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EFFECT OF DEXMEDETOMIDINE OR CLONIDINE ON THE CHARACTERISTICS OF BUPIVACAINE SPINAL BLOCK IN SURGERIES BELOW UMBILICUS

Anaesthesiology

Hetal Hathiwala Senior Resident Department of Anaesthesia, SMIMER Hospital, Surat

Divyang Shah Additional professor Department of Anaesthesia, SMIMER Hospital, Surat

Pragna Vachharajani Head and professor Department of Anaesthesia, SMIMER Hospital, Surat

ABSTRACT

This study aimed to compare the onset and duration of sensory and motor block, postoperative analgesic requirements as well as hemodynamic stability following intrathecal bupivacaine with either dexmedetomidine or clonidine. 90 patients of ASAgrade I and II scheduled for lower abdominal surgery were divided into three groups. Each patient was given 3ml of 0.5% of hyperbaric bupivacaine and 0.1ml of normal saline(group BP), 10µg of dexmedetomidine(group BD) and 15µg of clonidine(group BC). Addition of these adjuvants to intrathecal hyperbaric Bupivacaine (0.5%) significantly prolongs the duration of sensory and motor block along with prolong postoperative analgesia & perioperative hemodynamic stability.

KEYWORDS

Spinal anaesthesia, bupivacaine, dexmeditomidine, clonidine, VAS(visual analogue score)

Introduction

"For all the happiness, mankind can gain is not in pleasure, but in rest from pain"-

John Druden (1631 – 1701). Pain is defined as "An unpleasant sensory and emotional experience associated with actual or potential tissue damage. Pain after surgery is inevitable. Hence effective pain control is essential and has been recognized as a prime concern for anaesthesiologists.

The technical skills and pharmacological knowledge are required to treat pain perioperatively. Any method of post-operative analgesia must meet basic criteria such as it must be safe, cost-effective and feasible. Adjuvant drugs are administered via spinal or epidural route nowadays to prolong the analgesia of local anaesthetics and prevent the deleterious clinical effects of their toxic doses.

The present study was undertaken to evaluate analgesic efficacy, hemodynamic stability and side-effects of intrathecally administered Dexmedetomidine or Clonidine as an adjuvant to Bupivacaine heavy (0.5%) for surgeries below umbilicus.

Aim and Objectives

To compare the onset and duration of sensory and motor blockade following intrathecal Bupivacaine supplemented with either Dexmedetomidine or Clonidine.

To assess the haemodynamic stability, postoperative analgesia requirement and any side effects in all groups perioperatively.

Review of literature

Kanazi et al (2006)3 studied intrathecal bupivacaine supplemented with either Dexmeditomedine 3 mcg/ml or Clonidine 30 mcg in 60 patient undergoing transurethral resection of prostate or bladder tumour.

Al Mustafa MM et al (2008)[1] studied effect of Dexmeditomedine added to spinal bupivacaine for urological procedures. Sixty-six patients were studied, they were randomly assigned in to 3 groups, each receiving spinal bupivacaine 12.5 mg combined with normal saline(group N) Dexmeditomedine 5 mcg (group D5) or Dexmeditomedine 10 mcg(groupD10).

M.Roesli Thaib (2010)[5] studied to determine the effects of clonidine(0.15mg) addition to hyperbaric bupivacaine 0.5% spinal analgesia for lower abdominal, perineal and lower limb surgery.Group I patients received 3ml of hyperbaric bupivacaine 0.5% plus 1ml normal saline; group II patients received 3ml of hyperbaric bupivacaine 0.5% plus 1ml clonidine(0.15mg).

Deepika Shukla et al (2011)[2] conducted study to evaluate the onset and duration of sensory and motor block as well as perioperative analgesia and adverse effects of dexmedetomidine (10µg) and magnesium sulfate(50mg) given intrathecally with 0.5% hyperbaric bupivacaine (15mg)for spinal anesthesia.

Kashif M. Madani and his colleagues (2014)[4] studied on 90 patients divided in 3 groups. Group A, B and C patients received inj. Bupivacaine (12.5mg) with normal saline, with dexmedetomidine (5µg) and with dexmedetomidine (10 µg) respectively.

Vidhi Mahendhru et al (2014)[6] studied on 120 patients undergoing lower limb surgeries under spinal anaesthesia. Group BF received Bupivacaine0.5% heavy (12.5mg) + Fentanyl 25 µg and Group BD received Bupivacaine 0.5% heavy (12.5mg) + Dexmedetomidine 5 µg and Group BC received Bupivacaine0.5% heavy (12.5mg) + Clonidine 30 µg.

Vania Kanvee et al (2015)[7] studied on 50 patients scheduled for lower abdominal and lower limb surgery and divided randomly into two groups clonidine 15 µg (groupC) and dexmedetomidine 10 µg (groupD).

