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Research Paper

A Comparative Study of Bupivacaine, Bupivacaine with Dexmedetomidine and Bupivacaine with Fentanyl in Spinal Anaesthesia for Lower Abdominal Surgery

Medical Science

KEYWORDS : spinal anaesthsia, bupivacaine, fentanyl, dexmedetomidine, Bromage criteria

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ABSTRACT

The present study was designed to 0.5% bupivacaine heavy 3.0ml (15mg) and intrathecal 0.5% heavy Bupivacaine 3.0ml (15mg) with fentanyl 0.5ml (25 ug) and intrathecal 0.5% heavy Bupivacaine 3.0ml (15mg) with Dexmedetomidine 0.05ml (5ug) in lower abdominal surgeries.(20 patients in each group.) Study was conducted in 60 patients of ASA grade 1, aged 20-60yrs, scheduled for lower abdominal surgeries after taking written informed consent.

- *To compare the onset of sensory and motor block*
- *To compare the duration of sensory and motor block*
- *To assess the duration of post op analgesia*
- *To compare hemodynamic changes*
- *To observe side effect*

Bupivacaine is the most commonly used local anaesthetic in spinal anaesthesia. The use of adjuvants with local anaesthetics provides prolonged and superior quality of anaesthesia and postoperative analgesia with relatively small doses of individual drugs with less requirement of postoperative analgesia.

INTRODUCTION

This study was undertaken to evaluate and compare the efficacy and potency of intrathecally administered Bupivacaine, Bupivacaine with fentanyl and Bupivacaine with DXM for onset and duration of sensory and motor block, hemodynamic stability, duration of effective analgesia, including post op analgesia and any adverse effects with each combination in patients undergoing lower abdominal surgeries.

AIMS OF STUDY

The present study was designed to 0.5% heavy 3.0ml (15mg) and intrathecal 0.5% heavy Bupivacaine 3.0ml (15mg) with fentanyl 0.5ml (25 ug) and intrathecal 0.5% heavy Bupivacaine 3.0ml (15mg) with DXM 0.05ml (5ug) in lower abdominal surgeries.(20 patients in each group.)

- To compare the onset of sensory and motor block
- To compare the duration of sensory and motor block
- To assess the duration of post op analgesia
- To compare hemodynamic changes
- To observe side effect

MATERIAL AND METHODS

The present study was conducted in 60 patients of ASA grade 1, aged 20-60yrs, scheduled for lower abdominal surgeries after taking written informed consent.

The patients were randomly allocated in 3 groups, each having 20 patients.

Group A: 0.5% heavy bupivacaine 3ml (15mg)

Group B: 0.5% heavy bupivacaine 3ml (15mg) + 0.05ml DXM (5μg)

Group C: 0.5% heavy bupivacaine 3ml (15mg) + 0.5ml Fentanyl (25 μg)

STUDY PROTOCOL

Pre anaesthetic assessment:

- Detailed preoperative history and physical examination done
- Procedure explained to the patient and patient was informed to communicate about the perception of any discomfort or pain during surgery
- Explained about VAS score
- Written informed consent was taken from the patients and his/her relatives

In the operation theatre:

- IV line taken and each patient were preloaded with 10ml/kg of Ringer's lactate solution
- Pulse oximeter, non-invasive blood pressure monitoring and ECG attached and base line reading taken.

Equipment:

- An autoclaved tray consisting of adequate cotton swabs with swab holding forceps.
- Disposable 23G lumber puncture needle.
- Disposable 5 cc syringe, tuberculin syringe.
- An ampoule of bupivacaine 0.5% heavy, an ampoule of fentanyl and DXM.

Technique:

- Under all strict aseptic and antiseptic precaution, with patient in left lateral position lumber puncture was performed at L2-L3 intervertebral space with 23G Quincke needle and selected drug was given slowly.

After completion of procedure, patient was immediately turned to supine position.

- Pulse, BP, SPO_2 and RR were recorded every 1, 5, 10, 15, 20, 25, 30, 45 and 60 minutes after giving spinal anaesthesia and then every 30 minutes.

Evaluation:

- The onset and duration of sensory blockade was assessed by using pinprick test every 1 minute till 15 minutes. Then at 20, 30, 45 and 60 minutes and then every 30 minutes till completion of surgery.
- Time required for sensory block to reach level T_{10} was considered as sensory onset.
- Motor blockade was assessed by modified bromage score.

