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CASE REPORT

A Case Report on Early-Onset Local Anesthetic Toxicity

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ABSTRACT

Systemic toxicity of local anesthetics results from excessive plasma concentrations of these drugs, most often from accidental intravascular injection. Systemic reactions primarily involve the CNS and the cardiovascular system. In general, the CNS is more susceptible to the actions of systemic local anesthetics than the cardiovascular system is, and thus the dose or blood level of local anesthetic required to produce CNS toxicity is usually lower than that resulting in circulatory collapse[1]. Here we present the case of a 45-year-old male patient who had ultrasonography guided supra-clavicular brachial plexus block. The patient had an episode of seizure immediately (with-in 30 sec) after administering the local anesthetic (13 ml given in 5 ml aliquots injected after negative aspiration). He was treated with intravenous midazolam (2 mg stat) and supplemental oxygen via facemask. He had no neurological symptoms afterwards. All laboratory tests and radiological investigations were normal. This case report records the occurrence of local anesthetic toxicity observed as seizure activity, after ultrasound guided brachial plexus block due to accidental intravascular injection, as negative aspiration of the syringe does not always exclude intravascular placement.

KEYWORDS

• Case report • Local anesthetic toxicity • Supraclavicular brachial plexus block • Seizure • Intravascular injection

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INTRODUCTION

Local anesthetic drugs are relatively safe if administered in an appropriate dosage and in correct anatomic location. However, systemic and localized toxic reactions can occur usually as a result of accidental intravascular or intrathecal injection or administration of excessive dose. The onset of LAST is usually very rapid, following a single LA injection by 50 secs or less in half of cases, and occurring before 5 mins in three-quarters of the cases[1]. Seizure is the most commonly reported sign of LAST, occurring in two-thirds of cases[1]. In general, the central nervous system is more susceptible to the actions of systemic local anesthetics than cardiovascular system[2]. In this report, we aim to present a case involving a supraclavicular brachial plexus block done under ultrasound guidance that led to immediate generalized tonic-clonic seizure activity which might be due to inadvertent intravascular injection even after negative aspiration.

CASE PRESENTATION

A 45-year-old male patient, weighing 36 kg and standing 147 cm tall, presented with a right distal radius fracture and was scheduled for open reduction and internal fixation with plating. The anesthetic plan involved an ultrasound-guided supraclavicular brachial plexus block. His medical history was unremarkable, with no known history of hypertension, diabetes mellitus, asthma, coronary artery disease, epilepsy, or previous surgeries. He reported no significant family history and was neither a smoker nor an alcoholic. All preoperative laboratory investigations, including electrocardiogram and chest radiography, were within normal limits. The patient was classified as ASA physical status-I. Detailed preoperative counseling was provided, and informed written consent was obtained. No premedication was administered to preserve the patient's cooperation during the procedure.

In the operating room, standard monitoring was initiated, and baseline vital signs were within normal parameters. Under strict aseptic technique, ultrasonography was performed using a 10-18 MHz linear probe. The probe was positioned superior to the clavicle and oriented caudally, providing clear visualization of the brachial plexus adjacent to the subclavian artery and overlying the first rib.

A local anesthetic solution was prepared, consisting of 14 mL of 0.5% bupivacaine (5 mg/mL) and 10 mL of 2% lignocaine with adrenaline (20 mg/mL). A 23-gauge, 9 mm Quincke spinal needle was introduced using an in-plane technique, with the needle's entire trajectory visualized from the skin to the target. After confirming the absence of vascular puncture via negative aspiration, the anesthetic mixture was administered incrementally, with repeated aspirations after every 5mL.

Following the administration of 5 mL of 2% lignocaine with adrenaline and 8 mL of 0.5% bupivacaine, the patient acutely developed generalized tonic-clonic seizures, followed by a loss of consciousness. The seizure episode lasted approximately 30 to 45 seconds. Immediate treatment included intravenous administration of 2 mg midazolam and supplemental oxygen via a facemask at 10 L/min. Upon regaining consciousness, the patient's neurological examination revealed no focal deficits. During the postictal phase, the patient's vital signs remained stable, with a blood pressure of 127/68 mmHg, heart rate of 98 beats per minute, respiratory rate of 16 breaths per minute, and oxygen saturation at 98%. Given the transient nature of the seizure and the patient's hemodynamic stability, lipid emulsion therapy was not initiated.

The planned surgical procedure was abandoned, and the patient was transferred to the intensive care unit for close monitoring. A neurologist was consulted, and a cranial CT scan was performed, revealing no significant abnormalities. As a prophylactic measure, the patient was started on levetiracetam (Tab. Levipil 500 mg BD). No further seizure activity was observed. Four days later, the patient successfully underwent surgery under general anesthesia without complications

DISCUSSION

Central nervous system symptoms are the most common clinical presentation of LAST and usually precede evidence of cardiovascular toxicity, which rarely occurs in isolation[1]. Local anesthetic readily crosses the blood-brain barrier and, as a result, CNS toxicity can occur with systemic absorption or inadvertent intravascular injections[2]. Increasing plasma concentrations of local anesthetics classically produce circumoral numbness, facial tingling,

restlessness, vertigo, tinnitus, culminating in tonic-clonic seizures[3]. The effects on the CNS are determined by the plasma concentration of the local anesthetics[4] (*table 1* dose dependent systemic effects).

