

A Comparative Study between 10µg and 15µg of Dexmedetomidine as an Adjuvant to Intrathecal 0.75% Isobaric Ropivacaine in Patients undergoing Total Abdominal Hysterectomy

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Abstract

Introduction: Dexmedetomidine is being increasingly used to prolong the duration of subarachnoid block. Various doses of dexmedetomidine are in practice. Isobaric Ropivacaine for its reduced cardiotoxicity and early motor recovery has gained edge over bupivacaine for subarachnoid block. **Aims and objectives:** To assess the efficacy and safety of two different doses of dexmedetomidine i.e 10µg and 15µg as an adjuvant to 0.75% isobaric ropivacaine intrathecally for abdominal hysterectomy surgeries. **Materials and Methods:** This prospective randomized and double blind study was conducted in 60 female ASA I and II patients scheduled for hysterectomy surgeries were randomized into two groups A and B. Group A received 2.5ml of 0.75% isobaric ropivacaine and 10µg dexmedetomidine whereas group B received 2.5ml of 0.75% isobaric ropivacaine and 15 µg dexmedetomidine. Onset and duration of sensory and motor block, hemodynamic variables were recorded and compared between the two groups. **Results:** The mean onset time of sensory and motor block of group A was 5.52±0.28mins and 6.95±0.22mins respectively whereas in group B was 4.48±0.35 and 6.1±0.28 mins which was statistically significant (p<0.0001). Duration of sensory and motor blockade in group A was 423±12.85 and 382±9.25mins respectively whereas in group B was 587±10.83 and 530±15.78 mins which was statistically significant (p<0.0001). There was no significance in hemodynamic and side effects between two groups. **Conclusion:** Our study showed that 15µg of Dexmedetomidine provided rapid onset and prolonged duration of subarachnoid block with isobaric 0.75% ropivacaine without significant side effects.

Keywords: Dexmedetomidine; Isobaric Ropivacaine; Subarachnoid Block.

Introduction

Subarachnoid block with Bupivacaine has been the choice of anesthesia for many decades for abdominal hysterectomy surgeries. Its S-enantiomer Ropivacaine has gained popularity for its early motor recovery, less cardiotoxicity and higher threshold for central nervous system toxicity (CNS) compared to bupivacaine [1]. Intrathecal isobaric (glucose-free) 0.75% ropivacaine in the dose of 15 and 22.5 mg produced a sensory block of variable extent with a proportion of patients requiring general anesthesia because of inadequate duration of block [2]. Various adjuvants like clonidine, fentanyl or dexmedetomidine were used along

with isobaric ropivacaine. Intrathecal dexmedetomidine has been used in the dose of 3 µg, 5 µg, 10 µg and 15 µg along with bupivacaine and in the dose of 5 µg and 10 µg as an adjuvant to plain ropivacaine.(3) So we compared 10 µg and 15µg of Dexmedetomidine with isobaric ropivacaine for subarachnoid block.

Materials and Methods

This prospective, randomized, double-blinded study was conducted in Narayana Medical college, Nellore from April 2017 to January 2018 with institutional ethical committee approval. After

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obtaining written informed consent, 60 female patients aged 20–60 years with American Society of Anesthesiologists (ASA) Physical Status class I–II who were scheduled for elective abdominal hysterectomies under subarachnoid block were divided into two groups A and B. Exclusion criteria included patient refusal for subarachnoid block, local sepsis at the site of proposed puncture, coagulation disorders, raised intracranial pressure, allergic reactions to study drug, patients on anticoagulants, bleeding diathesis, spinal anatomical deformities, uncooperative patients like with psychiatry diseases etc.

All the patients received tab. Alprazolam 0.5mg as premedication on the previous night. Standard fasting guidelines were followed. On the day of surgery in the operation theatre after securing wide bore i.v cannula, patients were preloaded with 15ml/kg of Ringers lactate solution. Standard monitors like heart rate(HR), noninvasive blood pressure(NIBP), pulse oxymeter and electro cardiography were connected. Subarachnoid block was performed in lateral position in L2,3 space intervertebral space with 25G quincke babcock spinal needle.

Group A patients received 2.5ml (18.75mg) of isobaric ropivacaine (0.75%) plus 10µg Dexmedetomidine (0.4ml) .

Group B patients received 2.5ml (18.75mg) of isobaric ropivacaine (0.75%) plus 15µg Dexmedetomidine (0.4ml).

Onset and duration of sensory block was assessed by pinprick method. Motor block was assessed using bromage scale. Haemodynamic variables like heart rate, mean arterial pressure were measured at 0, 3, 5, 10, 15, 30, 60, 90, 120, 150, 180 mins. Side effects like hypotension, bradycardia, sedation,

nausea and vomiting were noted. Hypotension (defined as a decrease in systolic blood pressure > 30% of the baseline value or systolic blood pressure < 90 mm hg) was treated with intravenous boluses of 3 mg mephentermine. Bradycardia defined as heart rate of < 50 beats/min was treated with boluses of 0.6 mg atropine.

