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RESEARCH ARTICLE
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EFFICACY OF ULTRASOUND-GUIDED OBLIQUE SUBCOSTAL TRANSVERSUS ABDOMINIS PLANE BLOCK (OSTAP BLOCK) WITH ROPIVACAINE FOR POSTOPERATIVE ANALGESIA IN LAPAROSCOPIC CHOLECYSTECTOMY – A PROSPECTIVE OBSERVATIONAL STUDY.

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Abstract:
Background: A significant proportion of patients who undergo surgical procedures experience acute post operative pain, making effective postoperative pain control an essential component of the job of perioperative anesthesiologist.
Aim: To assess the effectiveness of ultrasound-guided OSTAP block using ropivacaine for postoperative analgesia within first 24 hours, using VAS scoring, in patients undergoing laparoscopic cholecystectomy.
Methods: A total of eighty patients of ASA physical status I-II of both sexes, aged between 18 to 70 years, scheduled for laparoscopic cholecystectomy were observed in this study for evaluating the efficacy of post operative analgesia after ultrasound-guided OSTAP using 20 ml of 0.2 % ropivacaine injection bilaterally.
Results: Visual analogue scale at different time intervals were statistically significantly lower at all times in Group A (Block group) than Group B (conventional analgesia group) withp-value <0.05. The overall VAS in 24 h was also significantly lower in Group A (2.4 ± 1.3) than Group B (4.8± 3.4) with a p-value of <0.05. Mean duration of first request for analgesia was 7.25±1.20 hours in group A, and 3- 4.05±80 hours in group B. The statistical difference was significant among the study groups (p value0.003). With regard to the post operative adverse effects observed among the two study groups,when compared statistically, the results were found not significant with a p value of >0.05.

Conclusion: As a promising novel post-operative pain treatment procedure, OSTAP block is cost effective and one of the safest, easiest and the most effective supplemental techniques as part of analgesic regimen. It improves pain scores in laparoscopic cholecystectomy involving the anterior abdominal wall.

Keywords: Laparoscopic cholecystectomy, Postoperative pain, VAS, OSTAP block, General anesthesia

Introduction:

Laparoscopic cholecystectomy (LC) is the gold standard for the treatment of symptomatic gallbladder diseases such as cholecystitis and cholelithiasis.[1,2] Despite the minimally invasive nature of this procedure, patients experience a considerable amount of pain in the first 24 h postoperatively. [3,4] Proper pain control is essential for optimizing clinical outcomes and earlier ambulation after surgery. Traditional pain management with opioids increases the incidence of side effects such as excessive sedation and postoperative nausea and vomiting (PONV). Multimodal analgesia strategies with different classes of analgesics or local anesthetics may enhance pain relief and reduce side effects after surgery [5] Transversus abdominis plane block (TAP Block) has become a popular component of postoperative analgesia after abdominal interventions. First described by Rafi et al. [6], this technique proved to be efficient in reducing perioperative opioid consumption in lower abdominal surgeries. [7,8] Hebbard et al. [9] described the achievement of this peripheral block by an ultrasound guided subcostal oblique approach, which allowed efficient analgesia in both the upper and lower abdominal surgeries, and a lower rate of complications due to the direct ultrasound visualization. Oblique Subcostal TransversusAbdominis Plane block (OSTAP block) is efficient in surgeries such as gastrectomy, laparoscopic bariatric procedures, liver transplant, open hepato-biliary surgeries, appendicectomy or renal surgery. [10-13] Only a few studies have been published regarding the OSTAP block approach in laparoscopic cholecystectomy, being heterogeneous concerning the procedure or the postoperative analgesic regimen. [14,15]

The use of Ultrasound significantly enhances the execution of the OSTAP block, removing the need to detect subjective 'pops' (indicating the loss of resistance felt as the needle passes through the external oblique fascia and internal oblique muscle), required by the traditional landmark technique, which is often subtle and imprecise. Using ultrasound, the muscle layers of the anterolateral abdominal wall are easily identified and accurate needle placement and deposition of local anesthetic can be facilitated by using 'real time' imaging. [16] The success rate and safety of OSTAP block may be improved by the use of ultrasound.[17]

The OSTAP block provides effective analgesia after abdominal operations and use of ultrasound guidance for TAP block facilitates real-time imaging of needle placement and drug deposition at the desired locus.

