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Original Research Article

A Hospital-Based Assessment of the Efficacy of Quadratus Lumborum Type-II and Erector Spinae Plane Block in Patients Undergoing Caesarean Section under Spinal Anaesthesia: a Comparative Study

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Abstract

Aim: The aim of the present study was to assess the efficacy of quadratus lumborum type-II and erector spinae plane block in patients undergoing caesarean section under spinal anaesthesia.

Methods: The present study was conducted at Department of Anaesthesia & Intensive care NMCH, Patna, Bihar, India and 100 pregnant women preparing for an elective cesarean delivery with spinal anaesthetic have been randomly assigned to one of two groups; QLP group and ESP group.

Results: There was no statistically significant difference in age, height, weight BMI, ASA and duration of surgery between the two groups. There was no statistically significant difference in mean arterial pressure and heart rate based on intra-operative between the two groups. There was no statistically significant difference in mean arterial pressure and heart rate based on post-operative between the two groups. There was no statistically significant differences exist between QLB and ESB regarding VAS score.

Conclusion: Ultrasound guided quadratus lumborum and erector spinae blocks provide an effective modality for control of postoperative pain associated with caesarean section. In patients undergoing caesarean section, both ultrasound-guided quadratus lumborum and erector spinae block have been linked to no significant side effects.

Keywords: Caesarean section, Postoperative analgesia, Quadratus lumborum block, Erector spinae plane block

Introduction

Caesarean delivery (CD) is the commonest surgical procedure performed worldwide. Adequately treated post caesarean pain allows early breastfeeding, enables the mother to take care of the new-born and helps in better maternal-neonatal bonding. [1] Management of post-delivery pain is thus one of the key determinants in improving perioperative care after CD.[2-4] Poorly managed pain after CD can lead to postpartum depression (approximate incidence of 19%), reduced breast feeding success, delayed early ambulation with risk of thromboembolism and progression to

persistent post-surgical pain. [2-5] The incidence of persistent post-caesarean pain has been found to be around 40% after three months and can last up to one year. [6,7] An ideal analgesic technique should not affect the mother's ability to take care of a newborn and is minimally transferred via breast milk. None of the single technique (neuraxial opioids, paracetamol, NSAIDS, or nerve blocks) provides sufficient analgesia and is devoid of adverse effects. Hence multimodal analgesia has been advocated to control postoperative pain.

With widespread availability and increase in expertise with the use of ultrasound by anaesthesiologist, truncal plane blocks like transversus abdominis plane (TAP) block, quadratus lumborum block (QLB), erector spinae plane (ESP) block are being increasingly used for the management of pain in obstetric patients. TAP block has been shown to minimize analgesic requirement and decrease the pain scores in postoperative period. However, it does not provide extensive analgesia due to inadequate visceral coverage and analgesic effect is mainly dependent on the anatomical technique used. [8]

Blanco described the quadrates lumborum block (QLB) for the first time in 2007 3. The main advantage of QLB over transverse abdominis plane block is that the local anesthetic agent is extended beyond the transverse abdominis plane to the thoracic paravertebral region. The greater the diffusion of local anesthetic agents, the broader the analgesic effect, and the longer the duration of the administered local anesthetic solution's action. Prior studies indicated that QLB might reduce opioid requirements in the postoperative period. [9] The erector spinae plane block (ESPB) is an interfacial plane block that was initially described as an effective therapeutic approach for thoracic neuropathic pain by Forero et al in 2016. [10] ESP blocks are being used as one of the pain treatment techniques for patients of all generations (newborns, infants, children, adolescents, and adults) having abdominal and thoracic surgeries with minimal complications compared to opioid consumption. [11]

The aim of the present study was to assess the efficacy of quadratus lumborum type-II and erector spinae plane block in patients undergoing caesarean section under spinal anaesthesia.

Materials and Methods

The present study was conducted at Department of Anaesthesia & Intensive care, NMCH, Patna, Bihar, India for three months and 100 pregnant women preparing for an elective cesarean delivery with spinal anaesthetic have been randomly assigned to one of two groups; QLP group and ESP group. We excluded patients with known hypersensitivity to study drugs, American Society of Anesthesiologists (ASA) class III and IV, [BMI]≥30kg/m², emergency operations, coagulation disorders and thrombocytopenia, infection at the injection site and insertion of needle, and patients' further refusal to participate in the study.

QLB Group: All members of this group were received bilateral quadratus lumborum block after spinal anesthesia at end of operation. The QLB was performed by using bupivacaine 0.25% (20 ml in each side).

ESB Group: All members of this group were received bilateral erector spinae block after spinal anesthesia at end of operation. The ESB was performed by using bupivacaine 0.25% (20 ml in each side).

Induction of anesthesia: For all patients, On arrival to the operative theatre monitor were be attached to the patient to display ECG, heart rate, non-invasive mean arterial blood pressure and oxygen saturation. Cesarean section was done under spinal anesthesia with 0.5% (2.2ml) heavy bupivacaine.

