



**COMPARISON OF POSTOPERATIVE ANALGESIC EFFECTS OF ROPIVACAINE AND ROPIVACAINE COMBINED WITH BUTORPHANOL USING ULTRASOUND GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCK AFTER LAPAROSCOPIC CHOLECYSTECTOMY.**

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**ABSTRACT**

**Background:** Recently, tremendous interest has evolved over the use of ultrasound guided transversus abdominis plane (TAP) as a multimodal analgesia strategy to control postoperative pain in various abdominal surgeries. We evaluated the analgesic efficacy of butorphanol as an adjunct to ropivacaine in ultrasound guided TAP block after laparoscopic cholecystectomy.

**Methods:** Fifty patients undergoing laparoscopic cholecystectomy under general anesthesia were randomized into two groups. Group R (n = 25) and group R+B (n = 25). Intraoperatively, all patients received standard analgesia with paracetamol and ketorolac. At the end of surgery, bilateral ultrasound guided TAP block was given using 20 ml of 0.2% ropivacaine or 19.5 ml of 0.2% ropivacaine and 0.5 ml of butorphanol (0.5 mg). Postoperatively, patients were assessed by a blinded investigator for visual analogue score (VAS) at regular interval and the time for rescue analgesia. SPSS (version 25.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism version 5 software was used. Demographic data were analysed using Student t-test or Fisher test and other parameters using paired t-test.

**Results:** The time to rescue analgesia administration was significantly prolonged in TAP block with ropivacaine (mean - 17.36 h) compared to ropivacaine and butorphanol (mean - 11.12 h) with  $P = 0.0036$ . Postoperatively, VAS was lower in TAP block with ropivacaine for the first 8-12 h compared to TAP block with ropivacaine and butorphanol.

**Conclusions:** Butorphanol as adjunct to ropivacaine in ultrasound guided TAP block does not prolong the postoperative analgesia in laparoscopic cholecystectomy.

**KEYWORDS :** Ultrasound guided transversus abdominis; Laparoscopic cholecystectomy; Butorphanol; Ropivacaine.

**INTRODUCTION:**

Laparoscopic cholecystectomy is a widely performed surgery with considerable post operative pain, mostly managed using multimodal analgesic strategies. Multimodal strategy is preferred due to enhance postoperative pain relief and decrease side effects of various analgesics. [1, 2]

Transversus abdominis plane (TAP) block is a part of a multimodal strategy where, the ultrasound guidance (USG) is used to inject local anaesthetic into the neurovascular plane of the abdominal wall and block the nerves from T6 to L1. [3, 4] We hypothesised that butorphanol as an adjunct to ropivacaine in TAP block would increase the quality and duration of postoperative analgesia.

**MATERIALS AND METHODS:**

After obtaining the approval of Institute ethic committee. A written informed consent was taken and fifty patients in the age group between 18 to 65 years, belonging to American Society of Anesthesiologist physical status classification I and II, scheduled for elective laparoscopic cholecystectomy and who understand visual analogue score (VAS) were included in this prospective, randomized, double-blind, controlled clinical trial which was conducted over a period of one year.

Patients excluded from the study were those who refuse to give written informed consent, local anesthetic sensitivity, coagulopathy, infection

at the site of needle entry and laparoscopic procedure that were converted to open surgery.

All selected patients were randomized using computer generated random number table, concealed in opaque envelop. Patients were randomly allocated into two groups. Group R (n = 25) received USG guided Tap block with 20 ml of 0.2% ropivacaine on either side. Group R+B (n = 25) received USG guided TAP block with 19.5 ml of 0.2% ropivacaine and 0.5 ml of butorphanol (0.5 mg) on either side. All patients received general anesthesia with injection fentanyl 2 mcg/kg intravenously (IV), injection propofol 2 mg/kg IV and injection vecuronium 0.1 mg IV. Anesthesia was maintained using oxygen, nitrous oxide and isoflurane 1-2%. Intraoperatively all patients received injection paracetamol 1 g IV and injection ketorolac 30 mg in intravenous fluid.

After the skin closure and patient in supine position, bilateral USG guided TAP block was administered using ultrasonography machine "ESAOTE MYLAB ONE Europe bv, mod 8100". The linear array ultrasound probe (7-12 MHz) was placed in a transverse plane between the lower costal margin and the iliac crest in the midaxillary line (posterior approach). Drug was injected using 21 gauge spinal needle with extension tubing, resulting in non-echo surface in the plane between internal oblique and transversus abdominis muscles. Patients were then observed in the postoperative recovery room.

Postoperatively, pain severity was assessed using VAS by an

investigator blinded to the allotment at 30 min, One h, one h 30 min, 2 h, 2 h 30min, 3, 5, 8, 12 and 24 h. VAS zero indicating no pain and VAS ten indicating the worst possible pain. Rescue analgesia was given when the VAS was more than 4 and on demand by the patients in the form of IV tramadol 2 mg/kg.

Since, not many studies have been conducted with a similar population. Therefore, the following assumption was used for sample size calculation. The standard values for alpha at 0.05 and beta at 0.2 with mean difference of 20, standard deviation of 18.5 was used. The sample size of 25 for each group was calculated.

The statistical analysis was done using SPSS (version 25.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5. Data was summarized as mean and standard deviation for numerical variables, count and percentages for categorical variables. Normally distributed continuous data were analysed using Student t-test or Fisher test as applicable. The comparison of VAS, sedation score and time to rescue analgesia administration between the two groups was done using paired t-test. Confidence interval was 85% and  $P \leq 0.05$  was considered for statistically significant.