Methods:

This prospective observational study was conducted in the department of anesthesiology, Government Sub District Hospital, Magam, Budgam, J&K, India, over a period of 18 months. A total of eighty patients of ASA physical status I-II of both sexes, aged between 18 to 70 years, scheduled for laparoscopic cholecystectomy were observed in this study for evaluating the efficacy of post operative analgesia after USG guided OSTAP using 20 ml of 0.2 % ropivacaine injection bilaterally. The patients were divided into two groups with 40 patients in each group. Patients who received 20 ml of 0.2% ropivacaine injection bilaterally and conventional analgesia were labeled as Group A (with block n=40): and who received only conventional analgesia were labeled as Group B (without block n=40). Patients who were allergic to local anesthetic, patients with acute cholecystitis, patients with severe cardiac, pulmonary, and neurological diseases, those in whom procedure had to be converted to open cholecystectomy were excluded from the study. After getting

approval from Institutional Ethical Committee, written informed consent was obtained from all the patients before surgery.

PRE-ANESTHETIC PREPARATION & METHOD:

Preoperatively, patients were informed regarding the Visual Analog Scale (VAS) (0 = no pain and 10 = the strongest pain imaginable) and how to quantify the pain intensity between these two values.

All patients received a standard general anaesthesia regimen that included premedication with intravenous injection of pantoperazole 40mg 30 minutes before surgery, tramadol 1.5mg/kg, propofol2 mg/kg, atracurium 0.5 mg/kg. Maintenance of anaesthesia was achieved with volatile isoflurane 1% MAC in oxygen and N_2O (50:50). Mechanical ventilation was achieved in a controlled regimen maintaining EtCO2 between 30-40 mmHg, and SpO2 between 96-100%.

Standard monitoring included electrocardiography (ECG), noninvasive blood pressure (NIBP), pulse oximetry (SpO2), capnography, temperature measurement. The transversus abdominis plane block was achieved by an ultrasound-guided subcostal oblique approach after completion of surgery just before extubation. To achieve the block, an ultrasound (Mindray DC-70 Exp) with a high-frequency linear probe (6-10 MHz) was used. After skin preparation and isolation, the transducer was placed 2 cm subxiphoidand then moved along the subcostal edge to identify the rectus abdominis and the transversus abdominis muscles. Once these structures were identified, a 24 G spinal needle was introduced in-plane 2-3 cm lateral to the transducer, under direct ultrasound visualization, and 1-2 ml of normal saline were injected between the rectus abdominis muscle and the transversus abdominis muscle. After confirming the correct placement of the needle and the negative aspiration, the anesthetic substance was injected along the subcostal line in the transversus abdominis plane (20 ml 0.2% ropivacaine) and the dissection of the plane was observed as lens shaped or fish mouth appearance.

The block was performed bilaterally. All blocks were performed by the anaesthetist who knew the technique and the type of the solution injected, but was not involved in the postoperative data collection.

The surgery lasted for about 50 minutes on average and consisted of the introduction of the 4 ports supra umbilically (two 5 mm ports and two 10 mm ports). Intraoperative non-opioid analgesia was administered with acetaminophen 20 mg/kg, 15 minutes before the end of the surgery.

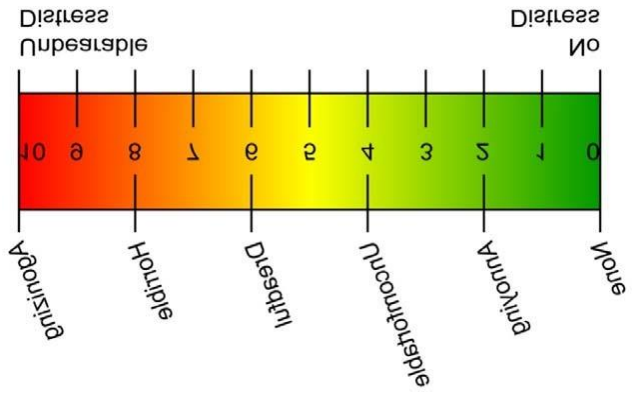
At the end of the surgery, the neuromuscular block was reversed with neostigmine 0.05 mg/kg and atropine 0.02 mg/kg or glycopyrolate 0.01mg/kg. Extubation was performed with the patient awake with good breathing efforts and muscle tone.

