Section Anesthesiology

Original Research Article

A PROSPECTIVE RANDOMIZED DOUBLE BLINDED COMPARATIVE STUDY OF DEXMEDETOMIDINE VERSUS FENTANYL AS ADJUVANT TO 0.5% HYPERBARIC BUPIVACAINE IN SPINAL ANAESTHESIA FOR ELECTIVE UNCOMPLICATED CAESAREAN SECTION

Balaji Elumalai[1], Sumathi Natarajan[2], Jayanthi Mohanasundaram[3]

[1]Assistant Professor, Institute of Anaesthesiology, Madras Medical College, Tamil Nadu, India.
[2]Assistant Professor, Institute of Anaesthesiology, Madras Medical College, Tamil Nadu, India.
[3]Assistant Professor, Institute of Anaesthesiology, Madras Medical College, Tamil Nadu, India.

Received : 20/12/2025
Received in revised form : 27/01/2026
Accepted : 14/02/2026

Keywords:
Dexmedetomidine, Spinal Anaesthesia, Fentanyl, Caesarean Section.

Corresponding Author:
Dr. Balaji Elumalai
Email: balaji231281@gmail.com

DOI: 10.47009/jamp.2026.8.1.142

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (1); 744-752

ABSTRACT

Background: Spinal anaesthesia using 0.5% hyperbaric bupivacaine is the preferred technique for caesarean sections due to its safety profile. Bupivacaine provides intense blockade but risks hemodynamic instability; dose reduction improves stability but shortens block duration. To optimize outcomes, adjuvants like fentanyl (a rapid-acting lipophilic opioid) and dexmedetomidine (an α2-agonist) providing prolonged analgesia and stability are used to enhance the quality of the block while minimizing local anaesthetic requirements. This study compares the efficacy and safety of these two adjuvants in elective, uncomplicated caesarean sections. **Aim:** To evaluate and compare intrathecal dexmedetomidine versus fentanyl as adjuvants to hyperbaric bupivacaine regarding anaesthetic profile, onset of block, hemodynamic stability, duration of analgesia, the pain score intensity, sedation, Apgar scores, duration of post-operative analgesia and any adverse events were evaluated in elective caesarean sections. **Materials and Methods:** A prospective, randomized, double-blind comparative study was conducted with sixty parturients with ASA I and II and gestational age ≥37 weeks were divided into Group A (7.5mg Bupivacaine + 5µg Dexmedetomidine) and Group B (7.5mg Bupivacaine + 25µg Fentanyl). Statistical analysis used t-tests, with $p < 0.05$ considered significant. **Results**: Demographic profiles were comparable. Group A showed significantly earlier motor block onset and a 53% longer duration of analgesia until first rescue analgesia compared to Group B. Sensory block onset and two-segment regression times were not statistically significant. Hemodynamically, Group A was more stable; Group B required ephedrine for hypotension more frequently and had a 64% incidence of pruritus, which was absent in Group A. **Conclusion:** Intrathecal dexmedetomidine is superior to fentanyl, providing faster motor block onset, significantly prolonged postoperative analgesia, better hemodynamic stability, and higher sedation without the adverse effect of pruritus.

INTRODUCTION

Spinal anaesthesia is the preferred technique for lower abdominal surgeries, particularly caesarean sections,[2,3] as it effectively attenuates surgical stress, provides robust early-stage pain control, dense blockade,[3,4] facilitates earlier ambulation,[1] with minimal neonatal impact. While cost-effective and efficient, its main drawback is a short duration of action that necessitates early rescue analgesia.[5] To extend postoperative pain relief—which is critical for early mobilization and breastfeeding, various pharmacological adjuvants are increasingly added to local anaesthetics such as opioids, magnesium sulphate or α2-adrenoceptor agonist,[7,8] they not only prolong the sensory-motor block,[9] and reduce local anaesthetic requirements,[6] but also significantly enhance overall patient satisfaction. This study directly compares two prominent adjuvants used with hyperbaric bupivacaine. Fentanyl: A highly lipophilic μ-opioid agonist. It provides rapid, segmental analgesia and synergistically improves sensory block quality without prolonging motor blockade.[10,11] Researches confirms that it extends analgesia by 180–240 minutes, making it ideal for rapid recovery. Dexmedetomidine: A highly

ISSN (O): 2687-5365; ISSN (P): 2753-6556

selective α2-adrenoceptor agonist. As some studies have proved that it is eight times more potent than clonidine. It prolongs both sensory and motor blocks by inhibiting neurotransmitter release and hyperpolarizing dorsal horn cells. It is associated with sedative and analgesic effects in supraspinal and spinal sites and has an antinociceptive impact on both visceral and somatic pain. More importantly, its low placental transfer confirms its safety safe for obstetric use.[12,14] (0.77 maternal/foetal index).

Aim

To evaluate and compare the efficacy of intrathecal dexmedetomidine and fentanyl as adjuvants to 0.5% hyperbaric bupivacaine in elective caesarean section, focusing on anaesthetic profile (onset/duration), hemodynamic stability, sedation, and post-operative rescue analgesia requirements.

