

**THE EFFECT BETWEEN TRANSVERSE ABDOMINIS PLANE BLOCK AND  
QUADRATUS LUMBORUM BLOCK ON ENDORPHIN BETA LEVELS AND PAIN  
SCALES IN POST CESAREAN SECTION PATIENTS**

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**ABSTRACT**

**Background:** Cesarean section is a surgical procedure that is often performed in labor and causes moderate to severe pain for 48 hours postoperatively. The provision of local anesthesia drugs post-cesarean section can be given by the Transverse Abdominis Plane (TAP) block and Quadratus Lumborum (QL) block. This study was to determine the effect of analgesia between the Transverse Abdominis Plane block and Quadratus Lumborum block on the scale of post-cesarean section pain and level of the beta-endorphin post-operative cesarean section under spinal anesthesia. **Methods:** An experimental randomized controlled clinical trial study was conducted on 30 pregnant women aged 18-45 years post-cesarean section who were treated electively with ASA I - II and anesthesia under spinal anesthesia. Patients who met the inclusion criteria were treated by dividing three groups randomly through the computer. In group A, control and Transverse Abdominis Plane Block are given; group B, given control and Quadratus Lumborum Block; and group C, given control (ketorolac and tramadol). Furthermore, it was recorded and measured the level of beta-endorphin, and the Wong Baker Faces Scale (WBFS) pain scale postoperatively and 6 hours postoperatively. Data collected then analyzed by SPSS's computer program. **Results:** The effect of QL block administration helps relieve the WBFS pain scale by five times and decreases beta-endorphin level by 0.2 times compared to TAP block administration. The effect of QL block administration helped relieve the WBFS pain scale by 13.5 times and decreased beta-endorphin level by 5.4 times compared to standard therapy. The effect of TAP block administration helps to reduce the WBFS pain scale by 7.4 times and to reduce beta-endorphin level by 5.1 times compared to standard therapy. **Conclusion:** QL block relieves the WBFS pain scale and decreases the beta-endorphin level better than the TAP block.

**Keywords:** Cesarean section, post-operative pain, beta-endorphin, Quadratus Lumborum block, Transversus Abdominis Plane block.

## ABSTRAK

**Latar belakang:** Operasi caesar merupakan tindakan pembedahan yang sering dilakukan dalam persalinan dan menyebabkan nyeri sedang hingga berat selama 48 jam pasca operasi. Pemberian obat anestesi lokal pasca seksio sesarea dapat diberikan dengan blok *Transverse Abdominis Plane* (TAP) dan blok *Quadratus Lumborum* (QL). Penelitian ini bertujuan untuk mengetahui pengaruh analgesia antara blok *Transverse Abdominis Plane* dan blok *Quadratus Lumborum* terhadap skala nyeri pasca seksio sesarea dan kadar beta-endorphin pasca seksio sesarea dengan anestesi spinal. **Metode:** Sebuah studi percobaan eksperimental klinis yang terkontrol dan acak dilakukan pada 30 wanita hamil usia 18-45 tahun pasca operasi caesar yang dirawat secara elektif dengan PS ASA I - II dan dilakukan pembiusan dengan anestesi spinal. Pasien yang memenuhi kriteria inklusi dibagi menjadi tiga kelompok secara acak melalui komputer. Dalam grup A, diberikan kontrol dan Blok *Transverse Abdominis Plane*; kelompok B, diberi kontrol dan Blok *Quadratus Lumborum*; dan kelompok C, diberi kontrol (ketorolac dan tramadol). Selanjutnya dicatat dan diukur kadar beta-endorphin, dan skala nyeri *Wong Baker Faces Scale* (WBFS) pasca operasi dan 6 jam pasca operasi. Data yang terkumpul kemudian dianalisis dengan program komputer SPSS. **Hasil:** Efek pemberian blok QL membantu meringankan skala nyeri WBFS sebanyak lima kali dan menurunkan tingkat beta-endorphin 0,2 kali dibandingkan dengan pemberian blok TAP. Efek pemberian blok QL membantu meringankan skala nyeri WBFS sebanyak 13,5 kali dan menurunkan tingkat beta-endorphin sebesar 5,4 kali dibandingkan dengan terapi standar. Efek pemberian blok TAP membantu mengurangi skala nyeri WBFS sebanyak 7,4 kali dan mengurangi tingkat beta-endorphin 5,1 kali dibandingkan dengan terapi standar. **Kesimpulan:** Blok QL mengurangi skala nyeri WBFS dan menurunkan tingkat beta-endorphin lebih baik daripada blok TAP.

**Kata kunci:** Seksio Sesarea, nyeri pasca operasi, beta-endorphin, *Quadratus Lumborum* blok, *Transversus Abdominis Plane* blok.

