



REGIONAL (LOCAL) ANAESTHESIA

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REGIONAL ANAESTHESIA

- **Neuraxial blocks**
 - Epidural (peridural) anaesthesia (...caudal block)
 - Subarachnoidal (spinal) anaesthesia (...saddle block)
- **N. plexus blocks**
 - (brachial plx, lumbal plx)
- **Peripheral nn blocks**
 - median n, foot block...

ANATOMICAL SITES

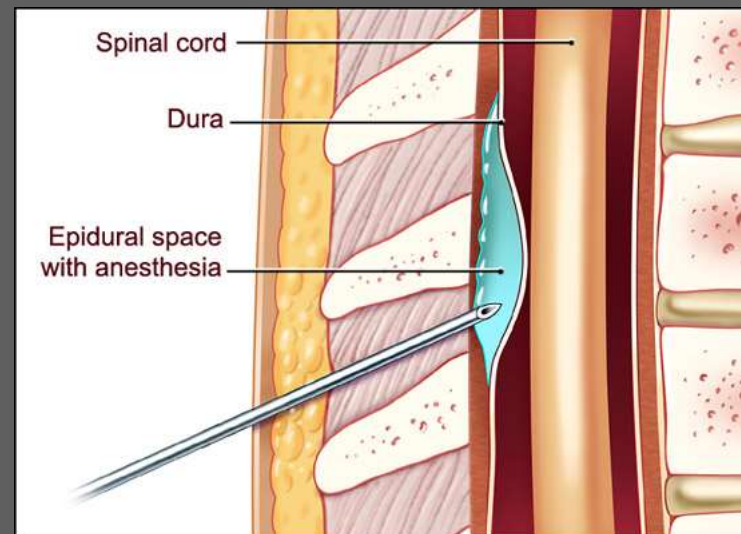
- Cutaneous & Mucosal an.
 - Infiltration anaesthesia
 - Peripheral nn. blocks
 - Plexus blocks
- Neuraxial block (Spinal & Epidural)
 - Autonomic block
 - IVRA (Bier's block)



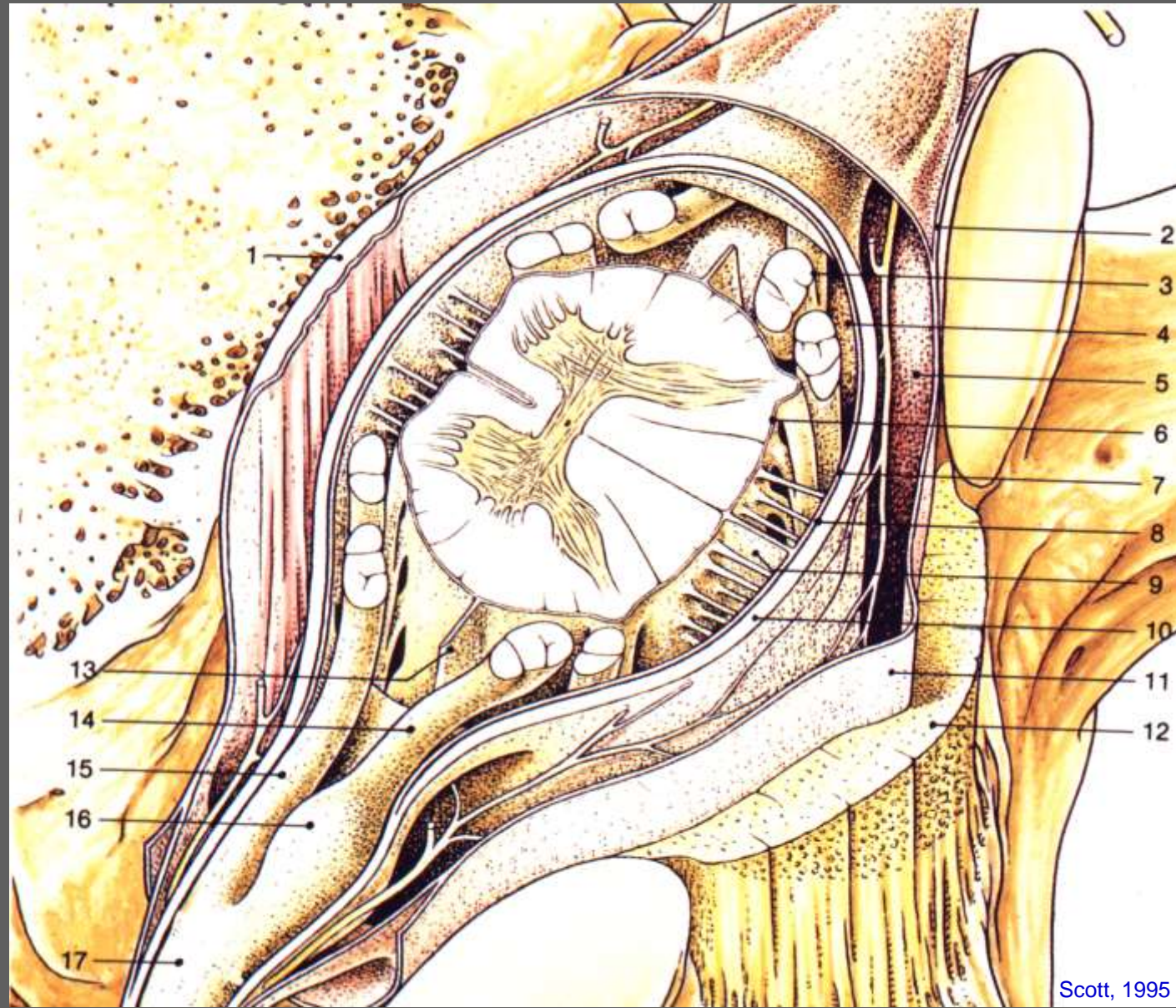
The famous German surgeon **August Bier** (1861-1949) – father of spinal and intravenous regional anesthesia, around 1920. Bier's Block (1908-2008)

