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XXIX CONGRESSO NAZIONALE

ESRA Italian Chapter

CESENA, Cesena Fiera

7-9 Novembre 2024

Presidenti del Congresso:
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European Society of Regional Anaesthesia & Pain Therapy

ESRA ITALIA

Gestione delle complicanze in corso di ALR

Antonio Coviello, Researcher

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Agenda : complications in ALR

1. BACKGROUND
2. PREVENTION
3. MANAGEMENT

https://doi.org/10.1016/j.mpaic.2021.11.007

COMPLICATIONS OF REGIONAL ANESTHESIA

Central Neuraxial Blockade

- Post-dural puncture headache
- Infective complications
- Vertebral canal haematoma
- Spinal cord injury
- Transient neurological neuropathy
- Adesive arachnoiditis
- High spinal block
- Total spinal block

Peripheral Nerve Block

- Peripheral nerve injury
- LAST
- Vasovagal reaction
- Hemidiaphragmatic paresis
- Pneumothorax
- Pneumoperitoneum

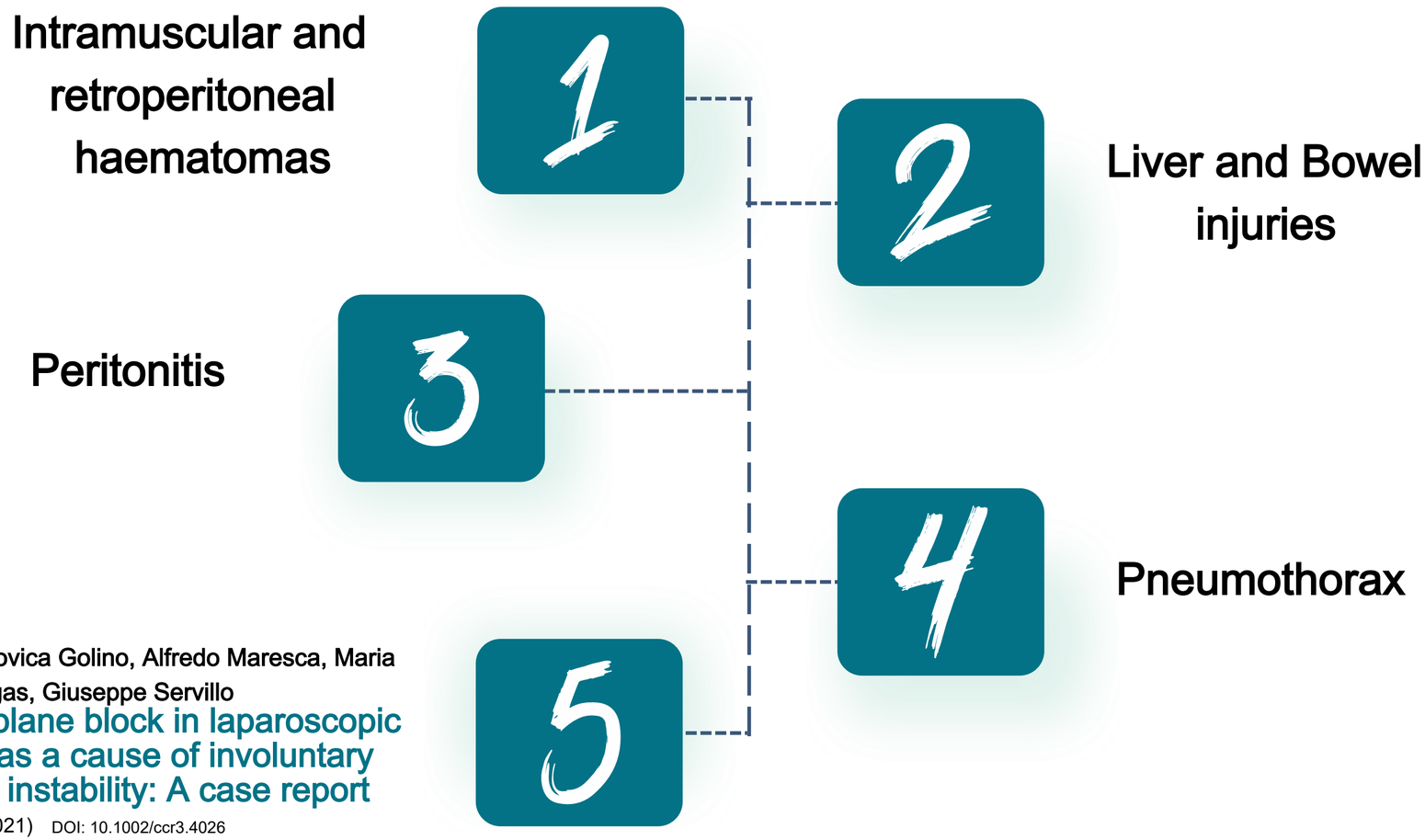
Both

- Hypotension
- Bradycardia
- Nausea
- Vomiting
- Failure block
- Wrong site block

B.Atterton, G.Crowe, EML. Moran

FASCIAL PLANE BLOCK- CON

Regional Anesthesia & Pain Medicine (2023)
10.1136/rapm-2023-ESRA.687



Antonio Coviello, Ludovica Golino, Alfredo Maresca, Maria Vargas, Giuseppe Servillo

Erector spinae plane block in laparoscopic nephrectomy as a cause of involuntary hemodynamic instability: A case report

