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Research Paper

A comparative study of bupivacaine,bupivacaine with dexmedetomidine and bupivacaine with clonidine in spinal anesthesia for lower abdominal surgery

Medical Science

KEYWORDS : Intrathecal, central neuraxial block, clonidine,dexmedetomidine(dexem,DXM), Bupivacaine.

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ABSTRACT

The present clinical comparative study was carried out in 90 patients of ASA GRADE I and II scheduled for lower abdominal surgery. They were divided into three groups of 30 each. The patients in group A received Bupivacaine alone and Patient in group B received Bupivacaine + dexmedetomidine and group c received bupivacaine + clonidine intrathecaly.

Total drug volume with saline in both the groups was 3.5 ml.

In our study we have found out that when clonidine/dexmedetomidine added to bupivacaine, prolongs the time of onset for sensory and motor block, Quality of central neuraxial block is good. Motor block achieved is complete, duration of central neuraxial block is increased and effective analgesia increases considerably. Hemodynamic stability were maintained, didn't produce excessive sedation. However these effects were more pronounced with clonidine than dexmedetomidine.

So we concluded that clonidine as an adjuvant to bupivacaine to produce CNB is better in prolonging the duration of spinal analgesia and postoperative analgesia with hemodynamic stability without any significant side effects.

1 INTRODUCTION

Lower abdominal surgeries may be performed under local, regional (spinal or epidural) or general anesthesia, but neuraxial blockade is the preferred mode of anesthesia.

Spinal block is still the first choice because of its rapid onset, superior blockade, less failure rates and cost effectiveness, but has the drawbacks of shorter duration of block and lack of postoperative analgesia.

The concept of post op analgesia is gaining importance in recent times. The aim is to have a technique which is minimally invasive, causes minimal alteration in routine activities, decreases perioperative complications, provides prolonged analgesia and is economically acceptable. That's why we selected spinal analgesia.

In recent years, use of intrathecal adjuvant has gained popularity with the aim of prolonging the duration of block, better success rate, patient satisfaction and faster recovery.

Bupivacaine is the most commonly used local anesthetic agent having satisfactory sensory and motor blockade with limited duration of action. Various intrathecal adjuvants have been tried with local anesthetic agent to prolong its duration of action.

Various adjuvants that are added to local anesthetic agents are adrenaline, phenylephrine, opiods, α2 agonists, neostigmine, ketamine, magnesium sulphate.

For the past two decades, the anesthetic use of adrenergic α2 agonists has been of considerable interest. Clonidine has been successfully used as an adjuvant with preservation of cardiovascular reflexes, reduced post op analgesic requirement and prolongation of the duration of bupivacaine induced sensory and motor blockade.

Dexmedetomidine (DXM) is a highly selective α2 agonist drug. DXM has been used in the epidural space in humans without any reports of neurological deficits. Based on earlier human studies, it is hypothesized that intrathecal 5μg DXM would produce prolonged postoperative analgesia with hyperbaric bupivacaine in spinal anesthesia with minimal side effects.

This study was undertaken to evaluate and compare the efficacy and potency of intrathecally administered Bupivacaine, Bupivacaine with clonidine 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.

2 AIMS OF STUDY

The present study was designed to evaluate effect of clonidine and dexmedetomidine when added to bupivacaine for producing central neuraxial block. In Group A 0.5% heavy Bupivacaine 3.0ml (15mg) with 0.9% normal saline 0.5ml and intrathecal 0.5% heavy Bupivacaine 3.0ml (15mg) with clonidine 1ugm/kg not exceeding 50ugm and intrathecal 0.5% heavy Bupivacaine 3.0ml (15mg) with DXM 0.05ml (5ug)with 0.9% normal saline 0.15ml in lower abdominal surgeries.(20 patients in each group.)

Total volume of drug injected in each patient is 3.5ml.

- ❖ 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 effects

MATERIAL AND METHODS

The present study was conducted in 90 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 30 patients.

Total volume of drug inject

Group A: 0.5% heavy bupivacaine 3ml (15mg) + 0.9% normal saline 0.5ml.

Group B: 0.5% heavy bupivacaine 3ml (15mg) + 0.05ml DXM (5μg) + 0.9% normal saline 0.15ml.

Group C: 0.5% heavy bupivacaine 3ml (15mg) + 1ugm/kg clonidine

Total volume of drug injected in each patient with saline is 3.5ml.Normal saline added to make volume 3.5 ml.

STUDY PROTOCOL

Pre anesthetic assessment:

- Detailed preoperative history and physical examination

done on the previous day of surgery.
- 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 before procedure.
- Pulse oxymeter, non-invasive blood pressure monitoring and ECG were 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 preservative free clonidine 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, SPO2 and RR were recorded every 1, 5, 10, 15, 20, 25, 30, 45 and 60 minutes after giving spinal anesthesia and then every 30 minutes till the completion of surgery.