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## INTRODUCTION

Cesarean Section (CS) is one of the surgical procedures that is often performed in childbirth assistance.<sup>1</sup> CS causes moderate to severe pain for 48 hours. Pain after CS surgery can be caused by two components, namely somatic pain due to the wound itself and visceral pain originating from the uterus.<sup>1</sup> Borges, Pereira, and Moura research state that acute pain after Caesarea Sectio is 92.7%. Based on the intensity of the pain using the Numerical Rating Scale (NRS) obtained 15.2% mild pain (NRS 1-4), 32.6% moderate pain (NRS 5-6), and 52.2% severe pain (NRS 7-10).<sup>2</sup> The optimal management of post-operative analgesics that are safe, effective with minimal side effects on mother and baby is not yet known.<sup>1</sup> Provision of local anesthetic drugs after CS can be given by Wound infiltration, Transverse Abdominis Plane (TAP) Block and Quadratus Lumborum (QL) Block.<sup>3</sup> TAP block action in post-CS patients still feels pain (visceral pain), so we need a block that can block visceral pain, namely QL block.

Beta-endorphins are endogenous opioid neuropeptides that are involved in pain management, have effects like morphine, and are involved in natural circulation such as eating, drinking, sex,

and behavior.<sup>4,5</sup> Beta-endorphins are released from the pituitary together with Adrenocorticotrophic hormone (ACTH) during stress and/or trauma, and the release of beta-endorphins is also triggered by many environmental stimuli that activate the hypothalamus-pituitary-adrenal (HPA) axis. The response of the HPA axis system to surgery is known that ACTH plasma and cortisol increase during and after major surgery.<sup>6</sup> In patients who underwent surgery with general anesthesia, an increase in beta-endorphin levels was found postoperatively. In patients who underwent surgery with regional anesthesia, there was no change in beta-endorphins levels in the post-operative period.<sup>7,8</sup> Beta-endorphins work by binding to your opioid receptors, thereby inhibiting pain modulation. The level of pain experienced by the surgical patient during and after the procedure correlates with plasma endorphin levels. Research Matejec et al. found that pre and post-operative plasma endorphin levels were positively correlated with the severity of post-operative pain.<sup>9</sup> Serum concentration of beta-endorphins can be used as a measuring tool for acute pain and a tool for analgesic efficacy in post-operative patients.<sup>10</sup>

Based on the description above, the researcher will analyze the effect of

*Transverse Abdominis Plane* Block and *Quadratus Lumborum* Block on Beta-Endorphin Levels and Pain Scale in Post-Cesarean Section Patients.

## MATERIAL AND METHODS

### Study Design and Setting

This research is an experimental randomized controlled clinical trial study. This research was conducted at the Integrated Surgery Central Hospital Dr. Soetomo Surabaya and conducted from February to March 2020, after obtaining research ethics permit. Subjects were pregnant women undergoing Cesarean Section surgery with spinal anesthesia according to inclusion criteria. Samples were collected by consecutive sampling, then divided into three groups randomly by computer, namely: the *transverse abdominis plane* block group, the *quadratus lumborum* block group, and the control group (ketorolac and tramadol). In the three groups, pre and post-action beta-endorphin levels were examined, and the pain scale at 6 hours postoperatively. The number of research subjects was ten subjects in each group, with a total of 30 subjects

### Participant Selection Criteria

Inclusion criteria included: 1) Ages 18 - 45 years, 2) Physical Status ASA 1-2, 3) Cooperative patients, 4)

Elective patients and operations after 07.00 hours, 5) Patients have no history of cerebrovascular disease and cardiovascular disease, valve disease, diabetes mellitus, 6) Patients are willing to sign an informed consent sheet to participate in the study.

Exclusion criteria in this study were:

- 1) Patients with contraindications to anesthesia and nerve block,
- 2) Patients with pre-anesthesia arrhythmias,
- 3) Patients with BMI > 40 kg / m<sup>2</sup>,
- 4) Patients have no history of hypersensitivity to the studied drugs.

Drop out criterias in this study were:

- 1) Patients experiencing severe complications during cesarean section surgery: Bleeding more than 20% estimated blood volume, high/total spinal block, failed block (choice of anesthesia changed with general anesthesia),
- 2) Patients experiencing pain before or shortly after 2 hours postoperatively (WBFS  $\geq$  4),
- 3) Patients withdraw from participation.

