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Original Research Article.

Comparison of Dexmedetomidine as an Adjuvant to Ropivacaine Vs. Ropivacaine Alone in Lower Abdominal & Lower Limb Surgeries

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ABSTRACT

Introduction: For lower abdominal and lower limb surgeries, epidural anesthesia technique of central neuraxial blockade is in used very commonly as this technique avoids the shortcomings and drawbacks of general anesthesia like airway manipulation and poly-pharmacy along with other untoward effects like postoperative nausea and vomiting while ruling out need for additional intravenous analgesics.

Methodology: In our study two groups were included that was group R and group RD. 50 cases were included in in each groups. This study was conducted in the Department of Anesthesia, Carrier Institute of Medical Sciences & Hospital, Lucknow, U.P., India.

Study Duration: The duration of study was over a period of six months.

Result: In our study two groups were included that was group R and group RD. 50 cases were included in in each groups. The mean duration of motor blockade is 149.00±14.21mins in group R and 233.70±15.26 minutes in group RD; also significant difference between the group (p=0.001).

Conclusion: This study suggested that Dexmedetomidine when added to Ropivacaine produces profound synergistic effect and prolongs motor and sensory blockade.

Keywords: Dexmedetomidine, Ropivacaine, Sensory Blockade.

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INTRODUCTION

Epidural and intrathecal anesthesia are the two most common regional anesthesia techniques that are used for lower abdominal and lower limb surgeries. Various advantages of epidural anesthesia have been discussed.[1,2] that provides anesthesia very effectively, minimizes the chances of hemodynamic changes and provides prolonged post-operative analgesia also. Thus, this anesthesia can meet the lengthy and prolonged durations of surgical needs. Various types of local anesthetic agents such as Bupivacaine and Lidocaine are commonly used for epidural anesthesia in India.[3] The intermediate duration of action of lidocaine is its biggest limitation. On the contrary, bupivacaine is long acting but increased incidences of fatal cardiac toxicity after accidental intravascular injection has been reported with it. This increase has been found because of narrow cardiovascular (CVS) collapse and central nervous system (CNS) toxicity (cc/cns).[4] Because of these limitations and toxicities, an alternative anesthetic agent was searched extensively keeping in mind the blocking properties of bupivacaine but with a greater margin of safety. The new local anesthetic agents with wide margin of safety in comparison to Bupivacaine with all its benefits are newer long acting amides Ropivacaine and levobupivacaine.[4]

For lower abdominal and lower limb surgeries, epidural anesthesia technique of central neuraxial blockade is in used very commonly as this technique avoids the shortcomings and drawbacks of general anesthesia like airway manipulation and poly-pharmacy along with other untoward effects like postoperative nausea and vomiting while ruling out need for additional intravenous analgesics. Epidural anesthetic agents have capabilities of sole anesthetic agent for procedures involving the lower abdomen, perineum, pelvis and lower limbs. It is suitable for procedures of long duration as it can maintain continuous anesthesia after placement of an epidural catheter.[5] An ideal local anesthetic infused in the epidural space should provide rapid onset, adequate motor block for surgical relaxation and efficient sensory block for providing post-op analgesia with minimal CVS and CNS toxicities. The advantage of this technique is that even during the surgery, it is possible to provide graded epidural anesthesia or supplementation of the drug.[6]

The aim of the recent study is to study and evaluate the synergistic effects of Dexmedetomidine mixed with Ropivacaine 0.75% as epidural anaesthesia, along with additional study of onset and duration of sensory and motor blockade as well as intensity of motor blockade, along with maximum dermatome level of analgesia, sedation score after 30 minutes, hemodynamic changes, etc. by comparing with 0.75% Ropivacaine alone, in lower abdominal and lower limb surgeries.

MATERIALS & METHODS

Study Population: In our study two groups were included that was group R and group RD. 50 cases were included in in each groups.

Study Area: This study was conducted in the department of Anesthesia, Carrier Institute of Medical Sciences & Hospital, Lucknow, U.P., India.

Study Duration: Over a period of six months.

