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Original Research Article

Mono-Centric Retrospective Comparative Study of Sufentanil and Dexmedetomidine as Neuraxial Adjuvants in Cesarean Section

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Abstract

With a full and predictable nerve block, a quick onset, and few problems, spinal anaesthesia is a popular option for caesarean deliveries. The quality, duration, and side effects of anaesthesia are improved with the administration of various intrathecal adjuvants. This analysis of medical data involved 62 patients who had spinal anaesthesia used during caesarean deliveries. In this retrospective analysis, we evaluated 62 patients who received hyperbaric bupivacaine (0.5%, 10 mg) and dexmedetomidine (10 µg) in group 1 (n=31) and bupivacaine (0.5%, 10 mg) and sufentanil (5 µg) in group 2 (n=31). Difference in the postoperative pain, motor and sensory block, unfavourable effects within the first 24 hours after delivery, and neonatal outcomes were measured in these two groups. The sufentanil group required much less analgesia than the dexmedetomidine group. According to the VAS scale, postoperative pain in G1 was more severe than in G2. There were no obvious variations in intraoperative sensory and motor block, motor recovery times, or neonatal Apgar ratings between two groups. Shivering was only noticed in G2. The dexmedetomidine group did not experience itchiness or shivering. The sufentanil group had better postoperative analgesia, although there were more side effects overall. Dexmedetomidine used as an adjuvant stopped postoperative shaking. Contrary to what has been reported in the literature, dexmedetomidine does not produce greater or equivalent analgesia to sufentanil.

Keywords: Caesarean delivery; Intrathecal; Dexmedetomidine; Intrathecal sufentanil.

Introduction

Spinal anaesthesia produces a thick and predictable block with a quicker onset and fewer problems than other anaesthetic procedures [1]. This makes it the best option for elective or urgent caesarean deliveries. However, this is associated with nausea, vomiting, shivering, bradycardia and hypotension that seriously jeopardise the safety of both the mother and the foetus. While shivering can affect a mother's

metabolic activity, maternal hypotension can cause a decrease in blood flow to the placenta. These conditions can cause the foetus to experience hypoxia and acidosis [2]. The occurrence of adverse events can be reduced by lowering the intrathecal local anaesthetic dose, according to numerous studies [3]. A smaller dosage, however, was linked to a shorter anaesthesia and analgesia duration.

With the aim of improving the excellence and increasing the duration of anaesthesia and analgesia a variety of adjuvants are frequently utilised with intrathecal local anaesthetics. In clinical practise, 2 adrenergic agonists (dexmedetomidine and clonidine) and opioids (morphine, fentanyl, and sufentanil) are more frequently employed as adjuvants [4]. However, opioid supplementation is associated with side effects such as nausea, vomiting, delayed respiratory depression and hypotension which are depends on the lipophilicity of drugs in use. One of the best opiodergic anaesthesia and analgesia without a rise in side effects is sufentanil at the dose of 5 µg [5]. Studies are reporting that, intrathecal administration of α-2 adrenergic agonists extend the analgesia and can lessen the likelihood of shivering during caesarean birth without causing side effects like nausea and vomiting [2]. When used as an adjuvant in spinal anaesthesia, dexmedetomidine can extend the time that a local anaesthetic can provide analgesia [6]. The dose affects the 2 adrenergic agonists' hemodynamic effects, including bradycardia or hypotension, as well as their consequences on the outcome of the foetus [7]. Neonatals were unaffected by the intrathecal adjuvant usage at levels that the literature has demonstrated to be safe. In actuality, there was no difference between neonatal Apgar ratings and umbilical cord blood gases [6].

In this study, we compare the intrathecal administration of sufentanil versus dexmedetomidine when they are combined with bupivacaine to induce anaesthesia in pregnant women who had caesarean deliveries. The level of intraoperative motor and sensory block was measured by measured by the Bromage and Hollmen scale, respectively. In addition, the neonatal Apgar score, first flatus time, motor recovery time and adverse effects such as pruritus or shivering, nausea and vomiting and were measured in the first 24 hours of surgical pain.

