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Efficacy Of Intrathecal 0.5% Isobaric Ropivacaine With (Or) Without Dexmedetomidine In Lower Limb (Or) Lower Abdominal Surgeries

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ABSTRACT
Introduction: *Spinal anaesthesia (SA), also called spinal block or subarachnoid block is a type of regional anaesthesia, in which an opioid or local anaesthetic is injected into the subarachnoid space. Local anaesthetics include amides and esters. Postoperative pain relief was a vital issue with for local anesthestics like Ropivacaine. So, an adjuvant is added with Ropivacaine to provide prolonged postoperative analgesia with better intraoperative haemodynamic conditions with minimal side effects.*
Aim: *To compare the efficacy of ropivacaine alone vs. ropivacaine added to dexmedetomidine in lower limb surgeries.*
Methods: *This randomized, single-blinded study included 60 patients who were scheduled to undergo lower limb or lower abdominal surgeries. The study was conducted at a tertiary care center named NRI Medical College & General Hospital, Chinakakani, Andhra Pradesh. Group R patients were given ropivacaine alone. Group D patients were given ropivacaine along with dexmedetomidine.*
Results: *Duration of analgesia was significantly more in group D patients. There is no significant difference in the time to achieve two-segment regression. The onset of sensory block was quick in group R and the onset of motor block was quick in group D patients. There is no significant difference in the mean VAS score between the two groups.*
Conclusion: *From our study, it was proved that Dexmedetomidine added to ropivacaine produced earlier onset of sensory and motor blockades and prolonged duration of analgesia without producing any significant side effects.*

Keywords: *Ropivacaine, Dexmedetomidine, Spinal Anaesthesia, Lower limb surgeries, Sub arachnoid block*

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I. INTRODUCTION:

Spinal anaesthesia (SA), also called spinal block or subarachnoid block is a type of regional anaesthesia, in which an opioid or local anaesthetic is injected into the subarachnoid space. It is the technique of choice for Caesarean section as it avoids a general anaesthetic and the risk of failed intubation which is lower than the incidence of 1 in 250 in pregnant women[1].

Local anaesthetics include amides and esters. Some examples are Lidocaine, tetracaine, bupivacaine, ropivacaine etc., used commonly for spinal anaesthesia in India. Lidocaine provides a short duration of anesthesia[2] and is mainly used for surgical and obstetrical procedures with less than one-hour duration. Tetracaine and bupivacaine are used for surgeries lasting 2 to 5[3] hours. Compared with tetracaine, bupivacaine was linked to a decreased incidence of hypotension and tourniquet pain. But bupivacaine was shown to be associated with cardiotoxicity[4]. So, the new congener Ropivacaine was selected in this study as it has the added advantage of less incidence of cardiotoxicity, and neurotoxicity with rapid recovery of motor function. Postoperative pain relief was a vital issue with Ropivacaine. So, an adjuvant is added with Ropivacaine to provide prolonged postoperative analgesia with better intraoperative haemodynamic conditions with minimal side effects. NICE guidelines of UK recommends supplementation of spinal anaesthesia for Caesarean section with intrathecal (IT) diamorphine[5] since 2004.

Drugs that activate central alpha 2 receptors include clonidine[6], Relminidine, moxonidine, Dexmedetomidine etc. Dexmedetomidine[7,8] is highly selective α-2 adrenergic agonist with eight times greater affinity for receptors than clonidine.

Alpha agonists also increase the effects of local anaesthetics by causing hyperpolarization of nerve cells and by altering the transmembrane potential and conduction of ion in the brain stem (Locus Coerulues).

II. OBJECTIVES:

1. To compare the analgesic efficacy of intrathecal isobaric 0.5% Ropivacaine alone with the combination of isobaric 0.5% Ropivacaine and Dexmedetomidine.
2. To compare the pattern of side effects in the group given Ropivacaine alone with the group given a combination of Ropivacaine and Dexmedetomidine.

III. METHODS

Type of study: Randomized, comparative, single blinded study.
This study was conducted on ASA1 and ASA2 patients posted for laparotomy under General Anaesthesia.
Sample size and groups: 60 patients were included. Patients were randomized into two groups. 30 patients belonged to group D and 30 patients belonged to group R.

