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SUCCESSFUL RESUSCITATION OF A THREE MONTH OLD CHILD WITH INTRALIPID INFUSION, PRESUMED TO HAVE BUPIVACAINE INDUCED SEIZURES AND CARDIOVASCULAR COMPLICATIONS: CASE REPORT

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SUCCESSFUL RESUSCITATION OF A THREE MONTH OLD CHILD WITH INTRALIPID INFUSION, PRESUMED TO HAVE BUPIVACAINE INDUCED SEIZURES AND CARDIOVASCULAR COMPLICATIONS: CASE REPORT

B. ADMANI and F. ESSAJEE

SUMMARY

Anaesthetic agents used locally can be toxic especially if given as an inappropriate dose or route. Lipid infusion has been demonstrated in several animal models to successfully resuscitate bupivacaine induced toxicity. We present a case of successful use of 26% lipid infusion to resuscitate a paediatric patient with a presumed subcutaneous injection of bupivacaine and lignocaine which led to neurological and cardiologic consequences.

INTRODUCTION

Bupivacaine is a local anaesthetic belonging to the amide group synthesised in 1963. The 50:50 racemic mixture of bupivacaine consists of the R (+) and S (-) enantiomer, the latter being less toxic (1). It is a high potent anaesthetic with long lasting effects and its potency is proportional to the toxic effects on the cardiovascular and central nervous system. R (+) bupivacaine is seven times more potent in blocking sodium channels than the S (-) enantiomer (2).

In 1998, Weinberg showed the successful resuscitation in rats with lipid emulsion following local anaesthetic overdose (3). Furthermore a paper in 2003 showed similar results in Dogs and concluded that infusing a lipid emulsion during resuscitation from bupivacaine induced cardiotoxicity substantially increased survival in Dogs and improved haemodynamics (4). These results led to the use of lipid emulsion in humans.

CASE REPORT

Patient is a three month old male child, 5.9 kilograms, with a history of bilateral inguinal hernia since birth. Past medical and surgical history was not significant. Physical examination was unremarkable. Child was admitted for an elective bilateral inguinal herniotomy.

An eventful surgery under general anaesthesia with, halothane, atracurium, fentanyl and morphine was undertaken.

On completion of the procedure, bupivacaine (0.5%) 5ml and lignocaine (2%) 5mls were mixed and 4 mls were injected subcutaneously on bilateral herniotomy sites. Epinephrine was not included in the injectate. Within five minutes of administration, child started convulsing, generalised tonic clonic in nature.

Simultaneously the child's ECG showed an initial bradyarrhythmia with a heart block, followed by premature ventricular complexes, ventricular tachycardia, ventricular fibrillation and ventricular tachycardia again.

A diagnosis of bupivacaine toxicity was entertained and the patient was commenced on 9mls of lipovenous bolus followed by an infusion at 0.25ml/kg/min of the same.

Subsequently the child was given dexamethasone 2mg, hydrocortisone 20mg and sodium thiopentone 5mg.

The child was then transferred to ICU. On admission he convulsed thrice. Initially the child had muscular spasms which lasted a few minutes followed by generalised tonic clonic convulsions. Vital signs were as follows; a temperature of 37.8°C, heart rate 184 beats per minute, respiratory rate 67 breaths per minute and a blood pressure of 110/50mmhg. The random blood sugar was 4mmol/l. The patient was maintained on mechanical ventilation. Intravenous midazolam and phenytoin was administered to control the seizures but without success, and subsequently was given two doses of diazepam after which the seizures settled. The ECG monitor at this

time showed a sinus tachycardia.

The intravenous lipid was continued and four hours post admission to ICU, the child was seizure free. Baby was extubated as spontaneous breathing resumed. Few hours post extubation, he was allowed to breast feed. Overnight, the child remained stable though was febrile for 24 hours. Investigations were essentially normal, including a haemogram, C-reactive protein, urea electrolytes and creatinine.

Following morning child was feeding well, with no seizures reported. Heart rate and rhythm were normal and was transferred to the ward. The fever was attributed to post operative pyrexia which subsided within 24 hours.

In the ward the child was observed for one day with no further complaints and was discharged home to be followed up at the paediatric clinic.

DISCUSSION

Bupivacaine has many applications; in this case it was used as infiltrative anaesthesia with the aim of achieving post operative analgesia. There are several case reports of neurotoxicity and cardiac toxicity in adults due to bupivacaine toxicity. Generalised tonic clonic seizures have been reported in a 27 year old patient following an intrascapular brachial plexus block after presumed intravenous injection of bupivacaine (5). There have also been case reports of central nervous system toxicity and grand mal seizures following an accidental intravascular injection of bupivacaine (6). However to our knowledge there have been no published case reports in the paediatric age group.

The first symptoms in our patient were noted five minutes after the injection of bupivacaine (without epinephrine) and lignocaine suggesting excessive absorption with consequent cardiovascular and neurological toxicity.

The toxic dose of bupivacaine has been reported at 1.6mg/kg (2). In our patient the dose was given at 4mg/kg, which was far higher than the calculated toxic dose.

The convulsions usually appear suddenly and can be stopped by use of antiepileptic agents like diazepam and barbiturates (7). Our patient was initially given phenytoin which acts by blocking sodium channels and was thought to have potentiated the neurotoxicity. Subsequently the seizures resolved with diazepam. Levobupivacaine the S(-) enantiomer, though less toxic has affinity for neuronal Na⁺ channels comparable with R (+) enantiomer (8).

An electroencephalogram (EEG) was not performed on our patient as it was handled as an acute emergency and the seizures resolved within a few hours. Of note is that this is the very first paediatric patient and hence no case reports were found to show the value of A EEG in the diagnosis of bupivacaine

toxicity or determining its prognosis. Further case reports or studies are required.

The cardiovascular effects are as a result of myocardial depression and vasodilatation. A combination of the above can lead to hypotension which can be life threatening (6). The first cardiac symptoms were noted within five minutes after injection of bupivacaine, suggesting excessive absorption from the site with consequent cardiotoxicity.

Soon after the initiation of 20% intravenous lipid the cardiac symptoms return to normal. The proposed mechanism is that lipid infusion accelerates the decline in bupivacaine myocardial content (reduced tissue binding) by creating a lipid phase that extracts the lipid-soluble bupivacaine molecules from the aqueous plasma phase (10). A beneficial energetic-metabolic effect may also occur. In our patient the lipid infusion was used in a peri arrest situation.

After the infusion of lipid at a bolus of 9mls (1.5mls/kg), cardiac function was restored. This was followed by a lipid infusion at 0.25ml/kg/min. Four hours after the infusion child's neurologic status had stabilised. We did not measure plasma bupivacaine concentrations hence we are unable to comment on the effect of intralipid on the serum concentration of the drug.

In conclusion, we concur with Picard and group that lipid emulsion should be routinely kept in hospitals for local anaesthetic toxicity. Lipid rescue has not been proven to be unquestionably superior to orthodox treatment for local anaesthetic intoxication in humans but experimental models and human case reports are increasingly suggestive (9).

Because of the challenges in diagnosing local anaesthetic toxicity and the paucity of data on the use of intralipid infusion in its management, we should continue to collate its reported uses in order to reach a consensus on the efficacy and aptness of this unique treatment.

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