

Original Article

The impact of adding fentanyl to bupivacaine on spinal anesthesia for caesarean

Ghada Rajab Alnaeli¹, Sara A Hwisa², Aboajela Ramadan Ajaj¹, Kareemah Ali Alhuwayj¹, Salaheddin Ali Etohy Elmaggoze¹,

1. Department of Anesthesia Faculty of Medical Technology, Surman , Sabratha University Libya .

2. Vice dean for Scientific Affairs, Faculty of Dentistry and Oral surgery , Surman , Sabratha University Libya .

Email :Medodi01@gmail.com

ABSTRACT:

Background and aim: A spinal block is commonly used procedure for cesarean section surgery worldwide. It involves injecting fentanyl, an opioid, into the spinal fluid to enhance and prolong the analgesic effects of spinal anesthesia. This study aimed to evaluate the effect of adding fentanyl to intrathecal bupivacaine for caesarean section on the duration and quality of analgesia and the reduction of local anesthetic dose requirement. Methods: This study compared the effects of two types of spinal anesthesia in women who had caesarean deliveries, as one group received both fentanyl and bupivacaine while the other group received only bupivacaine. Results: a significant differences in the duration of analgesia between the two groups (P-value = 0.02) was determined. The mean duration of analgesia in the bupivacaine only received group was (3:43) hours, while in the bupivacaine and fentanyl group was (5:2) hours. The pain relief also started faster for the group that received Bupivacaine and fentanyl than for the group that received only Bupivacaine. Conclusion: Fentanyl, when added to bupivacaine for spinal anesthesia in cesarean section surgery, enhances the duration of sensory and motor block and prolongs the postoperative analgesia.

Keywords: Cesarean section, Spinal anesthesia, Hyperbaric bupivacaine, Intrathecal, Fentanyl.

Citation: Rajab Alnaeli, Hwisa Sara A, Ramadan Ajaj Aboajela, Alhuwayj Kareemah Ali, Elmaggoze Salaheddin Ali,.The impact of adding fentanyl to bupivacaine on spinal anesthesia for caesarean . <https://doi.org/10.26719/LJM172.11> **Received:** 12/11/2023; **accepted:** 23/11/2023; **published:** 31/12/2023 Copyright ©Libyan Journal of Medical Research (LJMR) 2023. Open Access. Some rights reserved. This work is available under the CC BY license <https://creativecommons.org/licenses/by-nc-sa/3.0/igo>

INTRODUCTION

Cesarean section (CS) is one of the most common surgeries in the world. It is considered the best way to ensure the safety of the mother and the distressed baby during the late stage of pregnancy or vaginal delivery.[1] The type of anesthesia used for a cesarean section depends on several factors, such as the reason for the surgery, the patient's preferences and the

anesthesiologist's opinion. [2] Spinal anesthesia is a widely used anesthetic technique for cesarean delivery. It has the advantages of being easy to perform, fast to take effect, and providing excellent operating conditions. It also reduces the fetal and maternal risks associated with general anesthesia and requires minimal postoperative anesthesia care. [3] The Bupivacaine is a local anesthetic drug that is

widely used for spinal anesthesia in cesarean deliveries. It has a longer duration of action and a lower cost than other local anesthetics. However, spinal anesthesia with bupivacaine and other local anesthetic agents can cause dose-dependent side effects such as respiratory depression, vomiting, and shivering. [4]

Postoperative pain is a common and unpleasant experience for women who undergo cesarean deliveries. It can have negative consequences such as delayed recovery, longer hospital stay, and delayed breastfeeding. Moreover, inadequate pain relief can increase the levels of stress hormones in the blood, which can harm various organs. [5] On the other hand, effective pain relief can enhance the mother-infant relationship, facilitate early mobility and discharge, increase satisfaction and promote early breastfeeding. [6] One way to achieve effective pain relief is to administer opioids along with local anesthetics into the spinal cord. This method improves the quality of pain relief during and after the surgery, compared to using local anesthetics alone. [7,8]

Fentanyl is a synthetic opioid that can easily cross the spinal cord membrane. It has a fast onset of action and can improve the quality of pain relief during surgery. It also reduces the amount of local anesthetic drugs needed and causes fewer side effects. Furthermore, it can provide good pain relief after surgery.[9] For elective caesarean section, the fentanyl has been added to bupivacaine for spinal anesthesia. This combination has improved the quality of the block and reduced the need for more opioids during the operation. [10] This study aimed to compare the effectiveness and safety of adding fentanyl to bupivacaine versus bupivacaine alone in spinal anesthesia with Monitor duration of analgesia and

improve the quality of block and reduce the need for intrathecal dose of local anesthetics

METHADODOLOGY:

Study design and setting: This is a comparative randomized clinical study that was conducted from January 1 to April 26, 2023, at the AL Zawiya Hospital. The study involved 30 healthy pregnant women who underwent cesarean section, the patients were randomly assigned to two groups that received intrathecal injections of either 2.5cc (12mg) of bupivacaine alone or 0.5cc (0.25 g) of fentanyl mixed with bupivacaine.

