Evaluating the pain relief effects after caesarean delivery by ultrasound-guided transversus abdominis plane (tap) block in Hanoi Obstetrics and Gynecology Hospital,Vietnam

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Abstract. Evaluation of analgesic efficacy and side effects of ultrasound - guided transversus abdominis plane (TAP block) in women undergoing intubation anesthesia for caesarean section in Hanoi Obstetrics and Gynecology hospital,Vietnam.Comparative randomized clinical trial, 120 women who underwent caesarean delivery under general anaesthesia were allocated randomly: the group received a TAP block in both sides (group TAPB, n = 60) or no TAP block (group control, n = 60). Both groups received analgesia with intravenous morphine controlled by the woman during 72 hours after surgery. Pain scores at rest and activity, morphine consumption in 72 hours, side effects (sedation, nausea and vomiting...) and satisfaction of women were recorded.The time to first analgesic request in TAP block: 817 ± 311 minute (13,6 ± 5,2 hours). There was reduction of VAS (visual analog scale) scores after surgery in TAP block group. The total morphine consumption was reduced more than 62% in Group TAPB (16,03 mg) compared with Group Control (41,65 mg). The incidence of PONV (postoperative nausea and vomiting) (5%) and sedation (3,33%) was reduced in patients undergoing TAP blockade. The patient satisfaction with regard to pain relief was more in Group TAPB (95% vs 65%). There were no complications attributable to the TAP block.Ultrasound - guided TAP block provided a better analgesic effect after caesarean section, reduced the morphine consumption in 72 hours and reduced the side effects compared to the control group.

Key words: TAP block, Caesarean delivery, general anaesthesia, morphine consumption, ultrasound

INTRODUCTION

Caesarean section is a major surgical procedure with substantial post-operative pain. Good control of pain following surgery is essential to facilitate early mobilization and to enable adequate care of the newborn. Achieving good pain relief is challenging because of the altered physiology and of the possibility of transmission of drugs through breastmilk.

Spinal morphine is most commonly used in postoperative analgesia because it is simple and has a good analgesic effect. However, this method can not be used for patients under general anesthesia for caesarean section such as: placenta previa, ablatio placentae and so on.

Transverse Abdominis Plane Block (TAP block) is an amount of local anesthetic applied to the plane between the abdominal and transverse abdominal muscles, where the spinal nerve fibers pass (Charlton et al., 2010). This is a classic method of regional anesthesia and since the introduction of ultrasound, it has been increasingly and widely used in postoperative analgesia in general and caesarean section in particular(Jankovic, 2009). Ultrasound-guided needle placement and infiltration offers improved safety and reliability of anesthetic delivery. TAP block reduces pain, prolongs the duration of analgesia and decreases supplemental opioid consumption when used for multimodal analgesia for pain relief after caesarean section(Jadon et al., 2018).

There are 11 published meta-analyses around the effects of TAP block. Only four of them are about analgesia after caesarean section. For example, Mishriky et al. (2012) published a meta-analysis, looking at analgesia after caesarean section. Nine studies were included. They found that TAP block significantly reduced opioid consumption (mg morphine equivalents) after caesarean section. A meta-analysis by Baeriswyl et al. (2015) of 1611 patients receiving TAP block for laparoscopy, laparotomy and Caesarean section showed a reduction in IV (Intravenous) morphine consumption as well as reduced pain scores at rest and movement at 6 hours aftersurgery.

But there is nothing about patients under general anesthesia. Therefore, we conducted a study aimed at: Evaluation of analgesic efficacy and undesirable effects of TAP block under the guidance of ultrasound in pregnant women who had general anesthesia for caesarean section.

MATERIALS AND METHODS

Subject

Selection criteria. Patients aged 18-50 years, ASA I, II and III. Patients after caesarean section with Pfannenstiel (Horizontal incision on pubic bone) are subjected to endotracheal anesthesia.

Exclusion criteria. Patients after caesarean section along the incision along the middle white line. Contraindications to ropivacaine, coagulopathy, puncture site infections, disagree with participating in the study.