MATERIALS AND METHODS

This randomized, prospective study was conducted on 60 uncomplicated parturient coming under ASA I and II, aged 18–35 years, gestational age ≥37 weeks undergoing elective caesarean section at Raja Mirasudhar Hospital, Thanjavur, from June 2014 to December 2014. After obtaining institutional ethical approval and patients were explained about the study protocol and obtained informed written consent. The parturient with uncomplicated singleton primi or multi gravida pregnancies were randomized into two groups using a closed-cover technique. Exclusion criteria included contraindications to spinal anaesthesia, drug hypersensitivity, obstetric complications, psychiatric illness, or chronic analgesic use. Following a comprehensive pre-anaesthetic evaluation and baseline investigations (haemoglobin, blood sugar, renal parameters, and ECG) were recorded. The patients were kept nil per oral for six hours for solid food and 4 hours for clear fluids before surgery. On the day of surgery all patients were premedicated with Inj. ranitidine 50mg IV and Inj. metoclopramide 10mg IV for aspiration prophylaxis and preloaded with Ringer Lactate before proceeding with the subarachnoid block.

Data was collected via pretested proforma, with baseline vitals checked before transporting patients in a left lateral position to the operating room. Under aseptic conditions, a 25 G Quincke's spinal needle was used to perform a lumbar puncture at L2-L3 or L3-L4 in a sitting position, and the study drug was injected upon confirming cerebrospinal fluid flow.

Group A: 0.5% Hyperbaric Bupivacaine 7.5mg (1.5ml) + Dexmedetomidine 5µg (0.5ml).

Group B: 0.5% Hyperbaric Bupivacaine 7.5mg (1.5ml) + Fentanyl 25 µg (0.5ml).

The study evaluated the onset, peak, and regression of sensory and motor blockades, alongside hemodynamic monitoring is measured at 0,3,6,9,12, and 15 minutes thereafter every 5 minutes up to 30 minutes and every 10 minutes up to end of the procedure SBP, DBP and MAP, pulse rate, SpO2 and sedation levels using the Ramsay score. Safety assessments included the monitoring of adverse events—such as nausea, shivering, pruritis and ECG changes—and neonatal APGAR scores at 1 and 5 minutes. Postoperative recovery was quantified through Visual Analogue Scale (VAS) pain scores (1-10), time to first rescue analgesic, and cumulative ephedrine requirements. Following surgery, the patient was observed in the PACU until hemodynamics were stabilized and motor blockade fully regressed. Vitals and SpO2 were monitored continuously until recovery. Once in the postoperative ward, 75mg IM diclofenac sodium was administered as rescue analgesia when the patient reported a VAS >3.

RESULTS

After obtaining institutional ethical committee approval and written informed consent, all 60 patients with ASA physical status I/II were randomly divided into two groups. All the patients satisfying all inclusion criteria who underwent elective lower segment caesarean section under subarachnoid block at Raja Mirasudhar Hospital -Thanjavur Medical College and Hospital, Tamil Nadu from June 2014 to December 2014 completed the study without any exclusion.

The collected data were analysed by t test and results obtained in form of mean and standard deviation. The probability value $p < 0.05$ is considered as statistically significant. The results were as follows:

Demographic Data

Demographically all parturient were comparable with regards to age, height, and weight (Table 1). The mean duration of surgery in group A and group B was comparable without statistical significance.

Table 1: Demographic variables and Duration of surgery

	Group A	Group B
Age	26.03 ± 3.86	26.27 ± 3.45
Height	148.87 ± 5	150.6 ± 5.62
Weight	55.77 ± 7.46	56.83 ± 8.27
Duration Of Surgery	50 ± 9.82	51.67 ± 8.02

Onset of Motor Blockade

Average time taken for onset of motor blockade (Table 2, Figure 1) was faster in group A than in group B (2.07 minutes Vs 2.57 minutes). It was found to be statistically significant (p value = 0.044).

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 2: Onset of motor blockade

	MEAN ± SD	p value < 0.05
GROUP A	2.07±0.91	p = 0.044 Significant
GROUP B	2.57±0.97	

Time for Complete Motor Blockade

Mean time for complete motor block (Table 3) of group A was 5.27 minutes & for group B was 6.10 minutes. It was not statistically significant (p = 0.073)

Table 3: Complete motor blockade

	MEAN ± SD	p value < 0.05
GROUP A	5.27 ± 1.98	p = 0.073 Not Significant
GROUP B	6.10 ± 1.56	

Onset of Sensory Blockade

The mean time for onset of sensory block (Table 4) for group A was 4.47 minutes & 4.67 minutes for group B which was not statistically significant (p value = 0.618).

Table 4: Onset of sensory blockade

	MEAN ± SD	p value < 0.05
GROUP A	4.47 ± 1.66	p = 0.618 Not Significant
GROUP B	4.67 ± 1.42	

Time for Maximum Sensory Blockade

The mean time for maximum sensory block (Table 5) in group A was 12.70 minutes and 12.40 in group B which was not significant (p = 0.686).

Table 5: Time for maximum sensory blockade

	MEAN ± SD	p value < 0.05
Group A	12.70 ± 2.84	p = 0.686 Not Significant
Group B	12.40 ± 2.88	

Time for Two Segment Regression

The mean two segment regression time (Table 6) was 93 minutes in group A and 88.33 minutes in group B was not statistically significant.