The two groups were as follows

Group A: This group consisted of 15 patients who received intrathecal bupivacaine alone.

Group B: This group consisted of 15 patients who received intrathecal bupivacaine and fentanyl mixture.

SAMPLE COLLECTION:

The patients arrived at the operation room and were monitored with non-invasive blood pressure, pulse oximeter, heart rate, respiratory rate, and oxygen saturation before surgery. A urinary catheter was inserted and each patient received 2000 ml of intravenous fluid.

The patients were positioned in a sitting posture and their lower back was cleaned and draped with 10% povidone iodine in a sterile manner. A local anesthetic skin wheal was made at the L4-L5 intervertebral space with 3-5 ml of 1% lidocaine, using a pencil point spinal needle (size 25-27 G). The spinal needle was inserted through the introducer until the loss of resistance and the dural puncture were felt. After confirming the adequate cerebrospinal fluid (CSF) flow through the needle, 12 mg of bupivacaine alone or with fentanyl was injected. All patients were assessed for analgesia and potential drug complications within 24 hours after surgery.

Data Analysis:

Statistical analysis was performed using SPSS version 26 Software. Data are expressed as mean ± SD. To detect a difference between the two groups (intrathecal bupivacaine alone or bupivacaine with fentanyl mixture), a sample size of n = 15 patients in each group was required. The t-test. P - values less than 0.05 were considered statistically significant.

RESULT:

The table (1) shows demographic data of participants

Group	AGE	WEIGHT	Hight
	Mean ± Sd	Mean ± Sd	Mean ± Sd
Bupivacaine	31.4 ± 2.02	81.6 ± 2.5	1.68 ± 5.6 cm
Bupivacaine and fentanyl	33.7 ± 1.31	79.7 ± 3.16	1.65 ± 4.85cm
P-VALUE	0.39	0.26	0.094

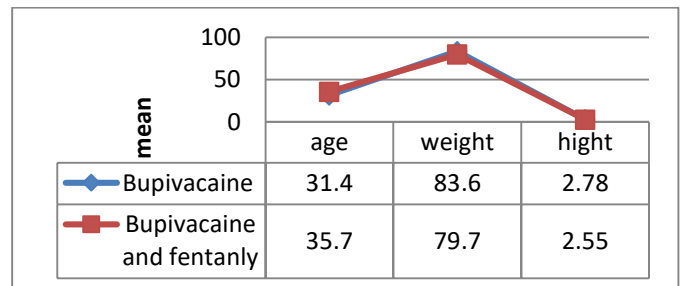
This table displays the age distribution of the study sample. The cases that received only a warning dose had a mean age of (31.4) and a standard deviation of (2.02), The cases that received Bupivacaine and

Ethical considerations:

This study received ethical approval from Al-Zawiya Teaching Hospital. The participants gave their informed consent after reading the study proposal and agreed to take part voluntarily. They were also assured that their responses would be anonymous and confidential

fentanyl had a mean age of (33.7) and a standard deviation of (1.31), The mean weight of the cases that received only a warning dose was 81.6 kg and the standard deviation was (2.5), The mean weight of the cases that received Bupivacaine and fentanyl was (79.7 kg) and the standard deviation was (3.16), The significance level of (0.26 > 0.05) indicated that there was no significant difference in weight between the two groups. The mean height of the cases that received only a warning dose was (1.68 cm) and the standard deviation was (5.6 cm), The mean height of the cases that received Bupivacaine and fentanyl was (1.65 cm) and the standard deviation was (4.85 cm), The significance level of (0.09 > 0.05) indicated that there was no significant difference in height between the two groups.

