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COMPARISON OF DEXMEDETOMIDINE AS AN ADJUVANT TO ROPIVACAINE VS. ROPIVACAINE ALONE IN LOWER ABDOMINAL & LOWER LIMB SURGERIES; A RANDOMIZED CLINICAL TRIAL.

Anesthesiology

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ABSTRACT

Background: Regional anaesthesia has a lot of advantages compared to general anesthesia such as effective motor & sensory blockade , prolonged postoperative analgesia , no airway manipulation etc. Adding adjuvant like Dexmedetomidine potentiates such action.

Method: A study was undertaken to compare anaesthetic properties of Ropivacaine alone with Ropivacaine and Dexmedetomidine. Hundred patients, age18-65 yrs , ASA I & II, randomly divided into 2 groups (each 50). Group I received Roipvacaine and Group II Roipvacaine with Dexmedetomidine. Onset time, maximum level and duration of sensory & motor blockade studied.

Result: Dexmedetomidine group showed rapid onset of action, prolonged duration of sensory and motor block, better sedation score.

Conclusion: Dexmedetomidine as an adjuvant to local anesthetic potentiates the anesthetic and analgesic properties.

KEYWORDS

Regional anaesthesia , Ropivacaine, Dexmedetomidine.

Introduction:

Regional anaesthesia has a lot of advantages compared to general anaesthesia for lower abdominal and limb surgeries such as effective motor and sensory blockade, prolonged postoperative analgesia, no airway manipulation, less incidence of postoperative nausea and vomiting etc[1]. Spinal anaesthesia and epidural anaesthesia are the two most popular regional anaesthesia techniques used for lower abdominal and limb surgeries. But the former technique has many limitations like short duration, rapid onset of sympathetic blockade causing hypotension, shorter duration of postoperative analgesia and postdural puncture headache. Hence epidural is the most preferred technique for lower abdominal & limb surgeries.

Stable haemodynamics, non neurotoxicity and ability to provide smooth & prolonged post-operative analgesia are the main desirable qualities of an adjuvant in neuraxial anaesthesia [5]. α-2 adrenergic agonists like Dexmedetomidine have both analgesic and sedative properties when used as an adjuvant in regional anaesthesia. The anesthetic and the analgesic requirement get reduced to a much greater extent by the use of Dexmedetomidine because of its analgesic properties and augmentation of local anesthetic effects as they cause hyperpolarisation of nerve tissues by altering transmembrane potential and ion conductance in the brainstem. The stable hemodynamic feature due to sympathoadrenal stability has proved this adjuvant a very useful pharmacological agent[12]. The aim of this study is to evaluate the synergistic effect of Dexmedetomidine mixed with Ropivacaine 0.75% in epidural anaesthesia, with regard to, onset of sensory blockade, onset of motor blockade, maximum dermatome level of analgesia, intensity of motor blockade, duration of sensory block, duration of motor block, sedation score after 30 minutes , hemodynamic changes etc by comparing with 0.75% Ropivacaine alone, in lower abdominal and lower limb surgeries.

Material and Method:

This study was undertaken in the Dept. of Anesthesiology at VIMSAR, Sambalpur during the period Nov. 2014 to Oct. 2016 after obtaining ethical committee approval. Hundred 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 15ml of 0.75% Ropivacaine + 0.6µg/kg of Dexmedetomidine**.** Patients with Pregnancy & lactation, raised intracranial pressure, severe hypovolemia , bleeding coagulopathy , local infection, uncontrolled hypertension or Diabetis 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 previous night. On the day of surgery, patients' basal parameters were recorded. All the patients were preloaded with 500 ml of RL 30 minutes prior to the procedure. Epidural space was identified. Using 18G Tuohy 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.

Result:

The results of the study were statistically analyzed using SPSS version 13.0. Descriptive statistics was done by calculating mean, standard deviation, range and proportion appropriately. The inferential statistics (test of significance) was done using unpaired t- test two way repeated measure ANOVA and chi-square test.

Table 1 Maximum level of sensory block:

Max Sensory level	Group R (No.of patients)	Group RD (No.of patients)	p-value
T5	0	5	0.10
T6	31	38	
T8	17	6	
T10	2	1	

Highest level for Group RD was T5 and in R group wasT6. There is no significant difference (p>0.05).

Table2: Mean time for onset of sensory and motor block (minutes)

	Mean time for sensory onset (mins)	SD	p-value	Mean time for motor onset (mins)	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	

The mean time of onset of sensory blockade in group R is 10.04±2.5 mins and in group RD 5.26±1.49mins. There is highly significant difference between the groups (p=0.000). The mean time taken for the onset of motor blockade is 15.36±3.28 mins in group R and 11.22±2.61 mins in group RD; significant difference (p=0.000).

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

Patients with Bromage 2 were 15 in group R and 0 in group RD, whereas patients with Bromage 4 were 0 in group R and 16 in group RD. More intense motor blockade of Bromage 4 was found in patients in group RD compared to R (p value - 0.001)

Table4: Sedation score

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

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).

Table5: Duration of sensory and motor blockade (minutes)

	Mean	SD	p-value
Duration of Sensory Block			
Group R	198.00	24.05	0.001
Group RD	359.30	61.94	
Duration of Motor Block			
Group R	149.00	14.21	0.001
Group RD	233.70	15.36	

The mean duration of sensory block is 198.0±24.05 mins in group R and 359.30±61.94 mins 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 mins in group RD; also significant difference between the group (p=0.001).

There is no significant difference in the mean heart rate and MBP. Four patients in RD group developed bradycardia. Seven patients in group RD and 4 in group R developed hypotension .

