

Efficacy of laparoscopic-guided transversus abdominis plane block for patients undergoing robotic-assisted gynaecologic surgery: A randomised control trial

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ABSTRACT

Background and Aims: Transverse abdominis plane (TAP) block has been used regularly as part of multimodal analgesia for caesarean sections and other lower abdominal surgeries. Adequate postoperative analgesia provided with regional blocks allows faster postoperative recovery and better patient satisfaction. In our study, we are comparing the analgesic efficacy of laparoscopic-guided TAP block with port infiltration using a local anaesthetic in patients undergoing gynaecologic robotic surgeries. **Methods:** After obtaining approval from the hospital ethics committee, Central Trial Registry of India (CTRI) clearance and written informed consent from patients, this prospective double-blinded randomised control trial was conducted on patients undergoing robotic-assisted gynaecologic surgery under general anaesthesia. Group B patients received bilateral TAP block under direct laparoscopic vision with 15 ml of 0.1% ropivacaine on each side and Group C patients received routine port site infiltration with 30 ml of 0.1% ropivacaine. Postoperative pain score was measured till 24 hours, need for rescue analgesics, complications associated were noted. Independent two sample 't' test, Mann Whitney u test, Chi-square and Fisher's exact test were used for statistical analysis. **Results:** Pain score was significantly lower in Group B patients up to 24h ($P < 0.001$). The use of rescue analgesic was also significantly less in group B compared to Group C ($P < 0.001$). No adverse events were noted in both groups. **Conclusion:** Laparoscopic-guided TAP block is effective and superior to port site infiltration in providing postoperative analgesia in patients undergoing robotic-assisted gynaecologic surgery.

Key words: Analgesia, laparoscopic, robotic, ropivacaine, TAP block

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INTRODUCTION

Postoperative pain is a major concern for patients undergoing any surgery. Patients undergoing robotic-assisted gynaecologic surgery have much lesser pain and shorter hospital stay when compared to patients undergoing open surgeries. But methods to reduce the pain further will allow faster postoperative recovery and better patient satisfaction. By transversus abdominis plane (TAP) block, the sensory nerves of the anterior abdominal wall from T6 to L1 are blocked. TAP block has been used regularly as part of multimodal analgesia for caesarean, lower abdominal surgeries.^[1-3] It is also used in laparoscopic surgeries to reduce postoperative pain and opioid requirements.^[4-7]

Studies have examined the effectiveness of TAP block on relieving postoperative pain in laparoscopic procedures with conflicting results. Many studies showed reduction in postoperative pain and opioid consumption with TAP block.^[8-10] In contrast, a study on TAP block performed for laparoscopic

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appendectomies did not show any improvement in pain scores.^[11] In this study, we are comparing the analgesic efficacy of laparoscopic-guided TAP block with port infiltration in gynaecologic robotic surgeries. Secondary objectives were to find the difference in postoperative use of rescue analgesics, adverse effects due to analgesic use, nausea and vomiting, time to first feed, time to discharge from recovery and hospital between the two modalities.

METHODS

This prospective double-blinded randomised control trial was conducted after obtaining approval from the hospital ethics committee (dated 12-11-2018), CTRI clearance (CTRI/2018/12/016612) and written informed consent from patients undergoing robotic-assisted gynaecologic surgery under general anaesthesia from December 2018 to May 2019. The study was conducted in accordance with the principles of the 2013 Declaration of Helsinki. Forty patients between 18-70 years belonging to American Society of Anaesthesiologist physical class I and II were included in the study. Patients not willing for TAP block, allergic to ropivacaine, surgery duration

of more than 3 hours and conversion to open surgery were excluded from the study. The recruited patients were divided into two equal groups B and C by closed envelope technique [Figure 1]. Group B patients received bilateral laparoscopic-guided TAP block using 15 ml of 0.1% ropivacaine on each side and group C patients received routine port site infiltration with 30 ml of 0.1% ropivacaine.

