A PROSPECTIVE STUDY OF COMPARISON BETWEEN ADDITIONS OF INTRAVENOUS INFUSION VERSUS EPIDURAL INTRATHECAL DEXMEDETOMIDINE WITH ROPIVACAINE FOR LOWER ABDOMINAL SURGERY

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ABSTRACT

BACKGROUND

Dexmedetomidine is a centrally acting active selective α_{2A} agonist, which is used as an adjunct to anaesthesia, analgesia and sedation are produced with little respiratory depression, amnesia or anaesthesia. Ropivacaine is a newer congener of bupivacaine, but less cardiotoxic. It blocks A□ and C fibre more completely than Aß fibres. A greater degree of separation of motor and sensory block occurs with this. Present study is designed to compare the effect of dexmedetomidine intravenous infusion with ropivacaine versus intrathecal dexmedetomidine with ropivacaine on various parameters like sensory and motor block and quality of analgesia.

MATERIALS AND METHODS

Total 120 patients were included in this study and were divided into two groups. Each group is having 60 patients. Group A were given 20 mL of 0.75% ropivacaine hydrochloride, intravenous infusion of 1 mcg/kg given over 10 min. followed by maintenance dose of 0.25 mcg/kg/hrs. of infusion of dexmedetomidine, while group B were given 20 mL of 0.75% ropivacaine with 16 mcg dexmedetomidine. Various parameters like sensory and motor block and quality of analgesia was measured in both the group.

RESULTS

Time required to reach T_{10} sensory level was having mean value 4.2 min. group A, but in group B, it was 3.6 min., this difference among the two group was statistically significant ($P<0.05$). Peak sensory block achieved in group A is T_5 and in group B was T_4. After administration of drug, the mean time taken to reach peak sensory level in group A was 11.2 min. and in group B it was 10.26, which was comparable to each other with P value <0.05. The onset of motor block as per Bromage scale was 5.6 min. group A and 4.2 min. in group B and the total duration of motor block was 360 min. in group B that is higher than group A that is 296 min. for 1st dose of analgesic was 8 hrs. in group A, in group B, it was early that is 6 hours.

CONCLUSION

Infusion of dexmedetomidine or with 16 mcg dexmedetomidine intrathecal produced a significant prolongation in the durations of motor and sensory block, but that administered intrathecally had more significant prolonging effect than that administered intravenously. But, there was significant difference in effect on haemodynamic profile.

KEYWORDS

Intravenous Infusion, Intrathecal, Dexmedetomidine.

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BACKGROUND

Surgical procedure is a kind of stress and its response developed to allow injured animals to survive by changing the physiological balance towards catabolism. Stress response has been interpreted in the form of increase in secretion of various hormones from endocrine gland like increase in ACTH, growth hormone, cortisol, aldosterone and glucagon, decrease in secretion of insulin and thyroxin. The net response to surgery is an increased secretion of catabolic hormones. A number of changes occur following tissue injury is also stimulated by IL-6. There occurs secretion of acute phase proteins that is C-reactive protein, fibrinogen, α_2-microglobulin and anti-proteinases. All these changes are responsible for postoperative pain, various organ dysfunction and prolonged hospitalisation.[1,2] Extensive epidural analgesia with local anaesthetic agents used to prevent stress response to surgery. Availability of various adjuvant drugs decreases the pain, helps in rapid recovery, early mobilisation and decrease the duration of study in the hospital.

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Dexmedetomidine is a centrally acting active selective α_{2A} agonist, which is used as an adjunct to anaesthesia, analgesia and sedation are produced with little respiratory depression, amnesia or anaesthesia. Ropivacaine is a newer congener of bupivacaine, but less cardiotoxic. It blocks A□ and C fibre more completely than Aß fibres. A greater degree of separation of motor and sensory block occurs with this.[3]

Present study is designed to compare the effect of dexmedetomidine intravenous infusion with ropivacaine versus intrathecal dexmedetomidine with ropivacaine on various parameters like sensory and motor block and quality of analgesia.