DEFINITIONS

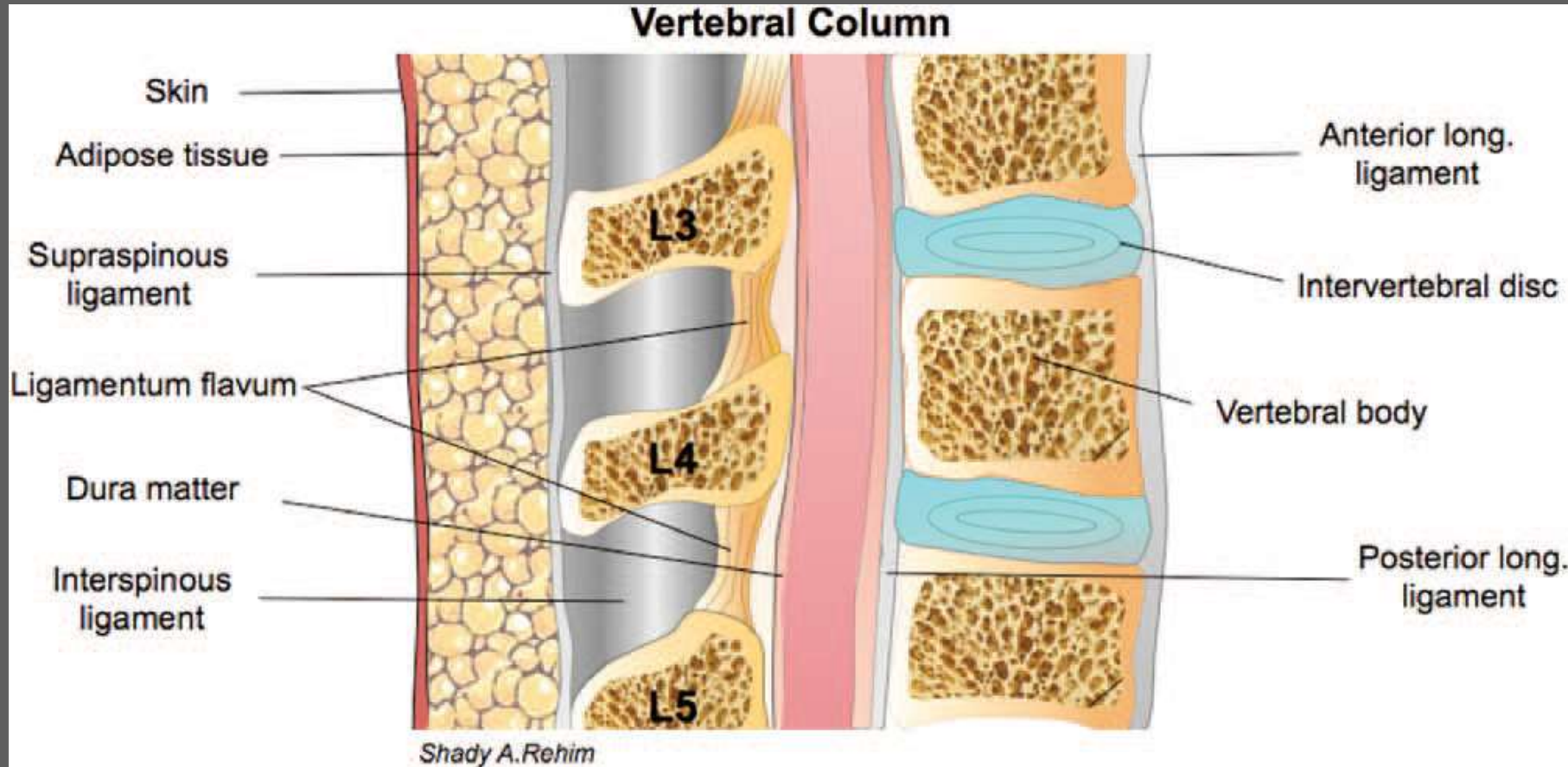
- **Spinal = subarachnoidal anaesthesia**
= administration of LA, analgetics or adjuvant medicament into **subarachnoidal** space
- **Epidural = peridural anaesthesia**
= administration of LA, analgetics or adjuvant medicament into **epidural** space