Standardised general anaesthesia protocol was followed. All patients received oral ranitidine 150 mg, metoclopramide 10 mg and alprazolam 0.5 mg as premedication on the morning of surgery. In the operating theatre, patients were induced with IV midazolam 2 mg, propofol 1-2 mg.kg⁻¹ and fentanyl 2-3 µg.kg⁻¹. All patients were intubated and anaesthesia was maintained using O₂, air and isoflurane 0.5-1.5%. In group B patients, the TAP block was performed by a single consultant surgeon. After inserting the first 10-mm-trocar and examining the abdominal cavity, a puncture with an 18-gauge needle was performed using classic landmark technique. Localisation of the needle was done under direct laparoscopic vision and the needle's tip was positioned at the fascial space between the internal oblique and the transverses abdominis

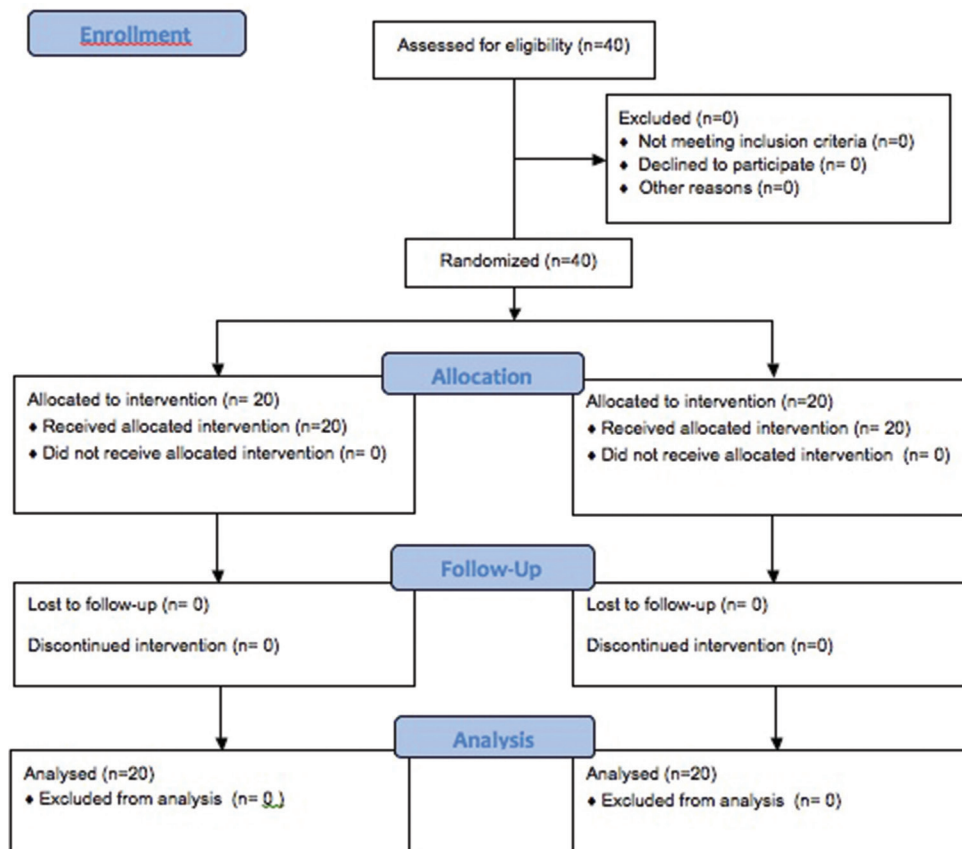


Figure 1: Flow chart

muscle. 15 ml of 0.1% ropivacaine was injected after aspiration to avoid intravascular injection. Transverse abdominis muscle can be seen bulging away from the internal oblique laparoscopically when the injection is correctly placed [Figure 2]. The procedure was performed bilaterally. Group C patients received laparoscopic port site infiltration preoperatively with 30 ml of 0.1% ropivacaine.

All patients were then positioned in Trendelenburg position as required for gynaecologic laparoscopic surgery. Towards the end of surgery patients in both groups received IV ondansetron 4 mg and paracetamol 1 gm. On completion of surgery, residual muscle relaxation was reversed with IV neostigmine 0.05 mg.kg⁻¹ and glycopyrrolate 10 µg.kg⁻¹. Patients were then extubated and shifted to the recovery room. All patients were shifted to the room once their modified Aldrete score was more than 9. Six hours after surgery all patients received oral paracetamol 650 mg 8th hourly. Patients were given rescue analgesia with IV tramadol 1 mg.kg⁻¹ along with 4 mg ondansetron as antiemetic if the patient complained of pain. The total dose of tramadol given in the first 24 h was noted for both groups.

