

# ***Comparative Study Between Dexmedetomidine versus Morphine as Adjuvants to Bupivacaine In Spinal Anesthesia***

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## **Abstract**

**Aim:** This study was designed to evaluate analgesic efficacy, duration of sensory and motor block, hemodynamic stability and adverse effects of intrathecal morphine and intrathecal dexmedetomidine as an adjuvant to bupivacaine in spinal anesthesia in patients undergoing lower abdominal surgeries. **Methods:** This was a prospective, randomized, double-blind study involving 30 patients in each group. Group A received 15 mg of 0.5% hyperbaric bupivacaine with 250 µg of morphine while Group B received 15 mg of 0.5% hyperbaric bupivacaine with 5 µg of dexmedetomidine. **Sensory and motor** characteristics of spinal block, time for first rescue analgesia, the total dose of rescue analgesia required and side effects were noted perioperatively. **Results:** The duration of sensory and motor blockade was significantly longer in dexmedetomidine group than in morphine group. Time for first rescue analgesia and total analgesic dose were similar in both groups. The itching was noticed only in morphine group, nausea and vomiting occurred in both groups and there was no respiratory depression occurred in the two groups. **Conclusion:** Intrathecal dexmedetomidine produces prolongation of sensory and motor blockade with less undesirable side effects than morphine **Keywords:** Dexmedetomidine, Morphine and Spinal Anesthesia

## **Introduction:**

neuraxial blocks are considered the most common modality for infra umbilical surgeries because these are economical and easily applied. (1). Spinal anesthesia uses a small number of local anesthetics to cover large dermatomal areas (2.) Using spinal anesthesia avoids the dangers like aspiration pneumonia and difficult intubation which can be faced in general anesthesia (3). However, achieving postoperative analgesia still a problem because using pure local anesthetics

without additives leads to a short duration of action and the early need for rescue analgesia in the postoperative period (4). Adjuvants to local anesthetics enhance their action regarding potency and duration of the block. (5). Using intrathecal opioids is associated with many unwanted effects as respiratory depression, retention of urine, itching, and vomiting (1). Dexmedetomidine is the first  $\alpha$ -2 agonist which was used as an additive in spinal anesthesia for resection of the

prostate with the advantage of prolonged sensory and motor block (2).

### **Patients and Methods**

Sixty patients aged between 16–60 years classified as American Society of Anesthesiologists (ASA) Physical Status I or II enrolled in infra-umbilical operations using intrathecal anesthesia were included in our study. This study was done in Sohag University Hospitals from April 2018 to August 2018. We excluded patients with a history of Opium or sedative abuse, therapy with adrenergic receptor antagonists, patients with sepsis or coagulopathy.

Patients were divided into 2 groups: (group A) 30 patients received 3ml (15mg) volume of 0.5% hyperbaric bupivacaine and 250µg morphine (group B) 30 patients received 3ml (15mg) volume of 0.5% hyperbaric bupivacaine and 5µg dexmedetomidine. Venous access was secured using a wide-bore cannula and the patient was given ringer lactate solution (10 ml/kg) before the induction of the spinal anesthesia. Under complete aseptic conditions, spinal anesthesia was carried out in the sitting position, at level (L2-3 or L3-4). After a free flow of cerebrospinal fluid was confirmed, each patient received one of the coded spinal solutions (group A or group B). Patients were monitored by ECG, pulse oximetry and noninvasive blood pressure (NIBP).

### **Observations:**

Patients were observed for (Pulse, oxygen saturation, systolic, diastolic and mean blood pressure) baseline and every 10 minutes. Patients were observed for onset, time to reach the highest level of sensory block and time of sensory regression of 2 segments by using pinprick with a short needle. The motor block (onset and duration) was assisted

by a modified Bromage scale:

0: The patient is able to move the hip, knee, and ankle.

1: The patient is unable to move the hip, but can move the knee and ankle.

2: The patient is unable to move the hip and knee but can move the ankle.

3: The patient cannot move the hip, knee, and ankle.

The sensory and motor evaluation were done every 2min after the spinal block until it became fixed after 4 consecutive tests, then every 15 minutes until the sensory and motor parameters were back to normal. In the post-anesthesia care unit (PACU), the time for first rescue analgesia and the total dose of Diclofenac over 24h were recorded.

Complications: Nausea, vomiting, pruritus and respiratory depression were noticed and managed accordingly.

Statistical analysis:

Quantitative data were represented as mean, standard deviation. Analyzing data was done by the t-test. Qualitative data was presented by number and percentage and compared using the Chi-square test. Graphics have been done using Excel. P-value was considered significant if it was less than 0.05.

### **Results:**

There was no significant difference between morphine group versus dexmedetomidine group in demographic data (age, sex, weight, and height).

