

## Comparative Study between Ultrasound Guided Quadratus Lumborum Plane Block Versus Ultrasound Guided Erector Spinae Plane Block for Postoperative Pain Relief in Patients undergoing Elective Caesarean Section

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Received for publication November 11, 2021; Accepted February 19, 2022; Published online February 19, 2022.

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doi: 10.21608/aimj.2022.104869.1648

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### ABSTRACT

**Background:** For elective cesarean birth, the anesthetic technique of preference is neuraxial anesthesia (primarily spinal anaesthesia). Adequate postsurgical analgesia is a key component of ERAS protocols; it's much more important for women who are having a cesarean birth, and it's quickly acquiring popularity.

**Aim of The Work:** To assess the effectiveness of quadratus lumborum plane block versus Erector Spinae Plane Block as a post-operative analgesic following cesarean section.

**Patients and Methods:** A prospective randomized controlled single-blinded clinical research study on 50 patients aged 22 to 35 years old was conducted at Al-Azhar University hospitals in Cairo. After receiving institutional ethics committee approval, she was scheduled for an elective cesarean birth under spinal anesthesia without any other surgical intervention like tubal ligation or ovarian cyst removal. Patients were randomized into 2 groups to receive either Quadratus lumborum block (QLB Group) or erector spinae block anesthesia (ESB). Each group constitute of 25 patients (n=25).

**Results:** The results of this study showed that QLB and ESB provide a good analgesic effect in patients undergoing caesarean section. In terms of duration of analgesia and total analgesic consumption, the Erector spinae block performed better than the QLB, but there was no statistically significant difference with P= 0.158, P= 0.179, respectively.

**Conclusion:** Ultrasound guided quadratus lumborum and erector spinae blocks provide effective modality for control of postoperative pain associated with caesarean section.

**Keywords:** Ultrasound; Quadratus Lumborum; Erector spinae; Cesarean Delivery.

**Disclosure:** The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.

**Authorship:** All authors have a substantial contribution to the article.

### INTRODUCTION

One of the most prevalent surgical procedures in the globe is a Caesarean section (CS). Both the mom and the newborn suffer from post-operative pain, especially in the first 48 hours following delivery.<sup>1</sup>

Suboptimal analgesia has been linked to delayed functional recovery, delaying mobilization that might raise the risk of thromboembolic complications, weak mother-newborn bonding, breastfeeding problems, and an increased risk of persisting pain as well as postpartum depression. NSAIDs and opioids are the most commonly used analgesics. Nevertheless, the use of these drugs is limited by the associated side effects.<sup>2</sup>

Blanco described the quadratus lumborum block (QLB) for the first time in 2007<sup>3</sup>. 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.<sup>4</sup>

The erector spinae plane block (ESPB) is an interfascial plane block that was initially described as an effective therapeutic approach for thoracic neuropathic pain by Forero et al in 2016<sup>5</sup>. 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.<sup>6</sup>

### PATIENTS AND METHODS

**Study Design:** prospective randomized controlled single blinded clinical study.

**Ethical Considerations:** The study was performed with the agreement of the Al-Azhar University Hospitals' institutional ethical committee in Cairo. All parturients gave written informed consent to participate in the research.

### Eligibility Criteria and Assignment:

Following informed agreement, 50 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/m<sup>2</sup>, emergency operations, coagulation disorders and thrombocytopenia, infection at the injection site and insertion of needle, and patients' further refusal to participate in the study.

**Randomization:** Patients have been allocated to one of the study groups at random using a computer-generated table, with the randomized sequence hidden in sealed opaque envelopes.

**Sample size:** The sample size was calculated using Epi-Info software statistical package created by World Health organization and center for Disease Control and Prevention, Georgia, USA version 2002. The sample size was calculated at n=25 per each group. The criteria used for sample size calculation were as follows: 95% confidence limit, 80% power. Patients were randomized into 2 groups to receive either Quadratus lumborum block (QLB Group) or erector spinae block after spinal anesthesia (ESB). Each group constitute of 25 patients (n=25):

**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 eachside).

**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 eachside).

**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 Marcaine.

**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 transversalis 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 (x<sup>2</sup>) 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

The following tables and figures show the findings of the current research.