Anaesthetist in charge of the recovery room, who was unaware to which group the patient belonged, monitored

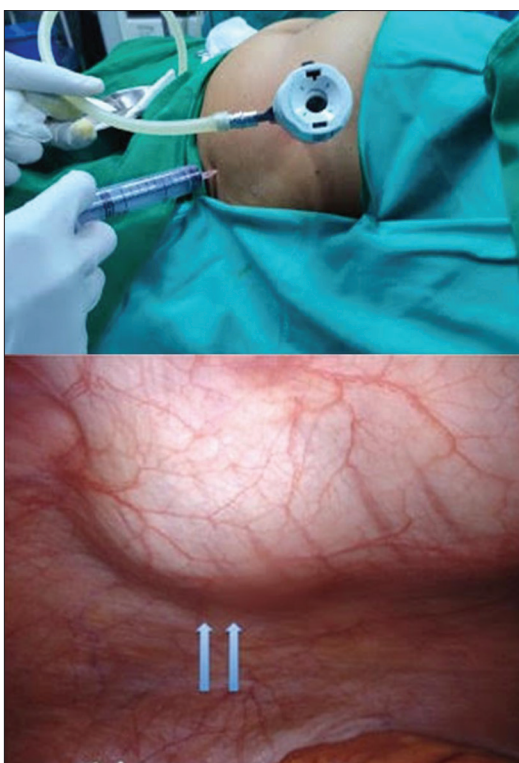


Figure 2: View of TAP block under laparoscopic vision, bulge after injection of local anaesthetic

the pain score. The postoperative parameters recorded were mean blood pressure, heart rate, numeric pain score, nausea and vomiting. These parameters were recorded on arrival to recovery, 4, 8 and 12 hours. 24-hour pain score was obtained telephonically. Patients were asked to rate pain experienced by them using a ten-point numeric pain scale (0 - no pain, 10 - worst possible pain). The severity of nausea and vomiting was rated using a scale (0-none, 1-present). Any local complications related to the procedure were also recorded.

As there was no previous similar study on gynaecologic robotic surgery, a pilot study was done. Based on this, the mean pain score after gynaecologic robotic surgery was compared among block and control groups at 12 h and 24 h, (0.20 ± 0.632 , 3.70 ± 2.797) and (0.20 ± 0.632 , 3.60 ± 2.797), with a 95% confidence interval at 80% power, the minimum sample size comes to 5 and 6 samples in each group respectively. But we assigned 20 patients in each group as too small a sample size increases the likelihood of a Type II error which can skew the results. For all the continuous variables, the results are given in mean \pm SD and categorical variables as a percentage. To compare the mean difference of numerical variables between groups, independent two samples 't' test was applied for parametric data and Mann-Whitney u test for non-parametric data. To obtain the association of categorical variables, Chi-square and Fisher's exact test was applied. A *P* value < 0.05 was considered as statistically significant. Statistical analysis was done using IBM SPSS 20.0 (SPSS Inc, Chicago, USA).

RESULTS

A total of 40 patients were enrolled in this study. Distribution of patients in both groups were similar with respect to demographics, American Society of Anesthesiologists' physical status, and duration of surgery. The intraoperative fentanyl consumption was comparable between the two groups. There was a significant difference in pain scores between the two groups with the patients receiving TAP block having lower scores up to 24 h ($P < 0.001$) [Figure 3]. The postoperative heart rate and mean arterial pressure did not show any significant difference between the groups [Figures 4 and 5]. The demand for rescue analgesic was less in group B compared to group C (15% vs. 90%), and this difference was also statistically significant ($P < 0.001$). On comparing the incidence of postoperative nausea and vomiting, there was no significant difference between the two groups [Table 1].