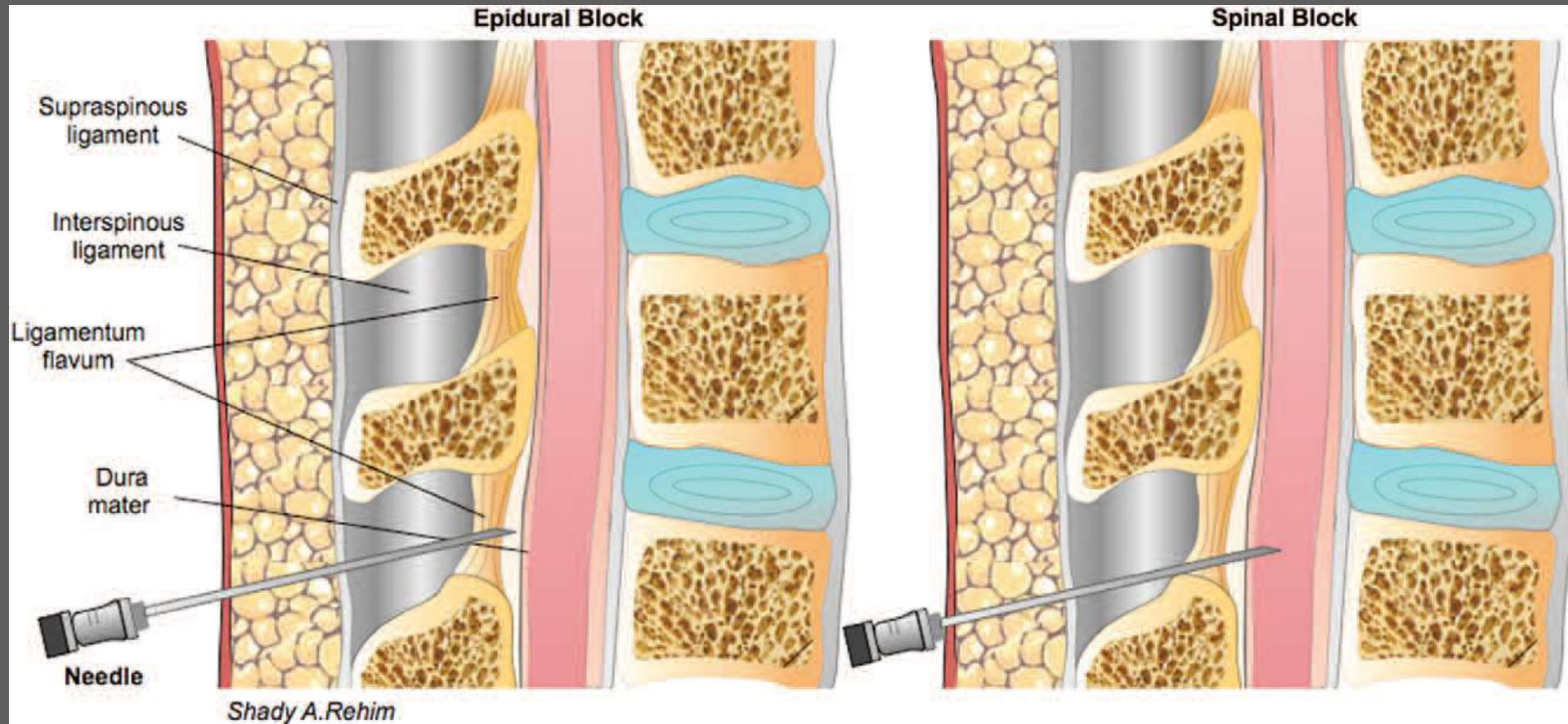
TRANSVERSAL CROSS-SECTION OF SPINAL CANAL