POST-OPERATIVE ASSESSMENT:

Immediately postoperatively, patients were transferred to the post anaesthetic care unit (PACU). The presence & severity of pain was assessed using VAS, evaluation intervals being at 0 h, 2 h, 4 h, 6 h, 12 h, and 24 h. Pain evaluation was performed at rest. Operationally a VAS is usually a horizontal line 100 mm in length, anchored by word descriptors at each end, as illustrated in Figure. The patient marks on the line the point that they feel represents their perception of their current state. The VAS score is determined by measuring in millimeters from the lefthand end of the line to the point that the patient marks.

Fig.: VAS Scale

In PACU first rescue analgesia tramadol 1mg/kg was administered when VAS score was more than 4 and time was noted, the pain was considered mild for VAS = 1-3, moderate for VAS = 4-6, or severe for VAS = 7- 9 and side effects like nausea, vomiting, shoulder pain and pruritus were noted. Pain evaluation and data recording were made by an anaesthesiologist.



Statistical analysis

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as Mean±SD and categorical variables were summarized as frequencies and percentages. Graphically the data was presented by bar and line diagrams. Student's independent t-test or Mann-Whitney U-test, whichever feasible, was employed for comparing continuous variables. Chi-square test or Fisher's exact test, whichever appropriate, was applied for comparing categorical variables. A P-value of less than 0.05 was considered statistically significant.

Results:

All the patients in treatment groups were compared with respect to age, weight, height, sex distribution, ASA class, and duration of surgery. The statistical analysis between two groups was not significant (p>0.05) [Table 1].

Table 1: Demographic profile among the study population

Variables	Group A	Group B	P Value
Age	**46.55±12.56**	**47.80±11.37**	**0.810**
Sex M/F	**15/25**	**17/23**	**0.756**
Weight	**61.50±8.87**	**62.50±9.88**	**0.721**
Height	**166.2±3.61**	**168.5±4.21**	**0.642**
ASA I/II	**22/18**	**23/17**	**0.562**
Duration of surgery	**49.13±10.13**	**48.91±9.98**	**0.467**

Visual analogue scale at different time intervals were statistically significantly lower at all times in Group A than Group B, p-value (p<0.05) [Table 2].

Table 2:Post operative VAS score (mean±SD) in studied groups

Time	Group	Mean	p-value
0	**A**	**2.1±1.2**	**0.0001**
	B	**4.9±1.6**	
2 hrs	**A**	**2.3±1.1**	**0.012**
	B	**4.2±2.2**	
4 hrs	**A**	**2.8 ±1.5**	**0.0056**
	B	**4.6 ±3.1**	
6 hrs	**A**	**3.0±1.9**	**0.0028**
	B	**4.7±2.6**	
12 hrs	**A**	**3.5 ±2.5**	**0.029**
	B	**5.1±2.9**	
24 hrs	**A**	**3.8±2.1**	**0.0061**
	B	**5.9±3.2**	

The time to first request for analgesia ranged from 4 to 12 hours with a mean of 7.25±1.20 hours in group A, and 3-4 hours with a mean of 4.05±80 hours in group B. the statistical difference was significant among the study groups (p value 0.003) [Fig 1].