		QLB group No. = 25	ESB group No. = 25	Test value	P-value	Sig.
Age	Mean ± SD	28.72±3.84	28.48±3.99	-0.217•	0.829	NS
	Range	22–35	24–35			
Weight	Mean ± SD	72.20±4.29	75.84±9.16	1.799•	0.078	NS
	Range	65–80	60–90			
Height	Mean ± SD	169.84±4.83	169.80±10.51	-0.017•	0.986	NS

	Range	160–178	150–180			
	Body Mass Index (BMI)	Mean ± SD	25.06±1.59			
ASA	Range	22.9–28.3	22–28.7	0.739•	0.390	NS
	I	16(64.0%)	13(52.0%)			
Duration of surgery (min.)	II	9 (36.0%)	12 (48.0%)	-0.507•	0.614	NS
	Mean ± SD	53.20 ± 13.90	51.20 ± 13.97			
	Range	32 – 77	30 – 74			

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

	MABP	QLB group	ESB group	Test value	P-value	Sig.
		No. = 25	No. = 25			
Base	Mean ± SD	70.40 ± 5.45	69.76 ± 10.54	-0.270•	0.788	NS
	Range	60 – 80	60 – 88			
10 min.	Mean ± SD	55.12 ± 7.00	57.72 ± 10.60	1.023•	0.311	NS
	Range	40 – 70	40 – 86			
20 min.	Mean ± SD	66.04 ± 5.65	64.68 ± 3.80	-0.999•	0.323	NS
	Range	60 – 80	60 – 70			
30 min.	Mean ± SD	66.56 ± 5.44	65.04 ± 3.63	-1.162•	0.251	NS
	Range	62 – 80	62 – 70			
40 min.	Mean ± SD	66.56 ± 5.44	66.12 ± 7.43	-0.239•	0.812	NS
	Range	62 – 80	60 – 88			
50 min.	Mean ± SD	66.32 ± 5.66	66.04 ± 4.77	-0.189•	0.851	NS
	Range	60 – 80	60 – 77			
60 min.	Mean ± SD	66.52 ± 5.48	66.72 ± 7.43	0.104•	0.917	NS
	Range	62 – 80	60 – 88			
70 min.	Mean ± SD	80.52 ± 9.50	76.24 ± 8.97	1.638•	0.108	NS
	Range	65 – 95	60 – 90			

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

	Pulse	QLB group	ESB group	Test value	P-value	Sig.
		No. = 25	No. = 25			
Base	Mean ± SD	98.64 ± 18.05	97.20 ± 13.34	-0.321•	0.750	NS
	Range	70 – 130	70 – 117			
10 min.	Mean ± SD	98.12 ± 12.23	103.00 ± 13.27	1.352•	0.183	NS
	Range	80 – 120	87 – 125			
20 min.	Mean ± SD	105 ± 18.26	97.20 ± 15.55	-1.626•	0.110	NS
	Range	70 – 120	70 – 120			
30 min.	Mean ± SD	107.20 ± 5.82	106.76 ± 7.72	-0.228•	0.821	NS
	Range	100 – 117	90 – 117			
40 min.	Mean ± SD	92.04 ± 5.09	94.00 ± 2.87	-1.678•	0.100	NS
	Range	85 – 97	85 – 97			
50 min.	Mean ± SD	90.28 ± 7.23	90.72 ± 5.39	-0.244•	0.808	NS
	Range	70 – 100	80 – 97			
60 min.	Mean ± SD	86.96 ± 5.74	87.32 ± 4.48	-0.247•	0.806	NS
	Range	80 – 97	80 – 97			
70 min.	Mean ± SD	85.64 ± 6.10	84.68 ± 5.92	-0.565•	0.575	NS
	Range	70 – 98	70 – 98			

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

	Postoperative MABP	QLB group	ESB group	Test value	P-value	Sig.
		No. = 25	No. = 25			
PACU	Mean ± SD	80.52 ± 9.50	76.24 ± 8.97	1.638	0.108	NS
	Range	65 – 95	60 – 90			
1 hr	Mean ± SD	81.80 ± 4.05	80.40 ± 5.39	-1.039	0.304	NS
	Range	70 – 85	70 – 85			
2 hrs	Mean ± SD	84.60 ± 5.39	83.20 ± 7.62	-0.750	0.457	NS
	Range	70 – 90	70 – 90			
4 hrs	Mean ± SD	85.00 ± 5.77	83.40 ± 7.18	-0.869	0.389	NS
	Range	70 – 90	70 – 90			
8 hrs	Mean ± SD	82.80 ± 6.78	81.20 ± 6.00	-0.883	0.381	NS
	Range	70 – 90	70 – 90			
12 hrs	Mean ± SD	81.96 ± 5.98	80.40 ± 7.21	-0.810	0.422	NS
	Range	70 – 90	70 – 90			
24 hrs	Mean ± SD	79.40 ± 4.86	78.80 ± 5.26	-0.419	0.677	NS
	Range	70 – 85	70 – 85			

