

COMPARISON OF THE ANALGESIC EFFICACY OF ULTRASOUND-GUIDED BILATERAL QUADRATUS LUMBORUM BLOCK VERSUS ERECTOR SPINAE PLAIN BLOCK FOR POSTOPERATIVE ANALGESIA IN TOTAL ABDOMINAL HYSTERECTOMY UNDER SPINAL ANAESTHESIA: A COMPARATIVE PROSPECTIVE STUDY

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ABSTRACT

Background: Hysterectomy is one of the most common major surgeries performed in gynaecology. post operative pain is an inevitable consequence of surgical incision involving full thickness of abdominal wall given in abdominal hysterectomy. Conventional method of pain management includes use of intravenous and oral NSAIDS and opioid. Use of Intrathecal opioid and epidural analgesia has been explored for post operative management. Regional anaesthesia gives a new ray of hope for post operative pain management. The aim of our study to compare the efficacy of bilateral Quadratus Lumborum block (QLB) and erector spinae plane block (ESPB) for post operative analgesia in total abdominal hysterectomy.

Material and Method: This Prospective observational study was carried out among 60 patients, which scheduled for elective surgery after getting approval from ethical committee and informed written consent from all patients, the prospective observational study was conducted on adult patients of either sex satisfying inclusion criteria. In our study patients were randomized into 2 groups (30 patient in each group), group QLB (spinal anaesthesia + USG guided bilateral QL3 block) and group ESPB (spinal anaesthesia + USG guided bilateral ESPB block). Post operative pain using NRS, time for first rescue analgesia and total analgesic requirement of the patient amongst all two groups were observed and compared.

Result: The mean NRS on rest and movement both were found to be significantly less in QLB group than ESPB group. Injection fentanyl was used as rescue analgesia for patients with NRS > 4. Patients belonging to group ESPB received rescue analgesia faster and significantly higher amount as compared with group QLB.

Conclusion: It can be concluded that patient undergoing total abdominal hysterectomy surgery Quadratus lumborum block and erector spinae plane block, both are effective but Quadratus lumborum block is more effective in decreasing postoperative pain and post operative analgesic consumption and lead to greater patient satisfaction, without any serious side effect oral hemodynamic instability.

Keywords: Hysterectomy, Erector spinae plane block, Quadratus lumborum block, Ultrasound, post operative pain, Numerical rating scale.

1. INTRODUCTION

Post operative pain is an inevitable consequence of surgical incision involving full thickness of abdominal wall given in abdominal hysterectomy. The intensity of pain is highest in first 48 hours of post-surgery that might lay foundation of undesirable outcomes like cardiac and pulmonary complications, venous thromboembolism, impaired wound healing and adverse health outcome.^[1] Both ESPB and QLB provide effective post operative pain relief in TAH patients but there is no research yet to advocate superiority or recommend one over the other. Therefore, we propose to conduct a prospective study to compare the “Efficacy of bilateral Quadratus lumborum (QL3) block and Erector spinae Plane block for post operative analgesia in total abdominal hysterectomy”. Regional anaesthesia gives a new ray of hope in post-operative pain management.^[2] Truncal nerve block and interfascial blocks are versatile in nature and have showed encouraging result in pain management after surgery.^[3] Erector spinae block is a contemporary technique which is frequently used and was first described by Forero et al for use in thoracic neuropathic pain.^[4] Further advancement of technique has extended its utility in acute pain after breast surgeries, thoracotomies, and abdominal surgeries to chronic neuropathic pain.^[5]

2. MATERIAL AND METHODS

The proposed study was conducted on female patients aged 35-65 years, ASA status I & II scheduled for elective total abdominal hysterectomy under spinal anaesthesia in Routine Operation Theatre of Department of Obstetrics and Gynaecology in Nehru Hospital in B.R.D. Medical College, Gorakhpur after approval from ethical committee and obtaining informed written consent from all female patients.