QL block technique: Ultrasound guided QLB was performed by placing the patient in a lateral posture with the side that was to be anaesthetized turned upward. Skin and transducer preparation was done. The

sterilized gel sufficiently coated the transducer ultrasound. The needle inserted from the posterior to anterior, toward the intersection of the tapering transverse abdominis muscles and the lateral border of the QL muscle. The transverses abdominis muscle's aponeurotic connection was then penetrated, and local anesthetic was deposited in the lateral border of the QL muscle at the intersection with the transversal is fascia (a possible area medial to the abdominal wall muscles and anterolateral to quadrates lumborum muscle).

ES Block technique: The ultrasound-guided ESB was performed by placing the patient in a lateral posture, having the side to be injected turned upward. A high-frequency linear ultrasound transducer had been sagittally positioned against thoracic vertebra 12 (T12) in the lateral posture and moved about 3-cm lateral to the spinous process of the spine. The tip of the transverse processes and the erector spinae muscle have been recognized, and a needle has been progressed in a plan from cephalic to caudal via the interfascial plane between the erector spinae and the underlying transverse process, followed by the injection of local anesthetic into the space between the two.

Postoperative measurements: Heart rate, Mean arterial blood pressure. Oxygen saturation was recorded before induction of spinal anesthesia, every 10 minutes intraoperatively and in PACU, then at 1,2,4,8,12,24 hours postoperatively. Patient satisfaction, Time of first analgesia required by the patient. Total amount of analgesia consumption (morphine) were be collected and recorded at the end of the 24 post-operative hours. Acute postoperative somatic and visceral pain within the first 24 hours postoperatively were assessed by using VAS (0-10) where 0=no pain, 10=worst pain at PACU and postoperative patient room at 1,2, 4,8,12,24hours postoperatively. For all patients of the two groups, ketolac (30mg iv infusion was given every 12 hours) rescue pain analgesia was given postoperatively for visual analogue scale (VAS)≥4 by morphine (.05mg/kg iv). VAS was reassessed 15 minutes later to any rescue analgesic injection.

Statistical Analysis:

The statistical package for social sciences, version 22.0, has been employed to analyze the data that has been collected (SPSS Inc., Chicago, Illinois, USA). The mean ± standard deviation (SD) of quantitative data is used (SD). The median, or frequency and percentage, of qualitative data are used. When comparing two means, the independent-samples t-test has been employed to determine significance. Mann-Whitney U test: used in non-parametric data for two-group comparisons. When comparing percentages between two qualitative variables, the Chi-square (x2) test of significance has been applied. The margin of error accepted is 5%, with a confidence interval of 95%. As a result, a P value of < 0.05 is deemed significant, whereas a P value of < 0.001 is regarded as highly significant.

Results

Table 1: Comparison of the studied groups based on demographic data

	QLB group	**ESB group**	**P Value**
	Mean ± SD	**Mean ± SD**	
Age	29.61±3.90	29.41±3.80	0.810
Height	168.70±4.50	169.50±9.40	0.080
Weight	71.29±4.32	74.36±8.16	0.920
Body Mass Index (BMI)	25.15±1.20	24.48±2.07	0.710
ASA I N%	32 (64)	26 (52)	0.320
ASA II N%	18 (36)	24 (48)	
Duration of surgery (mins)	52.40 ± 12.90	50.20 ± 12.96	0.610

There was no statistically significant difference in age, height, weight BMI, ASA and duration of surgery between the two groups.

Table 2: Comparison of study groups based on intra-operative mean arterial blood pressure (mmHg)

MABP	QLB group	ESB group	P-value
Base	69.40 ± 5.25	69.10 ± 8.32	0.735
10 min.	57.13 ± 8.00	57.50 ± 9.51	0.327
20 min.	65.05 ± 6.34	64.70 ± 3.14	0.333
30 min.	66.34 ± 5.39	65.10 ± 3.90	0.240
40 min.	67.60 ± 5.20	67.01 ± 8.42	0.840
50 min.	66.40 ± 5.30	66.10 ± 5.50	0.851
60 min.	68.40 ± 6.30	67.90 ± 8.40	0.931
70 min.	80.20 ± 8.50	77.30 ± 9.81	0.110

There was no statistically significant difference in mean arterial pressure based on intra-operative between the two groups.

Table 3: Comparison of study groups based on intraoperative heart rate

Pulse	QLB group	ESB group	P-value
Base	98.64 ± 18.05	97.20 ± 13.34	0.750
10 min.	98.12 ± 12.23	103.00 ± 13.27	0.183
20 min.	105 ± 18.26	97.20 ± 15.55	0.110
30 min.	107.20 ± 5.82	106.76 ± 7.72	0.821
40 min.	92.04 ± 5.09	94.00 ± 2.87	0.100
50 min.	90.28 ± 7.23	90.72 ± 5.39	0.808
60 min.	86.96 ± 5.74	87.32 ± 4.48	0.806
70 min.	85.64 ± 6.10	84.68 ± 5.92	0.575

There was no statistically significant difference in heart rate based on intra-operative between the two groups.

