

## Assessment of Ultrasound-Guided Transversus Abdominis Plane Block with Bupivacaine and Ropivacaine as Adjuncts for Postoperative Analgesia in Laparoscopic Cholecystectomies

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### Abstract:

**Aim:** To assess ultrasound-guided transversus abdominis plane block with bupivacaine and ropivacaine as adjuncts for postoperative analgesia in laparoscopic cholecystectomies.

**Methodology:** Fifty American Society of Anesthesiologists Physical Status I/II patients of either sex, aged 18–65 years, scheduled to undergo 4-port laparoscopic cholecystectomy of both genders were divided into 2 groups of 25 each. Group I underwent ultrasound-guided TAP block with 0.25% bupivacaine (plain) and group II underwent ultrasound-guided TAP block with 0.375% ropivacaine (plain). All patients were assessed for post-operative pain and rescue analgesic consumption at 10 min, 30 min, 1 hour, 4 hours, 8 hours, 12 hours and 24 hours time points.

**Results:** Group I had 15 males and 10 females and group II had 13 males and 12 females. The mean weight in group I was 63.2 Kgs and in group II was 62.8 Kgs. The mean height was 157.4 cms in group I and 159.3 cms in group II. Duration of surgery was 72.4 minutes in group I and 75.2 minutes in group II. The difference was non-significant ( $P > 0.05$ ). The mean pain score at 10 minutes in both groups was 0.0. At 30 minutes was 1.5 in group I and 0.0 in group II. At 1 hour was 1.9 in group I and 0.0 in group II. At 4 hours was 2.3 in group I and 2.4 in group II. At 8 hours was 2.1 in group I and 2.2 in group II. At 12 hours was 1.5 in group I and 2.0 in group II. At 24 hours was 1.1 in group I and 1 in group II. The difference was significant ( $P < 0.05$ ).

**Conclusion:** The ultrasound-guided deposition of ropivacaine 0.375% in the TAP provided superior analgesia in the early post-operative period in comparison to bupivacaine 0.25% in patients undergoing laparoscopic cholecystectomy.

**Keywords:** Bupivacaine, Ropivacaine, Laparoscopic Cholecystectomy.

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### Introduction

Laparoscopic cholecystectomy is a minimally invasive surgical procedure used to remove the gallbladder, which is located

in the upper right side of the abdomen. This procedure is typically used to treat gallstones or other conditions that affect the gallbladder.[1] During a laparoscopic

cholecystectomy, the surgeon makes small incisions in the abdomen and inserts a tiny camera called a laparoscope. The camera allows the surgeon to view the inside of the abdomen on a monitor while using specialized instruments to remove the gallbladder through the incisions.[2]

Compared to traditional open surgery, laparoscopic cholecystectomy offers several benefits, including less pain, a shorter hospital stay, and a quicker recovery time.[3] It is also associated with fewer complications and a lower risk of infection. Laparoscopic cholecystectomy is considered a safe and effective procedure for most patients who require gallbladder removal. However, as with any surgical procedure, there are risks and potential complications that should be discussed with a qualified healthcare professional.[4]

Numerous modalities have been used to alleviate pain after laparoscopic cholecystectomy, which include non-steroidal anti-inflammatory drugs (parecoxib/valdecoxib, ketoprofen, paracetamol), opioids (intravenous [IV] patient-controlled analgesia), local anaesthetic (LA) infiltration (before and/or after pneumoperitoneum), thoracic epidural block and multi-modal analgesia.[5,6] Transversus abdominis plane (TAP) block inhibits abdominal neural afferents by introducing LA into the neurofascial plane between the internal oblique and transversus abdominis muscles. With the

widespread availability of ultrasound guidance for more accurate localisation of TAP, the TAP block is now established as an important technique for reduction of post-operative pain following abdominal surgery.[7] The present study was conducted to ultrasound-guided transversus abdominis plane block with bupivacaine and ropivacaine as adjuncts for postoperative analgesia in laparoscopic cholecystectomies.

### Methodology

A total of fifty American Society of Anesthesiologists Physical Status I/II patients of either sex, aged 18–65 years, scheduled to undergo 4-port laparoscopic cholecystectomy of both genders were selected for this prospective, observational study. All patients gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 25 each. Group I underwent ultrasound-guided TAP block with 0.25% bupivacaine (plain) and group II underwent ultrasound-guided TAP block with 0.375% ropivacaine (plain). All patients were assessed for post-operative pain and rescue analgesic consumption at 10 min, 30 min, 1 hour, 4 hours, 8 hours, 12 hours and 24 hours time points. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

### Result

**Table 1: Distribution of patients**

Groups	Group I	Group II
Agent	0.25% bupivacaine	0.375% ropivacaine
M:F	15:10	13:12

Group I had 15 males and 10 females and group II had 13 males and 12 females (Table I).

