



Local Anesthetic Systemic Toxicity Following Ultrasound Guided Popliteal and Adductor Canal Blockade: A Case Report

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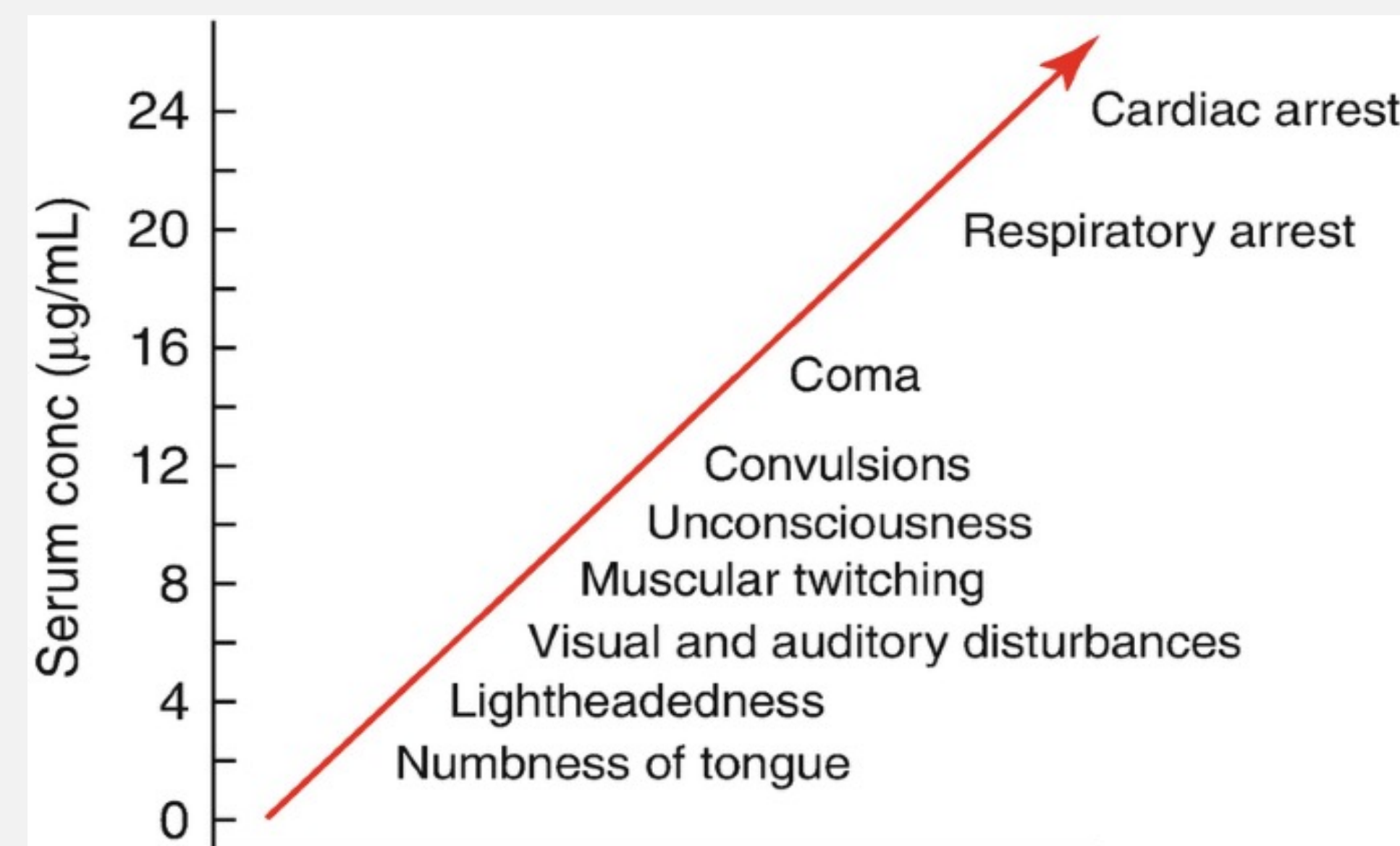
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Introduction

Local anesthetic systemic toxicity (LAST) is a complication following peripheral nerve blocks that presents as a myriad of signs and symptoms, primarily involving the central nervous and cardiovascular systems. It can be detrimental if not treated promptly. In the last decade though, its incidence and prevalence have significantly reduced following the arrival of the ultrasound [1,2]. But anatomical variations and altered physiology in patients can still increase the risk of LAST while performing peripheral nerve blocks under ultrasound guidance and vigilant local anesthetic dosing. We present a patient who suffered from LAST following procedurally insignificant popliteal and adductor canal blocks that required prompt management.