Clinical case reports (2021) DOI: 10.1002/ccr3.4026

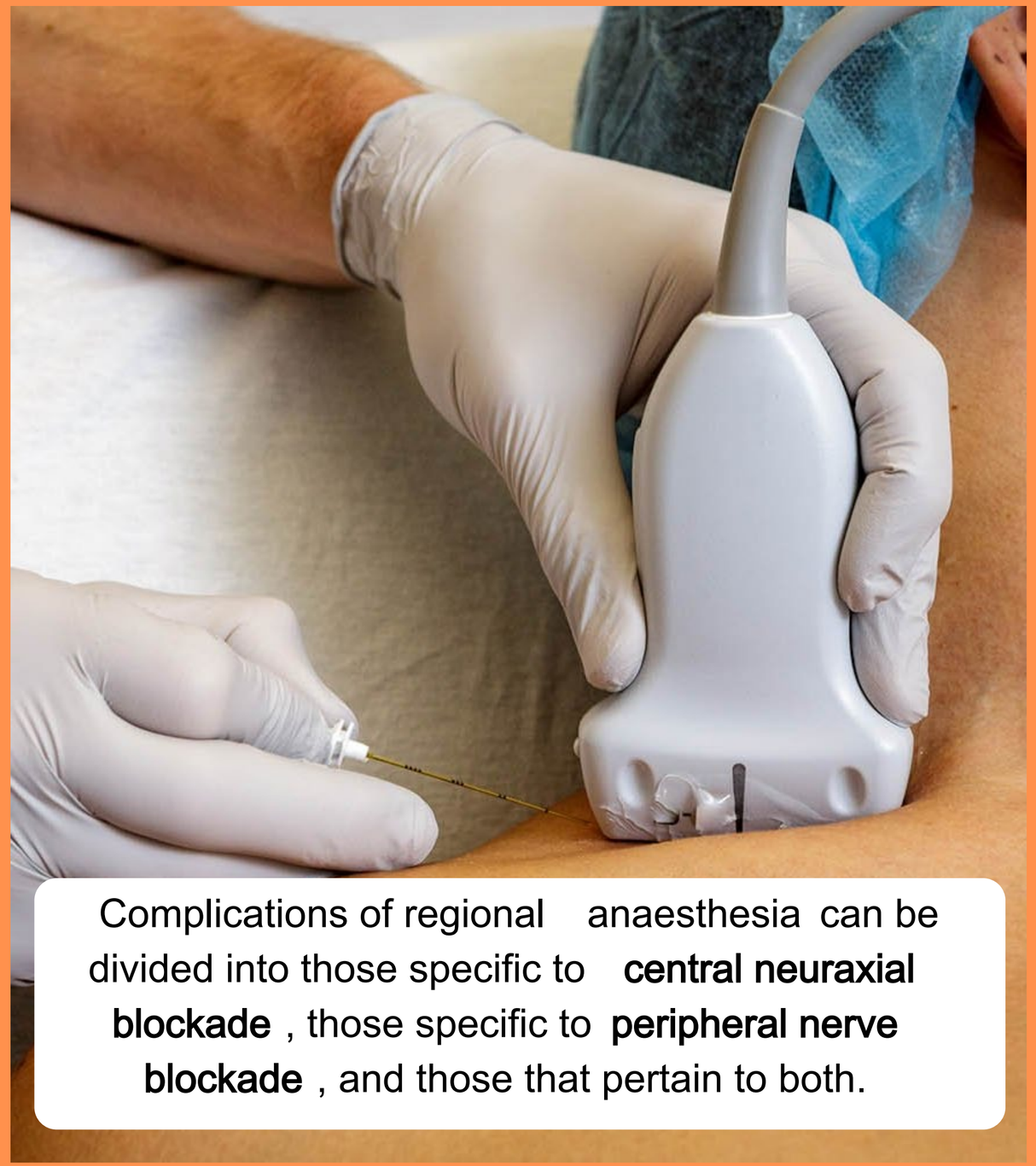
Alasdair Taylor, Calum RK Grant

COMPLICATIONS OF REGIONAL ANESTHESIA

Anaesthesia & Intensive Care Medicine (2022)
10.1016/j.mpaic.2021.11.007

The incidences of major complications of regional anaesthesia

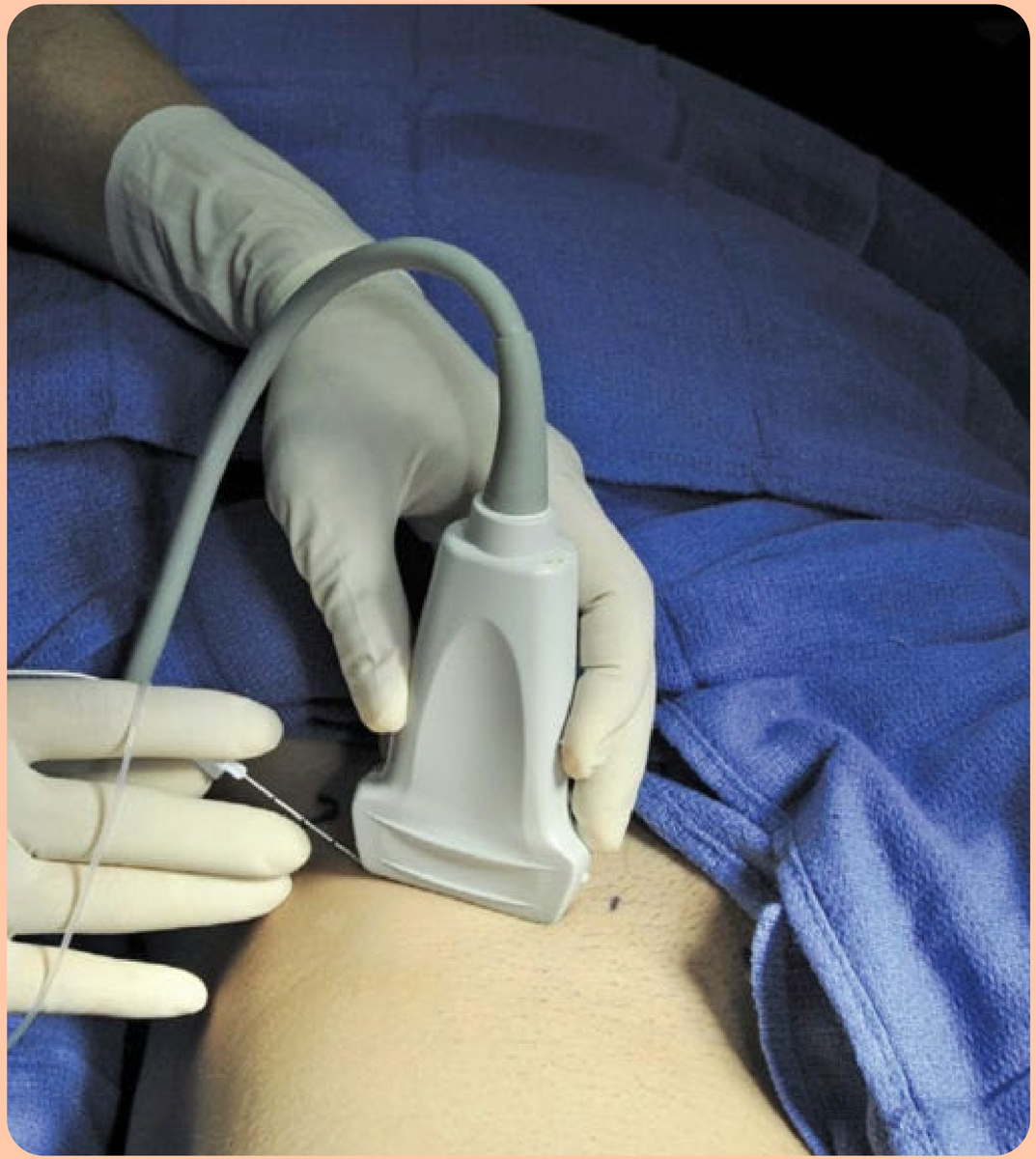
Complication	Incidence
Central neuraxial blockade	
PDPH following spinal	1 in 500[9]
PDPH following epidural tap	66 in 100[9]
Epidural abscess	1 in 47,000[3]
Meningitis	<1 in 200,000[3]
Vertebral canal haematoma	1 in 118,000[3]
Spinal cord injury	1 in 100,000–243,000[3]
Peripheral nerve block	
Peripheral nerve injury	1 in 2,500–5,000[5]
Central or peripheral complications	
LA toxicity	Unknown
Total spinal	Unknown
Failed block (spinal)	1 in 100[12]