Material and method

The present study was conducted in 90 patients between the age group 18 to 70 years belonging to ASA class I and II scheduled for lower abdominal surgeries, after approval from the institutional ethical committee and written informed consent.

A detailed general and systemic examination were done. On arrival in recovery room, NBM status was confirmed. All patients were explained about the Visual Analogue Scale (VAS; 0 = no pain and 10=worst pain) for assessing the intensity of pain during postoperative pain interview. After securing18G intravenous line, preloading was done with Inj. Ringer lactate 10 ml/kg 45 minutes before procedure. Patients were premedicated with inj. Glycopyrrolate 0.004 mg/kg and Inj. Midazolam 0.04 mg/kg.

In operation theatre, baseline parameters like pulse, blood pressure, respiratory rate and spO2 were recorded. Sabarachnoind block was administered in L3-L4 space using 25G Quincke neddle with all aseptic and antiseptic precautions in sitting position.
Patients are divided into 3 groups:

GROUP BP : Inj. Bupivacaine heavy (0.5%) 3 ml + 0.1 ml Normal saline

GROUP BC : Inj.Bupivacaine heavy (0.5%) 3 ml + 0.1 ml inj.Clonidine 15 microgram

GROUP BD : Inj.Bupivacaine heavy (0.5%) 3 ml + 0.1 ml inj.Dexmedetomidine 10 microgram.

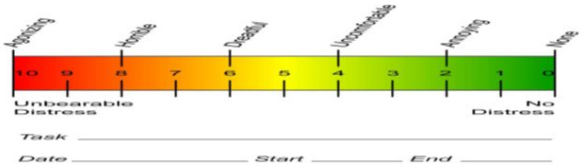
Immediately after administering spinal anaesthesia, patients were positioned supine.

The level of sensory block was assessed by pinprick method. The time of onset of highest sensory level (T6) was noted and Degree of motor block was assessed by Bromage scale.

Pulse rate, Blood pressure, Oxygen saturation and Five point sedation score were recorded at 5 mins, 10 mins and then 10 mins interval up to 150 mins. At the end of surgery, the patient was shifted to the recovery room.

Post-operatively pulse rate, blood pressure and SpO2 were recorded up to 24 hrs.

Post-operatively pain was assessed by visual analogue scale. VAS score were recorded at 1, 2, 3, 4, 6, 10, 14, 18 and 24 hours post-operatively.



The time till VAS ≥ 4 was recorded as total duration of analgesia. Rescue analgesic was provided with inj. Diclofenac sodium1.5 mg/kg intramuscularly at that time.

Time for two segment regression of anaesthesia level and total duration of motor block were noted.
Side effects like bradycardia, hypotension, nausea, vomiting were noted.

The results were expressed as mean ± SD. Statistical analysis consisted of ANOVA test with p value ≤ 0.05 was considered as significant and p value ≤ 0.01 was considered as highly significant. P value ≥ 0.05 was considered as non-significant.

OBSERVATIONS AND RESULTS

Neuroaxial anaesthesia is the preferred technique for surgeries below umbilicus. Although epidural, spinal, and combined spinal epidural techniques have all been advocated, most surgeries below umbilicus are performed under single shot spinal anesthesia. Even when a long acting local anesthetic like bupivacaine is used, the duration of spinal anesthesia (SA) is short and higher doses of analgesics are required in the postoperative period.

So, there is a need to prolong the duration of postoperative analgesia without increasing the intensityand duration of motor blockade.
Demographic Data were comparable in all groups (P>0.05).

Pre-operative Pulse rate, Systolic BP, Diastolic BP and SPO2 were comparable in all the three groups (P>0.05).

The average duration of surgery was 146.16±4.1 min in Group BC, 146.83±4.9 min in Group BD and 148.83±4.8 min in group BP which were comparable (P>0.05).

Table 1:Comparision of sensory block in three groups

PARTICULAR	GROUP BC (MEAN±SD)	GROUP BD (MEAN±SD)	GROUP BP (MEAN ± SD)	'P' VALUE
Onset of sensory block(sec)	127.2± 4.77	126±9.33	126.4±10.16	>0.05
2segment regression(min)	272± 12.22	352±9.25	194±7.25	<0.0001
Rescue analgesic(min)	330± 21.5	468±5.22	252±7.10	<0.0001

Onset of sensory blockade was127.2±4.7 sec in Group BC,126±9.33sec in Group BD and 126.4± 10.16 sec in Group BP which was comparable (P>0.05).

Two segment regression time from highest sensory level was significantly prolonged in Group BD (352±12.2 min) as compared to Group BC (272±9.25min) than Control Group (194±7.25min),which was statistically highly significant(P<0.001).