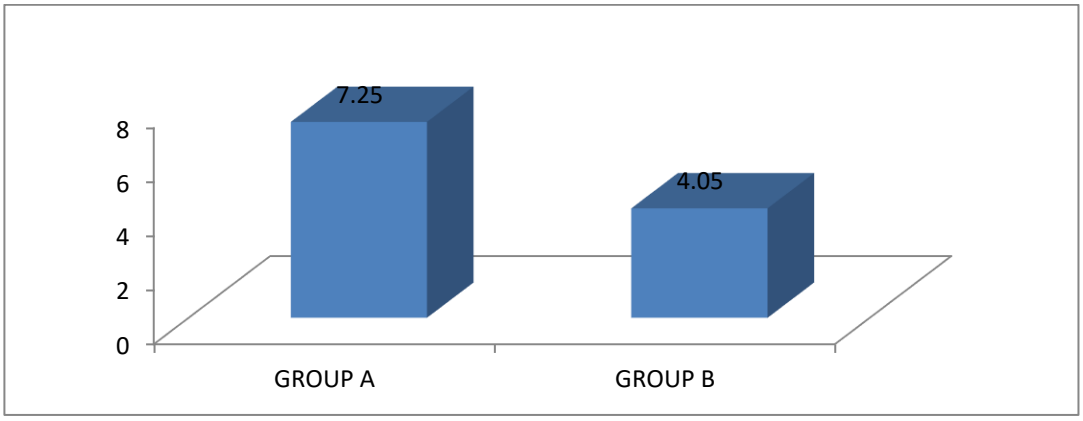


Fig 1

Total tramadol consumption was also lowest in Group A (80 ± 30.2 mg) than Group B (170 ± 70.5). The statically difference was significant with P value <0.05 [Fig2].

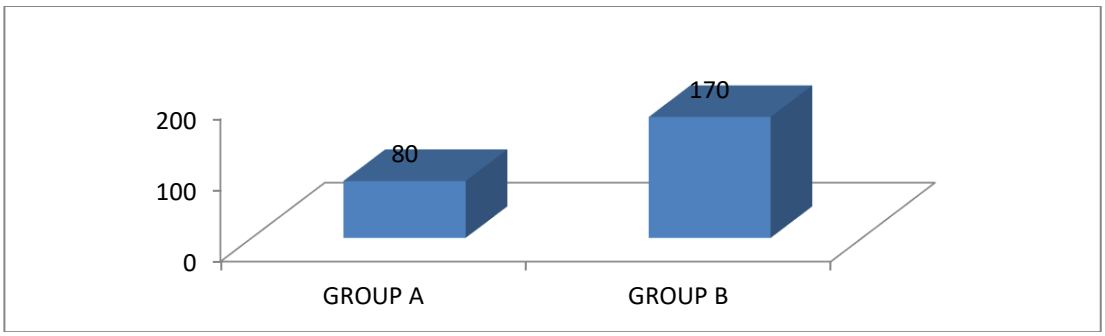


Fig 2

There were no statistically significant differences among the two study groups with respect to post operative adverse effectswith a p value of >0.05 [Fig 3].

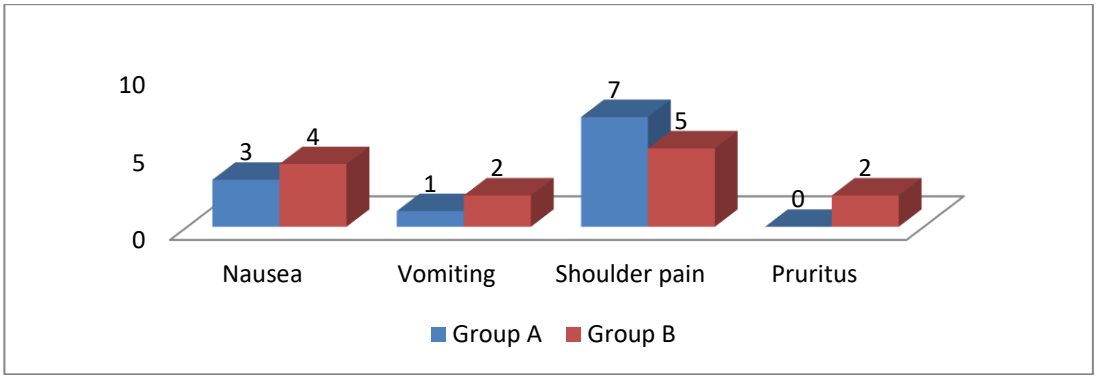


Fig 3

Discussion

Transverse Abdominis Plane Block is an effective means of providing pain relief. In Transverse abdominis plane there is lesser vascularity as described in the study done by Rozen WM et al, [18]"A new understanding of the innervation of the anterior abdominal wall", which account for longer duration of blockade. Apart from producing adequate analgesia it has various beneficial