Materials and Methods

This study was a monocentric, retrospective, level III comparative analysis performed in our hospital. Since study design was retrospective analysis approval from Institutional Review Board was not obtained. Before analysis, the data were deidentified, and all procedures used in this study complied with the 1964 Helsinki Declaration and any later revisions or broadly accepted ethical standards.

Inclusion and Exclusion Criteria

Using MS Office Excel 2007, the data of patients who underwent caesarean deliveries at our facility between February 2022 and August 2022 was pulled from the department's archive, entered into a pre-filled form, and stored in a password-protected computerised database. Full-term expectant mothers who were having an elective caesarean section under spinal anaesthesia and who had a physical status of I-II (as per American Society of Anesthesiologists (ASA) criteria) were considered for the study analysis. Exclusion criteria was preeclampsia, a gestational age other than 36–40 weeks, an ASA of III-IV, multiple gestations, spinal block contraindications and hypersensitivity.

Study Population

Total seventy-four patients had caesarean operations during the study period under our consideration. After considering the inclusion criteria and applying exclusion

criteria only 62 women were included in the study. Women with preeclampsia (n=5), pregnancies before 36 weeks (n=4) and multiple gestations (3) were excluded.

Interventions

In the operating room, set up was established for an intravenous infusion (18-16 G). Thirty minutes before making a skin incision, Pantoprazole (40 mg), Ondansetron (8 mg), and antibiotic prophylaxis (Cefazolin 1 or 2 g) or in case of allergies Clindamycin (600 mg) were administered via intravenous infusion.

Patients were monitored for the changes in the body temperature, non-invasive blood pressure (NIBP), pulse oximetry (SpO2) and electrocardiogram (ECG) until foetal extraction—and then every 5 minutes thereafter.

A 500 mL IV crystalloid co-loading was started at 15-20 mL/kg/hour as intraoperative fluids.

When the patient was positioned on their left side, spinal anaesthetic was administered at the lumbar 2-3 or lumbar3-4 interspace. The sacrum served as the first vertebral level to be identified. After counting the laminae from caudal to cephalad, we noted them with a surgical pen. After seeing clean cerebrospinal fluid in the spinal needle of 27 gauge, the procedure was carried out aseptically in the subarachnoid space without freeing the cerebrospinal fluid. Patients were administered with 5 µg of sufentanil or 10 µg of dexmedetomidine in combination with of hyperbaric bupivacaine (0.5%, 10 mg). Patients were placed in the supine posture, and the uterus' position was stabilised to the left until delivery by inserting a Crawford wedge.

In case of maternal hypotension associated with bradycardia (Heart rate 60 bpm) Ephedrine (0.1 mg/kg, IV) and that associated with tachycardia (Heart rate > 100 bpm) was treated with IV Phenylephrine 100 µg/each bolus. Maternal hypotension (SAP 90 mmHg, MAP 60 mmHg) was treated with IV Oxytocin 5 IU provided as a gradual bolus at the time of foetal extraction (3 min for all patients and 5 min in case of cardiopathic patients). The next post-partum 2–4 hours saw the gradual infusion of 500 mL of oxytocin at 10 IU/hour. Oxytocin infusion started soon after birth. Methylergometrine 0.4 mg (IM) was administered for poor uterine contraction or postpartum hemorrhage (defined as blood loss exceeding 1000 mL).

Operation started when block reached level T5. During the healing phase, the VAS was measured using a 10 cm long line with the verbal anchors "no pain" on the far left and "the most excruciating pain" on the far right. The patient drew a mark on the line to represent their level of pain.

We gave intravenous paracetamol 1 g three times each day after surgery. As a last resort, keterolac 30 mg was available. When the VAS score was under 4, the pain management was deemed to be satisfactory. Every 6 hours throughout the first 24 hours following surgery, clinicians assessed the patients to ascertain their VAS, the occurrence of any negative side symptoms such vomiting, nausea, pruritus, or shivering, and the timing of their first flatus and motor recovery time. Based on the patients' reactions, pharmacological therapy was prescribed. Treatment with 8 mg of ondansetron was given in cases of nausea, vomiting, or shivering.

