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Efficacy of quadratus lumborum block and transversus abdominis plane block in patients undergoing lower abdominal surgeries

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Abstract

Background: Truncal blocks have been used as a part of multimodal techniques to manage postoperative pain. Availability of ultrasound makes it easier to perform truncal blocks for abdominal surgeries, thus it reduces the amount of opioids and improves patient outcome. In our study, we compared the efficacy of ultrasound guided quadratus lumborum block and transversus abdominis plane block for post-operative analgesia in patients undergoing lower abdominal surgery.

Methods: Total 50 patients between 18 to 70 years of age of either gender, belonging to ASA Class I or II and willing to give informed written and verbal consent without any exclusion criteria posted for elective abdominal surgery. Patients were divided in two groups; patients with transversus abdominis plane block (TAP group) and patients with quadratus lumborum block with posterior approach (QL group). Each patient received general anaesthesia and blocks were performed under the guidance of ultrasonography prior to extubation. The blocks were compared with the duration of analgesia, visual analogue scale (VAS) score was recorded at 0, 2, 4, 6, 12, 24 hours and the total amount of analgesic consumed. The statistical analysis was performed with Student t-test.

Results: The duration of pain relief for patients given QL block was significantly higher than TAP block. The

requirement of tramadol was significantly lower in patients with QL block.

Conclusion: The results show that QL block was more efficacious to provide postoperative analgesia then TAP block with longer duration of analgesia and reduced consumption of tramadol. VAS at 12 hours was comparatively higher in group receiving TAP block.

Keywords: Quadratus lumborum block, Abdominis plane block, Abdominal surgery

Introduction

Postoperative pain management using multimodal means after major abdominal surgeries improves patient outcome and reduces hospital stay.[1]The severity of pain in postoperative period varies due to numerous factors including the extent of surgical incision, duration of surgery, the anaesthesia technique used, use of opioids intraoperatively, nonsteroidal anti-inflammatory drugs.[2] The patients those who undergoes abdominal surgeries also needs multimodal approach in the postoperative period for analgesia.[3]Different modalities have been employed to control pain and decrease opioid consumption and the side effects associated with them.[4]Due to the availability and usage of ultrasound, truncal blocks can be performed under the guidance of ultrasound. This reduces the total amount of opioids required. The use of ultrasound allows visualisation of the correct needle placement and spread of local anaesthetic. [5]The quadratus lumborum (QL) block was first described by Blanco. [6] Currently, the QL block is performed as one of the perioperative pain management procedures. Several approaches for quadratus lumborum have been described: lateral QL (QL1) where local anaesthetic is given at the anterolateral border of the QL muscle; Posterior block (QL2) where the site of interest is the junction of quadratus and thoracolumbar fascia; anterior approach where the site of injection is anterior between quadratus lumborum and psoas major; intramuscular approach where drug is deposited in the QL muscle.[7] QL block after abdominal surgeries provides analgesia for prolonged duration. Transversus abdominis plane (TAP) block it blocks the sensory supply of anterior abdominal wall and is performed by injecting local anaesthetic in the transverse abdominis plane. [8, 9] Abdominal nerve blocks can provide a speedy recovery in terms of reduced pain scores, early mobilisation and recovery which leads to reduced hospital stay. Opioid requirement is significantly low in these patients. [10]

Aim

The aim of this study was to compare the efficacy of ultrasound guided quadratus lumborum block and ultrasound guided transversus plane block for postoperative analgesia in patients undergoing abdominal surgeries.

Methods and Materials

After the approval from the Institutional Ethics Committee, reference number PIMS/DR/RMC/IEC-UG-PG/2021/69, this study was conducted as an observational study, keeping follow-up of patients making it a prospective longitudinal study design. Fifty patients between 18 to 70 years of age of either gender, belonging to ASA Class I or II willing to give informed written and verbal consent without any exclusion criteria and scheduled for elective or emergency abdominal surgery were included in the study. The patients were explained in detail regarding the anaesthetic procedure and the study. Written and verbal consent was taken for the procedure as well as for inclusion in the study. The patients were divided into

two groups, patients receiving Quadratus lumborum block (QL group) and Transversus abdominis plane block (TAP group). As per routine protocol of the institution, the patients were thoroughly evaluated by a pre-anaesthetic check-up with general, physical and systemic examination on the evening prior to the proposed surgery. The visual analogue scale (VAS) was explained to all patients with 0 corresponding to no pain and 10 to the worst imaginable pain. All the patients were fasted for a period of 6 hours pre-operatively.

