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UNSAFE EPIDURAL DOSE OF ADRENALINE – AN UNRESOLVED PARADIGM

Dr. Rajeev Dayananda[1], Dr. Prashantha Kesari N K[2]

[1]MD, DNB, Consultant Anaesthesiology and Pain Management.

[2]MS, MCh, DNB, MRCS, PGDMLE, Consultant Plastic and Reconstructive Surgery.
[2] Gleneagles Global Hospitals, 5/ 5, Richmond Road, Near Richmond Circle, Bangalore 560025. Karnataka, India.

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INTRODUCTION

A 43 year old female of ASA grade 1, weighing 72 kg was scheduled for liposuction of abdomen, thighs and back, under combined spinal epidural anaesthesia (CSEA). In the operating room, under local anaesthesia (LA) infiltration, epidural catheter was inserted at L_{2-3} interspinous space. This was followed by sub-arachnoid block at L_{3-4} space with 3.4 ml of 0.5% heavy bupivacaine and 25 µg fentanyl which enabled liposuction of the back in prone position, till T_6 level. For liposuction above T_5 level, additional LA infiltration with intravenous midazolam and fentanyl sufficed. As planned, liposuction of back started at T_5 level and then proceeded to the lower back level. Patient was then made supine for liposuction of abdomen and thighs. For epidural top-ups, adrenaline 5µg/ml in 2% lignocaine was prepared by adding 1.5 ml of 1 in 10,000 adrenaline to 30 ml of 2% plain lignocaine. Two such vials of lignocaine with adrenaline were prepared. The 10 ml syringe containing 7 ml of 1 in 10,000 adrenaline (700µg) was still remaining. Epidural test dose of 3 ml of lignocaine with adrenaline was administered followed by top-ups of 12 ml, 10 ml and finally 8 ml thrice. A 10 ml syringe with 8 ml of 2% lignocaine-adrenaline was kept ready for the next top-up when required.

Seven hours later, in the supine position, patient complained of pain in left subcostal region. In the rush, the syringe containing adrenaline was picked and entire 7 ml of 1 in 10,000 adrenaline solution was given epidurally. Error was realized immediately and epidural space was diluted with 30 ml of normal saline. No change in haemodynamics or in level of block was noted. Totally, 49 ml of 2% lignocaine-adrenaline had been administered epidurally over 5.5 hours. The surgery was completed in the next 30 minutes. Recovery of motor and sensory block started after 1 hour and after 2.5 hours (of giving wrong medication) respectively. Next morning (11 hours after epidural adrenaline), patient was able to ambulate without support.

A certain laxity exists with respect to drug administration into epidural space. Usual causes for errors are: syringe exchange, mistaken ampoule identification and confusion regarding epidural and intravenous lines. No consensus or guidelines existed until International

Corresponding author: Dr. Rajeev Dayananda

Organization for Standardization for Neuraxial applications and major regional anesthesia guidelines (ISO 80369-6) were published in 2016, to avoid such mishaps.[1] A common rescue measure undertaken is dilution of epidural space to minimize drug effects. Support of airway, breathing, circulation and assessment of neurological status remain prime concerns. We report a case where a large dose of dilute adrenaline was wrongly administered epidurally.

Spinal cord blood flow (SCBF) has several protective mechanisms like blood flow from multiple arterial territories, bidirectional flow between artery supply zones and lower mean arterial pressure (MAP) range for auto-regulation which ensures that it does not behave as an end organ.[2]

Injury to spinal cord from drugs injected could be by various mechanisms such as, differences in the physical properties of the drug (pH and osmolality) from the cerebrospinal fluid (CSF), neurotoxicity of the drug and its preservatives. CSF has a pH of 7.33- 7.41 and osmolarity of 295 mOsm/L. In contrast, adrenaline preparations have a pH 2.60-3.29 and osmolality of 200-400 mOsm/kg.[3] Theoretically, weakly acidic adrenaline preparations could be expected to decrease the pH of CSF causing vasodilation and increased SCBF. In a few animal studies conducted on dogs and cats where solutions containing local anesthetic alone or local anaesthetic with adrenaline were administered intrathecally (IT), it was observed that adrenaline alone normally affects SCBF minimally, but in situations where local SCBF was increased abnormally, there was a reduction in SCBF caused by IT adrenaline.[4,5]

Catechol-O-methyl transferase (COMT) metabolizes most of epidurally administered adrenaline, so that only a small fraction reaches CSF.[6] Neuraxially administered adrenaline has also been proposed to provide analgesia via α_2 pathways.[6] Also, weak concentrations of intravenous adrenaline (1-2µg/min) exert β_2 effects causing vasodilatation. Keeping this in mind, we diluted epidurally administered adrenaline with saline.

Therefore, we speculate that our patient did not suffer any neurological sequelae due to the inherent protective mechanisms of SCBF and probably a mild vasodilatory effect of dilute epinephrine solution administered epidurally.

Now with ISO 80369- 6 (standards for small-bore catheters in medical use) guidelines having been published, the multitude of issues relating to misconnections or wrong route administration is expected to decrease.[1,7] However, a definitive time-line for this transition has not been announced. Till then, human vigilance, as ever, remains the strongest safeguard against such errors.

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