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Comparison of Low-Dose Bupivacaine Plus 5µg And 10µg Dexmedetomidine for Spinal Anesthesia in Anorectal Surgery

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Abstract
Background:
The aim of this study was to investigate the effects of spinal anesthesia using two different doses of dexmedetomidine combined with low-dose bupivacaine in anorectal surgery.
Methods:
In this prospective, double-blind study, 52 American Society of Anaesthesiologists I–II patients scheduled for elective anorectal surgery were randomized into two groups. The patients in group I received intrathecal 2.5 mg hyperbaric bupivacaine plus 5µg dexmedetomidine and in group II received intrathecal 2.5 mg hyperbaric bupivacaine plus 10 µg dexmedetomidine. All the patients remained in the seated position for 10 min after completion of the spinal anesthesia. Sensory block was evaluated with pin-prick test and motor block was evaluated with a modified Bromage scale.
Results: *Motor block was not observed in both of the groups. The sensory block was limited to the S2 level in group I, and S1 level in group II. None of the patients required additional analgesics during the operation. Time to two-segment regression was shorter in group I compared with group II ($p < 0.01$). Hemodynamic parameters were stable during the operation in both of the groups.*
Conclusion:*Spinal saddle block using hyperbaric bupivacaine with both 5 µg and 10 µgdexmedetomidine provided good quality of anesthesia without motor block for anorectal surgery in the lithotomy position.*
Keywords: *Hyperbaric bupivacaine, dexmedetomidine, saddle block, anorectal surgery*

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I. Introduction

Spinal anesthesia for anorectal surgery is a popular and commonly used method characterized by rapid onset and offset, easy mobilization and short hospital story. An ideal anesthetic technique for anal surgery on an outpatient basis should permit early mobilization without pain or residual complications of anesthesia. Various adjuvants are being used with bupivacaine to attain ideal intraoperative conditions. Dexmedetomidine is still under evaluation as an ideal neuraxial adjuvant as it provides stable hemodynamic conditions, good quality of intraoperative and prolonged postoperative analgesia with minimal side effects Considering all these observations we aimed to conduct a study to evaluate and compare the effect of 5µg and 10µg of dexmedetomidine added to 2.5 mg of 0.5% hyperbaric bupivacaine intrathecally, for anorectal surgery, with respect to duration of sensory and motor block, adequacy of analgesia, and associated side effects if any.

II. Materials And Methods

The study was conducted with the approval of ethical committee of the institution. A written and informed consent was obtained from all patients. Patients included for the study were all ASA physical status I or II, of either sex (18-50 years) presenting for anoretal surgeries. Patients who had contraindications to spinal anaesthesia, allergy to drug, patients of heart block and hypertension were excluded from the study groups. All patients received a tablet of diazepam 0.2 mg/kg orally the night before surgery. On arrival in the operating room, patients were preloaded with lactated ringer's solution at 15ml/kg. All patients were monitored with automated non-invasive blood pressure, pulse oximetry and electrocardiogram. Patients were randomised on the basis of a sealed envelope technique to receive one of the following into the subarachnoid block: Group 1 received 2.5mg hyperbaric bupivacaine plus 5 µg dexmedetomidine and Group II received 2.5mg hyperbaric bupivacaine plus 10 µg dexmedetomidine. Spinal anesthesia was performed at the L4-5 or L5-S1 intervertebral space using a 25 G Quincke type of spinal needle in the seated position. The test solution was injected slowly over 10 sec and the patients were kept in the sitting position for 10 min to achieve sufficient block. Sensory block was evaluated by the pin-prick method at every 2 min until the sufficient block reached the S4 level and testing was conducted at every 5 min until the end of the operation. After sitting for 10 min patients were placed

