

## Efficacy of USG-Guided Bilateral Subcostal Transversus Abdominis Plane Block and Conventional Port Site Infiltration after Laparoscopic Cholecystectomy: A Prospective Randomised Controlled Study

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### Abstract

*Aim and objectives:* This prospective, randomised, single blinded controlled study evaluated and compared the efficacy of Bilateral subcostal USG- guided Transversus Abdominis muscle plane block to the Conventional Port site Infiltration in patients who undergo elective Lap- cholecystectomy in Rajiv Gandhi Government General hospital – Madras medical college. Sixty patients belonging to ASA1 and 2, between 18 to 60 years of either sex, satisfying inclusion criteria were randomised into two groups containing 30 patients each. Group 1- TAP block. Group 2 - Port site infiltration. At the end of surgery USG guided TAP block or port site infiltration were given, before extubation. The block was performed under ultrasound guidance. *Results:* Two groups were similar with respect to demography. Hemodynamics response was similar without any statistical difference between the two groups. Post operative VAS scoring was significantly low in the TAP block with less amount of rescue analgesic requirement. *Conclusion:* We conclude that bilateral USG guided sub costal Transversus abdominis plane block is a better and more efficient alternative method to conventional port site infiltration in Laparoscopic cholecystectomy to provide analgesia in the postoperative period.

**Keywords:** Lap- cholecystectomy; sub costal Transversus abdominis plane block; VAS Score; Post operative period.

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### Introduction

Abdominal field blocks have been described as early as 1993 [1]; TAP blocks were formally documented by Rafi in 2001 [2]. The TAP block was originally performed using a single-pop technique through the Triangle of Petit. A second pop is felt as

needle passes through the transversus abdominis muscle. The flank bulge sign confirms correct infiltration [3]; ultrasound has been advocated to decrease the injury to the abdominal organ. The ultrasound-guided technique has been described in detail using an abdominal and subcostal approach. The subcostal approach may have a better effect

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on higher incisions, but it does extend down to the pubis with occasional sparing of L1 in some patients [4].

Main purpose of this study is to evaluate and compare post operative analgesia after USG guided subcostal TAP block, and conventional port site infiltration in laparoscopic cholecystectomy.

### Aims and Objectives

#### Aims

The aim of my study is to assess and compare the efficacy of USG-guided bilateral Sub costal TAP block with conventional port Site infiltration after laparoscopic cholecystectomy.

#### Objectives

To compare subcostal transverses abdominis plane block with port site infiltration after laparoscopic cholecystectomy in respect to

1. Post operative analgesia using VAS score
2. Post operative rescue analgesia initiation time
3. Complications

### Materials and Methods

After getting the Approval of Institutional Ethics Commitee, informed consent from the patients, this study was done in 60 patients coming under American Society of Anaesthesiology- 1, and ASA- 2 of either male or female and aged between 18-60 yr, who undergo elective laparoscopic cholecystectomy surgery in Madras Medical College hospital. This a prospective, randomised (closed envelope method), single blinded, controlled study.

#### Inclusion Criteria

- Age: 18 – 60 years
- Weight: BMI < 30 Kg/m<sup>2</sup>
- ASA: I & II
- Surgery: Elective
- Mallampatti scores: I & II
- Who have given valid informed consent.

#### Exclusion Criteria

- Skin conditions precluding the block
- Patients posted for emergency surgery

- Patients with allergy to local anaesthetics
- Preoperative opioid dependence
- Lack of written informed consent
- Patients not satisfying inclusion criteria

#### Study design

All the patients in the study will be divided into two groups. Randomisation was done by closed envelope method.

Group 1-subcostal transverse abdominis block.

Group 2-port site infiltration.

Anaesthesia protocol

The patients will be given an inj. of midazolam i.v., injection glycopyrolate i.v. Induction was done with thiopentone sodium, it was titrated till the loss of eyelash reflex. ET tube was introduced after giving Atracurium as muscle relaxant. Anaesthesia had been maintained with isoflurane and N<sub>2</sub>O:O<sub>2</sub>.

Blood pressure, ECG, ET CO<sub>2</sub> and saturation were monitored. IV fluids like Normal Saline and RL, were infused as much as needed. Each patient was given antiemetic injection (ondansetron 4 mg i.v.).

Oblique subcostal TAP blocks were performed under aseptic precautions using PHILIPS HD7 Diagnostic<sup>®</sup> ultrasound machine with a linear 5–12 MHz ultrasound transducer. 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 0.2% Ropivacaine plain. The contralateral side block was performed near the xiphoid alone in a similar manner with 20 ml 0.2% Ropivacaine plain. When the surgery is finished, patient will be extubated after the reversal with neostigmine and glycopyrolate. Postoperatively, when they complained of pain (VAScore of 4 or more) they received inj. Tramadol 100 mg, as rescue analgesia and dose consumption of the same was calculated between two groups.