Data Extraction

Age, body mass index, ASA physical condition, gestational age, prior pregnancy, any kind of morbid conditions during pregnancy, and caesarean delivery indication were all taken from medical records. Additionally, the length of the procedure, the prevalence of hypotension, and intraoperative blood loss were assessed. The level of intraoperative sensory and motor

block was assessed using the Hollmen scale and the Bromage scale, respectively. At birth, the neonatal Apgar score was assessed. We evaluated postoperative pain using a VAS scale, the existence of side effects including vomiting, nausea, shivering or pruritus, the initial flatus time, and motor recovery time for the first 24 hours.

Statistical Analysis

Patients were divided into Group 1 and Group 2. Patients in group 1 (G1) were treated with bupivacaine (0.5%, 10 mg) + dexmedetomidine (10 µg). Patients in group 2 (G2) were treated with bupivacaine (0.5%, 10 mg) + sufentanil (5 µg). Using the chi-square test, categorical variables were compared and presented as percentages. For unpaired samples, continuous variables were compared using the Student's t-test and provided as mean and standard deviation. The cutoff for statistical significance was P 0.05. The Graph Pad Prism was used for statistical analysis (V8).

Results

Demographic Data

In the chosen cohort, 31 patients (50%) from G1 and 31 patients (50%) from G2 were included. Even with regard to one or more prior pregnancies, there was no apparent change in the demographic data amongst the two groups (Table 1). No patient who was a part of the trial gained more than 12 kg while pregnant. There were only two pregnant women with gestational diabetes (one in each group). Every patient had a healthy pregnancy, although five patients—two from the dexmedetomidine group and three from the sufentanil group—were at risk for preterm labour and had to take it easy throughout the pregnancy. No patient had a history of anxiousness or any other psychiatric problems. Surgical complications or major blood loss were not observed for any patient. The incidence of hypotension is not statistically significant between the two groups; data are shown in Table 1.

Table 1: Demographic and surgical characteristics

Parameters	Group 1 (n=31)	Group 2 (n=31)	p-Value
Age (years)	30.5 ± 3.4	31.7 ± 3.9	P>0.05
Body mass index (kg/m^2)	24.3 ± 3.5	24.1 ± 3.2	P>0.05
ASA II physical status	31 (100%)	31 (100%)	P>0.05
Gestational age (mean week)	39.7 ± 1.3	39.3 ± 1.1	P>0.05
Duration of surgery (mean minute)	64 ± 9	68 ± 11	P>0.05
Time of onset of sensory block (min)	7.7 ± 0.7	7.6 ± 0.5	P>0.05
Patients with one or more previous pregnancies (number)	14 (14.2%)	13 (42%)	P>0.05
Blood loss during surgery (mean ml)	645	656	P>0.05
Incidence of Hypotension (number)	9 (29%)	6 (19.35%)	P>0.05

Intraoperative Degree of Motor Block and Sensory Block Level

There was no difference between the two groups' sensory block levels as measured by the Hollmen scale and Bromage scale for the onset of sensory block and intraoperative motor block, respectively. The two groups' motor recovery times did not significantly differ from one another.

Surgical Data

Table 2 presented the caesarean delivery indications. The mean time required to perform caesarean section operations was comparable between two groups (64±9 min in G1 vs 68±11 min in G2). All other indicators were also comparable between the groups.

Table 2: Indications for elective cesarean section

Indications	Group 1 (n=31) n (%)	Group 2 (n=31) n (%)	p-Value
Previous cesarean section (number)	11 (35.5%)	13 (42%)	P>0.05
Maternal pelvic deformity (number)	2 (6.5%)	2 (6.5%)	P>0.05
Abnormal fetal presentation (number)	4 (13%)	6 (19.3%)	P>0.05
Disproportion in size between fetus and maternal pelvis (number)	2 (6.5%)	4 (13%)	P>0.05
Maternal request (number)	8 (25.8%)	9 (29%)	P>0.05
Fetal pathology (number)	6 (19.3%)	4 (13%)	P>0.05

Postoperative Pain

The VAS scale revealed that G1 had higher postoperative pain levels in the first 24 hours than G2 (5.4 ± 2 vs. 2.1 ± 1, P<0.01).