Table 6: Two segment regression time

	MEAN ± SD	p value < 0.05
Group A	93 ± 12.91	p = 0.126 not significant
Group B	88.33 ± 10.2	

Comparison of Hemodynamic of Two Groups

Comparison of Mean Heart Rate

The mean heart rate (Table 7, Figure 2) of Group B (p value = 0.022, 0.005, 0.003, 0.047) was significantly and continuously lower than group A in the first 12 minutes (3, 6, 9, 12 minutes intervals). In the next three intervals the mean heart rate was stable and similar in both groups.

Table 7: Mean heart rate

Time In Min	Group A MEAN ± SD	Group B MEAN ± SD	p value < 0.05
O Min	95.9 ± 11.74	94.73 ± 9.37	0.672
3 Min	94.87 ± 15.58	87.27 ± 8.28	0.022 (significant)
6 Min	88.6 ± 16.67	77.93 ± 10.84	0.005 (significant)
9 Min	82.73 ± 12.14	74.47 ± 8.46	0.003(significant)
12 Min	80.03 ± 11.31	74.27 ± 10.72	0.047(significant)
15 Min	79.17 ± 13.49	78.13 ± 15.44	0.784
30 Min	83.03 ± 14.40	81.47 ± 8.44	0.609
60 Min	78.97 ± 10.1	77.4 ± 6.45	0.477

Comparison of Mean Systolic Blood Pressure

The mean systolic blood pressure (Table 8, Figure 3) of two groups A and B was statistically significant at three intervals (9min, 12 min & 30 min, 108.57 Vs 104.33, 107.2 Vs 101.4 and 105.2 Vs 98.4 respectively). Though the systolic BP was not significant at the 15th minute interval, it was higher in group B than group A.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 8: Mean systolic blood pressure

Time In Min	Group A MEAN ± SD	Group B MEAN ± SD	p value < 0.05
O Min	128.77 ± 10.28	132.93 ± 5.00	0.051
3 Min	117.5 ± 10.55	118.87 ± 6.92	0.555
6 Min	111.5 ± 9.18	109.13 ± 9.03	0.312
9 Min	108.57 ± 5.48	104.33 ± 7.37	0.014(significant)
12 Min	107.23 ± 8.04	101.47 ± 9.23	0.002 (significant)
15 Min	105.9 ± 11.19	109.33 ± 9.25	0.201
30 Min	105.2 ± 10.72	98.47 ± 8.73	0.010 (significant)
60 Min	112.4 ± 6.10	108.53±17.91	0.268

Comparison of Mean Diastolic Blood Pressure

The mean diastolic blood pressure (Table 9, Figure 4) of two Group A and Group B was statistically significant at two intervals (15 min 59.8 Vs 65.13 (p value 0.008) and 60 min 64.77 Vs 68(p value 0.007)

Table 9: Mean diastolic blood pressure

Time In Min	Group A MEAN ± SD	Group B MEAN±SD	P Value < 0.05
O Min	79.2 ± 94	82.13± 4.86	0.090
3 Min	69.17± 10.88	71.8 ± 5.49	0.242
6 Min	64.6 ± 8.23	64.6 ± 6.66	1
9 Min	62.67 ± 5.15	61.53± 6.78	0.469
12 Min	60.27 ± 6.02	58.77± 9.49	0.468
15 Min	59.8 ± 7.17	65.13± 7.96	0.008(Significant)
30 Min	58.63 ± 7.52	55.27± 6.77	0.074
60 Min	64.77 ± 4.57	68 ± 4.29	0.007(Significant)

Comparison of Mean Arterial Pressure

The mean arterial pressure (Table 10, Figure 5) of Group A and Group B were statistically significant (p = 0.034) at 30 minutes interval (69.5 ± 6.90 Vs 65.8 ± 6.52).

Table 10: Mean arterial blood pressure

Time In Min	Group A MEAN ± SD	Group B MEAN ± SD	p value < 0.05
O Min	91.5 ± 7.48	94.53 ± 4.86	0.068
3 Min	81 ± 9.99	82.67 ± 5.76	0.432
6 Min	76.73 ± 8.57	75.13 ± 7.15	0.436
9 Min	73.43 ± 4.75	72.2 ± 7.34	0.471
12 Min	71.67 ± 6.32	69.6 ± 9.29	0.317
15 Min	71.3 ± 7.68	75.13 ± 8.97	0.081
30 Min	69.57 ± 6.90	65.8 ± 6.52	0.034 (significant)
60 Min	76.27 ± 4.89	77.73 ± 5.139	0.262

Ephedrine Requirement

The total number of patients requiring Ephedrine (table 11) was equal in two groups (22 Vs 23) but the mean ephedrine requirement was more in group B (11.80 ± 4.38) than group A (9.50 ± 7.18) but was not statistically significant.

Table 11: Mean Ephedrine Requirement

	MEAN ± SD	p value < 0.05
Group A	9.50 ± 7.18	p = 0.140 Not Significant
Group B	11.80 ± 4.38	

Neonatal Outcome - APGAR

APGAR score (Table 12) at 1 minute and 5 minutes compared between two Group A and B was not statistically significant.

Table 12: APGAR at 1 minute and 5 minutes

	1 minute MEAN ± SD	5 minutes MEAN ± SD	p value < 0.05
Group A	7.93 ± 1.01	9.40 ± 0.49	p = 0.658 Not Significant
Group B	7.83 ± 0.69	9.87 ± 0.35	

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Duration for Rescue Analgesia

The duration for rescue analgesia (Table 13, Figure 6) was defined as the period from spinal injection to the first occasion when the patient complaints of pain (VAS >3) in the postoperative period. This was prolonged by 53% in Group A than Group B (232 vs 151.5 minutes) and showed statistically significance (p value 0.00001).