in the lithotomy position. Motor block was evaluated according to a modified Bromage scale (0: no motor block, 1: inability to raise extended legs, 2: inability to flex knees, able to move feet, 3: inability to flex ankle points). Onset time of S4 level sensory block (time to readiness for surgery), maximum level of sensory block, time to 2 segment regression, time to urination and time to first analgesic requirement were evaluated by an observer blinded to the study groups and recorded. Postoperative side effects like nausea, vomiting, headache were recorded by nursing staff. Tramadol 50 mg intramuscular (IM) was used for rescue analgesia and first analgesia requirement time was recorded. Hypotension was defined as a decrease in systolic arterial blood pressure >20% of baseline and was treated with intravenous (IV) 3–6 mg bolus doses of mephetermine. Bradycardia was defined as heart rate <60 beat per minute and was treated with 0.01 mg/kg bolus doses of atropine. After completion of the surgery, patients were asked to rate the quality of their anesthesia using a 4 point scale (1: Perfect, 2: Satisfactory, comfortable but some feelings of pressure or traction, 3: Poor, discomfort because of feeling intense pressure or traction, 4: Worst: Major discomfort because of pain).

III. Results

Fifty-two patients were enrolled in the study. No significant difference was observed between the groups with respect to gender, age, height, weight, ASA physical status, and duration of the operation (Table 1). The maximum sensory block level reached to S1 dermatome in both of the groups. The median upper limit of the sensory block was S2 in Group II and S1 in Group I preoperatively. Time to reach S4 dermatome was similar between the groups. Preoperative and postoperative maximum blocked dermatomes in both of the groups are given in Table 2. Mean times to two-segment regression were shorter in group I than group II ($p < 0.001$). All patients in both of the groups were able to position themselves with Bromage scores 0. Time to voiding was similar in both of the groups ($p = 0.085$), and none of the patients needed catheterization. First analgesic requirement time was shorter in group I compared with group II ($p < 0.001$). None of the patients needed supplemental analgesic during the operation. Patients satisfaction were similar in both of the groups, and 80.77% of the patients in group I and 92.31% of the patients in group II assessed the anesthetic quality as 'perfect' (Table 2). The adverse effects during the intraoperative and postoperative period; nausea vomiting and hypotension was not reported in any of the case. There were no significant differences between the groups regarding mean arterial blood pressure and heart rate values, before and during the surgery.

Table 1. Patient characteristics, operation time, type of surgical procedure.

	Group I (n = 26)	**Group II (n = 26)**	**p**
Age (years)	41.27 ± 5.64	40.4 ± 4.74	0.520
Height (cm)	149.73 ± 4.76	149.03 ± 5.77	0.610
Weight (kg)	51.43 ± 7.24	52.83 ± 6.8	0.476
Gender (female/male)	4/22	3/23	0.687
Duration of surgery (min)	21 ± 7	36 ± 12	0.233
Surgical procedure (n)			
Hemorrhoidectomy	21	22	0.021
Anal fissure	5	4	

Data are expressed as mean values ± SD.

Table 2. Spinal block characteristics, time to first voiding of urine, analgesic requirement and patient satisfaction.

	Group I (n = 26) Median (range)	**Group II (n = 26) Median (range)**	**p value**
Time to reach S4 blockade (min)	3 (2–5)	3 (3–5)	0.821
Preoperative maximum blocked dermatome	S2 (S1–S3)	S1 (S1–S3)	0.014
Postoperative maximum blocked dermatome	S2 (S1–S3)	S1 (S1–S2)	0.408
2-Segment regression time (min)	25 (20–40)	35 (30–75)	p < 0.001
Time to first analgesic requirement (min)	320 (60–400)	435 (15–540)	p < 0.001
Time to first void (min)	192 (120–292)	240 (105–420)	0.085
Patient satisfaction, n (%)			
1 = perfect	21 (80.77)	24 (92.31)	
2 = satisfactory	5 (19.23)	2 (7.69)	
3 = poor	0	0	
4 = worst	0	0	

Data are expressed as median (range).