Data Collection: 100 adult patients, age 18 to 65 yrs, scheduled for various elective lower abdominal and limb surgeries belonging to ASA I & II, randomly divided using computer generated randomization numbers into two groups, 50 patients each. Group R (n=50) received 15ml of 0.75% Ropivacaine and Group RD (n=50) received 15 ml of 0.75% Ropivacaine + 0.6 µg / kg of Dexmedetomidine**.** Patients with Pregnancy & lactation, raised intracranial pressure, severe hypovolemia, bleeding coagulopathy, local infection, uncontrolled hypertension or Diabetes mellitus, neurological disorder and deformities of spine, cardiac disease, hepatic disease were excluded from study. A routine pre-anesthetic examination was conducted on the previous day. Patients were premedicated with tablet alprazolam 0.5 mg and ranitidine 150 mg and kept nil orally from 10 pm onwards on the recorded. All the patients were preloaded with 500 ml of RL 30 minutes prior to the procedure. Epidural space was identified. Using 18G needle at either L2-3 or L3-4 inter spinous space, an epidural catheter was threaded and fixed at 3 cms inside the epidural space. After ruling out intrathecal and intravascular placement of the tip of the catheter, study drug was injected in increments of 5 ml. Assessment of sensory and motor blockade were done at the end of each minute with the patient in supine position after completion of the injection, as the starting time. The onset time for sensory and motor block, the maximum level of sensory block, intensity of motor block and sedation score were recorded. Motor blockade in the lower limb was assessed using modified Bromage scale. Hemodynamic parameters recorded every 5 minutes till the end of 1st hour and then every 15 minutes till the end of surgery. Onset of sensory block is recorded as the time from the completion of the injection of the study drug till loss of sensation at T10 level. Onset of motor blockade is taken from the completion of the injection of study drug till the patient develops modified Bromage scale grade 1 motor blockade. Duration of motor block is taken from the time of injection till the patient attains complete motor recovery (Bromage 0). Duration of sensory block is taken from the time of injection till the patient complains of pain at the T10 dermatome.

Data Analysis: Data were analyzed by using Microsoft excel and statistics.

Table 1: Distribution of cases according to maximum level of sensory block

Max sensory level	Group R (number of cases)	Group RD (number of cases)	P value
T5	0	5	
T6	31	38	
T8	17	6	0.10
T10	2	1	

Table 2: Mean time for onset of sensory and motor block (minutes)

	Mean time for sensory onset	SD	P value	Mean time for motor onset	SD	P value
Group R	10.04	2.55	0.000	15.36	3.28	0.000
Group RD	5.26	1.49		11.22	2.61	

Table 3: Grade of motor block

	Group R	Group RD	P value
Bromage 2	15	0	<0.001
Bromage 3	35	34	0.35
Bromage 4	0	16	<0.001

Table 4: Sedation score

Sedation score	Group R	Group RD	P value
S1	17	0	
S2	33	15	
S3	0	29	0.001
S4	0	6	

Table 5: Duration of sensory and motor blockade (minutes)

	Mean	SD	P value
Duration of sensory block			
Group R	198.00	24.05	
Group RD	359.39	61.94	0.001
Duration of motor block			
Group R	149.00	14.21	
Group RD	233.70	15.36	0.001

