

COMPARATIVE STUDY OF ULTRA SOUND GUIDED SUBCOSTAL TRANSVERSE ABDOMINIS PLANE BLOCK VERSUS PORTSITE INFILTRATION IN LAPAROSCOPIC CHOLECYSTECTOMIES FOR POSTOPERATIVE PAIN RELIEF

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Abstract

Background: Subcostal transverse abdominis plane (SCTAP) block where the local anaesthetics enhances the greater cranial spread of local anaesthetics so it should provide better analgesia than a plain TAP block. In the present study compares subcostal transversus abdominis (STA) block to traditional port-site infiltration of the local anaesthetic in reducing postoperative pain, opioid consumption, and time for recovery. **Material & Methods:** Sixty patients scheduled for elective laparoscopic cholecystectomy were randomly selected into two group STA group (subcostal TAP block with 20ml of 0.25% bupivacaine on each side using ultrasound guidance) Port site infiltration group (20ml of 0.25% bupivacaine as port site infiltration). VAS scores upto 8 hours postoperatively, need for rescue analgesia, time for requirement of first rescue analgesic and incidence of complications like nausea, vomiting and liver injury were recorded and compared between two groups **Results:** VAS score in two Groups S & P in all-time series was statistically significant upto 5 hours postoperatively (P value <0.01). There was no significant difference between the groups after 6 hours (P value =0.119). **Conclusion:** STA provides longer duration of postoperative analgesia, reduces postoperative opioid consumption when compared to port site infiltration of local anaesthetic with no complications.

INTRODUCTION

Laparoscopic cholecystectomy is a minimally invasive procedure which is increasingly performed in the daycare unit.^[1] As a part of multi-modal analgesia, various approaches are employed for achieving safe and effective postoperative analgesia. Transversus abdominis plane (TAP) block that delivers local anaesthetic into the transversus abdominis fascial plane has been shown to reduce perioperative opioid use in elective abdominal. A variant of the tap block is subcostal transverse abdominis plane (SCTAP) block where the local anaesthetics deposited between the transverse abdominis plane inferior and parallel to the costal margin providing adequate analgesia for supraumbilical surgeries because of its greater cranial spread (T6-T10).^[2,3,4] In the present study compares subcostal transversus abdominis (STA) block to traditional port-site infiltration of the local

anaesthetic in reducing postoperative pain, opioid consumption, and time for recovery.

Aim of The Study

To compare the efficacy of STA block provides superior postoperative analgesia and reduces analgesia requirement than port site infiltration following laparoscopic cholecystectomy.

Primary Objective

To compare analgesic efficacy of Subcostal transversus abdominis plane block with port site infiltration for postoperative pain relief.

Secondary Objectives

To assess the duration of analgesia as request for first analgesic medication after surgery, postoperative total rescue analgesic consumption and to look for Immediate post-op complication / haemodynamic stability.

MATERIALS AND METHODS

Study Design

A prospective, randomized control study

Randomization

Sixty patients were randomly selected based on computer generated random numbers and group allocation done by sealed envelope technique.

Study population

Sixty Patient under ASA PS- 1&2 who underwent elective Laparoscopic cholecystectomy in general surgery theatre at Government Stanley hospital was taken up for surgery.

GROUP S STA – EACH 20ml of 0.25% bupivacaine injected bilaterally using ultrasound guidance in sterile technique.

GROUP P PORT SITE-The 20ml of 0.25% bupivacaine injected in port site infiltration equally divided.

Primary outcome

To compare analgesic efficacy of Subcostal transversus abdominis plane block with port site infiltration for post-operative pain relief determined by first request of rescue analgesia by the patient

Secondary outcome

- To evaluate Immediate post-op complication and haemodynamic stability.

Patients posted for Emergency cholecystectomy, with increased airway resistance and decreased lung compliance were excluded from the study. Group allocation was done using sealed envelope technique

Methods

ASA PS 1 and 2 Patient scheduled for an elective laparoscopic Cholecystectomy in a prospective, randomized, controlled clinical trial. Baseline values were recorded. Peripheral I.V access was secured. The Patient were Premedicated and general anaesthesia induced with INJ. Fentanyl 2mcg/kg, INJ. Propofol 2mg/kg and endotracheal intubation done after INJ. Atracurium 0.5mg/kg Iv. Intraoperatively both groups received INJ. Paracetamol 1g intravenous infusion. The Patients were randomly allocated to undergo ultrasound guided bilateral STABLOCK with 20 ml of 0.25% bupivacaine one each side and Port site infiltration with 20 ml of 0.25% bupivacaine administered equally as per the number of ports by the surgeon before Extubation. In group S STA, Linear array ultrasound probe with 6-13 MHZ high frequency was used under sterile technique for right STA block, The USG probe was placed in the midline of abdomen 2 cm below the xiphisternum and moved right laterally along the subcostal margin to the anterior axillary line. The transverse abdominis muscle was identified lying beneath and extending laterally to rectus abdominal muscle. The 18g needle was then guided in-plane, to a point just inferior to right costal margin at 31-32 anterior axillary line such that the tip was between the rectus abdominis and transverse abdominis within the neurovascular facial plane following carefully aspiration 20 ml of 0.25%

bupivacaine was deposited within the plane. Bilaterally the same procedure was followed.

