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COMPARATIVE STUDY BETWEEN BUPIVACAINE VERSUS BUPIVACAINE WITH FENTANYL IN BILATERAL TRANSVERSUS ABDOMINIS PLANE BLOCK FOR POSTOPERATIVE PAIN RELIEF IN PATIENTS UNDERGOING CESAREAN DELIVERIES

By

Mohammed Ahmed Ismail El-Fakharany, Mohammed Mohammed Salah El-Den Shamlol and Saad El-Den Mahmoud Abd El-Rahman El-Khateeb

Department of Anesthesiology and Intensive Care, Faculty of Medicine, Al-Azhar University

Corresponding author: Mohammed Ahmed Ismail El-Fakharany,

E-mail: malfkhrany428@gmail.com

ABSTRACT

Background: Cesarean section (CS) is one of the most common surgical procedures in the world. Post-operative pain afflicts both mother and the newborn, especially the first 48 h after birth. Local anesthetics alone provide analgesia for a few hours. Increasing the duration of local anesthetic action is often desirable because it prolongs surgical anesthesia and analgesia. These achieve by adding fentanyl with buipvacine. Different additives have been used to prolong the duration of blockade and thus improve the quality of anesthesia and postoperative analgesia.

Objective: To evaluate the efficacy and safety of ultrasound transverses abdomen plane block with bupivacaine, and the effects of adding fentanyl to bupivacaine for caesarian section.

Patients and methods: This was a randomized, prospective, double-blind, clinical trial study conducted on 60 patients of American Society of Anesthesiologists (ASA) physical status I or II, scheduled for Cesarean deliveries were enrolled. The study was carried out at Al-Azhar University Hospitals (Al-Husein and Sayed Galal Hospitals), during the period from October 2018 to October 2020. They were divided into two equal groups: Group (A) patients were receiving ultrasound-guided TAP block with 20 ml of bupivacaine 0.25% bilaterally, and Group (B) received ultrasound-guided transversus abdominis plane block with 20 ml of bupivacaine 0.25% and 50 µg of fentanyl bilaterally.

Results: The amount of diclofenac and nalbuphine consumed in 24 hours by both the groups were compared. The consumption of diclofenac and nalbuphine was significantly lower among the bupivacaine-fentanyl group. Baseline mean arterial blood pressure was comparable between the two study groups with no statistically significant difference. After 15, 30 and 45 minutes in postanesthesia care unit. The mean arterial blood pressure was significantly lower in group B, Bupivacaine combined 3 with fentanyl transversus abdominis plane block, compared to the Bupivacaine-only group. In the sub-sequent recordings, there was no statistically significant difference between both groups. Baseline heart rate was comparable between the two study groups with no statistically significant difference. Postoperative pain was evaluated through assessment of the mean visual analog scale score, at postanesthesia care unit, 0.5, 1, 2, 4, 6, 8, 12, 24 hours postoperatively. The mean visual analog scale scores indicated a significant reduction during recovery time in B group, at 2 and 6 hours postoperatively. However, no significant difference was observed in the mean of pain intensity between the two groups at other times.

Conclusion: The addition of fentanyl as an adjuvant to bupivacaine in TAP block lowered postoperative pain scores, prolonged the time for first rescue analgesic, and decreased the postoperative nalbuphine consumption.

Keywords: Bupivacaine, Bupivacaine with Fentanyl, Bilateral Transversus Abdominis Plane Block, Caesarian section.

INTRODUCTION

Cesarean section (CS) is one of the most common surgical procedures in the world. Post-operative pain afflicts both mother and the newborn, especially the first 48 h after birth. Pain can be excruciating, disrupting mother/child bonding *(Khan et al., 2016)*.

The well-known side effects of the analgesic morphine as nausea, vomiting, itching and sedation, may interfere with the interaction between mother and child, breastfeeding and post-partum experience in a dose-dependent manner. However, a number of alternative strategies have been described in order to reduce morphine consumption post-operatively *(Carney et al., 2010)*.

One of these is the transversus abdominis plane (TAP) block, aregional anesthetic technique that can provide sensory and motor block of anterior abdominal wall from T7 to L1 although lacking any visceral effect. It is used for lower abdominal surgery such as CS *(McDonnel et al., 2012)*.

