

Original Research Article

**COMPARATIVE STUDY OF INTRATHECAL
DEXMEDETOMIDINE AND FENTANYL AS AN ADJUVANTS
TO LEVOBUPIVACAINE HEAVY 0.5% FOR INFRA -
UMBILICAL SURGERIES**

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Abstract

Background & Methods: The aim of the study is to compare Intrathecal Dexmedetomidine and Fentanyl as an adjuvants to Levobupivacaine 0.5% for Infra - Umbilical Surgeries. Clinical comparative study to evaluate the duration of analgesia, hemodynamic stability and adverse effects of using intrathecal dexmedetomidine and fentanyl as an adjuvant to 0.5% Levobupivacaine heavy for Infra umbilical surgery (general surgery and gynaecology patient). The study participants were randomly divided into three groups.

Results: Onset of sensory block was earlier and duration of sensory block was maximum in group C. Motor block regress faster in group A. postoperative analgesia was more in group C and side effects was more in group B.

Conclusion: Incidence of Bradycardia and hypotension was higher in the dexmedetomidine group and itching and urinary retention was maximum in fentanyl group as compared to dexmedetomidine group. Levobupivacaine with dexmedetomidine has prolonged duration of sensory and motor blockade, good hemodynamic stability with decreased incidence of side effect as compared to the fentanyl group. And levobupivacaine alone group.

So as compared to 25 mcg fentanyl. 5 µg of dexmedetomidine may be used as an alternative adjuvant to intrathecal 0.5% Levobupivacaine heavy in elective Infra umbilical surgery hence, dexmedetomidine seems to be an attractive alternative as Intrathecal adjuvant with Levobupivacaine when compared with fentanyl

Keywords: Intrathecal, Dexmedetomidine, Fentanyl, Levobupivacaine & Surgeries.

Study Design: Comparative Study.

1. Introduction

Spinal anesthesia is one of the most common anesthetic procedures in lower abdominal surgery. Some of the advantages of this method include patient's wakefulness during surgery, rapid onset of effect, low failure rate, low-dose drug, desirable sensory and motor blocks and affordability[1]. Despite the advantages of spinal anesthesia, it has side effects such as hypotension, bradycardia, nausea, vomiting and shivering. To reduce the side effects of conventional spinal anesthesia, it is possible to lay the patient in the lateral position, rotate the bevel of needle to the bottom and inject the hyperbaric local anesthetics slowly so that the turbulent movement of the local anesthetics in the CSF can be avoided and the spinal anesthesia can be restricted to one side[2]. This method is especially appropriate for patients with low cardiovascular reserve, hypovolemia, elderly patients and traumatic patients. It reduces hemodynamic, respiratory and systemic side effects of conventional spinal anesthesia[3]. To overcome this defect, some adjuvants can be added to local anesthetics. One of the drugs traditionally used for this purpose is opioid and in particular fentanyl which has side effects such as itching and respiratory depression. Dexmedetomidine is an Alpha₂agonist which has recently been increasingly popular. It is added to the local anesthetics as an adjuvant for regional blocks. According to the studies, intrathecal dexmedetomidine has improved the properties of the block. It also plays an important role in alleviating the visceral pain by stimulating Alpha₂-Adrenergic Receptors (2-ARs) in the posterior spinal cord.⁵ This study aimed to compare the effects of levobupivacaine, levobupivacaine with dexmedetomidine and levobupivacaine with fentanyl[4].

Fentanyl is the most common short-acting opioid that is used intrathecally in combination with local anesthetics. It has synergistic effects with local anesthetics and improves the status of intraoperative and postoperative analgesia. It has been reported that intrathecal administration of fentanyl at the dose of 10–25 microgram can prolong the duration of postoperative analgesia for approximately 180–240 min. However, intrathecal opioids can cause some side effects such as itching, urinary retention, nausea and vomiting as well as respiratory depression[5-6].

