Revista Mexicana de Anestesiología

CONFERENCIAS MAGISTRALES
Vol. 36. Supl. 1 Abril-Junio 2013
pp S81-S94

Lipid Rescue From Bench to Bedside

Meg A Rosenblatt, MD*

* Professor of Anesthesiology and Orthopaedics.
Icahn School of Medicine at Mount Sinai.

THE PLAN…

- Science of «lipid rescue»
- Safety of lipid infusions
- Current research
- Diagnosis of LAST
- What's next

TIMELINE OF BUPIVACAINE AND LAST

1957 BUPIVACAINE SYNTHESIZED

1963 USED IN CLINICAL PRACTICE

1970 REPORTS OF CARDIAC ARRESTS

1977 FIRST REPORT OF TOXICITY WITH PNB

1983 75% NO LONGER INDICATED IN OB

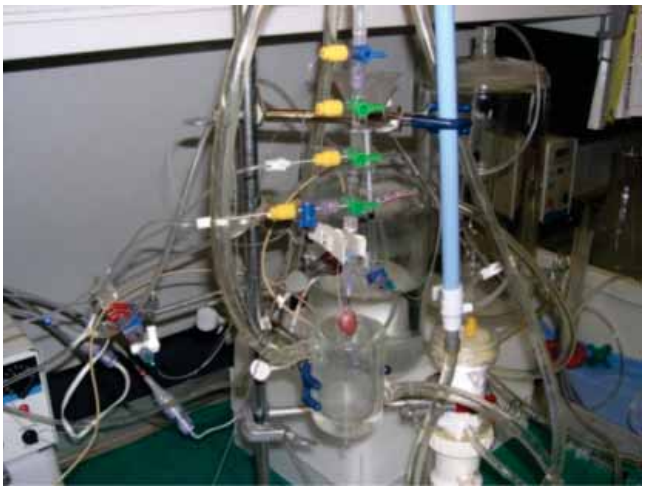
1998

2010

2006

GUY WEINBERG, M.D.

- 16 yr-old female
- Isovaleric acidemia
  - — Autosomal recessive dx of leucine catabolism
    - Isovaleryl-CoA dehydrogenase deficiency
    - Carnitine deficiency
    - May sensitize heart to arrhythmias
  - — Arrhythmias during axillary liposuction
    - 22 mg (0.4 mg/kg) bupivacaine
- Bupivacaine inhibits carnitine-dependent pathway



INVESTIGATION

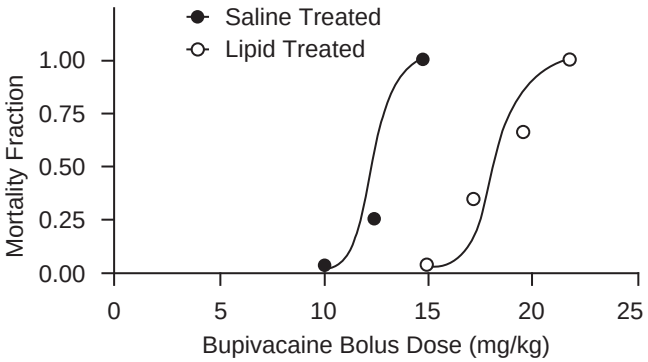
- Measured respiration in cardiac mitochondria oxidizing lipid and non-lipid substrates
  - — To see effect of bupivacaine
- Found bupivacaine inhibits key step in mitochondrial transport

- Also…
  - — Pretreatment with lipid increases the dose of bupivacaine to induce asystole in rats

- Pretreatment experiment
- 6 rats/treatment group—GA and instrumentation
- Pretreated with 3 mL/kg/min with:
  — Saline
  — Intralipid 10%
  — Intralipid 20%
  — Intralipid 30%
- 0.75% bupivacaine 10mg/kg/min to 10s of asystole
- Concentrations of bupivacaine in plasma to cause arrest:
  — 12.7 mg/kg
  — 17.8 mg/kg
  — 49.8mg/kg
  — 82.0 mg/kg

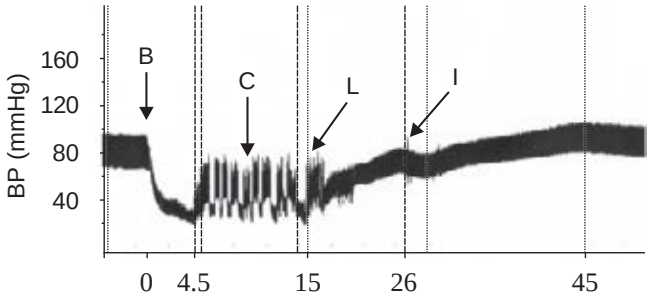
RESUSCITATION

- Anesthetized rats
- Bupivacaine bolus
- Ventilation 100% O_2
- Bolus of:
  — Saline
  — 30% lipid
  — Followed by infusions
- Compressions PRN
- Survival
  — HR > 100 bpm
  — SBP > 60 mmHg
- Lipid shifts dose-response curve to bupivacaine–induced asystole
  — LD50 from 12.5 to 18.5 mg/kg



Weinberg. Anesthesiology 1998;88:1071.

- 12 hounds (22-26 kg) under GA
- Bupivacaine 10 mg/kg injected
- 10 minutes internal cardiac massage
- 20% lipid -or- saline
- 4mL/kg bolus then 0.5 mL/kg/min infusion
- 100 *versus* 0% survival



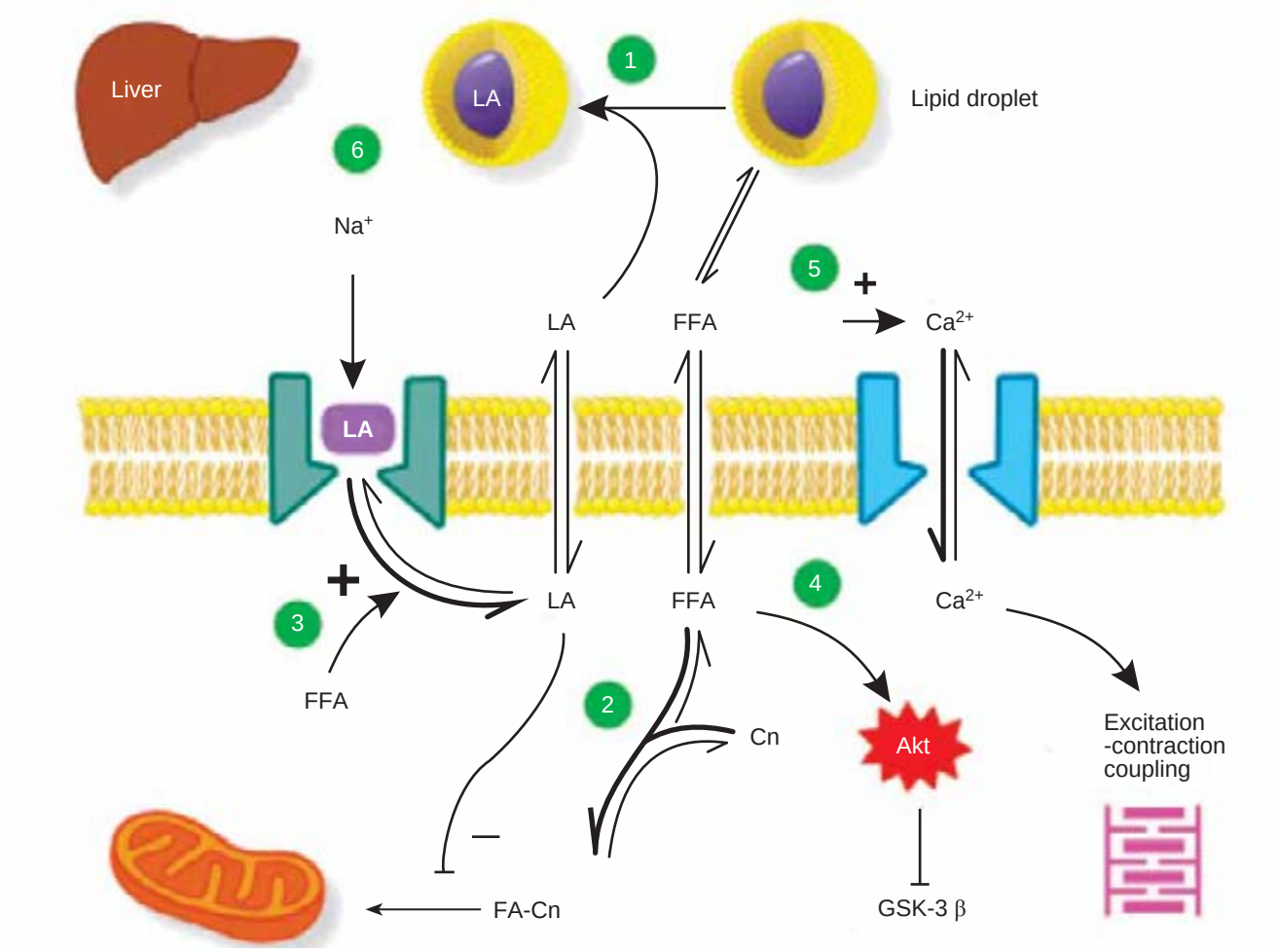
Weinberg. RAPM 2003;28:198.