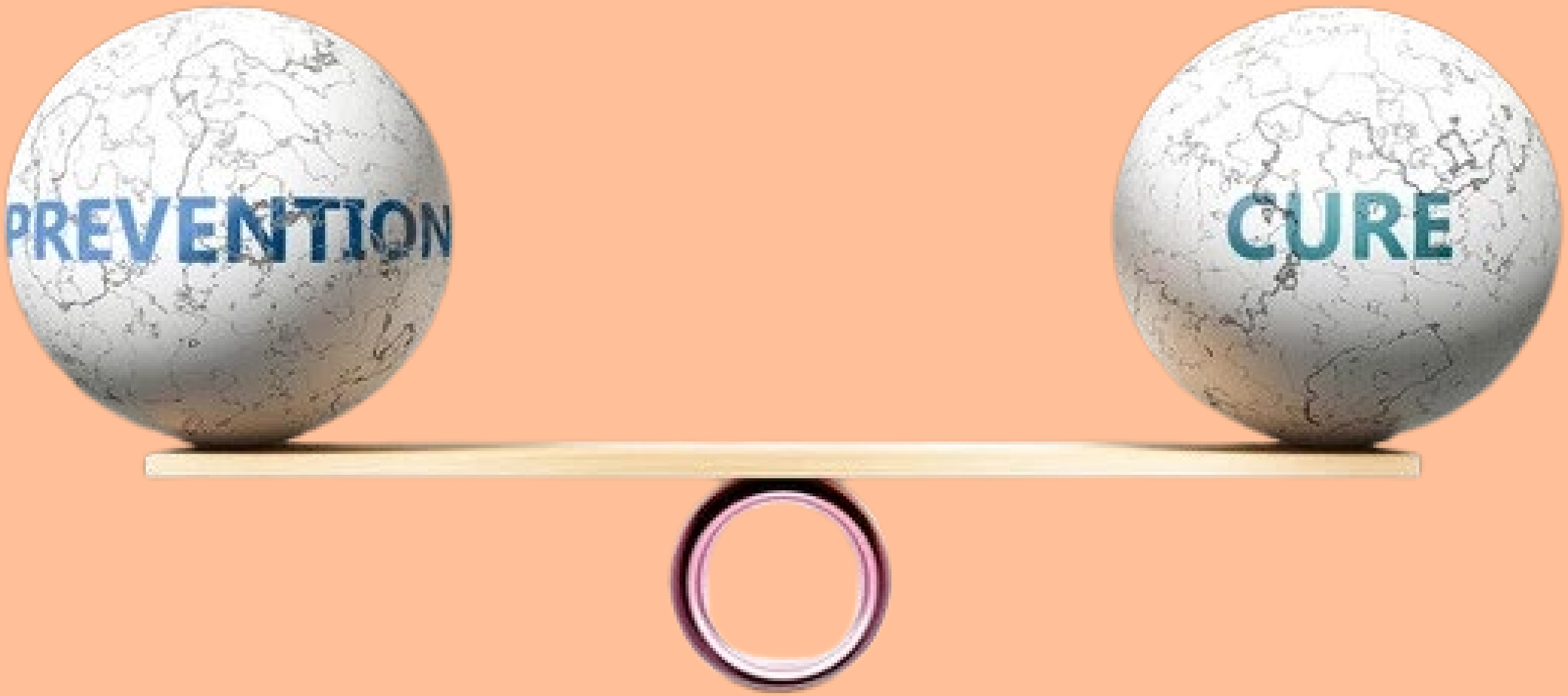


Complications of regional anaesthesia can be divided into those specific to **central neuraxial blockade**, those specific to **peripheral nerve blockade**, and those that pertain to both.

☐ CENTRAL NEURAXIAL BLOCKADE

☑ PERIPHERAL NERVE BLOCK




PREVENTION
CURE

Linee guida per la sicurezza in anestesia loco -regionale

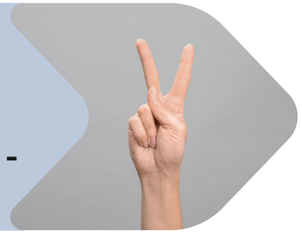
Versione 1 - 28/08/2024

European Society of Regional Anaesthesia & Pain Therapy
ESRA ITALIA

SIAARTI
PRO VITA CONTRA DOLOREM SEMPER

1 DUAL GUIDANCE

Administration by “dual guidance” vs exclusive ENS use in peripheral nerve blocks with motor component is suggested because it reduces the risk of occurrence of serious neurological and/or nerve related complications -

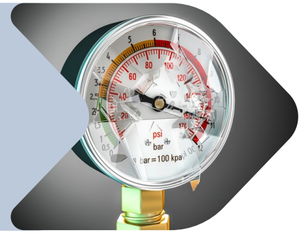


2 USE OF ULTRASOUND

In adult patients, the use of ultrasound guidance for peripheral nerve block administration is suggested because it ensures the safety of the procedure in the patient, reducing the risk of complications.

3 PRESSURE

Performing peripheral blocks performed with infusion pressure monitoring techniques does not reduce the occurrence of neurological complications in the adult patient



4 HYGIENIC STANDARDS

Skin disinfection with chlorhexidine in 2% ethyl solution, disposable probe covers, and a no-touch technique may be sufficient to reduce the occurrence of technique -related infection

Azi LMTA, Fonseca NM, Linard LG (Systematic Review)

