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Original Research Article

Analysis of Anaesthetic Outcome of Ropivacaine Alone and Combination with Dexmedetomidine in Caesarean Section

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Abstract

Background: Ropivacaine is an amino amide family of local anaesthetics that has been introduced not too long ago. It has been used for regional blocks since some time but recently its use has been seen in spinal anaesthesia, according to several recent reports. Intrathecally given dexmedetomidine is a highly selective 2-adrenergic agonist. At the spinal cord level, dexmedetomidine principally affects 2 receptors. The combination of Ropivacaine along with Dexmedetomidine has been seen in rather few studies hence we have conducted such a study to observe the efficacy of these drugs.

Aims and Objectives: To find out the efficiency of the sensory and motor block with ropivacaine alone and ropivacaine with dexmedetomidine.

Methods: A prospective analytical interventional comparative randomized study was conducted from February 2021 to January 2023 on patients who are undergoing cesarean section in the department of anaesthesia in tertiary care hospital. The study considered 80 patients of ASA physical class I and II who were posted for cesarean section at our hospital were selected for the study. The study population was randomly selected based on the closed-sealed opaque envelope technique into 2 groups as mentioned above, with the dose of 13.5mg Ropivacaine alone and the other group with 13.5mg Ropivacaine with 5mcg Dexmedetomidine.

Results: The time of onset and completion is fast in a sensory block of RD. the total duration of anaesthesia in the body is highest in RD of the sensory block than in the motor block. The motor blockage is similar in both the groups and highest on scale III compared to I. nausea is the most common complication (15%) seen in ropivacaine the bradycardia in RD (5%). The onset of analgesia is fast in the RD group.

Conclusion: Present study concluded that ropivacaine with dexmedetomidine produces a rapid and more prolonged motor and sensory block and provides a longer duration of postoperative analgesia as compared to ropivacaine alone.

Keywords: Ropivacaine, Dexmedetomidine, Intrathecal, Sensory, Motor, Blocked.

Introduction

Cesarean section is one of the most common surgical procedure seen in the obstetric unit. There has been an increase in the number of Cesarean sections due to increase of high-risk pregnancies which indicate the need of cesarean sections. Worldwide, spinal anaesthesia is recognized as a secure method for cesarean sections. It appears to be more appropriate than general anaesthesia because it supports the mother-child bond and helps breastfeed the infant while in the operating room. It also eliminates the need of multiple analgesics and its side effects, and the ability to maintain consciousness [2,3]. Ropivacaine is an amino amide family of local anaesthetics that was just recently introduced. It is structurally and pharmacodynamically comparable to bupivacaine. Ropivacaine has been used for spinal anaesthesia, according to several recent reports [8]. Ropivacaine is used to treat epidural pain during labour or for cesarean sections because it has a greater level of separation seen between motor and sensory blocking than bupivacaine [9].

It is a cardio stable drug with minimal effect of patient's hemodynamics and thus can be used safely. It being an isobaric preparation can be given in any preferred position. The ideal dosing schedule for spinal ropivacaine has not yet been established. Additionally, because to lower dose requirements in obstetrics, data from non-obstetric patients cannot be readily generalized to obstetrics. There are limited data available on the dosage levels of spinal ropivacaine in obstetric patients [12-16].

Intrathecally given dexmedetomidine is a highly selective 2-adrenergic agonist. At the spinal cord level, dexmedetomidine principally affects 2 receptors [17,18]. In recent years, some researchers concluded from clinical findings that intrathecal dexmedetomidine injection during a cesarean section could reduce post pain, hasten the onset of lumbar anaesthesia, and increase the effectiveness of local anaesthetics with no adverse effects on newborns. Dexmedetomidine-assisted analgesia is safe after a cesarean section since it can stimulate uterine contractions [19-21].

Materials and Methods

Study design

A prospective analytical interventional comparative randomized study was conducted from February 2021 to January 2023 on patients, who are undergoing cesarean section in the department of anaesthesia in tertiary care hospital. The study considered 80 patients of ASA physical class I and II who were posted for cesarean section at our hospital were selected for the study. The study population was randomly selected based on the closed-sealed opaque envelope technique into 2 groups as mentioned, the ropivacaine group (only ropivacaine was given to them) and the RD group (who were given ropivacaine with dexmedetomidine). The following steps were followed for each patient.

