

Transversus abdominis plane block and quadratus lumborum block did not reduce the incidence or severity of chronic postsurgical pain following cesarean section: a prospective, observational study

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Abstract

Background: Sparse data exist on the prevalence and severity of chronic postsurgical pain (CPSP) following cesarean section. Our study aimed to compare the effectiveness of transversus abdominis plane (TAP) block and quadratus lumborum block (QLB) in the prevention of CPSP after cesarean section.

Methods: The study was conducted at a tertiary hospital from June 2017 to July 2018 as a prospective, observational trial. We recruited 233 women with singleton pregnancies, above 18 years of age, ≥ 36 weeks of gestation, undergoing cesarean section under spinal anesthesia. The patients received either TAP block or QLB as the primary analgesia technique following cesarean section. The control group consisted of patients without any postsurgical plane block. The incidence and characteristics of chronic pain were evaluated using the Neuropathic Pain Symptom Inventory at the first, third, and sixth months after surgery.

Results: Fewer patients in the control group perceived CPSP than in TAP or QLB groups one and three months after cesarean section, but not after six months. Accordingly, CPSP severity was significantly lower in the control group than after plane blocks at the first and third month. No difference in the risk of CPSP was found between different indications for cesarean delivery.

Conclusions: CPSP is highly prevalent following cesarean section. The studied plane blocks did not reduce the incidence or severity of CPSP after cesarean section when compared to the standard analgesic regimen.

Key words: cesarean section, anal, transversus abdominis plane block, quadratus lumborum block, chronic postsurgical pain.

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Chronic postsurgical pain (CPSP) is one of the most common complications following surgery, with increasing evidence of both its prevalence and intensity [1]. Various regional anesthetic techniques have been investigated for their potential use in alleviating CPSP, especially after high-risk procedures, such as thoracotomy and mastectomy [2, 3]. However, only epidural analgesia and paravertebral blocks proved to be effective in decreasing the prevalence CPSP [3].

Postoperative pain remains a leading concern for women undergoing a cesarean section. Furthermore, cesarean sections are associated with a high prevalence of CPSP. According to various authors, 2–22% of mothers experience CPSP for months after the procedure [4–8]. To the best of our knowledge,

the effects of regional anesthetic techniques on CPSP in obstetric patients have not been studied extensively.

The transversus abdominis plane (TAP) block and the quadratus lumborum block (QLB) are relatively new methods for providing effective pain control in obstetric patients [9]. Blanco *et al.* [10] reported that type II QLB is superior to TAP block in treating acute postoperative pain in obstetric patients. Furthermore, it was suggested that QLB is associated with decreased prevalence of CPSP due to the spread of the local anesthetic agent into the paravertebral space [11].

Our study aimed to evaluate the occurrence and severity of CPSP in patients after cesarean section

receiving QLB or TAP block when compared to the standard analgesic regimen.

METHODS

This prospective, observational study was conducted in a tertiary obstetric department. The study protocol was approved by the local bioethics committee of the Medical University of Lublin, Lublin, Poland. Informed, written consent was obtained from every patient, and the study methods met the tenets of the Declaration of Helsinki for medical research involving human subjects.

The inclusion criteria included pregnant females (singleton pregnancy), older than 18 years, scheduled for cesarean section under single shot spinal anesthesia.

The exclusion criteria included coagulopathy, allergy to local anesthetics, depression, antidepressant drug therapy, epilepsy, chronic painkiller use before surgery, addiction to alcohol or recreational drugs, and gestational age < 36 weeks.

Anesthesia, regional blocks, and control group

All patients received single-shot spinal anesthesia with a 0.5% solution of hyperbaric bupivacaine. Patients received 2.0 to 3.0 mL of local anaesthetic to reach the sufficient level of the blockade (T4–T6). In patients scheduled for postsurgical analgesia using plane blocks, TAP and QLB blocks were performed in the operating theatre, before the transfer of parturients to the ward. The blocks were administered bilaterally with a 0.25% solution of bupivacaine (0.2 mL of local anesthetic per kilogram, to a maximum dose of 20 mL per side).

Only three anesthesiologists performed TAP and QLB blocks. Therefore, some patients did not receive any plane block after cesarean section. These individuals received the standard analgesic regimen and were used as a control group.

Chronic postsurgical pain assessment

One, three, and six months after surgery, the study participants were interviewed over the phone

to assess the prevalence and characteristics of CPSP using the Neuropathic Pain Symptom Inventory (NPSI) adapted from the study by Bouhassira *et al.* [12]. The inventory includes ten descriptors quantified on a numerical scale (0–10), and two temporal items. Two independent investigators translated the NPSI form from French and English to Polish. Both forms were cross-compared, and the final version of the Polish NPSI was established.

Statistical analysis

Analysis of variance was used for the analysis of parametric data. These findings were presented as means with confidence intervals (CI). Nonparametric data were calculated with the Kruskal-Wallis test by ranks. These results were presented as medians and interquartile ranges. The Freeman-Halton extension of the Fisher exact test was used to analyze contingency tables. All measurements were performed using the Statistica 13.1 software (StatSoft. Inc., Tulsa, USA).