On the day of surgery, the patients were shifted to the operating room and standard monitoring including electrocardiogram, mean arterial blood pressure, respiratory rate and oxygen saturation were started using multi-para monitors. The anaesthesia machine, breathing circuits, emergency resuscitation trolley and airway equipment was kept ready. For both groups, general anaesthesia was induced. Premedication IV injection of Glycopyrrolate (0.008mg/kg), Midazolam (0.04mg/kg) and Fentanyl (1mcg/kg) was given. Induction was done with injection Propofol (2 mg/kg) and then, Succinylcholine (2 mg/kg) injected for endotracheal intubation. Anaesthesia was maintained with Isoflurane and injection Vecuronium (0.1mg/kg) followed by top-ups of 0.01mg/kg. Intraoperatively injection paracetamol 1gm was given for analgesia. At the end of surgery prior to extubation, blocks were performed. Both blocks were performed under complete aseptic precautions using ultrasound machine with high frequency linear probe covered with sterile sheath. In TAP block, the probe was placed between the iliac crest and the lower costal margin in the anterior axillary line at the level of umbilicus and the layers of abdominal wall were identified. Under USG guidance in plane technique was used for giving TAP block and the tip of the needle was placed between the internal oblique and transverse abdominis muscle. After negative aspiration for blood, 20 mL of 0.25% bupivacaine was injected and the same block performed on the other side. In QL group, the posterior Quadratus lumborum block was performed with the patient placed in supine position with a lateral tilt and the curvilinear probe was used to perform the block. The probe was placed at the level of the anterior superior iliac spine and moved upwards till the three abdominal muscles were identified. The external oblique muscle was visualised and its posterior end was identified. The probe was then tilted down to identify the layer of the thoracolumbar fascia. The needle was inserted in plane and the tip was placed between the thoracolumbar fascia and quadratus lumborum muscle. After negative aspiration, an injection of 20 mL of 0.25% bupivacaine was then applied and the same technique was performed on the other side. After performing the blocks, patient was extubated after reversal with injection Neostigmine (0.05mg/kg) and Glycopyrrolate (0.01mg/kg). At the end of the surgery, the patients were shifted to the post-anaesthesia care unit and received the same basic standard of post-operative care. Post-operatively patients were monitored for 24 hours. Vitals and VAS was recorded. Injection Tramadol 100mg was given for a VAS of more than 4. Mean amount of tramadol consumed in 24 hours was noted. Patients were observed for side effects and following outcomes were noted.

Primary Outcome

To measure the total duration of analgesia.

Secondary Outcome

Block performance time, quality of analgesia using Visual Analogue Score (VAS) at 0, 2, 4, 6, 12 and 24 hours, total amount of analgesic consumed in 24 hours after the surgery, variation in hemodynamic parameters and side effects were monitored and recorded.

Sample Size Calculation

Sample size was calculated taking reference from the study by Yousef NK et al [11] we performed a power analysis using duration of analgesia as the primary outcome variable. We calculated a sample size so that an intergroup mean difference in duration of analgesia would allow a type I error of α at 0.05 and the null hypothesis would be retained with type II error of β at 0.1. A sample size of 5 patients per group was found after this analysis. Considering the dropouts and the sample size for the study to be significant, we selected a sample size of 25 patients per group. Data from the study proforma of the individual study subject was entered, compiled in Microsoft office excel sheet and was analysed using SPSS version 21. Student's t test was used.

