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An Analytical Vision On: Valuable of Functioning Position of Analgesia after Epidural Dexmedetomidine and Ketamine

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Abstract

Hip fractures are intensely painful, so post-operative analgesia is an integral part of patient care for early rehabilitation and mobility. After the Institutional Review Board approval and written informed consent, this prospective, randomised controlled, double-blind study was conducted on sixty patients belonging to the American Society of Anesthesiologists' physical status 1 or 2 of either gender, aged 18–75 years, posted for elective hip fracture surgeries.

Keywords: Analgesia, Dexmedetomidine, Ketamine, HR, Patient, Demographic.

1. Introduction

Hip fractures are intensely painful, so post-operative analgesia is an integral part of patient care for early rehabilitation and mobility. [1] Local anaesthetics with epidural additives ideally should provide stable hemodynamic and prolonged analgesia. There is limited literature comparing dexmedetomidine and ketamine as epidural additives. We conducted a study of continuous epidural infusion of bupivacaine plus dexmedetomidine comparing with bupivacaine plus preservative-free (PF) ketamine in patients undergoing hip fracture surgeries to assess the quality of post-operative analgesia.

1. Method

After the Institutional Review Board approval and written informed consent, this prospective, randomised controlled, double-blind study was conducted on sixty patients belonging to the American Society of Anesthesiologists' physical status 1 or 2 of either gender, aged 18–75 years, posted for elective hip fracture surgeries. Patients with hypersensitivity to the study drug, denying regional anaesthesia, bleeding diathesis, uncontrolled hypertension and heart rate (HR) <60 beats/min were excluded from the study. Patients were allocated into Group D and Group K using a computer-generated randomisation chart. Group D received bupivacaine 0.125% with dexmedetomidine (1 μg/mL) and Group K received bupivacaine 0.125% with PF ketamine (0.5 mg/mL) epidurally using 250 mL elastomeric pump. In the operating room after recording vitals under aseptic precautions combined spinal-epidural (CSE) anaesthesia was performed using CSE set at L3–L4 interspace. Patients received 12 mg hyperbaric bupivacaine intrathecally. An epidural catheter was inserted and fixed such that 5 cm remained in the epidural space. At the start of the surgery, Group D received bolus dose 1 μg/kg dexmedetomidine diluted to 5 mL in normal saline (NS) and Group K received bolus dose 0.5 mg/kg ketamine diluted to 5 mL in NS epidurally. The epidural infusion was started 1 h after the incision. Haemodynamics were monitored from the pre-operative period up to 48 h post-surgery. Changes in haemodynamics were defined as: HR <60/min or >120/min, systolic blood pressure (SBP) >150 mmHg or <80 mmHg and diastolic blood pressure (DBP) >100 mmHg or <50 mmHg. Post-operative pain scores were

recorded using visual analogue scale (VAS) ranging from 0 to 10 (0 - no pain, 10 - worst pain ever) at 0, 1, 2, 4, 6, 12, 24 and 48 h. Patients with breakthrough pain received epidural top-up with 0.125% bupivacaine 1.5 mL/segment depending on the number of segments to be blocked. Rescue analgesia requirement was noted and side effects if any were addressed accordingly.

2. Result

Demographic profile was comparable among both groups which included 30 in each group of which all of them completed the study with no dropouts. We observed that change in HR, SBP and DBP between groups was statistically insignificant [Table 1]. Receding time for sensory block (pain sensation to pin-prick perceived at L5) in Group D was 9.33 ± 4.34 h and in Group K was 7.03 ± 3.79 h. The mean duration of sensory block was compared between the groups and the difference was statistically significant (P = 0.033). Receding time for motor block (Modified Bromage scale in non-operated limb) in Group D was 7.10 ± 3.53 h and in Group K was 3.80 ± 1.49 h [Table 1]. The mean duration of motor block was compared between the groups and the difference was statistically significant (P = 0.000). The value of median VAS score [Figure 1] was 0.25 for Group D and 1 for Group K and the difference was statistically significant (P = 0.034). Six and 11 patients out of the 30 in Group D and Group K, respectively, required rescue analgesia and the difference was statistically insignificant (P = 0.150). Two of the thirty patients in Group D had bradycardia (HR <60/min), of which one had severe bradycardia requiring treatment with intravenous glycopyrrolate 0.2 mg. One patient in Group D had significant prolongation of the motor blockade which required discontinuation of the infusion pump. No adverse events were observed in Group K.