Discussion:

The hypothesis before the study was that Ropivacaine will produce lesser duration of sensory and motor blockade than Ropivacaine in combination with Dexmedetomidine, as Dexmedetomidine causes significant prolongation of sensory and motor blockade and improves the quality of anaesthesia and perioperative analgesia [3]. The lower lipid solubility of Ropivacaine predicts that it is likely to produce a greater differential block of sensory and motor function than Bupivacaine [9]. Ropivacaine is less lipophilic than Bupivacaine due to substitution of the pipecoloxylidine with a 3 – carbon side chain instead of a 4-carbon side chain[1].

Casati et al. reported that patients receiving 0.5% Ropivacaine more frequently had an inadequate motor blockade during surgery than those receiving Bupivacaine [4]. Hence in our study 0.75% Ropivacaine was selected. Dexmedetomidine dose employed in our study is 0.6µg/kg. The volume of 0.5% Bupivacaine used in our hospital routinely for lower abdominal and lower limb surgeries under epidural anaesthesia is 15 ml. In our study the mean time for onset of sensory analgesia at T10 is 10.04 ± 2.55 mins in group R and 5.26±1.49 mins in group RD. This is statistically significant (p<0.001). The studies conducted by Bajwa SJ, Bajwa SK et al. showed onset of sensory analgesia at T10 in Ropivacaine with Dexmedetomidine group was 8.52 ± 2.36 min Vs 9.72 ± 3.44 min in Ropivacaine with clonidine group and this is statistically significant similar to our study [18]. They showed onset of sensory analgesia at T10 in Ropivacaine with Dexmedetomidine group was 7.12± 2.44 mins VS 9.14 ± 2.94 mins in ropivacaine with fentanyl group. This is also statistically significant similar to our study. In our study the maximum level of sensory block in group RD was T5 and in group R was T6. The range of block was very wide in both the groups. Bajwa SJ et al showed maximum level of sensory block at T4-6 level in group RD compared to T5-T7 in group RF which again compares with our study. In our study the duration of sensory block is longer with Ropivacaine with Dexmedetomidine group compared with Ropivacaine group[18]. Onset of motor blockade was 15.36 ± 3.28 min in group R and 11.22 ± 2.61 mins in group RD which is statistically significant. In our study motor blockade is assessed using modified Bromage scale and onset was taken as soon as the patient developed grade I motor block.

Saravia P.S.F, Sabbag AT et al found no significant change in the onset time for motor block between control and Dexmedetomidine groups[12]. In our study it was found that group RD produced more intense motor block than group R . 16 patients in RD group had grade 4 motor block compared with 0 patients in group R. Also 15patients in R group had grade 2 motor block compared with 0 patients in group RD group. This is statistically highly significant(p<0.001). In a study conducted by Saravia P.S.F, Sabbag AT et al78 found the duration of motor blockade was significantly higher in the Dexmedetomidine group, averaging 30% higher than that observed in the control group similar to our study[12].

The studies conducted by Bajwa SJ, Bajwa SK, Kaur J et al82 showed the mean duration of motor blockade was 246.72 ± 30.46 mins in Ropivacaine with Dexmedetomidine group and 228.44 ± 27.18 mins in Ropivacaine with Clonidine group [18]. This was not statistically significant, but the result of ropivacaine and dexmedetomidine group is similar to our study.

Conclusion:

We concluded that there is statistically significant difference in the onset of sensory and motor blockade between Ropivacaine alone (R) and Ropivacaine with Dexmedetomidine (RD). Group RD produced more intense motor blockade than group R. Duration of sensory and motor block were prolonged with Group RD. The later had greater sedation scores. Hence it can be concluded that Dexmedetomidine when added to Ropivacaine produces profound synergistic effect and prolongs motor and sensory block significantly.

References:

1. Miller's Anesthesia. 8th edition.
2. Michael J Cousins. Neural blockade in clinical anesthesia and pain medicine. 4th ed.
3. Collin VJ. Principles of anesthesiology.
4. Casati A, Putzu M. Bupivacaine, Best Practice and Research Clinical Anaesthesiology 2005; 19:247-68.

5. Arthur GR, Feldman HS. Anesthesiology 1986;65:A182.
6. Katz JA, Bridenbaugh PO, Anesth Analg. 1990;70:16-21.
7. Concepcion M, Arthur GR,. Anesthesia and Analgesia 1990;70:80-5.
8. Katz JA, Knarr DC,. Regional anesthesia 1990;15:250-2.
9. Brown DL, Carpenter RL. Anesthesiology 1990;72:633-6.
10. Arthur GR, Feldman HS,. Anesth Analg 1988;67:1053-8.
11. Finucane BT, Sandler AN, McKenna J. Can J Anaesth 1996;43:442-9.
12. Saraiva P.S.F, Sabbag A.T,. Brazilian journal of medical 2008;54:
13. Nysora – The new York school of regional anesthesia 2008
14. Ellis H. anatomy for anaesthetists. 8th edition. Blackwell Publishing; 2004.
15. Paul G Barash. Clinical anesthesia. Lippincott Williams and Wilkins; 2009.
16. Kutiyala G, Chaudhary G. Ropivacaine: A review of its pharmacology and clinical use. IJA 2011;55:104-110.
17. Morgan & Mikhail`s clinical anaesthesiology.5th ed:2014.
18. Bajwa SJ, Bajwa SK, Dexmedetomidine and clonidine in epidural anaesthesia: Indian Journal of Anaesthesia 2011;Mar-Apr55(2):116