Table 13: Time for rescue analgesia

	MEAN ± SD	p value < 0.05
Group A	232 ± 29.40	p = 0.00001
Group B	151.5 ± 19.44	Significant

Comparison of Sedation Score

The mean sedation score (Table 14, Figure 7) for Group A and Group B (1.13 Vs 1) was statistically significant (p = 0.039) at the start of the surgery and later it was statistically not significant in the other interval.

Table 14: Sedation score

Time In Hr	Group A MEAN ± SD	Group B MEAN ± SD	P Value < 0.05
First ½ Hr	1.13 ± 0.346	1 ± 0	0.039 (Significant)
Second ½ Hr	1.93 ± 0.365	1.97 ± 0.183	0.656
2 Hr	2	2	-
6 Hr	2	2	-

Comparison of Side Effects

The side effects (Table 15) such as nausea and vomiting were comparable in Group A and Group B, but Pruritis occurring in Group B was 64% (19 out of 30 parturient) and there were no case reported in Group A so it was very highly significant in Group B.

Table 15: Side effects

Side Effects	Group A MEAN ± SD	Group B MEAN ± SD	P < 0.005
Nausea	1.50 ± 0.51	1.53 ± 0.51	0.8
Vomiting	1.80 ± 0.41	1.73 ± 0.45	0.549
Pruritis	0	1.33 ± 0.48	0.04 (Significant)