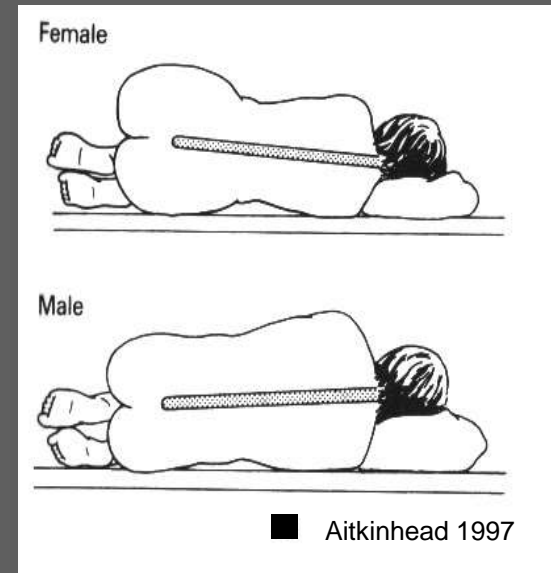
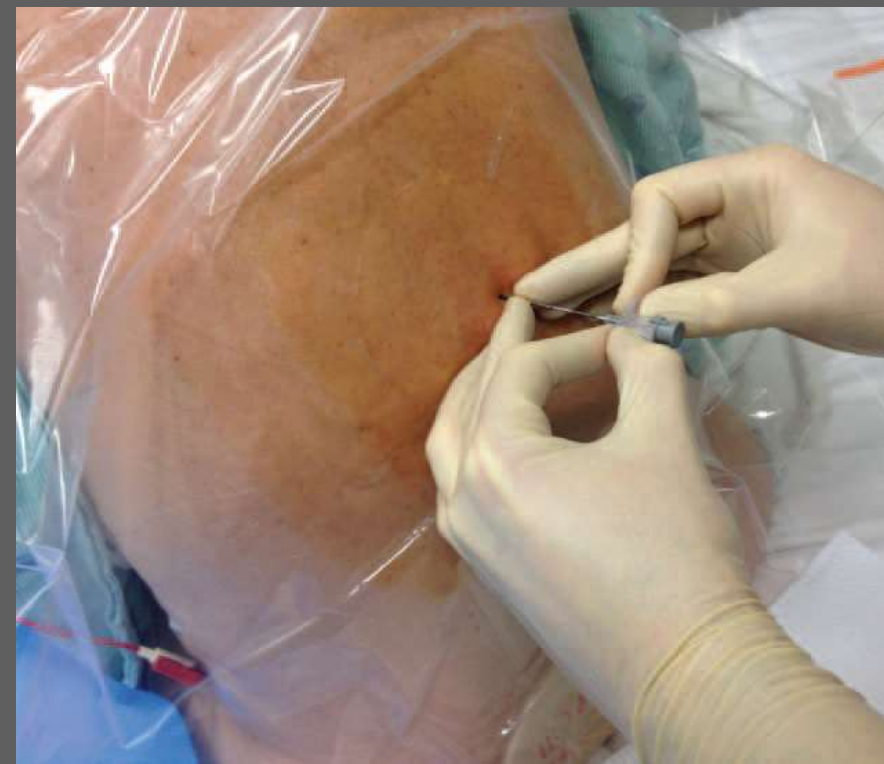
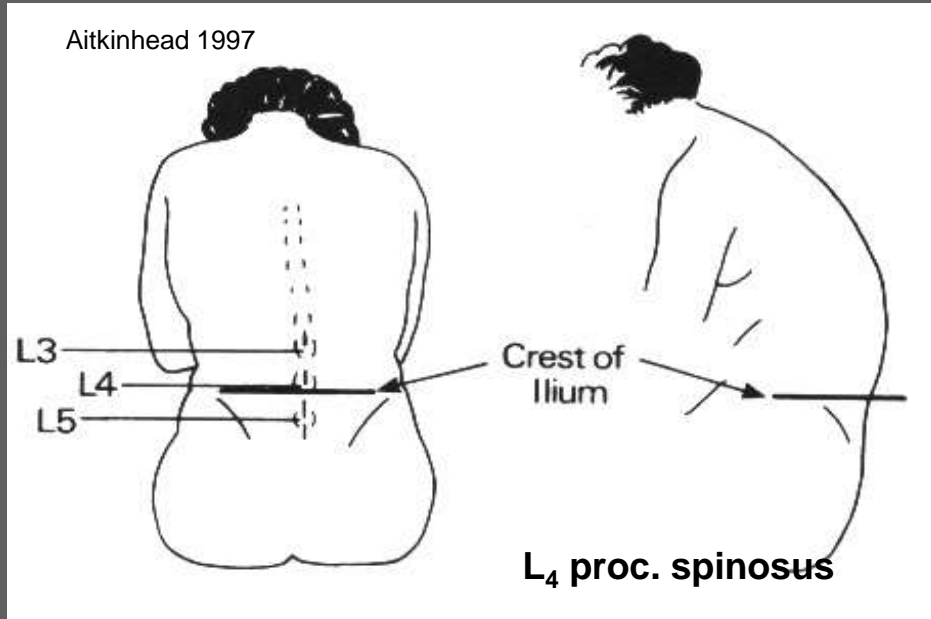
Anatomy of the vertebral column and supporting ligaments