- A preoperative assessment was done for each patient and written informed consent was taken.
- A complete history of patients was taken along with a thorough clinical examination.
- The patient was shifted to the Operating room.
- Patients posted for the cesarean section were Co-loaded with Ringer's lactate/Normal Saline at 10ml/kg solution when taken for surgery.
- The patient was given Inj. Ondansetron 0.08mg/kg as premedication when taken for surgery.
- Vitals were assessed by using a multiparameter monitor for heart rate, non-invasive blood pressure, oxygen saturation, and pulse rate.

- Under all aseptic conditions, the subarachnoid block was given in L3-L4/L2-L3 space via a midline approach using a 25-gauge Quincke's spinal needle. The drug was injected at the speed of 0.2cc/ second as per the groups mentioned above.
- Patients were put in a recumbent position immediately after giving the block.
- The patient's vitals were monitored throughout the study

Inclusion Criteria

1. Parturient between the age 18 years to 40 years
2. Height (150-170cm)
3. ASA grade II
4. Parturient with BMI < 40
5. Parturient having single-viable or twin-viable pregnancy
6. Elective and Emergency LSCS
7. Duration of surgery < 2 hours
8. No history of addiction to opioids

Exclusion Criteria

1. Patients with co-morbid conditions like uncontrolled diabetes mellitus, asthma, and Parturient with Eclampsia.
2. Parturient with significant cardiac disorders.
3. Parturient with significant renal disorders.
4. Parturient with significant neurological disorders.
5. Patient on any anticoagulants.
6. Any local infection at the site where anaesthesia needs to be given.
7. Any allergy to local anaesthetics.
8. On any opioid medication.

Statistical Analysis

All the data was noted down in a pre-designed study proforma. Qualitative data was represented in the form of frequency and percentage. Association between qualitative variables was assessed by the Chi-Square test and Fisher's exact test for all 2 X 2 tables. Quantitative data was represented using Mean ± SD. Analysis of Quantitative data between the two groups was done using an unpaired t-test if the data passed 'Normality test' and by Mann-Whitney Test if the data failed the 'Normality test'. A $p<0.05$ was taken as the level of significance. Results were graphically represented where deemed necessary. SPSS Version 21.0 was used for most analyses and Microsoft Excel 2010 for graphical representation.

Ethical approval

The patients were given a thorough explanation of the study by the authors. The patients' permissions have been gotten. The Institutional Ethical Clearance Committee has approved the study's methodology.

Results

The present study included 80 patients divided into two groups with 40 in each group. The mean age of the patients is 26.5 and 24.81 in the ropivacaine and RD group respectively. The mean weight is 57 in RD and 56.05 in ropivacaine. The BMI and height are almost similar compared to within groups (Table 1).

Table 1: Baseline characteristics of the study sample

Variables	Ropivacaine N=40	Ropivacaine + dexmedetomidine (RD) N=40	*p*-value
Age (mean ± SD)	26.54 ± 5.62	24.81 ± 4.79	0.23
Weight (kg) (mean ± SD)	56.05 ± 6.20	57.00 ± 6.01	0.47
Height (cm) (mean ± SD)	161.73 ± 3.44	161.45 ± 3.58	0.78
BMI (kg/m^2) (mean ± SD)	21.39 ± 1.90	21.83 ± 1.86	0.29

The time of onset and completion is fast in a sensory block of RD. the total duration of anaesthesia in the body is highest in RD of the sensory block than in the motor block (table 2).

Table 2: Mean comparison of sensory and motor block parameters among study groups

Sensory block	**Ropivacaine N=40**	**Ropivacaine+ dexmedetomidine (RD) N=40**	***p*-value**
Time of onset (mins)	4.67 ± 0.55	3.63 ± 0.56	<0.01
Time to complete sensory block (mins)	22.70 ± 0.79	19.60 ± 1.22	<0.01
Total duration (mins)	426.60 ± 17.40	520.43 ± 16.31	<0.01
Motor block			
Time of onset (mins)	6.43 ± 0.73	5.23 ± 0.77	<0.01
Time to complete sensory block (mins)	25.77 ± 1.01	23.03 ± 4.12	<0.01
Total duration (mins)	412.00 ± 17.15	503.37 ± 16.87	<0.01

The motor blockage is similar in both the groups and highest on scale III compared to I. nausea is the most common complication (15%) seen in ropivacaine the bradycardia in RD (5%). The onset of analgesia is fast in the RD group.