Statistical Analysis

All recorded data were entered using MS Excel software and analysed using SPSS 20 version software for determining the statistical significance. Results were presented as mean+standard deviation. Proportions were compared using Chi-square test. Statistical difference between both the study groups was determined by student ‘t’ test. p <0.0005 was taken as statistically significant, p value of <0.0001 was considered as extremely statistically significant.

Results

Sixty patients scheduled for abdominal hysterectomy in the two groups were statistically comparable in age, weight, height, operative time (Table 1) Onset of sensory blockade in group B (4.48±0.35 mins) compared to group A (5.5±0.28mins) was significantly shorter which was extremely statistically significant (p<0.0001). Onset of motor blockade in group B (6.1 mins) compared to group A was shorter (6.95 mins) which was statistically extremely significant (p<0.0001) (Table 2 Figure 1). Duration of sensory blockade in group B (587 mins) was significantly prolonged compared to group A (423mins) which was statistically extremely significant (p<0.0001). Duration of motor blockade

Table 1:

Demographic Variables among the groups	Group D	Group M	P Value
Age in years (Mean±SD)	39.18±12.13	38.87±10.12	0.954
Height in cms (Mean±SD)	166.88±66	164.32±2.10	0.63
Weight in kgs (Mean±SD)	58.45±3.26	60.32±7.22	0.52
Duration of Surgery (Mean±SD)	104±4.32	103±5.61	0.58

Table 2:

	Group A	Group B	P Value
Onset of Sensory	5.52±0.28	4.48±0.35	P<0.0001
Onset of Motor	6.95±0.22	6.1±0.28	P<0.0001
Duration of Sensory	423±12.85	587±10.82	P<0.0001
Duration of Motor	382±9.25	530±15.78	P<0.0001
Side Effects			
Hypotension	5(16.60%)	11(36.66%)	P=0.774
Bradycardia	4(13.33%)	9(30%)	P=0.109

in group B (530 mins) was again significantly prolonged compared to group A (382 mins) which was statistically extremely significant ($p < 0.0001$) (Table 2 Figure 2). There was no statistically significant difference in hemodynamic variables like

heart rate, Mean arterial pressure though there was initial fall in heart rate and mean arterial pressure in both the groups (Figure 3, 4). Side effects were also comparable between both the groups (Table. 2, Figure 5).

Fig. 1:

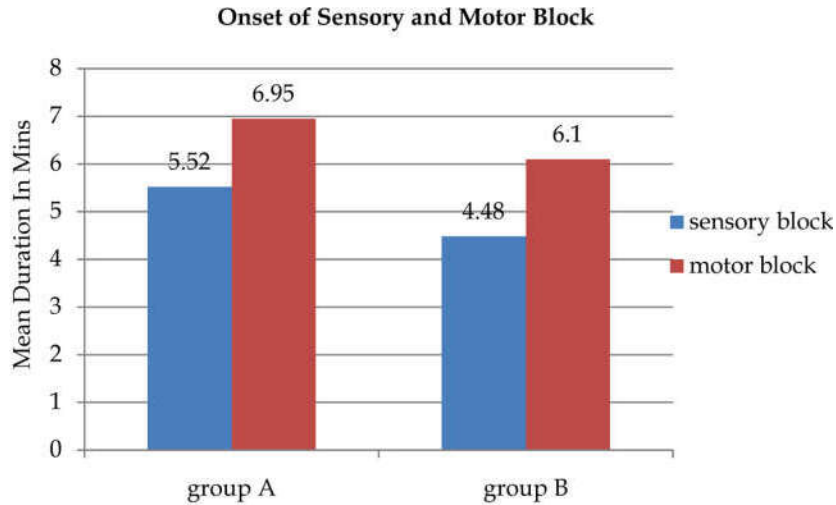


Fig. 2:

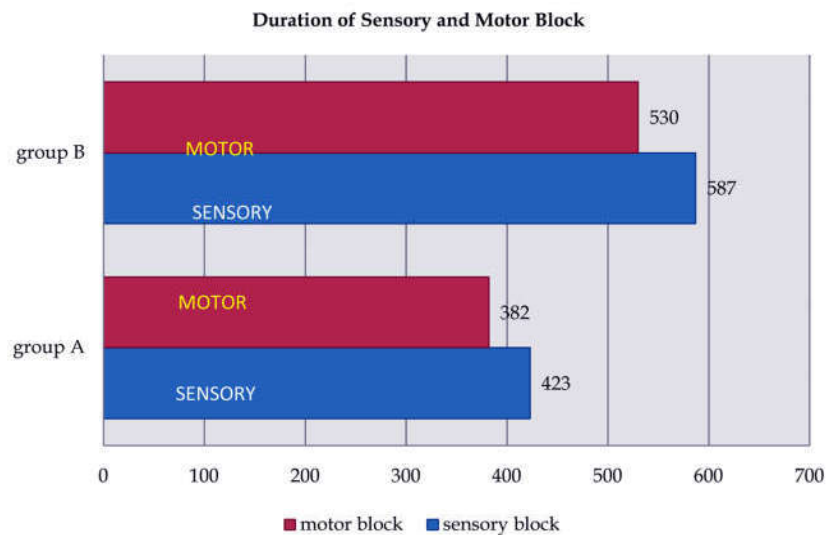
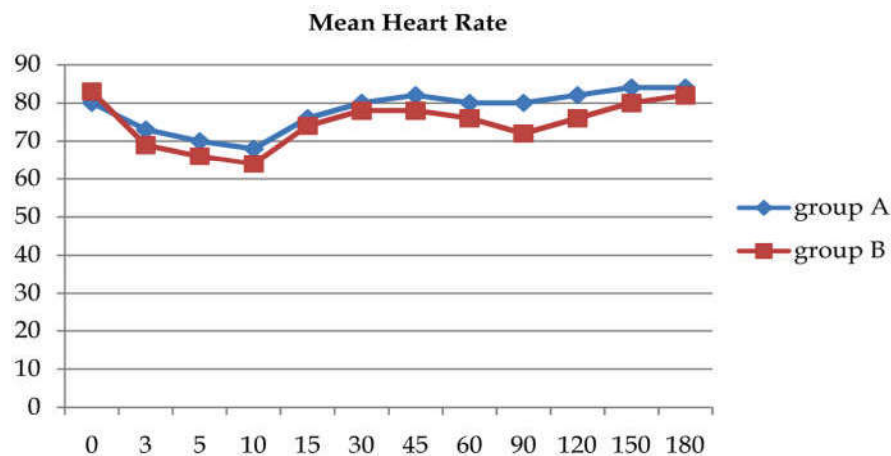