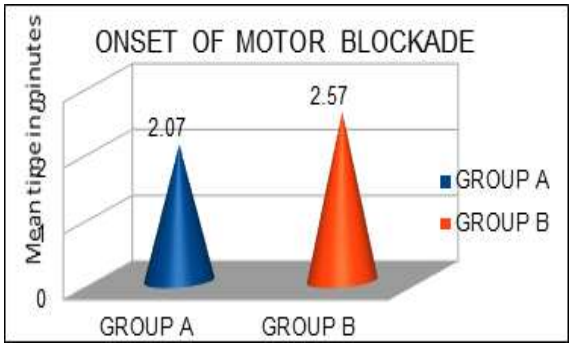

Figure 1: Onset of motor blockade

Figure 2: Mean heart rate

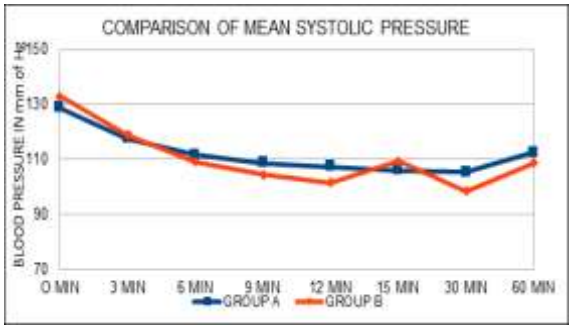

Figure 3: Mean systolic blood pressure

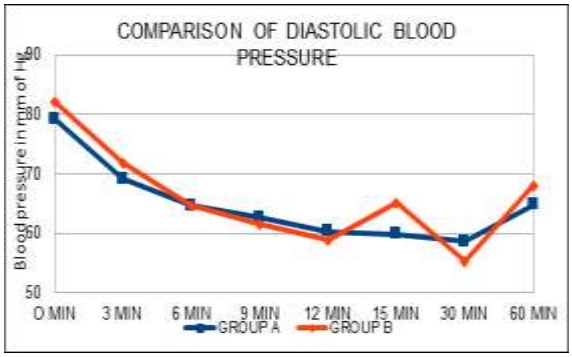

Figure 4: Mean diastolic blood pressure

ISSN (O): 2687-5365; ISSN (P): 2753-6556

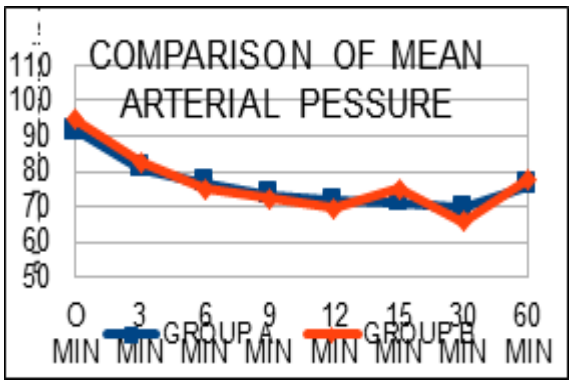

Figure 5: Mean diastolic blood pressure

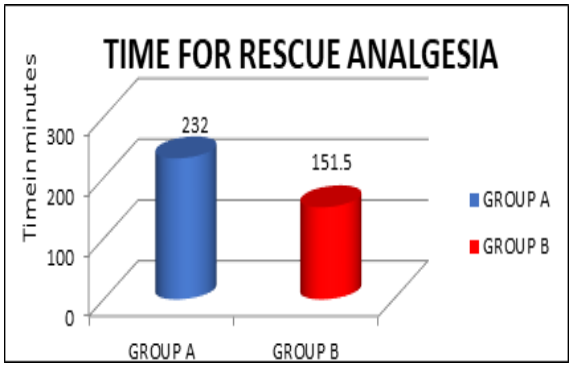

Figure 6: Time for rescue analgesia

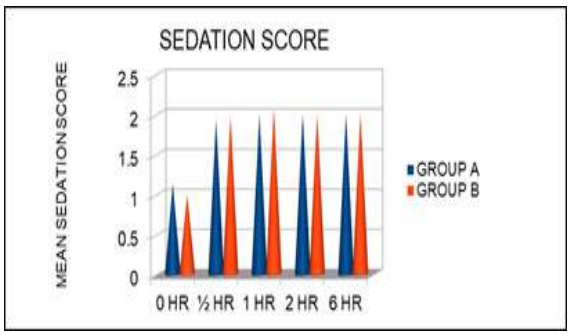

Figure 7: Sedation score

DISCUSSION

As a primary neuraxial technique, spinal anaesthesia is favoured for lower abdominal surgeries due to its predictable sensory and motor blockade. It effectively attenuates surgical stress, provides robust early-stage pain control, and facilitates earlier ambulation.[1] Its cost-efficiency and minimal equipment requirements make it particularly advantageous in various clinical settings. Spinal anaesthesia remains the cornerstone of anaesthetic management for caesarean sections,[2,3] favoured for its rapid onset, dense sensory blockade,[3,4] and minimal neonatal depression. However, its primary limitation is a relatively short duration of action, which often fails to provide sustained postoperative analgesia and early demand for rescue analgesics.[5] Effective pain management in the puerperium is paramount as it facilitates early mobilization, improves breastfeeding success, and enhances maternal-newborn bonding. Conversely, inadequately managed pain can lead to detrimental physiological stress and psychological morbidity. To address these limitations, various pharmacological adjuvants,[7,8] including opioids, magnesium sulfate and α2-adrenergic agonists like dexmedetomidine are increasingly added to local anaesthetics. These agents not only prolong the sensory-motor block,[9] and reduce local anaesthetic requirements,[7,8] but also significantly enhance overall patient satisfaction. While numerous intrathecal adjuvants are used in caesarean sections, head-to-head comparisons of dexmedetomidine and fentanyl as additives to hyperbaric bupivacaine,[8,13] —such as the work by Mahdy et al.[23] This study was designed to bridge that gap by directly evaluating the clinical efficacy and safety of these two agents.

Fentanyl is the most common short-acting opioid that is used intrathecally in combination with local anaesthetics,[5] Fentanyl is a highly potent synthetic μ-opioid (mu) opioid agonist with a rapid latency to onset (typically 5–10 minutes). Its high lipophilicity ensures rapid sequestration into the spinal cord, promoting localized segmental analgesia while minimizing extensive rostral spread. When utilized as an adjuvant, it demonstrates a profound synergistic effect with local anaesthetics (e.g., bupivacaine),[5] improves the status of intraoperative and postoperative analgesia by targeting distinct ionic channels to reduce neuronal excitability. Significantly intensifies the quality of sensory blockade,[10,11] and extends the duration of effective postoperative analgesia by approximately 180–240 minutes at doses of 10–25 μgm.[18,19] Crucially, it enhances pain relief without inducing a concomitant extension of motor blockade, facilitating early mobilization and accelerated post-surgical convalescence. Ideally suited for day-case surgeries, obstetric procedures (e.g., caesarean sections), and major joint replacements where rapid recovery is prioritized. Studies have suggested that there is a potential synergism between fentanyl and bupivacaine, fentanyl being a effective adjuvant to hyperbaric bupivacaine for caesarean section which have also been proved by various studies.

Dexmedetomidine, a new highly selective α2-adrenoceptor agonist, is increasingly utilized as an adjuvant to local anaesthetics due to its potent analgesic, sympatholytic, and sedative properties. Dexmedetomidine, a selective α2 adrenoceptor agonist, causes presynaptic inhibition of release of nor epinephrine hence terminates pain signals. Several studies have shown that dexmedetomidine is 8 times more potent than clonidine for α2 adrenoceptor,[15] which is associated with sedative and analgesic effects in supraspinal and spinal sites and has an antinociceptive impact on both visceral and somatic pain. Literature has suggested that the mechanism of prolongation of sensory and motor blockade may be due to inhibition of release of neuro transmitters of C- fibers and hyper polarization of post synaptic dorsal horn cells,[16] More importantly,

ISSN (O): 2687-5365; ISSN (P): 2753-6556

this drug does not cross the placenta significantly (0.77 maternal/foetal index), which confirmed its safety in caesarean delivery.

Dose selection

The incidence of bradycardia and hypotension during spinal anaesthesia is primarily dictated by the extent of the sympathetic blockade.[5] Consequently, these adverse effects may be mitigated by limiting the segmental spread through dose reduction of bupivacaine which have been studied in many double-blind studies on parturient undergoing elective caesarean sections, comparing 7.5 mg, 8.75 mg, and 10 mg of 0.5% hyperbaric bupivacaine demonstrated in many studies.[6,22,23] Their findings revealed a significantly higher incidence of hypotension in the 8.75 mg and 10 mg cohorts ($p \leq 0.05$). Notably, the 7.5 mg dose provided effective surgical analgesia while minimizing hemodynamic instability. So, in this study 1.5 ml of 0.5% hyperbaric bupivacaine was used in both groups.