Needle placement for medication delivery in spinal and epidural techniques



POSITION & PROCEDURE



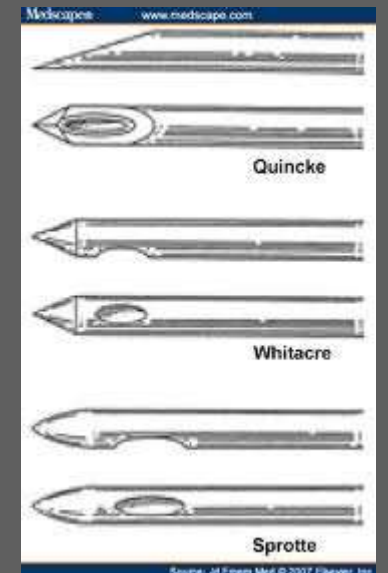
EPIDURAL vs SPINAL

	<i>E (Marc 0.5%)</i>	<i>S (Marc 0.5%)</i>
Technique	Epid. space	LP L ₂ -L ₅
Amount of LA	12-24 ml	1.5 - 4 ml
Latent period	15-20 min	3-6 min
Sensory block	++	+++
Motor blockade	+	+++
Duration block	3-5 hrs +cat.	2-4 hrs

EPIDURAL vs SPINAL

cont.

	E (Marc 0.5%)	S (Marc 0.5%)
Catheter	Yes	Yes (special)
Complications	DP (70% PDPH)	PDPH (young women)
Indications	longer surg.	urgent better m. relax.
Needles	Tuohy	Quincke, Sprotte Whitacre, Atraucan



WHY REGIONAL?

