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The analgesic efficiency of transversus abdominis plane (TAP) block after caesarean delivery

Anna Kupiec[1], Jacek Zwierzchowski[1], Joanna Kowal-Janicka[1], Waldemar Goździk[1], Tomasz Fuchs[2], Michał Pomorski[2], Mariusz Zimmer[2], Andrzej Kübler[1]

[1]Chair and Clinic of Anaesthesiology and Intensive Care, Jan Mikulicz-Radecki University Teaching Hospital in Wrocław, Poland
[2]2nd Chair and Clinic of Gynecology and Obstetrics, Jan Mikulicz-Radecki University Teaching Hospital in Wrocław, Poland

ABSTRACT

Objectives: The ultrasound-guided transversus abdominis plane (TAP) block is a supporting method of pain relief after different types of surgical and gynecological procedures. The aim of the present study was to evaluate the analgesic effects of the TAP-block in patients undergoing caesarean section.

Material and methods: 88 women undergoing elective caesarean section under spinal anaesthesia were prospectively randomized into two groups. In the first group, an ultrasound-guided bilateral TAP block was performed using 40 mL 0.25% bupivacaine, while the second group was treated without a regional nerve block. Both groups received a standard analgesia protocol with intravenous paracetamol administered every 6 hours and intravenous tramadol on-demand, delivered using the Patient Controlled Analgesia (PCA) method. Pain intensity was assessed according to the visual analogue scale (VAS) directly after the TAP block and at 3, 6 and 12 hours postoperatively. Any patient complaints and side-effects during the postoperative period were recorded.

Results: The TAP block resulted in a significant reduction of pain intensity using the visual analogue scale after 3, 6 and 12 hours ($p < 0.05$) and a significant decrease in tramadol administration ($p < 0.05$) during the first 12 hours postoperatively. No significant differences in the heart rate and blood pressure were noted between groups ($p > 0.05$). There were no complications related to the TAP block.

Conclusions: The TAP block is a safe and effective adjunctive method of pain relief after caesarean delivery.

Key words: TAP block, caesarean section, postoperative pain

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INTRODUCTION

The transversus abdominis plane (TAP) block is a regional technique for analgesia, which involves the injection of a local anaesthetic between the transversus abdominis muscle and the oblique abdominal muscle. It was initially carried out using the "Petit triangle" formed by the latissimus dorsi and external oblique muscles and the iliac crest [1]. The introduction of ultrasonography enabled accurate visualisation of the muscles and fasciae of the abdominal wall. It also enabled ultrasound-guided needle injections and the monitoring of local anaesthetic spread [2]. This method has been described in patients following laparoscopy and laparotomy colorectal procedures, laparoscopy cholecystectomy, appendectomy, abdominoplasty, urological procedures, inguinal hernia repair and gynaecological procedures, such as hysterectomy and caesarean section [3].

Objectives

Effective analgesic management following caesarean section is essential and needs to take into account possible side effects of the therapy and early mobilisation of the patients following surgery. The aim of the study was to carry out a prospective randomized assessment of the effectiveness of the transversus abdominis plane block following caesarean section as an additional component of postoperative analgesia.

Corresponding author:
Anna Kupiec
Chair and Clinic of Anaesthesiology and Intensive Care,
Jan Mikulicz-Radecki University Teaching Hospital in Wrocław, Borowska St. 213, 50–556 Wrocław, Poland
e-mail: annakupiec11@gmail.com

MATERIAL AND METHODS

The study was approved by the Bioethics Committee of the Wroclaw Medical University (permission no. 373/2015) and was performed in the Department and Clinic of Gynaecology, Obstetrics and Neonatology of the Wroclaw Medical. A written informed consent was obtained from each study participant.