**Table 2: Comparison of parameters**

Parameters	Group I	Group II	P value
Weight (Kg)	63.2	62.8	0.91
Height (cm)	157.4	159.3	0.84
Duration of surgery (mins)	72.4	75.2	0.95

The mean weight in group I was 63.2 Kgs and in group II was 62.8 Kgs. The mean height was 157.4 cms in group I and 159.3 cms in group II. Duration of surgery was 72.4 minutes in group I and 75.2 minutes in group II. The difference was non- significant ( $P > 0.05$ ) (Table II)

**Table 3: Comparison of post-operative pain scores**

Time	Group I	Group II	P value
10 mins	0.0	0.0	0
30 mins	1.5	0.0	0.01
1 hour	1.9	0.0	0.01
4 hours	2.3	2.4	0.94
8 hours	2.1	2.2	0.97
12 hours	1.5	2.0	0.05
24 hours	1.1	1	1

The mean pain score at 10 minutes in both groups was 0.0. At 30 minutes was 1.5 in group I and 0.0 in group II. At 1 hour was 1.9 in group I and 0.0 in group II. At 4 hours was 2.3 in group I and 2.4 in group II. At 8 hours was 2.1 in group I and 2.2 in group II. At 12 hours was 1.5 in group I and 2.0 in group II. At 24 hours was 1.1 in group I and 1 in group II. The difference was significant ( $P < 0.05$ ) (Table III).

### Discussion

Bupivacaine and ropivacaine are both local anesthetic medications that can be used as adjuncts for postoperative analgesia in laparoscopic cholecystectomies.[8] Local anesthetics can be administered through several routes, including epidural, intrathecal, and wound infiltration. When used as wound infiltration, bupivacaine and ropivacaine can provide effective pain relief after laparoscopic cholecystectomy by blocking the transmission of pain signals from the surgical site to the brain.[9]

Studies have shown that the use of bupivacaine and ropivacaine as adjuncts for postoperative analgesia in laparoscopic cholecystectomies can reduce the need for opioids and other pain medications, as well as decrease postoperative pain scores and improve patient satisfaction with pain management.[10] However, the use of local anesthetics for postoperative analgesia can also have potential side effects, such as

local anesthetic toxicity, allergic reactions, and nerve damage.[11] Therefore, the use of bupivacaine and ropivacaine as adjuncts for postoperative analgesia in laparoscopic cholecystectomies should be carefully considered and monitored by a qualified healthcare professional.[12,13] The present study was conducted to ultrasound-guided transversus abdominis plane block with bupivacaine and ropivacaine as adjuncts for postoperative analgesia in laparoscopic cholecystectomies.

Our study showed that Group I had 15 males and 10 females and group II had 13 males and 12 females. Sinha et al[14] evaluated the relative efficacy of bupivacaine versus ropivacaine for post-operative analgesia using ultrasound-guided TAP block in laparoscopic cholecystectomies. Sixty adults undergoing elective laparoscopic cholecystectomy were randomised to receive ultrasound-guided TAP block at the end of the surgical procedure with either 0.25% bupivacaine (Group I, n = 30) or 0.375% ropivacaine (Group II, n = 30). All patients were assessed for post-operative pain and rescue analgesic consumption at 10 min, 30 min, 1 h, 4 h, 8 h, 12 h and 24 h time points. Patients receiving ultrasound-guided TAP block with ropivacaine (Group II) had significantly lower pain scores when compared to patients who received the block with bupivacaine (Group I) at 10 min,

30 min and 1 h. However, both the drugs were equivalent for post-operative analgesia and 24 h cumulative rescue analgesic requirement (median [interquartile range]) (75.00 [75.00–75.00] in Group I vs. 75.00 [75.00–93.75] in Group II,  $P = 0.366$ ).

The mean weight in group I was 63.2 Kgs and in group II was 62.8 Kgs. The mean height was 157.4 cms in group I and 159.3 cms in group II. Duration of surgery was 72.4 minutes in group I and 75.2 minutes in group II. Ra et al[15] reported reduced post-operative pain scores and rescue analgesic requirement in laparoscopic cholecystectomy patients who received TAP block with varying concentration of levobupivacaine (0.25–0.5%). Baeriswyl et al[16] conducted a study on TAP block used for various abdominal surgeries has also reported statistically significant reduction in post-operative opioid consumption at 6 h and 24 h, respectively which is independent of the timing of injection or block approach adopted.

We observed that the mean pain score at 10 minutes in both groups was 0.0. At 30 minutes was 1.5 in group I and 0.0 in group II. At 1 hour was 1.9 in group I and 0.0 in group II. At 4 hours was 2.3 in group I and 2.4 in group II. At 8 hours was 2.1 in group I and 2.2 in group II. At 12 hours was 1.5 in group I and 2.0 in group II. At 24 hours was 1.1 in group I and 1 in group II. Carney et al[17] in their clinical study done in non-laparoscopic gynaecological surgeries, 0.375% ropivacaine was used for TAP block and the reported pain scores were lower when compared for the patients who did not receive TAP block; higher VAS scores were observed when 0.75% of ropivacaine was used in TAP block, attributed to different pain profile in the 'open' large incision used for the surgery.

### Conclusion

Authors found that the ultrasound-guided deposition of ropivacaine 0.375% in the TAP provided superior analgesia in the

early post-operative period in comparison to bupivacaine 0.25% in patients undergoing laparoscopic cholecystectomy.

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