The interest in transversus abdominis plane (TAP) block increased in the last years after introduction of ultrasound in anesthetic practice *(El-Malla et al., 2021)*.

There are multiple benefits for mother and baby obtained by TAP block as Long and effective analgesia, earlier oral nutrition, earlier mobilization and short duration of hospital stay *(Moll et al., 2014)*.

Researches have focused on prolongation of the analgesia provided by the block *(Metwally al., 2017)*.

Local anesthetics alone provide analgesia for a few hours. Increasing the duration of local anesthetic action is often desirable because it prolongs surgical anaesthesia and analgesia. These achive by adding fentanyl with buipvacine. Different additives have been used to prolong the duration of blockade and thus improve the quality of anaesthesia and postoperative analgesia *(McDonnel et al., 2012)*.

The aim of the current study was to evaluate the efficacy and safety of ultrasound transverses abdomen plane block with bupivacaine and the effects of adding fentanyl to bupivacaine for cesarian section.

PATIENTS AND METHODS

This was a randomized, prospective, double-blind, clinical trial study conducted on 60 patients of American Society of Anesthesiologists (ASA) physical status I or II, scheduled for Caesarean Deliveries were enrolled. The study was carried out at Al-Azhar University Hospitals (Al-Husein and Sayed Galal Hospitals) during the period from October 2018 to October 2020.

Patients were divided into two equal groups: Group (A) received ultrasound guided TAP block with20 ml of bupivacaine 0.25% bilaterally, and **Group (B)** received ultrasound guided TAP block with 20 ml of bupivacaine 0.25% and 50 µg of fentanyl bilaterally.

Inclusion Criteria: ASA I to II patients, aged between 21 and 45 years.

Exclusion Criteria: Patient refusal, known Allergy to local anesthetics, body mass index >35 kg m2, history of chronic use of opioids, emergency CS, coagulopathy, infection at puncture site, and physical status ASA III or more.

Sample size: Using STATA program, setting alpha error at 5% and power at 80% according to previous study (Kandi and Kandi., 2015) evaluating the bupivacaine versus bupivacaine with Fentanyl In bilateral transversus abdominis plane block for postoperative pain relief in patients undergoing cesarean deliveries.

Ethical considerations:

The study was performed after ethical committee approval and obtaining informed consents from the patients. The study protocol was explained to the patients after taking their consent to the type of anesthesia and surgical procedure.

All patients were subjected to:

1. Monitor for vital signs: Electrocardiograph (ECG), noninvasive blood pressure (NIBP), oxygen saturation (SpO2).
2. Ultrasound machine (sonosite M turbo).
3. Spinal anesthesia needle (25G).
4. Bupivacaine 0.5% - Lidocaine 2%.
5. Resuscitation equipment and drugs.

The pre-anesthetic assessment was performed with history, clinical examination and investigations. Furthermore, after insertion of venous access, all patients received 0.01 mg/kg atropine as a premedication, 1 mg of metoclopramide, and 20 mg of famotidine was administered intravenously (IV) before the operation. 20 mL/kg of Ringer’s lactate solution was infused for 15 minutes as a preload. Preoperative monitoring and baseline readings of mean arterial blood pressure (MAP), heart rate (HR) and oxygen saturation (PO) was recorded.

All the study participants who received spinal anesthesia had a standard spinal anesthetic consisting of 10-12 mg of 0.5% hyperbaric bupivacaine. The patients then moved immediately to the supine position with a 15° head elevation. After confirmation of a sufficient level of anesthesia, abdominal surgery was performed with continuous hemodynamic monitoring of blood pressure and heart rate. If the systolic blood pressure decreased to 20% below the baseline or less than 90 mmHg, 6 mg of ephedrine was injected IV. Moreover, if the heart rate reduced to 50 bpm or less, 0.6 mg of atropine was injected IV.

After completion of surgery, fascial plane block was applied to reduce and control pain following the surgery. At the end of surgery, linear US probe (high frequency probe 10–12 MHz) connected to a portable US unit (SonoSite, USA) was placed in the mid-axillary plane midway between the lower costal margin and the highest point of iliac crest with the patient in supine position. After skin disinfection, a 23-G 50-mm needle with an injection line was inserted in plane with the probe. Once the tip of the needle was placed in the space between the internal oblique abdominal muscle and transversus abdominis muscle and, after negative aspiration, 5 ml saline (0.9%) was injected to distend the transversus abdominis plane, then 20 ml of bupivacaine (0.25%) was injected, and the same procedure was done on the other side.