RESULTS

Patient demographics

The study was conducted from June 2017 to July 2018. During the study period, 233 patients were recruited. 232 women were analyzed after a month from the surgery: 90 in the TAP group, 92 in the QLB group, and 50 in the control group. 214 individuals were evaluated at the third month: 81 in the TAP group, 85 in the QLB group, and 48 in the control group. Of 232 patients, 208 individuals were assessed at the sixth month: 81 in the TAP group, 79 in the QLB group, and 48 in the control group. The patient demographics are shown in Table 1. No difference was found in age, body mass, height, or BMI between the study groups. The indications for cesarean deliveries are listed in Table 2.

Chronic postoperative pain

The prevalence of CPSP following cesarean section at different points of time is presented in Table 3. A lower number of patients in the control

TABLE 1. Patient demographics, numbers of deliveries and cesarean sections

Group	TAP	QLB	CON
Age (years)	31.73 (30.88–32.57)	32.75 (31.81–33.69)	32.20 (30.81–33.59)
Body mass (kg)	80.40 (78.05–82.75)	78.87 (76.75–80.98)	75.88 (72.47–79.27)
Height (m)	1.67 (1.65–1.68)	1.66 (1.65–1.67)	1.65 (1.63–1.66)
BMI (kg m ⁻²)	28.97 (28.20–29.74)	28.73 (27.98–29.47)	27.97 (26.74–29.21)
Number of deliveries	1.97 (1.81–2.10)	2.05 (1.90–2.21)	1.74 (1.52–1.96)
Number of cesarean sections	1.63 (1.48–1.77)	1.73 (1.59–1.89)	1.46 (1.29–1.63)

Results are presented as means and confidence intervals.

CON – conventional treatment, without postoperative regional block, QLB – quadratus lumborum block, TAP – transversus abdominis plane

group perceived CPSP after one and three months after cesarean section, but not after six months. Accordingly, CPSP severity was significantly lower in the control group than after plane blocks at the first and third month (Table 4). One patient in the QLB group reported numbness and lack of sensation in the area of the regional block at the first and third month, but not at the sixth month after surgery. This complication could occur due to the applied regional anesthesia technique. Six months after surgery, four patients experienced CPSP, most likely associated with surgical site infection. More detailed descriptions of neuropathic pain items are presented in Tables 5 and 6. No difference in the risk of CPSP was found between different indications for cesarean delivery.

DISCUSSION

The primary goal of our study was to compare two plane blocks with the standard treatment group in preventing CPSP following cesarean section. Interestingly, in the control group, without any additional regional technique, chronic pain severity was significantly lower than in QLB and TAP groups after one and three months from hospital discharge. However, no difference was noted between the study groups in pain severity after six months from the hospital discharge (Table 4).

To the best of our knowledge, the role of plane blocks in the prevention of CPSP after cesarean section has not been studied extensively. Long-term outcomes in parturients who received TAP block were examined in two studies. Bollag *et al.* [13] investigated the impact of TAP block on wound hyperalgesia and pain in patients after cesarean section. In this study, women were randomly allocated to one of three groups. Ultrasound-guided TAP block was performed with bupivacaine, bupivacaine with clonidine, or standard saline (placebo group). Although morphine request was significantly higher in the placebo group compared with the other TAP groups, the wound hyperalgesia index did not differ at the 48th hour. Moreover, at the third, sixth, and

TABLE 2. Indications for cesarean delivery

Indication	Group		
	TAP n (%)	QLB n (%)	CON n (%)
Subsequent cesarean section	44 (48)	51 (55)	21 (42)
Fetal malpresentation	20 (22)	24 (26)	1 (2)
Nonreassuring fetal heart rate tracing	7 (8)	7 (8)	7 (14)
Failure to progress	5 (5)	4 (4)	10 (20)
Others	15 (16)	6 (7)	11 (22)

Indications for cesarean delivery are presented as the number and percentage (in brackets) of patients in each group. TAP – transversus abdominis plane, QLB – quadratus lumborum block, CON – conventional treatment, without postoperative regional block

TABLE 3. Prevalence of chronic postsurgical pain after cesarean section

Time of assessment	Number of patients (%)			Probability
	TAP	QLB	CON	
1 month	50 (56.88)	47 (53.41)	12 (24.0)	0.0005
3 months	32 (39.51)	34 (40.48)	9 (18.0)	0.017
6 months	25 (30.86)	20 (25.32)	11 (22.0)	0.51

The table presents the number of patients who experienced chronic postsurgical pain detected with Neuropathic Pain Symptom Inventory at three time points for the three study groups. Probability was calculated with the Freeman-Halton extension of the Fisher exact test.