• VASCULAR COMPLICATIONS

Deep venous thrombosis

Lung emboli

Myocardial infarction

Cerebral stroke

• BLEEDING

Peroperative (> 2U blood)

Postoperative with transfusion

• INFECTIONS

Wound infection

Pneumonia

Other inf. mortality

• ANOTHER COMPLICATIONS

Respiratory depression

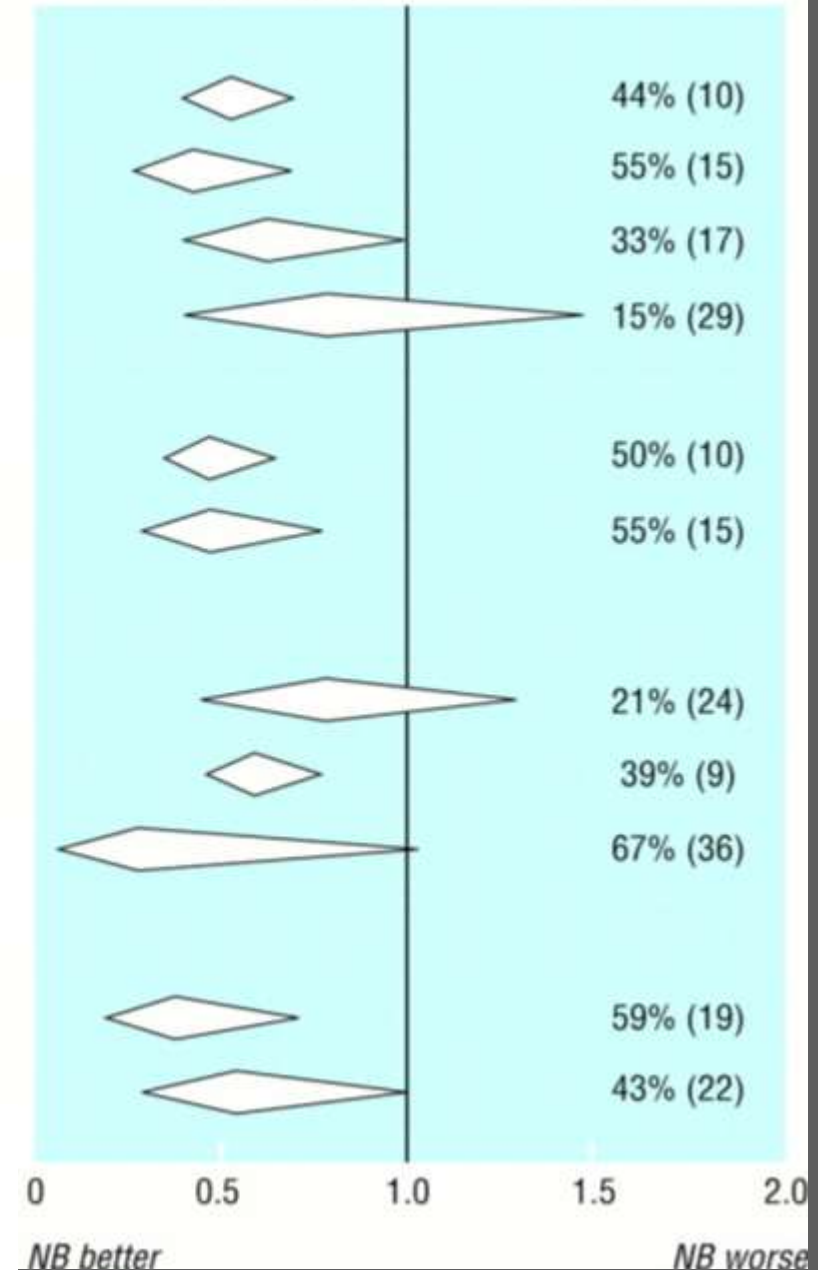
Renal failure

Events	
NB	No NB
n=4871	n=4688

145	220
30	66
45	59
19	23
193	280
31	69
29	33
149	238
2	10
26	38
18	32

Odds ratio
and 95% CI

Odds
reduction



Reduction of postoperative mortality and morbidity with epidural or spinal anaesthesia: Results from overview of randomised trials.