In group P the port site infiltration was performed by a surgeon. A total of four-port – supraumbilical, subxiphoid and two-port in the right costal area at the midclavicular and anterior auxiliary line were made the 20 ml of 0.25% bupivacaine was equally divided and injected. Presence and severity of pain were assessed using vas scores at 30min, 1,2,3,4,5,6,7,8 hours by an investigator blinded to Group allocation. Vitals BP, Heart rate, SPO2, was also recorded up to 8 hours in the immediate postoperative period after sta block and port site infiltration, inj. Tramadol 50 mg Iv was used as rescue analgesia whenever vas score was >3. Time for first rescue analgesia demand, and total dose of tramadol as rescue analgesia to the patient was noted.

RESULTS

In our study, we have evaluated the analgesic efficacy and opioid-sparing effect of subcostal transversus abdominis plane block in laparoscopic cholecystectomy for postoperative pain relief, the observation and result were analyzed. The collected data were analyzed with IBM.SPSS statistics software 23.0 Version.

To describe the data descriptive statistics frequency analysis, percentage analysis was used for categorical variables and the mean & S.D were used for continuous variables. To find the significant difference between the bivariate samples in Independent groups the Unpaired sample t-test and the Mann-Whitney U test was used. To find the significance in categorical data Chi-Square test was used. In all the above statistical tools the probability value .05 is considered as significant level.

Statistically no significant difference was found in between two groups with regards to age distribution (P-value=0.256>0.05).

In group S, 76.7% were females and in group P,66.7% were females. Results show that statistically no significant difference was found between two groups in gender distribution (P-value=0.390>0.05). Patients in group P were found to have higher systolic blood pressures when compared to patients in group S at first (P-value=0.003) and second (P-value=0.012) hour postoperatively. Statistically no significant difference was found between the two groups at other times. Comparison of Diastolic Blood pressure between two groups S&P which shows that no statistical significance difference was found between the groups in any of the time series, P-value > 0.05. [Table1]

The table shows the comparison of Heart rate between two groups S & P (Table 2) which shows that no statistical significance difference was found between the groups in any of the time series, P-value > 0.05. [Table 2]

Visual analog scale pain scores were found to be lower at 30min, 1 ,2, 3, 4, 5 hours postoperatively in

group S when compared to group P ($P < 0.05$) statistically no significant difference was found in VAS scores between two groups after 5 hours post operatively (Table 3)

Mean duration for first rescue analgesic requirement was 4 hours and 15 mins in group S and 1 hour and 9 min group P.

Result show that mean duration for first rescue analgesic requirement was longer in group S when

compared to Group P and was found to be statistically significant. ($P = 0.0005 < 0.01$). In group S, 22 patients (73.4%), and in group P, 29 Patients (96.7%) required rescue analgesia in first 8-hour postoperative period. 8 patients (26.6%) in group S did not require rescue analgesia, whereas only 1 patient (3.3%) in group P did not require rescue Analgesia which is statistically significant ($P = 0.023$).

Table 1: Comparison of Mean Arterial Pressure

	Groups	N	Mean	S.D	t-value	P-value
Baseline	Group S	30	92	12	1.449	0.153 #
	Group P	30	87	11		
15 Mins	Group S	30	92	7	0.204	0.839 #
	Group P	30	92	8		
30 Mins	Group S	30	90	7	0.108	0.914 #
	Group P	30	90	10		
1st hour	Group S	30	90	9	1.441	0.155 #
	Group P	30	93	11		
2nd hour	Group S	30	87	8	1.819	0.074 #
	Group P	30	91	8		
3rd hour	Group S	30	89	9	0.059	0.953 #
	Group P	30	89	8		
4th hour	Group S	30	87	10	1.044	0.301 #
	Group P	30	90	7		
5th hour	Group S	30	88	9	0.860	0.393 #
	Group P	30	90	9		
6th hour	Group S	30	89	8	0.098	0.922 #
	Group P	30	88	7		
7th hour	Group S	30	89	8	0.967	0.338 #
	Group P	30	92	16		
8th hour	Group S	30	89	8	0.757	0.452 #
	Group P	30	90	5		