## Exposure and Outcome

Patients who met the criteria for spinal anesthesia were performed spinal anesthesia using lidodex 5% 1.2-1.5 ml (60-75 mg) with targets as high as Thoracal 6 blocks. In group A (*transverse abdominis plane* block); After the operation is complete, the patient is in the supine position; the ultrasonographic probe is placed in the transverse plane between the lower costal margin and the iliac crest in the midaxillary line. The needle is advanced using the in-plane technique in the anteromedial-to-posterolateral direction. A needle is inserted between the internal oblique muscle aponeurosis and transversus abdominis. With intermittent aspiration, a local anesthetic is injected and is seen as a hypoechoic shadow that pushes two separate layers. Visualization of hypoechoic spread, with the fascial layer above and the muscular layer below, ensures proper distribution of local anesthetic drugs. The local anesthetic drug given was 0.1875% ropivacaine, 20 ml given on each side.

In group B (*quadratus lumborum* block); After the operation is completed, the patient is tilted right or left, a linear or curve ultrasound probe is placed in the axial plane in the midaxillary line and moves posteriorly to the lateral inter fascial triangle (LIFT), which

encapsulates the paraspinal muscles, and becomes visible between the latissimus dorsi and quadratus lumborum muscle. The target is the inner layer (PRS) of the middle layer of the TLF. The needle is inserted from the lateral end of the transducer. The needle tip is advanced

until it is in the middle layer of the TLF close to the LIFT. Local anesthesia is injected intrafascially. The local anesthetic drug given was 0.1875% ropivacaine, 20 ml given on each side. If the patient experiences pain with more than 3 WBFS, rescue fentanyl fifty mcg is given. If the patient experiences local anesthetic drug toxicity, resuscitation is carried out according to AAGBI (Association of Anesthetist of Great Britain and Ireland) guidelines. The patient's blood is drawn as much as 3 mL after surgery or before the TAP block or QL block, and 6 hours after the TAP block or QL block. Blood sampling is done aseptically and placed in a tube of Ethylene Diametraetic Acid (EDTA) and sent to a laboratory for examination using the Enzyme-Linked Immuno Sorbent Assay (ELISA) method according to the manufacturer's inspection instructions Elabscience Biotechnology. In the three groups, pre and post-action beta-endorphin levels were examined, and the pain scale at 6 hours postoperatively.

## Statistical Analysis

Statistical analysis was performed using SPSS statistics software version 25. Comparative statistical tests between the *transverse abdominis plane* block group, the *quadratus lumborum* block group, and the control group with beta-endorphins and pain scales were used by Anova, Wilcoxon Signed Ranks test, Kruskal-

Wallis test, and Cohen's d test.

## RESULTS

The study was conducted on 30 pregnant women patients after cesarean section surgery in the recovery room of the Integrated Surgery Center Building at RSUD Dr. Soetomo Surabaya from February to March 2020. The operation began between 09.00 and 17.00.

**Table 1.** Age characteristics of research subjects

Age (yr)	n (sample size)	Percentage (%)
< 20	0	0
20 - 30	10	33.3
30 - 40	17	56.7
41 - 44	3	10

**Table 2.** Body Mass Index (BMI) characteristics of research subjects

BMI (kg/m <sup>2</sup> )	n (sample size)	Percentage (%)
< 18.5	0	0
18.5 – 24.9	7	23.3
25 – 29.9	15	50
30.0 – 34.9	6	20
35.0 – 39.9	2	6.7

**Table 3.** Age and BMI statistical results

	TAP block (n=10)	QL block (n=10)	Control (n=10)	<i>p</i>
Age	32.9 ± 6.1	33.6 ± 5.4	31.3 ± 5.9	0.664*
BMI	26.2 ± 4.5	27.8 ± 3.8	28.8 ± 5.9	0.456*

\*) Anova's Test

Age and BMI characteristics in the three groups were no different ( $p > 0.05$ ).

**Table 4.** Wong Baker FACES Scale (WBFS) values between groups of TAP blocks, QL blocks and controls

	TAP (n=10)	QL (n=10)	Control (n=10)	<i>p</i>
WBFS post op	0 (0-0)	0 (0-0)	0 (0-0)	1.000*
WBFS 6 hour post op	3 (2 - 4)	0 (0 - 2)	6 (6 - 6)	< 0.001*

\*) Kruskal-Wallis's Test

**Table 5.** Beta-endorphin levels between the TAP block, QL block and control group

	Beta-endorphin post-op (Min – Max)	Beta-endorphin 6 hour post-op (Min – Max)	<i>p</i>
TAP (n=10)	172 (137 - 180)	105 (91 - 147)	0.005*
QL (n=10)	156.5 (139 - 178)	95.5 (86 - 106)	0.005*
Control (n=10)	168 (142 - 178)	258.5 (211 – 294)	0.005*

\*) Wilcoxon Signed Rank's Test

**Table 6.** Delta beta levels of pre and post endorphins between the TAP block, QL block and control groups

	TAP (n=10)	QL (n=10)	Control (n=10)	<i>p</i>
Delta beta endorfin level	-58.2 ± 20.9	-62.5 ± 18.7	83.3 ± 33.4	< 0.001*

\*) Anova's Test

**Table 7.** Measuring the effect of pain scale reduction between TAP block and QL block

	TAP	QL
Mean	3	0
SD	0.57	0.63
N	10	10

Cohen's  $d = (0 - 3)/0.60075 = 4.993762$ .  
Glass's  $\delta = (0 - 3)/0.57 = 5.263158$ .  
Hedges'  $g = (0 - 3)/0.60075 = 4.993762$ .