LIPID INFUSIONS ARE:

- Emulsion in water:
  — Soybean oil
    - (predominantly neutral triglycerides)
    - Made isotonic with glycerin
  — Egg lecithin
    - The emulsifying agent
  — NO preservatives
- Particles 0.5 μm in diameter
- In blood these fat droplets form a lipid compartment
- But not just a lipid sink…

POTENTIAL MECHANISMS OF ACTION

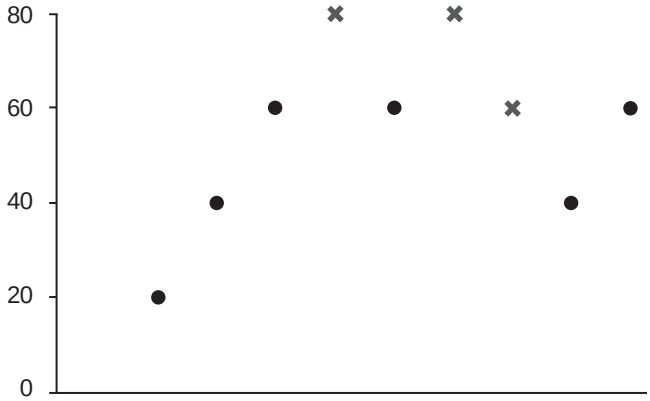
- «Lipid sink»
  — Sequestration of toxins of high lipophilicity
  — Bupiv lipid: aqueous partition coefficient = 11.9:1
- Cytoprotection
  — Akt (protein kinase B) activation
- Competition
  — Inhibition of ion channel binding
- Pharmacokinetics
  — Shunting to sequestering organs
- Inotropic/ionotropic
  — Activation of calcium currents
- Metabolic
  — Reverses the inhibitory effect of bupivacaine on lipid-based mitochondrial respiration



Weinberg. Anesthesiology 2012;117:180.

SAFETY OF LIPID INFUSIONS - LD 50 IN RATS

- 20% lipid (20, 40, 60 or 80 mL/kg) or saline
- Over 30 minutes
- Dixon «up-and-down» method
- Recovered and observed for 48 hours
- Euthanized and organs harvested
- Three additional rats given 60 mL/kg
  — Euthanized at 1, 4, 24 hours
  — To identify progression of organ damage



Hiller. RAPM 2010;35:140.

LD_{50} = 67.72 ± 10.69 ML/KG

- Three animals died
  — 2 at 80 mL/kg, 1 at 60 mL/kg
  — No specific etiology
- No CNS excitation/focal defects/motor abnormalities
  — Lethargy after receiving 80 mL/kg
- No CV changes
- Triglycerides markedly ↑ after all infusions
  — All returned to baseline by 48 hours
- Microabnormalities in lung and liver at 60/80 mL/kg
  — Histopathology worse at 1 hour than 4 and 24 hours
- Supports safety of lipid infusion at current doses

Hiller. RAPM 2010;35:140.

REACTIONS

- Contamination
- Direct reactions
  — Pyogenic
    - 10-20 min post-infusion
    - Nausea, vomiting, chills fever, headache chest pain, dyspnea, cyanosis (< 1%)
  — Thrombophlebitis
- Allergy
  — Soybean oil

OTHER CONCERNS

• Pulmonary comps— — Pts w/nl lung or pulm compromise without ARDS do not demonstrate ↓ oxygenation or pulmonary vascular changes • Pulmonary changes with ARDS 2° to: — Enhanced inflammation — Transient	• Pancreatitis— — All reported cases in patients with concomitant diseases - Crohn's - EtOH - HIV
Large lipid doses will interfere with laboratory studies and have caused chemical hyperamylasemia without symptoms of pancreatitis	

Are all formulations of lipid equal?

- Long chain triglyceride (LCT) emulsions more efficient than LCT/medium chain triglyceride (MCT) formulations to bind long-acting LAs
  — Study *in vitro*

Mazoit. Anesthesiology 2009;110:380

- Model of anesthetized and ventilated piglets
- LCT and LCT/MCT both reversed effects
  — QRS duration
  — Atrial-His
  — PQ intervals

Candela. A&A 2010;110:1473

- Caution with extrapolations to humans

BACK TO THE STORY…

A 58 year-old male presents for shoulder surgery

- H/o coronary artery bypass
- Has angina
- ECG
  — Right bundle branch block
  — Left anterior hemiblock
  — Old anterior wall MI
- Meds
  — NTG PRN
  — Lisinopril
  — Atenolol
  — Clopidogrel
  — Aspirin
- Refused further cardiac work-up

THE BLOCK

- ASA monitors, O_2 via nc
  - — Midazolam 2 mg
  - — Fentanyl 50 µg
- ISB→ stimulation at .34 mA
  - — Negative aspiration
- Agents
  - — Mepivacaine 300 mg
  - — Bupivacaine 100 mg
  - — In 5 cm^3 aliquots with aspiration between

AND THEN…

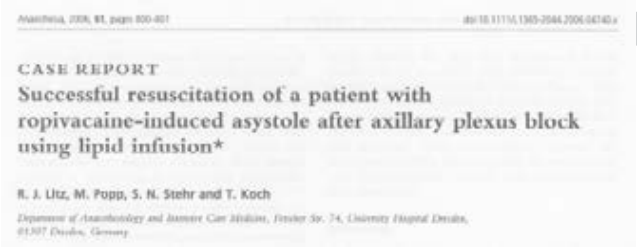
- 30 seconds after injection
  - — Tonic-clonic seizure
  - — O_2 via self-inflating resuscitation bag
  - — Propofol 50 mg
- 90 seconds later
  - — Seizure restarts
  - — Propofol 100 mg
  - — V tach → V fib → Asystole
- Endotracheal intubation and CPR