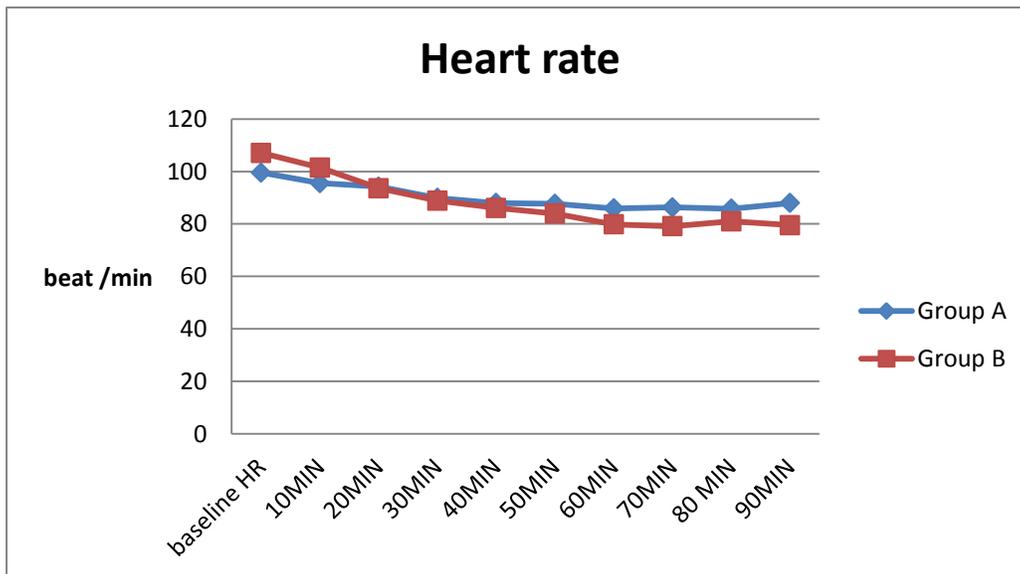
There was a progressive decrease in heart rate in both groups which was insignificant except in 60, 70min readings but this decrease did not need atropine administration. On the other hand, there was no significant difference between the two groups as regard systolic, diastolic and mean blood pressure except at 60,70 min readings of systolic blood pressure.

There was no significant difference between the two study groups as regard onset and time to reach the highest level of sensory block, however, there was a significant difference between the two

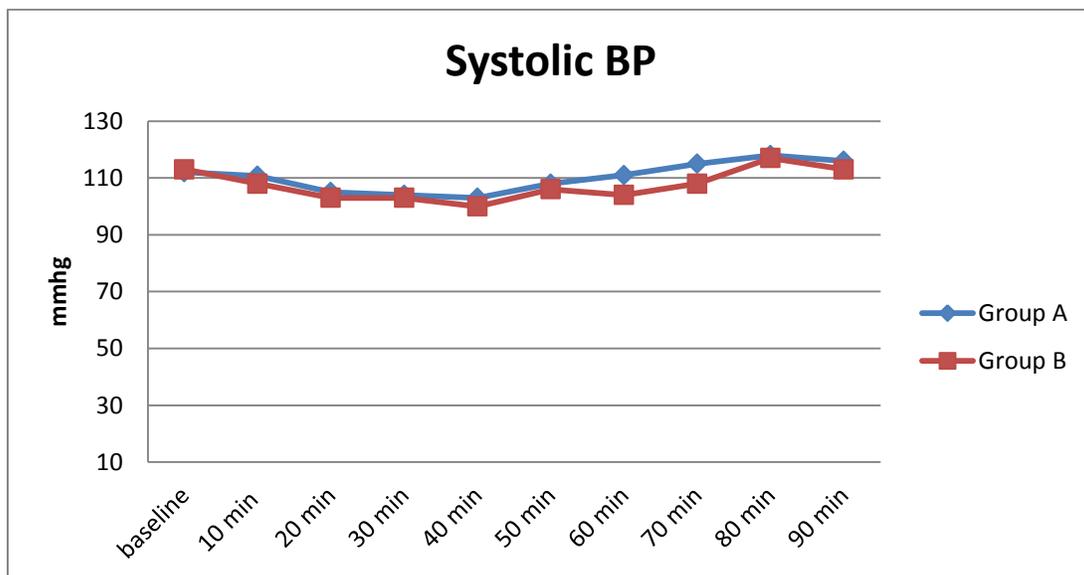
groups in the time for the 2 segment regression which is longer in dexametomedine group( $94 \pm 27$ min) than in morphine group( $77.8 \pm 22$ min). There was no significant difference as regards the onset of motor block and time needed to reach Bromage3 but there was a highly significant difference in time to return to Bromage 0 (time to reach Bromage 0 was longer in dexametomedine group( $518 \pm 126.6$ min) than in morphine group( $342.4 \pm$

$85.3$ min). There was no significant difference between the two groups as regard time for first rescue analgesia and the total analgesic dose required between the two groups.