Results

The demographic data of the patients in each group in terms of age, weight, height Table (1) and duration of the surgery were comparable; Table (2).The types of surgery which were included in the study are as described in Figure (1).The block performance time for the TAP block was (7.6±4.42min) whereas for QL block it was (12.7±5.13min) with (P value 0.0001) which was significant. Table (3);The duration of analgesia was significantly longer in the patients who received QL block (11.78 ± 0.5773) as compared to TAP block (7.06$\pm$1.03 hours) with (P value 0.0001) as shown in Table (4) and Figure (2).VAS for pain was significantly higher in TAP group than in QL group postoperatively upto12 hours. There was no significant difference in VAS between the groups at 24th hour shown in Table (5).The total requirement of Tramadol was significantly higher for the patients given TAP block(212±47.25)as compared to those who received QL block(120±54.16); Table (6) and Figure (3).

Table 1: Demographic Data

Data	Group A (TAP)	Group B (QL)	P value
Age (years)	55.8±5.9	56±5.8	0.904
Sex(M/F)	7/18	9/16	
Weight (kg)	58.3±9.07	56.8±7.36	0.523
Height (cm)	154.53± 3.83	155.3±5.31	0.559

*P-value significant, P-value not significant. Values are mean ±SD or number of patients, SD – Standard deviation

Figure 1

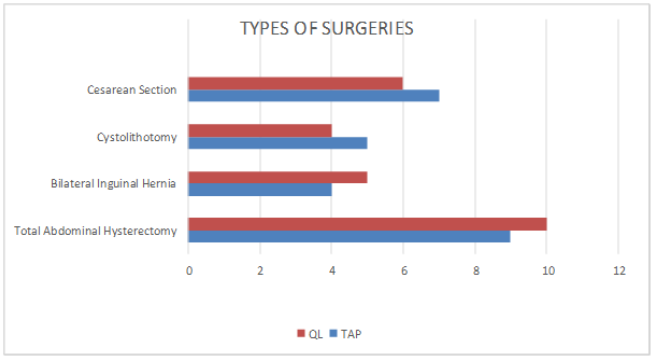


Table 2: Duration of Surgery

	Group (TAP)	Group (QL)	P value
Duration of surgery(min)	118±25.42	112±27.35	0.426

P value is not significant.

Table 3 : Block Performance Time

	Group (TAP)	Group (QL)	P value
Time for block (min)	7.6±4.42	12.7±5.13	0.001*

P* value is significant.

Table 4: Duration of Analgesia

Block performed	TAP group	QL group	P value
Duration of analgesia	7.06±1.03	11.78±0.5773	<0.001*

*P-value significant, P-value not significant. Values are Mean ± SD or number of patients, SD – Standard deviation

Figure 2: Duration of Analgesia

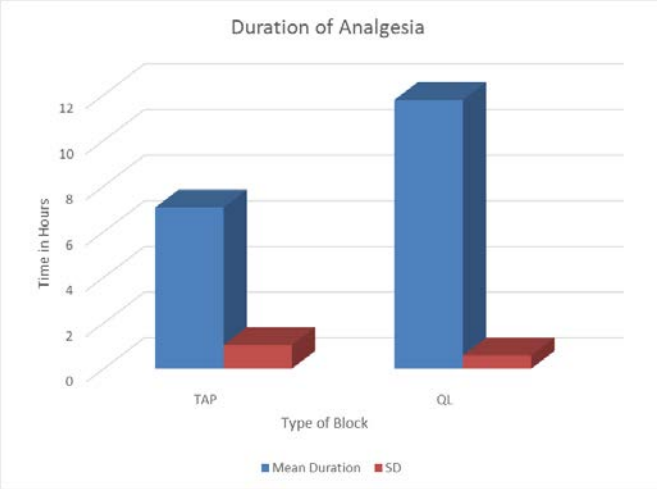


Table 5: VAS recorded

Time	VAS score TAP	VAS score QL	P value
0	2.1±0.58	2.0±0.63	0.562
2	3.5±0.66	2.4±0.60	<0.001*
4	3.9±0.69	2.5±0.67	<0.001*
6	4.1±0.65	2.8±0.60	<0.001*
12	4.2±0.66	3.3±0.61	<0.001*
24	3.2±0.55	3.0±0.58	0.217

Table 6: Total amount of Tramadol

Total amount of tramadol consumed in 24 hours	TAP block	QL block	P value
	212±47.25	120±54.16	<0.001*

Data expressed as Mean± SD. *P value <0.05 statistically significant, P value <0.001- highly significant.