RESUSCITATION

- Full ACLS
  - — (At least 6 attendings and 1 resident)
- Central line/arterial line attempts
- Plans for cardiopulmonary bypass

OUR INTERVENTION

- 100 cm^3 of 20% lipid infusion IV
- Continued CPR
- Single sinus beat
  - — Epinephrine
  - — Atropine
- Return to sinus rhythm
- No neurologic sequelae
- (ISB block)



CASE REPORT

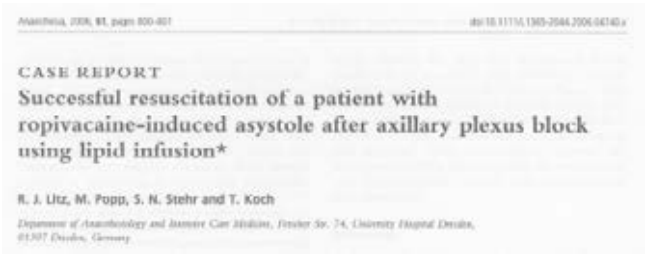
Successful resuscitation of a patient with ropivacaine-induced asystole after axillary plexus block using lipid infusion*

R. J. Litz, M. Popp, S. N. Stehr and T. Koch

TOO SOON TO CELEBRATE?

QUESTIONS

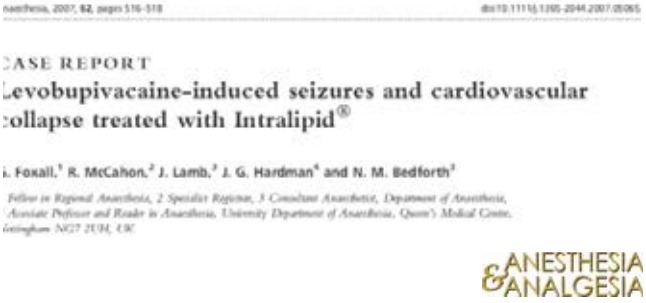
- Adequacy of cardiac work-up
- Use of propofol to manage seizures
- Appropriate use of defibrillation
- Timeliness of initiation of mechanical ventilation
- Possibility of spontaneous recovery
- Choice of local anesthetic
  - — «Retrobupivacaine»



CASE REPORT

Successful resuscitation of a patient with ropivacaine-induced asystole after axillary plexus block using lipid infusion*

R. J. Litz, M. Popp, S. N. Stehr and T. Koch



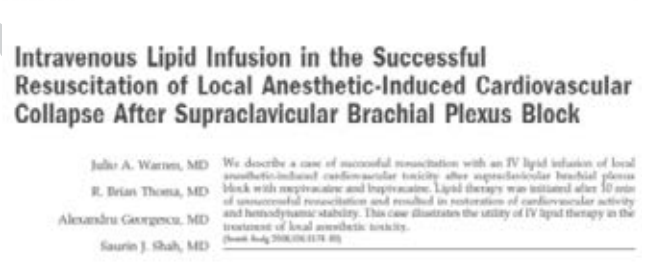
CASE REPORT

Levobupivacaine-induced seizures and cardiovascular collapse treated with Intralipid®

ANESTHESIA & ANALGESIA

Case Report

Simulation Education in Anesthesia Training: A Case Report of Successful Resuscitation of Bupivacaine-Induced Cardiac Arrest Linked to Recent Simulation Training



Case Report

Intravenous Lipid Infusion in the Successful Resuscitation of Local Anesthetic-Induced Cardiovascular Collapse After Supraclavicular Brachial Plexus Block

Case Report

Reversal of Central Nervous System and Cardiac Toxicity After Local Anesthetic Intoxication by Lipid Emulsion Injection

Rainer J. Litz, MD
Thomas Roessel, MD
Axel R. Heller, MD
Sebastian N. Stehr, MD

A 91-yr-old man (57 kg, 156 cm, ASA III) received an infraclavicular brachial plexus block for surgery of humitis of the olecranon. Twenty minutes after infraclavicular injection of 40 mL of mepivacaine 1% (Scandicain®) and 5 min after supplementation of 10 mL of prilocaine 1% (Xylonest®) using an axillary approach, the patient complained of agitation and dizziness and became unresponsive to verbal commands. In addition, supraventricular extrasystole with bigeminy occurred. Local anesthetic toxicity was suspected and a dose of 200 mL of a 20% lipid emulsion was infused. Symptoms of central nervous system and cardiac toxicity disappeared within 5 and 15 min after the first lipid injection, respectively. Plasma concentrations of local anesthetics were determined before, 20, and 40 min after lipid infusion and were 4.08, 2.30, and 1.77 μg/mL for mepivacaine and 0.02, 0.35, and 0.24 μg/mL for prilocaine. These concentrations are below previously reported thresholds of toxicity above 5 μg/mL for both local anesthetics. Signs of toxicity resolved and the patient underwent the scheduled surgical procedure uneventfully under brachial plexus blockade.

(South Med J 2008;101:1175-7)

Case Report

Successful Resuscitation After Ropivacaine and Lidocaine-Induced Ventricular Arrhythmia Following Posterior Lumbar Plexus Block in a Child

Hugues Ludot, MD*
Jean-Yves Thacin, MD*
Mohamed Belouadah, MD†
Jean-Xavier Mazoit, MD, PhD‡§
Jean-Marc Malinovsky, MD, PhD‖

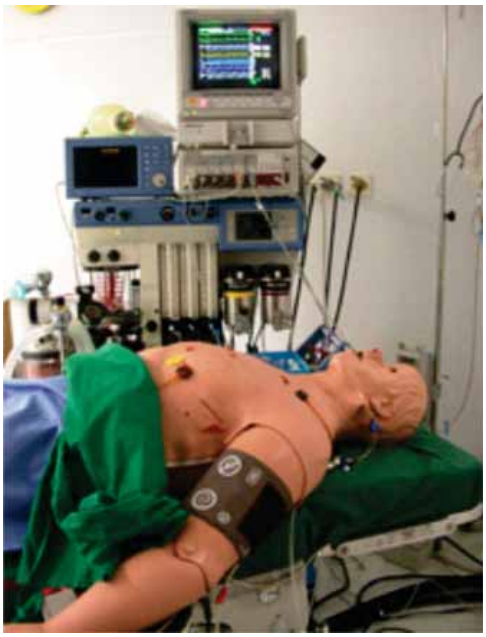
We report the case of a 13-yr-old girl scheduled for knee surgery under general anesthesia and posterior lumbar plexus block. A ventricular arrhythmia developed 15 min after local anesthetic injection. A 20% lipid emulsion was successful in converting the ventricular arrhythmia to a sinus rhythm. This is consistent with previous reports suggesting that lipid emulsion is an effective emergency treatment of local anesthetic toxicity. We recommend the immediate availability of lipid emulsion along with other emergency therapeutics in operating rooms where local anesthetics are used.