While pharmacologically distinct, dexmedetomidine and fentanyl both enhance hemodynamic stability and intraoperative analgesia as adjuvants to bupivacaine, outperforming control groups. However, many researches,[17] highlights that these drugs differ significantly in their onset and duration of sensory and motor blockade. Furthermore, few clinical studies,[21] have identified variations in their adverse effect profiles. Existing literature,[18] has established 25 µg of fentanyl as a standard adjuvant for hyperbaric bupivacaine in caesarean sections. In a study specifically focused on uncomplicated caesarean deliveries, demonstrated the efficacy of 5 µg of dexmedetomidine as a neuraxial additive.[23] . Based on these established benchmarks, this study compares 5 µg of dexmedetomidine and 25 µg of fentanyl as adjuvants to hyperbaric bupivacaine.

Motor blockade

This study defined the onset of motor blockade as Bromage scale 1 (unable to move hip but able to move knee and ankle) and the time for maximum motor blockade as Bromage scale 3 (8,23) (unable to move hip, knee and ankle). In this study the onset of motor blockade (Bromage 1) showed statistically significant (2.07 ± 0.90 Vs 2.57 ± 0.97, p value 0.044). But maximum motor blockade in this study was found to be statistically insignificant ($p > 0.073$). It was found that dexmedetomidine acts faster than fentanyl when the Bromage scale was 1 (2.07 ± 0.90 Vs 2.57 ± 0.97, p value = 0.044*). Some studies found Group A had a prolonged motor recovery time,[23] compared to Group B (176.2 ± 9.4 Vs 169.3 ± 9.1, p value 0.005). Similar finding was seen in many studies also, which concluded that prolonged duration of motor blockade with dexmedetomidine may be undesirable for short term surgical procedures or ambulatory surgeries.[20]

Sensory blockade

In this study, the sensory level was assessed using a cold stimulus applied bilaterally along the midclavicular line. This method was chosen over the pinprick technique,[17] (using a 23G hypodermic needle) to avoid potential capillary bleeding and patient discomfort. The onset of sensory blockade was defined as reaching the T6 dermatome.[18,23] We found no statistically significant difference between two groups in onset times between groups (4.4 ± 1.65 Vs 4.67 ± 1.42, p value = 0.618). Maximum level of sensory blockade was T4,[17] (median) in both groups (group A T2 – T6 and Group B T2 – T4). The mean duration to achieve this level was (12.70 ± 2.84) in group A and group B was (12.40 ± 2.88) which was not statistically significant,[21] (p = 0.686).

Two segment regression time

In this study time to two segment regression was 93 ± 12 Vs 88 ± 10 in group A and B respectively (p value 0.126) which was also not statistically significant.

Sedation score

Ramsay sedation score has been instituted to compare the sedation level of the parturient in two groups. It was observed to be statistically significant in first ½ hr in Group A (1.13 ± 3.46 Vs 1.00 ± 0.00, p value < 0.03)[17,23] but later on it was statistically not significant in the other interval.

Comparison of Hemodynamic

Heart rate

In our study mean heart rate of Group B was significantly and continuously lower in initial 4 successive intervals (3, 6, 9and 12 minutes).[23] This could be expressed by two reasons, a delay in fall in heart rate in Group A or by a steady fall in heart rate in Group B. The delay in fall in heart rate in Group A could be due to the lower dosage (5 µgm).[17] The reason for steady fall of heart rate in Group B could be due to dose dependent depression of carotid sinus baroreceptor.[5,25] Fentanyl has vagal nucleus stimulation action which produces significant fall in heart rate, supported by various studies. All though fall in heart rate was significant in Group B, only one patient required inj. atropine 0.6 mg IV as supplementation.

Blood pressure

The fall in systolic blood pressure in Group B was more compared to Group A particularly in initial 3 intervals,[8,26] (9, 12 minute & 30 minute) in this study. This was statistically significant [108 ± 5.48 Vs 104 ± 7.37 (p value 0.014), 107.23 ± 8.04 Vs 101.47 ± 9.23(p value 0.002) and 105.2 ± 10.72 Vs 98.4 ± 8.73 (p value 0.001)]. There was gradual fall in diastolic blood pressure in Group A which was statistically significant later in the study (15 & 60 minutes after spinal anaesthesia). (59.8 ± 7.17 Vs 65.13 ± 7.96 (p value 0.008) & 64.77 ± 4.57 Vs 68 ± 4.29 (p value 0.007).

The variation in mean arterial blood pressure in this study did not have significant difference between two groups [18] except for fall in Group B at 30 minute (69.57 ± 6.9 Vs 65.8 ± 6.52) compared to Group A which was statistically significant (p = 0.034). Studies to evaluate the role of dexmedetomidine added to heavy bupivacaine intrathecally for lower abdominal surgeries had observed that dexmedetomidine evokes a biphasic blood pressure

ISSN (O): 2687-5365; ISSN (P): 2753-6556

response, a short hypertensive phase and a subsequent hypotensive phase. The two phases are mediated by α2B-AR and α2A-AR receptors respectively. Initial hypertensive phase lasts for 5 to 10 minutes followed by fall in blood pressure about 10 to 20 % below baseline which was caused by inhibition of central sympathetic outflow. This could explain the initial less fall of blood pressure and later stabilization of the same in Group A compared to Group B in this study. The rise in blood pressure group B at 15th minute interval could be explained by the administration of ephedrine in the previous 9th and 12th minute intervals to treat the hypotension. This was observed by the larger ephedrine dosage required in the Group B (11.80 ± 4.38 Vs 9.50 ± 7.18, p value 0.140).

