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A comparative study between intrathecal isobaric ropivacaine 0.75% (15 mg) plus dexmedetomidine (10 mcg) and isobaric ropivacaine 0.75% (15 mg) plus clonidine (30 mcg) for elective lower abdominal and lower limb surgeries

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Abstract

Background: Pain is one of the most noxious stimuli a living being perceives; the most painful moments are the surgical procedure. The present study compared intrathecal isobaric ropivacaine 0.75% (15 mg) plus dexmedetomidine (10 mcg) and isobaric ropivacaine 0.75% (15 mg) plus clonidine (30 mcg) for elective lower abdominal and lower limb surgeries.

Materials and Methods: 100 consenting patients undergoing lower abdominal and lower limb surgeries under intrathecal anesthesia were randomized into the following groups with 50 patients in each group. Group C patients received isobaric ropivacaine 0.75% 15 mg + 30 mcg clonidine. Group D patients received isobaric ropivacaine 0.75% 15 mg + 10 mcg dexmedetomidine.

Results: The mean duration of surgery is 101.04 ± 24.18 mins in Group C and 107.42 ± 27.50 mins in Group D. In Group C, the mean time to onset of sensory analgesia till T10 was 6.1 minutes and in Group D was 3.68 minutes. In Group C, 30 patients (60%) had a maximum sensory level of T6, 8 patients (16%) had a level of T8, and 12 patients (24%) had a level of T10. In Group D, 2 (4%) had a maximum sensory level of T5, 32 patients (64%) had a level of T6, 6 patients (12%) had a level of T8, 10 patients (20%) had a level of T10. There was no statistically significant difference between the groups (p value > 0.05) in the maximum sensory level achieved. In Group C the mean time taken from onset of sensory blockade to regression to T12 was 151.7 minutes and in Group D was 199.7 minutes. In Group C the mean time to first postoperative analgesic requirement was 267.6 minutes and in Group D was 356.9 minutes. In Group C, the mean time taken to achieve complete motor blockade was 12.66 minutes and in Group D was 11.14 minutes.

Conclusion: Dexmedetomidine added to ropivacaine provided earlier sensory blockade, prolonged duration of sensory and motor blockade for patients under intrathecal anesthesia for lower limb surgeries.

Keywords: Dexmedetomidine, ropivacaine, limb surgeries

Introduction

Pain is one of the most noxious stimuli a living being perceives; the most painful moments are the surgical procedure^[1]. With the advances in the field of anesthesia various techniques are being used to alleviate pain in the peri-operative period. Intrathecal anaesthesia has replaced general anesthesia as the first-line method to provide anaesthesia for lower abdominal and lower limb surgeries as it is very economical and easy to administer^[2]. Local anaesthetics are the commonest agents used for spinal anaesthesia. Ropivacaine is a new local anaesthetic which combines the anaesthetic potency and long duration of action of bupivacaine with a toxicity profile intermediate between bupivacaine and lidocaine and has advantage of faster recovery.

The efficacy of ropivacaine is similar to that of bupivacaine and levobupivacaine for peripheral nerve blocks and, although it may be slightly less potent than bupivacaine when administered epidurally or intrathecally, equi-effective doses have been established^[3]. Thus, ropivacaine, with its efficacy, lower propensity for motor block, and reduced potential for CNS toxicity and cardiotoxicity, appears to be an important option for regional anaesthesia and management of postoperative and labour pain^[4].

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Clonidine, a selective partial α_2 -adrenergic agonist, is being extensively evaluated as an adjuvant to intrathecal local anaesthetics and has proven to be a potent analgesic free of opioid-related side effects [5]. It is known to increase both sensory and motor blockade of local anaesthetics. Intrathecal clonidine has been used as an adjuvant to local anaesthetics in various surgical procedures without any clinically significant side effects. Previous studies have described the use of clonidine in a wide range (15–150 mcg) [6].

Dexmedetomidine is new, highly selective α_2 adrenoceptor agonist that has been approved by the Food and Drug Administration (FDA) as an intravenous sedative and analgesic drug in intubated patients in the intensive care settings. Its $\alpha_2:\alpha_1$ selectivity is eight times higher than that of Clonidine [7]. The present study compared intrathecal isobaric ropivacaine 0.75% (15 mg) plus dexmedetomidine (10 mcg) and isobaric ropivacaine 0.75% (15 mg) plus clonidine (30 mcg) for elective lower abdominal and lower limb surgeries.

Materials and Methods

The present study was conducted at Narayana Medical College Hospital for a period of two years on 100 consenting patients undergoing lower abdominal and lower limb surgeries under intrathecal anesthesia who fulfilled a pre-determined inclusion & exclusion criteria.

This study was done after Ethical Committee approval and written informed consent obtained from all the patients included in the study.