Dexmedetomidine (Dex), a new selective α_2 -agonist, is being introduced as an adjuvant to local anesthetics with significant analgesic, sympatholytic and sedative properties. Compared to clonidine; Dex is approximately eight times more selective towards α_2 -adrenergic receptors (α_2 -AR), which is associated with sedative and analgesic effects in supraspinal and spinal sites and also has an antinociceptive impact on both visceral and somatic pain. More importantly, this drug does not cross the placenta significantly (0.77 maternal/fetal index), which confirmed its safety in cesarean delivery. Many reports have indicated that intrathecal administration of Dex can prolong analgesia and reduce the side effects associated with the administration of opioids[7]. However, some studies have reported that intrathecal injection of Dex is frequently associated with some side effects, such as a decrease in heart rate and blood pressure.

2. Material and Methods

Present study was conducted at Sri Aurobindo Institute of Medical Science, Indore, M.P for 01 Year. Clinical comparative study to evaluate the duration of analgesia, hemodynamic stability and adverse effects of using intrathecal dexmedetomidine and fentanyl as an adjuvant to 0.5% Levobupivacaine heavy for infraumbilical surgery. The study participants were randomly divided into three groups Levobupivacaine (Group A) levobupivacaine with fentanyl (group B) and levobupivacaine with dexmedetomidine (Group C)

Randomization was done by computer generated randomization table and allocated to one of the three study groups. The authors reported various parameters like: time of onset of block, onset of motor block, duration of sensory block, duration of motor block and duration of spinal anaesthesia. Hemodynamic parameters Heart rate , Blood pressure (SBP, DBP, MAP)the proposed study, three groups have been considered with levobupivacaine alone , fentanyl and dexmedetomidine as adjuvants with the anaesthetic drug. A sample of 20 per group can provide significant difference in the parameters of interest especially duration of sensor block, motor block with 95% confidence and 80% power.

Inclusion criteria:

- 1) Patients of age 18 years to 65 years
- 2) ASA physical status I and II

Exclusion criteria:

- 1) Lack of written or informed consent
- 2) Hypersensitivity to the study drug
- 3) Bleeding diathesis
- 4) ASA III and IV
- 5) Local site infection
- 6) Patient with abnormal spinal anatomy

3. Result

Table 1: Comparison of demographic parameters

Parameters	Group A (Levobupivacaine)	Group B (Fentanyl)	Group C (Dexmedetomidine)
Age	34.45±9.84	36.28±14.39	37.60±14.39
Weight (Kg)	62.70±2.75	62.28±1.61	62.93±2.05
Height (m)	157.20±2.69	158.78±2.93	158.15±3.08
Duration of Surgery	90.37±16.83	96.88±18.28	98.38±13.02
ASA			
1	18	18	18
2	02	02	02

Table 2: Comparison of Sensory and Motor block

Parameters	Group A levobupivacaine		Group B Fentanyl		Group C Dexmedetomidine		
	Onset of sensory block (in min)	10.70	3.93	8.25	2.89	2.10	
Duration of sensory block (in min)	112.28	7.01	159.00	6.36	203.28	12.69	< 0.001* (S)
Onset of motor block (in min)	10.95	4.03	9.00	3.24	3.23	1.25	< 0.001* (S)
Duration of motor block (in min)	157.45	6.30	184.25	6.52	250.20	11.73	< 0.001* (S)
Time taken to achieve for maximum sensory block (in min)	15.55	4.86	13.25	3.49	5.33	1.85	< 0.001* (S)

Table 3: First analgesic requirement in patients – Post operative period

Post-operative first analgesic requirement	No. (%)
Group A	
Intraoperative	04 (30.0)
Postoperative recovery	06 (30.0)
2 hr	08 (40)
Group B	
Intraoperative	0
Postoperative recovery room	02 (10.0)
2 hr	06 (30)
4 hr	09 (45.0)
6 hr	10 (50)
Group C	
Intraoperative	0
Postoperative recovery room	01 (05)
2 hr	02 (10.0)
4 hr	06 (30)
6 hr	07 (35.0)