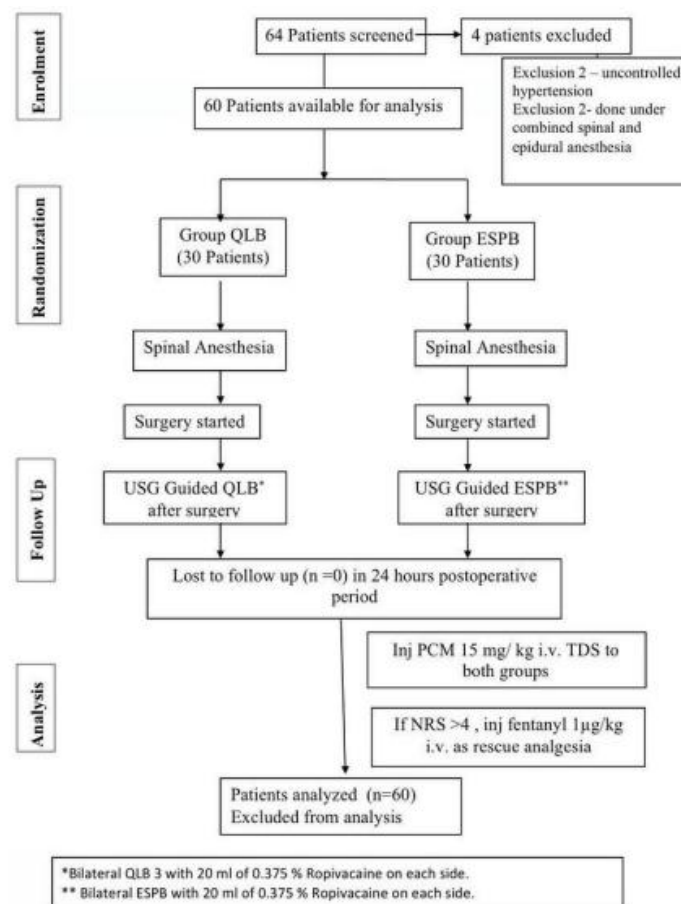
60 patients, scheduled for elective surgery after getting approval from ethical committee and informed written consent from all patients, the prospective observational study was conducted on adult patients of either sex satisfying inclusion criteria. In our study patients were randomized into 2 groups (30 patient in each group), group QLB (spinal anaesthesia + USG guided bilateral QL3 block) and group ESPB (spinal anaesthesia + USG guided bilateral ESPB block). Post operative pain using NRS, time for first rescue analgesia and total analgesic requirement of the patient amongst all two groups were observed and compared.

INCLUSION CRITERIA

1. Female patients scheduled for elective total abdominal hysterectomy under spinal anaesthesia
2. Age 35 years to 65 years
3. Patients with ASA physical status I and II

EXCLUSION CRITERIA

1. Refusal or consent denied from patient
2. ASA status III or more.
3. Patient on anticoagulant treatment without monitoring of coagulation profile
4. Local site infection
5. Hypersensitivity to local anaesthetic used in study
6. Pregnant patients
7. Patients with systemic hypertension, cardiovascular disease, cerebrovascular insufficiency, renal or hepatic insufficiency
8. Patients converted to general anaesthesia intra-operatively
9. Failed spinal anaesthesia
10. Spinal deformity
11. Patients who are on chronic pain medication
12. Participants having difficulty in visualisation of sono-anatomy of QL or ESP
13. Participants having difficult airway
14. Participants with communication disabilities



Consort flow diagram

*Bilateral QLB3 with 20 ml of 0.375% ropivacaine on each side.

**Bilateral ESPB with 20 ml of 0.375% ropivacaine on each side.

3. OBSERVATION AND RESULT

Table 1-Analysis of Absolute Change in NRS on Rest Over Time

The following table summarizes the mean change in NRS on Rest from the 1st Hour Post-Operative timepoint to the various follow-up timepoints.

Timepoint Comparison	Change in NRS on Rest from 1st Hour Post-Operative to Follow-up Timepoints				P-Value for Comparison of the two Groups in Terms of Difference of NRS on Rest from 1st Hour Post-Operative to Follow-up Timepoints
	Group: QLB		Group: ESPB		
	Mean (SD) of Absolute Change	P Value of Change Within Group	Mean (SD) of Absolute Change	P Value of Change Within Group	
2nd Hour Post-Operative - 1st Hour Post-Operative	0.00±0.00	1.000	0.27±0.69	1.000	0.022
3rd Hour Post-Operative - 1st Hour Post-Operative	0.00±0.00	1.000	1.03±0.96	0.777	<0.001