MATERIALS AND METHODS

It is a prospective study conducted in the Department of Anaesthesia and Critical Care, Konaseema Institute of Medical Science, Amalapuram, Andhra Pradesh. The Study was conducted for a period of one year from 2012-2013. During this period, 160 patient were enrolled for this study as per exclusion and inclusion criteria.

Inclusion Criteria	Exclusion Criteria
Age 20 to 60 years	-Any contraindication for spinal anaesthesia.
Both sex	-Cardiac, renal disorder.
Belong to ASA grade I and II	-Hypersensitivity to drug.

This study was approved by Institutional Ethics Committee, Konaseema Institute of Medical Sciences and before start of the study informed written consent was obtained from patient.

Total 120 patients were included in this study and were divided into two groups. Each group is having 60 patients. Group A were given 20 mL of 0.75% ropivacaine hydrochloride, intravenous infusion of 1 mcg/kg given over 10 min., followed by maintenance dose of 0.25 mcg/kg/hrs. of infusion of dexmedetomidine, while group B were given 20 mL of 0.75% ropivacaine with 16 mcg dexmedetomidine. All patients were given same preanaesthetic advice and medication and were explained visual analogue scale for paying to all patients. All the vital parameters like HR, SBP and DBP was measured preoperatively. A peripheral venous access was secured with 18G cannula. The patients were preloaded with Ringer lactate 10 mL/kg over 20 min. prior to spinal anaesthesia. Multipara monitor was attached and baseline pulse rate, SBP, DBP, oxygen saturation, respiratory rate and ECG was recorded.

Under all ascetic conditions, epidural block was performed in L3-L4 intervertebral space. Group A received 20 mL of 0.75% ropivacaine hydrochloride along with that intravenous infusion of dexmedetomidine 1 mcg/kg given over 10 min. followed by maintenance dose of 0.25 mcg/kg/hr. infusion of dexmedetomidine till the end of surgery and Group B received (n=80) 20 mL of 0.75 ropivacaine hydrochloride with 16 mcg dexmedetomidine.

Continuous monitoring of various vital parameters were done throughout the study. A decrease of more than 25% from the baseline of SBP was considered. Hypotension and heart rate below 50/min. was considered bradycardia and appropriately treated.

Sensory Block

It was assessed by loss of sensation to pinprick by 22G blunt needle at every 2 mins. interval until T_{10} dermatome was reached and then 5 mins. interval till no change level reached. Time to achieve highest sensory level, maximum level of sensory block and duration of sensory block was recorded in both the group.[4,5]

Motor Block[6,7]

It was assessed by modified Bromage scale.

Bromage 0 = Able to move knee and hip.

Bromage 1 = Inability to move hip, but can move knee and ankle.

Bromage 2 = Unable move hip and knee, but can move ankle.

Bromage 3 = No movement.

Total duration of motor block time required to reach maximum block reached was noted. The time was calculated from the time of intrathecal injection.

All the haemodynamic parameter was calculated every 5 mins. for first 45 mins. after that every 15 mins. till the end of surgery.

Analgesia

Postoperative VAS was recorded for study every 30 mins. for first 3 hrs., then 1 hourly for 12 hrs., then 3 hrs. for next 24 hrs. When VAS score was more than 3 rescue analgesia given time required to first rescue analgesia and then number of patients required rescue analgesia was also noted.[8]

RESULTS

The demographic profile shows that both the groups were comparable to each other in terms of sex, age, weight and height and ASA grading as per Table 1.

Regarding spinal block as per table 2, it is clear that time required to reach T_{10} sensory level was having mean value 4.2 min. group A, but in group B, it was 3.6 min., this difference among the two group was statistically significant ($P<0.05$). Peak sensory block achieved in group A is T_5 and in group B was T_4. After administration of drug, the mean time taken to reach peak sensory level in group A was 11.2 min. and in group B, it was 10.26, which was comparable to each other with P value <0.05. Similarly, mean time taken for two dermatome regression in group A was 200.6 min., but in group B, it was 324.6 min. The time for regression to L5 was delayed in group B that is 4.6 min., then group A that is 346.4 min.

