# INTRAVENOUS BUPIVACAINE INFUSION: AN ERROR IN ADMINSTRATION

## - A Case Report -

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Bupivacaine has long been used in epidurals for pre and post operative analgesia, with or without narcotics. In our hospital, epidural catheters were routinely placed for pre and post operative analgesia for total knee replacement surgeries.

## Case Report

We report an incident, which happened with a 52 yrs old female suffering of osteoarthritis and was scheduled for total knee replacement. Epidural catheter was placed before giving general anesthesia. A bolus of 10 ml of 0.25% Bupivacaine with 5 microgram/ml fentanyl was given. Patient was given general anesthesia followed by an infusion of 8 ml/hr of 0.1% bupivacaine with 2 microgram fentanyl.

At the end of surgery, patient was reversed and shifted to recovery room. Patient was discharged from recovery room after meeting the discharge criteria.

At the time of discharge, recovery room nurses discontinued the infusion through the epidural so that the infusion could be started in the ward through the ward infusion pump. In the ward, the recovery room nurses handed over the patient to the ward technician. The ward technician unknowingly connected the infusion to the intravenous cannula and started the infusion at 1930 hrs. At 0500 hrs the on call anesthetic registrar received

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call from ward that the infusion is near to finish and requires refilling. When the registrar went to refill the burette, he saw that the epidural catheter was lying on the pillow with heplock and the infusion was going intravenously. Infusion was immediately stopped and patient was shifted to high dependency unit for monitoring and oxygen was given. Patients blood pressure was in the range of the preoperative levels but she had tachycardia with heart rate of 95 beats/min when compared to preoperative levels. 12 leads ECG was otherwise normal. Patient was observed in the high dependency ward for six hours and then discharged to ward.

## Discussion

Bupivacaine was synthesized by AF Ekenstam in 1957[1]. It was the first long-acting amino-amide local anesthetic and was clinically introduced by Widman in 1963.

Bupivacaine (marcaine) is a homologue of mepivacaine and ropivacaine, from which it differs in having a longer side chain (butyl group) on the xylidide ring instead of methyl-and propyl-groups, respectively. Marcaine is widely used, and has long been the standard reference for long acting local anesthetics. It has a clinical potency, which is about four times that of carbocaine and xylocaine, and its duration is two to four times longer than that of these drugs.

Around 1980, clinical reports indicated that bupivacaine possessed a relatively high potency for cardiotoxicity[2]. It was also found that patients with cardiac depression or arrest due to bupivacaine toxicity could be unexpectedly difficult to resuscitate, especially if the patient was in late pregnancy[3,4]. Sullivan and Abbott[5] have reported cases of bupivacaine toxicity after intraarticular injection. Meinig et al. measured venous samples of plasma bupivacaine levels after intraarticular instillation of 30 ml of 0.5% bupivacaine and found mean plasma levels to be <650 ng/ml with a peak level occurring at 20 min after injection.

Kaeding et al. reported peak bupivacaine levels of 480 ng/ml occurring at 43 min after instillation. These levels are 8 to 10 times less than those

reported to cause convulsions in humans[6]. Bupivacaine particularly, which is one of the most used local anesthetics, adversely affects intraventricular conduction and cardiac contractile strength from the 3.0-4.0 micrograms/ml blood levels[7].

The effect of the intravenous infusion of bupivacaine (2 mg/min for 3 hr) on cardiovascular function and various endocrine metabolic parameters were studied by Hasselstrom LJ[8] in a randomized single-blind crossover study in eight normal subjects. They found that bupivacaine infusion resulted in plasma concentrations about 1-2 micrograms/ml. Heart rate increased significantly from approximately 70 to 70 beats/min. Mean arterial blood pressure increased from 87 to about 100 mmHg, and cardiac output decrease about 20%. Our patient was getting 8 mls/hr of 0.1% bupivacaine and so 8 mg/hr of intravenous bupivacaine, we stipulate that the patient was metabolizing the drug and so the levels of bupivacaine to cause cardiac toxicity were not achieved.

Patient was either pain free due effect of intravenous fentanyl of 16 micgm/hr or she did not complain of pain. In was the early hours of morning and in the process of quickly moving to high dependency, blood to measure the level of bupivacaine was not taken. The patient did not develop any cardiovascular or neurological toxicity due to low level of infusion and hence low blood levels.

Drug related errors are a major factor associated with iatrogenic injury in hospitalized patients. The Harvard Study of Medical Practice found adverse events occurring in 3.7% of hospital admissions, whilst a similar study performed more recently in Australia demonstrated an adverse event rate of 16.6%[9].

The task of administering an intravenous drug to a patient during anesthesia is a highly complex procedure, often taking place under conditions of stress, haste and fatigue. Each drug administration can be associated with up to 40 component steps; therefore it is not surprising that errors can and do occur. In a recent survey of medication errors in anesthesia, most respondents admitted to being involved in at least one drug administration error[9]. There were 126 (14%) route of administration errors, of which only

four were pre-errors. The mot significant feature of this issue was the large number of errors associated with regional anesthesia[9]. In the case reported, the element of communication error was also found in the Australian study[9]. The major contributing factors cited was inattention and inexperience. In our case, inexperience was an element.

In conclusion, drug error is still an important cause of anesthetic related morbidity, we recommend that infusions should be colour coded and also different size leuer lock system for infusion to system should be adapted.

**Keywords:** Drug error, Bupivacaine infusion, Critical incident, Local anesthetic.

## References

1. Af Ekenstam B, Egner B, Petersson G: Local Anesthetics: 1. N-alkyl pyrrolidine and N-alkyl piperidine carboxylic amides. *Acta Chemica Scandinavica;* 1957, 11:1183-90.
2. Albright GA: Cardiac Arrest Following Regional Anesthesia with Etidocaine or Bupivacaine. *Anesthesiology;* 1979, 51:285-7.
3. Marx GF: Cardiotoxicity of Local Anesthetics-The Plot Thickens. *Anesthesiology;* 1984, 60:3-5.
4. Reiz S, Nath S: Cardiotoxicity of local anesthetic agents. *British Journal of Anesthesia;* 1986, 58:735-746.
5. Sullivan SG, Abbott PJ Jr: Cardiovascular toxicity associated with intraarticular bupivacaine. *Anesth Analg;* 1994, 79:591-3.
6. Gregory A,Liguori, George F Chimento, Leslie Borow, Mark Figgie: Possible Bupivacaine Toxicity After Intraarticular Injection for Postarthroscopic Analgesia of the Knee: Implications of the Surgical Procedure. *Anesth Analg;* 2002 Apr., 94(4):1010-3.
7. Timour Q, Gallard P, Bui-Xuan B, Vial T, Evreux JC, Freysz M: Cardiac accidents of locoregional anesthesia: experimental study of risk factors with bupivacaine. *Bull Acad Natl Med;* 1998, 182(2):217-32.
8. Hasselstrom LJ, Mogensen T, Kehlet H, Christensen NJ: Effects of intravenous bupivacaine on cardiovascular function and plasma catecholamine levels in humans. *Anesth Analg;* 1984 Dec., 63(12):1053-8.
9. Abeysekera A, Bergman IJ, Kluger MT, Short TG: Drug error in anesthetic practice: a review of 896 reports from the Australian Incident Monitoring Study database. *Anaesthesia;* 60(3):220-227.