Comparison of APGAR Score

The neonatal outcome in this study was assessed by APGAR score during first minute and fifth minute after delivery of the baby (27). It was found to be statistically insignificant (7.93 Vs 7.90, p value = 0.658 for 1st minute, 9.40 Vs 9.87, p value = 0.07 for 5th minute). Although there is uteroplacental transfer of dexmedetomidine it does not affect the foetal wellbeing.[25] In this study even though the dexmedetomidine dose (5 µgm) was higher the neonatal outcome was not affected as the APGAR score did not show significant difference..

Rescue analgesia

The time to first request for rescue analgesia was significantly longer in the Group A compared to the Group B (232 ± 29.40 Vs 151.5 ± 19.44, p value - 0.00001), representing a significant 53% increase in analgesic duration.[17] This suggests that dexmedetomidine offers a superior clinical profile regarding postoperative pain control compared to fentanyl.

Neuraxial administration of dexmedetomidine induces a dose-dependent prolongation of sensory blockade and intensifies motor block, while significantly extending postoperative analgesia through its action on spinal dorsal horn α2-AR adrenoceptors. Its antinociceptive efficacy, when combined with intrathecal bupivacaine, is mediated by the suppression of neurotransmitter release from C-fibers and the hyperpolarization of postsynaptic dorsal horn neurons. This synergistic interaction results in an extended duration of sensory blockade and a delayed requirement for rescue analgesia.[21,28] In contrast, intrathecal fentanyl, a lipophilic opioid agonist, exerts its effects primarily via μ-opioid opioid receptors in the dorsal horn, though it may also involve supraspinal mechanisms. Comparative studies investigating varying doses of fentanyl as a bupivacaine adjuvant in lower abdominal surgeries suggest a plateau effect; specifically, fentanyl does not appear to provide dose-dependent prolongation of analgesia once the dose exceeds 10 µg.[29]

Adverse effects

In this study there were few adverse effects such as nausea, vomiting and pruritis.[13] Nausea (1.50 ± 0.51 Vs 1.53 ± 0.51, p value 0.80) and vomiting (1.80 ± 0.41 Vs 1.73 ± 0.45, p value 0.549) were found to be statistically insignificant. Pruritis occurrence was observed to be very high in Group B,[13] which was 64 % (19 out of 30 parturient) whereas there were no pruritis was encountered in Group A which was significant statistically.[30]

Ephedrine requirement

Although the number of patients requiring ephedrine in Group A(n = 22) and Group B (n = 23) was nearly equal, the mean dose requirement was lower in Group A (9.5 ± 7.18) compared to Group B (11.8 ± 4.38), but the requirement dose was not significant statistically.[8]

Limitations

Motor recovery to Bromage scale 0, Sensory regression time to S1 segment, umbilical artery sampling for acid base analysis, total post operative analgesic requirement were not noted in this study. A placebo group with low dose bupivacaine (7.5mg) alone would have been a better comparison for either of the adjuvant group.

CONCLUSION

The study concludes that dexmedetomidine (5 µg) is a superior intrathecal adjuvant to bupivacaine compared to fentanyl for elective caesarean sections as it significantly accelerated the onset of motor blockade and markedly prolonged the duration of postoperative analgesia, delaying the requirement for first rescue medication along with a superior hemodynamic profile and offered a more favourable safety profile by eliminating the incidence of pruritus without affecting the foetal outcome.

Acknowledgement: Nil
Conflict of Interest: Nil
Sources of funding: Nil

REFERENCES

1. Lee YY, Muchhal K, Chan CK, Cheung AS. Levobupivacaine and fentanyl for spinal anaesthesia: a randomized trial. Eur J Anaesthesiol 2005;22(12):899–903.
2. Mccartney CJ, Brull R, Chan VW, et al. Early but no long-term benefit of regional compared with general anesthesia for ambulatory hand surgery. Anesthesiology. 2004 Aug;101(2):461-7.
3. Bandi E, Weeks S, Carli F. Spinal block levels and cardiovascular changes during post-cesarean transport. Can J Anaesth 1999;46(8):736–40.
4. Parpaglioni R, Frigo MG, Lemma A, Sebastiani M, Barbati G, Celleno D. Minimum local anaesthetic dose (MLAD) of intrathecal levobupivacaine and ropivacaine for caesarean section. Anaesth 2006;61(2):110–5.
5. Biswas BN, Rudra A, Bose BK. Intrathecal fentanyl with hyperbaric bupivacaine improves analgesia during caesarean delivery and in early postoperative period. Indian J Anaesth 2002;46:469
6. Subedi A, Tripathi M, Bhattarai BK, Gupta PK, et al. The effect of height and weight adjusted dose of intrathecal hyperbaric bupivacaine for elective caesarean section. J Nepal Med Assoc 2011;51:1-6.
7. 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;71:535-40.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