Eighty-eight patients with an American Society of Anaesthesiologists (ASA) score of I-II who underwent caesarean section using the Pfannenstiel method and subarachnoid anaesthesia with 0.5% bupivacaine were enrolled in the study. The anaesthesia was carried out using a 25G or 27G pencil point spinal needle in order to obtain a Th4-Th6 sensory block. Patients were excluded from the study if they underwent a caesarean section using different surgical techniques, if they had a body mass index (BMI) above 35 or if they received general or epidural anaesthesia. Computer randomisation was used to assign the patients into two groups. Group I consisted of patients that received an ultrasound-guided (Ultrasonix Touch GPS — Trimed) bilateral TAP block immediately following surgery using a block needle (Echoplex® 85 mm 21G, Vygon). The presence of ultrasound lens symptoms was considered an indicator of a correctly performer TAP block. 20 mL of 0.25% bupivacaine, which was used as the local anaesthetic, was administered bilaterally (Bupivacainum hydrochloricum, Polfa Warszawa). During the anaesthesia, ECG tracings, blood pressure and pulse oximetry were obtained from each patient. In addition, all the patients received 1.0 g of paracetamol intravenously every 6 hours and a pump infusion of tramadol via a patient controlled analgesia system. Tramadol was administered without a basal infusion, with a bolus dose of 25 mg and a lockout interval of 10 minutes. The maximum dose of tramadol was 200 mg every 8 hours. A basic tramadol infusion was not administered due to different post-operative pain perception among patients. This approach enabled a more precise analgesic treatment of individual patients. Group II consisted of patients who did not receive a TAP block and received the same intravenous analgesic treatment as the patients from group I. The patients assessed their pain within 12 hours of surgery according to the visual analogue scale, VAS, where 0 represented no pain and 10 indicated 'the worst pain ever possible'. In addition, the amount of tramadol used, the arterial pressure and heart rate were analysed. Any postoperative nausea and vomiting were also recorded. The study was planned to burden the patients as little as possible. Hence, the study observation period was limited to 12 hours due to early patient mobilisation and child care, leaving participants with little time and motivation to fill out the pain assessment questionnaire after then.

The obtained results were collected, systematised and pre-analysed using Excel 2010 spreadsheet tools. Quantitative analyses were carried out using Statistica 10.0 PL software. P values less than 0.05 were considered statistically significant. The W-Shapiro-Wilk test indicated a non-normal distribution of the quantitative data. Hence, non-parametric tests were used to further assess the data between the groups. The U-Manna-Whitney test, chi2 and Friedman test with a post-hoc (test Dunn) analysis were carried out.

Table 1. Baseline characteristics of the study participants. No statistically significant differences between groups were found (p > 0,05)

	TAP block group	Control group
Height [m]	1.69 (0.071)	1.66 (0.062)
Weight [kg]	77.36 (11.47)	75.9 (10.89)
BMI	27.02 (3.22)	27.54 (3.9)
Dose of 0,5% hyperbaric bupivacaine [mg]	12.09 (2.07)	12.02 (1.44)

Data are presented as mean (SD)

RESULTS

Initially, 100 patients were included in the study. However, 22 patients were excluded due to administrative reasons, such as a lack of pain questionnaires or incomplete questionnaires. Forty-six patients underwent a TAP block, and 42 patients received intravenous analgesia. There were no statistically significant differences in the patient height, weight, BMI or amount of hyperbaric bupivacaine used for subarachnoid analgesia between the two groups (Tab. 1).

The patients who received a TAP block were administered significantly less on-demand tramadol ($p = 0.005$). They also had significantly lower VAS values three ($p = 0,000014$), six ($p = 0.015$) and 12 hours ($p = 0.006$) postoperatively. There was no significant difference in the arterial pressure and heart rate between the two groups ($p > 0.05$). The data are presented in Table 2, and the comparison of the VAS values is presented in Figure 1.

Vomiting, nausea and dizziness were reported in three patients from group I. Similarly, in group II, two patients were nauseous and one reported dizziness. No complications or symptoms associated with the TAP block were reported.

DISCUSSION

The surgical wound was the main source of pain following caesarean section. According to literature, 86% to 97% of patients experience post-surgical pain two months postoperatively [4]. The TAP block provides analgesia to the cranial branches of the Th10-L1 nerve roots [5]. Thus, it may be a promising adjunctive analgesic therapy in the treatment of postoperative pain following caeserean delivery although not all reports confirm this [6–8].