Group B: received spinal anesthesia according to the same protocol as in group A and US guided Transversus Abdominis Plane block (TAP) block bilaterally after the end of surgery with 20 ml of bupivacaine 0.25% and 50 µg of fentanyl.

The following parameters were assessed and recorded:

1. Hemodynamic monitoring: Mean arterial blood pressure and heart rate were recorded every 15 minutes for the first postoperative hour then at 2 ,4 , 6 , 12 and 24 hours postoperatively.
2. Respiratory monitoring: Peripheral oxygen saturation (SPO2) was recorded every 15 minutes for the first hour postoperative then at 2, 4, 6, 12 and 24 hours postoperatively.
3. Assessment for post-operative pain using visual analogue scale score every 15 minutes for the first postoperative hour then at 2, 4, 6, 12 and 24 hours postoperatively.
4. Analgesic requirements (Rescue analgesic): The time to first rescue analgesic Nalbuphine (0.1 mg/kg) was recorded in both groups VAS reached 4 and the total consumption of analgesia in first 24 hours postoperatively was recorded in both groups.
5. Post operative nausea and vomiting: The incidence of postoperative nausea and vomiting was assessed in both groups in first 24 hours, and average consumption of rescue antiemetic doses of Granisetron (1mg) was recorded in both groups.
6. The time to hospital discharge was recorded.

Statistical analysis:

The collected data was organized, tabulated, and statistically analyzed using SPSS software statistical computer package (IBM Corp., Armonk, NY, USA). Numerical variables, such as age and body weight, was normally distributed and was summarized as the mean ± standard deviation. An independent t-test was used to compare the mean values in the two groups. Other variables which were not normally distributed and are presented as the median and interquartile range (IQR). Mann–Whitney U-test was used as a test of significance. Qualitative data was presented as the number and percentage, and Chi-square test was used to determine significance. P-value of <0.05 was considered statistically significant.

RESULTS

Sixty patients were recruited in the study, of these, thirty were randomized to undergo TAP block with 20 ml of 0.25% bupivacaine bilaterally + 2 ml normal saline and the remaining thirty patients with 20 ml of 0.25% bupivacaine + 2 ml of 50 µg fentanyl bilaterally. Regarding demographic data, there was no statistically significant difference between group B (Bupivacaine) and group BF (Bupivacaine-fentanyl) **(Table 1)**.

Table (1): Comparison between group A (TAP block) and group B (TAP block) according to demographic data

Groups / Demographic data	Group A TAP block (n=30)	Group B TAP block (n=30)	p-value
Age (years) Mean±SD	29.97±6.45	29.10±6.58	0.608
Body Weight (kg) Mean±SD	59.70±6.83	60.33±5.97	0.704
ASA			0.718
I	26 (86.7%)	25 (83.3%)	
II	4 (13.3%)	5 (16.7%)	
Duration of surgery (min) Mean±SD	46.37±9.25	48.13±8.70	0.449

Data were expressed as Mean ± standard deviation, number (%)
T-Independent Sample t-test; #x2: Chi-square test

Baseline mean arterial blood pressure (MAP) was comparable between the two study groups with no statistically significant difference. After 15, 30 and 45 minutes in PACU, the MAP was significantly lower in group B, Bupivacaine combined 3with fentanyl TAP block, compared to the Bupivacaine-only group. In the sub-sequent recordings, there was no statistically significant difference between both groups.

Baseline heart rate was comparable between the two studied groups with no statistically significant difference. In the subsequent recordings, there was no statistically significant difference between both groups.

There was no statistically significant difference between both groups regarding oxygen saturation.

Postoperative pain was evaluated through assessment of the mean VAS score, at PACU, 0.5, 1, 2, 4, 6, 8, 12, 24 hours postoperatively. The mean VAS scores indicated a significant reduction during recovery time in the BF group, at 2 and 6 hours postoperatively. However, no significant difference was observed in the mean of pain intensity between the two groups at other times (P>0.05).

The incidence of nausea and vomiting was compared among the two groups. The difference was not statistically significant.