IV. Discussion

Various animal studies have been conducted in rats, rabbits, dogs and sheep using intrathecal dexmedetomidine at a dose range of 2.5 to 100 μg without any neurological deficits. [1],[2] In human beings, studies using epidural dexmedetomidine have been conducted without any report of neurological deficit. [3],[4] Intrathecal dexmedetomidine in combination with bupivacaine have been studied in human beings without any postoperative neurological deficit. [5],[6] Intrathecal small dose of dexmedetomidine (3 μg) used in combination with bupivacaine in human beings for spinal anaesthesiahave been shown to produce a shorter onset of motor block and a prolongation in the duration of motor and sensory block with haemodynamic stability and lack of sedation. [5] Al - Ghanem *et al.'s*[6] study concluded that 5 μg dexmedetomidine seems to be alternative as adjuvant to spinal bupivacaine in surgical procedures, especially in those who need quite long time with minimal side effects and excellent quality of analgesia. In our study, we had compared the intrathecal hyperbaric bupivacaine with two different doses of dexmedetomidine for anorectal surgery. In this study, we had used dexmedetomidine as an adjuvant to bupiivacaine intrathecally.The mechanism of action by which intrathecal α_2 - adrenoceptor agonists prolong the motor and sensory block of local anaesthetics is not well known. The local anaesthetics act by blocking sodium channels, whereas the α_2 -adrenoceptor agonist acts by binding to pre-synaptic C-fibres and post-synaptic dorsal horn neurons. The analgesic action of intrathecal α_2 - adrenoceptor agonists is by depressing the release of C-fibre transmitters and by hyperpolarisation of post-synaptic dorsal horn neurons. [7] It may be an additive or synergistic effect secondary to the different mechanisms of action of the local anaesthetics and the α_2 -adrenoceptor agonist as studied by Salgado *et al*. [8] This antinociceptive effect may explain the prolongation of the sensory block when added to spinal anaesthetics. The prolongation of the motor block of spinal anaesthetics may result from the binding of α_2 - adrenoceptor agonists to motor neurons in the dorsal horn. [9],[10]

The minimal recommended dose of spinal hyperbaric bupivacaine is 4–5 mg for anorectal surgery.[11]. Gurbet et al.[12] compared 5 mg 0.5% spinal hyperbaric bupivacaine and 2.5 mg 0.5% hyperbaric bupivacaine plus 25 μg fentanyl in outpatient anorectal surgery. They found that addition of 25 μg fentanyl to 2.5 mg 0.5% bupivacaine prolonged the duration of sensory blockade and reduced postoperative analgesic requirement. Wassef et al.[15] investigated the efficacy of 1.5 mg bupivacaine in short perianal procedures with the dose of 6 mg which was regularly used in spinal saddle block. They concluded that spinal perianal block produced by 1.5 mg bupivacaine provided a significantly restricted sensory block levels (median maximum = S4), and motor block was not observed in any of the patient in this group compared with the group which was 6 mg bupivacaine used.

We used 2.5 mg of hyperbaric bupivacaine 0.5% with two different dexmedetomidine doses combinations for spinal anesthesia in anorectal surgery. The median upper limit of the sensory block was S1 in the spinal anesthesia group provided by hyperbaric bupivacaine plus10 μg dexmedetomidine. Median time to S4 sensory blockade was 3 min and motor blockade was not observed in the any of the patients. Bradycardia or hypotension was not observed during the surgery. We suggest that 2.5 mg hyperbaric bupivacaine with10 μg dexmedetomidine can be preferred for spinal anesthesia in anorectal surgery for good intraoperative and postoperative analgesia without motor blockade.

V. Conclusion

In conclusion, we found that the two regimens provided good quality spinal anesthesia in anorectal surgery without affecting the motor functions and hemodynamic stability. However, the addition of10 μ dexmedetomidine increased duration of sensory analgesia with longer first analgesic requirement time without intensifying the motor blockade.

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