SBA 2020: Regional anesthesia safety recommendations update

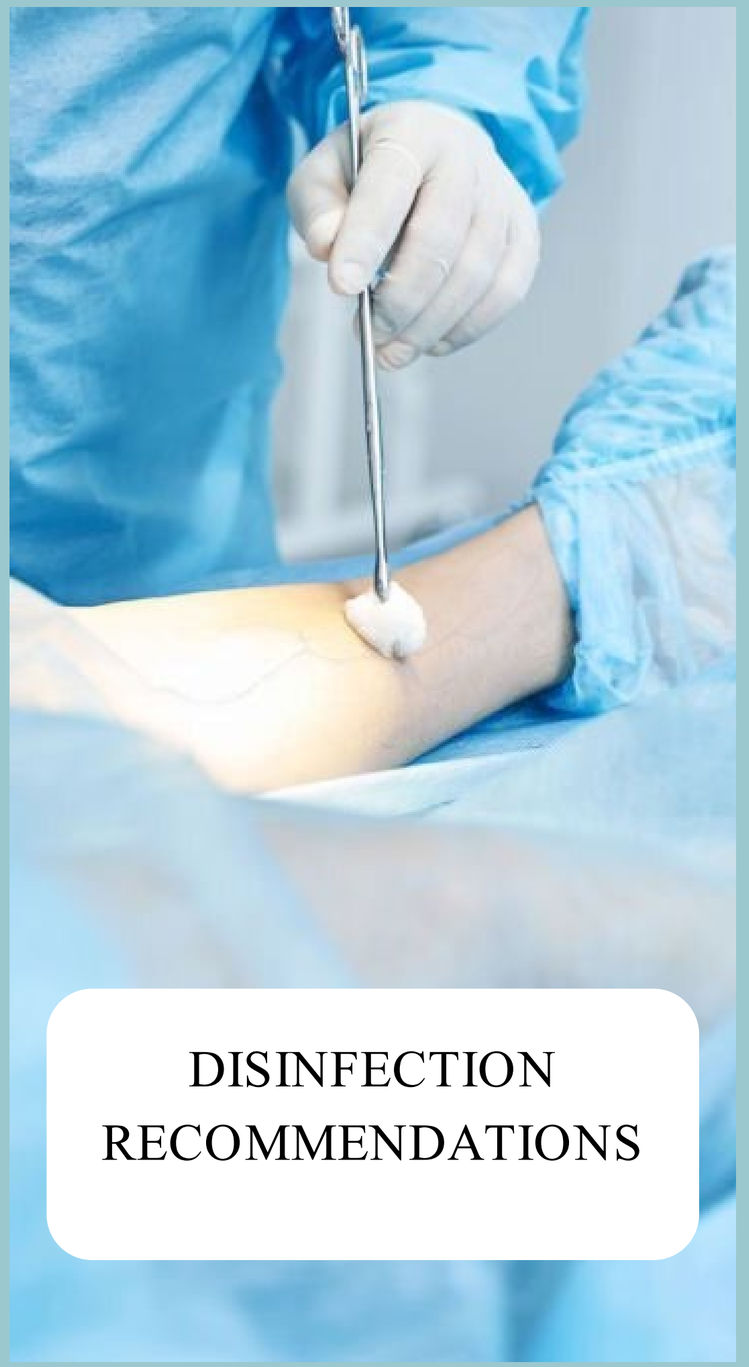
Brazilian Journal of Anesthesiology (2020)
10.1016/j.bjan.2020.02.005

1 CHLORHEXIDINE 0.5%

A meticulous technique is recommended when 0.5% chlorhexidine in 70% alcohol is used for skin antisepsis.

2 ULTRASOUND PROBE

Sterile gel and sterile trasducer cover are required. Ideally, a telescopic cover should be used and secured in place by sterile rubber band.



DISINFECTION RECOMMENDATIONS

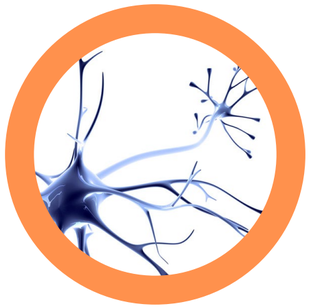
Alasdair Taylor, Calum RK Grant

COMPLICATIONS OF REGIONAL ANESTHESIA

Anaesthesia & Intensive Care Medicine (2022)
10.1016/j.mpaic.2021.11.007

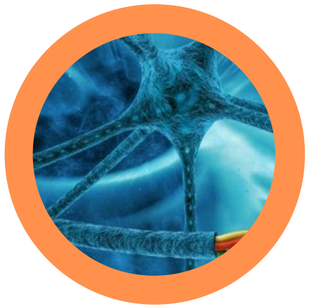
PERIPHERAL NERVE INJURY

Meta-analysis gives an incidence of 9% of transient neurological symptoms lasting up to 28 days postoperatively, regardless of whether ultrasound or electrical stimulation was used.



The rate of long-term nerve injury is 2-4 per 10,000 for both ultrasound and electrical stimulation guided blocks

Ultrasound-guided techniques may be associated with more needle manipulation, potentially increasing the risk of direct needle-to-nerve trauma



The vast majority of peripheral nerve injuries are transient. A range of incidences are quoted in the literature, from 0 to 2.2% at 3 months, 0-0.8% at 6 months, falling to 0e0.2% at 12 months

Ben Carey, Michael Barrington

NERVE INJURY IN REGIONAL ANESTHESIA

(2022)

https://resources.wfsahq.org/atotw/nerve -injury -in -regional -anaesthesia/

Seddon	Sunderland Type	Severity	Pathopysiology	Prognosis	Recovery Time
Neuroapraxia	1	Mild	Focal demyelination with intact axon;. slow conduction	Good	Weeks to month
Axonotmesis	2 3 4	Moderate	2. Axonal interruption; conservation of endoneurium, perineurium, and epineurium; no conduction 3. Type 2, endoneurium disruption 4. Type 2, endoneurium and perineurium disruption	Fair	Variable
Neurotmesis	5	Severe	Completely severed	Poor	Variable