Adverse Effects

Shivering was seen in both groups, however in G1 and G2, only 2 and 3 women, respectively, had it. The findings demonstrated that there was no statistically significant change (P>0.05). First flatus occurred sooner in G1 than G2 (after 12 hours, G1 had a flatus rate of 93.54% compared to G2's 29%, P<0.01). Although there were more cases of nausea and vomiting in G2 than in G1, the difference was not statistically significant (P>0.05). Sufentanil recipients reported irritation, although intrathecal dexmedetomidine had no effect on the occurrence of itching (Table 3).

Table 3: Adverse event profile in different treatment groups

Adverse event	Group 1 (G1) (Bupivacaine 0.5% 10 mg and dexmedetomidine 10 µg)	Group 2 (G2) (Bupivacaine 0.5% 10 mg and sufentanil 5 µg)	Significance (P value)
Shivering	2 (6.45%)	3 (9.67%)	Not significant (P>0.05)
First Flatus Time (within 12 h)	29 (93.54%)	9 (29%)	Significant P>0.01
Nausea and vomiting	11 (35.4%)	16 (51.6%)	Not significant (P>0.05)
Itching	0	3 (9.67%)	Significant P>0.05

Neonatal Apgar

Neonatal Apgar scores at 1 and 5 minutes did not differ between the two groups. (Table 4).

Table 4: Outcomes

Parameters	Group 1 (n=31)				Group 2 (n=31)				
	1	2	3	4	1	2	3	4	**p-Value**
Bromage scale	31 (100%)	0 (0%)	0 (0%)	0 (0%)	31 (100%)	0 (0%)	0 (0%)	0 (0%)	* (Constant)
Hollmen scale									
T3	9 (29%)				10 (32%)				
T4	17 (54.8%)				19 (61.3%)				
T5	4 (45.2%)				3 (10%)				
Apgar 1 min									
<7	0 (0%)				0 (0%)				* (Constant)
>7	31 (100%)				31 (100%)				
Apgar 5 min									
<7	0 (0%)				0 (0%)				* (Constant)
>7	31 (100%)				31 (100%)				
Motor recovery time (min)	133.5 ± 7.6				130.3 ± 8.1				

Discussion

This study showed that a caesarean birth can be effectively conducted when spinal anaesthesia is provided using small, disposable needles and when bupivacaine is injected into the subarachnoid space together with adjuvant drugs. Actually, intrathecal administration of bupivacaine with dexmedetomidine or sufentanil identified a sufficient anaesthetic plane with total motor block (Bromage scale 1) and sensory-level block tested via a pinprick and ice tests at least at the T5 level. Pregnant women who received intrathecal sufentanil had more analgesia in the first 24 hours after surgery compared to those who received dexmedetomidine as an intrathecal adjuvant. Itching was the most significant adverse impact that our study identified in the pregnant patients who got intrathecal sufentanil, which is consistent with the review of previous studies. The additional side effects that were looked at in this study were comparable between the two groups. This study, like earlier ones [8,9], did not discover any variations in infant Apgar scores between the groups given dexmedetomidine or sufentanil. It's unclear if the intrathecal adjuvant usage has any unfavourable impact on newborns.

The most frequent type of regional anaesthetic used nowadays for caesarean deliveries is spinal anaesthesia with a T4-T6 level. When a quick induction of anaesthesia is necessary, spinal anaesthesia can be helpful for an urgent caesarean birth. The choice of a local anaesthetic for spinal anaesthesia is made mostly based on the amount of time it needs to take effect; however, a T4 level of sensory block is essential for a caesarean delivery. It has been demonstrated that hyperbaric bupivacaine offers caesarean delivery anaesthetic that is both efficient and low in intraoperative complications and motor block [10]. As clonidine dose increases, sedation levels significantly rise as well. The central nervous system's (CNS) stimulation of α-2 adrenergic receptors, which inhibits noradrenaline production, is recognised to be the cause of this. The impact starts 20 to 30 minutes after injection and is dose-dependent and independent of the administration route. [11].

