

## Ultrasound guided unilateral erector spinae blockade in open cholecystectomy in COVID-19 era

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### ABSTRACT

**Background:** The erector spinae plane (ESP) blockade acts as a potent unilateral analgesic technique. The block is performed by injecting local anaesthetic drug in the plane between the erector spinae muscle and the vertebral transverse process, with its effect due to diffusion of the local anaesthetic into the paravertebral space through spaces between the adjacent vertebrae. It is a relatively safe and easy technique as compared to the thoracic epidural because our target in ESP blockade is the transverse process, which is identified easily and is distant from neural or major vascular structures and the pleura. **Aim of the study:** To assess the analgesic effect of ultrasound guided unilateral erector spinae blockade in open cholecystectomy **Material and methods:** We present a case series of ESP blockade under ultrasound guidance in nine patients scheduled for open cholecystectomy because surgeons chose to avoid laparoscopic surgery due to the increased risk of COVID-19 infection due to intraperitoneal aerosol generation. **Results:** All patients with postoperative ESP blockade maintained an NRS pain score of 03/10 for 24 h, except for those requiring emergency analgesia. The pain relief was excellent in all our patients and there were no complaints of nausea, vomiting. **Conclusion:** ESP blockade is proving to be a successful technique for intraoperative and postoperative analgesia.

**Keywords:** Ultrasound, erector spinae plane blockade, open cholecystectomy, Covid-19 era, analgesia

### INTRODUCTION

The erector spinae plane (ESP) blockade [1] acts as a potent unilateral analgesic technique. The block is performed by injecting local anaesthetic drug in the plane between the erector spinae muscle and the transverse process. The dorsal and ventral branches of spinal nerves are blocked by the anaesthetic drug [1-3]. It is a relatively safe and easy block as compared to thoracic epidural because ESP blockade is performed using ultrasound (USG) and the target is transverse process, which is identified easily and is distant from neural or major vascular structures and the pleura. Sometimes it is difficult to perform epidural block due to complex anatomical variation as well as due to the calcification of the ligaments attached with the vertebrae which is not seen with the ESP blockade. An added advantage of

ESP blockade is that it is devoid of any haemodynamic instability which is sometimes seen with epidural block. The ESP blockade provides extensive analgesia in one puncture and can be performed in a sitting, prone, and side position. Ultrasound-guided local anesthesia is the most common technique for patients [1]. The most recently described planar block in ultrasound is the erector spinae plane (ESP) blockade. This novel block is performed at the level of the T7 spinous process in longitudinal ultrasound using a linear probe and a sensor block spanning T3-T9. This technique is performed in a sitting position with the patient [2].

## **MATERIAL AND METHODS**

This is a case series of 9 patients conducted at a tertiary care centre of northern India during the 2<sup>nd</sup> wave of pandemic covid-19 infection between May 2021 and September 2021. This case series presents 9 patients with ESP blockade using a continuous technique of intraoperative and postoperative analgesia. Written informed consent was obtained from all patients included in this case series. Patients were given ESP blockade and catheter placement done prior to surgery under ultrasound control [FIGURE1]. Catheters were inserted deep to the erector spinae muscle and have been successfully used for postoperative pain relief. ESP catheter was inserted prior to general anesthesia in a sitting position. Block was given at the level of T7 vertebra with local anesthetic (LA) using 25 ml of 0.2% ropivacaine in all cases [FIGURE2]. Top ups were given every 6 hourly for first 48 hours postoperatively through catheter and paracetamol (PCM) 1 gram intravenously was given 8 hourly as a part of multimodal analgesia. The catheter was removed 3 days after surgery. It was decided to use fentanyl 1 µg/kg as an emergency analgesic when the patient's NRS (neumeric pain rating scale) was >3/10.

All cases underwent surgery under general anesthesia with the same procedure for all patients. Most publications on ESP blockades to date have focused on their use in thoracic surgery, with little mention of surgery at the abdominal level. There is limited data on ESP blockade in open cholecystectomy. Therefore, ESP blockade was scheduled in 9 patients scheduled for open cholecystectomy because the surgeons decided to avoid laparoscopic surgeries due to increased risk of covid-19 infection because of aerosol generation during pneumoperitoneum.