(South Med J 2008;101:213-4)

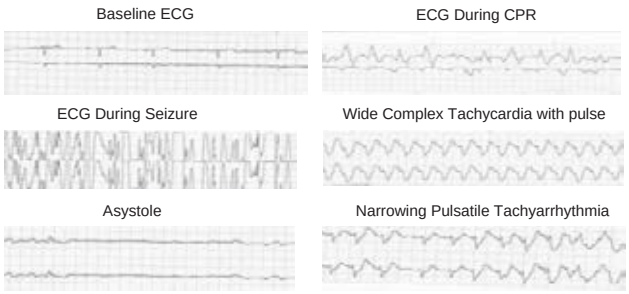
SCIATIC BLOCK

- 83 yr-old 75 kg, TKA with GA plus:
  - — Continous FNB
  - — Single-injection sciatic block
- Block with NS technique
- During injection of bupivacaine 130 mg
  - — LOC
  - — Tonic-clonic seizure
  - — Pulselessness

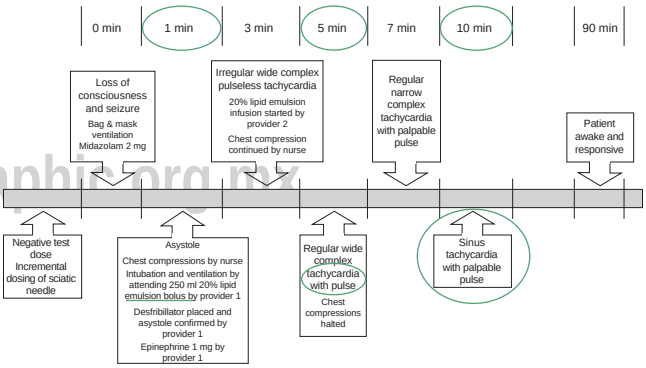
SIMULATION TRAINING



LIPID EMULSION 3 ML/KG



Smith. A&A 2008;106:1581-4.

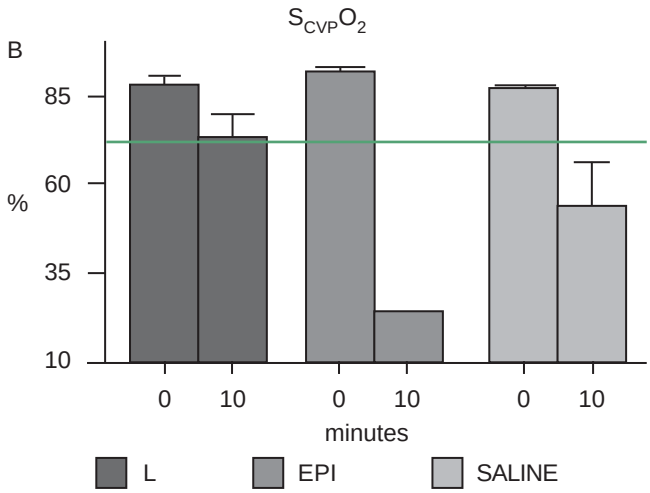


Smith. A&A 2008;106:1581-4.

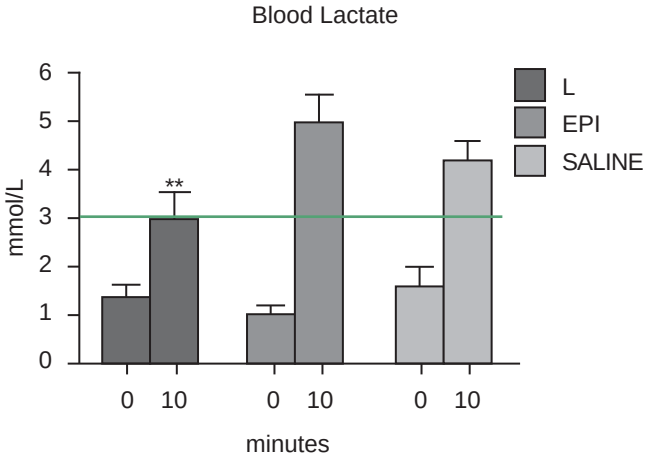
***VERSUS* EPI**
***VERSUS* SALINE**

- Rats + isoflurane + bupiv 20 mg/kg
- 100% O_2 + chest compressions
- Boluses of resuscitation drugs at 2.5 and 5 min
  - — 30% lipid
  - — Saline
  - — Epinephrine 30 µg/kg
- Continuous ECG, arterial pressure
- RPP, pH, lactate, $S_{CVP}O_2$

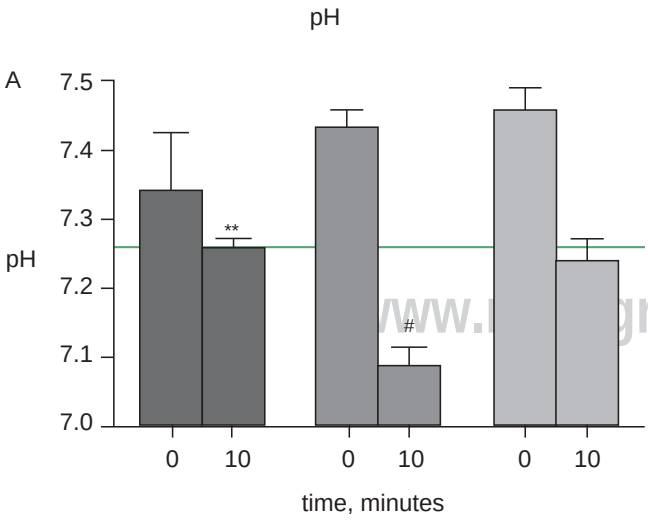
Weinberg. Anesthesiology 2008;108:907.

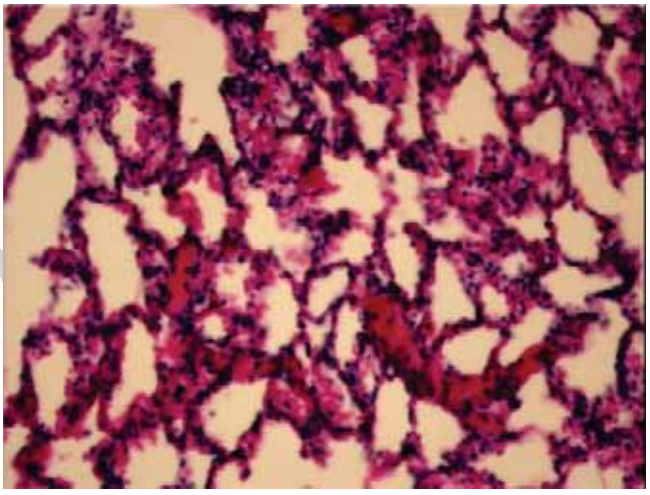


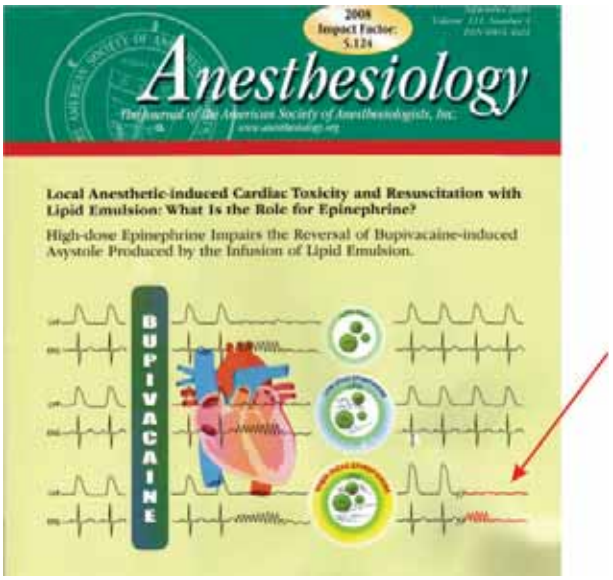
Weinberg. Anesthesiology2008;108:907.