Rescue analgesia was required at 252 ±21.5min in group BP, 330 ±5.22min in group BC and 468±7.1min in group BD, thus requirement of rescue analgesic was earlier in control group BP compared to group BC and group BD and the difference among three groups was statistically highly significant (P<0.001).

Effective postoperative analgesia was significantly prolonged in both Clonidine (330 ±38.88min) and Dexmedetomidine (468 ±32.14min) added groups compared to Bupivacaine alone group (252 ±15.23min). Thus effective post-operative analgesia was more with Dexmedetomidine group compared to Clonidine group (P<0.05).

No statistically significant difference observed in mean pulse rate intra operatively in all groups (P>0.05).

The mean systolic BP recorded at different interval intra-operatively shows that there was no significant statistically difference of systolic BP in all groups (P>0.05).

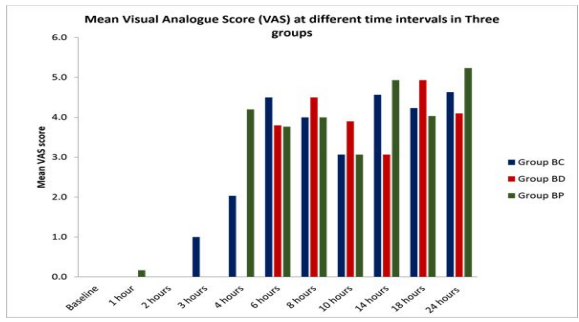
Table 2 :Comparision of motor block in three groups

PARTICULAR	GROUP BC (MEAN ± SD)	GROUP BD (MEAN ± SD)	GROUP BP (MEAN ± SD)	'P' VALUE
Onset of motor block(sec)	206± 19.8	208± 19.4	208.6± 10.30	>0.05
Duration of motor block(min)	259± 17.9	331± 8.14	140± 8.71	<0.001

Mean onset of motor block was 206±19.8sec, 208±19.4sec & 208.6±10.30 sec in Group BC, Group BD and Group BP, respectively and were comparable among all groups (P>0.05).

Duration of motor block was significantly higher in Clonidine group 259±17.9min and Dexmedetomidine group 331±8.14min compared to controlgroup140±8.71min (p<0.001)

Chart 1: VAS in three groups



Requirement of rescue analgesia at VAS score ≥ 4 was 252 ± 15.23 min in group Bupivacaine alone, 330 ±38.88 min in clonidine group and 468 ±32.14 min in dexmedetomidine group, which shows earlier requirement of rescue analgesic in control group as compared to groups with adjuvant (P < 0.001).

Thus, postoperative analgesia was significantly higher in Group BD (468±32.14 min) than Group BC (330±38.88 min) than Control group (252 ± 15.23 min) (P<0.05).

Grade 1sedation observed in Group BC and Group BD.

Incidence of Nausea in 3 patients and Vomiting in 4 patients in Group BP as compared to none of the patient in group BD and Group BC. Hypotention, Bradycardia and Shivering were not observed.

DISCUSSION

Inadequate relief of postoperative pain can prolong recovery, increase the duration of stay in hospital and increase the health care cost. It is therefore the responsibility of the modern anaesthesiologist as a peri-operative physician to ensure patient comfort throughout the peri-operative period.Spinal anesthesia has become the preferred

anaesthesia technique for surgeries below umbilicus.[5]

Various adjuvants added with LA intrathecally is an excellent technique which improves the quality and success of anaesthesia, so need to supplement general anaesthesia is decreased. Apart from this, it enables good peri-operative cardiovascular stability, postoperative analgesia and makes early discharge possible.

In the present study, demographic data like mean age, weight and height were comparable in all groups. The duration of surgery was also comparable.

In present study, mean time for onset of sensory blockade was 127.2±4.7sec (2.11min) in Group BC, 126±4.4sec (2.10min) in Group BD and 126.4± 10.16sec (2.10min) in Group BP. There was no statistically significant difference for onset time of sensory block (P>0.05).

In our study, onset time of sensory block of 128sec (2.11 min) in dexmedetomidine group which is consistent with study conducted by Dipika shukla (2011)[2] and lower than the studies done by Vania Kanvee (2015)[9,] Kashif M.(2014)[4],Vidhi Mahendru(2014)[7],AL Mustafa MM(2009)[1] in which time was 297 sec.