Figure 1 showing erector spinae plane (ESP) catheter while insertion under ultrasound guidance



Figure 2 showing ESP block landmarks under ultrasound guidance. ESM-erector spinae muscle, TP-transverse process of T7 vertebrae

## RESULTS

Patients were given 25ml ropivacaine 0.25% plus before the induction of general anaesthesia and then every 6 hourly via catheter. All patients had an NRS for pain of 03/10, except one patient who required emergency or rescue analgesia within 24 hours of surgery. 25ml of 0.25% ropivacaine was administered to the patients until general anaesthesia was induced, and then administered through a catheter every 6 hours. Patients were followed and evaluated for pain and post operative nausea and vomiting every 2 hourly for the first 24 hours. Catheter was removed on the third postoperative day.

### Case 1

A 44-year-old male patient, weighing 68kg, was scheduled for open cholecystectomy. On evaluation, the patient was posted for the operation under American Society of Anesthesiologists class II risk status. We decided to perform an ultrasound-guided unilateral ESP blockade as a part of multimodal analgesia. The patient was informed in detail about the procedure, and a written informed consent was taken.

The patient was shifted to the operating room, and all standard monitors were attached to the patient. Intravenous line was secured, and ringer lactate infusion was started. Sedation was given by intravenous injection (IV) of midazolam (2 mg). The T7 vertebrae level was identified using spinal processes. The target surface were swabbed with povidone iodine and covered with a sterile drape. The probe was placed at the T7 spinous process and then shifted 3 cm to the right lateral direction to identify the transverse process. Once the target transverse process was identified, 5 ml of 2% lidocaine was administered to the predicted needle entry point. Next an 18-gauge touhys needle was inserted by the in-plane technique in cephalocaudal direction. The needle tip was advanced towards the transverse process . After the contact with transverse process the needle was withdrawn 1–2 mm. Then 25 ml of 0.25% ropivacaine was injected with intermittent negative aspirations into the fascia of the erector spinae muscle and then ESP catheter was passed and secured at T7 vertebra. The patient was then anesthetized with 2 mg/kg of propofol, 1 mcg/kg of fentanyl, and 0.1mg/kg of vecuronium intravenously . oxygen(40%) and nitrous oxide(60%) mixture with 1% isoflurane was used as inhalational agents. Additionally, paracetamol (1 g) was given intravenously.

No hyperdynamic response was observed during the surgery, which lasted for one and half hour. After the surgery, the patient was extubated and shifted to the post-anesthesia care unit (PACU). The numeric rating score (NRS) of 3 was recorded in the PACU at follow-up. On follow-up, the NRS score was 2/10 for 24 hours. The patient was comfortable and complained only mild pain in the abdomen. No rescue analgesia was demanded by the patient.

## Case 2

A 37-year-old woman weighing 62 kg at a height of 158 cm and with American Society of Anesthesiologists (ASA) physical status I underwent open cholecystectomy under general anesthesia. Patient was premedicated with 2mg midazolam and 4mg of ondansetron . The patient was placed in a sitting position ansite of puncture was prepared, draped and under all aseptic precautions was infiltrated with 5ml of 2%lidocaine. A linear US probe was used for ESP blockade catheter placement at the T7 spinous process approximately 3 cm laterally similarly as we did in the first case. 25ml of 0.25% ropivacaine was injected deep into the erector spinae muscle. After LA injection, an epidural catheter was inserted and fixed to the skin. Anaesthesia was given with propofol 2.5mg/kg ,fentanyl 1microgram/kg, vecuronium 0.1mg/kg maintaining anaesthesia with oxygen, nitrous oxide and isoflurane. Paracetamol 1gram infusion was given intraoperatively. Postoperative top ups were given every 6 hourly along with intravenous PCM infusion (1gm) 8hourly. The patient's neumeric rating scale (NRS) score was 2/10 in the postoperative care unit (PACU) in the first 24 h, and no rescue analgesia was needed.