Figure (2) Tramadol Requirement

No statistically significant difference was found between the groups with regard to heart rate and mean blood pressure (MAP) (Figure 3) (p > 0.05), Figure (3). Hemodynamic parameters were comparable in both the groups and there were no complications developed in both the groups.

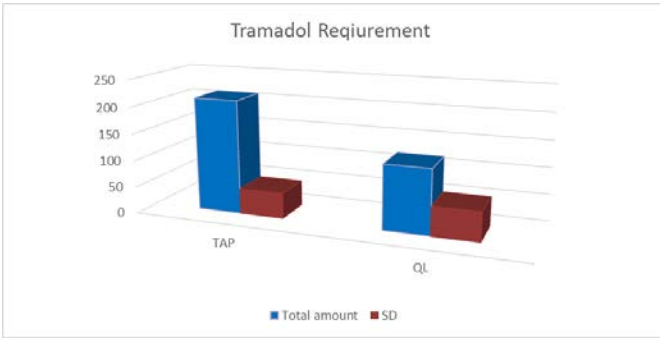
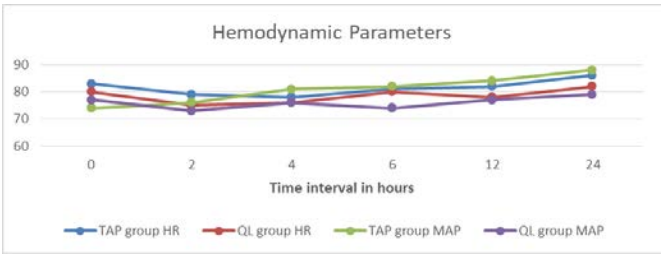


Figure 3



Discussion

Management of postoperative pain after major abdominal surgeries becomes a crucial part of post - operative care provided by an anaesthesiologist, with various challenges. It is important to provide a pain free recovery period, which will help in early patient mobilisation with lesser respiratory complications after administration of general anaesthesia. Patients, who underwent abdominal surgeries and met the inclusion criteria, were given truncal blocks for postoperative

analgesia. In this study we compared the efficacy of QL and TAP block as a multimodal means of analgesia. Multiple studies have been done with comparisons made in the two blocks, with respect to drug used, duration, use of adjuvants, need for other modalities and comparing the various approaches of quadratus lumborum and transversus plane block.[12] Transversus abdominis block, which is a more anterior approach to the nerve supply of the abdomen, can be used to block nerves from T10 to L1. In abdominal surgeries with midline incision, TAP block needs to be supplemented with intravenous opioids or additional truncal block like Rectus sheath block for a pain free post- operative period. There have been studies to increase the duration of TAP block using adjuvants with the local anaesthetic. [13] Comparing Quadratus lumborum block to TAP block, using a posterior approach, where the drug is deposited posterior to the quadratus lumborum muscle, spread of drug is more in the paravertebral space so analgesia was prolonged and the better analgesia with QL block makes it a better modality. The volume of the drug needed to achieve adequate effect is about 20ml of local anaesthetic for the bilateral blocks. [14]

In our study the ease of performing the blocks was studied, the block performance time was longer in QL block as compared to TAP block this mainly due to the positioning and anatomical considerations though both block were performed with ultrasound guidance. Baytar C et al [15] observed that subcostal tap block applied under USG guidance can be considered to have the advantages of easier application and shorter time compared with QL block. TAP block is easier to perform with lesser expertise. Similar results were found in the El boghdadly et al [16], in their meta-analysis. However, the quality of analgesia is better with QL block than TAP block. In our study total duration of analgesia was significantly longer in QL group than TAP group. Jadon et al [17] studied the analgesic efficacy of QL block and TAP block in patients after caesarean section, with Ropivacaine 0.375% and found the first analgesic request was at 12th hours in the QL group and at 9th hour in the TAP group. This difference was significant and p value is 0.0008. Yousef et al [11] conducted study in patients undergoing total abdominal hysterectomy, observed that duration of postoperative analgesia was higher in QL group than in TAP group (15.1 ± 2.12 h vs. 8.33 ± 4 h, P = 0.001) with significantly reduced opioid requirement in QL group; While El Boghdadly et al [16] did a systematic review and analysed TAP block and QL block in patients undergoing caesarean sections, found that the duration of analgesia was comparable in both group and the drug distribution in QL block depends on the type of the approach used.