Table 4: Total analgesic requirement in 24 hr – Postoperative period

Group / Number of doses in 24 hr.	No. (%)
Group A	
4	07 (35)
5	10 (50)
6	03 (15)
Group B	
1	01 (05)
2	04 (30.0)
3	18 (90.0)
Group C	
1	01 (05)
2	01 (05)
3	15 (75)

Table 5: Hemodynamic Parameters

Parameters	Group A (Levobupivacaine)	Group B (Fentanyl)	Group C (Dexmedetomidine)
Heart Rate (min)	51.2	63.5	71.9
BP Mean	52.9	58.7	79.3
Systolic BP (mm Hg)	73.2	83.1	98.7
Diastolic BP (mm Hg)	50.7	51.9	59.3

Table 6: Side Effect

Parameters	Group A (Levobupivacaine)	Group B (Fentanyl)	Group C (Dexmedetomidine)
Nausea	11	09	07
Vomiting	04	02	02
Itching	03	08	01
Urinary Retention	01	03	01
Respiratory Depression	01	02	02

4. Discussion

It has shown that Intrathecal administration of dexmedetomidine and fentanyl combined with bupivacaine compared in patient undergoing infraumbilical surgery. The results showed that adding 5 µg of dexmedetomidine to bupivacaine has a better effect on postoperative pain management compared to 25 µg fentanyl[8].

Today, intrathecal administration of Dex has attracted considerable attention during spinal anesthesia with the aim of increasing the duration of analgesia and decreasing postoperative pain. Many studies have addressed the administration of different doses of intrathecal Dex (3 µg, 5 µg, 10 µg, 15 µg) as an adjuvant to local anesthetics. It seems that Dex induces the activation of α_2 -agonist receptors in the spinal cord, which leads to a decrease in the transmission of nociceptive signals such as substance P. It has also been revealed that its analgesic effects after the surgery are due to the inhibition of the intracellular potassium transport activities[9].

Aamir Laique Khan et.al in 2015 studied that the time for first analgesic requirement in the dexmedetomidine group was (280±7.84) min and in the fentanyl group it was (173.88±8.12) min after the starting of surgery which was highly significant with p value of (<0.001).

Farhad Safari, et al in 2016 total morphine doses in 24 hours was significantly lower in the dexmedetomidine group as compared to fentanyl and control groups (P < 0.05).

As Dex binds to α_2 receptors in the locus coeruleus, reduces norepinephrine release, and inhibits sympathetic activity, it can cause hypotension and bradycardia. Hence, evaluation of hemodynamic changes in patients was of great importance in this study[10]. There was no significant difference between the B-D and B-F groups in terms of SBP, DBP, HR, MAP, and

SpO₂ at most of the studied times, which is in accordance with the results of the previous studies. Moreover, the findings of this study revealed the usage of ephedrine and atropine had no significant difference between the two groups, which were similar to the other studies. However, Contractor et al showed that the probability of MAP and HR decrease was higher in the Dex group compared to the control group. It is worth mentioning that in the mentioned study, the patients received intravenous Dex infusion under spinal anesthesia. The study by Shukla et al also showed that although MAP was similar between groups, bradycardia was more likely in the Dex group[11]. However, the mentioned study also examined Dex and MgSO₄ as an adjunct to spinal anesthesia. In our study we found that levobupivacaine required more rescue analgesia when compared to fentanyl and dexmedetomidine group, we also found that the Incidence of Bradycardia and hypotension was higher in the dexmedetomidine group and itching and urinary retention was maximum in fentanyl group as compared to dexmedetomidine group. Levobupivacaine with dexmedetomidine has prolonged duration of sensory and motor blockade.

5. Conclusion

Incidence of Bradycardia and hypotension was higher in the dexmedetomidine group itching and urinary retention was maximum in fentanyl group as compared to dexmedetomidine group. Levobupivacaine with dexmedetomidine has prolonged duration of sensory and motor blockade, good hemodynamic stability with decreased incidence of side effect as compared to the fentanyl group.

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6. References

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