### Case 3

A 66-year-old man weighing 80 kg at a height of 170 cm and with ASA physical status I was scheduled for an open cholecystectomy under general anesthesia. A US guided ESP blockade was performed before starting general anesthesia. A linear US probe was used for the block, which was placed at the T7 vertebral level. General anaesthesia was given using same drugs as used in the previous two cases. After surgical procedure, patient was extubated and transferred to the PACU. The patient's NRS score was 0/10 in the PACU in the first 12 hours, and 2-3/10 for next 12 hours. The patient's pain scores were assessed every 2 hourly, and he did not need rescue analgesia for the first 24 hours.

### Case 4

56 year old woman with weight 74 kg was posted for open cholecystectomy. The patient was shifted to the operating room, and the required monitors were attached to the patient. Venous access was secured, and ringer lactate infusion was started. Sedation was given by injecting midazolam 2 mg intravenously. The T7 vertebrae level was identified using spinous processes. The surface of target zone were swabbed with povidone iodine and covered with a sterile drape. the linear probe of ultrasound was placed horizontally on the T7 vertebra level. The probe was then moved 3 cm to the right lateral direction and the transverse processes was identified. 5 mL of 2% lidocaine was administered to the predicted needle entry point. A touhys needle of 18 gauge was advanced by the in-plane technique in cephalocaudal direction. The needle was inserted toward the transverse process. After the contact with the transverse process the needle was withdrawn 1-2mm and 25 ml of 0.25% ropivacaine was injected with intermittent negative aspirations deep to the fascia of the erector spinae muscle and after injecting drug an ESP catheter was passed and secured at T7 vertebra. After the block, the patient was anesthetized with 2 mg/kg of propofol, fentanyl in the dose of 1 microgram per kg, and 0.1mg/kg of vecuronium intravenously. Oxygen(40%) and nitrous oxide(60%) mixture with 1% isoflurane was used as inhalation agents. Additionally, IV paracetamol 1gm was given intraoperatively. Surgery lasted for 2 hours and extubation was smooth Postoperatively ESP top-ups were given every 6 hourly along with paracetamol infusion 1gm 8 hourly. No rescue analgesia was demanded by the patient. NRS score was 0-3/10 for first 24 hours postoperatively.

### Case 5

48 year old woman 66 kg weight posted for open cholecystectomy. Written informed consent was taken. We performed unilateral ultrasound guided ESP blockade and secured ESP catheter at T7 level in sitting position before general anesthesia induction. The anesthetic solution consisted 25ml of 0.25% ropivacaine. After the successful administration of block general anaesthesia was induced and the procedure was started. The surgery lasted for 2 hours and the extubation was smooth. Postoperatively ESP top-ups were given every 6 hourly. PCM 1 gram infusion was given

additionally every 8 hourly. NRS pain score was 2-3/10 for first 24hours postoperatively. No rescue analgesia was required. The patient was comfortable and satisfied and experienced no nausea or vomiting.

### **Case 6**

51-year-old woman, height 165 cm, weight 86 kg was posted for open cholecystectomy and ESP blockade was selected as the regional analgesia. Monitors were attached and intravenous line was secured and patient was premedicated with 2mg midazolam, 4mg ondansetron. ESP blockade and catheter was placed in a sitting position before induction of anaesthesia . A high-frequency linear ultrasound probe was placed in a parasagittal orientation over the right T7 transverse process. An 18G tuohys needle was inserted using an in plane, caudal-to-cranial approach. 25 ml of ropivacaine 0.25% was injected under the erector spinae muscle and ESP catheter was passed and secured. Patient was then induced with propofol 2.5mg/kg fentanyl 1microgram per kg, vecuronium 0.1mg/kg and intubated with PVC ETT. Maintenance of anaesthesia was with oxygen nitrous oxide and isoflurane. Intraoperatively 1gm pcm infusion was also given to the patient. The hemodynamics of the patient were stable. Patient showed no signs of pain and extubation was smooth. Postoperatively ESP top-ups were given every 6 hourly. PCM infusion was given 1gm every 8 hourly. NRS pain score was 2-3/10 for first 24hours postoperatively. No rescue analgesia was required. The patient was comfortable and satisfied and experienced no nausea or vomiting