Table 3: Comparison of the maximum motor block level, time for first rescue analgesia, adverse reactions

Max motor block (Bromage scale)	**Group**		**Total**	***p*-value**
	RD	**Ropivacaine**		**1.0**
II	5 (12.5%)	5 (12.5%)	10 (12.5%)	
III	35 (87.5%)	35(87.5%)	70 (87.5%)	
Total	40 (100%)	40 (100%)	90 (112.5%)	
Complications (time)				
Bradycardia	2 (5.0%)	0 (0.0%)	2 (2.5%)	0.48
Nausea	1 (2.5%)	6 (15.0%)	7 (8.8%)	<0.01
Vomiting	1 (2.5%)	0 (0.0%)	1 (1.3%)	1.00
None	36 (90.0%)	34 (85.0%)	70 (87.5%)	0.71
Analgesia				
Time for first rescue analgesia (mins) (mean ± SD)	401.43 ± 23.50	552.93 ± 28.69		<0.01

Discussion

According to studies, adding intrathecal dexmedetomidine to local anaesthetics can enhance the quality of the spinal anaesthesia and lower the amount of local anaesthetic needed for spinal anaesthesia during cesarean delivery. The extent of this effect has not yet been completely defined, though. The intrathecal hyperbaric ropivacaine's ED50 with or without dexmedetomidine during cesarean delivery in healthy parturient was therefore the subject of a study. To calculate the effect of intrathecal dexmedetomidine versus placebo on the need for ropivacaine, ED50 values were obtained and compared. According to the study, intrathecal dexmedetomidine (5 g) decreased the ED50 of intrathecal hyperbaric ropivacaine for cesarean delivery in healthy parturient under combination spinal-epidural anaesthesia by around 18% under the settings of the present investigation [24].

Considered to be the epidural anaesthetic most frequently used is ropivacaine. Ropivacaine alone (R group) and

ropivacaine coupled with dexmedetomidine were tested for effectiveness and safety (RD group). In comparison to the R group, the RD group experienced motor and sensory blocks earlier and for a longer period. There was no discernible difference between the groups when the time to rescue was compared. At 10 minutes, the pulse rate and arterial pressure of the R group were steadier than those of the RD group. In comparison to the RD group, the R group experienced more shivering and less bradycardia. According to the study's findings, RD may be a better option than R alone for providing epidural anaesthesia with better anaesthetic results [25].

A study was conducted to determine the impact of various dexmedetomidine dosages when used as a spinal anaesthetic adjuvant to hyperbaric ropivacaine during cesarean section procedures. According to the study, 3 g of intrathecal dexmedetomidine as an adjuvant to ropivacaine improved postoperative analgesia and intraoperative somato-visceral sensory block characteristics, reduced parturient shivering, and did not prolong the duration of motor block or cause any side effects, making this dose suitable for cesarean delivery [26].

To assess the effects of spinal anaesthesia (SA) using bupivacaine and dexmedetomidine (DEX) during cesarean delivery, examine the unfavourable drug reactions brought on by this combination, and serve as a guide for responsible medication usage, a meta-analysis was conducted. When compared to the control group, the bupivacaine DEX group took considerably less time to reach the greatest level of sensory block. The incidence of shivering during anaesthesia was considerably lower in the bupivacaine-DEX group than in the control group, particularly at a dose of 5 mg DEX. The symptoms of bradycardia, hypotension, nausea/vomiting, and pruritus showed no discernible differences. According to the study, using dexmedetomidine during SA can considerably reduce the rate of shivering during anaesthesia and shorten the onset time compared to using bupivacaine alone for SA in cesarean section [27].

In a study, the anaesthetic and neonatal effects of dexmedetomidine and ropivacaine after cesarean delivery under epidural anaesthesia were investigated. The study finds that giving dexmedetomidine and ropivacaine together can have some positive benefits on newborns, including early onset, the establishment of sensory anaesthesia, considerably greater sedation levels, a reduction in the severity of traction reaction, and a lower incidence of shivering [28,29].

Conclusion

The present study concluded that ropivacaine with dexmedetomidine produces a rapid and more prolonged motor and sensory block and provides a longer duration of postoperative analgesia as compared to ropivacaine alone. However, in both cases, they were similar with hemodynamic changes and adverse reactions like bradycardia and hypotension. More patients of the ropivacaine group complained of postoperative nausea. Thus, to conclude, combination with dexmedetomidine has a clinically significant effect over ropivacaine when used alone for intrathecal anaesthesia in caesarean section patients.

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