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

Postoperative pulse		QLB group No. = 25	ESB group No. = 25	Test value	P-value	Sig.
PACU	Mean $\pm$ SD	85.64 $\pm$ 6.10	84.68 $\pm$ 5.92	-0.565•	0.575	NS
	Range	70 – 98	70 – 98			
1 hr	Mean $\pm$ SD	84.12 $\pm$ 5.26	83.00 $\pm$ 5.95	-0.705•	0.484	NS
	Range	70 – 90	70 – 90			
2 hrs	Mean $\pm$ SD	86.00 $\pm$ 4.33	84.20 $\pm$ 4.72	-1.406•	0.166	NS
	Range	80 – 90	75 – 90			
4 hrs	Mean $\pm$ SD	82.60 $\pm$ 3.77	81.08 $\pm$ 4.28	-1.332•	0.189	NS
	Range	75 – 88	75 – 88			
8 hrs	Mean $\pm$ SD	82.60 $\pm$ 3.77	81.08 $\pm$ 4.28	-1.332•	0.189	NS
	Range	75 – 88	75 – 88			
12 hrs	Mean $\pm$ SD	79.76 $\pm$ 4.57	78.28 $\pm$ 4.50	-1.154•	0.254	NS
	Range	70 – 88	70 – 85			
24 hrs	Mean $\pm$ SD	78.28 $\pm$ 5.92	76.52 $\pm$ 4.68	-1.166•	0.249	NS
	Range	70 – 90	70 – 85			

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

VAS Score		QLB group No. = 25	ESB group No. = 25	Test value	P-value	Sig.
PACU	Median (IQR)	1(1 – 1)	1(1 – 1)	0.000 $\neq$	1.000	NS
	Range	1 – 1	1 – 1			
1 hr	Median (IQR)	1(1 – 1)	1(1 – 1)	0.000 $\neq$	1.000	NS
	Range	1 – 1	1 – 1			
2 hrs	Median (IQR)	1(1 – 1)	1(1 – 1)	0.000 $\neq$	1.000	NS
	Range	1 – 1	1 – 1			
4 hrs	Median (IQR)	1(1 – 2)	1(1 – 1)	-0.319 $\neq$	0.750	NS
	Range	1 – 2	1 – 2			
8 hrs	Median (IQR)	1(1 – 3)	1(1 – 3)	-0.181 $\neq$	0.856	NS
	Range	1 – 4	1 – 4			
12 hrs	Median (IQR)	4(1 – 4)	2(1 – 4)	-1.064 $\neq$	0.287	NS
	Range	1 – 6	1 – 6			
24 hrs	Median (IQR)	4(4 – 5)	4(2 – 4)	-1.416 $\neq$	0.157	NS
	Range	1 – 6	1 – 6			

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

		QLB group No. = 25	ESB group No. = 25	Test value	P-value	Sig.
Morphine consumption	No	6 (24.0%)	10 (40.0%)	1.471*	0.225	NS
	Yes	19 (76.0%)	15 (60.0%)			
Morphine consumption (mg)	Median (IQR)	6 (3 – 7)	3 (3 – 7)	-1.343 $\neq$	0.179	NS
	Range	3 – 9	3 – 7			
Time of analgesia	Median (IQR)	12 (12 – 12)	12 (12 – 24)	-1.414 $\neq$	0.158	NS
	Range	8 – 24	8 – 24			
Patient satisfaction	8	4 (21.1%)	2 (13.3%)	2.547*	0.280	NS
	12	12 (63.2%)	7 (46.7%)			
	24	3 (15.8%)	6 (40.0%)			
	Poor	0 (0.0%)	0 (0.0%)	3.359*	0.186	NS
	Fair	6 (24.0%)	2 (8.0%)			
	Good	12 (48.0%)	11 (44.0%)			
	Excellent	7 (28.0%)	12 (48.0%)			

**Table 7:** Comparison between studied groups according to pain assessment.

There is no statistically significant difference in mean arterial pressure or heart rate between the two groups. Furthermore, there was no statistically significant difference in postoperative mean arterial pressure or postoperative heart rate between the two groups.

Regarding pain assessment, no statistically significant differences exist between QLB and ESB regarding VAS score, morphine consumption, time of analgesia, and patient satisfaction.

## DISCUSSION

The current study measured and compared postoperative hemodynamics in the forms of heart rate, mean arterial pressure. Morphine consumption, time of analgesia, and patient satisfaction were lower in the ESB group than in the QLB group, but there was no statistically significant difference,

demonstrating that QLB and ESB have approximately the same analgesic effect for pain control after caesarean section.

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.<sup>7</sup>

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.<sup>8</sup>

### 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. Overall satisfaction was good in both groups.

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