A very selective adjuvant used in anaesthesia is dexmedetomidine. The anaesthetic ability boosted by the α2 adrenergic agonist can be explained by a number of trustworthy mechanisms. Dexmedetomidine's α2-agonism, according to some researchers, causes vasoconstriction, which may contribute to the analgesia lasting longer. Additionally, dexmedetomidine potentiates spinal block by interacting synergistically with sodium channels and α2 receptors, which reduces the amount of local anaesthetics needed to achieve effective spinal anaesthesia during several surgical procedures [6]. To increase the analgesic impact of local anaesthesia, 10 μg of dexmedetomidine was administered during spinal anaesthesia. When combined with bupivacaine, dexmedetomidine can lengthen the duration of anaesthesia with quicker onsets of sensory and motor blocks than bupivacaine alone.

Due to its supra-spinal action and more selective α2-agonist receptor than clonidine, dexmedetomidine prolongs spinal anaesthesia and has stronger sedative and analgesic effects. The results demonstrate that, in comparison to the bupivacaine-fentanyl combination, the addition of a α2-agonist, clonidine, to hyperbaric bupivacaine prolongs both the duration of effective analgesia as well as the sensory and motor blocks. This outcome is consistent with earlier research, which found no shivering in the dexmedetomidine groups and incidences of shivering ranging from 10 to 30% in the control groups. Shivering after caesarean deliveries was significantly reduced by intrathecal dexmedetomidine, which also suppressed the body's thermoregulatory centre by preventing the transfer of body temperature information at the spinal cord level.

Dexmedetomidine can lessen the need for opioids to be administered during a caesarean delivery, lowering the likelihood of nausea and vomiting. Additionally, it exhibited an opioid-sparing impact in the postoperative period, lowering the rescue dose of opioids and analgesics [2]. Intrathecal dexmedetomidine looks to be safe for both the mother and the foetus after a caesarean section because it is not easily transported via the placenta due to its fat-soluble properties, which means that it does not heighten neonatal adverse reactions during a caesarean section. The neonatal 1 and 5 min Apgar scores and cord blood gas measurements did not show any significant differences. Dexmedetomidine may be a safe intrathecal adjuvant because no adverse nervous system symptoms or signs were discovered.

The duration of analgesia is significantly prolonged by the intra-subarachnoid space administration of combination of sufentanil plus hyperbaric bupivacaine as opposed to bupivacaine alone. The duration of analgesia does not, however, increase proportionally with intrathecal sufentanil doses above 10 g [12]. In the post-operative period, the incidence of itching or pruritus in the literature ranges significantly from 30% to 95%. According to several reports, the frequency and severity of pruritus increase with an opioid dose [8].

In our facility, sufentanil is routinely used as an intrathecal adjuvant; it is infrequently used with other intrathecal adjuvants, such as clonidine or dexmedetomidine, in the same anaesthetic mixture. A combination spinal epidural is typically the anaesthetic of choice when the surgical procedure will likely take longer or when the postoperative discomfort may be more severe than with a caesarean delivery. When a pregnancy-related problem involving intrathecal opioids or postoperative shivering is reported, dexmedetomidine is administered alone as an adjuvant in spinal anaesthesia.

Our research has some drawbacks. First, the retrospective nature of the study's design created a potential for bias in the results analysis. Secondly, the study's patient

population was relatively small. Thirdly, the clinicians chose which patients would receive adjuvant treatment based on their medical histories. Fourthly, not all patients received care from the same intraoperative and postoperative team. Fourth,

Conclusions

We came to the conclusion that combining adjuvants of hyperbaric bupivacaine (5 μg) and sufentanil (10 μg) gave an appropriate level of anaesthesia and postoperative analgesia. Contrary to what has been reported in the literature, dexmedetomidine failed to produce greater or equivalent analgesia to sufentanil. The sensory and motor block that results from the spinal anaesthesia caused by bupivacaine is prolonged by dexmedetomidine and sufentanil. Adjuvant dexmedetomidine did not enhance the incidence of hypotension, although it did decrease postoperative shivering. However, more research is necessary before dexmedetomidine or sufentanil are accepted as the preferred adjuvants for caesarean deliveries.

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