effects. It reduces the intra operative and postoperative analgesics requirements in the form of narcotics and NSAIDS. It provides faster and comfortable wake up time, helps in early ambulation, less hospital stays, thereby alleviating most of the anxiety.
Although laparoscopic surgery is considered to be a minimally invasive procedure, acute surgical pain is common, especially in the first postoperative day. Traditionally, analgesic drugs were used for pain relief, however drug efficacy is not the only prerequisite for a positive acute surgical analgesic trial.In recent years, TAP blocks have demonstrated effectiveness in reducing postoperative pain when used as part of a multimodal analgesic regimen.[19]

With the increasing number of TAP block studies appearing in the literature, many meta-analyses have been published.Rita Champaneria et al. published a small meta-analysis of five RCTs, demonstrating short-term efficacy (within 24 hours) of transversus abdominis plane blocks for pain relief and reduced morphine consumption during hysterectomy, though this effect may not persist at 48 hours.[20] Two analysis indicated that TAP blocks improve pain relief after abdominal surgery,[21,22]. Mishriky BM et al. reported significantly improved postoperative analgesia in women undergoing Cesarean delivery who received TAP block for postoperative analgesia. [23] However, there has been no systematic review evaluating the efficacy of the TAP block undergoing laparoscopic surgery.

TAP block was introduced by Rafi in 2001.[6] He described it as block delivering local anaesthetics in the TAP using the anatomical landmarks (iliac crest) by first identifying the lumbar triangle of Petit. In 2007, Hebbard et al.introduced the USG-guided approach for TAP block. [9] The USG probe was placed transverse to the abdominal wall which made the three muscle layers distinctly visible after which the probe was moved to the mid-axillary line just above the iliac crest (i.e., over the triangle of Petit). The needle was then advanced medially by in-plane approach. This is referred to as the posterior approach.

TAP block has been used for various abdominal procedures other than caesarean section such as large bowel resection, open/laparoscopic appendectomy, total abdominal hysterectomy, laparoscopic cholecystectomy, open prostatectomy, abdominoplasty with or without flank liposuction, inguinal hernia and iliac crest bone graft.[24-31] The TAP has poor vascularity, and hence the action is prolonged and not associated with any major complications. In the present study we used the USG-guided technique to avoid complication more common with the blind approach.[32] In addition, it gives a real-time picture and chances of failure are reduced.

In the present study using USG-guided TAP block with 0.2% Ropivacaine after laparoscopic cholecystectomy was associated with reduction in VAS score at 0,2,4,6,12 and 24 hours and overall average VAS score, which was significantly low in Group A (2.3 vs. 4.7 P = 0.001). In the present study, the time to first request for analgesia ranged from 4 to 12 hours with a mean of 7.25±1.20 hours in Group A, and 3-4 hours with a mean of 4.05±80 hours in Group B and the statistical differencewere significant among the study groups (p value 0.003).In the present study total tramadol consumption was also lowest in Group A (80 ± 30.2 mg) than Group B (170 ± 70.5). The statistical difference was significant with P value <0.05. Similarly, a study was conducted in 2008 using TAP block after caesarean delivery by the blind approach, with 1.5 mg/kg ropivacaine (to a maximal dose of 150 mg) or saline on each side. [33,34] The study confirmed the usefulness of TAP block as seen by the reduced VAS score and requirement for morphine (66 ± 26 mg vs. 18 ± 14 mg, P <0.001). Two similar studies of TAP block were conducted in ASA I and II patients undergoing elective caesarean section under spinal anaesthesia using 20 ml of 0.25% bupivacaine or levobupivacaine. The studies revealed that pain scores were lower and time of demand for first analgesia was significantly longer in study groups compared to control (no drug) groups. [35,36]

We did not find any significant difference in post operative side effects and we did not record any complications due to USG-guided OSTAP technique.

Conclusion:
Ultrasound guided OSTAP block with ropivacaine can significantly decrease the perioperative cumulative dosage of analgesics and improve analgesic effect without obvious side effects for the patients who undergolaparoscopic cholecystectomy with ultrasound guided OSTAP block.

Conflict of interest: Nil

Funding: Nil

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