Rogers, BMJ 2000, 321, s.1493

ADVANTAGES OF LA

1. Patient maintains airway
2. Reduction in surgical stress
3. Discussion certain matters
4. Postoperative analgesia
5. Less confused
6. Smooth recovery
7. Peristalsis not depressed
8. TE prophylaxis
9. Earlier discharge
10. Less expense

DISADVANTAGES OF LA

1. Patient wants to sleep
2. Practice and skill of anaesthetists
3. Later onset of anaesthesia than GA
4. Analgesia may not always be totally effective
5. Generalised toxicity
6. Some operation are unsuitable for LA
7. Sympathetic blockade - hypotension
8. Nerve damage

DIFFERENT NERVE FIBRES

Fibre type	Diameter (μm)	Function
A α	12-20	motor, proprioception
β	5-12	touch, pressure
γ	3-6	motor to spindles
δ	2-5	pain, temperature, touch
B	<3	preganglionic autonomic
C	0,2-1,4	pain, postganglionic autonomic

LOCAL ANAESTHETICS

- Temporary blockade
- Block of the Na⁺ channels
- Classification
 - Chemical formula (Esters, Amides)
 - Duration (1, 1-2, more 2 hours)
 - Effect on blood vessels (dilation, constriction)

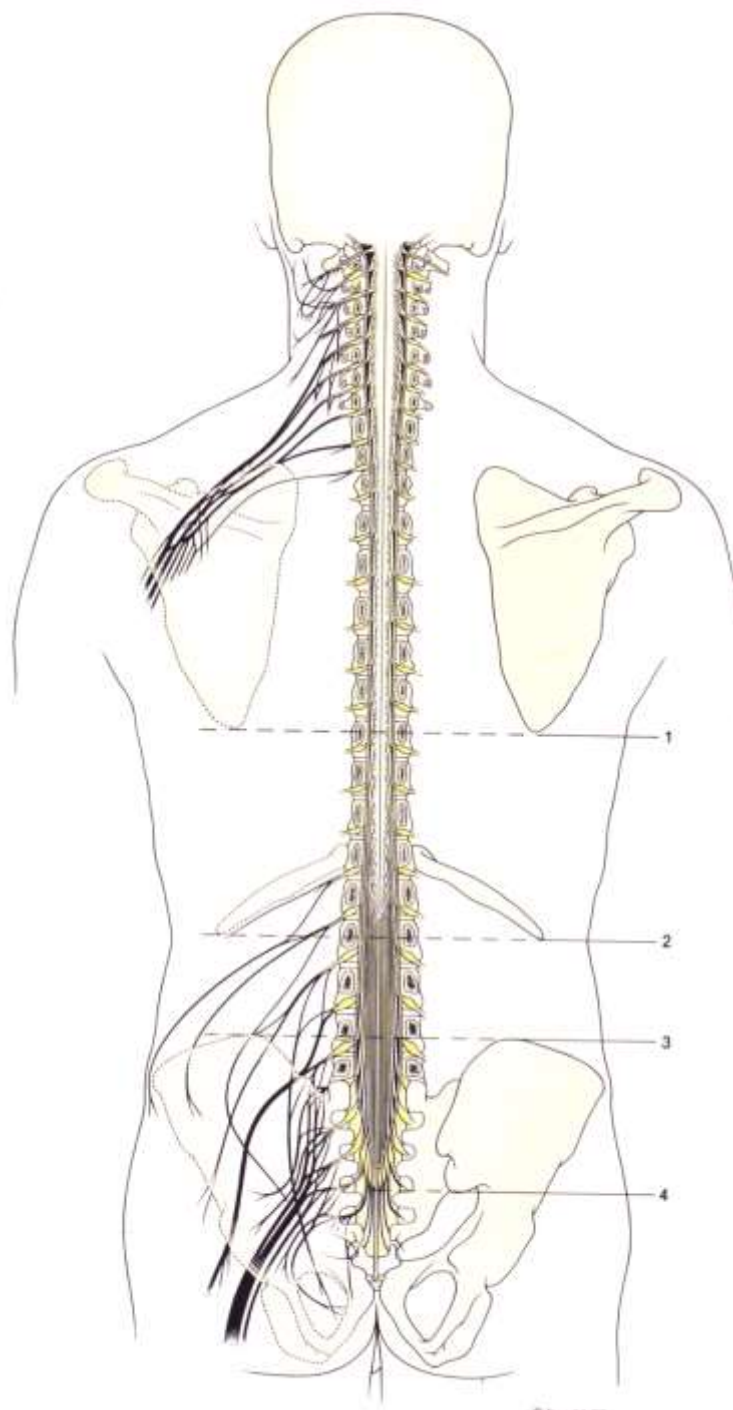
L-Bupivacain	2000
Ropivacain	1996
Articain	1987
Etidocain	1971
Bupivacain	1963
Prilocain	1960
Mepivacain	1957
Chlorprocain	1955
Lidocain	1947
Tetracain	1932
Procain	1905
Cocain	1884