- All metrics improved more with lipid
- 80% rats with Epi had pulmonary edema
- 100% w/epi had ectopy
- Epi might worsen:
  - — Tissue perfusion
  - — Cardiac output
  - — O_2 delivery
- Epi exerts direct metabolic effects that ↑ lactate
- Quality of recovery after epi no better than controls
  - — May even be worse

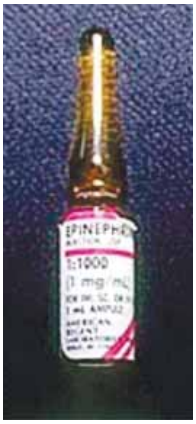






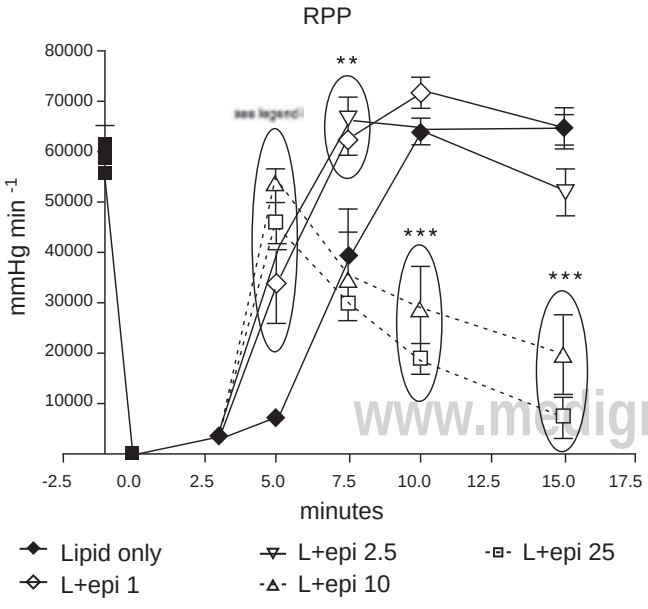
IS HYPERADRENERGIC STIMULATION DETRIMENTAL?

- Epinephrine
  - — Is arrhythmogenic
  - — ↑ myocardial oxygen demand
  - — ↓ subendocardial perfusion
  - — Causes pulmonary edema
- LA cardiac toxicity ↓ contractility, worsened by acidosis
- Repeat boluses may aggravate toxicity
  - — By causing intense vasoconstriction
  - — Increasing lactate



EPINEPHRINE IMPAIRS RESUSCITATION

- 30 rats/6 groups
- Bupivacaine 20 mg/kg
- All tx at 3 minutes
- 30% lipid + epi
- Lipid alone had slower but more sustained recovery
- Epi > 10 µg/kg improved initial return but not sustainable
- Pulmonary edema

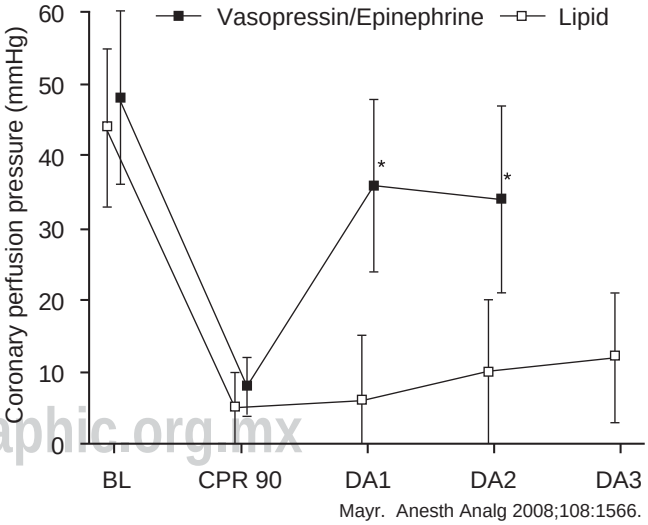


Hiller. Anesthesiology 2009;111:498.

VASOPRESSIN + EPI ↑ CPP MORE THAN LIPID IN A PORCINE MODEL OF BUPI-INDUCED ARREST

- 10 adult pigs with GETA
- 5 mg/kg bupivacaine
- CPR begun 1 minute post-arrest x 2 minutes
- Randomized
  - — 4 mL/kg lipid → 0.5 mL/kg/min
  - — Vasopression + epi (0.4/45, 0.4/45, 0.8/200 U/kg and µg/kg) every 5 minutes
- 5 in the vasopressor group survives, 0 in lipid

Mayr. Anesth Analg 2008;108:1566.



Mayr. Anesth Analg 2008;108:1566.

Pig in a Poke: Species Specificity in Modeling Lipid Resuscitation

Guy Weinberg, MD,*† and Israel Rubinstein, MD†§

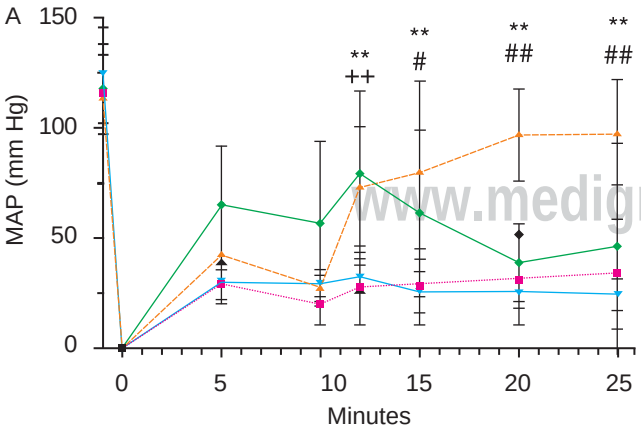
- Compliment activation-related pseudoallergy (CARPA)
  - — Hypersensitivity to liposomal preparations
    - Mottling
    - Hypoxemia
- Authors of 16 papers who did studies 1991-2011 contacted
  - — 12 replies
    - 3 negative
    - 9 reported mottling
    - Shock state or 2° lipid?
- Are pigs an appropriate model?

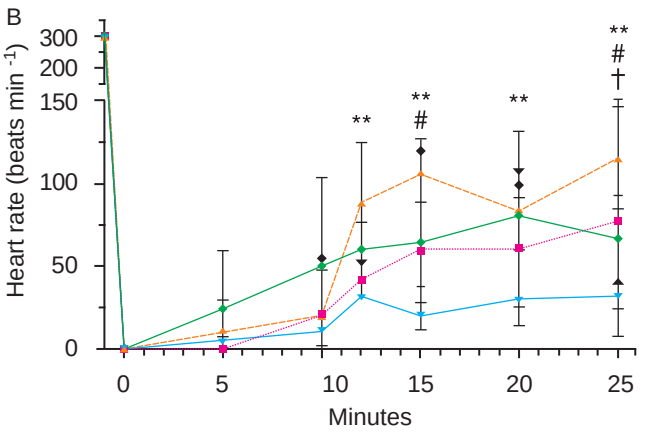
Anesth Analg 2012;114:907.

