IAEM Clinical Guideline

Management of Local Anaesthetic Systemic Toxicity (LAST) in the Emergency Department

Version 1.0

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DISCLAIMER

IAEM recognises that patients, their situations, Emergency Departments and staff all vary. These guidelines cannot cover all clinical scenarios. The ultimate responsibility for the interpretation and application of these guidelines, the use of current information and a patient's overall care and wellbeing resides with the treating clinician.

Revision History

Date	Version	Section	Summary of changes	Author
27/04/23	V1.0	All	Final version	EC/RO'M/ VM

CONTENTS

GLOSSARY OF TERMS

ACLS	Advanced Coronary Life Support
ANPs	Advanced Nurse Practitioners
CPR	Cardiopulmonary Resuscitation
ECG	Electrocardiogram
ED	Emergency Department
IV	Intravascular
LA	Local Anaesthetic
LAST	Local Anaesthetic Systemic Toxicity
NCHD	Non-consultant Hospital Doctor
US	Ultrasound

Management of Local Anaesthetic Systemic Toxicity (LAST) in the Emergency Department

INTRODUCTION

Local anaesthetic (LA) is a commonly used drug in the Emergency Department (ED) to provide pain relief. It can be used to provide local and regional anaesthesia and is generally safe and effective. Local anaesthetic systemic toxicity (LAST) is a life-threatening adverse event that can occur following administration of any type of LA, administered by any route, if a large amount reaches the systemic circulation[1].

Familiarity with maximum dosages of LA drugs is vital for patient safety when administering LA to avoid LAST. There is evidence that despite familiarity with LA drugs, NCHDs working in the ED are often unaware of safe dosing and management of toxicity[4,5,6].

LA drugs can be administered topically, subcutaneously and via perineural injection. Systemic absorption depends on rate of diffusion. The rate of diffusion is dependent on the site of injection and its vascular supply, individual drug lipophilicity and molecular weight and patient factors including age, weight and comorbidities. Increasing dose and rate of administration increases the rate of diffusion into systemic circulation and therefore increases the risk of systemic toxicity[7].

Local Anaesthetic Agent	Onset of action	Duration of action	Max Dose
Lidocaine	2-4 mins	1-2 hours	3-4.5 mg/kg
Lidocaine w/ adrenaline	2-4 mins	1-1.5 hours	7mg/kg
Prilocaine	2-4 mins	1-2 hours	6 mg/kg
Levobupivacaine	15 mins	3-12 hours	2-3 mg/kg
Bupivacaine	15 mins	6-30 hours	1.5 mg/kg

LAST can occur after inadvertent intravascular (IV) injection of LA or absorption after a large volume of LA is injected into tissues[9]. LA can act on the central nervous system and cardiovascular system with potentially fatal results. Signs and symptoms of toxicity can be very variable and therefore knowledge of the prevention, recognition and management of systemic toxicity is essential for all staff using LA drugs[10].

PARAMETERS

Target audience	ANPs, NCHDs and Consultants in the Emergency Medicine
Patient population	All patients presenting to the ED requiring administration of LA for, but not limited to the following: subcutaneous infiltration around wound sites requiring exploration, suturing or stapling; perineural injection for peripheral nerve block or regional anaesthesia.

AIMS

This guideline aims to highlight evidence-based techniques to prevent, recognise and treat local anaesthetic systemic toxicity (LAST) in adults.

The approach to prevention, recognition & management of Local Anaesthetic Systemic Toxicity (LAST) in the Emergency Department.

Prevention

Preventing systemic toxicity from LA is vital because toxicity may cause serious morbidity and mortality. Prevention requires detailed documentation of patient risk factors and attention to administration technique.

Patient risk factors [11,12,13,14,15,16]

Document a detailed history prior to administration of LA

- Age
- History of renal disease
- History of liver disease
- History of cardiac failure
- Pregnancy
- Previous allergy to LA

Regional Anaesthesia

Regional anesthesia techniques are more commonly performed in the ED in recent years[15] e.g., fascia iliaca and serratus anterior plane blocks. These blocks require large volumes (with corresponding larger doses) of LA drugs and are associated with an increased risk of systemic absorption. Injection in highly vascular sites also increases the risk of systemic absorption[17]

Administration technique

The approach to administering LA drugs can significantly reduce the risk of developing LAST. LAST may occur after administration of any LA drugs via any route.

The following are a guide to best practice in administration of LA drugs[8,9,10];

1. Always know the maximum dose of the LA drug being used and where possible use the lowest effective dose. Document the maximum safe dose prior to performing any procedure. Maximum dose should be calculated based on ideal rather than actual body weight.
2. Anticipate any factors that may affect the pharmacokinetics of LA e.g., low serum pH. An acidotic environment delays uptake of LA into cells thereby delaying onset of effect, increasing unbound LA and causing a higher probability of systemic toxicity.[10]
3. Always use an aseptic technique when administering LA. [9]
4. Always aspirate as you advance the needle and prior to injection / infiltration of LA to prevent IV injection.[18, 20]
5. Use ultrasound (US) to guide the procedure where possible and appropriate.[20] Use of US to guide the delivery of LA reduces the incidence of inadvertent IV injection and allows for a reduced dose compared with landmark technique, however, use of US does not reduce the risk of LAST resulting from systemic absorption of LA.
6. Inject LA slowly to minimize pain at the injection site, rapid injection increases the risk of inadvertent IV injection and nerve damage.
7. If injecting a large dose, do so in small divided incremental doses of 3-5 ml maximum and pausing for 30-45 seconds between injections (rather than continuous infiltration)[21].