Bromage criteria		
Scale	Criteria	Degree of block
0	Free movement of legs and feet with ability to raise extended legs.	None
1	Inability to raise extended leg and knee flexion decreased, but full flexion of feet and ankle is present	Partial (33%)
2	Inability to raise leg or flex knees, but flexion of ankle and feet present.	Partial (66%)
3	Inability to raise leg, flex knees or ankle or move toes.	Complete paralysis

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- Time for onset of grade 3 motor blockade was noted.
- Time for sensory regression to S_2 was noted.
- Time for motor regression to bromage 0 was noted.
- After establishment of adequate level of block, surgery was started and time of beginning of surgery was noted.
- Intravenous fluids were administered depending on the weight of patient and adjusted according to surgery.
- Total duration of analgesia: from sensory level T_{10} to first demand for analgesia.
- Patients were observed for any intraoperative complications like bradycardia, hypotension, sedation, shivering, nausea, vomiting, dryness of mouth and respiratory depression.
- After surgery, patients were monitored every hourly for 12 hours.
- Postoperatively pain measurement was assessed by VAS scale.

STATISTICAL ANALYSIS

- Data was expressed as mean and standard deviation. Data were compared using analysis of variance (ANOVA). The level of significance used was $p<0.05$.

Sedation score by chernik et al	
Score	Response
0	Awake
1	Sleeping comfortably, but easily arousable
2	Deep sleep, but arousable
3	Deep sleep, but not arousable

10	9	8	7	6	5	4	3	2	1	0
Agonising		Horrible		Uncomfortable			Annoying		None	

OBSERVATION AND RESULTS

TABLE-1: DEMOGRAPHIC DATA

VARIABLES	Group A	Group B	Group C
Age (years) 39.25±9		36.45±9 39.05±9	
Height(cm)	165.9±7	165.9±6	164.2±7
Weight(kg)	60.1±4	60.4±4.2	61.4±5.5
Sex ratio (M:F)	10:10	9:11	8:12

TABLE-2: DURATION OF SURGERY

Duration (minutes)	Group A No. of patients	Group B No. of patients	Group C No. of patients
60-90	12	11	12
91-120	8	9	8
121-150	-	-	-
151-180	-	-	-
Mean ± SD (minutes)	91.5±23	92.6±21.9	90.5±21

TABLE-3: MEAN ONSET TIME OF SENSORY AND MOTOR BLOCKADE

TIME (minutes)	Group A (Mean± SD)	Group B (Mean± SD)	Group C (Mean± SD)
Time to T_{10} Sensory level	4.35±0.7	6.95±1.2	4.75±0.6
Time to Modified Bromage Scale III	5.2±0.8	8.45±1.0	5.8±0.6

TABLE-4: DURATION OF SENSORY AND MOTOR BLOCKADE

TIME (minutes)	Group A (Mean± SD)	Group B (Mean± SD)	Group C (Mean± SD)
Sensory regression to S_2 from highest sensory level	214.5±26.4	320±24.0	287.7±14.6
Motor regression to bromage scale 0	196.5±27.2	298±23.4	269.5±13.1

TABLE-5: CHANGES IN PULSE RATE PER MINUTE

Time (minutes)	Group A (Mean± SD)	Group B (Mean± SD)	Group C (Mean± SD)
Preop	86.5±5.9	87.2±7.3	86.7±5.5
1 mins	87.7±4.5	86.5±7.7	87.8±4.2
5 mins	86.7±5.7	84.5±7.5	87.2±4.3
10 mins	85.0±6.0	83.0±8.8	84.7±4.8
15 mins	82.3±6.4	79.7±9.4	82.1±5.8
20 mins	81.2±8.6	77.3±9.2	81.2±8.2
25 mins	81.7±7.9	75.8±8.4	80.6±8.5

TABLE-6: CHANGES IN MEAN ARTERIAL BLOOD PRESSURE

Time (minutes)	Group A (Mean± SD)	Group B (Mean± SD)	Group C (Mean± SD)
Preop	95.5±7.0	91.8±6.4	96.3±3.0
1 mins	92.3±5.5	90.4±4.9	93.4±4.6
5 mins	91.7±6.2	87.1±6.2	88.1±5.8
10 mins	90.5±6.2	85.6±8.4	87.2±8.9
15 mins	85.7±4.9	82.5±7.9	84.2±8.2
20 mins	85.3±5.2	81.2±6.5	82.5±8.3

The baseline pulse rate was comparable in all 3 groups. The pulse rate in group B (Bupivacaine- DXM) was significantly lower as compared to group A(Bupivacaine) and group C(Bupivacaine-fentanyl) from 30 minutes to 120 minutes after subarachnoid block. There was no statistically significant change in pulse rate between 120mins to 12hrs postoperatively among all three groups.

The baseline blood pressure was comparable in the three groups. The mean arterial blood pressure was significantly lower in group B (Bupivacaine- DXM) as compared to group A(Bupivacaine)) from 25mins to 180mins and group C(Bupivacaine-fentanyl) from 30mins to 120 mins after subarachnoid block. There was no statistically significant difference thereafter up to 12 hrs post operatively.