The amount of diclofenac and nalbuphine consumed in 24 hours by both the groups were compared. The consumption of diclofenac and nalbuphine was significantly lower among the bupivacaine-fentanyl group.

There was no significant statistical difference between both groups as regard the hospital stay (days) **(Table 2)**.

Table (2): Comparison between group A (TAP block) and group B (TAP block) according to Mean arterial blood pressure, heart rate, Spo2%, VAS score, postoperative nausea and vomiting, analgesic requirements and hospital Stay

Groups / Time of assessment	Group A TAP block (n=30)	Group B TAP block (n=30)	p-value
Mean arterial blood pressure:			
Baseline (At PACU)	77.90±11.76	79.91±12.25	0.505
After15 min.	74.81±10.98	68.88±9.51	0.0291
After 30 mi	72.3 7±9.52	65.87±8.52	0.008
After45 min	69.53±8.44	62.94±7.52	0.002
After 60 min	65.87±7.93	62.87±9.33	0.184
After 2hrs	66.55±8.52	63.86±7.67	0.203
After 4 hrs	67.65±9.14	64.88±8.77	0.236
After 6hrs	70.87±10.43	68.32±7.92	0.291
After 12 hrs	69.88±9.43	67.98±11.75	0.492
Postoperative heart rate:			
Baseline (At PACU)	80.50±6.33	81.39±5.44	0.561
After 15 min.	76.36±5.24	75.33±4.55	0.419
After30 min.	73.34±4.54	72.62±6.56	0.623
After 45 min.	75.09±3.28	75.83±4.55	0.4728
After 60 min.	77.09±6.28	76.74±7.25	0.842
After 2 hrs.	78.43±5.73	76.83±6.55	0.318
After 4 hrs	78.70±6.49	75.85±7.44	0.119
After 6hrs	77.74±6.36	76.70±8.38	0.590
After12 hrs	76.70±2.40	77.70±3.57	0.2080
Spo2%:			
Baseline (At PACU)	98.80±0.41	98.67±0.48	0.250
After 15min	98.67±0.48	98.70±0.47	0.786
After 30min	99.87±0.35	99.90±0.31	0.694
After 45 min	99.97±0.18	99.93±0.25	0.561
After 60 min	99.90±0.31	99.87±0.35	0.694
After 2hrs	99.90±0.31	99.90±0.31	1.000
After 4 hrs	99.90±0.31	99.90±0.31	1.000
After 6hrs	99.90±0.31	99.90±0.31	1.000
After 12 hrs	99.90±0.31	99.90±0.31	1.000
VAS score:			
Baseline (At PACU)	0.6 (0.37-0.83)*	0.51 (0.18-0.83)*	0.250
After 30 min	0.91 (0.58-1.23)*	0.82 (0.43-1.2)*	0.786
After 60 min	2.3 (1.8-2.8)*	1.52 (0.9-2.1)*	0.694
After 2hrs	4.7 (3.6-5.7)*	1.4 (0.6-2.2)*	0.004
After 4 hrs	2.5 (1.7-3.3)*	1.41 (0.19-2.6)*	0.811
After 6hrs	5.8 (4.6-7)*	4.2 (3.1-5.3)*	0.013
After 8 hrs	2.5 (0.9-3.1)*	2.3 (1.7-2.9)*	1.000
After 12 hrs	2.6 (1.8-3.3)*	1.1 (0.7-2.9)*	0.997
After 24 hrs	3.5 (2.4-4.6)*	1.2 (0.9-3.4)*	0.312

Postoperative nausea and vomiting (PONV):			
No	(73.3) 22	(70.0)21	0.250
Yes	(26.7) 8	(30.0) 9	0.786
Total analgesic requirements in 24 hours:			
Diclofenac	2.55 (1.9-3.2)	3.36 (2.5-4.2)	0.023
Nalbuphine	9.6±1.7	7.4±1.3	<0.001
Hospital Stay (days):			
Median (IQR)	1.88 (1.4-2.4)	2.08 (1.6-2.5)	0.284

* Data was presented as median (IQR)
* Analysis was done by Mann–Whitney U test

DISCUSSION

Pain is ranked highest among undesirable clinical outcomes associated with caesarean section (CS) *(Kerai et al., 2017)*. Adequate post-operative analgesia in the obstetric patients is crucial as they have different surgical recovery needs which include breastfeeding and care of the newborn; these can be impaired if analgesia is unsatisfactory. The ideal post-CS analgesic regime should be efficacious without impacting the ability of mother to take care of the neonate and with minimal drug transfer through breast milk. Indeed, multiple analgesic modalities have been introduced to alleviate pain after cesarean delivery, including the TAP block.