Study design

It's prospective research, which takes a group of subjects, and monitors the group for outcomes. And it's randomized controlled study, where the subjects were randomly allocated into treatmentand control groups using a computer-generated sequence of random numbers. The group sequence was concealed opaque envelopes which were opened only after obtaining informed consent. The injectate syringes were prepared by an anaesthesiologist not involved in the study. The anaesthesiologists, the subjects and the post-operative care providers were blinded to the group assignment.

Location, time of research: Anesthesiology Department - Hanoi Obstetrics and Gynecology Hospital. The period is from August 2018 to June 2019.

Sample size: 120 patients divided into 2 equal groups.

Sampling: Grouping by random drawing.

Group 1 (Control group): The patient was not anesthetized at transverse abdominal plane (TAP block).

Group 2 (TAPB group): The patient was relieved of postoperative pain by using a transverse abdominal muscle plane (TAP block) under the guidance of ultrasound.

Procedure: Patients in both groups received general anesthesia for caesarean section. Immediately after the closure of the abdomen, the patient will be randomly assigned to two study groups (the group must not undergo TAP block anesthesia and the group will be under anesthetic TAP block). TAPB group was anesthetized with TAP block under ultrasound guidance with 0.3ml / kg Ropivacaine 0.25% + Dexamethasone 4mg + Adrenalin 5mcg / ml. Both groups were then fitted with intravenous morphine PCA (principal component analysis**)** with self-control patients.

Evaluation criteria: Patient-related characteristics, anesthesia process and surgery. Success rate, amount and volume of anesthetic TAP block. The level of postoperative analgesia is based on a VAS scale evaluated in a state of rest (Figure 1) and when the patient is active (Figure 2). The morphine consumed in first 72 hours after surgery (Figure 3). The total morphine intake after surgery was also calculated (Figure 4). Satisfaction evaluation (Dissatisfied: Severe pain and / or undesirable effects; Satisfaction: Mild pain or unwanted but transient effects; Very satisfied: No or minor pain, comfortable and pleasant). Assessment of unwanted effects included nausea and vomiting, itching, urinary retention, sedative (Figure 5).

Time of assessment: After extubation, after surgery 1 hour (H1), 2 hours (H2), 3 hours (H3), 6 hours (H6), 9 hours (H9), 12 hours (H12), 18 hours (H18), 24h (H24), 36h (H36), 48h (H48), 60h (H60), 72h (H72).

Data processing

Research data were analyzed and processed according to SPSS 20.0 software. Quantitative variables are described as mean (X) and standard deviation (SD). Qualitative variables are described as percentages (%). To compare the differences between ratios (qualitative variables), use the test when squared (χ^2). Comparing the difference between means (quantitative variables): using T - Student test when comparing 2 groups. The difference is considered to be statistically significant when p

<0.05.

Research ethics

The study was in accordance with the ethical standarts of the responsible committee on human experimentation: the procedures were approved by the scientific council of Hanoi Medical University in accordance with Decision No. 3012 / QD - DHYHN on July 13, 2018 and allowed to be conducted in the Department of Anesthesiology and Recovery at Hanoi Obstetrics and Gynecology Hospital. Moreover, research is in accordance with the Helsinki Declaration of 1975, as revised in2000.

Each woman signed a voluntary informed consent to participate in the study and to publish its results. Participants could refuse to take a part in the study any time.