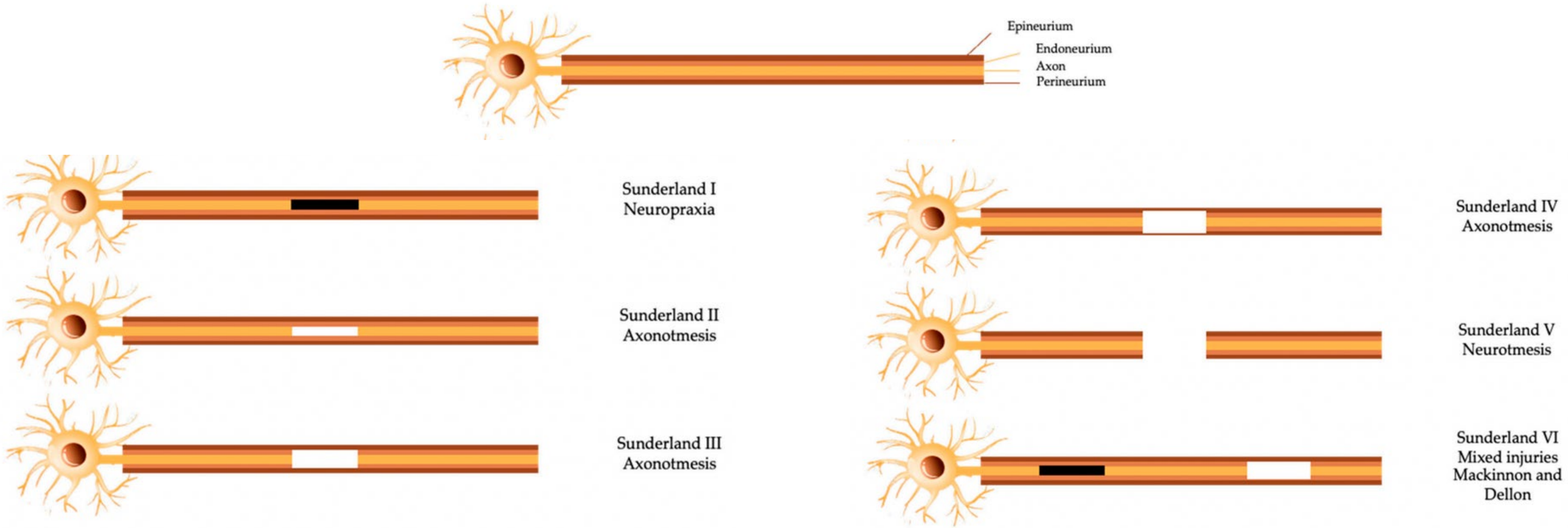
Bruna Lopes, Patria Sousa et al. (Review)

Peripheral Nerve Injury Treatments and Advances: One Health Perspective

Int. J. Mol. Sci. 2022

https://doi.org/10.3390/%20ijms23020918

6-degree injury by Mackinnon and Dello (1988)



Alasdair Taylor, Calum RK Grant

COMPLICATIONS OF REGIONAL ANESTHESIA

Anaesthesia & Intensive Care Medicine (2022)
10.1016/j.mpaic.2021.11.007

Cause neuropraxia, giving a better prognosis as the axon is left intact.

Axonal loss or damage and carry a less favourable prognosis

Direct needle trauma

absence of pain and paraesthesia on injection is not a reliable indicator of extraneural needle placement.

Toxic injury

caused by subepineural LA injection and neural exposure to high concentrations of LAs.

Compressive injury

may be caused by prolonged tourni - quet use, by poor positioning in theatre or by a haematoma

Stretch injury

a result of excessive traction or improper positioning.

Ischaemic injury

can result from vascular injury, pre - existing atherosclerosis, pre - existing neuropathy, and the use of vasoconstrictors.

Ben Carey, Michael Barrington

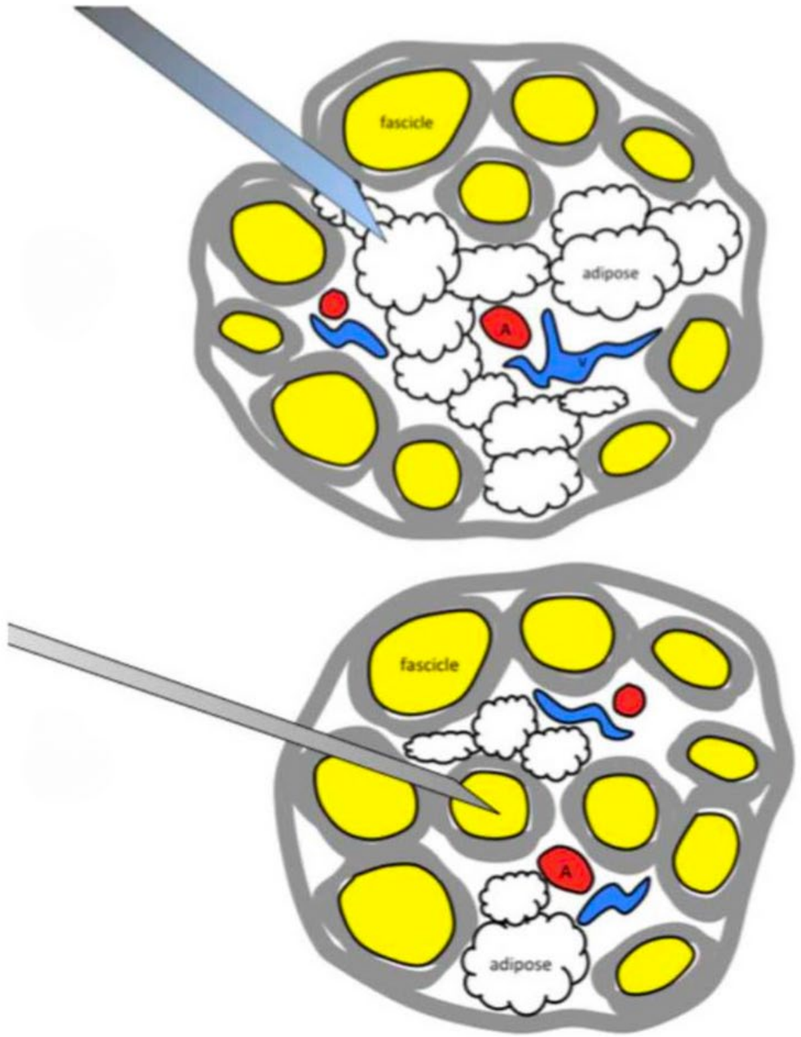
NERVE INJURY IN REGIONAL ANESTHESIA

(2022)

https://resources.wfsahq.org/atotw/nerve-injury-in-regional-anaesthesia/

- In clinical practice after block needle direct trauma injury, local anesthetics and corticosteroids are used to reduce swelling and inflammation

- No difference has been found in the literature between perineural and intravenous administration of corticosteroids for the treatment of peripheral nerve injury



Bruna Lopes, Patria Sousa et al. (Review)

Peripheral Nerve Injury Treatments and Advances: One Health Perspective

Int. J. Mol. Sci. 2022
https://doi.org/10.3390/%20ijms23020918

Pharmacologic and nutritional therapy of peripheral nerve injury

01

CORTICOSTEROIDS

The study of Bernstein et al. demonstrated that the administration of oral corticosteroids enhances the motor and sensory recovery after iatrogenic PNI

02

ERYTHROPOIETIN (EPO)

The mechanism of action is not well known but it is thought that EPO promotes the expression of myelin genes, such as MPZ and PMP22, maintaining more myelinated axons at the site of injury

03

4-AMINOPYRIDINE (4 -AP)

Improve nerve velocity of conduction, allowed a better and faster behavioral and motor recovery and promotes remyelination, in established mouse model after PNI.