The TAP block is commonly used during a cesarean delivery, in which it forms part of a multimodal postoperative analgesic regimen *(Kanazi et al., 2010) (Abdallah et al., 2012) (Ismail et al., 2012) (McDonnell et al., 2012)*.

Numerous analgesic adjuncts have been added to LAs in various peripheral nerve blocks in order to improve the analgesic duration *(Ammar and Mahmoud, 2012)*; however, a conflict has been evoked, regarding the analgesic efficacy of adding opioid as fentanyl to bupivacaine in TAP block. The present study aimed to investigate whether the addition of fentanyl to the transversus abdominis plane (TAP) block procedure may improve the analgesic duration and requirements following cesarean delivery.

The present study demonstrated that the addition of 50 µg fentanyl to bupivacaine was able to improve the TAP block analgesia following cesarean delivery, as assessed by the duration of analgesia, VAS pain scores and post-surgery analgesic requirements. The mean VAS score was significantly lower among the bupivacaine-fentanyl group, compared the the bupivacaine-only group at 2 and 6 hours postoperatively (1.4 Vs 4.7 and 4.2 Vs 5.8, $P < 0.05$) respectively. No statistically significant difference was noticed at the other time points. In addition, the consumption of nalbuphine and declofenac was significantly lower among the bupivacaine-fentanyl group. The duration of analgesia and time to first rescue analgesia were significantly longer in the bupivacaine-fentanyl group.

Indeed, the early analgesic-sparing effect associated with perineural fentanyl may have been mediated by systemic effects due to peripheral uptake. In addition, the late analgesic-sparing effect associated with perineural fentany can be attributed to the local anaesthetic LA-like action of opioids, including fentanyl, when administered perineurally *(Hashim et al., 2019)*. Fentanyl acts both presynaptically and postsynaptically to produce an analgesic effect. Presynaptically, opioids block calcium channels on nociceptive afferent nerves to inhibit the release of neurotransmitters such as substance P and glutamate, which contribute to nociception. Postsynaptically, opioids open potassium channels, which hyperpolarize cell membranes, increasing the required action potential to generate nociceptive transmission. The mu, kappa, and delta-opioid receptors mediate analgesia spinally and supraspinally *(Cohen et al., 2021)*.

Previous studies have reported improved analgesia following the addition of fentanyl to LAs in various nerve blocks, including the axillary brachial plexus *(Akhondzadeh et al., 2019)*, cervical plexus, infraorbital nerve *(Rajan et al., 2021)*, paravertebral analgesia *(Bakeer et al., 2017)* and caudal block *(Tewari and Singh, 2020)*. Moreover, *Khezri et al. (2016)* and *Weigl et al. (2016)* reported that addition of intrathecal fentanyl to spinal anesthesia is effective for intraoperative analgesia and decreases opioid consumption after cesarean section. Supportingly, *Kumar et al. (2016)* found that low-dose bupivacaine with fentanyl is superior to bupivacaine and butorphanol in terms of early PO recovery resulting in early discharge and better outcome of elderly patients with comorbidity. Also, *Singh et al. (2016)* found fentanyl as an adjuvant to intrathecal ropivacaine prolongs PO pain relief without increasing duration of motor blockade. *Karakaya et al (2010)* found that the addition of fentanyl to bupivacaine in brachial plexus axillary block approach enhanced and prolonged anesthesia and analgesia, increased duration of sensory and motor block and increased the duration of postoperative analgesia.

Conversely, other studies *(Fanelli et al., 2010) (Johansson et al., 2013)* have been unable to detect improved analgesia following co-administration of LAs and fentanyl. *(Murphy et al., 2010)* reported that opioids had limited benefits as analgesic adjuncts to the brachial plexus block, whereas they were shown to exert a definite but mild analgesia following intraarticular injection in another study.