RESULTS

General characteristics of the patient

Table 1. Characteristics of studied patients

Index \ Group		Control Group (n_1)	TAPB group (n_2)	p
Age (years)	$\overline{X}$ ± SD	30,48 ± 5,3	31,87 ± 5,9	>0.05
Height (cm)	$\overline{X}$ ± SD	156,1 ± 4,29	155,2 ± 4,57	>0.05
Weight (kg)	$\overline{X}$ ± SD	64,15 ± 4,58	63,03 ± 4,78	>0.05
BMI (kg / m2)	$\overline{X}$ ± SD	26,36 ± 2,0	26,21 ± 2,12	>0.05
Gestational age (Week)	$\overline{X}$± SD	38,05 ± 1,80	37,83 ± 1,66	>0.05
Surgical time (Minutes)	$\overline{X}$ ± SD	31,45 ± 7,32	30,93 ± 7,02	>0.05
Anesthesia time (minutes)	$\overline{X}$ ± SD	54,12 ± 8,2	53,70 ± 7,01	>0.05

Pain relief effect

TAP block anesthesia technique: 100% success rate, the average time to perform bilateral anal anesthesia technique is 8.10 ± 1.56 minutes. The average amount of ropivacaine anesthetic used was 93.8 ± 5.8 mg with 1-sided anesthetic volume of 18.7 ± 1.16ml.

Time required for the first TAPB painkillers: 817 ± 311 minutes (13.6 ± 5.2 hours), the shortest time is 360 minutes and the longest time is 1620 minutes.