Patients were randomized into the following groups with 50 patients in each group.

Group C patients received isobaric ropivacaine 0.75% 15 mg + 30 mcg clonidine

Group D patients received isobaric ropivacaine 0.75% 15 mg + 10 mcg dexmedetomidine

In both groups, total volume of the drug was exactly same and the dilution was with normal saline. Patients included in the study underwent thorough preoperative evaluation which included history, Hb, PCV, BT, CT, RFT, Blood sugar, ECG, CXR, Platelet count, Blood grouping and cross matching were done. Hypotension, tachycardia, bradycardia were noted. Assessment of sensory blockade by pin prick, motor blockade by Modified Bromage scale, analgesia by VAS were done.

Results

Table 1: Type of surgery

Surgery	Group C	Group D
Inguinal hernia	18	18
THR	5	5
DHS	9	9
ORIF	8	8
PFN	10	10
Total	50	50

Table 1 shows that type of surgery was inguinal hernia, THR, DHS, ORIF and PFN.

Table 2: Comparison of parameters

Parameters	Group C	Group D	P value
Mean duration of surgery (mins)	101.04	107.42	0.12
Onset of sensory analgesia (mins)	6.1	3.68	0.001
Maximum sensory level (MSL)			
T10	12	10	0.01
T8	8	6	
T6	30	32	
T5	0	2	
Time taken for regression of sensory block to t12	151.7	199.7	0.05
Time to first postoperative analgesic requirement (in minutes)	267.6	356.9	0.01
Time taken to achieve complete motor blockade (in minutes)	12.66	11.14	0.03

Table 2 shows that mean duration of surgery is 101.04 ± 24.18 mins in Group C and 107.42 ± 27.50 mins in Group D. In Group C, the mean time to onset of sensory analgesia till T 10 was 6.1 minutes and in Group D was 3.68 minutes. In Group C, 30 patients (60%) had a maximum sensory level of T6, 8 patients (16%) had a level of T8, and 12 patients (24%) had a level of T10. In Group D, 2 (4%) had a maximum sensory level of T5, 32 patients (64%) had a level of T6, 6 patients (12%) had a level of T8, 10 patients (20%) had a level of T10. There was no statistically significant

difference between the groups (p value > 0.05) in the maximum sensory level achieved. In Group C the mean time taken from the onset of sensory blockade to regression to T12 was 151.7 minutes and in Group D was 199.7 minutes. In Group C the mean time to first postoperative analgesic requirement was 267.6 minutes and in Group D was 356.9 minutes. In Group C, the mean time taken to achieve complete motor blockade was 12.66 minutes and in Group D was 11.14 minutes.

Figure 1 VAS score

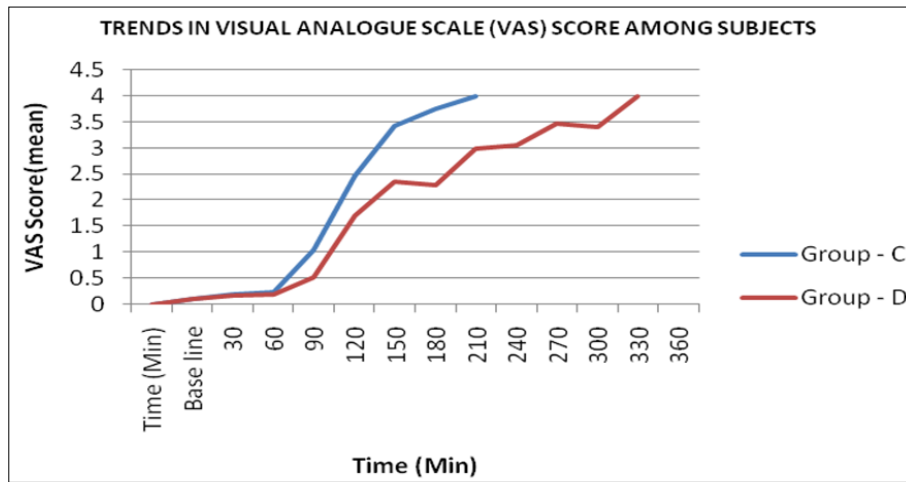


Fig 1: Shows significant difference in VAS score among both group ($P < 0.05$).