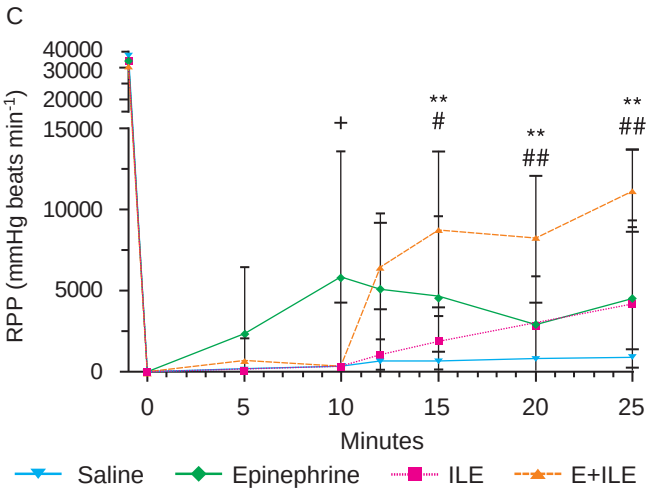
DELAYED RESUSCITATION

- 32 rats with bupivacaine arrest (30 mg/kg)
- BLS x 10 minutes
- Treatment
  - — Saline-1 mL/kg @ 1, 3, 5 min then 5 mL/kg at 10 min and 0.5 mL/kg/min
  - — Epi-10 µg/kg @ 1, 3, 5, 10 min then q 3 min to RPP < 20% baseline
  - — Lipid-1 mL/kg @ 1, 3, 5 min then 5 mL/kg at 10 min and 0.5 mL/kg/min
  - — Lipid+epi-same as lipid but epi 10 µg/kg @ 10 min (12, 15 if needed)
- Results
  - — Lipid+epi had marked improvement in hemodynamics to lipid at 25 min
    - CPP higher
    - Myocardial bupivacaine content lower
  - — Lipid alone (3/8 survived)
    - Higher PO_2
    - Less severe acidosis

Li. BJA 2012;108:857.

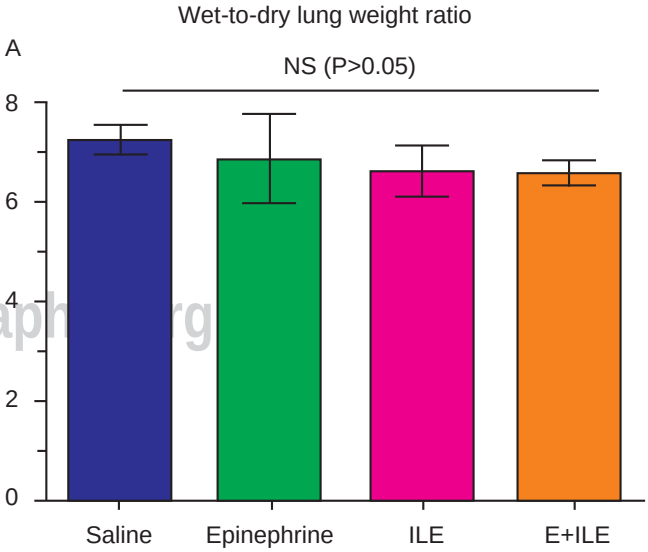


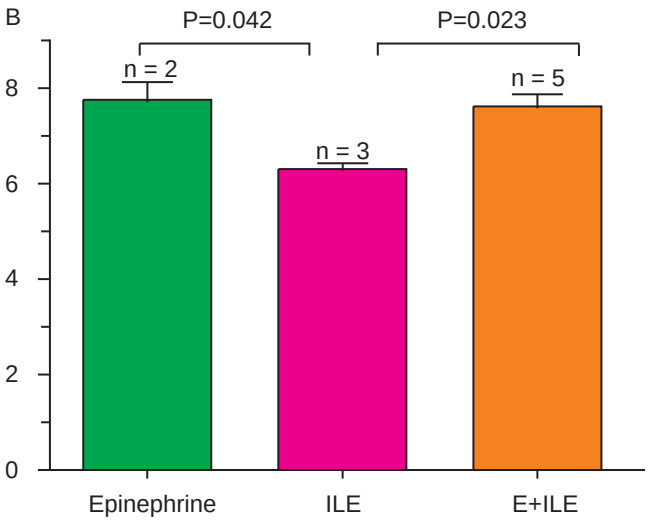




Li. BJA 2012;108:857.

LIPID-ONLY RATS HAD LESS INTERSTITIAL PULMONARY EDEMA



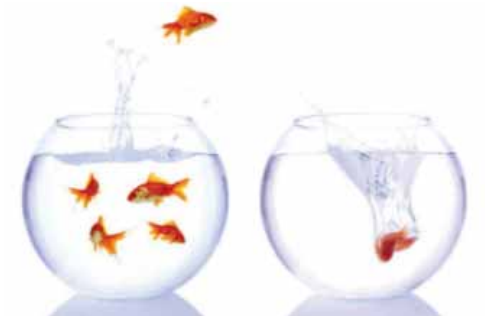


Li. BJA 2012;108:857.

ASRA RECOMMENDS

REDUCING INDIVIDUAL DOSES OF EPINEPHRINE TO < 1 µG/KG

INTELLECTUAL LEAPS…



AMELIORATION OF LIPID SOLUBLE DRUG TOXIDROMES

TOXICOLOGY/CASE REPORT

Use of Lipid Emulsion in the Resuscitation of a Patient With Prolonged Cardiovascular Collapse After Overdose of Bupropion and Lamotrigine

Archie J. Sirianni, MD
Kevin C. Osterhoudt, MD
Diane P. Calello, MD
Allison A. Muller, PharmD
Marie R. Wiserhouse, MD
Michael R. Goodkin, MD
Guy L. Weinberg, MD
Fred M. Henretig, MD

From the Department of Anesthesiology (Sirianni) and Division of Cardiology (Goodkin), Riddle Memorial Hospital, Media, PA; the Department of Pediatrics, University of Pennsylvania School of Medicine and The Children's Hospital of Philadelphia, Philadelphia, PA (Osterhoudt, Calello, Muller, Wiserhouse, Henretig); the Section of Clinical Toxicology, Division of Emergency Medicine, and the Poison Control Center, The Children's Hospital of Philadelphia, Philadelphia, PA (Osterhoudt, Calello, Muller, Henretig); and the Department of Anesthesiology, University of Illinois College of Medicine at Chicago, and Jesse Brown VA Medical Center, Chicago, IL (Weinberg).

Intralipid Infusion Ameliorates Propranolol-Induced Hypotension in Rabbits

Martyn G. Harvey, MBChB[a], Grant R Cave, MBChB[b]

[a]Department of Emergency Medicine, Waikato Hospital, Hamilton, New Zealand
[b]Emergency Medical Systems, Australia, Melbourne Australia

Medical Hypotheses

journal homepage: www.elsevier.com/locate/mehy

Intravenous lipid emulsions combine extracorporeal blood purification: A novel therapeutic strategy for severe organophosphate poisoning

Yaguang Zhou, Chengye Zhan, Yongsheng Li, Qiang Zhong, Hao Pan, Guangtian Yang *

TOXICOLOGY/ORIGINAL RESEARCH

Intralipid Outperforms Sodium Bicarbonate in a Rabbit Model of Clomipramine Toxicity

Martyn Harvey, BHB, MBChB, FACEM
Grant Cave, BHB, MBChB, FACEM

From the Department of Emergency Medicine, Waikato Hospital, Hamilton, New Zealand (Harvey), and the Department of Intensive Care Medicine, Monash Medical Centre, Melbourne, Australia (Cave).