### **Case 7 and 8**

In cases 7and 8 we used an ESP blockade similarly in both patients (two women aged 58and 64 years respectively) who were posted for an open cholecystectomy. Before the induction of anaesthesia ESP blockade was performed similarly and the catheter was secured at the level of T7vertebra with patient in the sitting position . The highest NRS score was 2/10 in one patient and 1/10 in second patient during follow-up (upto48 h). These patients reported only mild abdominal discomfort . In addition to 25ml ropivacaine( 0.2% )6 hourly, which was given for 48 hours, intravenous paracetamol (1 g) was advised . Both patients were comfortable and no rescue analgesia was demanded by the patients.

### **Case 9**

54-year-old woman weighing 60 kg was posted for open cholecystectomy. ESP blockade was performed in sitting position. ESP catheter was secured at T7 vertebral level. Patient showed no signs of pain and extubation was smooth. Postoperatively ESP top-ups were given every 6hourly. PCM infusion was given 1gm every 8hourly. NRS pain score was 2-3/10 for first 8hours postoperatively. After 10 hours of surgery patient complained pain with NRS5-6/10 which was associated with movement and coughing so fentanyl 60 micrograms was given in

the form of rescue analgesia . After that episode patient was comfortable and experienced no nausea or vomiting.

## **DISCUSSION**

Laparoscopic surgery was temporarily decreased in the era of pandemic COVID-19 infection. At our institution, laparoscopic procedures had been temporarily suspended due to the risk of aerosol formation during laparoscopic surgery. Therefore, the remaining option for gallstones was open cholecystectomy at the discretion of the surgeon. Epidural catheterization and general anesthesia are the most common methods of open cholecystectomy. This method is used as the standard because it provides better pain control and we know that open cholecystectomy is associated with severe pain. However, thoracic epidural anesthesia is difficult and not always easy due to various reasons, such as the risk of hematoma formation due to blood clotting disorders, various technical and anatomical difficulties, and inherent complications of thoracic epidural anesthesia. Therefore, it was decided to perform ultrasound-guided ESP blockade as an alternative to epidural block because it has a better safety profile, is easier to perform and has fewer complications. Blockade of ESP relieves pain by blocking truncal nerves [1]. Blockade of ESP is accomplished by injecting a local anesthetic under the erector spinae muscle and above the transverse process. Due to the diffusion of local anesthetics, the ventral and dorsal branches of the thoracic nerve are blocked [1,2,4]. It was found that the landmarks of the ESP blockade under ultrasound were easily identified and the technique to execute the block was simple. Our patients were mobilized early with relatively short hospital post-operative stay. This was the first time we were doing a case series by performing ESP blockade instead of epidural catheter in patients of open cholecystectomy. There were number of studies on ESP in thoracic surgeries but very few in abdominal surgeries [5-7]. During intraoperative period requirements of anaesthetic drugs as well as analgesic were reduced. We performed block and secured catheter at T7 level in all our nine patients. The pain relief was excellent in all our patients and there were no complaints of nausea, vomiting. Only one patient required fentanyl as a rescue analgesia that too for once.

## **CONCLUSION**

ESP blockade has proven to be a successful technique for intraoperative as well as postoperative analgesia in patients of open cholecystectomy. Pain relief for all patients was excellent, and there were no complaints of nausea or vomiting. Therefore, our results for unilateral erector spinae blockade were successful and we will perform more ESP blockades in patients in the future.

Areas of Investigation Additional studies may be conducted to elucidate the effects of ESP blockade on chronic pain and lung function tests associated with a variety of surgical and nonsurgical issues.

Statement of Patient Consent: The author certifies that all necessary forms of patient consent have been obtained. A form in which the patient(s) have consented to publish their images and other clinical information in a journal. Patients understand that their names and initials will not



be revealed and that every effort will be made to hide their identity, but anonymity cannot be guaranteed.

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