Figure 2 Trends in modified Bromage score

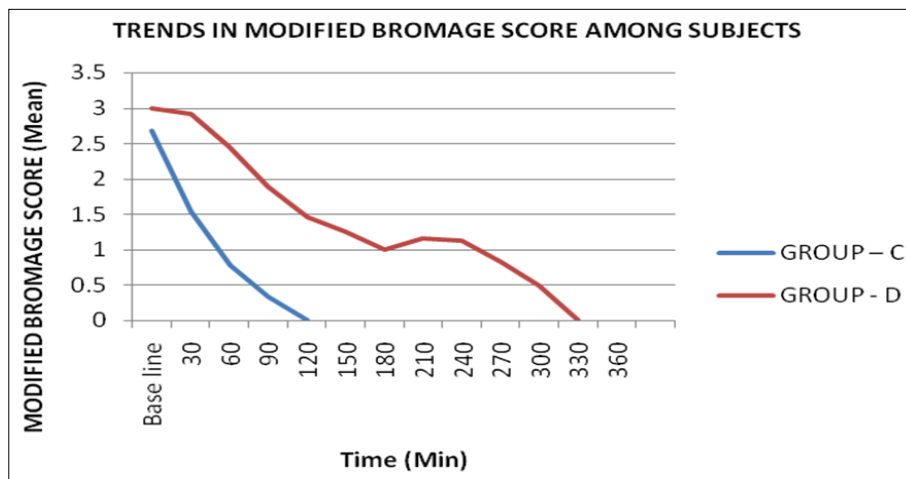


Fig 2: Shows significant difference in trends in modified Bromage score among both groups ($P < 0.05$).

Discussion

Spinal adjuvants decrease the dose of local anaesthetics, improve the quality of intraoperative anaesthesia without altering the height of the block, provides effective postoperative analgesia. The anaesthetic and analgesic requirements gets reduced by the use of alpha2 adrenergic agonists [8]. Besides analgesia and sedation they decrease sympathetic tone and attenuate stress response to anaesthesia and surgery [9]. Till recently dexmedetomidine was not available in India though it is being used in other countries since many years [10]. Since it has been recently introduced in India and not many studies have been done in India regarding its use as an adjuvant to local anaesthetic agents for intrathecal purpose hence there is a need to study its effectiveness for spinal anaesthesia. However, only a few studies are currently available in literature evaluating the efficacy of intrathecal Dexmedetomidine in prolonging the duration of spinal block [11]. The present study compared intrathecal isobaric ropivacaine 0.75% (15 mg) plus dexmedetomidine (10 mcg) and isobaric ropivacaine 0.75% (15 mg) plus clonidine (30 mcg) for elective lower abdominal and lower limb surgeries.

In present study, the mean age of patients in Group C was 37.96 ± 13.99 (years) and the mean age of patients in Group

D was 38.88 ± 12.09 (years). There was no statistically significant difference between the mean ages of the two groups. In both Groups C and D, 76% of the patients were male and 24% were female, and there was no statistically significant difference.

We found there was significant difference in mean duration of surgery, onset of sensory analgesia, maximum sensory level (MSL), time taken for regression of sensory block to T12, time to first postoperative analgesic requirement (in minutes) and time taken to achieve complete motor blockade (in minutes). Martin *et al.* [12] who used Clonidine with ropivacaine intrathecally in three different doses of 15, 45, and 75 μg for ambulatory knee arthroscopy, observed that a small 15 μg dose of Clonidine significantly improves the quality of anaesthesia without delaying sensory and motor recovery. They also noted that a 45 μg dose of Clonidine prolongs the sensory blockade without any influence on motor blockade, but a dose of 75 μg is associated with delayed sensory and motor recovery as well as detectable side effects such as hypotension and sedation.

We found significant difference in VAS score and trends in modified bromage score among both group ($P < 0.05$). El-Attar *et al.* [13] who used dexmedetomidine with hyperbaric bupivacaine intrathecally in four different doses of

5,10,15,20 µg for lower abdominal surgeries observed that dexmedetomidine enhances the onset and duration of both sensory and motor blocks and also duration of analgesia in a dose dependent manner. They also noted higher incidence of hypotension and bradycardia with 15 and 20 µg but with 10 µg there is prolongation of analgesia with fewer side effects. They concluded that 10 µg of dexmedetomidine is the optimum intrathecal dose.

We found that the mean height and the mean weight in either group were also identical. The type of surgeries performed were also identical in both the groups. These parameters were kept identical in both the groups to avoid variations in intraoperative and postoperative outcome of patients. However, the dose required was 1µg/kg dexmedetomidine bolus and an infusion of 0.5µg/kg/hr. whereas when dexmedetomidine has been used intrathecally by various authors the total dose is used from 3 µg to 15 µg. So intrathecal route is more specific and hence low doses can be used.

Mahendru *et al.* [14] compared intrathecal administration of clonidine and dexmedetomidine with hyperbaric ropivacaine in fifty patients for lower abdominal surgeries found that dexmedetomidine group had a longer duration of analgesia when compared with clonidine and this difference was statistically significant.

Conclusion

Dexmedetomidine added to ropivacaine intrathecally provided earlier sensory blockade, prolonged duration of sensory and motor blockade, excellent quality of postoperative analgesia with stable cardiorespiratory parameters for elective lower abdominal and lower limb surgeries.

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