In our study we found statistically significant difference in the VAS score at 0, 2, 4, 6, 12 hours of performing blocks. While at 24 hr difference was not significant. Yousef et al [11] conclude that VAS score was significantly higher in TAP group than in QL group at all the measured time postoperatively up to 24 hr. Verma K et al[18] observed that VAS score at rest and with movement was significantly reduced in the QL group than in the TAP group at all times, post caesarean section. Kumar GD et al [19] observed that there was a significant difference in mean pain scores between the two groups at the 1st, 2nd, 4th, 6th, 8th, 10th, 12th, and 16th postoperative hours and there was no significant difference in the pain scores 24 hrs post-surgery indicating the wearing off the block in both the

groups. Oksuz et al.[20] compared TAP block and QL block in paediatric patients undergoing lower abdominal surgery and reported that TAP block group showed significantly higher postoperative FLACC scores (face, legs activity, cry, consolability scale) than QLB group ($P < 0.05$). Our result is in line with all this previous study [11, 18, 19, 20]. Baytar C et al [15] did not observed any significant difference in VAS score between the two groups. In our study, we included patients undergoing exploratory laparotomy where patient recovery and a better outcome will depend on the pain management. Making use of QL block with posterior approach and TAP block has reduced analgesic requirement in both groups. The total 24 hr of tramadol consumption was significantly reduced in QL group than TAP group. Verma K et al [18] studied the efficacy of QL and TAP in patients undergoing caesarean section for duration of 72 hours he concluded that the total amount of tramadol required postoperatively was significantly lower for QL group. Blanco et al [21] and Yousef et al[11] observed that QL group had significantly lower requirement of morphine than TAP group. Oksuz et al [20] reported, the number of patients who received rescue analgesia in the first 24 hrs postoperatively was significantly higher in TAP block group than in QLB group ($P < 0.05$). Baytar C et al [15] did not found any significant difference in total tramadol consumption in both groups. Hemodynamic parameters were comparable in both the group and no significant side effects was noted in either of the study group.

Conclusion

Our study concludes the quadratus lumborum block has a better efficacy and longer duration of analgesia and less tramadol requirement when compared with transversus plane block. All these factors contribute to faster postoperative recovery and earlier mobilization of patient.

References

1. Gopal TV, Maniar A, Chakraborty A, Kulkarni R. Abdominal Wall Blocks in Abdominal Surgery: An Update. TVS. 2021 Jan;1(2):3.
2. 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 journal of anaesthesia. 2016 Apr; 60 (4):264.
3. Deshpande JP, Ghodki PS, Sardesai SP. The analgesic efficacy of dexamethasone added to ropivacaine in transversus abdominis plane block for transabdominal hysterectomy under subarachnoid block. Anesthesia, essays and researches. 2017 Apr; 11(2):499.
4. Adeel S, Narayan P, Chandrashekaraiah MM, Abuhassan KA, Elsemeen RM, Skowronski S. Ultrasound-guided transversus abdominis plane block: An evaluation of its efficacy in reducing post-operative opioid requirements in caesarean section. Journal of Obstetric Anaesthesia and Critical Care. 2017 Jul 1;7(2):81.
5. Yarwood J, Berrill A. Nerve blocks of the anterior abdominal wall. Continuing Education in Anaesthesia, Critical Care and Pain. 2010 Dec 1;10(6):182-6.
6. Blanco R. 271. Tap block under ultrasound guidance: the description of a “no pops” technique
7. Ueshima H, Otake H, Lin JA. Ultrasound-guided quadratus lumborum block: an updated review of anatomy and techniques. BioMed research

international. 2017 Jan 3;2017. (Doi:10.1155/2017/2752876.)