Table (2) Shows the Mean of blood pressure before administration drug:



Graph (1) Show demographic data of samples

The two groups did not show any significant

Group	Systolic	Diastolic
	Mean ± Sd	Mean ± Sd
Bupivacaine	114 ± 4.4	84± 2.8
Bupivacaine and fentanyl	116 ± 3	86.17± 0.69
P-value	0.172	0.113

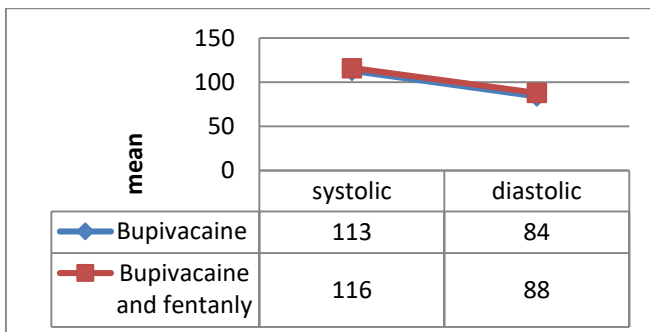
differences in their diastolic or systolic blood pressure, as indicated by the *P*-values of (0.172) and (0.113), respectively.

	Group	Mean ± Sd (minute)	<i>P</i> - value
	Bupivacaine	± 0.62. 3.43	0.022
	Bupivacaine and fentanyl	5.2 ± 0.47	

Table (3) Shows the Mean time between begin operation and the end

Group	Mean ± Sd (minute)	<i>P</i> - value
Bupivacaine	33 ± 0.1	0.072
Bupivacaine and fentanyl	30 ± 1.8	

The table (3) shows that the process time for the two groups was not significantly different, with a *P*-value of (0.072), The mean time of performing the operation was (33 minutes) for the first group and (30 minutes) for the second group.



Graph (2) Show the Mean of blood pressure before administration drug

Table (4) Shows the Mean time of duration analgesia:

The results showed that there was a significant difference between the two groups, with a *P*-value of (0.02) , The mean duration of analgesia

in the group that received bupivacaine alone was (3.43 hours) , while the group that received bupivacaine and fentanyl had a mean duration of (5.2 hours) .

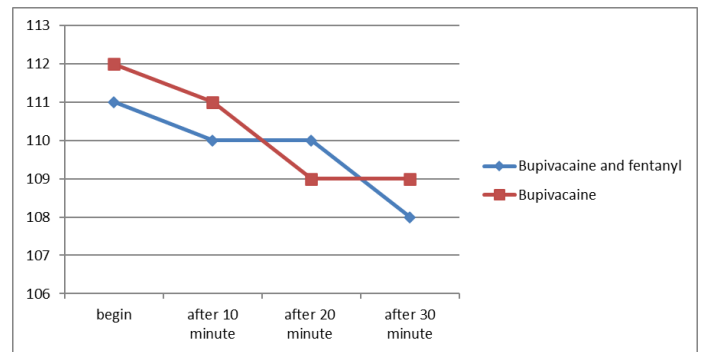
The Vital signs:

Five variables were analyzed (Bp), (HR), (SPO2), (RR) and (Pulse).

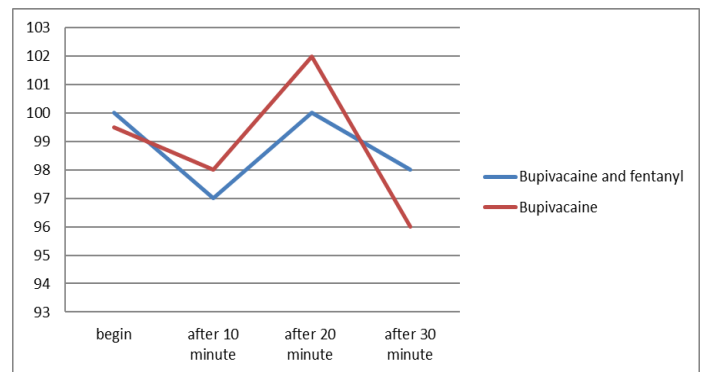
Table (5) Shows the vital signs:

Vital signs	Bupivacaine	Bupivacaine and fentanyl	<i>P</i> -value
	Mean ± Sd	Mean ± Sd	
Blood pressure (BP)	120/76	118/78	0.228
HEART RATE (HR)	116 ± 1.85	114.34± 2.31	0.316
SPO2	98 ± 0.03	98 ± 0.056	0.793
Respiratory rate	19 ± 0.08	20 ± 0 25.	0.445
Pulse	101.21 ± 4.74	104.2 ± 1.91	0.068

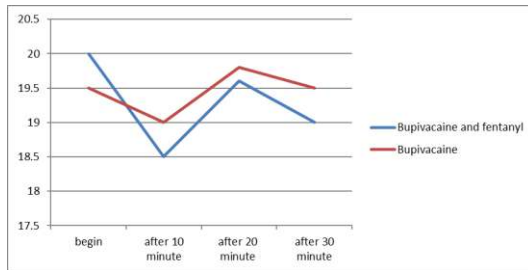
The results showed that no significant differences were found between the two groups for vital signs of blood pressure, heart rate, SPO2, breathing rates, pulse.