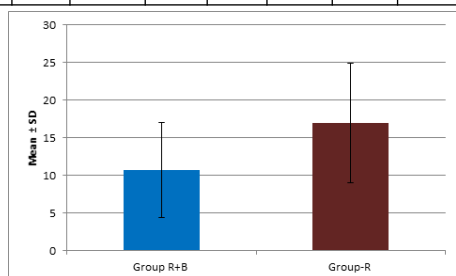
**RESULTS:**

The demographic data in respect to age and weight were comparable between the two groups. Heart rate and blood pressure were comparable between the two groups.

The time to first rescue analgesia administration was significantly prolonged in Group R (mean - 17.36 h) compared to Group R+B (mean - 11.12 h) with  $P = 0.0036$  [Table 1, Fig. 1].

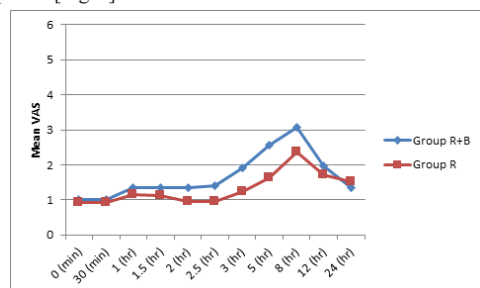
**Table 1 Distribution of mean Time for first rescue analgesia in hours**

Time for first rescue analgesia Hours	Number	Mean	SD	Minimum	Maximum	Median	p-value
Group R+B	25	10.7200	6.3082	1.0000	24.0000	8.0000	0.0036
Group R	25	16.9600	7.9973	6.0000	24.0000	24.0000	



**Fig. 1 Distribution of mean Time for rescue analgesia in Hours**

VAS was recorded immediately after the TAP block, then at 30 min, One h, one h 30 min, 2 h, 2 h 30min, 3, 5, 8, 12 and 24 h. Post-operatively VAS was lower in Group R for the first 8-12 h compared to Group R+B [Fig. 2].



**Fig. 2 Distribution of mean VAS at different time interval**

Distribution of Modified Ramsay Sedation Scale was higher in Group R+B compared to Group R but it was not statistically significant ( $p = 0.0912$ ).

**DISCUSSION:**

Our study showed that butorphanol as an adjunct to ropivacaine in TAP block does not increase the duration of postoperative analgesia after

laparoscopic cholecystectomy. The result of our study also showed that TAP block with ropivacaine alone produced longer postoperative analgesia and delayed the time for rescue analgesia.

Rafi first described TAP block in 2001. [5] A regional technique that provides analgesia to the parietal peritoneum, muscles, skin and anterior abdominal wall. [6] Ultrasound guided TAP block was described in 2007 by Hebbard et al. [7] TAP was identified between the internal oblique and transverses abdominis when the ultrasound probe lie across the midaxillary line just superior to the iliac crest and over the triangle of petit. A hypochoic layer is visualized as the local anesthetic is injected. This approach is referred as posterior approach and was used in our study.

TAP block is a part of multimodal analgesia for a wide variety of abdominal procedures. [8, 9, 10, 11, 12, 13, 14, 15, 16] Most of these studies highlight the combination of reduced postoperative opioid requirement and lower pain score. Thus, USG guided TAP block may have an important role in multimodal therapy laparoscopic cholecystectomy. The results of our study also showed a decrease in VAS postoperatively in both the groups and postoperative analgesia was more prolonged in patients who received TAP block with ropivacaine alone.

The effect of TAP block can last up to 48 h postoperatively due to the slow clearance of the local anesthetic from the neurovascular plane of the abdominal wall where few blood vessels are located. Thus, the risk of local anesthetic toxicity can be reduced due to the few blood vessels located in the neurovascular plane as compared to other peripheral nerve block. [17] Other complications associated with TAP block are liver laceration in right TAP block, spleen and kidney may be injured in left TAP block and femoral nerve block. [18, 19] However, in our study we used the USG guided TAP block which gave a real-time picture and avoided the complications which are more common with the blind approach.

TAP block can be best achieved with long acting anesthetics like ropivacaine or bupivacaine with an adjunct such as opioids, dexamethasone, alpha - 2 agonist. [20] Various adjuncts such as midazolam, magnesium sulphate, dexamethasone, tramadol have been used with local anaesthetics in TAP block and have shown to reduce the 24 h analgesic consumption, prolong the duration of postoperative analgesia, reduced postoperative pain score. [21, 22] A study have showed that butorphanol can be used safely and effectively for postoperative analgesia.[23]

A study done using dexamethasone with ropivacaine in TAP block could not show a statistically significant prolongation of analgesia may be due to the combination of ropivacaine which has a PH of 4 to 6 with an alkaline drug like steroid. [24] In our study also, butorphanol as an adjunct to ropivacaine in TAP block did not prolong postoperative analgesia though both the drugs have similar PH.

A study done using butorphanol in brachial plexus block showed that it hastens the onset and prolongs the duration of sensorimotor blockade and analgesia but is associated with a higher incidence of sedation which requires intense monitoring. [25] In our study, sedation scale was higher in Group R+B compared to Group R but it was not statistically significant.

Thus, butorphanol as an adjunct to 0.2% ropivacaine in USG guided TAP block does not prolong the postoperative analgesia in laparoscopic cholecystectomy.

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