By giving QL a block helps relieve the WBFS pain scale by five times compared to the TAP block.

**Table 8.** A measure of the effect of decreasing beta-endorphin levels between TAP block and QL block

	TAP	QL
Mean	-58.20	-62.5
SD	20.93	18.75
N	10	10

Cohen's  $d = (-62.5 - -58.2)/19.869919 = 0.216408$ .  
Glass's  $\delta = (-62.5 - -58.2)/20.93 = 0.205447$ .  
Hedges'  $g = (-62.5 - -58.2)/19.869919 = 0.216408$ .

By giving QL blocks can reduce the beta-endorphins level by 0.2 times compared with the TAP block.

In this study, no subjects were dropped out, and there were no Adverse Effect (A.E.) or Serious Adverse Effect (SAE) events. This study also found subjects who received analgesic rescue at 6 hours postoperatively (WBFS pain scale of more than 3) of 1 research subject in the TAP block group and ten subjects in the control group. In the QL block group, none of the subjects received analgesic rescue during this study.

## DISCUSSION

In this study, beta levels of endorphins and post-operative pain scales were no different because the study sample was still in an anesthetized state (Bromage score 0), and there were no feelings of pain. At the time of sampling beta-endorphins, the investigator ensured that all samples were hemodynamically stable, and intravascular volume was sufficient to reduce the biased effect of examining beta-endorphins. The results of beta-endorphins 6 hours postoperatively are lower than post-operative beta-endorphins levels can be influenced by surgical stress factors.

The stress response to surgery is characterized by an increase in pituitary hormone secretion and activation of the sympathetic nervous system. Changes in pituitary secretion have a secondary effect on hormone secretion from target organs.

Hypothalamic activation of the sympathetic autonomic nervous system results in increased secretion of catecholamines from the adrenal medulla and release of norepinephrine from the presynaptic nerve terminal. The main function of norepinephrine is as a neurotransmitter, but a portion of norepinephrine is released from nerve terminals into the circulation. The effect of increased sympathetic nervous system activity and the release of some norepinephrine into the circulation will produce cardiovascular effects in the form of tachycardia and hypertension.<sup>11</sup>

WBFS evaluation 6 hours postoperatively found differences in the WBFS pain scale between QL block, TAP block, and standard therapy (control) because the therapy given to the QL block group and TAP block is a multimodal therapy, namely ketorolac, tramadol, and local anesthetic drugs, ropivacaine.

QL blocks provide better analgesia because QL blocks can block somatic and visceral pain (as high as V Thoracal 4 - V lumbar 1)<sup>12</sup> so that the study sample does not cause pain so that the patient mobilization can take place early. In TAP, the block only blocks somatic pain (as high as V Thoracal 9 - V Thoracal 12)<sup>13,14</sup>, so that visceral pain in the form of stomach pain like being



pulled.

The research of Blanco et al. states that quadratus lumborum block is more effective than transverse abdominis plane block after cesarean section surgery.<sup>15</sup> From the research of Kumar, et al. mentioned that patients who received QL block had a significant increase in postoperative pain reduction by reducing opioid consumption for post-operative lower abdominal analgesia.<sup>16</sup> From the research of Mieszkowski, et al. mentioned that QL Block significantly reduces morphine consumption and pain levels up to 48 hours postoperatively after cesarean section.<sup>17</sup>

From the research of Blanco et al., Kumar et al., Mieszkowski et al., the level of effectiveness is based on reducing opioid consumption, how much reduction in postoperative pain has not been discussed in that study.

### **Study Limitations**

Some limitations in this study are the objectivity when measuring the minimal WBFS pain scale and the actions of Quadratus Lumborum Block, which in practice requires ultrasound because the location of the quadratus lumborum muscle is very close to the kidney so that if done without ultrasound, it can injure the kidneys and require more assistants to position subjects. This is different from

the Transverse Abdominis Plane Block, which can be performed without an ultrasound, and the patient is lying down.

### **CONCLUSION**

The effect of block QL administration helped relieve the WBFS pain scale five times and decreased beta-endorphins level by 0.2 times compared to TAP block administration.

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