Timepoint Comparison	Change in NRS on Rest from 1st Hour Post-Operative to Follow-up Timepoints				P-Value for Comparison of the two Groups in Terms of Difference of NRS on Rest from 1st Hour Post-Operative to Follow-up Timepoints
	Group: QLB		Group: ESPB		
	Mean (SD) of Absolute Change	P Value of Change Within Group	Mean (SD) of Absolute Change	P Value of Change Within Group	
4th Hour Post-Operative - 1st Hour Post-Operative	0.43±0.57	0.893	2.27±1.05	<0.001	<0.001
5th Hour Post-Operative - 1st Hour Post-Operative	1.13±0.73	0.039	2.76±1.02	<0.001	<0.001
6th Hour Post-Operative - 1st Hour Post-Operative	2.03±0.89	<0.001	3.93±1.23	<0.001	<0.001
12th Hour Post-Operative - 1st Hour Post-Operative	3.23±0.97	<0.001	4.73±0.94	<0.001	<0.001
18th Hour Post-Operative - 1st Hour Post-Operative	3.00±0.98	<0.001	4.43±1.33	<0.001	<0.001
24th Hour Post-Operative - 1st Hour Post-Operative	2.97±0.93	<0.001	3.60±1.28	<0.001	0.087

Post-Hoc pairwise tests for Friedman test performed using Nemenyi test were used to explore the statistical significance of the change in NRS on Rest from the 1st Hour Post-Operative timepoint to the various follow-up timepoints. Group comparisons for change in NRS on Rest performed using Wilcoxon-Mann-Whitney Test. Green background denotes statistically significant difference at $p < 0.05$.

- The two groups differed significantly in terms of change in NRS on Rest from the 1st Hour Post-Operative timepoint to the following timepoints: 2nd Hour Post-Operative, 3rd Hour Post-Operative, 4th Hour Post-Operative, 5th Hour Post-Operative, 6th Hour Post-Operative, 12th Hour Post-Operative, 18th Hour Post-Operative.
- There was a significant difference between the 2 groups in terms of NRS on Rest (2nd Hour Post-Operative to 18th Hour Post-Operative) with the median NRS on Rest being lowest in the QLB Group.
- There was no significant difference between the groups in terms of NRS on Rest in 1st Hour Post-Operative and 24th Hour Post-Operative.

TABLE. 2 Comparison of the two Groups in Terms of change in NRS on movement over time.

NRS on Movement	Group		P value for comparison of the two groups at each of the timepoints (Wilcoxon-Mann-Whitney Test)
	QLB	ESPB	
	Mean (SD)	Mean (SD)	
1st Hour Post-Operative	0.00 ±0.00	0.21 ±0.68	0.076
2nd Hour Post-Operative	0.03 ±0.18	0.90 ±1.30	<0.001
3rd Hour Post-Operative	0.43 ±0.50	2.10 ±1.21	<0.001
4th Hour Post-Operative	1.40	3.47 ±1.17	<0.001

NRS on Movement	Group		P value for comparison of the two groups at each of the timepoints (Wilcoxon-Mann-Whitney Test)	
	QLB	ESPB		
	Mean (SD)	Mean (SD)		
	±0.56			
5th Hour Post-Operative	2.03 ±0.72	3.90 ±1.06		<0.001
6th Hour Post-Operative	3.03 ±0.89	5.40 ±1.52		<0.001
12th Hour Post-Operative	4.30 ±1.06	6.37 ±1.27		<0.001
18th Hour Post-Operative	4.07 ±1.14	5.80 ±1.49		<0.001
24th Hour Post-Operative	3.97 ±0.93	4.67 ±1.42		0.068
P Value for change in NRS on Movement over time within each group (Friedman Test)	<0.001	<0.001		
Overall P Value for comparison of change in NRS on Movement over time between the two groups (Generalized Estimating Equations)	<0.001			
	Wilcoxon-Mann-Whitney U Test			
	QLB	ESPB	W	p value
Mean (SD)	13.25 ±4.17	6.40 ±2.70		
Median (IQR)	12 (11-15.25)	6 (5-8)	784.000	<0.001
Min - Max	6 – 24	2 – 12		

- The two groups differed significantly in terms of NRS on Movement at the following timepoints: 2nd Hour Post-Operative, 3rd Hour Post-Operative, 4th Hour Post-Operative, 5th Hour Post-Operative, 6th Hour Post-Operative, 12th Hour Post-Operative, 18th Hour Post-Operative.
- The overall change in NRS on Movement over time was compared in the two groups using the Generalized Estimating Equations method. There was a significant difference in the trend of NRS on Movement over time between the two groups (p = <0.001).
- There was a significant difference between the 2 groups in terms of NRS on Movement (2nd Hour post - operative to 18th Hour post -operative), with the median NRS on Movement being lowest in QLB Group.

Table 3-Association between 'Group' and 'Time for First Rescue Analgesia (Hours)'

Time For First Rescue Analgesia (Hours)	Group		Wilcoxon-Mann-Whitney U Test	
	QLB	ESPB	W	p value
Mean (SD)	13.25±4.17	6.40 ±2.70	784.000	<0.001
Median (IQR)	12 (11-15.25)	6 (5-8)		
Min – Max	6 - 24	2 - 12		

There was a significant difference between the 2 groups in terms of Time For First Rescue Analgesia (Hours) (W = 784.000, p = <0.001), with the median Time For First Rescue Analgesia (Hours) being highest in the Group: QLB group.