The addition of morphine to the subarachnoid labor analgesia results in a less marked TAP block effect — it

Table 2. Tramadol requirement, systolic blood pressure, diastolic blood pressure and heart rate in TAP block group and control group. Data are presented as mean (SD)

	Postoperative time interval	TAP block group	Control group	p
Tramadol requirement [mg]	0–12 h	234.0 (135.9)	309.6 (90.1)	**0.005**
Systolic blood pressure [mm Hg]	0 h	118.9 (14.1)	116.3 (13.2)	0.37
	3 h	119.5 (11.2)	119.8 (14.6)	0.96
	6 h	119.5 (13)	119.8 (14.3)	0.81
	12 h	119 (12.9)	118.0 (10.6)	0.88
Diastolic blood pressure [mm Hg]	0 h	72 (10.5)	65.4 (9.9)	**0.002**
	3 h	72.5 (7.2)	70.4 (12.2)	0.62
	6 h	73.3 (9.3)	73.2 (11.5)	0.93
	12 h	74.3 (11)	72.3 (9.1)	0.33
Heart rate	0 h	77.5 (12.0)	76.6 (11.7)	0.81
	3 h	76.8 (12.0)	73.1 (11.3)	0.15
	6 h	75.3 (11.5)	73.6 (12.0)	0.45
	12 h	76.0 (9.7)	74.6 (11.2)	0.43

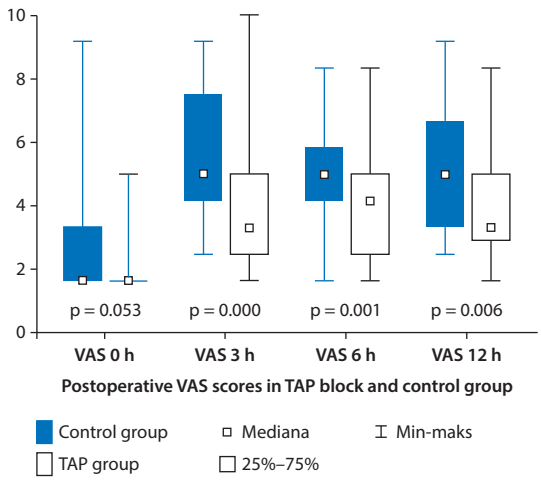

Figure 1. Postoperative VAS scores

does not reduce pain or the use of analgesic drugs [7, 8]. In the presented study, subarachnoid analgesia was obtained using 0.5% hyperbaric bupivacaine and 0.25% hyperbaric bupivacaine was used for the TAP block. Opioids were not administered into the subarachnoid space due to lack of sufficient postoperative monitoring of the patients and in order to avoid possible complications, such as pruritus and difficulties in passing urine [9, 10].

The ultrasound-guided TAP block is a simple and safe analgesic technique. There are few reports of complications of this technique. E. Weiss et al. described two cases of tremors following an ultrasound-guided bilateral TAP block after caesarean delivery. In the first patient, the tremors appeared following a block using 40 mL levobupivacaine at 3.75 mg/mL. The second patient received 40 mL of 7.5 mg/mL ropivacaine [11]. In turn, J. D. Griffiths et al. observed a systemic toxic reaction in the form of slurred speech, numbness of the tongue and a metallic taste sensation, to a ropivacaine block administered at a 2.5 mg/kg in three of 30 patients [12]. P. Lancaster et al. reported liver damage following an ultrasound-guided TAP block. The patient was treated conservatively in the intensive care unit and discharged after seven days [13]. None of the above described complications were observed in the patients in this study.

The presented study had some limitations, such as the size of the study population and difficulties in carrying out the study protocol in certain patients, which is understandable given the study circumstances. The authors plan to carry out further research in order to determine the serum bupivacaine concentration following a TAP block.

The administration of the TAP block in patients after caesarean delivery reduced pain and the use of on-demand analgesics in the first 12 hours post surgery.

CONCLUSIONS

The standard analgesic treatment of patients following caesarean delivery is often inadequate. The TAP block provides effective and safe postoperative analgesia, improving patient comfort and reducing the doses of the administered analgesics.

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