04

POLY-UNSATURED ACIDS (PUFA)

A study in Wistar rats, proved that the intake of n-3 PUFAs has positive effects on the regeneration of a sciatic nerve injury

05

VITAMINS

- Vitamin B6 supplementation mitigates symptoms of neuropathy and numbness.
- Vitamin B12 promotes axonal regeneration by improving the remyelination
- Vitamin C can promote SC myelination through direct epigenetic regulation after PNI

06

FOLIC ACID, CURCUMIN, RESVERATROL

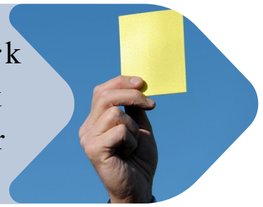
seem to be powerful neuroprotectors

El-Boghdadly K, Chin KJ, Chan VWS.
PHRENIC NERVE PALSY AND REGIONAL ANESTHESIA FOR SHOULDER SURGERY: ANATOMICAL, PHYSIOLOGIC AND CLINICAL CONSIDERATIONS
Anesthesiology (2017)
doi: 10.1097/ALN.0000000000001668

PHRENIC NERVE PALSY: epidemiology

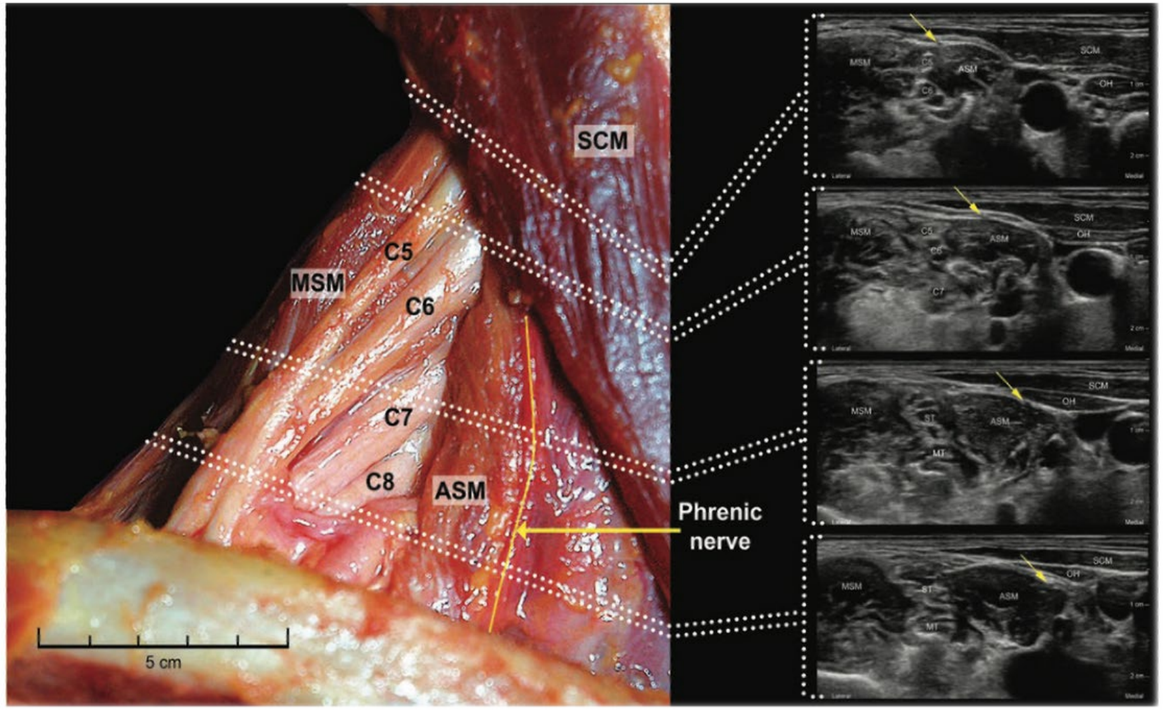
1 ***TRANSIENT***

Its incidence is virtually 100% after landmark and paresthesia-guided interscalene block that use a large-volume of 20 ml or greater



2 ***PERSISTENT***

Its incidence has been estimated from case series data to range from 1 in 2.000 up to 1 in 100



Ryung A Kang and Justin Sangwook Ko (Review)

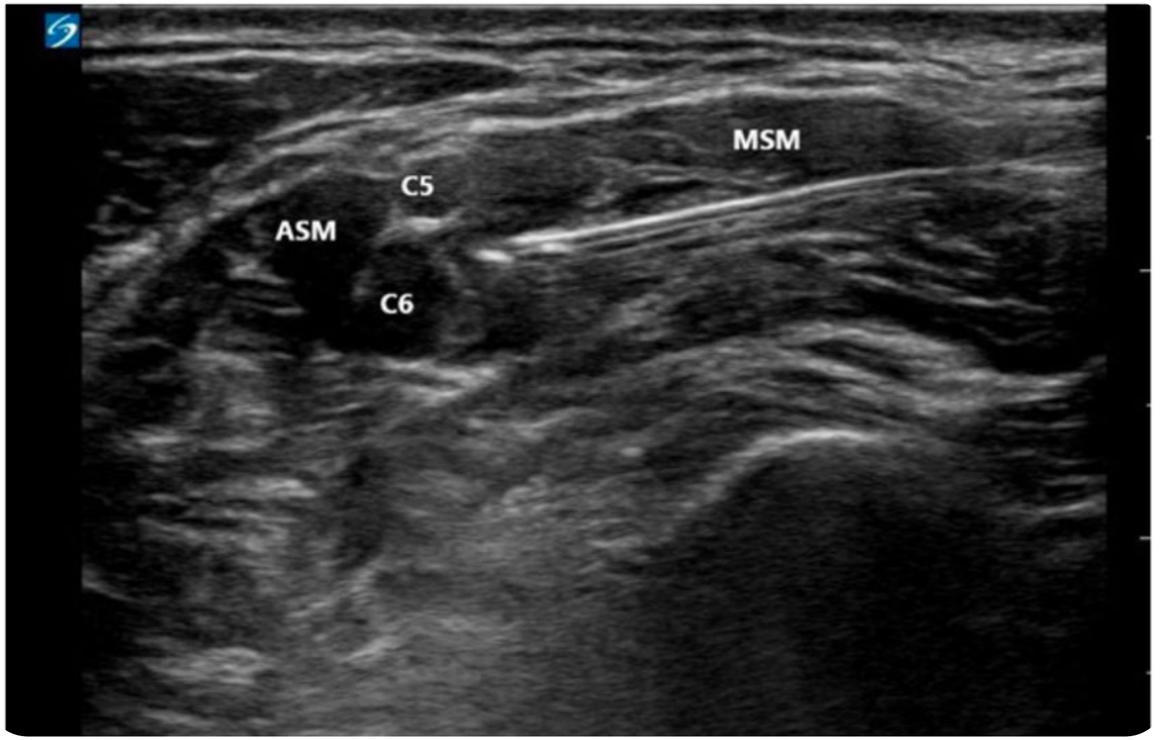
RECENT UPDATES ON INTERSCALENE BRACHIAL PLEXUS BLOCK FOR SHOULDER SURGERY

Anesthesia and Pain Medicine (2023)
doi:
10.17085/apm.22254.