4. DISCUSSION

This study shows that Quadratus Lumborum block (QLB) and Erector Spinae plane block (ESPB) significantly reduce postoperative pain in initial 24 hours after total abdominal hysterectomy. It also leads to prolonged period of analgesia in both the group. The comparison of NRS between the study groups at 1st, 2nd, 3rd, 4th, 5th, 6th, 18th and 24th hr revealed that the mean value of NRS was significantly higher in group ESPB as compared to group QLB (p<0.001). This difference in the mean NRS at rest was significant at all points except at 1st hour, which can result from the fact that the QLB takes its effect when the spread of LA occurs from its lumbar deposition site into the paravertebral space. The onset time of QLB depends on a number of factors like vascularity of the area, tissue plane where LA is deposited, type and concentration of LA which is used. These findings are supported by the study done by **Borglum et al** [6] where they stated that onset of QLB analgesia occurs approximately 30 minutes after block administration.

The difference in mean NRS at rest increased markedly from 1st hour to 12th hour and then decreased slightly towards end of the observed period of 24 hours, though the mean value always remained higher in group ESPB. This finding correlates with the study done by **Murouchi et al** [7], where they found that the effect of QLB lasts upto 24 hours, though this may vary with the LA volume given to the patients. The mean value of NRS during movement were higher in both the groups, but the patient in group QLB had significantly lower NRS than patient in group ESPB (p< 0.001). The study finding was comparable with studies done by **Kadam VR et al** [8-10] where they showed that the patient receiving QLB reported significant decrease in mean value of pain score as compared to control group. However, **Hamed et al** [11] in their study found bilateral ESPB provided effective postoperative analgesia and markedly decreased postoperative fentanyl consumption in patients undergoing an abdominal hysterectomy. While Yamak et al in their study found that bilateral postoperative guided ESP block can result in a good sensory blockade and visceral analgesia after an open abdominal hysterectomy. **Sebbag et al** [12] found that NRS values remained less than 6 during the first 24 hours after surgery with administration of QLB. The result of our study also in line with this finding, with the mean value of NRS at rest and movement in group QLB remaining below 6 at all-time points. **Ishio et al** [13] also found reduction in NRS scores, both at rest and movement and QLB group as compared to controls which once again support our findings.

Rescue analgesia was administered to the patients who had NRS >4 at any time interval during the observation period in the form of inj. Fentanyl (1µg/kg). It was found that the mean consumption of rescue analgesic (fentanyl) in 24 hours was significantly lower (p< 0.001) in Group QLB when compared to Group ESPB. In agreement with the present study, **Kadam VR et al** [8-10] demonstrated decreased demand of rescue analgesia. **Tulgar et al** [10] and **Sindwani et al** [14] also found that QLB resulted in lesser fentanyl consumption in their respective studies. The time taken for demand of first rescue analgesia in Group QLB was significantly longer as compared to Group ESPB. Congruent to our finding, **Ahmed et al** [15] also found that the patients receiving QLB had delayed time of first analgesic request. In addition, it was observed that in group ESPB, all patients

required rescue analgesia while in group QLB, 2 patients did not demand for fentanyl till 24 hours after the surgery. The heart rate (HR), systolic BP (SBP), diastolic BP (DBP) and MAP were recorded for each patient in both the study groups at different time-points intraoperatively and postoperatively.

There was no significant difference in the hemodynamic parameters in both the groups which shows that the QLB and ESPB has no unfavourable effects on HR, SBP, DBP and MAP of the patients. In our exhaustive literature search, we found no hemodynamic complications being reported in any study. This is of importance considering the fact that QLB is a deep block and carries with it, a risk of hematoma formation and organ injury.

The satisfaction of the patients with the QLB and their overall experience was noted by using seven-point Likert-type satisfaction scale after 24 hours of the surgery. In group QLB, 76.7% were extremely satisfied (grade=7) in group QLB and remaining 23.3% were satisfied (grade=6) with their experience. None of the patient in group QLB reported any dissatisfaction (grade <4). On the contrary, only 13.3% patients in group E reported satisfaction (grade = 6 or 7) while 30.0 % being somewhat satisfied (grade=5) and 46.7% being dissatisfied (grade < 4). This shows that the patients in group QLB fared better in terms of patient's satisfaction. This is supported by study done by **Sebbag et al** ^[12] where they also state in their findings that the patients who received QLB were well satisfied with quality of pain relief.