As per Table 3, the onset of motor block as per Bromage scale was 5.6 min. group A and 4.2 min. in group B and the total duration of motor block was 360 min. in group B that is higher than group A that is 296 min.

The first dose of analgesic was 8 hrs. in group A; in group B, it was early that is 6 hours.

Sex (Percentage)	Group A (n=80) Male = 38 (47.5) Female = 42 (42.5)	Group B (n=80) Male = 46 (57.5) Female 34 (42.5)
Age (mean)	37.81	39.43
Mean weight(kg)	62.42	64.23
Mena height (in cm)	158.32	161.42
ASA grade (%) grade I	62(77.5)	58(72.5)
Grade II	18(22.5)	22(27.5)

Table 1. Demographic Profile of Patients

Onset of Block	Group A (Mean)	Group B (Mean)	P value
Time to reach T10 level (min.)	4.2	3.6	<0.05
Peak sensory block level	T5	T4	
Time to reach peak sensory level (min.)	11.2	10.26	<0.05
Time for two dermatomal regression (min.)	200.6	324.6	<0.01
Time for regression to L5 (min.)	346.4	424.6	<0.01

Table 2. Sensory Block Characteristics

Parameters	Group	Group B	P value
On set of motor block (min.)	Mean 4.2	Mean 5.6	Value <0.01
Total duration of block (min.)	360 min.	296	<0.05

Table 3. Motor Block Characteristics

Time for first dose of rescue analgesic in (hr.)	Group A	Group B
	Mean	Mean
	8 hrs.	6 hrs.

Table 4. Time for first Dose of Analgesia

	Group A	Group B
Lowest HR	56/min.	60 min.
SBP lowest	98 mm of Hg	100 mm of Hg
DBP lowest	56 mm of Hg	58 mm of Hg

Table 5. Haemodynamic Parameter

DISCUSSION

Ropivacaine is a newer amide local anaesthetic, which is less toxic on cardiovascular system and shows rapid recovery of motor function and used as alternative to bupivacaine. In present study, we have compared the effect of dexmedetomidine as adjuvant with ropivacaine when it is given by two different routes. Dexmedetomidine is a selective α2 adrenoreceptor agonist has analgesic and sedative effect.

It has been found in various studies that dexmedetomidine as an adjuvant to spinal anaesthesia improves motor and sensory block and analgesic requirements.[9,10] In our study, we have found that time to reach peak sensory block level was 11.2 and 10.26 min. in Group A and Group B, respectively. Peak sensory block achieved in group A is T_5 and in group B was T_4. After administration of drug, the mean time taken to reach peak sensory level in group A was 11.2 min. and in group B. it was 10.26 min. Time to regression to L5 was delayed in Group B than Group A, which is similar to the work of Udita et al.[11]

In our study, the time of onset of motor block was more in Group A, then Group B, but duration of motor block was more in Group B, which is also found in the study of various authors.[12,13] The time required for first dose of rescue analgesia was 8 hrs. in group and 6 hrs. in group B, similar result was found by Hamid et al[3] and Mahamed et al as per these study dexmedetomidine given intrathecally improves the quality and the duration of postoperative analgesia and also provides an analgesic sparing effect in patients undergoing major abdominal surgery.[13]

Regarding haemodynamic parameters, there was no difference in both the group, which is similar to the study of Xiao et al. As per this study, dexmedetomidine would not increase the risk of side effects such as nausea, headache, vomiting, shivering and hypotension.[14]

CONCLUSION

In our study, we have observed that in spinal anaesthesia by ropivacaine when we give intravenous infusion of 1 mcg/kg given over 10 min. followed by maintenance dose of 0.25 mcg/kg/hrs. Infusion of dexmedetomidine or with 16 mcg dexmedetomidine intrathecal produced a significant prolongation in the durations of motor and sensory block, but that administered intrathecally had more significant prolonging effect than that administered intravenously. But, there was significant difference in effect on haemodynamic profile. Analgesic requirement was delayed in intravenous group.

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