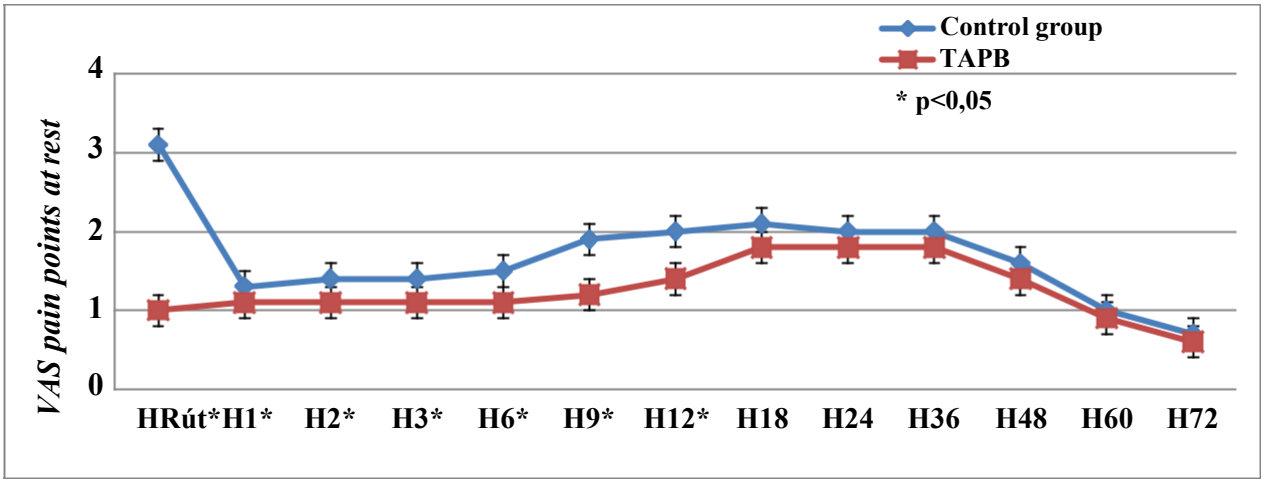

Figure 1. VAS pain points at rest

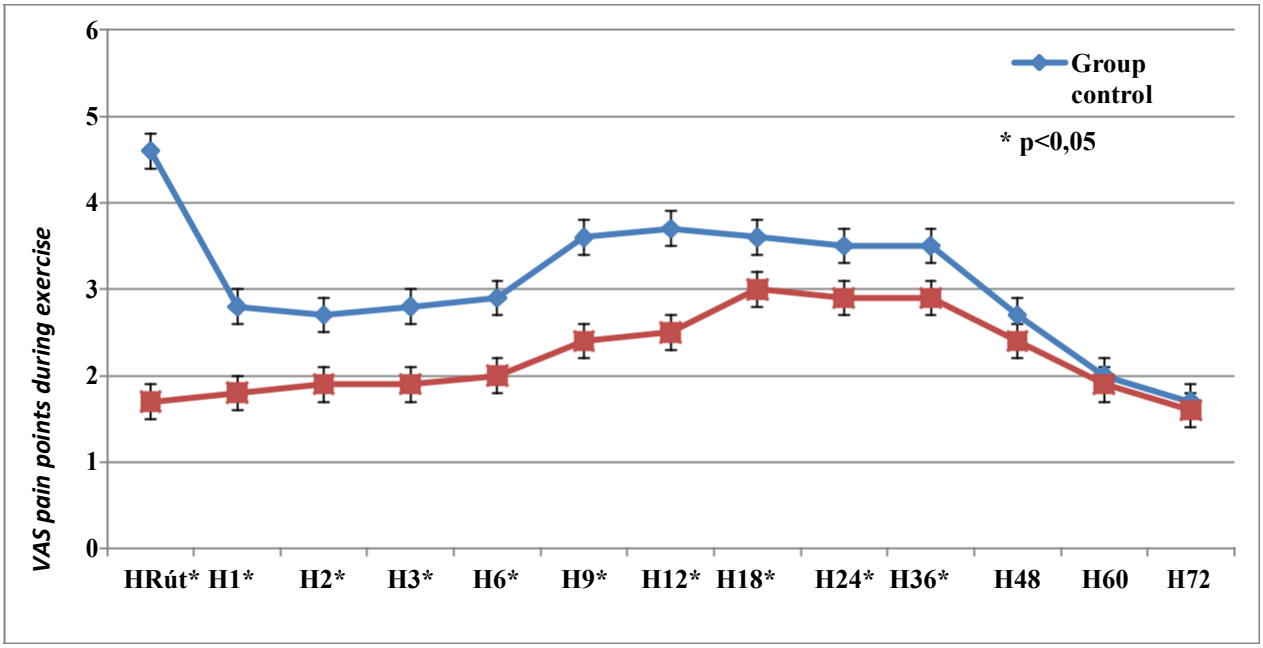

Figure 2. VAS pain points during exercise

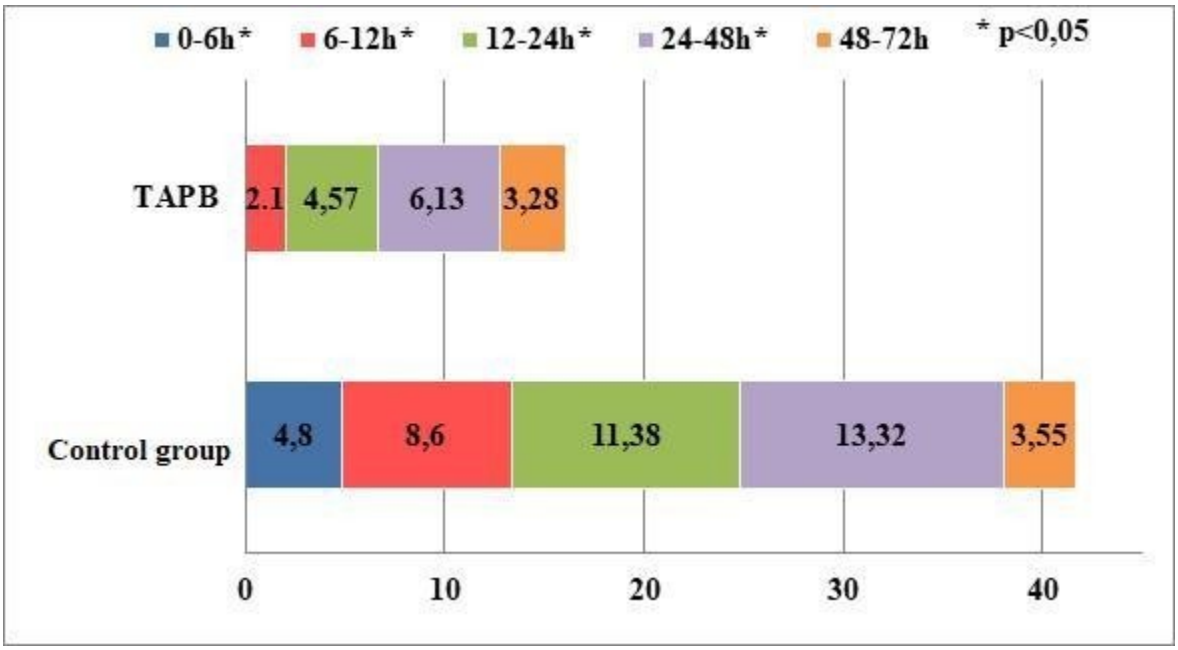

Figure 3. Morphine consumption over time

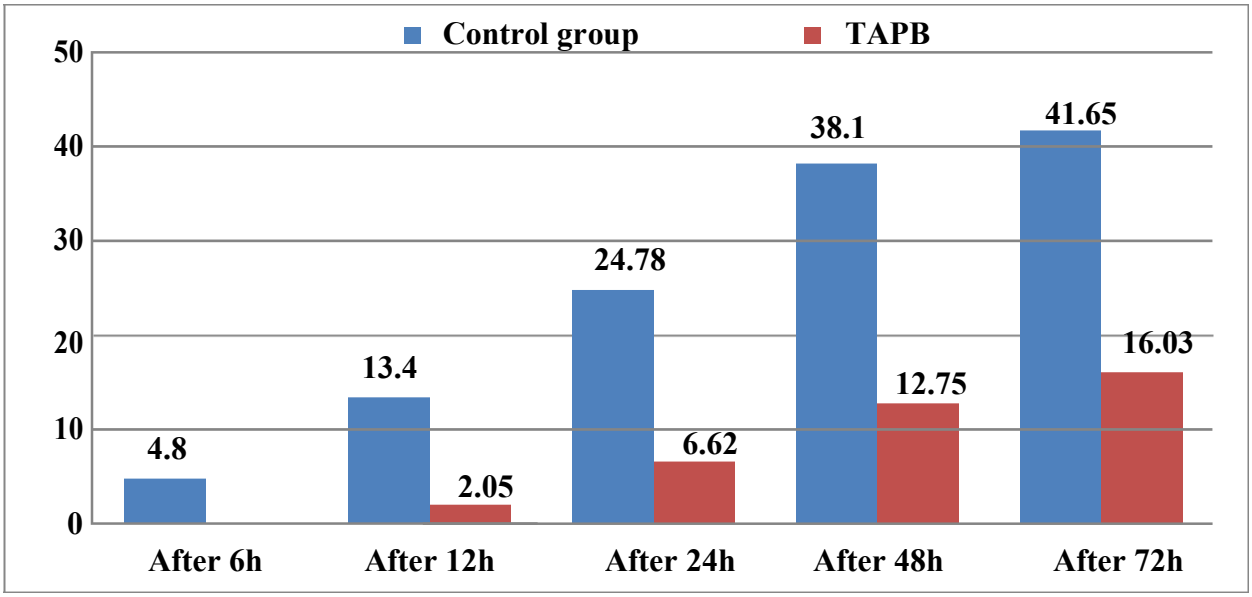

Figure 4. Cumulative morphine consumption after surgery

Satisfaction level: the percentage of Delighted and Satisfied in the TAPB group was 95% and 5%, while the control group had 35% of patients Satisfied and Delighted rate was 65%, this difference is significant. Statistical significance with $p < 0.05$.

Unwanted effects

Related complications of TAP block anesthesia. There is no case of anesthesia poisoning or damage to abdominal organs such as peritoneal injection, liver bleeding, intestinal injury or transient femoral nerve numbness.