Graph (3) Shows the HR



Graph (4) Shows the SPO2



Graph (5) Shows the (RR)

DISCUSSION:

The choice of anesthesia technique for caesarean section is very important to ensure the safety and comfort of both the mother and the fetus, There are different options for anesthesia, such as spinal anesthesia with intrathecal morphine or spinal anesthesia with intrathecal fentanyl. Intrathecal morphine is an effective opioid that can provide pain relief during and after the surgery, Intrathecal fentanyl is another opioid that can enhance the quality of the anesthesia and improve the postoperative analgesia. This study aimed to compare the effects of these two options on several variables, especially the duration of analgesia.

The study involved 30 cases, divided into two groups of 15 cases each. The first group received spinal anesthesia with intrathecal morphine, while the second group received spinal anesthesia with intrathecal fentanyl. The two groups were matched for age ($P = 0.39$) and weight ($P = 0.26$), Blood pressure was measured before the administration of the drugs to ensure the similarity of the two groups. The results showed that there was no significant difference between the two groups in terms of systolic blood pressure ($P = 0.113$) and diastolic blood pressure ($P = 0.172$). However, some previous studies [12,13] indicated that a high concentration of bupivacaine, which is a local anesthetic drug, could cause a high incidence of hypotension (50-85%).

The study also evaluated the duration of the surgical procedure for the two groups. The results showed that there was no significant difference between the two groups in terms of the process time ($P = 0.072$), The average process time for the first group was 33 minutes, while the average process time for the second group was 30 minutes. [14]

Our study aimed to compare the effects of two different doses of intrathecal fentanyl on the duration and quality of analgesia and anesthesia in patients undergoing cesarean section, we used either 12 mg of hyperbaric bupivacaine alone or combined with 25 μ g of fentanyl. We measured the time from the injection of the drugs to the first movement of the patients after the surgery, as well as their vital signs and satisfaction levels. We found that the group that received bupivacaine and fentanyl had a significantly longer duration of analgesia than the group that received only bupivacaine (5.2 hours vs. 3.43 hours, $P = 0.02$). This means that adding fentanyl to bupivacaine extended the analgesic effect by about 1.8 hours. However, the two groups did not differ significantly in their vital signs, satisfaction levels, or the quality of anesthesia during the surgery, Our results are consistent with previous studies that reported similar durations and qualities of anesthesia and analgesia with intrathecal bupivacaine and fentanyl. [11,13,15,16,17] However, unlike a previous study that used a lower dose of 10 μ g of fentanyl, [10] we did not observe any additional benefit of fentanyl on the postoperative analgesia.

Therefore, we conclude that a combination of 12 mg of hyperbaric bupivacaine and 25 μ g of fentanyl provides effective and safe anesthesia for cesarean section patients, with a longer duration of analgesia than bupivacaine alone, but without any significant improvement in the postoperative pain relief.

CONCLUSION:

By adding fentanyl to bupivacaine, the quality and duration of spinal anesthesia and analgesia can be improved for patients who undergo this procedure, This combination results in quicker and longer-

lasting effects of sensory and motor block, which means that the patients feel less pain and have more muscle relaxation, The findings also suggest that fentanyl can extend the time of postoperative pain relief without altering the vital signs of the patients who do not receive any other painkillers along with the anesthetic drug.

RECOMENDATION:

The addition of fentanyl to bupivacaine can enhance the quality of lumbar anesthesia and provide effective postoperative pain relief, More medical research is needed on these opioid substances by experts to examine them from various perspectives.

CONFLICT OF INTEREST:

The combination of fentanyl and bupivacaine can increase the effectiveness of lumbar anesthesia and offer satisfactory postoperative pain relief, especially for surgical procedures that last longer than two hours, This is based on the findings of the research studies that examined this topic.

ACKNOWLEDGMENT / NELL.