EXTRAFASCIAL VS INTRAFASCIAL INJECTION

EXTRAFASCIAL INJECTION FOR ISBPB:

- Reduce the incidence of hemidiaphragmatic paresis.
- Affect pulmunary function
- Providing analgesia similar to a conventional intrascial injection
- May reduce the potential for neurologic injury



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Anesthesiology (2017)
doi: 10.1097/ALN.0000000000001668

STRATEGIES TO REDUCE PHRENIC NERVE PALSY

ALTERNATIVE TECHNIQUES OF LRA

- Superior trunk(C5 -C6 roots)
- Suprascapular and axillary nerve block

LA CONCENTRATION REDUCTION

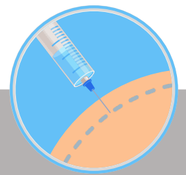
- The incidence of phrenic nerve palsy was reduced from 71% to 42% by halving the concentration of ropivacaine from 0.2% to 0.1%

CHANGE OF LA INJECTION SITE

- US-guided extrafascial (periplexus) injection performed 4 mm lateral to the brachial plexus sheath reduced drastically the incidence of diaphragmatic paresis

CHANGE OF LA INJECTION METHOD

- Injecting LA through a catheter produces less dramatic change in diapgragmatic sonographic excursion than a large -volume bolus injection through a needle



LA VOLUME REDUCTION

- A volume of 5ml : reduces the incidence of phrenic nerve palsy to between 27 and 45%,
- A volume of 10ml : reduces the incidence to as low as 60%.

Nysora

MONITORING PHRENIC NERVE PALSY WITH “POCUS” AFTER REGIONAL ANESTHESIA

May 16, 2024

01

PREOPERATIVE DIAPHRAGM ASSESSMENT

Subcostal view: excursions **of 1 cm** were measured during shallow breathing, indicating that the patient’s diaphragm was functioning properly.

02

POSTOPERATIVE DIAPHRAGM MONITORING

In case of significant reduction in diaphragmatic excursion partial paralysis of the diaphragm is confirmed

03

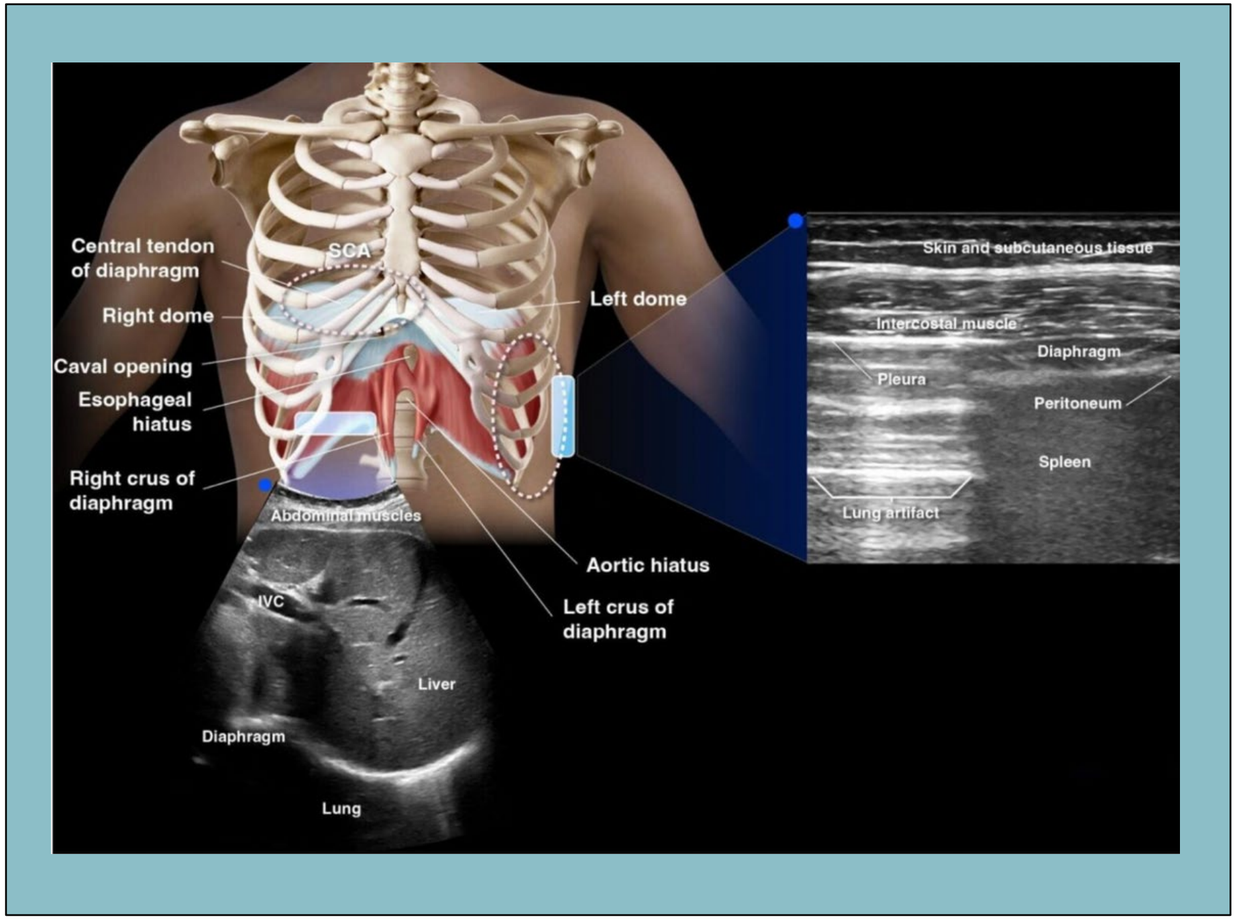
AVOID UNNECESSARY INTERVENTIONS

Such as supplemental oxygen or more invasive monitoring

04

POCUS: ENSURE PATIENT SAFETY

Through continuous and serious evaluation of residual diaphragmatic block



A. J. R. Macfarlane, M. Gitman , K. J. Bornstein, K. El-Boghdadly and G. Weinberg

Updates in our understanding of local anaesthetic systemic toxicity: a narrative review

Anaesthesia (2021)
doi:10.1111/anae.15282

LAST: incidence

Based on the congruity of Rubin et al. and Morwald et al., a LAST rate of 1–2 events per 1000 nerve blocks is reasonable.