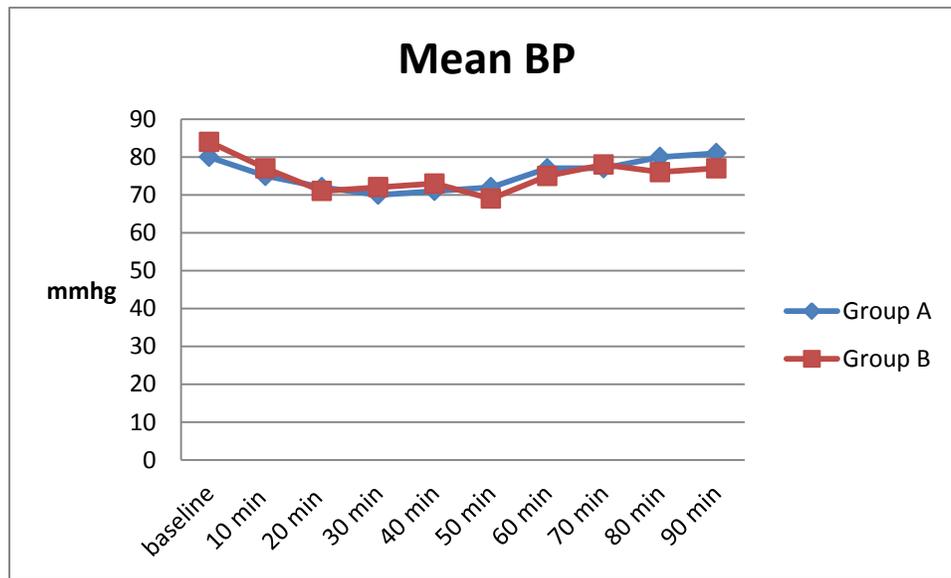
Nausea and vomiting occurred in both groups with no significant difference but pruritis occurred only in the morphine group and no cases complained of respiratory depression in both groups.



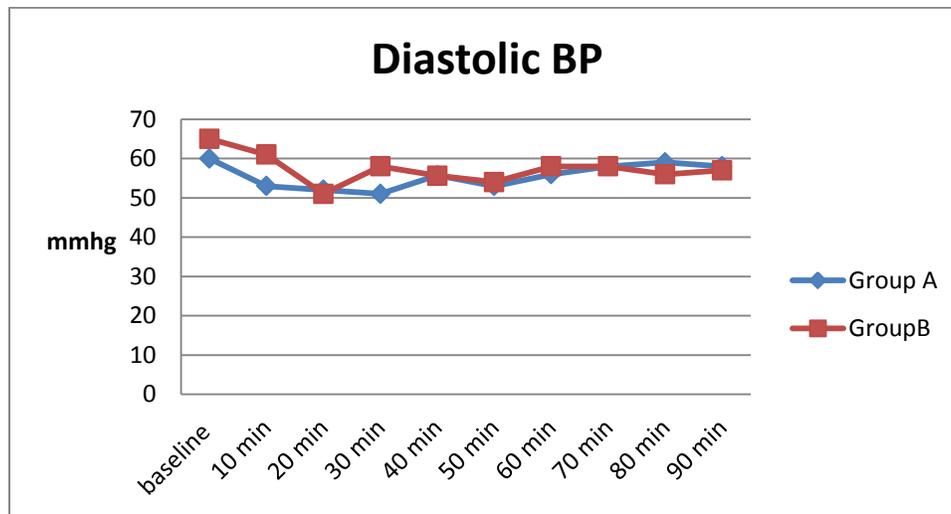
figure(1):heart rate changes in both groups



figure(2): systolic blood pressure changes in both groups



figure(3):mean blood pressure changes in both groups



figure(4):diastolic blood pressure changes in both groups

**Table:(1):sensory blockade data of study groups**

<u>VARIABLE</u>	<u>Morphine Group(A)</u>	<u>Dexametomedine group(B)</u>	<u>P value</u>
<i>Onset of sensory block(min)</i>	2.1±0.3	2±0.3	0.53
<i>Time to reach highest level(min)</i>	19.3±8.3	24.2±10.6	0.08
<i>Time for 2 segment regression(min)</i>	77.8± 22.6	94±27.7	0.03

-Data expressed as mean ± standard deviation(SD)

-significant p value is(<0.05)

