 1 gm of paracetamol and 100 mg of diclofenac, but were not given to the patient as he was not complaining of any pain. His recovery was smooth, and he was transferred to the surgical ward 24 hrs post-surgery with minimal discomfort and stable vitals. Patient was advised to do incentive spirometry in the ward for increasing the lung function.

3.5. Case 5

A 60-year-old man with a history of smoking and chronic obstructive pulmonary disease (COPD) was scheduled for a laparoscopic assisted right radical nephrectomy due to renal cell carcinoma. His medical history included chronic kidney disease, managed with regular monitoring and medication and history of laminectomy at T8,T9,T10 and T11 levels. On the day of surgery, he was given 150 mg of propofol and 100 mcg of fentanyl for general anaesthesia, followed by cisatracurium for neuromuscular blockade and intubation was done. Initially positioned supine arterial line was placed for monitoring the arterial blood pressure and a 16G cannula was secured in anticipation of any blood loss intraoperatively at the time of surgery, he was then moved to the left lateral position for optimal access to the renal region. After the nephrectomy and before extubation an ultrasound-guided unilateral erector spinae block (ESB) was performed using a 22G spinal needle, a total of 20 ml of ropivacaine 0.2% with 15 mcg of dexmedetomidine was given at the T8 level on right side. After extubation the sensory blockade was from dermatome T6 – T12 level as shown in Figure 3.

In the post anaesthesia care unit, the patient reported an average pain score of 2 out of 10 for the first 12hrs followed by an average pain score of 3 out of 10 for next 12 hrs. Rescue analgesics advised for him were 1 gm of paracetamol and 100 mg of diclofenac, but were not given to the patient as he was not complaining of any pain. This indicating effective analgesia. Recovery was smooth and he was transferred to the surgical ward after 24 hrs with minimal discomfort and stable vitals.

The erector spinae block which was given with ropivacaine along with dexmedetomidine as an adjuvant provided effective analgesia and contributed to a favourable postoperative outcome with no opioid use and minimal rescue analgesia requirement facilitating a smoother recovery. The visual analogue score was monitored for all the cases for 24 hrs, that is from shifting to post anaesthesia care unit to being transferred to surgical ward. Score was monitored for every 15 mins in the 1^{st} hour followed by 2^{nd} hour and then it was monitored once every 2hrs till 24hrs were completed as shown in Table 1. Only 2 patients out of the 5 patients required rescue analgesia, that too those 2 patients required rescue analgesia as a large surgical incision was given during the procedure intraoperatively because of surgical complexities.

4. Discussion

Epidural and paravertebral blocks have been commonly used for relieving acute or chronic pain for cervical, thoracic, or abdominal surgeries.[11] Recently, many myofascial blocks and regional techniques have been introduced like transverus abdominis plane block, rectus sheath block and quadratus lumborum block for abdominal surgeries, pectoral nerve block for breast surgeries and intercostals and interpleural blocks for thoracic surgeries.[12–14] Erector spinae block has emerged as an excellent novel regional technique with effective analgesia with less opioid requirements along with simplicity and safety.[15–17]

The addition of dexmedetomidine to ropivacaine in the erector spinae block significantly enhances analgesia and decreases postoperative opioid requirement, leading to fewer opioid-related side effects. Erector spinae block also has potential uses in condition where conventional therapies have limited role, such as in case 4 who had indistinct spine anatomical landmarks and case 5 who had undergone laminectomy, in these patients epidural analgesia is difficult. In erector spinae block there are no structures nearby at risk of needle injury thus making it simpler, safer to give even with less expertise and has no procedural complications when compared to epidural and paravertebral blocks. It eliminates risk of hypotension of epidural analgesia, vascular puncture of paravertebral blocks and also there procedural complications due to their vicinity to spinal cord and pleura. For thoracic surgeries or rib fractures, erector spinae block also helps for better lung expansion, superior analgesia, allows patient to cough, weaning off mechanical ventilation, and early ambulation.

Our case series suggests that it can be used for selective Multi dermatomal sensory blockade according to surgery or site of pain and it also underscores the efficacy and adaptability of the erector spinae block when combined with ropivacaine and dexmedetomidine. Each case demonstrates how erector spinae block can be tailored to different surgical procedures for providing effective pain relief while reducing the need for opioids. In 4 out of 5 cases, the block was administered bilaterally and in remaining case it was unilateral. For thoracic procedures such as lobectomy's the block can be given targeting higher thoracic levels (T4-T6) to cover the pain zones, while in abdominal procedures it can be given at lower levels (T10-T12). But our findings are based on a small case series. Hence we suggest further controlled studies to compare erector spinae block with conventional analgesic techniques for respective surgeries in terms of technical difficulty, efficacy, and patient comfort. We also suggest studies should be done on variability of sensory dermatomal block associated with injection at different level of transverse process, volume of the drug and even the use of other adjuvant drugs in combination for pain relief of the patients.

Table 1: Visual analogue pain scoresfor all the cases for the first 24 hrs postoperatively

Surgery/ Time	0 mins	15 mins	30	45 mins	1 hr	2 hrs	4 hrs	6 hrs	8 hrs	10 hrs	12 hrs	14 hrs	16 hrs	18 hrs	20 hrs	22 hrs	24 hrs
Bilateral Mastectomy	0	1	1	1	1	2	2	2	1	2	2	3	3	3	3	3	3
Open Cholecystectomy	0	1	0	1	1	1	2	2	2	2	3	3	3	4	2	2	2
Total Abdominal Hysterectomy	0	0	0	1	1	2	2	3	2	2	3	3	3	3	3	4	2
Video Assisted Thoracoscopic Surgery	1	1	1	1	2	3	3	2	2	2	2	3	3	3	3	3	3
Right Radical Nephrectomy	1	1	0	1	1	2	2	2	3	2	2	3	3	3	3	3	2

5. Conclusion

Ultrasound-guided erector spinae block is a versatile and effective regional anaesthesia technique with significant applications in managing both acute postoperative pain and chronic neuropathic pain. Further research is essential to better understand the variability of sensory dermatomal blockade with different injection levels, optimize drug volumes and dosing strategies, evaluate the role of adjuvants, refine block techniques, and assess long-term outcomes. Such advancements will enhance the efficacy and broaden the scope of this promising anaesthetic modality.

6. Sources of Funding

None.

7. Conflict of Interest

None.

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