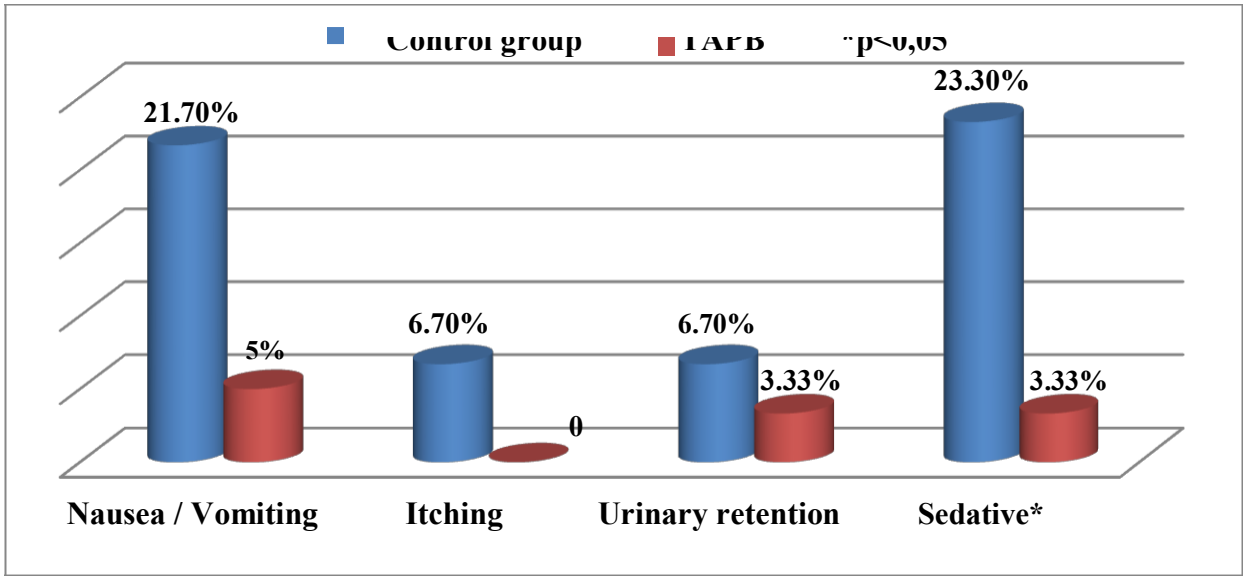

Figure 5. The rate of unwanted effects

DISCUSSION

Patient characteristics

The patients in our study are of reproductive age from 22 to 45 years old, the solid and obstetric indicators are similar. The factors related to anesthesia and surgery are similar, p> 0.05.

Analgesic effect

TAP block anesthesia technique. 100% success rate, the average time to perform bilateral anal anesthesia technique is 8.10 ± 1.56 minutes. This result is similar to the research results of Kiran (8.67 minutes) (Kiran et al., 2017). The average amount of ropivacaine anesthetic used was 93.8 ± 5.8 mg with 1-sided anesthetic volume of18.7
± 1.16 ml. The dose of anesthetic we used was 1.5 mg / kg in accordance with the condition of the pregnant woman, not exceeding the toxic threshold of the recommended ropivacaine anesthetic 100mg (Ng et al., 2018).

Time required for the first TAPB painkillers: 817 ± 311 minutes (13.6 ± 5.2 hours), the shortest time is 360 minutes and the longest time is 1620 minutes. This result is similar to Deshpande (13.2 ± 7.6 hours) (Deshpande et al., 2017). The addition of anesthetics Dexamethasone and adrenalin increased analgesic effect, lasting over 2.98 hours to3.08 hours (Zhang et al., 2019; Chen et al., 2018). The analgesic effect of dexamethasone is due to many mechanisms: possibly due to its anti-inflammatory and immunosuppressive effects, the direct mechanism of neurotransmitters that induces pain sensation and prolongs the depolarization phase of nerve cells, Local vasoconstriction reduces the rate of absorption of anesthetic agents, increases the inhibitory activity of potassium channels on Cfibers.