Recognition of local anaesthetic systemic toxicity (LAST)

The diagnosis of LAST is based on a constellation of clinical features that occur after administration. Patient observation and monitoring after LA injection is vital. The signs and symptoms of LAST are variable and range from mild to severe. The most common effects occur in the central nervous and cardiovascular systems.

Neurological effects; early symptoms include[16]

- Metallic taste
- Tinnitus
- Disorientation
- Dizziness
- Visual disturbance
- Perioral tingling/numbness
- Light headedness

Inhibition of all neurons eventually leads to seizures, coma, and respiratory arrest [11].

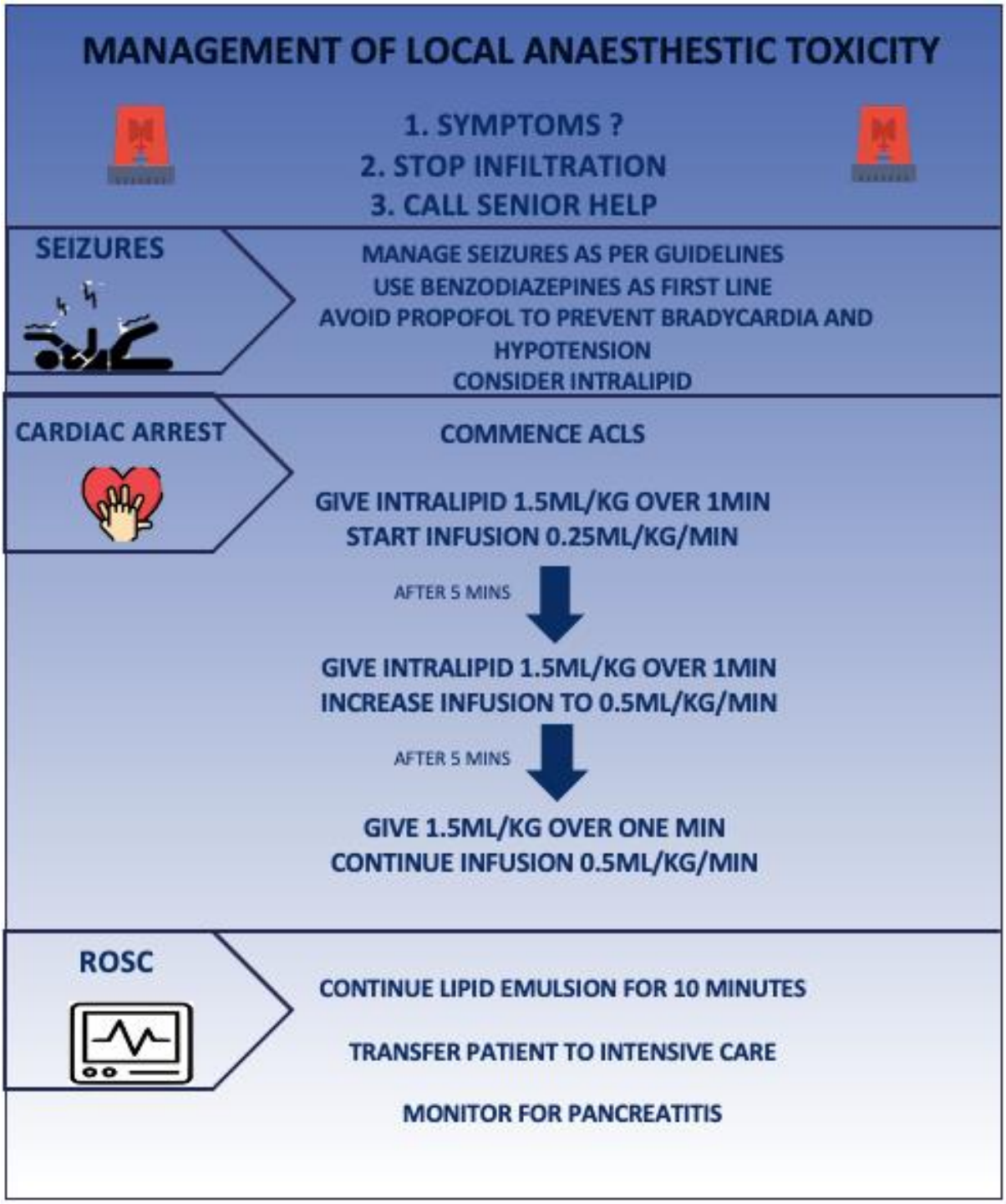
Cardiac effects [11]

- Bradycardia and heart block
- Re-entrant arrhythmias, Ventricular Tachycardia and Fibrillation
- Cardiac arrest
- Prolonged PR interval and widening of QRS on ECG

75% of patients will develop signs of toxicity within 5 minutes but these signs can develop up to 30 minutes post LA administration[9].

MANAGEMENT OF LOCAL ANAESTHETIC SYSTEMIC TOXICITY (LAST)

If there is clinical suspicion of LAST, the immediate priorities are to stop LA injection, call for help and manage the patient's airway, breathing and circulation.



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