Regarding the hemodynamic effects, both groups had stable hemodynamic parameters with no occurrence of hypertension or tachycardia that required medications, but the TAP fentanyl group showed a significant decrease in the MAP for prolonged time postoperatively in comparison to the bupivacaine-only group. Heart rate was lower in the fentanyl group but no significant difference was reported. This can be postulated by the extended analgesic effect of fentanyl, reducing pain intensity, which stimulates the sympathetic system and causes increase in HR and MAP of the patient.

In a study conducted by *Tsuchiya et al., 2012* hemodynamic stability is reported with the use of TAP block even in high-risk patients with American Society of Anesthesiologists score III with cardiovascular disease. Conversely, the study conducted by *Metwally et al., 2017* reported no reduction in the MAP as a result to the addition of fentanyl to bupivacaine in TAP block.

Regarding PONV, there was no statistically significant difference in the incidence of postoperative nausea and vomiting in both groups. Supportingly, the study conducted by *Wang et al., 2015* showed that addition of fentanyl to bupivacaine in TAP block for elective cesarean delivery was not associated with increased incidence of side effects, including PONV. In a study conducted by *Sindjelic et al., 2010* they reported that the addition of fentanyl to local anaesthetic in cervical plexus block was associated with better quality and duration of analgesia without significant adverse effects reported. Our results were also in agreement with *Carney et al., 2010* who compared the analgesic efficacy of ipsilateral TAP block after appendectomy in children versus placebo. They did their study on 40 child undergoing appendectomy randomized into two groups who underwent TAP block versus placebo in addition to PCA morphine. They found that there was no significant difference in the incidence of nausea or distribution of nausea scores between the two studied groups at any time interval.

A limitation of the present study was that the extent of abdominal wall sensory block following the TAP block was not assessed, due to the residual sensory block from spinal anesthesia in the early postoperative period; thus, the failed blocks were not excluded. Another limitation to our study was the limited sample size in each group. Further investigations are needed on wider population, in order to concur our results, to confirm their safety, and to support the absence of systemic complications. A large individual variation in post cesarean delivery analgesia was noted, which may limit the conclusion of the study.

CONCLUSION

The addition of fentanyl as an adjuvant to bupivacaine in TAP block lowers postoperative pain scores, prolongs the time for first rescue analgesic, and decreases the postoperative nalbuphine consumption. Future studies should endeavour to investigate other measures, including the application of the continuous catheter-based technique, that may prolong the postoperative analgesic duration of the TAP block.

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دراسة مقارنة بين بوبيفاكين مقابل بوبيفاكين مع فنتانيل في اغلاق مستوي عضله البطن المستعرضه علي الجانبين في تسكين الالام مابعد الولادة القيصيرية

محمد أحمد إسماعيل الفخراني، محمد محمد صلاح الدين شملول،

سعد الدين محمود عبد الرحمن الخطيب

قسم التخدير والرعاية المركزة، كلية الطب، جامعة الأزهر

E-mail: malfkhrany428@gmail.com

خلفيــة البحــث: العمليــة القيصــرية هــي واحــدة مــن أكثــر العمليــات الجراحيــة شــيوعًا فــي العــالم. يصــيب ألــم مــا بعــد الجراحــة كــل مــن الأم والمولــود، خاصــة فــي أول 48 ســاعة بعــد الــولادة. ويــوفر التخــدير الموضــعي وحــده تســكينًا لبضــع ســاعات، وغالبًــا مــا يكــون زيــادة مــدة عمــل التخــدير الموضــعي أمــرًا مرغوبًــا لأنــه يطيــل التخــدير الجراحــي والتســكين. ويــتم تحقيــق ذلــك عــن طريــق إضــافة الفنتانيــل مــع البويبفاســين، ثــم إســتخدام إضــافات مختلفــة لإطالــة مــدة الحصــار، وبالتــالي تحســين جــودة التخــدير والتســكين بعــد الجراحة.

الهــدف مــن البحــث: تقيــيم فعاليــة وســلامة إغــلاق مســتوي عضــلة الــبطن المستعرضــة علــي الجــانبين بالموجــات فــوق الصــوتية مــع البيوبيفــاكين وتــأثيرات إضــافة الفنتانيــل إلى البيوبيفاكين لتسكين آلام ما بعد العمليات القيصرية.