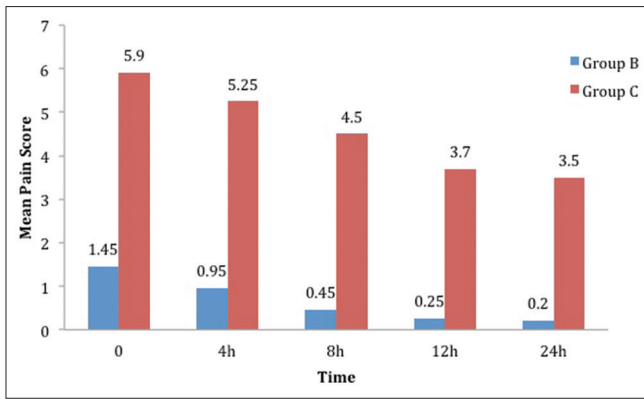


Figure 3: Pain scores at various time points

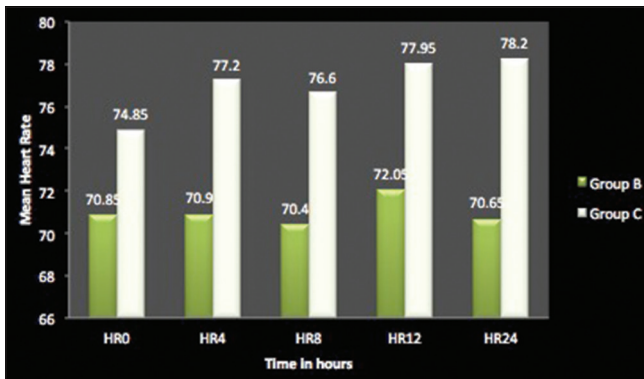


Figure 4: Mean heart rate

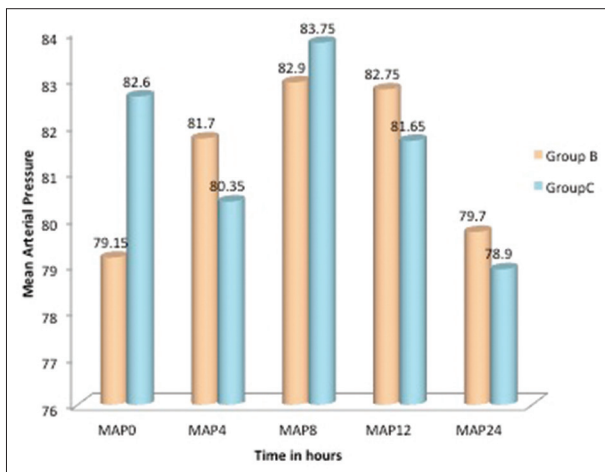


Figure 5: Mean arterial pressure

All patients were ambulated at 3-4 hours in the postoperative period and none of them were over sedated. We did not encounter any complications associated with the procedure in both groups.

DISCUSSION

This randomised controlled trial has demonstrated decreased pain scores and reduced requirement of

Table 1: Postoperative rescue analgesic and incidence of nausea and vomiting

Variable	Category	Group		P
		B (%)	C (%)	
Postop tramadol consumed	No	17 (85.0%)	2 (10.0%)	<0.001
	Yes	3 (15.0%)	18 (90.0%)	
Nausea and vomiting	0	19 (95.0%)	17 (85.0%)	0.605
	Yes	1 (5.0%)	3 (15.0%)	
4 h	No	20 (100.0%)	17 (85.0%)	0.231
	Yes	0 (0.0%)	3 (15.0%)	
8 h	No	20 (100.0%)	14 (70.0%)	0.020
	Yes	0 (0.0%)	6 (30.0%)	
12 h	No	20 (100.0%)	19 (95.0%)	1.000
	Yes	0 (0.0%)	1 (5.0%)	
24 h	No	20 (100.0%)	20 (100.0%)	-
	Yes	0 (0.0%)	0 (0.0%)	

rescue analgesics with laparoscopically-guided TAP block in patients undergoing minimally invasive robotic gynaecologic surgeries. But there was no difference in ICU stay or discharge from hospital. None of the patients in our study group had any adverse effects associated with the block or port site infiltration.