Fig 1. Presentations of LAST with respect to Lidocaine plasma concentrations



Background

CNS toxicity, primarily seizures, is the most common feature of Local Anesthetic Systemic Toxicity (LAST). Typically, it starts with CNS excitation (e.g., numbness, metallic taste, tinnitus, blurry vision, dizziness, confusion, agitation, tremors), followed by seizures and potential CNS depression (lethargy, coma, respiratory arrest).

Progression to cardiovascular toxicity may occur, including dysrhythmias, conduction delays, cardiac arrest (often asystole), and bradycardia/hypotension. Some patients (40%) present atypically, showing signs of cardiovascular involvement without CNS toxicity or both simultaneously, sometimes with delayed onset (over 5 minutes after injection). This delay may be due to ultrasound guidance, local tissue infiltration, or continuous infusion, occurring even 30 minutes after injection.

Case Description

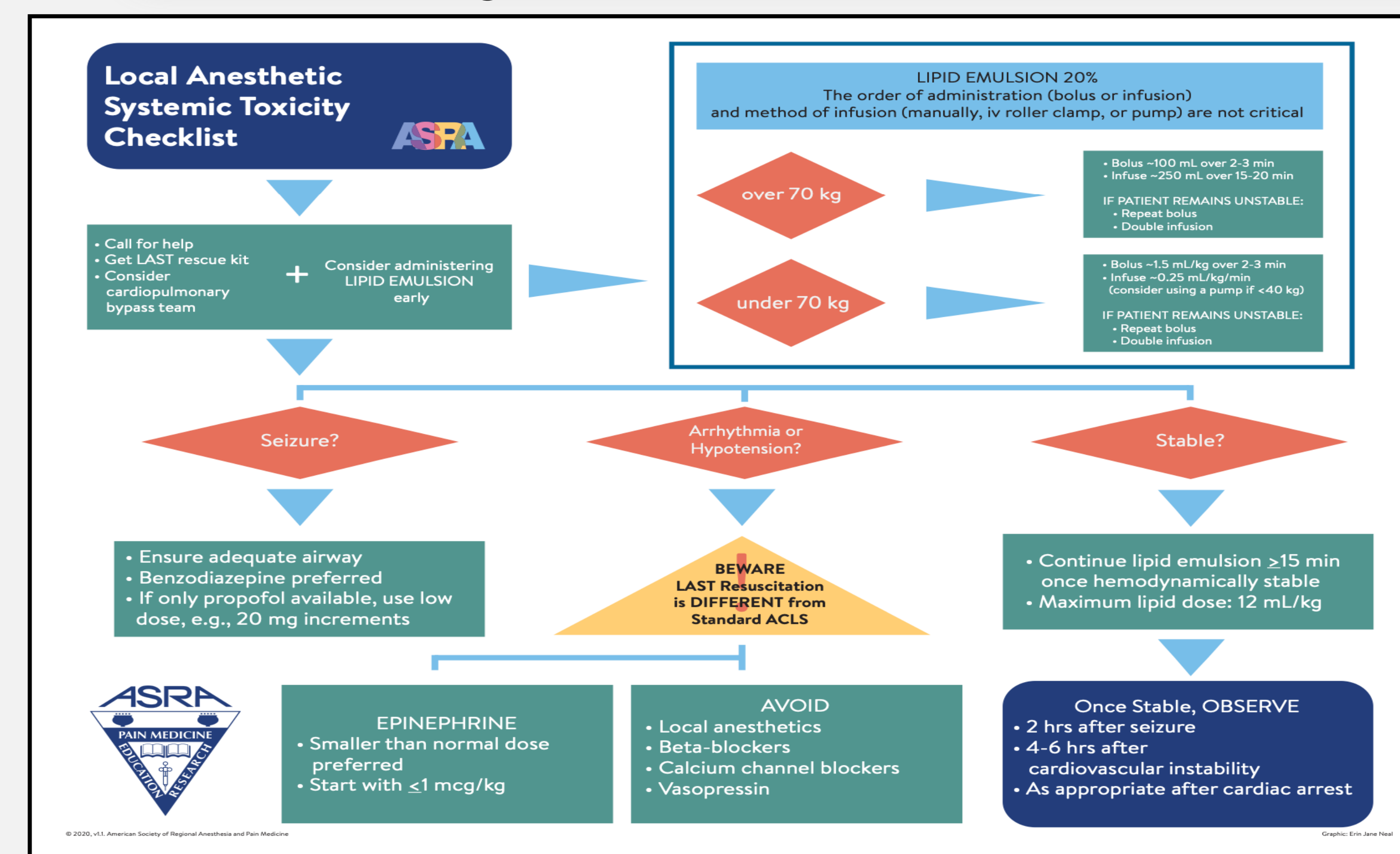
A 64-year-old female with a BMI of 28 kg/m² [Height 5' 1", Weight 67.7 kg, IBW 48 kg] arrived for an elective ankle revision fusion surgery. Her past medical history included IgM monoclonal gammopathy of uncertain significance, fibromyalgia, lymphoplasmacytic lymphoma, polyneuropathy, B-Cell lymphoma, migraines and depression. She had a known allergy to cefazolin and verapamil. She was on anti-depressant medications. Her physical examination was unremarkable. Vital signs were stable among presentation. Recent laboratory tests were within normal limits.