The following parameters were noted and compared. The Visual Analogue Scale was used to assess pain which has value between 0 and 10 (0 = no pain to 10 = worst pain). The VAS scores, had been noted post operatively, after extubation then at 1,2,3,4,5,6,7 and 8 hours. Baseline vital parameters like, systolic & diastolic BP, MAP, and heart rates were noted. The above mentioned vital readings

had been also recorded during particular time intervals intraoperatively, after extubation and for the period of 8 hr postoperatively. Initiation time of rescue analgesia in both the groups were also noted.

Adverse reactions like convulsion, drowsiness, respiratory depression, cardiac arrest, hypersensitivity and any other complications, were also noted every hour till eighth hour post operatively.

### Observation and Results

The sample size was determined by power analysis to detect a difference of 15 in VAS as the minimum desired difference between the groups, with alpha = 0.05, beta = 0.2 error. Taking reduction in VAS upto 30% as significant a sample size of

24 patients per group was arrived. To compensate for the drop out we had taken thirty patients in each groups as our sample size. This study was conducted in sixty patients of either male or female in the age group between 18 to 60 yr, coming under ASA class-1 and ASA class- 2, posted for elective Laparoscopic cholecystectomy under GA.

The patients involved in study were allocated into 2 groups.

Group 1-Patients in this group received USG guided bilateral subcostal TAP block, 20 ml 0.2% Ropivacaine plain bilaterally at the end of surgery before extubation.

Group 2-Patients in this group received conventional port site infiltration. 10-20 ml of 0.2% Ropivacaine, 4 ml of each port site, at the end of surgery before extubation.

Table 1:

	TAP Block	Port Site Infiltration	p value
Age	46.10 ± 8.38	45.03 ± 6.89	0.59
Sex	Male	14	>0.9999
	Female	16	
Weight	57.13 ± 5.15	57.23 ± 4.34	0.935457
Height	1.57 ± 0.05	1.54 ± 0.06	0.911121
BMI	23.16 ± 1.65	23.18 ± 1.30	0.942048
ASA	I	15	>0.9999
	II	15	

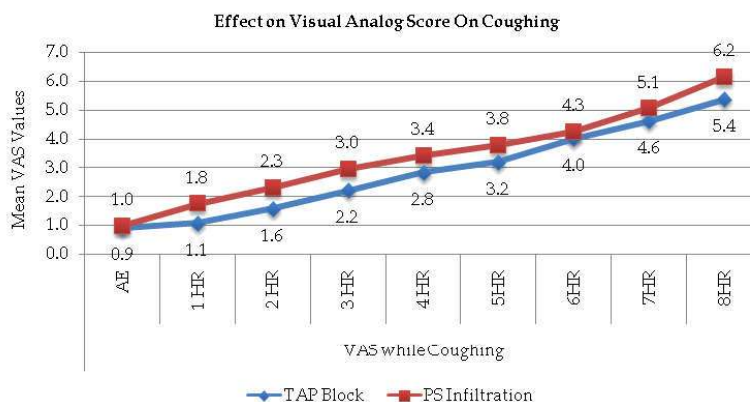


Fig. 1:

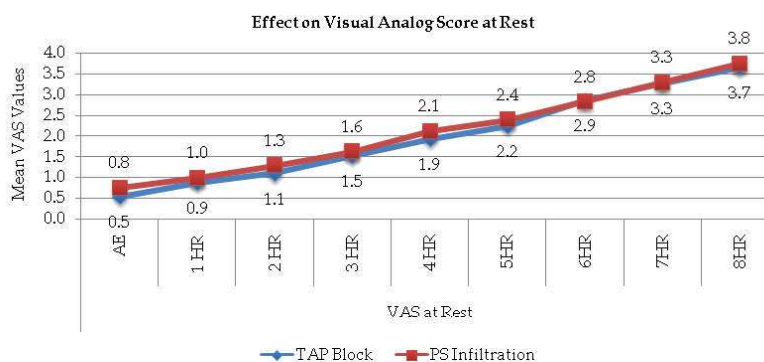


Fig. 1:

Table 2:

TAP Block	On Coughing								
	AE	1 HR	2 HR	3 HR	4 HR	5 HR	6 HR	7 HR	8 HR
N	30	30	30	30	30	30	30	26	14
Mean	0.90	1.07	1.57	2.20	2.83	3.20	4.00	4.62	5.36
SD	0.31	0.25	0.57	0.48	0.65	0.55	0.74	1.02	1.08
PS Infiltration	On Coughing								
	AE	1 HR	2 HR	3 HR	4 HR	5 HR	6 HR	7 HR	8 HR
N	30	30	30	30	30	30	30	26	12
Mean	1.00	1.77	2.33	2.97	3.43	3.80	4.27	5.08	6.17
SD	0.00	0.57	0.48	0.49	0.50	0.41	0.64	1.16	0.83
P Value Unpaired	0.083	0.000	0.000	0.000	0.000	0.000	0.014	0.01	0.041
t test	07	00	00	00	19	01	17	351	88

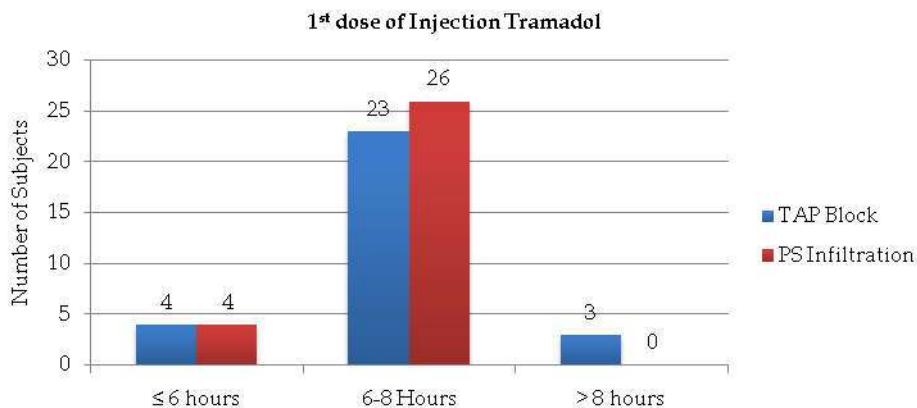


Fig. 3:

Table 3: 1<sup>st</sup> dose of Injection Tramadol

No of patients equiring tramadol	TAP Block	PS Infiltration
≤ 6 hours	2(0.66%)	12(40%)
6-8 Hours	6(2%)	22(73%)
> 8 hours	8(26%)	30(100%)
Total	30	30

1st dose of Injection Tramadol	TAP Block	PS Infiltration
N	30	30
Mean	7.50	7.23
SD	0.86	0.77
P Value Unpaired t test		0.02121

total analgesic requirement	TAP Block	PS Infiltration
N	30	30
Mean	150.5	240.4
SD	0.86	0.77
P Value Unpaired t test		0.0001

Complication	TAP Block Group	Port Site Infiltration Group	P value
Shivering	10(33%)	11(36%)	1.0000
Nausea	8(26%)	10(33%)	0.7787
Vomiting	3(1%)	4(1.3%)	1.0000
Toxicity	0	0	

## Statistical Methods

Descriptive statistics was done for all data and suitable statistical tests of comparison were done. These included the mean and standard deviation (SD) for quantitative variables, and category frequency counts for qualitative variables. Next, inferential statistical analysis was undertaken.

Continuous variables were analysed with the unpaired t-test and categorical variables were analysed with the Chi-Square Test with Yates correction. Alpha for significance for all inferences was set at  $p < 0.05$ . All tests of Hypotheses, wherever applicable, were two-tailed. The data was analysed using EpiInfo software (7.1.0.6 version; Center for disease control, USA) and Microsoft Excel 2010.  $p$  - value of less than 0.05 is taken as significant.

## Results

The demographic profiles of the two groups were matched and the two groups were comparable with respect to age, ASA, sex, weight, height and BMI. The mean Heart Rate at Baseline was 74.60 beats per minute in the TAP Block Group and 73.83 beats per minute in the Port Site Infiltration Group. The mean Heart Rate Intra Operatively varied from 79.20-84.60 beats per minute in the TAP Block Group and 73.37-87.00 beats per minute in the Port Site Infiltration Group. By conventional criteria the association between the techniques and Heart Rate (Baseline and Intra Operative) is considered to be not statistically significant since  $p > 0.05$ .

The Mean Arterial Pressure Intra Operatively varied from 89.33-104.63 mm Hg in the TAP Block Group and 86.33-102.43 mm Hg in the Port Site Infiltration Group. The Mean Arterial Pressure Post Operatively varied from 86.03-97.23 mm Hg in the TAP Block Group and 89.87-98.80 mm Hg in the Port Site Infiltration Group. By conventional criteria the association between the techniques and Mean Arterial Pressure (Baseline, Intra -operative and Post-Operative) is considered to be not statistically significant since  $p > 0.05$ .