Pain points of VAS. VAS at both groups were <4 at times, VAS at TAPB was

always smaller than the control group at the same time in 12 hours after surgery, this difference was statistically significant with p <0 , 05. This proves that anesthesia in the abdominal plane under the guidance of ultrasound has good postoperative analgesia effect. In 36 hours after surgery, we found that the VAS score in TAPB group was significantly smaller than the control group at the same time, p <0.05. This result is also consistent with Abdallah et al. (2012), showing that the effect of TAP block was effective up to 36 hours after surgery with the VAS score in the TAP block was 1.29 points lower than the control group (95% CI - 3.74 to - 1.16, p = 0.01).

Morphine consumption after surgery. In the first 48 hours after surgery, the amount of morphine consumed at the time of the study in the TAPB group was significantly less than the control group, this difference was statistically significant with p <0.05. Especially at the first 6 hours after surgery in the TAPB group, no case had to use morphine. However, at the time of 48 - 72 hours after surgery, the morphine consumption of the two groups is similar. The total amount of morphine consumed 72 hours after surgery of the TAPB group was 16.03 mg, a decrease of 62% compared to the control group (41.65 mg). This result is similar to that of Baajet al. (2010) (down 60%), Jankovic (2009) (down 70%), McDonnell et al. (2007) (down72%).

Satisfaction level. The level of satisfaction depends on the pain relief effect as well as the unwanted effects. TAP block anesthesia with the rate of patients with satisfaction level of satisfaction is 100% (delighted 95% and satisfied 65%). No patient requested to stop analgesia after surgery. Meanwhile, the control group had 35% of patients Satisfied and Delighted rate was 65%, and the difference between the two groups was statistically significant with p <0.05. This result is similar to Fusco et al. (2016). In the TAP block group, the rate of patients was delighted 95.8% and satisfied was 4.2%, while the control group had the delighted rate of 62.5% and satisfaction was 37.5%.

Undesirable effects

Our research results showed that the rate of nausea and vomiting in 72 hours of PCA morphine after surgery in the control group was 21.7%, much higher than the TAPB group of 5%. This difference is significant with p <0.05. This result is similar to the study of Belavy et al.(2009) with the rate of nausea and vomiting in the control group was 20.8% and the group anesthetized TAP block was 4.3%. Sivapurapuet al. (2013) with a proportion of PONV of TAP block accounted for 4% significantly lower than that of control group 23%. In our study, there were 2 sedation cases in the TAPB group (3.33%), while in the control group we had 14 cases (23.3%) of the sedative patients. Thus, the TAPB group reduced 20% of patients with sedation compared to the control group, this difference was significant with p <0.05. All patients with sedation in 2 groups are at level 1, sometimes drowsiness and easy to wake up verbally. We did not encounter any case of deep sedative patients difficult to awaken, to support breathing or to handle naloxon. Our results are similar to those of Kahsayet al. (2017). TAP block groupreduced 23% of patients with sedation. The rate of pruritus and urinary retention of 2 groups did not differ. Anesthesia under the guidance of ultrasound ensures the accuracy and safety, in our study there were no

complications related to TAP block anesthesia.

CONCLUSION

TAP block under the guidance of ultrasound has a better analgesic effect after caesarean section, reducing total morphine consumption in 72 hours and reducing unwanted effects compared to the non-group be anesthetized. TAP block is a comfortable and feasible method which reduces post-operative analgesia need and does not lead any serious complications.

There are many options for developing this topic. For example, researchers have studied the effect of the TAP block in healthy volunteers, but there are prospects for using this method in obstetric or gynecological pathology (Jakobsson et al., 2015).

However, the risk of local anaesthetic systemic toxicity remains unknown with this block. There is a need to develop new and well-designed randomized clinical trials, with enough statistical power to compare different approaches, drugs, doses, and volumes for the same intervention, aiming to answer the current questions and assess the effect of TAP-block effects in routine clinicalpractice.

In the near future, we hope to see studies that better define the clinical characteristics of blocks and studies that compare the TAP block to local anesthetic infiltration and epidural technique for postoperative pain management (Ortiz and Wofford, 2016).

Role of ultrasound guided transversus abdominis plane block as a component of multimodal analgesic regimen for lower segment caesarean section: arandomized double blind clinicalstudy.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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