8. Al-Ghanem,SM, Massad IM, Al-Mustafa MM, Al-Zaben KR, Qudaisat IY, et al. Effect of adding dexmedetomidine versus fentanyl to intrathecal bupivacaine on spinal block characteristics in gynecological procedure. Amer Jour of Appl Scien. 2009; 6(5): 882-887. (2): 83-95.
9. Akerman B, Arwestrom E, Post C, Local anesthetics potentiates spinal morphine antinocioception. Anesth Analg1988; 67(10):943-8.
10. BenDavid B, Miller G, Gavriel R, Gurevitch A. Low-dose bupivacaine-fentanyl spinal anesthesia for caesarean delivery. Reg Anesth Pain Med. 2000 May-Jun;25(3):235-9.
11. A.J.Gissen, L.D.Gugino, Datta S, et al. Effects of fentanyl and sufentanyl on peripheral mammalian nerves. Anaes & Anal 1987; 66(12): 1271-76.
12. Moller RA, Covino BG. Effect of progesterone on the cardiac electrophysiologic alterations produced by ropivacaine and bupivacaine. Anesthesiology 1992;77:735-41
13. Gupta R , Varma R , Bogra J, Kohli M, Raman R, Kushwala J K. A comparative study of intrathecal Dexmedetomidine and Fentanyl as adjuvants to Bupivacaine. J Anaesthesiol clin Pharmacol 2011 ;27(3):339-43.
14. Neumann MM, Davio MB, Macknet MR, Applegate RL. Dexmedetomidine for awake fiberoptic intubation in a parturient with spinal muscular atrophy type III for cesarean delivery. Int J Obstet Anesth 2009;18:403-7.
15. Gertler R, Brown HC, Mitchell DH, Silvius EN. Dexmedetomidine: A novel sedative- analgesic agent.Proc (Bayl Univ Med Cent) 2001;14:13–21.
16. Eisenach JC, Shafer SL, Bucklin BA, Jackson C, Kallio A.Pharmacokinetics and pharmacodynamics of intraspinal dexmedetomidine in sheep. Anesthesiology 1994; 80:1349-1359.
17. Gupta R, Bogra J,Verma R,Kohli M, Kushwaha JK,Kumar S, Dexmedetomidine as an intrathecal adjuvant or postoperative analgesia. Indian J Anesth. 2011;55:347-51.
Harold Ellis, Anatomy for anaesthetist: Blackwell publishing 8th edition:Part 3: 95-136.
18. Srivatasava U, Adithya kumar, Gandhi NK. Hyperbaric or plain bupivacaine combined with fentanyl for spinal anesthesia during cesarean delivery.Indian J Anaesth 2004;48(1):44-46.
19. Herman NL,Choi KC, Afflck PJ et al. Analgesia , pruritis and ventilation exhibit a dose response relationship in parturients receiving intrathecal fentanyl during labor.Anesth Analog 1999;89:378-83.
20. Mahendru V, Tewari A, Katyal S, Grewal A, Singh MR and Katyal R. A comparison of intrathecal dexmedetomidine, clonidine, and fentanyl as adjuvants to hyperbaric bupivacaine for lower limb surgery: A double blind controlled study. J Anaesthesiol Clin Pharmacol. 2013; 29:496-502.
21. HA Nayagam, N Ratan Singh, and H Shanti Singh Indian J Anaesth. 2014 Jul-Aug; 58(4): 430–435.
22. Kiran S, Singal NK. A comparative study of three different doses of 0.5% hyperbaric bupivacaine for spinal anesthesia in elective caesarean section. Int J Obstet Anesth. 2002;11(3):185-9
23. Mahdy WR, Abdullah SI. Effect of adding dexmedetomidine versus fentanyl to intrathecal bupivacaine on spinal block characteristics and neonatal outcome in uncomplicated caesarean delivery: a randomized double blind placebo controlled study. Meno Med Journ. January 2011; 24(1): 221-232.
24. Das A, Halder S, Chattopadhayay et al. Effect of two different doses of dexmedetomidine as adjuvant in bupivacaine induced subarachanoid block for elective abdominal hysterectomy operations. A prospective ,double blind randomized controlled study. Oman med J 2015;30(4):257-63.
25. Fyneface-Ogan S, Job OG and Enyindah CE. Comparative effects of single shot intrathecal bupivacaine with dexmedetomidine and bupivacaine with fentanyl on labor outcome. ISRN Anesthesiol. 2012:1-6.
26. Abdelhamid S A, El-Lakany M H. Intrathecal dexmedetomidine: Useful or not. J Anaesth Clinc Res 2013;4:9.
27. Mohamed A A, Salem R A.Intrathecal dexmedetomidine – fentanyl for labor analgesia:Randomized comparative study. J Anesthesiol clin sci. 2015;4:1.
28. Panzer O, Moitra V, Sladen RN – Pharmacology of sedative-analgesic agents: dexmedetomidine, remifentanil, ketamine, volatile anesthetics, and the role of peripheral mu antagonists. Crit Care Clin 2009;25:451-69.
29. Seewal R, Shende D, Kashyap L, Mohan V. Effect of addition of various doses of fentanyl intrathecally to 0.5% hyperbaric bupivacaine on perioperative analgesia and subarachnoid-block characteristics in lower abdominal surgery: a doseresponse study. Reg Anesth Pain Med. 2007 Jan-Feb; 32(1): 20-6.
30. Dilesh P K, Eapen S, Kiran S et al. A Comparison of intrathecal dexmedetomidine versus intrathecal fentanyl with epidural bupivacaine for combined spinal epidural labor analgesia. J Obstet Anaesth Crit Care 2014;4:69-74.

ISSN (O): 2687-5365; ISSN (P): 2753-6556