TAP block is a non-dermatomal field block. Transversus abdominis plane is a potential space between transverse abdominis and internal oblique muscle. TAP block can be performed by blind insertion of local anaesthetic using anatomical landmarks, ultrasound guidance or under laparoscopic guidance. Studies have shown that TAP blocks performed by either blind or under ultrasound guidance are effective in providing analgesia in laparoscopic surgeries.^[4,5,7-9] Blind TAP blocks are performed after locating the triangle of Petit using the double pop loss of resistance technique.^[12] It is associated with a high incidence of penetrative injuries and a higher failure rate. Ultrasound-guided TAP blocks became popular because of their effectiveness and safety profile compared to blind TAP blocks.^[12,13] But it needs great skill and the availability of ultrasound machines in the operation theatre. Also at times, we might encounter difficulty in identification of muscle planes. In laparoscopic-guided TAP block, local anaesthetic is injected into the transversus abdominis plane by a semi-blind technique. It can be easily performed by the surgeon under direct vision of the laparoscope without the need for any additional skills.^[14-16] The presence of an internal bulge which can be visualised laparoscopically confirmed the correct placement of the drug. Recently, robotic-assisted gynaecologic surgeries are becoming popular in centres where

robotic facilities are available. Patients undergoing robotic-assisted surgery have less pain than patients undergoing laparoscopy or open surgery. This advantage may be due to the endowristed instruments reducing port movement on the abdominal wall. But these patients may also complain of pain. The inadequate treatment of acute postoperative pain can delay discharge, and lead to the development of chronic pain, which is difficult to treat. Adequate postoperative analgesia provided with blocks will allow faster postoperative recovery and better patient satisfaction. We used laparoscopic-guided approach to perform TAP block as it is associated with less risk of visceral injury, is easy to perform with shorter procedure time and has a high success rate.^[10]

Many studies on laparoscopic TAP block used bupivacaine as a local anaesthetic.^[17] But we have used ropivacaine because it is safer and is equally effective.^[18,19] Studies have demonstrated pain relief, lesser narcotic use and shorter hospital stay with the use of laparoscopic-guided TAP.^[14,16,20] But unlike Tihan *et al.*,^[10] we could not demonstrate any improvement in time to discharge from hospital. This may be due to the fact that our patients in both groups were already day care patients and were discharged before 24 hours.

Laparoscopic TAP block provided analgesia up to 24 hours, which reduced the requirement of postoperative opioids. This reduces the incidence of opioid-induced side effects like sedation and nausea and vomiting. But in our study even though there was a significantly increased consumption of tramadol in the control group, which received only port infiltration, the incidence of postoperative nausea and vomiting was not significantly different between the two groups. The use of antiemetic, ondansetron along with tramadol could have prevented our patients from excessive emesis.

This study is limited by the fact that it is from a single institution and also the TAP block was administered by a single operating surgeon. Various additives and liposomal bupivacaine have been shown to prolong the duration of analgesia produced by TAP block. This should be studied further to see if there is an increased benefit to patients.

CONCLUSION

Laparoscopic-guided TAP block is effective in reducing postoperative pain in patients undergoing

robotic gynaecologic surgeries and is superior to port site infiltration.