Table 1: Parameters assessed during the study

Parameters	Mean±SD (n=30)		P
	Group D	Group K	
Age (years)	56.8±15.8	56±13.6	0.820
Weight (kg)	55.67±7.28	55.67±7.28	0.272
Gender (male/female)	22/8	19/11	0.405
Receding time of sensory blockade (h)	9.33±4.34	7.03±3.79	0.033*
Receding time of motor blockade (h)	7.10±3.53	3.80±1.49	0.000*
Change in HR			
0	22	23	0.766
1	08	07	
Change in SBP			
0	24	22	0.542
1	06	08	
Change in DBP			
0	22	22	1.000
1	08	08	

0 – No change; 1 – Change; HR – Heart rate; SBP – Systolic blood pressure, DBP – Diastolic blood pressure; SD – Standard deviation; *P<0.05 - Significant

3. Discussion

Epidural bolus help build cerebrospinal fluid levels and infusion thereafter maintains these drug levels leading to lesser incidences of breakthrough pain. Dexmedetomidine is known to cause slight decrease in BP and modest reduction in HR[2,3] while ketamine causes hypertension and tachycardia. Our study did not find any significant difference in haemodynamic variables. Our results are in concordance with another study that observed lower values of haemodynamic parameters for epidural dexmedetomidine with insignificant hypotension and bradycardia.[2] Statistically significant difference was observed for median VAS (P = 0.034) which was in concordance with other studies[3] where caudal bupivacaine with dexmedetomidine resulted in prolonged post-operative analgesia. Epidural dexmedetomidine causes prolonged post-operative analgesia and lowers consumption of local anaesthetic postoperatively.[4-6] Studies with ketamine concluded that epidural ketamine is useful for post-operative pain relief and the superior dose is 0.5 mg/kg without much side effects.[7-9] We observed that dexmedetomidine with bupivacaine prolongs the

duration of both sensory and motor blockade thus increasing the duration of post-operative analgesia. Furthermore, epidural ketamine as pre-emptive analgesic increased the time between first and second analgesic dose thus prolonging the duration of post-operative analgesia.[10,11] Number of patients requiring rescue analgesia in Group K was more as compared to Group D but the difference was insignificant. Reduced rescue analgesia requirement resulted in decreased amount of local anaesthetics and other systemic analgesics consumed postoperatively.[3,6] There are no studies mentioning the safe dose of dexmedetomidine to be used in neuraxial anaesthesia. Furthermore, our study did not find any adverse neurological side effects, but there are conflicting animal studies regarding neurotoxicity. Thus, a large randomized multicentre trial is required.

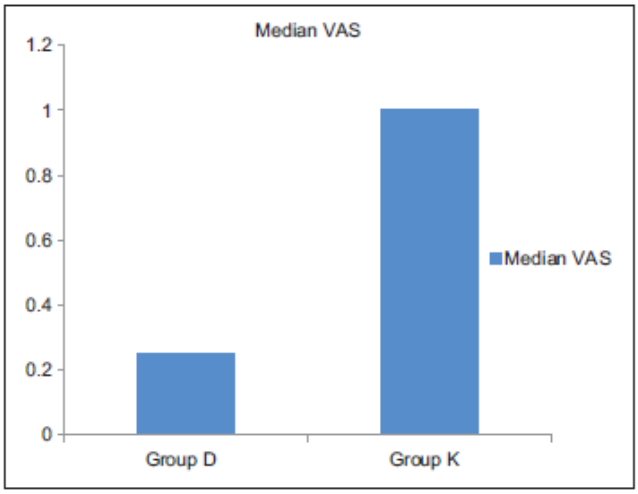

Figure 1: Comparison of median visual analogue scale score over 48 h. Student's *t*-test *P* = 0.034.

4. Conclusion

Dexmedetomidine as an adjuvant to epidural bupivacaine infusion results in reduction in pain scores with minimum hemodynamic alterations compared to PF ketamine as an adjuvant to epidural bupivacaine.

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