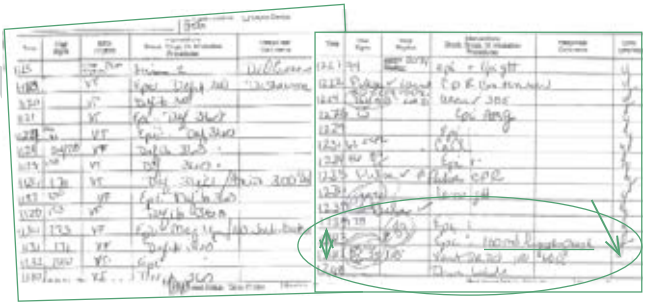
Hemodynamic Effects of Intravenous Fat Emulsion in an Animal Model of Severe Verapamil Toxicity Resuscitated with Atropine, Calcium, and Saline

Theodore C. Bania, MD, MS, Jason Chu, MD, Eric Perez, MD, Mark Su, MD, In-Hui Hahn, MD

OVERDOSE IN THE ED

- 17 yr-old female
- Seizure activity and cardiovascular collapse
  - — 7.95 g bupripion (Wellbutrin XL)
    - Dopamine, norepi and serotonin-reuptake inhibitor
  - — 4 g lamotrigine (Lamictal)
    - Blocks voltage-dependent sodium channels
- > 10 hours post ingestion cardiovascular collapse
- 100 mL bolus 20% lipid emulsion
- 1 minute later sustainable pulse

Sirianni. Ann Emer Med 2008;51:412.



WHERE ARE WE NOW?

Other Therapies

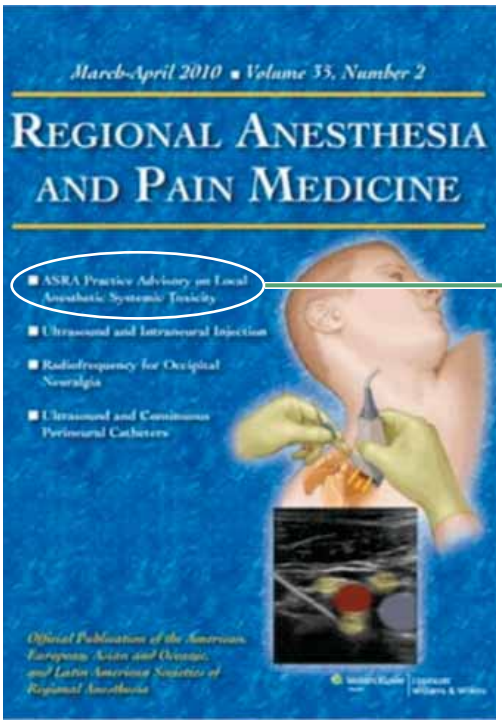
Case reports have suggested that in patients who remain critically hypotensive despite maximal vasopressor therapy, specific interventions using intra-aortic balloon counterpulsation, ventricular assist devices, and extracorporeal membrane oxygenation or other extra corporeal life support (ECLS) devices may be lifesaving.[272–274] While evidence remains weak, at least two human case reports indicate a possible benefit from lipid emulsion infusion for overdose by β-blockers.[275,276] Animal studies are mixed.[277–280] Because this area of therapy is rapidly evolving,[281–283] prompt consultation with a medical toxicologist or other specialists with up-to-date knowledge is recommended when managing treatment-refractory hypotension from β-blocker overdosage.

Local Anesthetic Toxicity

Inadvertent intravascular administration of local anesthetics, such as bupivacaine, mepivacaine, or lidocaine, can produce refractory seizures and rapid cardiovascular collapse leading to cardiac arrest. Clinical case reports[351–355] and controlled animal studies[356–360] have suggested that rapid IV infusion of lipids may reverse this toxicity either by redistributing the local anesthetic away from its site of action or by augmenting metabolic pathways within the cardiac myocyte.

Case reports have shown return of spontaneous circulation in patients with prolonged cardiac arrest unresponsive to standard ACLS measures,[361,362] suggesting a role for administration of IV lipids during cardiac arrest. Although ideal dosing has not been determined, because dosage varied across all studies, it may be reasonable to consider 1.5 mL/kg of 20% long-chain fatty acid emulsion as an initial bolus, repeated every 5 minutes until cardiovascular stability is restored (Class IIb, LOE C).[363] After the patient is stabilized, some papers suggest a maintenance infusion of 0.25 mL/kg per minute for at least 30 to 60 minutes. A maximum cumulative dose of 12 mL/kg has been proposed.[363]

Some animal data suggest that lipid infusion alone may be more effective than standard doses of epinephrine or vasopressin.[357,360] Although there is limited evidence to change routine care for severe cardiotoxicity, several professional societies advocate protocolized clinical use.[364–366] Because this is a rapidly evolving clinical area,[367,368] prompt consultation with a medical toxicologist, anesthesiologist, or other specialist with up-to-date knowledge is strongly recommended.



ASRA Practice Advisory on Local Anesthetic Systemic Toxicity

ORIGINAL ARTICLE

Clinical Presentation of Local Anesthetic Systemic Toxicity

A Review of Published Cases, 1979 to 2009

REVIEW ARTICLE

Treatment of Local Anesthetic Systemic Toxicity (LAST)

Guy L. Weinberg, MD

REVIEW ARTICLE

Prevention of Local Anesthetic Systemic Toxicity

Michael F. Mulvey, MD and Michael R. Hejtmanek, MD

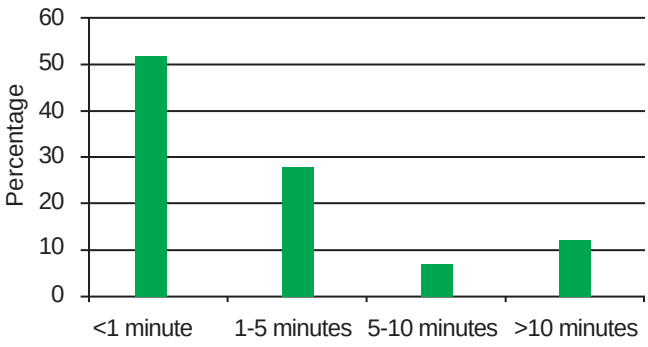
HISTORY ARTICLE

Local Anesthetic Systemic Toxicity

A Historical Perspective

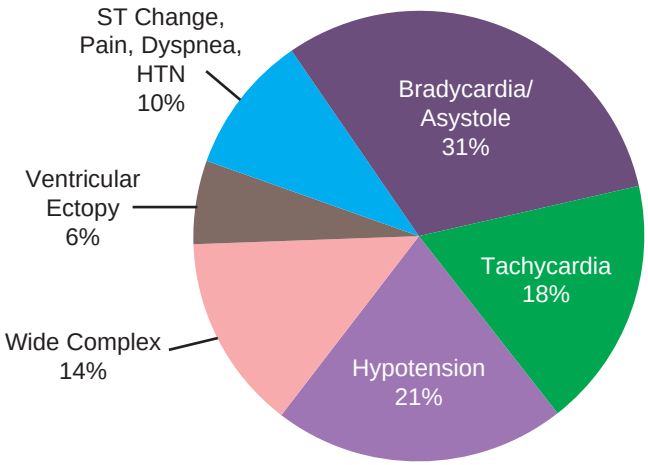
Kenneth Drasner, MD

TIMING OF ONSET OF SYMPTOMS, N = 77



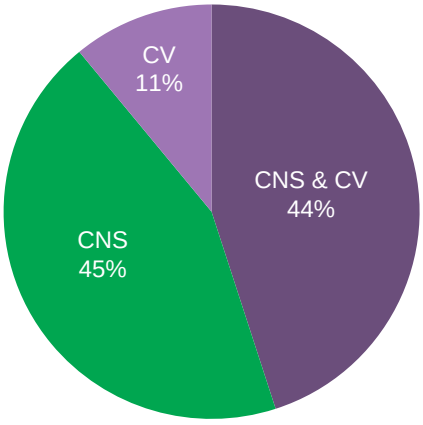
Di Gregorio. RAPM 2010;35:181.