No Significant at $P < 0.05$ level

Table 2: Comparison of Heart Rate

	Groups	N	Mean	S.D	t-value	P-value
Baseline MAP	Group S	30	97	8	0.283	0.778 #
	Group P	30	98	10		
15 Mins	Group S	30	100	15	0.126	0.900 #
	Group P	30	100	10		
30 Mins	Group S	30	94	6	0.927	0.358 #
	Group P	30	96	8		
1st hour	Group S	30	93	7	2.785	0.007 **
	Group P	30	98	7		
2nd hour	Group S	30	94	7	1.502	0.139 #
	Group P	30	97	8		
3rd hour	Group S	30	94	8	0.506	0.615 #
	Group P	30	95	10		
4th hour	Group S	30	94	7	2.099	0.040 #
	Group P	30	98	8		
5th hour	Group S	30	92	6	1.488	0.143 #
	Group P	30	95	10		
6th hour	Group S	30	93	6	1.593	0.117 #
	Group P	30	96	10		
7th hour	Group S	30	94	8	0.266	0.791 #
	Group P	30	94	7		
8th hour	Group S	30	94	8	1.079	0.285 #
	Group P	30	96	8		

No Significant at $P < 0.05$ level and ** Highly Significant at $P < 0.01$ level

Table 3: Comparison of Visual analog scale

	Groups	N	Mean	S.D	t-value	P-value
15 Mins	Group S	30	3	0.4	4.161	0.0005 **
	Group P	30	4	0.9		
30 Mins	Group S	30	3	0.4	2.564	0.010 **
	Group P	30	4	0.8		
1st hour	Group S	30	3	0.4	5.14	0.0005 **

hour	Group P	30	4	0.8		
2nd	Group S	30	3	0.6	3.477	0.001 **
hour	Group P	30	4	0.8		
3rd	Group S	30	3	0.7	2.956	0.003 **
hour	Group P	30	4	0.8		
4th	Group S	30	3	0.6	3.246	0.001 **
hour	Group P	30	4	0.6		
5th	Group S	30	3	0.6	3.59	0.0005 **
hour	Group P	30	4	1		
6th	Group S	30	3	0.6	1.822	0.068 #
hour	Group P	30	3	1		
7th	Group S	30	3	0.8	1.558	0.119 #
hour	Group P	30	4	1		
8th	Group S	30	3	0.8	2.598	0.009 **
hour	Group P	30	4	1		

No Significant at P < 0.05 level and ** Highly Significant at P < 0.01 level

Groups in any of the time series, P-value > 0.05 except the 1st hour of the time duration with P-value=0.007.

DISCUSSION

Truncal blocks are commonly used for postoperative pain management in various anterior and posterior abdominal surgeries. With the introduction of ultrasonogram in anesthetic practice, the truncal blocks have gained more popularity with the advantage of real view imaging and lesser failure and toxicity rates. Good postoperative analgesia is an important component of adequate perioperative care. Truncal nerve blocks are associated with improved perioperative outcomes, reduction in perioperative stress, improved patient satisfaction, coupled with reduction in opioid consumption, fewer adverse effects and lesser requirement of rescue analgesia following elective laparoscopic cholecystectomy.

We conducted a randomized, prospective study to compare the postoperative analgesic efficacy and opioid-sparing effect of subcostal TAP block with port site infiltration of local anaesthetic administered at the end of surgery prior to extubation in patients undergoing laparoscopic cholecystectomy under general anaesthesia.

We selected tramadol for rescue analgesia as several studies have used Inj. Tramadol 50-100mg. It can provide effective postoperative analgesia comparable to that obtained with morphine, pentazocine, and ketorolac.^[5]

Bilateral Subcostal TAP block has been demonstrated to provide excellent analgesia to the skin and musculature of the anterior abdominal wall in patients undergoing Laparoscopic Cholecystectomy. Patients in subcostal TAP block Group had no difficulty in breathing, coughed freely without limitation and showed better pain score when compared to the port site infiltration group. The reason for prolonged duration of analgesic effect after subcostal tap blockade may be due to relatively poor vascularity and slower drug clearance from transversus abdominis plane.

Demographic data like age and gender of the patients in two groups were compared and there was no statistically significant difference between two groups.

Post-Operative Vas Scores

In our study, VAS scores were significantly lower in Group S up to 5 hours postoperatively, when compared to Group P.

Indususeela et al,^[6] in 2018 administered 20 ml of 0.25% bupivacaine as bilateral subcostal TAP block and port site infiltration of 5 ml of 0.5% bupivacaine at each of the 4 ports and measured NRS pain scores at 1, 2, 3, 6, 12 and 24 hours postoperatively. It was demonstrated in their study that NRS pain scores were lower in TAP block group at all time frames except at 1 hour postoperatively when compared to port site infiltration group. But in our study, VAS scores were lower only upto 5 hours postoperatively in subcostal TAP block group.