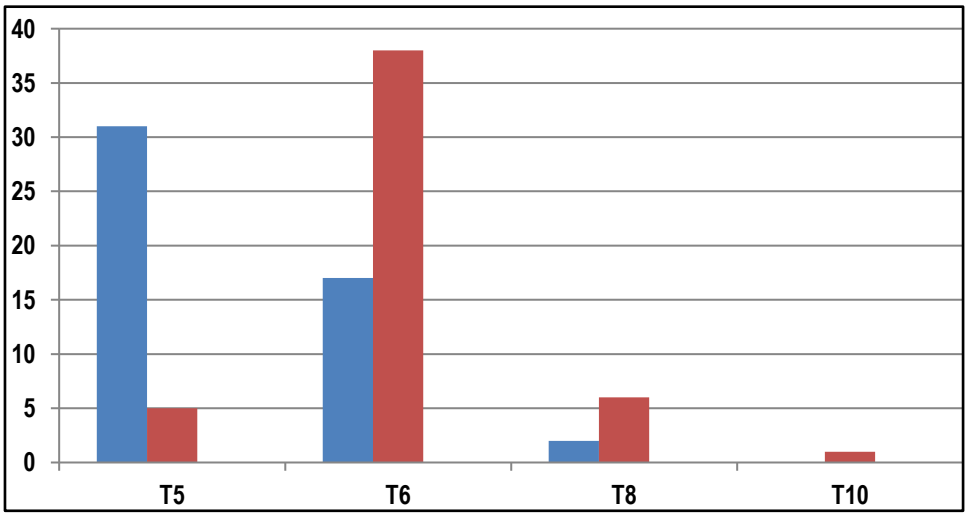

Chart 1: Distribution of cases according to maximum level of sensory block

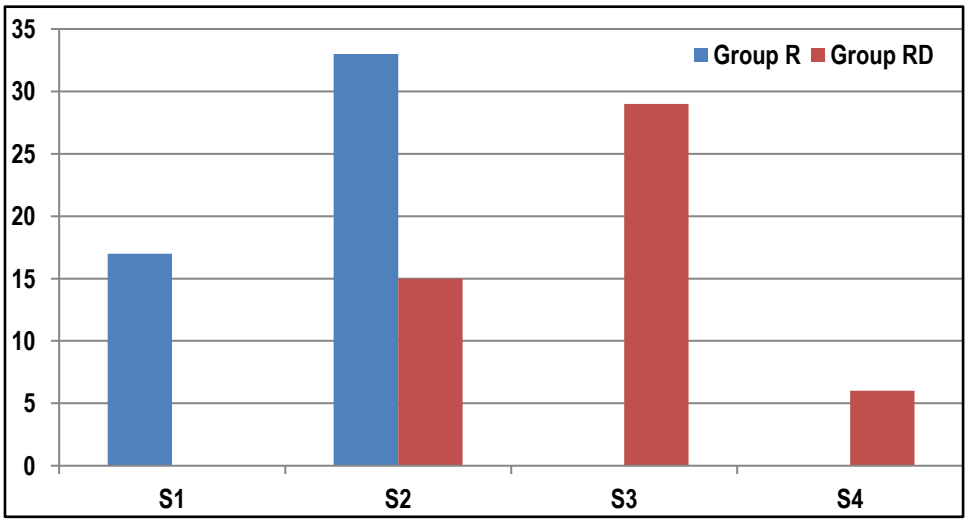

Chart 2: Sedation score

RESULTS

In our study two groups were included that was group R and group RD. 50 cases were included in in each groups. In this study we found that Maximum level of sensory block level in T6 in R group as well as RD. This study showed mean time for onset of sensory and motor block (table 2). In the present study, Group R had the highest score of 2 and highest score in group RD was 3.Dexmedetomidine group had greater scores compared to ropivacaine alone; significant difference (p=0.001). This study showed mean duration of sensory block is 198.0±24.05 minutes in group R and 359.30±61.94 minutes in group RD; significant difference (p=0.001).The mean duration of motor blockade is 149.00±14.21mins in group R and 233.70±15.26 minutes in group RD; also significant difference between the group (p=0.001).

DISCUSSION

The hypothesis before the start of current study was that Ropivacaine will cause smaller duration of sensory and motor blockade in comparison to Ropivacaine in combination with Dexmedetomidine. Dexmedetomidine has been reported to cause prolongation of sensory and motor blockade along with improving the quality of anesthesia and perioperative analgesia.[2] Ropivacaine has the lower lipid solubility than Bupivacaine due to substitution of the pipecoloxylidine with a 3 – carbon side chain instead of a 4-carbon side chain.[7] Because of this lesser lipid solubility Ropivacaine produces a better differential block of sensory and motor function in comparison to Bupivacaine.[8] Patients receiving 0.5% Ropivacaine has been found to develop inadequate motor blockade during surgery than Bupivacaine

receivers.[9] Hence in the present study 0.75% Ropivacaine was the selected drug. The dose of Dexmedetomidine was 0.6µg/kg. The volume of 0.5% Bupivacaine used in the present study under epidural anesthesia was 15 ml. The study of Bajwa et al. time of onset of sensory analgesia at T10 in Ropivacaine with Dexmedetomidine group was 8.52 ± 2.36 minutes while in Ropivacaine with clonidine group was 9.72 ± 3.44 minutes and these findings are significant statistically similar to the present study.[10] Their comparison of onset of sensory analgesia at T10 between Ropivacaine with Dexmedetomidine group and ropivacaine with fentanyl group was supporting our findings. The maximum level of sensory blockade at T4 to T6 level in group RD compared to T5 to T7 in group RF have been shown in the study of Bajwa SJ et al which again supports the present study. In the present study the duration of sensory blockade was longer in Ropivacaine with Dexmedetomidine group compared to Ropivacaine group.[10] In the present study, there was statistically significant differences in onset of motor blockade between group R and group RD while in study of Saravia P.S.F et al, no significant change was found.[11]

In the present study, the group RD produced significantly intense motor blockade than group R and the study of Saravia P.S.F et al demonstrated almost the similar results.[11] In the present study, there was statistically Significant difference in the onset of sensory and motor blockade between Ropivacaine alone (R) and Ropivacaine with Dexmedetomidine (RD) just like another study of Bajwa SL et al.[10] It was found that the group RD produced more intense motor blockade than group R and the duration of sensory and motor blockades were prolonged with Group RD.

CONCLUSION

This study suggested that Dexmedetomidine when added to Ropivacaine produces profound synergistic effect and prolongs motor and sensory blockade.

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