المرضــى وطــرق البحــث: تــم تســجيل هــذه الدراســة الســريرية العشــوائية، المرتقبــة، مزدوجــة التعميــة، علــى 60 مريضًــا مــن الحالــة الجســدية للجمعيــة الأمريكيــة لأطبــاء التخــدير، المقــرر إجراؤهــا للــولادة القيصــرية. أجريــت الدراســة فــي مستشــفيات جامعــة الأزهــر (مستشــفى الحســين وســيد جــلال)، الفتــرة مــن أكتــوبر 2018 إلــى أكتــوبر 2020. تــم تقســيمهم إلــى مجمــوعتين متســاويتين: مجموعــة (أ) يتلقــون العــلاج بالموجــات فــوق الصــوتية باســتخدام جهــاز ضــغط الــدم باســتخدام الموجــات فــوق الصــوتية مــع 20 مــل. مــن بوبيفاكــائين 0.25٪ علــى المســتوى الثنــائي، ومجموعــة (ب) يتلقــون كتلــة عضــلة الــبطن المستعرضــة الموجهــة بالموجــات فــوق الصــوتية مــع

20 مـــل مـــن بوبيفـــاكين 0.25٪ و 50 ميكروغـــرام مـــن الفنتانيـــل علـــى المســـتوى الثنائي.

نتـــائج البحـــث: كـــان اســـتهلاك ديكلوفينـــاك ونـــالبوفين أقـــل بشـــكل ملحـــوظ بـــين مجموعـــة بوبيفـــاكين – فنتانيـــل، وكـــان متوســـط خـــط الأســـاس لضـــغط الـــدم الشـــرياني قـــابلاً للمقارنـــة بـــين مجمـــوعتي الدراســـة مـــع عـــدم وجـــود فـــرق معتـــد بـــه إحصـــائيًا. وبعـــد 15 و 30 و 45 دقيقـــة فـــي وحـــدة رعايـــة مـــا بعـــد التخـــدير، كـــان متوســـط ضـــغط الـــدم الشـــرياني أقـــل بشـــكل ملحـــوظ فـــي المجموعـــة BF، تـــم دمـــج بوبيفـــاكين مـــع كتلـــة طـــائرة الفنتانيـــل المســـتعرض البطنـــي، مقارنـــة بمجموعـــة بوبيفـــاكين فقـــط. وفـــي التســـجيلات المتسلســـلة الفرعيـــة، لـــم يكـــن هنـــاك فـــرق ذو دلالـــة إحصـــائية بـــين المجمـــوعتين، وكـــان معـــدل ضـــربات القلـــب الأساســـي قـــابلاً للمقارنـــة بـــين مجمـــوعتي الدراســـة مـــع عـــدم وجـــود فـــرق معتـــد بـــه إحصـــائيًا. وتـــم تقيـــيم الألـــم بعـــد الجراحـــة مـــن خـــلال تقيـــيم متوســـط درجـــة المقيـــاس التنـــاظري البصـــري، فـــي وحـــدة رعايـــة مـــا بعـــد التخـــدير، 0.5 ، 1، 2، 4، 6، 8، 12، 24 ســـاعة بعـــد الجراحـــة. وأشـــار متوســـط درجـــات المقيـــاس التنـــاظري البصـــري إلـــى إنخفـــاض كبيـــر خـــلال وقـــت الاســـترداد فـــي (مجموعـــة ب)، فـــي 2 و 6 ســـاعات بعـــد الجراحـــة. ومـــع ذلـــك، لـــم يلاحـــظ أي فـــرق كبيـــر فـــي متوســـط شـــدة الألـــم بـــين المجموعتين في أوقات أخرى.

الاســـتنتاج: إضـــافة الفنتانيـــل كعامـــل مســـاعد إلـــى بوبيفاكـــاين فـــي إغـــلاق مســـتوي عضـــلة الـــبطن المستعرضـــة علـــي الجـــانبين بالموجـــات فـــوق الصـــوتية يقلـــل مـــن درجـــات الألـــم بعـــد الجراحـــة، ويطيـــل مـــن وقـــت أول مســـكن للإنقـــاذ، ويقلـــل مـــن اســـتهلاك النـــالوفين بعـــد الجراحة.

الكلمـــات الدالـــة: بوبيفاكـــايين، بوبيفاكـــايين مـــع فينتانيـــل، عضـــلة الـــبطن المستعرضـــة علي الجانبين، الولادة القيصيرية.