More recent data and the advent of new techniques, such as fascial plane blocks, suggest that the incidence of LAST is increased.

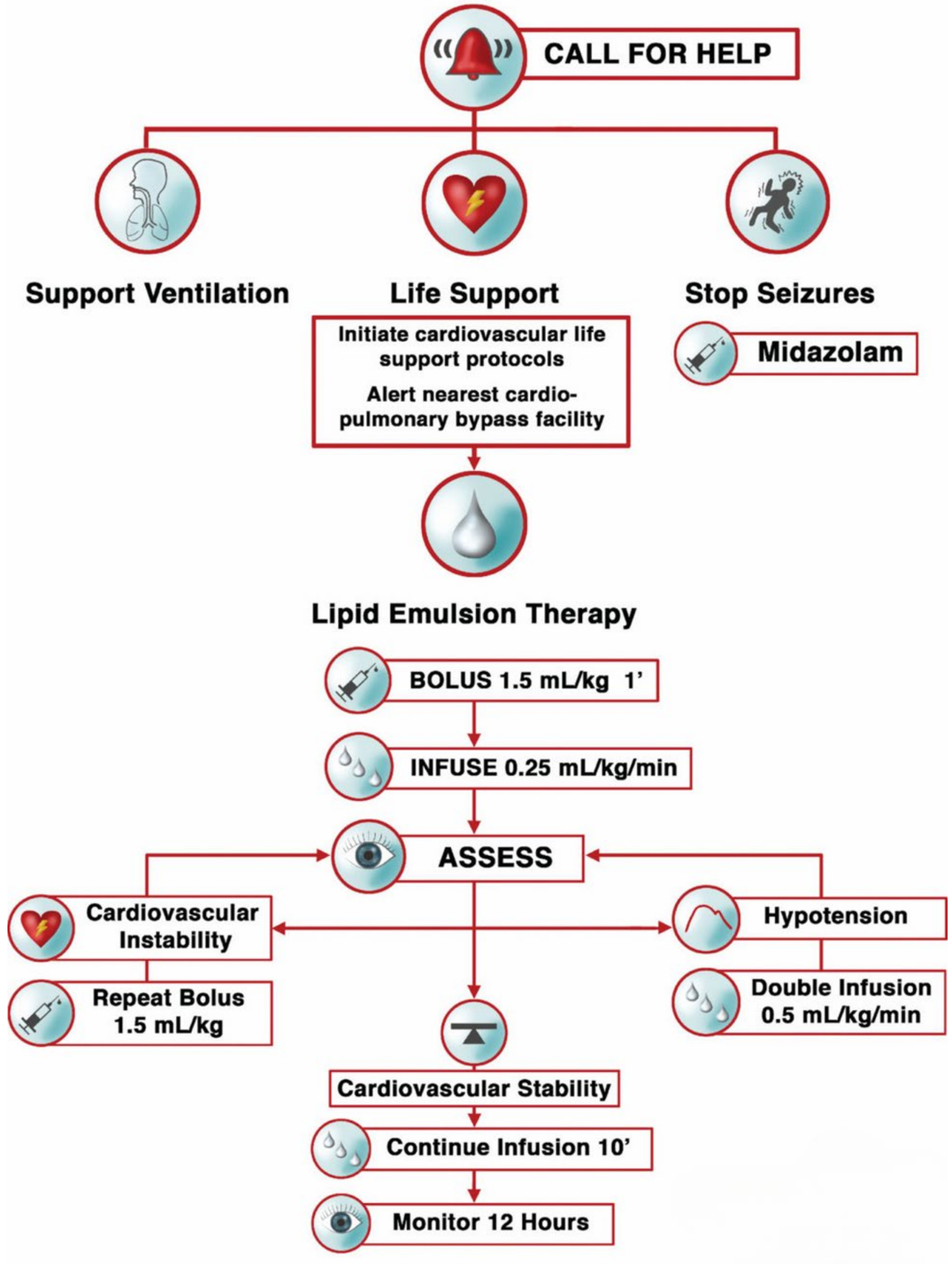
The frequency of LAST was greatest with paravertebral blocks, lower with upper limb blocks and zero with lower limb blocks.

Individuals who perform nerve blocks generally focus on antalgic blocks, like fascia planel blocks, rather than those for upper and lower limbs. As a result, the occurrence of LAST is more common.

Marina Gitman, Michael Fettiplace, and
Guy Weinberg

Local Anesthetic Systemic Toxicity

NYSORA®



Paweł Radkowski , Magdalena Fadrowska -Szleper , Katarzyna Podhorodecka , Marcin Mieszkowski

Neurological Complications of Regional Anesthesia: An Update Review with Clinical Guidelines

Medical Science Monitor (2023)
DOI: 10.12659/MSM.940399

The incidence of LAST has increased with the advent of fascial plane blocks, but often, the symptoms are not recognized because they are performed in addition to general anesthesia.

Neurological symptoms	Cardiac symptoms	Drug concentration
• Tongue tingling • Headache • Ringing in the ears • Dizziness • Speech disorders • Muscle twitches • Confusion • Unconsciousness • Seizure • Coma	• Hypertension • ECG changes • Tachycardia • Bradicardia • Myocardial Ischemia • Hypotension • Asystole • **Cardiac arrest**	↓

A. J. R. Macfarlane, M. Gitman , K. J. Bornstein, K. El-Boghdadly and G. Weinberg

Updates in our understanding of local anaesthetic systemic toxicity: a narrative review

Anaesthesia (2021)
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Suggested future directions to improve the management of LAST

Domain	Implementations
Education	• Training for healthcare professionals caring for patients after local anaesthetic administration (e.g. PACU and ward nurses)
Systems	• Daily local anaesthetic systemic toxicity brief • Addition of local anaesthesia brief to the WHO checklist • Computer-generated dosing threshold reminders
Research	• Dose-limiting techniques of local anaesthetic administration • Novel needle devices to detect intravascular injection • International standardisation of treatment algorithms

Accidental vascular injury : management clinical pratice

- Cold Cristalloyds
- Adrenaline

“After an accidental vascular injury, it is recommended to administer perivascular adrenaline and cold crystalloids with vasoconstrictive purpose to reduce haematoma or bleeding”

1

Prevention is one of the main cornerstones of complication management in ALR.

2

The most fearsome complication remains LAST, and fascial plane blocks have led to an increase in its incidence.
Training of health care providers is a crucial point in its management.

3

Peripheral nerve injury are very common during ALR procedures, taking longer to heal but is often a transient and reversible injury.

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Thanks
for the attention

Antonio Coviello, Researcher

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