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

- Time for onset of grade 3 motor blockade was noted.
- Time for sensory regression to S2 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 T10 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.
- Hypotension was defined as systolic blood pressure <90 mmHg or > 20% decrease in baseline value.
- Tachycardia was defined as heart rate >100/mins and bradycardia was defined as heart rate < 60/mins.
- After surgery, patients were monitored every hourly for 12 hours.

Postoperatively pain measurement was assessed by VAS scale

OBSERVATIONS AND RESULTS

All the three groups comparable in respect to age, height, weight and sex ratio.

The mean duration of surgery was 91.5±23.9 minutes in group A given Bupivacaine alone, 92.6±21.9 minutes in group B given Bupivacaine and DXM and 90.5±21.1 minutes in group C given Bupivacaine and clonidine, which was comparable.

The mean time to achieve T10 sensory level and modified bromage scale III was prolonged in group B (5.5±0.8, 7±1)and in group c (5.2 +0.64) as compared to group A (4.3±0.8, 5.2±0.8) which was statistically highly significant (P value < 0.001).

The changes in Heart Rate and mean arterial pressure in both the groups were comparable and statistically not significant.

TABLE-1: DURATION OF SENSORY AND MOTOR BLOCKAGE

TIME (minutes)	Group A (Mean± SD)	Group B (Mean± SD)	Group C (Mean± SD)	P value
Sensory regression to S_2 from highest sensory level	215.5±26.4	321±24.0	330±36.66	A VS B-<0.05 A VS C->0.05 B VS C-<0.05
Motor regression to bromage scale 0	196.5±27.2	298±23.4	310±12.4	A VS B-<0.05 A VS C->0.05 B VS C-<0.05

Table 1 showing statistically significant prolongation of duration of sensory and motor blockade in group B (P value < 0.001) and group C(P value < 0.001) as compared to group A.

TABLE-2: DURATION OF POST OPERATIVE ANALGESIA

	Group A	Group B	Group C	P value
No. of patients	30	30	30	
Duration of effective analgesia (mins)	180-240	170-220	220-320	A VS B-<0.05 A VS C->0.05 B VS C-<0.05
Mean ± SD (mins)	203.16 +12.62	188±6.54	304+36.66	A VS B-<0.05 A VS C->0.05 B VS C-<0.05

Table 2 showing

The difference in the duration of effective analgesia between groups A and C was statistically highly significant (P value < 0.05). The duration of effective analgesia was comparable in group

A and B which was significantly lower than Group C. (Bupivacaine + clonidine. Also the duration of effective analgesia in group C was significantly higher than in the group B.

DISCUSSION

Central neuroaxial block is one of the preferred anesthetic technique for lower abdominal surgeries. General anesthesia is associated with many biochemical changes in the body. It also produces more discomfort and may be best avoided in circumstances like Diabetes mellitus, Respiratory diseases. Spinal anesthesia is easier to perform, it has rapid and predictable onset, produce more intense and complete block and has high success rate.

To increase duration of spinal anesthesia various adjuvants have been added to bupivacaine .In this study we have added dexmedetomidine in group b and clonidine in group c to bupivacaine.

Dexmedetomidine.
- DXM is a D-enantiomer of medetomidine.
- Highly selective, potent α2 agonist with short duration of action
- α2 agonists do have an analgesic effect when injected via the intrathecal or epidural route.
- The primary site of analgesic action is thought to be the spinal cord.

So we decided to study effect of intrathecal dexem when added to bupivacaine.

Clonidine.
It's a partial agonist at alpha 2 receptors.

α2 agonists do have an analgesic effect when injected via the intrathecal or epidural route.

Clonidine potentiates action of local anesthetic drugs when given via intrathecal route.

We wanted to compare effectiveness of both alpha agonists as an adjuvant to bupivacaine.

We selected 90 adult patients of ASA grade I and II undergoing elective lower abdominal surgeries and divided into 3 groups of 30 patients in each.

Group A: 0.5% heavy bupivacaine 3ml (15mg) + 0.9% normal saline 0.5ml.

Group B: 0.5% heavy bupivacaine 3ml (15mg) + 0.05ml DXM (5μg) + 0.9% normal saline 0.15ml.

Group C: 0.5% heavy bupivacaine 3ml (15mg) + 1ugm/kg clonidine

Total volume of drug injected in each patient with saline is 3.5ml.

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

Our study demonstrates that addition of dexem /clonidine had no significant effect on mean pulse rate and mean arterial blood pressure.

Dextomeditidine did not produce noticeable increase in duration of sensory blockade and postoperative analgesia as compared to bupivacaine alone.

Clonidine when added to bupivacaine produces statistically significant increase in duration of sensory blockade and postoperative analgesia as compared to bupivacaine alone.

CONCLUSION
We conclude that clonidine and dexmedetomedine used as an adjuvant to bupivacaine are useful in prolonging duration of sensory and motor blockade of spinalanalgesia . Both produces prolongation of postoperative analgesia without significant side effects .However duration of sensory blockade and effective postoperative analgesia is more with clonidine than dexmedetomidine.

So clonidine is drug of choice as both drugs are easily available.

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