Table 4: Comparison of study groups based on postoperative mean arterial pressure (MAP)

Postoperative MABP	QLB group	ESB group	P-value
PACU	79.40 ± 8.50	77.33 ± 9.52	0.112
1 hr	83.30 ± 5.10	82.43 ± 6.42	0.312
2 hrs	84.36 ± 6.40	83.40 ± 6.60	0.440
4 hrs	85.00 ± 6.44	84.25 ± 7.25	0.375
8 hrs	81.47 ± 6.75	81.30 ± 6.00	0.378
12 hrs	80.78 ± 5.98	80.01 ± 8.20	0.445
24 hrs	79.21 ± 5.86	78.24 ± 5.20	0.628

There was no statistically significant difference in mean arterial pressure based on intra-operative between the two groups.

Table 5: Comparison of study groups based on postoperative heart rate

Postoperative pulse		QLB group	ESB group		P-value
PACU		86.34 ± 7.10	84.68 ± 5.92		0.520
1 hr		85.15 ± 6.22	86.00 ± 6.40		0.434
2 hrs		86.00 ± 5.25	85.30 ± 3.70		0.175
4 hrs		83.30 ± 3.14	82.08 ± 5.25		0.180
8 hrs		82.18 ± 4.77	82.08 ± 4.18		0.180
12 hrs		80.42 ± 4.55	79.30 ± 4.50		0.240
24 hrs		79.28 ± 5.90	77.40 ± 4.68		0.232

There was no statistically significant difference in heart rate based on intra-operative between the two groups.

Table 6: Comparison of study groups based on post-operative VAS

VAS Score		QLB group	ESB group	P-value
PACU		1(1 – 1)	1(1 – 1)	1.000
1 hr		1(1 – 1)	1(1 – 1)	1.000
2 hrs		1(1 – 1)	1(1 – 1)	1.000
4 hrs		1(1 – 2)	1(1 – 1)	0.730
8 hrs		1(1 – 3)	1(1 – 3)	0.820
12 hrs		4(1 – 4)	2(1 – 4)	0.240
24 hrs		4(4 – 5)	4(2 – 4)	0.150

There was no statistically significant differences exist between QLB and ESB regarding VAS score.

Discussion

Acute pain after caesarean section (CS) can lead to postpartum depression and decreased breastfeeding, therefore affecting maternal well-being and neonatal care. [12] Persistent pain after CS can occur due to inadequate analgesia in the immediate postoperative period, so guidelines have been proposed to streamline post-CS pain management and thus improve recovery outcomes. [4] Non-steroidal anti-inflammatory drugs (NSAIDs), opioids, intravenous ketamine, wound infiltration with local anaesthetic drugs, transverse abdominis plane (TAP) block, and intrathecal and epidural additives have been applied to control postoperative pain following CS but all have limitations. [13] Quadratus lumborum block (QLB) targets thoracolumbar nerves close to the quadratus lumborum muscle. [14] An increased density of sympathetic fibres and mechanoreceptors in this region contributes to both somatic and visceral analgesia, unlike TAP block, which provides only somatic analgesia. [15] The erector spinae plane block (ESPB) involves local anaesthetic drug injection over the transverse process of thoracic vertebrae below the erector spinae muscle. It provides somatic and visceral analgesia by action on the ventral rami and rami communicantes of spinal nerves. [16]

There was no statistically significant difference in age, height, weight BMI, ASA and duration of surgery between the two groups. There was no statistically significant difference in mean arterial pressure and heart rate based on intra-operative between the two groups. The results of this study agreed with the study done by Aygun in (2020), who compared ultrasound guided ESP Block with QL Block for postsurgical analgesia in patients undergoing laparoscopic cholecystectomy. There were two groups of 80 patients (ESP group, QLP group). During the first 24 hours after surgery, mean opioid use and numeric rating scores have been measured. There was no significant difference

between the groups in terms of NRS scores or opioid use at any hour. [17]

There was no statistically significant difference in mean arterial pressure and heart rate based on post-operative between the two groups. There was no statistically significant differences exist between QLB and ESB regarding VAS score. Meta-analysis of various approaches to QLB for post-CS analgesia concluded that QLB, when compared with placebo or no intervention, significantly reduced 24-h IV morphine requirement by 14.1 mg (95% CI −20.8 to −7.5 mg), and reduced pain scores at 12 h. [18] The results of this study agreed with the study done by Tulgar in (2018), who compared ultrasound guided ESP Block and QL Block for postsurgical analgesia during hip and proximal femur surgeries. A total of 60 patients were divided into three groups of similar size (control group with standard multimodal analgesia, QLP group, and ESP group). Numeric Rating Scores were used to compare the intensity of pain in each group. Tramadol use and the need for further rescue analgesics were also measured. The outcomes showed that there was no difference in Numeric Rating Scale (NRS) score between the block groups at any hour; tramadol usage during the first 12 hours, as well as the number of patients who needed rescue analgesics in the next 24 hours, were significantly greater in the control group than in both block groups. [19]

Conclusion

Ultrasound guided quadratus lumborum and erector spinae blocks provide an effective modality for control of postoperative pain associated with caesarean section. In patients undergoing caesarean section, both ultrasound-guided quadratus lumborum and erector spinae block have been linked to no significant side effects.

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