The mean Visual Analog Score at Rest varied from 0.53-3.67 in the TAP Block Group and 0.77-3.75 mm Hg in the Port Site Infiltration Group. By conventional criteria the association between the techniques and VAS at Rest is considered to be not statistically significant since  $p > 0.05$ . By conventional criteria the association between the techniques and VAS on cough since  $p < 0.05$ .

The mean dose Tramadol is 150.5 in the TAP

Block Group compared to the Port Site Infiltration Group 240.4 with a  $p$ -value of 0.000. The increase in Mean time for first dose of injection Tramadol is meaningfully 1.04 times more in the TAP Block Group compared to the Port Site Infiltration Group.

Complication like shivering, nausea, vomiting, local Anaesthetic toxicity were noted. Shivering was present in 10 in TAP Block Group and 11 patients in Port Site Infiltration Group. Nausea was present in 8 in TAP Block Group and 10 patients in Port Site Infiltration Group. Vomiting was present in 3 in TAP Block Group and 4 patients in Port Site Infiltration Group. No local anaesthetic toxicity present in any patient present in any of the patients.

## Discussion

Post operative pain relief is an integral part of comprehensive care of any surgical patient. Multiple and multimodal approaches are available for the above purpose in abdominal surgeries, namely Local Anaesthetic Infiltration, Epidural blocks, I.V. Patient controlled Analgesia, Transversus Abdominis Plane Block, Peripheral Nerve Block etc. Various factors should be considered to decide on the type of pain modality to be given to the patient. They are the patients co-morbid diseases, psychological status, previous exposure to analgesics, and the type of operation. The multimodal approach can lower peri operative morbidity, decrease the duration of hospital stay, and enhance patient satisfaction. Even though a multi pharmacological approach is being universally accepted, medicines and their route of application have to be changed based on the type of operation and hospital resources, and the patient needs.

Transversus Abdominis Plane (TAP) Block is an effective mode of managing post operative pain and analgesic drug requirements after abdominal surgeries. Local Anaesthetic Infiltration (LAI) is a simple post operative analgesia method and is routinely followed in many centres. Thus comparing the above techniques in post operative pain relief after abdominal surgeries helps us understand the advantages and disadvantages of these techniques. Comparing pain relief in postoperative period is our primary goal. Visual Analogue Score on a scale of 1 to 10 both at rest and with movement was used to evaluate severity of pain.

A meta analysis of the clinical effectiveness of Transversus Abdominis Plane block by Siddiqui MR et al. Clinical Anaesth 2011 [4], has concluded that TAP block reduces the need for postoperative opioid use, it increases the time of first request for further analgesic, it provides more effective pain

relief and reduces opioid related adverse effects. These results were similar to our study.

A randomised controlled trial by Hotta K et al. *J. Anaesth* 2016 [5] comparing the analgesic effect between Continuous wound infiltration (CWI) single injection TAP block after gynaecological laparotomy has concluded that CWI reduced pain on coughing after the day of surgery compared with single injection TAP block when performed as part of multimodal analgesia. But our study does not use Continuous Wound Infiltration.

In another systematic review and meta analysis of randomised controlled trial on TAP block versus LAI in lower abdominal by Nanze Yu et al. *BMC Anaesth* 2014 [6], it was concluded that TAP block and LAI provide comparable short term post operative analgesia but TAP block had better long term effect. These results are comparable with our study. We had significant increased duration of analgesia in Transversus Abdominis Plane (TAP) Block (7.5 hrs) when compared to the port site infiltration (7.23 hrs) with less rescue analgesic consumption in the Transversus Abdominis Plane (TAP) Block.

A prospective randomised double blinded clinical trial on ultrasound guided TAP block for post operative analgesia in living liver donor by Kitlik et al. *J Clin Anaesth* 2017 [7] has concluded that TAP block reduced 24 hour post operative morphine consumption and contributed to pain relief in living liver donors who underwent upper abdominal incision. Likewise, another meta-analysis by Charlton et al., discovered a significant decrease in twenty four hour opioid requirements in TA Plane block patients compared to controls. More over, subcostal TA Plane blocks were associated with lesser early.

Postoperative visual analogue scores both at rest and while coughing. Postoperative drowsiness, postoperative complications like nausea and vomiting, was decreased in patients who were given subcostal TA Plane blocks. Considering the volume required for the TAP block (40 ml as in our study) we had chosen Ropivacaine as our study

drug because of its less cardiotoxic effect.

## Conclusion

We conclude that bilateral USG guided sub costal Transversus abdominis plane block is a better and more efficient alternative method to conventional port site infiltration in Laparoscopic cholecystectomy to provide analgesia in the postoperative period.

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