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Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Jain S, Kalra S, Sharma B, Sahai C, Sood J. Evaluation of ultrasound-guided transverses abdominis plane block for postoperative analgesia in patients undergoing intraperitoneal onlay mesh repair. *Anesth Essays Res* 2019;13:126-31.
- Belavy D, Cowlshaw PJ, Howes M, Phillips F. Ultrasound-guided transverses abdominis plane block for analgesia after caesarean delivery. *Br J Anaesth* 2009;103:726-30.
- Mishriky BM, George RB, Ashraf SH. Transversus abdominis plane block for analgesia after Cesarean delivery: A systematic review and meta-analysis. *Can J Anesth* 2012;59:766-78.
- Oliveria GSD, Castro-Alves LJ, Nadar A, Kendell MC, McCarthy RJ. Transversus abdominis plane block to ameliorate postoperative pain outcomes after laparoscopic surgery: A meta-analysis of randomized controlled trials. *Anesth Analg* 2014;118:454-63.
- Shahait M, Lee DL. Application of TAP block in laparoscopic urological surgery: Current status and future directions. *Curr Urol Rep* 2019;20:20.
- Hamid HKS, Khan IZ. Anatomical considerations for transverses abdominis plane block in laparoscopic surgery. *Ame J Surg* 2019. doi: 10.1016/j.amjsurg.2019.02.013.
- Suseela I, Anandan K, Aravind A, Kaniyil S. Comparison of ultrasound-guided bilateral subcostal transverses abdominis plane block and port-site infiltration with bupivacaine in laparoscopic cholecystectomy. *Indian J Anaesth* 2018;62:497-501.
- Emile SH, Abdel-Razik MA, Elbahrawy K, Elshobaky A, Shalaby M, Elbaz SA. Impact of ultrasound-guided transverses abdominis plane block on postoperative pain and early outcome after laparoscopic bariatric surgery: A randomized double-blinded controlled trial. *Obes Surg* 2019;29:1534-41.
- Peng K, Ji FH, Liu HY, Wu SR. Ultrasound-guided transversus abdominis plane block for analgesia in laparoscopic cholecystectomy: A systematic review and meta-analysis. *Med Princ Pract* 2016;25:237-46.
- Tihan D, Totoz T, Tokocin M, Ercan G, Calikoglu TK, Vartanoglu T, *et al.* Efficacy of laparoscopic transverses abdominis plane block for elective laparoscopic cholecystectomy in elderly patients. *Bosn J Basic Med Sci* 2016;16:139-44.
- Tupper-Carey DA, Fathil SM, Tan YK, Kan YM, Cheong CY, Siddiqui FJ, *et al.* A randomized controlled trial investigating the analgesic efficacy of transversus abdominis plane block for adult laparoscopic appendectomy. *Singapore Med J* 2017;58:481-7.
- Tsai HC, Yoshida T, Chuang TY, Yang SF, Chang CC, Yao HY. Transversus abdominis plane block: An updated review of anatomy and techniques. *Bio Med Res Int* 2017;2017:8284363. doi: 10.1155/2017/8284363.
- Saxena R, Joshi S, Srivastava K, Tiwari S, Sharma N, Valecha UK. Comparative study of ultrasound-guided abdominal field blocks versus port infiltration in laparoscopic cholecystectomies for postoperative pain relief. *Indian J Anaesth* 2016;60:578-83.
- Mughal A, Khan A, Rehman J, Naseem H, Waldron R, Duggan M, *et al.* Laparoscopic-assisted transverses abdominis plane block as an effective analgesic in total extraperitoneal

- inguinal hernia repair: A double-blind, randomized controlled trial. *Hernia* 2018;22:821-826.
15. Zaghiyan KN, Mendelson BJ, Eng MR, Ovsepyan G, Mirocha JM, Fleshner P. Randomized clinical trial comparing laparoscopic versus ultrasound guided transverse plane block in minimally invasive colorectal surgery. *Dis Colon Rectum* 2019;62:203-10.
 16. Chetwood A, Agarwal S, Hrouda D, Doyle P. Laparoscopic assisted transverse abdominal plane block: A novel insertion technique during laparoscopic nephrectomy. *Anaesthesia* 2011;66:317-8.
 17. Ar AY, Ari DE, Kuplay YY, Iscan Y, Karadogan F, Kirim D, *et al.* Ultrasound-guided transverses abdominis plane block in patients undergoing laparoscopic cholecystectomy: Comparison of efficacy of bupivacaine and levobupivacaine on postoperative pain control. *Rev Bras Anestesiol* 2018;68:455-61.
 18. Sarvesh B, Shivaramu BT, Sharma K, Agarwal A. Addition of dexmedetomidine to ropivacaine in subcostal transverses abdominis plane block potentiates postoperative analgesia among laparoscopic cholecystectomy patients: A prospective randomized controlled trial. *Anesth Essays Res* 2018;12:809-13.
 19. Sinha S, Palta S, Saroa R, Prasad A. Comparison of ultrasound-guided transversus abdominis plane block with bupivacaine and ropivacaine as adjuncts for postoperative analgesia in laparoscopic cholecystectomies. *Indian J Anaesth* 2016;60:264-9.
 20. Favuzza J, Brady K, Delaney CP. Transversus abdominis plane blocks and enhanced recovery pathways: Making the 23-h hospital stay a realistic goal after laparoscopic colorectal surgery. *Surg Endosc* 2013;27:2481-6.