Table(2): motor blockade data of study groups

<u>VARIABLE</u>	<u>Morphine Group(A)</u>	<u>Dexametomedine group(B)</u>	<u>P value</u>
Onset of motor block(min)	1.2±0.4	1.2±0.3	0.56
Time to reach bromage 3 (min)	5.04±1.5	5.2±2.1	0.82
Time to reach bromage 0 (min)	342.4± 85.3	518±126.6	0.001

Data expressed as mean ± standard deviation(SD)  
-significant p-value is(<0.05)

Table(3): analgesic data in study groups

<u>VARIABLE</u>	<u>Morphine group(A)</u>	<u>Dexametomedine group(B)</u>	<u>P VALUE</u>
TIME FOR FIRST RESCUE ANALGESIC INJ(DICLOFENAC) IN MIN	502.6±456.3	490.7±375.4	0.19
TOTAL DOSE OF DICLOFENAC IN 24h(mg)	98.5±70.4	131.08±78.9	0.23

Data expressed as mean ± standard deviation(SD)  
-significant p value is(<0.05)

Table(4): side effects distribution in both groups

<u>Variable</u>	<u>Morphine group(A)</u> <u>n=(30)</u>	<u>Dexametomedine group(B)</u> <u>n=(30)</u>	<u>P value</u>
<u>Nausea</u>	8(26.7%)	6(20%)	0.3
<u>Vomiting</u>	13(43.3%)	12(40%)	0.28
<u>Pruritus</u>	13(43.3%)	0(0%)	0.003
<u>Resp depression</u>	0(0%)	0(0%)	-

Data expressed as mean ± standard deviation(SD)  
-significant p value is(<0.05)

## Discussion:

In this study, we compare the using of 1 dexmedetomidine intrathecally and intrathecal morphine for spinal anesthesia during infra umbilical surgeries as regarding the onset and duration of motor and sensory blockade, side effects and postoperative analgesia. PranjaliKurhekar and S Madan Kumar in their study (group M received 15 mg of 0.5% hyperbaric bupivacaine with 250 µg of morphine while group D received 15 mg of 0.5% hyperbaric bupivacaine with 2.5 µg of dexmedetomidine), they found faster onset with prolonged sensory and motor blockade with

intrathecal dexmedetomidine when compared to intrathecal morphine. α<sub>2</sub> adrenoreceptors are seen in dorsal horn lamina I, II, V with specific mRNA in ventral horn more than dorsal horn. This could be the reason for the more potent anesthetic action of dexmedetomidine. (8).

Different doses of intrathecal dexmedetomidine used as an adjuvant to hyperbaric bupivacaine have shown that a higher dose of dexmedetomidine was associated with fast onset and slow regression of both motor and sensory block and decreased analgesic

requirement in the postoperative period. (9).

In our study, there was no significant difference between the onset of sensory and motor block of both groups. There was no significant difference between the time needed to reach the highest sensory level and time to reach Bromage 3 in both groups. The time for two-segment regression was long in Group Dexametomedine ( $P = 0.029$ ). Time to return to Bromage grade 0, was significantly longer in Group Dexametomedine ( $P = 001$ ) than in the morphine group.

Morphine that injected intrathecally results in analgesia by the same mechanisms of  $\alpha_2$  adrenoreceptors agonists. Analgesia is adequate and long-lasting due to its hydrophilicity, decreased systemic absorption, cephalad spread in the cerebrospinal fluid and slow rate of clearance from the opioid receptors(9).

Kanazi and Aouad said that both intrathecal morphine and dexmedetomidine were relatively similar in first analgesic demand time and total analgesic requirement with no significant difference. (10).

In the present study, dexmedetomidine produced analgesic properties similar to morphine regarding the first rescue analgesics (dexametomedine group relatively first demand analgesia) and total volume consumed during 24 h (dexametomedine group relatively demand analgesia more than morphine group)

- The most significant side effects reported for the use of intrathecal  $\alpha_2$ -

adrenoreceptor agonists are decreased in heart rate (11).

Weinbaum AA, Ben-Abraham R. in their studies have shown that intrathecal dexmedetomidine at doses of 5 and 10  $\mu\text{g}$  has no effect on blood pressure or heart rate(12)

Intrathecal morphine and dexmedetomidine both are known to cause hypotension by action on adrenoreceptors. (12).

The most benefit of using dexmedetomidine is to avoid the pruritus in comparison with morphine. Nausea, vomiting, and shivering are present but less (with no significant difference) in the dexmedetomidine group compared with the morphine group(13).

In our study, there are no significant differences in both groups as regard nausea and vomiting (p value was 0.269&0.285 respectively), but in morphine group, the cases were more but with no significance. On the other hand, there is a significant difference as regard pruritis ( $p=0.003$ ).

### **Conclusion:**

Intrathecal dexmedetomidine produces prolongation of sensory and motor block of spinal anesthesia with less undesirable side effects than intrathecal morphine.

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