Arghya Murkherjee et al in 2016,^[7] used 20ml of 50:50 mixture of bupivacaine 0.5% and lignocaine 2% with adrenaline for subcostal TAP block on each side. VAS scores were recorded at 1, 2, 6, 12, 18 and 24 hours postoperatively and it was concluded that 63 % of patients in TAP group had VAS scores of less than 3 upto 18 hours postoperatively and 17% of the patients in placebo group had VAS scores of less than 3 upto 12 hours postoperatively. Addition of adrenaline in the local anaesthetic mixture in above study might be the reason for prolongation of duration of analgesia upto 18 hours when compared to our study in which it was upto 5 hours.

S. Tolchard et al in 2012,^[8] in their study recorded VAS scores at 1,4 and 8 hours postoperatively and demonstrated that subcostal TAP block resulted in significant reduction in VAS scores upto 8 hours postoperatively, which concurred with the findings of our study. In the study by S. Tolchard, duration of effective postoperative analgesia was longer (8hours) when compared to our study (5 hours).

Time to First Rescue Analgesia

In our study, the mean time for requirement of first rescue analgesic was 4 hours and 15 mins in group S and 1 hour and 9 min in group P and the difference was found to be statistically significant (P=0.0005 < 0.01). Results of the study conducted by

Indususeela et al,^[6] in 2018 also showed that the mean time for requirement of first rescue analgesia was longer in TAP block group (510.3± 154.55mins)

when compared to port site infiltration group (290.7 ± 67.03 mins). But in our study, the mean time for requirement of first rescue analgesia STA group was only 4 hours 15 mins. Thus, there is a statistically significant difference between the two groups in the mean time for requirement of first rescue analgesic. Beena et al in 2013,^[9] observed in their study that the mean duration to first dose of rescue analgesic requirement was longer (547.13±266.96 min) in ultrasound guided transversus abdominis plane block when compared to the placebo group (49.17±24.95 min). Duration to first rescue analgesic was significantly longer when compared to our study. It may be probably due to use of higher concentration of local anaesthetic (0.375%) and larger volumes (25ml) on each side.

Rescue Analgesic Requirement

Result of our study showed that, 22 patients (73.4%) in group S, and 29 Patients (96.7%) in group P required rescue analgesia at 8 hours postoperatively. 8 patients (26.6%) in group S did not require rescue analgesia, whereas in group P only 1 patient (3.3%) did not require rescue analgesia and the difference was found to be statistically significant (P =0.023). Thus, patients requiring rescue analgesia was lower in TAP block group when compared to port site infiltration group and the difference was found to be statistically significant.

Beena et al in 2013,^[9] demonstrated that rescue analgesic (tramadol) requirement was lower in ultrasound guided transversus abdominis plane block group (103.8 ± 32mg) when compared to placebo group (235.8±47.5 mg) at 24 hours post operatively which correlates with the findings of our study.

Similar results were found in the study conducted by S. Tolchard et al,^[8] results of which showed that STA BLOCK provided nearly 50% reduction in the usage of rescue analgesia in the first 8 hours postoperatively. Our results also occurred with the study conducted by Induseela et al,^[6] which showed that patient who received subcostal TAP block had lower rescue analgesic requirement (48.69 +36.14mg) when compared to port site infiltration group (141.8+ 60.01 mg).

There were no reference studies which compared hemodynamic variables like HR and BP. In our study, Group P showed a statistically significant increase in heart rate and blood pressure at first hour post operatively when compared to Group S. The comparison of mean arterial pressure between two groups showed no significant difference (P- value >0.05) except during the 1st hour postoperatively (p-value =0.007).

Complications like peritoneal and visceral puncture related to subcostal tap block were not encountered in our study. Farooq M Carey M. in 2008,^[10] reported liver trauma with blunt regional anaesthesia needle while performing transverse abdominis plane block.

Familiarity with anatomy, safe monitoring and injection technique, knowledge of local anaesthetic pharmacology and toxicity would prevent the possibility of complications. The use of ultrasound to confirm the needle position is a promising approach to further reduce the risk of complications.

CONCLUSION

Subcostal TAP block under ultrasound guidance for laparoscopic cholecystectomy provides longer duration of postoperative analgesia, reduces postoperative opioid consumption when compared to port site infiltration of local anaesthetic. Subcostal TAP block is devoid of complications. It provides reliable and effective postoperative analgesia in patients undergoing laparoscopic cholecystectomy.

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