SPECTRUM OF CARDIAC SIGNS



Di Gregorio. RAPM 2010;35:181.

SPECTRUM OF PRESENTING SIGNS, N = 93



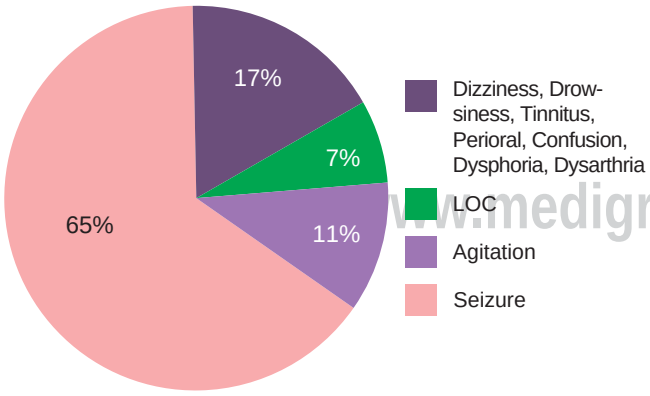
Di Gregorio. RAPM 2010;35:181.

RECOMMENDATIONS FOR DIAGNOSING LAST

- Progression of subjective symptoms
  - — Vigilant
- Timing is variable
  - — < 1 minute - IV injection with direct access to brain
  - — 1-5 minutes - partial IV injection/slow circ time/delayed absorption
  - — > 15 minutes - consider monitoring for 30 min
- Heightened vigilance
  - — Underlying disease
  - — Extremities of age
- Have LOW threeshold for considering dx of LAST with atypical symptoms after receiving more than minimal dose

Di Gregorio. RAPM 2010;35:181

SPECTRUM OF CNS SIGNS

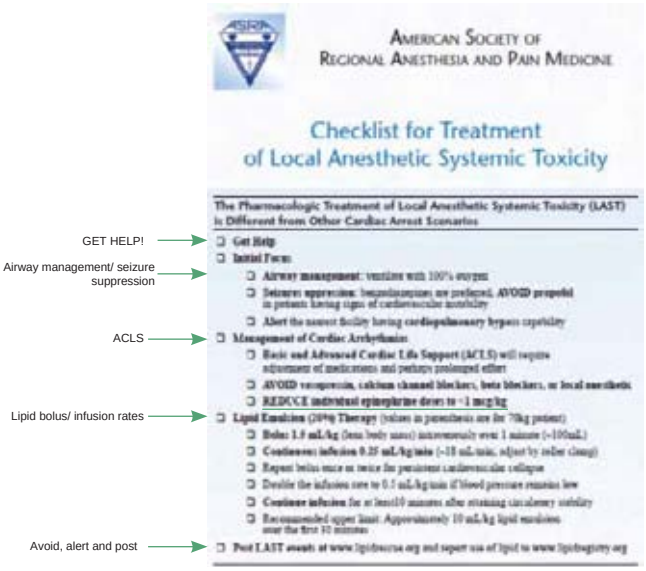


Di Gregorio. RAPM 2010;35:181.

PREVENTION

Use the lowest effective dose of local anesthetic (dose = volume x concentration).
Particularly with fixed needle techniques, incrementally pause 15-30 seconds between injections.
Aspirate before each injection, but recognize that aspiration has a 2% false-negative rate.
Intravascular markers are highly recommended. Only epinephrine (10-15 mcg per test dose) or fentanyl (100 mcg in laboring patients) have been proven effective for this purpose.
Ultrasound guidance reduces the frequency of accidental vascular puncture, but studies are conflicting regarding its ability to actually decrease LAST events. Ultrasound-guidance should not be considered a substitute for other preventative measures.
Patients receiving potentially toxic doses of local anesthetic should be monitored for at least 30 minutes after injection.

Neal. ASA Newsletter. 2012;76:22.



American Society of Regional Anesthesia and Pain Medicine

Checklist for Treatment of Local Anesthetic Systemic Toxicity

The Pharmacologic Treatment of Local Anesthetic Systemic Toxicity (LAST) is Different from Other Cardiac Arrest Scenarios

- GET HELP!
- Airway management/ seizure suppression
- ACLS
- Lipid bolus/ infusion rates
- Avoid, alert and post

WWW.LIPIDRESCUE.ORG

LipidRescue™

Rescate Lipidico

TRATAMIENTO PARA LA PARADA CARDIACA INDUCIDA POR ANESTESICO LOCAL

POR FAVOR MANTENGA ESTE PROTOCOLO ADJUNTO A LA BOSA DE INTRALIPID

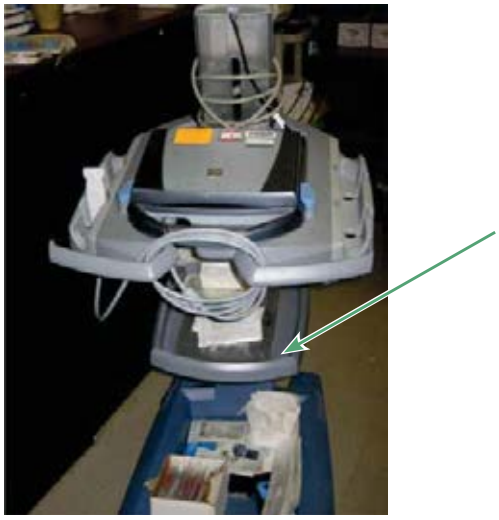
En caso de parada cardiaca precipitada por anestesico local que no responde al tratamiento standard, a parte de la reanimacion cardiopulmonar, Intralipid 20% debe ser administrado de acuerdo con el siguiente regimen:

- Intralipid 20% 1.5 mL/kg inyeccion rapida durante 1 minuto
- Seguido inmediatamente por una infusion a 0.25 mL/kg/min,
- Continue el masaje cardiaco (el lipido tiene que circular)
- Repetir una inyeccion rapida cada 3-5 minutos llegando a los 3 mL/kg dosis total en inyeccion rapida hasta que la circulacion recomience
- Continuar la infusion hasta que se establezca estabilidad hemodinamica. Aumentar la velocidad a 0.5 mL/kg/min si la presion arterial baja
- La dosis total maxima recomendada es 8 mL/kg

En la practica, en la reanimacion de un adulto que pesa 70 Kg:

- *Coja una bolsa de 500ml de Intralipid 20% y una jeringuilla de 50 ml.*
- *Prepare 50 ml de Intralipid de la bolsa y administrelo en inyeccion rapida, repita la operacion otra vez*
- *Despues introduzca un gotero en la bolsa de Intralipid y dejelo correr intravenosamente durante los proximos 15 minutos*
- *Repetir la inyeccion rapida inicial dos veces mas – si la circulacion espontanea no ha vuelto.*

Si usa Intralipid para tratar un caso de toxicidad de anestesico local por favor informenos a traves de la pagina web www.lipidrescue.org.



WHAT'S ON THE HORIZON?

- Dissemination of guidelines for the treatment of LAST
- Studies elucidating the role of epinephrine/vasopressors in resuscitation needed with attention to:
  — Experimental design
  — Endpoints
- The development of anionic pegylated particles with increased surface area that may be specific LA antidotes