TABLE-7: DURATION OF POST OPERATIVE ANALGESIA

	Group A	Group B	Group C
No. of patients	20	20	20
Duration of analgesia (mins)	100-150	180-230	150-200
Mean ± SD (mins)	126.7±13.6	208±14.3	175.2±15.5

TABLE-8: PERIOPERATIVE SIDE EFFECTS

Side effects	Group A	Group B	Group C
Hypotension	4 (20%)	3 (15%)	3 (15%)
Bradycardia	3 (15%)	2 (10%)	3 (15%)
Nausea, vomiting	-	-	-
Dryness of mouth	-	-	-
Shivering	2 (10%)	1 (5%)	1 (5%)
Respiratory depression	-	-	-
Sedation	-	-	-

DISCUSSION

Spinal anaesthesia is the preferred anaesthesia technique for lower abdominal surgery. Bupivacaine is the most commonly used local anaesthetic in spinal anaesthesia. The use of adjuvants with local anaesthetics provides prolonged and superior quality of anaesthesia and postoperative analgesia with relatively small doses of individual drugs with less requirement of postoperative analgesia.

We evaluated the time taken for the onset and duration of sensory and motor blockade, hemodynamic stability, duration of analgesia and side effects in each study group.

- **Effect on onset and duration of sensory and motor block:**
- As shown in table 3, mean time of sensory onset in group B (6.95±1.23) was significantly higher than group A (4.35±0.74) and group C (4.75±0.63). There was no significant difference between group A and group C.
- As shown in table 4, mean time of duration of sensory block was highest in group B (321±24) as compared to group A (215.5±26.4) and group C (288.75±14.67). Also prolongation was more in group C as compared to group A.
- As shown in table 3, mean time of onset of grade 3 motor block was significantly higher in group B (8.45±1.05) as compared to group A (5.2±0.83) and group C (5.8±0.69). There was no significant difference between group A and group C.
- Mean time of total duration of motor blockade was also highest in group B (298±23.46) as compared to group A (196.5±27.2) and group C (269.5±13.16). The duration of motor blockade was higher in group C as compared to group A

- **Hemodynamic changes:**
- Preoperatively there was no significant difference in mean pulse rate, MAP, RR and SPO_2 between 3 groups.
- As shown in table 5, at 30 minutes up to 120 minutes after subarachnoid block, we observed decreased in heart rate in group B as compared to group A and group C. however, incidence of bradycardia was 10% in group B and 15% in group A and group C. There was no significant difference in mean pulse rate between group A and group C.
- As shown in table 6, The mean arterial blood pressure was significantly lower in group B as compared to group A(Bupivacaine)) from 25mins to 180mins and group C(Bupivacaine-Fentanyl) from 30mins to 120 mins after subarachnoid block. However incidence of hypotension is 15% in group B as compared to 20% in group A.
- In our study, no significant changes were observed in the RR and SPO_2 during perioperative period in all 3 groups.

CONCLUSION

The age, sex, weight and height were comparable in all 3 groups.

- Duration of surgery was also comparable between all 3 groups.
- Parameters were noted in the form of mean±SD.
- The pulse rate in group B was significantly lower as compared to group A and group C from 30 minutes to 120 minutes after subarachnoid block. No difference was seen between group A and group C. There was no statistically significant change in pulse rate between 120mins to 12hrs postoperatively among all three groups.
- The mean arterial blood pressure was significantly lower in group B as compared to group A from 25mins to 180mins and group C from 30mins to 120 mins after subarachnoid block. No difference was seen between group A and group C. There was no statistically significant difference thereafter up to 12 hrs post operatively.
- There was no significant change in RR and SPO_2 in any group.
- Onset and duration of sensory and motor blockade and duration of analgesia were compared.
- Mean time of sensory onset in group B (6.95±1.23) was significantly higher than group A (4.35±0.74) and group C (4.75±0.63). There was no significant difference between group A and group C.
- Mean time of duration of sensory block was highest in group B (321±24) as compared to group A (215.5±26.4) and group C (288.75±14.67). Also prolongation was more in group C as compared to group A.
- Mean time of onset of grade 3 motor block was significantly higher in group B (8.45±1.05) as compared to group A (5.2±0.83) and group C (5.8±0.69). There was no significant difference between group A and group C.
- Mean time of total duration of motor blockade was also highest in group B (298±23.46) as compared to group A (196.5±27.2) and group C (269.5±13.16). The duration of motor blockade was higher in group C as compared to group A.
- Duration of analgesia in group B (208±14.36) and group C (175.25±15.5) was significantly higher as compared to group A. Duration was higher in group B as compared to group C.
- Intraoperative and postoperative complications were noted.
- No any specific side effect related to DXM or fentanyl were noted in perioperative period.

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