INCLUSION CRITERIA:
● ASA grade 1 and 2 patients
● Aged 18 to 65 years
● Patients are undergoing elective Laparotomy under GA.
● Male and female patients

EXCLUSION CRITERIA:
Patients with severe hepatic or renal disorders
- Patients with cardio-pulmonary disorders
- Patients with Physical dependence on opioids
- Known allergies to the medications used.
- Patients with abnormalities in clotting factors.
- Pregnant and lactating women

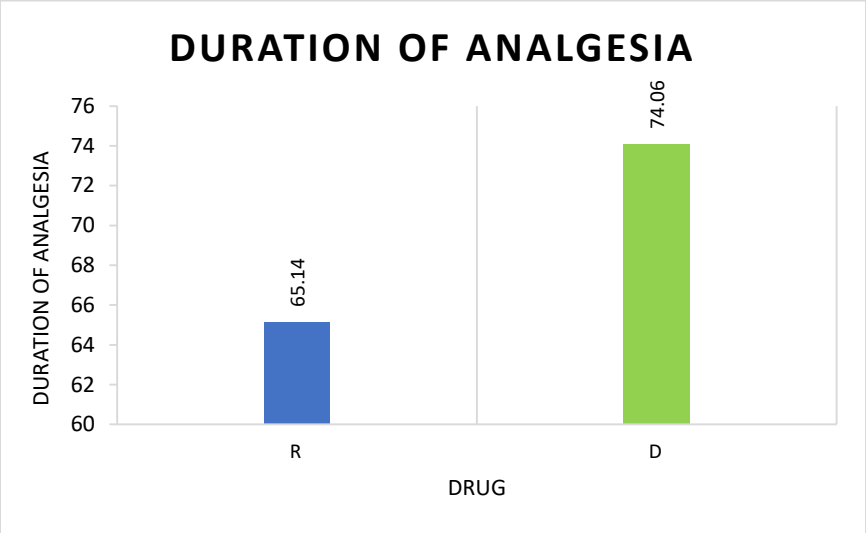
Methodology:
- Pre anaesthetic exam is done 24 hours before surgery. All the patients underwent proper physical examination and required blood testing. Medical history was taken from all patients as per the case record form (CRF). The patients who were involved in randomization and drug preparation doesn't know the information about the type of drug that is given to them (single-blinded). The information on the Visual Analogue Scale (VAS) scoring
- We have used a 10-point VAS scale. All the patients were asked to fast for at least six hours before the surgery. In the surgery room, we monitored the patient's electrocardiograph (ECG), heart rate (HR), oxygen saturation (SpO2) and blood pressure. Baseline vital parameters were also assessed. Premedication with Alprazolam 0.5mg is given one night before surgery. Alprazolam is a benzodiazepine that decreases apprehension-it acts by increasing Inhibitory CNS neurotransmitter gamma-aminobutyric acid (GABA).
- Preanesthetic medication like glycopyrrolate(5mcg/kg), Midazolam (0.03mg/kg) and fentanyl (2mcg/kg) were given along with propofol (2mg/kg). Vecuronium (0.1mg/kg) is given to relax muscles. Endotracheal intubation is performed and maintained using sevoflurane (0.2-1%), nitrous oxide, and oxygen. Neuromuscular blockage is reversed with neostigmine (0.05mcg/kg) and glycopyrrolate (10mcg/kg). Intravenous paracetamol is used as a rescue analgesia depending on the visual analog scale (VAS) pain score.

ETHICAL APPROVAL: Ethics committee approval was obtained from NRI Medical College, Chinakakani. Permission was obtained from the concerned authority to collect data. Informed consent was taken from all study participants.

DATA ANALYSIS: The P value was calculated based on the student's t-test- and chi square tests.

IV. RESULTS

Duration of analgesia: It was significantly more in the Dexmedetomidine group compared to ropivacaine only group.



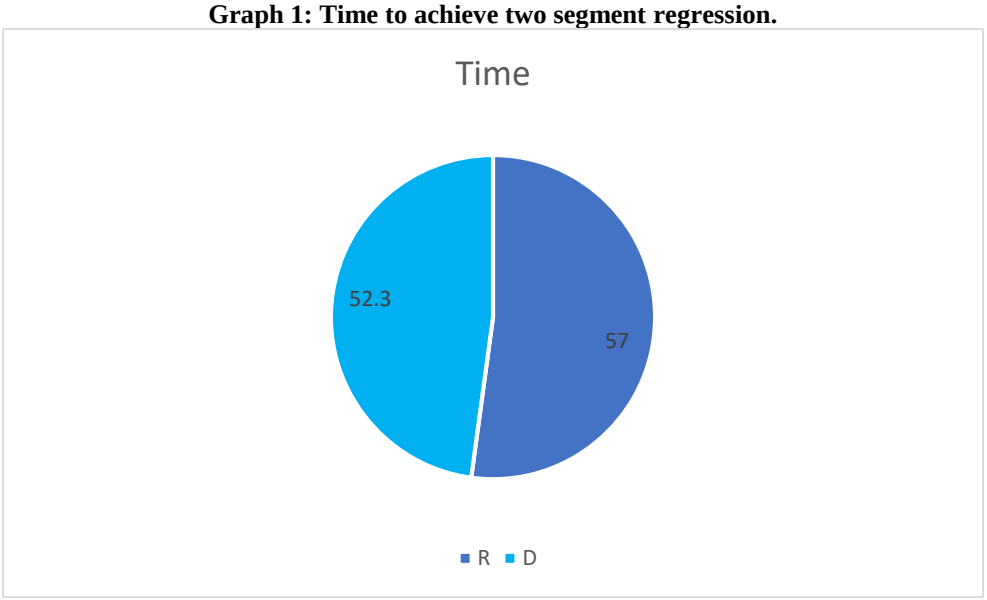
Highest sensory block achieved: 19 patients achieved T5 sensory block overall. There is no significant difference in the highest sensory block achieved in both groups. (p=0.9)