8. Mallan D, Sharan S, Saxena S, Singh TK. Anesthetic techniques: focus on transversus abdominis plane (TAP) blocks. Local and regional anesthesia. 2019;12:81-88.
9. Mankikar MG, Sardesai SP, Ghodki PS. Ultrasound-guided transversus abdominis plane block for post-operative analgesia in patients undergoing caesarean section. Indian journal of anaesthesia. 2016 Apr; 60(4):253.
10. Carney J, McDonnell JG, Ochana A, Bhinder R, Laffey JG. The transversus abdominis plane block provides effective postoperative analgesia in patients undergoing total abdominal hysterectomy. Anesthesia & Analgesia. 2008 Dec 1;107(6):2056-60.
11. Yousef NK. Quadratus lumborum block versus transversus abdominis plane block in patients undergoing total abdominal hysterectomy: a randomized prospective controlled trial. Anesthesia, essays and researches. 2018 Jul;12(3):742.
12. Amany S A, Khaled M M. Effect of adding dexamethasone to bupivacaine on transversus abdominis plane block for abdominal hysterectomy: a prospective randomized controlled trial. Saudi J Anaesth.2012 Jul-Sep;6(3):229-233.
13. Ammar AS, Mahmoud KM. Effect of adding dexamethasone to bupivacaine on transversus abdominis plane block for abdominal hysterectomy: A prospective randomized controlled trial. Saudi journal of anaesthesia. 2012 Jul;6(3):229.
14. Elsharkawy H, El-Boghdadly K, Barrington M. Quadratus lumborum block: anatomical concepts, mechanisms, and techniques. Anesthesiology. 2019 Feb;130(2):322-35.
15. Baytar Ç, Yılmaz C, Karasu D, Topal S. Comparison of ultrasound-guided subcostal transversus abdominis plane block and quadratus lumborum block in laparoscopic cholecystectomy: a prospective, randomized, controlled clinical study. Pain Research and Management. volume 2019 Oct;2019. (https://doi.org/10.1155/2019/2815301)
16. El-Boghdadly K, Desai N, Halpern S, Blake L, Odor PM, Bampoe S, Carvalho B, Sultan P. Quadratus lumborum block vs. transversus abdominis plane block for caesarean delivery: a systematic review and network metaanalysis. Anaesthesia. 2021 Mar;76(3):393-403.
17. Jadon A, Amir M, Sinha N, Chakraborty S, Ahmad A, Mukherjee S. Quadratus lumborum or transversus abdominis plane block for postoperative analgesia after cesarean: a double-blinded randomized trial. Brazilian Journal of Anesthesiology (English Edition). 2021 Jul 8.(http//doi.org/10.1016/j.bjane.2021.06.014)
18. Verma K, Malawat A, Jethava D, Jethava DD. Comparison of transversus abdominis plane block and quadratus lumborum block for post-caesarean section analgesia: A randomised clinical trial. Indian journal of anaesthesia. 2019 Oct; 63(10):820-826.
19. Kumar GD, Gnanasekar N, Kurhekar P, Prasad TK. A comparative study of transversus abdominis plane block versus quadratus lumborum block for postoperative analgesia following lower abdominal

surgeries: a prospective double-blinded study. Anesthesia, essays and researches. 2018 Oct;12(4):91-923.

20. Oksuz G, Bilal B, Gurkan Y, Urfalioglu A, Arslan M, Gisi G, et al. Quadratus lumborum block versus transversus abdominis plane block in children undergoing low abdominal surgery: A Randomized controlled trial. Reg Anesth Pain Med 2017;42: 674-9.
21. Blanco R, Ansari T, Girgis E. Quadratus lumborum block for postoperative pain after caesarean section: a randomised controlled trial. European Journal of Anaesthesiology| EJA. 2015 Nov 1; 32(11):812-8.