Fig. 3:



Discussion

The main limitation of local anesthetics when used alone for subarachnoid block was the shorter duration of the block they produce [4]. which prompts the anesthesiologists to use various analgesics very early in the postoperative period. Traditionally, Bupivacaine is the most commonly used local anesthetic for spinal anesthesia. Adjuvants like fentanyl, ketamine, tramadol, clonidine and Dexmedetomidine etc were added to bupivacaine to prolong the duration and reduce the postop requirement of analgesics.

Ropivacaine, a newer amide local anesthetic, has forayed into anesthetic practice and is substituting bupivacaine because of its less cardiotoxicity, early motor recovery and duration of anesthesia similar to bupivacaine. Akin to Bupivacaine many adjuvants have been added to isobaric ropivacaine to increase its duration. Addition of fentanyl, clonidine [5] and Dexmedetomidine [3] to isobaric 0.75% ropivacaine have been studied to prolong the duration of both sensory and motor blockade.

Intrathecal alpha-2 adrenergic agonists have a thorough synergistic effect with local anesthetics because both have different mechanism of action. The local anesthetics act by blocking sodium channels, whereas the alpha 2 adrenergic agonists act by binding to presynaptic c-fibers and postsynaptic dorsal horn neurons [6,7]. Intrathecal Dexmedetomidine when joined with spinal local anesthetics prolongs the sensory block by depressing the release of c-fibers transmitters and by hyperpolarization of postsynaptic dorsal horn neurons.

Motor block prolongation by alpha 2 adrenergic agonist may be due to attachment of alpha 2 agonists to motor neuron in the dorsal horn of the spinal cord [8] intrathecal alpha2 agonists possess antinociceptive action for both somatic and visceral pain [9]. Hence, use of Dexmedetomidine as an adjuvant to isobaric ropivacaine causes significant prolongation in duration of analgesia [10,11].

Previous literature shows a 1:10 equivalence dose ratio between Dexmedetomidine and clonidine, with a maximally effective dose of intrathecal clonidine equating to 150µg [12]. Considering the dose ratio, theoretically maximal effective dose of Dexmedetomidine comes out to be 15µg. Hence we choose 15mcg Dexmedetomidine in our study and compared it with 10µg dexmedetomedine which was more frequently studied compared to 15µg.

Singh, et al evaluated the efficacy of two different doses of dexmedetomidine i.e 5 or 10 µg to 0.75% isobaric ropivacaine and concluded that Dexmedetomidine appears to augment the efficacy of intrathecal ropivacaine in a dose dependent manner without associated increase in the incidence of associated adverse effects [13].

Naithani, etal have studied 0.5% isobaric ropivacaine (15 mg) with dexmedetomidine (3 µg or 5 µg) for spinal anesthesia which did not show much promise for abdominal hysterectomy as one third cases required analgesic supplementation [14].

Very few studies were done on 15µg of Dexmedetomidine with Ropivacaine. So we compared 10 and 15µg of Dexmedetomidine added to isobaric 0.75% Ropivacaine. We have observed that 15µg of Dexmedetomidine (Group B) provided faster onset and prolonged duration of sensory and motor block compared to 10µg dexmedetomidine (group A).

Though 16% of patients in group A and 36% in group B developed hypotension, the difference was not statistically significant. Similarly 10% of patients in group A and 30% in group B developed Bradycardia which was not significant statistically. None of the patients developed nausea vomiting, shivering and respiratory depression.

Conclusion

We conclude that intrathecal Dexmedetomidine in dose of 15 µg as an adjuvant to isobaric ropivacaine significantly hastens the onset of action of sensory and motor block and increases the duration of sensory and motor block when compared to intrathecal Dexmedetomidine 10mcg without any associated adverse effects.

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