In our study, mean onset time of motor block was 206±19.8sec (3.43min), 208±19.4sec (3.46min) & 208.6±10.30sec (3.47min) in clonidine group, dexmedetomidine group and control group respectively. Thus, data for mean onset time of motor block were comparable between all three groups (P >0.05). Vania Kanvee et al(2015)[9,] Kashif M. et al(2014)[4] and Al Mustafa MM et al(2009)[1] conducted study with Bupivacaine(H) 0.5% alone and Bupivacaine (H) 0.5% with Dexmedetomidine intrathecally10µg and observed onset time of motor block of 619sec(10.32min), 582sec (9.7min) and 624sec (10.4min) respectively. This was not consistent with our study result.

In present study, total duration of motor block was significantly prolonged in Clonidine group (250±28.54min) and Dexmedetomidine group (331±26.18 min) compared to control group (140±8.71mins). Dexmedetomidine (10µg) and Clonidine (15µg), when added to intrathecal Bupivacaine, produces prolongation in the duration of motor block.Vidhi Mahendru(2014)[7] and Al Mustafa MM(2009)[1] administered Bupivacaine (H) 0.5% alone and Bupivacaine (H) 0.5% with Dexmedetomidine 5µg intrathecally and observed total duration of motor block of 198 min and 246 min respectively which is lower than our study (331 min). This shorter duration of action may be due to administration of lower dose of dexmedetomidine. Vania Kanvee et al(2015)[9] and M.Roesli(2010)[6] administered Bupivacaine (H) alone and Bupivacaine(H) with Clonidine 15 µg intrathecally and observed total duration of motor block of 251min and 288min.These were consistent with our study result.

In our study, mean the time required for two-segment regression from highest sensory level was significantly prolonged in Group Dexmedetomidine (352± 9.25 min) than Group Clonidine (272±12.2 min) than Control Group (194±7.25min) ,which was highly significant (P<0.001).

Rescue analgesia was given at VAS ≥ 4 and the mean time for rescue analgesia was 252±15.23min (4.2hr) in Bupivacaine group, 330±38.88min (5.5hr) in Clonidine group and 468±32.14min (7.8hr) in Dexmedetomidine group, which shows earlier requirement of rescue analgesic in control group as compared to groups with adjuvants and the difference between three groups was statistically highly significant (P < 0.001). Thus, addition of intrathecal Clonidine or Dexmedetomidine to Bupivacaine significantly improves the duration and quality of perioperative analgesia.

Thus, effective postoperative analgesia was significantly prolonged in both Clonidine(330±38.88 min) (5.5hr) and Dexmedetomidine (468±32.14min) (7.8hr) added groups as compared to Bupivacaine group (252 ±15.23min) (4.2hr). Total duration of effective post-operative analgesia was more with Dexmedetomidine group as compared to Clonidine group and the difference was statistically significant (P<0.05).

Vania Kanvee et al(2015)[9] administered Bupivacaine (H) 0.5% and Dexmedetomidine intrathecally 10 µg and observedthe mean time for rescue analgesia time of 492 min (8.2 hr) which is consistent with our study.

In our study, Grade 1 sedation observed in 2 patients at 45min, in 1 patient at 60min, in 2 patients at 90min and in 1 patient at 120min in Clonidine Group.

Grade 1 sedation observed in 2 patients at 45min, in 1patient at 60min, in 1 patient at 90min, in 1 patient at 120min and in 1 patient at 150min in Dexmedetomidine Group.

None of the patient in control group had sedation Intra-operatively. So it was statistically insignificant.

Intra-operatively mean systolic and diastolic Blood pressure and Heart rate were stable in all the patients of all groups in our study.

None of the patient of clonidine and dexmedetomidine group had any episode of hypotension and bradycardia.

Kanazi(2006)[3] observed that addition of Bupivacaine (H) 0.5% and dexmedetomidine(3 µg) and Bupivacain (H) 0.5% and clonidine (30 µg) did not cause a significant decrease in blood pressure intraoperatively and postoperatively.

Nausea and/or Vomiting was seen in 3 patients of control group and but none of the patient in study groups developed nausea and/or vomiting in our study.

Summary and conclusion

Addition of Dexmedetomidine 10µg or Clonidine 15µg to intrathecal hyperbaric Bupivacaine (0.5%) significantly prolong duration of sensory and motor block without affecting onset of sensory and motor block along with prolong postoperative analgesia & perioperative hemodynamic stability without any side effect.

Addition of Dexmedetomidine 10µg or Clonidine 15µg to intrathecal hyperbaric Bupivacaine (0.5%) significantly improves the quality of anesthesia and duration of post-operative analgesia.

But Intrathecal Bupivacainine –Dexmedetomidine combination is better than Bupivacaine –Clonidine combination as it provide longer sensory and motor blockade, excellent postoperative analgesia and less rescue analgesic requirement .So it is recommended to use intrathecal Dexmedetomidine with hyperbaric Bupivacaine (0.5%) in surgeries below umbilicus.

Bibilography

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