Table 2: Highest sensory block achieved.

		Group	
		D	R
Highest sensory block achieved	T4	7	8
	T5	10	9
	T6	9	7

Time to achieve two segment regression: There is no significant difference in time to achieve two segment regression (p=0.89).

Graph 1: Time to achieve two segment regression.



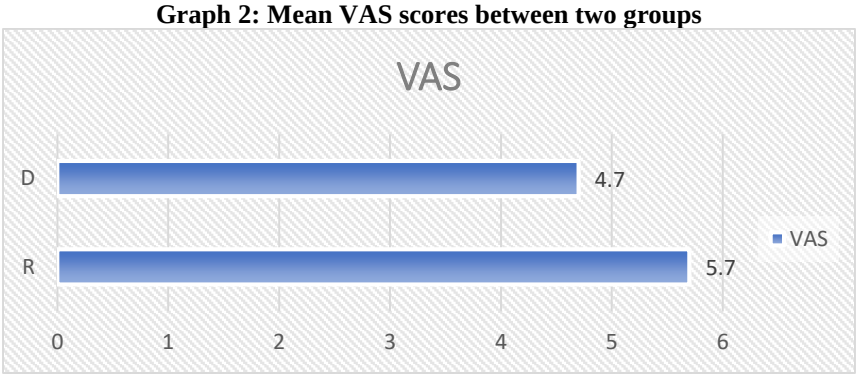
Onset of sensory and motor blocks: The onset of sensory block was quick in group R and onset of motor block was quick in group D patients.

Table 3: Onset of sensory and motor blocks

	Drug	N	Mean	Std. Deviation	P value
Onset of motor block	R	30	21.66	1.154	0.002
	D	30	24.16	.738	
Onset of sensory block	R	30	261.58	19.892	0.000
	D	30	192.42	8.500	

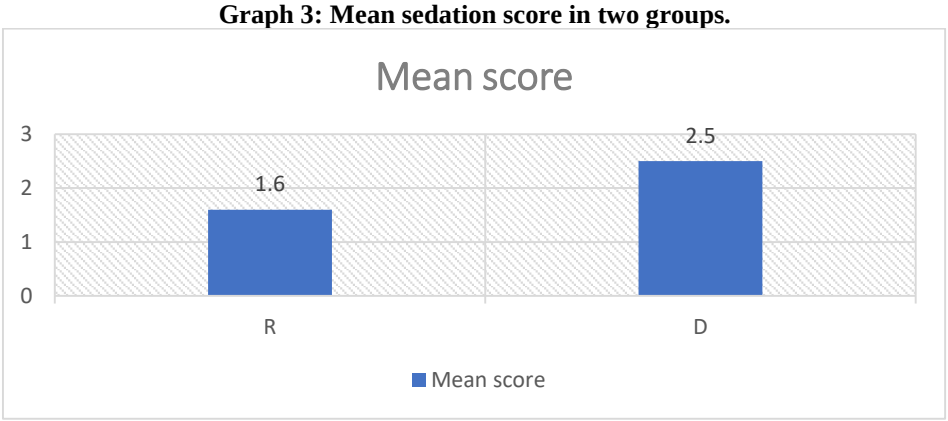
VAS score: There is no significant difference in mean VAS scores between groups R and D. (p=0.876)