Table 1: Dose Dependent Systemic Effects of Lidocaine

Plasma Concentration (μg/mL)	Effects
1-5	Analgesia
5-10	Lightheadedness, Tinnitus, Numbness of tongue
10-15	Seizures, Unconsciousness
15-25	Coma, Respiratory Arrest
>15	Cardiovascular Depression

A range of precautions are available to reduce the risk of local anesthetic systemic toxicity during central and peripheral block administration. These include individualized dose, slow and intermittent medication administration, aspiration before injection, observation of local anesthetic filling in the injection area, monitoring variations in heart rate and blood pressure, premedication with coadministration of CNS depressive agents, such as barbiturates and benzodiazepines preventing seizure activity[5], continuous communication with patient.

The use of ultrasound compared to paresthesia or nerve stimulators for peripheral nerve blocks reduced the incidence of toxicity by 60%[6]. However, negative aspiration of the syringe does not always exclude intravascular placement.

Treatment, according to ASRA LAST Checklist[7] (*Fig. 1*) begins with prompt intervention, with administration of supplemental oxygen and assisting Incremental, fractionated dosing should be the rule for all patients undergoing major conduction blockade ventilation as indicated to prevent hypoxemia and hypercarbia. Benzodiazepines (midazolam, diazepam, lorazepam) are generally the drugs of first choice to terminate seizures because of their efficacy and relative hemodynamic stability. Propofol, although more immediately accessible, should be used with caution, as it can compromise cardiac function.

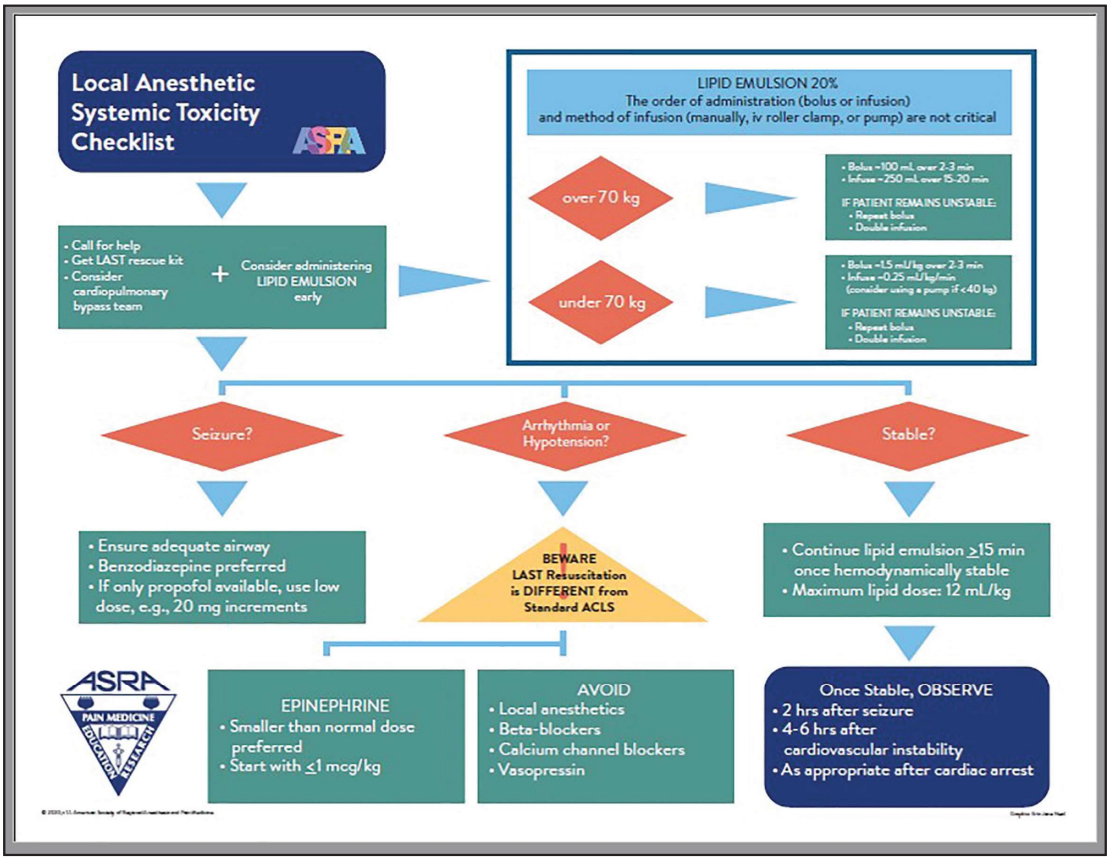

Fig. 1

CONCLUSION

Based on the preceding discussion, it should be apparent that clinicians performing major conduction blockade should make a routine practice of having the following ready at hand - monitoring equipment, an oxygen tank or wall oxygen outlet, rescue airway equipment and drugs to terminate convulsions, such as midazolam, thiopental, or propofol. "Incremental, fractionated dosing" should be the rule for all patients undergoing major conduction blockade even under ultrasonography guidance.

Ethical issues: we hereby state that there were no ethical issues involved.

Consent: consent for publication has been obtained from the patient.

Conflict of interest: None declared

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