Popliteal & adductor canal peripheral nerve blocks were decided as her primary anesthesia plan. With the patient in the supine position with standard ASA monitoring, the blocks were performed preoperatively following 2 mg of midazolam administration for anxiety. Ultrasound guidance was used and the patient was given 25 ml and 10 ml of 0.5% preservative free bupivacaine as slow fractions with negative aspiration for any blood return for both popliteal and adductor canal blocks, respectively.

Ten minutes after completion of the nerve blocks, the patient became tachycardic, unresponsive, and exhibited facial twitching concerning for focal seizures. Help was called, vital signs monitored, supplemental oxygen started, and treatment medications were administered.

The patient received an additional 2 mg of intravenous midazolam + 100 ml of intralipid bolus over 2-3 minutes. Another 250 ml bolus was administered over 15-20 minutes. After the subsequent infusion, the patient's seizures resolved, she regained consciousness, and started breathing spontaneously with adequate saturations. There were no incidents of arrhythmias or hemodynamic instability in the due course. A physical examination and 12 lead EKG were obtained after medical management, and both were ultimately normal. The patient's surgery was cancelled, and the patient was subsequently admitted for overnight observation. The patient was later discharged the next day without any further events.

Fig 2. LAST Checklist



Discussion/Conclusion

Of recent, the risk of developing LAST following peripheral nerve blocks has been abated by the common use of ultrasound. Despite such improvement, multiple factors including patient related factors such as extremes of age, low muscle mass, mitochondrial dysfunction, acid-base imbalances, and heart, liver or renal diseases may increase risk [3]. Factors that may have contributed to the patient's symptoms in this case were likely the patient's recent decline in weight and muscle mass along with the bupivacaine dosing reaching close to the maximum allowable safety threshold (2.5 – 3 mg/kg).

LAST presents predominantly with CNS symptoms (≈45%) among which seizures accounts for ≈25% of the presentations [4]. This can vary for different local anesthetics. Bupivacaine, has one of the lowest cardiovascular to CNS ratios of toxicity (≈2) where CNS symptoms appear early before the onset of cardiovascular collapse. Early detection and prompt management is thus necessary to prevent significant morbidity and mortality. The ASRA guidelines on LAST management is a valuable tool to guide in the management of LAST with various agents including intralipid and benzodiazepines mentioned earlier [5].

In conclusion, the occurrence of LAST can be due to a plethora of patient related and non-patient related factors despite the use of ultrasound guidance for peripheral nerve blocks. This necessitates a close attention to patient and pharmacological factors while having the resources to manage LAST promptly.

References

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