Graph 2: Mean VAS scores between two groups



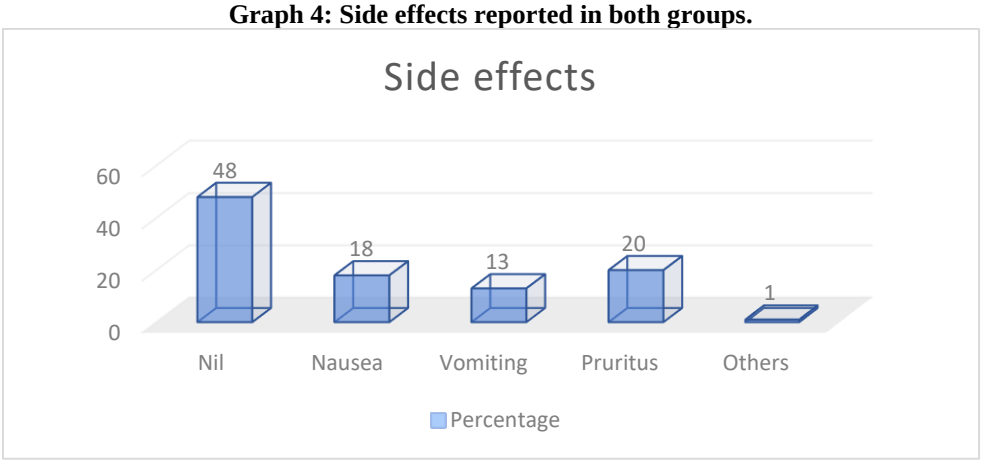
Sedation score: There is no significant difference in the mean sedation score between two groups (p=0.18).

Graph 3: Mean sedation score in two groups.



Side effects: 48 patients had no side effects.

Graph 4: Side effects reported in both groups.



V. DISCUSSION

Duration of analgesia was significantly more in group D patients. There is no significant difference in the time to achieve two-segment regression. The onset of sensory block was quick in group R and the onset of motor block was quick in group D patients. There is no significant difference in the mean VAS score between the two groups in the present study.

In Vijayanand's study[9], 0.75% isobaric ropivacaine was used. In our study, we used 0.5% isobaric ropivacaine. Results of Vijayanand's study showed that the addition of Dexmedetomidine to Ropivacaine significantly prolonged the duration of analgesia like our study. The addition of dexmedetomidine produced more sedation similar to our study. No episodes of respiratory depression were noted in both the study groups similar to our study.

In Bhavana Sharma's study[10], fifty patients were divided to receive ropivacaine (0.2%) with dexmedetomidine and ropivacaine (0.2%) with normal saline. The mean pain scores were low in dexmedetomidine group like our study.

114 patients scheduled for upper limb surgeries were included in Liu's study[11]. They received ropivacaine alone or ropivacaine combined with dexmedetomidine. Results shown that time for sensory and motor blockades was significantly less in combination group compared to the control group similar to our study, like our study. Duration of the blockade was more in the combination group.

In Yan's study[12], 140 patients undergoing elective lung lobectomy were randomized into 2 groups to receive dexmedetomidine plus 0.1% ropivacaine and sufentanil plus 0.1% ropivacaine for postoperative analgesia. In our study, we enrolled 100 patients and didn't use sufentanil. Results shown that The VAS values at rest during the postoperative 6–48 hrs were lower in dexmedetomidine group compared to sufentanil group. The study concluded that Dexmedetomidine combined with ropivacaine may provide better postoperative analgesia and sedative effect similar to our study. Zhao's meta-analysis[13] was done using PubMed, the Cochrane Library, Google Scholar, Ovid Medline, the Web of Science, Scopus, Embase, and ScienceDirect databases. This analysis included eleven randomized controlled including 337 patients in the Ropivacaine alone group and 336 patients in the ropivacaine with dexmedetomidine group. The combination group had a shorter time to onset of sensory and motor block and a longer duration of anesthesia similar to our study.

In the study by Ashem Singh[14], authors compared epidural ropivacaine alone and ropivacaine with dexmedetomidine on block characteristics, hemodynamics, and postoperative analgesia. The study was done on 50 patients. There is a difference in the duration of sensory block and motor blocks, duration of postoperative analgesia in the combination group and consequently low doses of rescue analgesia are required in the combination group, similar to our study.

In the study by D. A. McNamee[15], researchers hypothesized that Ropivacaine provides effective spinal anaesthesia for total hip arthroplasty. Sixty-six patients were included. Results show that the onset of motor and sensory blocks was rapid with no significant differences between the two groups.

VI. CONCLUSION:

From our study, it was proved that Dexmedetomidine added to ropivacaine produced earlier onset of sensory and motor blockades and prolonged duration of analgesia without producing any significant ADRs. The study is self-sponsored. There were no conflicts of interest.

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