In our study, we sought to find out any complications associated with block procedure but none such events were reported in any of the patients. This study was conducted to study the efficacy of QLB block and ESP block in post operative analgesia in total abdominal hysterectomy.

The findings of this study were that the Quadratus Lumborum block provides superior pain relief to the patient undergoing total abdominal and spares them from excessive use of opioids by decreasing its demand. It has a prolonged analgesic action as compared to Erector Spinae Plane block which further reduces the need to institute any kind of analgesics.

This study adds to our knowledge the understanding that patients undergoing in total abdominal hysterectomy will surely benefit from the administration of the QL block and will have a better outcome.

We recommend that QL block can be used as the main component of multimodal analgesia postoperatively. However, we have a few limitations to this study.

Limitations:

1. In this study, the LA dose is fixed in all patients irrespective of height, weight and age. Variable volumes of LA in regard to each QL block have been reported. Considering previous reports, we have given 20 mL of LA at each side. This is a topic for further research.
2. The block procedure were performed after spinal anaesthesia. Thus it is not possible to assess the sensory block area and detect potential block failure.
3. Possibility of inter- individual variability in extent of block cannot be ruled out due to patient factors such as differences in amount of adipose tissue and anatomical variations.
4. Although all the patients were instructed about Numeric Rating Scale (NRS) prior to the surgery, it being a subjective scale, the pain reporting can vary with the patient's own perception of pain and understanding of scale. However minuscule, this might add to some differences in inter-individual pain scoring.
5. In the initial postoperative period, the reduced NRS may be due to the combined effect of subarachnoid block working in tandem with the QL block.
6. Small sample size leads to higher variability, which may lead to bias.
7. The block requires use of ultrasonography (USG) which requires training and experience in USG guided needle techniques and has a learning curve associated with it.

5. CONCLUSION

The present study "Efficacy of USG guided bilateral Quadratus Lumborum Block and Erector Spinae Plane Block for post operative analgesia in patients undergoing total abdominal hysterectomy: a prospective study" was conducted in the Department of Anaesthesiology Nehru Hospital BRD Medical College Gorakhpur, from October 2021 to September 2022, after due approval from ethical committee and informed written consent from all patients. As per inclusion and exclusion criteria 60 patients aged between 35 to 65 years of ASA physical status I and II scheduled for elective total abdominal hysterectomy under central neuraxial blockade were included in the study where group QLB (30 patients) received spinal anaesthesia with 0.5 % hyperbaric bupivacaine and USG guided bilateral quadratus lumborum block with 20 ml of 0.375% ropivacaine on each side after completion of surgery and group ESPB (30 patients) received spinal anaesthesia with 0.5 % hyperbaric bupivacaine and USG guided bilateral erector spinae plane block with 20 ml of 0.375% ropivacaine on each side after completion of surgery.

Post-operative NRS at rest and on movement was assessed at 1hr, 2hr, 3 hr, 4 hr, 5hr, 6hr, 12hr, 18hr, 24hrs. Secondary outcome like total postoperative analgesic consumption in first 24 Hours, and time taken to its requirement were noted Along with hemodynamic changes and complication post-operatively.

Satisfaction of patients was assessed using Likert-type verbal rating scale. Data was documented as per the study proforma and master chart was prepared. Statistical testing has been conducted with SPSS version 24(IBM Corp).

With careful appraisal of present study, it can be concluded that:

1. Both the groups were comparable demographically.
2. NRS on Rest and NRS on Movement both were significantly less in QLB Group than ESPB Group at all time intervals except at 1 hour.
3. There was significant difference between two Groups showing that QLB group was better in terms of time for first rescue analgesia in 2 Groups (Hours) ($p = <0.001$).
4. Total fentanyl consumption with the median Total fentanyl consumption was highest in the ESPB Group.
5. The QLB and ESPB groups differed significantly in terms of patient satisfaction score. Greater number of participants in the QLB group had Extremely Satisfied Patient Satisfaction Score as compared to participants in the ESPB group.
6. No haemodynamic instability or any complication were reported in patients of both groups.

So in this present study, it can be concluded that in patients undergoing total abdominal hysterectomy surgery quadratus lumborum block and Erector spinae plane block, both are effective but Quadratus Lumborum Block is more effective in decreasing postoperative pain and postoperative analgesic consumption and lead to greater patient satisfaction, without any serious side effects or hemodynamic instability. However more studies with larger population are needed to validate the result of our study.

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