REFERENCES:

1. Abebe FE, Gebeyehu AW, Kidane AN, Eyassu GA. Factors leading to cesarean section delivery at Felegehiwot referral hospital, Northwest Ethiopia: a retrospective record review. *Reprod Health*. 2016;13:6.
2. Farzi F, Mirmansouri A, Naderi Nabi B, Atrkar Roushan Z, Ghazanfar Tehran S, Nematollahi Sani M, Makhlooghi Azad S, Nemati M. Comparing the Effect of Adding Fentanyl, Sufentanil, and Placebo with Intrathecal Bupivacaine on Duration of Analgesia and Complications of Spinal Anesthesia in Patients Undergoing Cesarean Section. *Anesth Pain Med*. 2017;7(5):e12738.
3. Ben-David B, Miller G, Gavriel R, Gurevitch A. Low-dose bupivacaine-fentanyl spinal anesthesia for cesarean delivery. *Reg Anesth Pain Med*. 2000;25(3):235-9.
4. Havas F, Orhan Sungur M, Yenigün Y, Karadeniz M, Kılıç M, Özkan Seyhan T. Spinal anesthesia for elective cesarean section is associated with shorter hospital stay compared to general anesthesia. *Agri*. 2013;25(2):55-63.
5. Khezri MB, Yaghobi S, Hajikhani M, Asefzadeh S. Comparison of postoperative analgesic effect of intrathecal magnesium and fentanyl added to bupivacaine in patients undergoing lower limb orthopedic surgery. *Acta Anaesthesiol Taiwan*. 2012;50(1):19-24.
6. Cowan CM, Kendall JB, Barclay PM, Wilkes RG. Comparison of intrathecal fentanyl and diamorphine in addition to bupivacaine for caesarean section under spinal anaesthesia. *Br J Anaesth*. 2002;89(3):452-8.
7. Choi DH, Ahn HJ, Kim MH. Bupivacaine-sparing effect of fentanyl in spinal anesthesia for cesarean delivery. *RAPM*. 2000;25(3):240-5.
8. Biswas, B.N., Rudra, A., Bose, B., Nath, S., & Chakrabarthy, S. Intrathecal Fentanyl With Hyperbaric Bupivacaine Improves Analgesia During Cesarean Delivery And In Early Post- Operative Period. *Indian Journal of Anaesthesia* . 2002; 46(6): 469- 472.
9. Bryant, B J., and Knights, K M . Pharmacology for health professionals 4th edition. *Chatswood, N.S.W. Mosby Elsevier*. 2015; pp. 273.
10. Thornton P, Hanumanthaiah D, O'Leary RA, Iohom G. Effects of fentanyl added to a mixture of intrathecal bupivacaine

- and morphine for spinal anaesthesia in elective caesarean section. *Rom J Anaesth Intensive Care*. 2015 ;22(2):97-102.
11. Ferrarezi WPP, Braga AFA, Ferreira VB, Mendes SQ, Brandão MJN, Braga FSDS, Carvalho VH. Spinal anesthesia for elective cesarean section. Bupivacaine associated with different doses of fentanyl: randomized clinical trial. *Braz J Anesthesiol*. 2021;71(6):642-648.
12. Ben-David B, Solomon E, Levin H, Admoni H, Goldik Z. Intrathecal fentanyl with small-dose dilute bupivacaine: better anesthesia without prolonging recovery. *Anesth Analg*. 1997;85:560–565.
13. Bano F, Sabbar S, Zafar S, Rafeeq N, Iqbal MN, Haider S, et al. Intrathecal fentanyl as adjunct to hyperbaric bupivacaine in spinal anesthesia for caesarean section. *J Coll Physicians Surg Pak*. 2006;16:87–90.
14. Hunt CO, Naulty JS, Bader AM, Hauch MA, Vartikar JV, Datta S, et al. Perioperative analgesia with subarachnoid fentanyl-bupivacaine for cesarean delivery. *Anesthesiology*. 1989;71:535–540.
15. Sanli S, Yegin A, Kayacan N, Yilmaz M, Coskunfirat N, Karsli B. Effects of hyperbaric spinal ropivacaine for caesarean section: with or without fentanyl. *Eur J Anaesthesiol*. 2005;22:457–461.
16. Shende D, Cooper GM, Bowden MI. The influence of intrathecal fentanyl on the characteristics of subarachnoid block for Caesarean section. *Anaesthesia*. 1998;53:706–710.
17. Cooper DW, Lindsay SL, Ryall DM, Kokri MS, Eldabe SS, Lear GA. Does intrathecal fentanyl produce acute cross-tolerance to i.v. morphine? *Br J Anaesth*. 1997;78:311–313.
18. Rajab Alneli Ghadah , Anesthesia and pain management drugs used in Libyan hospitals and clinics. *Libyan J Med Res*. 2023;17(1):133-145

