

## Ultrasound guided oblique subcostal transversus abdominis plane block: An observational study on a new and promising analgesic technique

### INTRODUCTION

The ultrasound-guided transversus abdominis plane (TAP) block involves local anaesthetics injection into the plane between the transversus abdominis and the internal oblique muscles to block the thoracolumbar intercostal nerves which are derived from anterior divisions of spinal segmental nerves T6 to L1.<sup>[1,2]</sup> The lateral branches leave the main nerve at the angle of the rib and pass obliquely through the abdominal wall to emerge from the muscles in the mid-axillary line where the needle placement is done during subcostal TAP block.

### METHODS

An observational case series study involving thirty patients was conducted after obtaining hospital ethical committee permission. Patients who underwent consecutive laparoscopic cholecystectomy and which were subsequently converted to open technique due to technical difficulty and/or anatomical variations were administered ultrasound-guided oblique subcostal TAP blockade for post-operative analgesia after the procedure. As most of the open surgical procedures were anticipated, written informed consent was obtained from all patients, and the technique of regional anaesthesia was explained to all. All patients were administered general anaesthesia with endotracheal intubation using fentanyl 2 µg/kg, propofol 2 mg/kg and atracurium 0.5 mg/kg, and maintained with minimum alveolar concentration 1.0 isoflurane in air-oxygen. Intraoperative analgesia

was maintained with paracetamol 15 mg/kg infusion, tramadol 1 mg/kg intravenously and intramuscular diclofenac sodium 75 mg.

After completion of surgery, oblique subcostal TAP blocks were performed under the guidance of a PHILIPS HD7 Diagnostic® ultrasound machine with a linear 5–12 MHz ultrasound transducer. The puncture area and the ultrasound probe were prepared in an aseptic manner. The rectus abdominis and underlying transversus abdominis muscles were identified near the costal margin and xiphoid process. An in-plane image was obtained and a 22 gauge Quincke 100 mm spinal needle was inserted through the rectus muscle 2–3 cm medial to the probe. Once the tip of the needle was visualised to be in the plane, 20 ml of 50:50 mixture of bupivacaine 5 mg/ml and lignocaine 21 mg/ml and adrenaline 1:200,000 was administered incrementally. The drug was injected along the oblique subcostal line, extending inferolaterally from the xiphoid towards the anterior part of the iliac crest by multiple punctures, and amounted to 15 ml [Figure 1]. The contralateral side block was performed near the xiphoid alone in a similar manner with remaining 5 ml. All patients were administered dexamethasone (8 mg) and ondansetron (4 mg) intravenously. Residual neuromuscular blockade was reversed, patients were observed in the post-operative recovery room with standard ASA monitoring by trained nursing staff and resident doctors for 2 h and then transferred to the surgical high dependency unit where they were observed for the next 24 h. Investigators later on collected the data, calculated and tabulated as per study protocol [Table 1]. The characteristics were described by median, interquartile ranges, proportion and percentage (%).

Post-operative pain severity, sedation, nausea score and duration of analgesia were recorded hourly for 2 h and then every 6 h until 24 h. Pain severity was measured using a visual analogue scale (VAS; 0 = no pain, 10 = worst imaginable pain). Sedation score was measured using a categorical

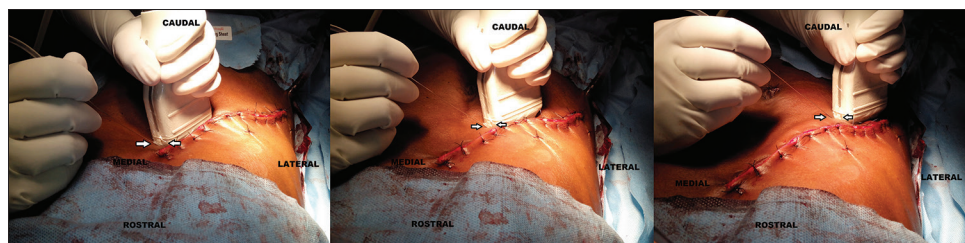


Figure 1: Puncture sites in sequence from medial to lateral, oblique subcostal transversus abdominis plane block

Table 1: Observational data

Parameters	Number of fentanyl boluses			Visual analogue scale score (median)		Duration of analgesia (h)			Sedation score (median)			Nausea score (median)	
	No bolus	1-2	>2	<3	≥3	<12	12-18	>18	1	2	>2	No nausea	nausea
	Number of patients	11	15	4	25	5	5	19	6	4	26	0	29
Percentage of patients	37	50	13	83	17	17	63	20	13	87	0	97	3

scoring system (0 = awake and alert, 1 = quietly awake, 2 = asleep but easily roused and 3 = deep sleep). Nausea was likewise measured using a categorical system (0 = none, 1 = mild, 2 = moderate, 3 = severe). When VAS score reached more than 3, rescue analgesia was administered with fentanyl boluses 0.5 µg/kg intravenously every 30 min for first 2 h and then by paracetamol 15 mg/kg every 6 h as an intravenous infusion. Duration of analgesia was considered as the time interval from an immediate post-operative period until VAS score reached 4 after all above mentioned analgesic interventions. Thereafter, analgesia was provided by pethidine 75 mg intramuscular injection.

## RESULTS

Median VAS score was below three in 83% of patients. No fentanyl bolus was required in 37% of patients while 50% required one or two and 13% more than two boluses. Sixty-three percent of patients enjoyed complete analgesia (VAS < 3) for 12–18 h, and in 17%, analgesia lasted <12 h. Only one patient had episodes of nausea while all the patients had sedation score below two without any other adverse effect [Table 1].

## DISCUSSION

The subcostal approach is suitable after abdominal surgery in the periumbilical region. Modified further, the needle can be introduced by multiple punctures along the oblique subcostal line from the xiphoid process towards the anterior part of the iliac crest and this approach is called the oblique subcostal TAP block.<sup>[3]</sup> During the classical TAP block, a 20 ml injection spreads to predominantly umbilical (T10) nerves and below, with some sparing of L1. Similar injection in subcostal region leads to block of higher nerves (T9–T11) with the spread able to be increased further by performing multiple injections across the line of the nerves.<sup>[4]</sup> Over the last few years, TAP blockade has been shown to improve patient comfort and decrease systemic opioid requirements postoperatively.<sup>[5-7]</sup> Chen and Phui stated that subcostal TAP block significantly reduced the

intra- and post-operative fentanyl usage in patients where laparoscopic procedure was converted to open cholecystectomy.<sup>[7]</sup> Other investigators, however, mentioned a major disadvantage of TAP block as the inability to block visceral pain.<sup>[8,9]</sup> In our study, patients only complained of mild upper abdominal pain with 17% having VAS score three or more and most of them were devoid of any major side-effect of systemic opioids. Patients with VAS score four and above even after fentanyl and paracetamol infusion, which was taken as regression of block, were treated with pethidine. Bupivacaine and lignocaine adrenaline mixture was chosen as consensus local anaesthetic to maximize the potency and duration with the dose well below toxic level after absorption.<sup>[10]</sup> Placement of a catheter instead and continuous infusion may be the future prospect.

## CONCLUSION

The profound analgesic coverage of oblique subcostal TAP block within first 24 post-operative hours shows its effectiveness as post-operative analgesic measure for upper abdominal surgery. However, more extensive studies on the intra- and post-operative analgesic efficacy are required to justify its routine application.

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### Conflicts of interest

There are no conflicts of interest.

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