TAP – transversus abdominis plane, QLB – quadratus lumborum block CON – conventional treatment, without postoperative regional block

TABLE 4. Severity of chronic postsurgical pain after cesarean section

Time of assessment	Group			Probability
	TAP	QLB	CON	
1 month	2 (0–6)	2 (0–6.5)	0 (0–0)	0.0001
3 months	0 (0–3)	0 (0–3.5)	0 (0–0)	0.017
6 months	0 (0–2)	0 (0–2)	0 (0–0)	0.58

The table presents the severity of chronic postsurgical pain detected with Neuropathic Pain Symptom Inventory (0–10) as medians and interquartile ranges. Probability was calculated with the Kruskal–Wallis test by ranks.

TAP – transversus abdominis plane, QLB – quadratus lumborum block, CON – conventional treatment, without postoperative regional block

twelfth month no difference was noted in CPSP intensity between the study groups using the Short-Form McGill Pain Questionnaire 2.

Similarly, McKeen *et al.* [14] assessed acute pain intensity and long-term outcomes in parturients after cesarean section. No difference was found in

TABLE 5. Spontaneous pain during the past 24 hours

Spontaneous pain	1 st month			3 rd month			6 th month		
	TAP	QLB	CON	TAP	QLB	CON	TAP	QLB	CON
Permanently	1	0	0	1	0	0	0	0	1
Between 8 and 12 hours	0	0	0	0	0	0	0	0	0
Between 4 and 7 hours	2	2	0	0	0	0	1	1	0
Between 1 and 3 hours	0	4	1	2	1	0	3	0	0
Less than 1 hour	20	19	3	8	7	1	5	6	1

The table presents the number of patients with spontaneous pain (burning, squeezing, and pressure) during the past 24 hours.

TAP – transversus abdominis plane, QLB – quadratus lumborum block, CON – conventional treatment, without postoperative regional block

TABLE 6. Pain attacks

Number of pain attacks	1 st month			3 rd month			6 th month		
	TAP	QLB	CON	TAP	QLB	CON	TAP	QLB	CON
More than 20	1	0	0	1	0	0	0	0	0
Between 11 and 20	1	0	0	0	0	0	0	0	0
Between 6 and 10	2	1	0	0	1	0	0	0	0
Between 1 and 5	10	17	1	10	5	1	9	4	0
No pain attack	79	75	49	71	78	47	74	75	48

The table presents the number of patients with pain attacks (electric shocks, stabbing) during the past 24 hours.
TAP – transversus abdominis plane, QLB – quadratus lumborum block, CON – conventional treatment, without postoperative regional block

postoperative pain severity or opioid consumption between TAP block with 0.2% ropivacaine and sham block groups. Moreover, health quality and physical functioning status measured with the Short Form 36 Health Survey (SF-36) were similar in both groups after one and six months from the hospital discharge. Although SF-36 is not dedicated to assessing CPSP, the survey contains a section on “bodily pain”.

During the process of conceptualization of the current study, we hypothesized that QLB would result in decreased prevalence of CPSP by the spread of the local anesthetic into the paravertebral space. However, even in the patients most prone to CPSP, such as breast surgery patients, the efficacy of regional blocks is inconsistent [3]. Kairaluoma *et al.* [15] observed a reduction of chronic pain after a preemptive paravertebral block. In contrast, in a more recent study, Karmakar *et al.* [16] did not observe a reduction of chronic pain in a similar group of patients. According to these facts, even a regional block well established in clinical practice, such as the paravertebral one, is not reliable in preventing CPSP. Therefore, more studies are needed to ascertain the place of new plane blocks both in acute and chronic pain.

The other finding of the current study was the relatively high prevalence of CPSP in patients after cesarean section. The occurrence of CPSP following cesarean section was reported by 48%, 34%, and 27% of patients at the first, third, and sixth postoperative month, respectively. In most studies, the incidence of CPSP after cesarean section rarely exceeds 18% at the sixth month [4–9]. In a study by Jin *et al.* [17], only 18.3% and 11.3% of patients experienced CPSP three and six months after cesarean section, respectively. The authors of this paper used the Brief Pain Inventory for CPSP evaluation. Ortner *et al.* [8] used the revised Short-Form McGill Pain Questionnaire to evaluate persistent pain and surgery-related symptoms in healthy women undergoing a planned cesarean delivery. In this study, only 3% and 0.6% of patients reported CPSP after six and twelve months from the cesarean section, respectively. However, the authors of most trials ex-

amining the prevalence of CPSP used study-specific questionnaires [4–7]. The explanation of the relatively high prevalence of CPSP in our study may be related to the sensitivity of NPSI in the detection of persistent pain. We decided to use the NPSI in our study because it was previously used to assess CPSP following laparotomy and thoracotomy [18, 19]. To our knowledge, NPSI has been used for the first time to evaluate CPSP in obstetric patients.

The number of techniques available to enhance postoperative pain control in puerperal patients is limited [20]. Pre-emptive administration of antiepileptic drugs, such as gabapentinoids, as well as lidocaine and ketamine, is controversial due to their transfer to the baby through the placenta and breastfeeding. Therefore, the wider implementation of regional anesthesia techniques seems to be the preferred approach in obstetric patients.

CONCLUSIONS

CPSP is highly prevalent following cesarean section. The studied plane blocks did not reduce the incidence or severity of CPSP after caesarean section when compared to the standard analgesic regimen.

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