LA vom Ester-Typ	LA vom Amid-Typ
$\text{R}_1-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{R}_2$	$\text{R}_1-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}-\text{R}_2$

COMMON LOCAL ANAESTHETICS

	max. epidurally mg		toxicity iv	analg. onset (min)		duration (min)	
Lidocaine (<i>Xylocain</i>)	400	500	250	10-20	7-15	90-120	120-180
Trimecaine (<i>Mesocain</i>)	400	500	250	10-20	7-15	90-120	120-180
Prilocaine (<i>Citanest</i>)	500	600	350	10-20	7-15	90-120	120-180
Mepivacaine (<i>Carbocain</i>)	400	600	350	10-20	7-15	90-120	120-180
Bupivacaine (<i>Marcain</i>)	100	125	80	20-40	15-30	180-240	200-300

BACK TOPOGRAPHY



- **C₇** vertebra prominens
- **T₃** spina scapulae
- **T₈** apex scapulae
- **T₁₀** costa X.
- **L₄** crista iliaca
- **S₂** sac. durae matris

SPINAL DERMATOMS

clavicle C₃₋₄

angulus sterni T₂

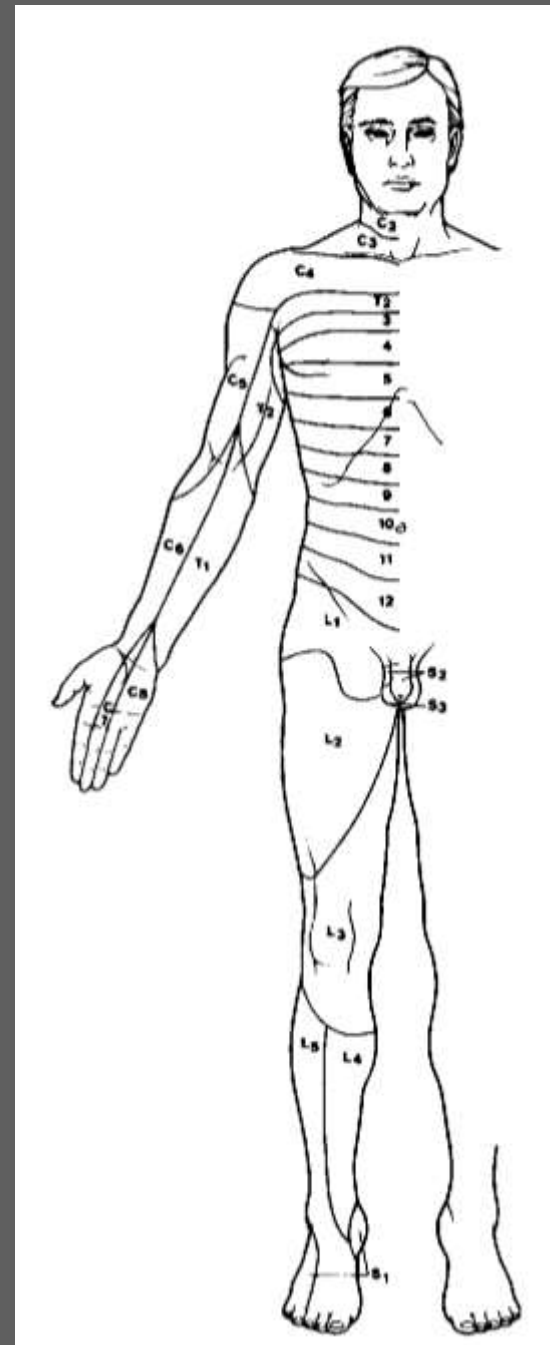
nipples T₄₋₅

subkostal T₆₋₈

navel T₁₀

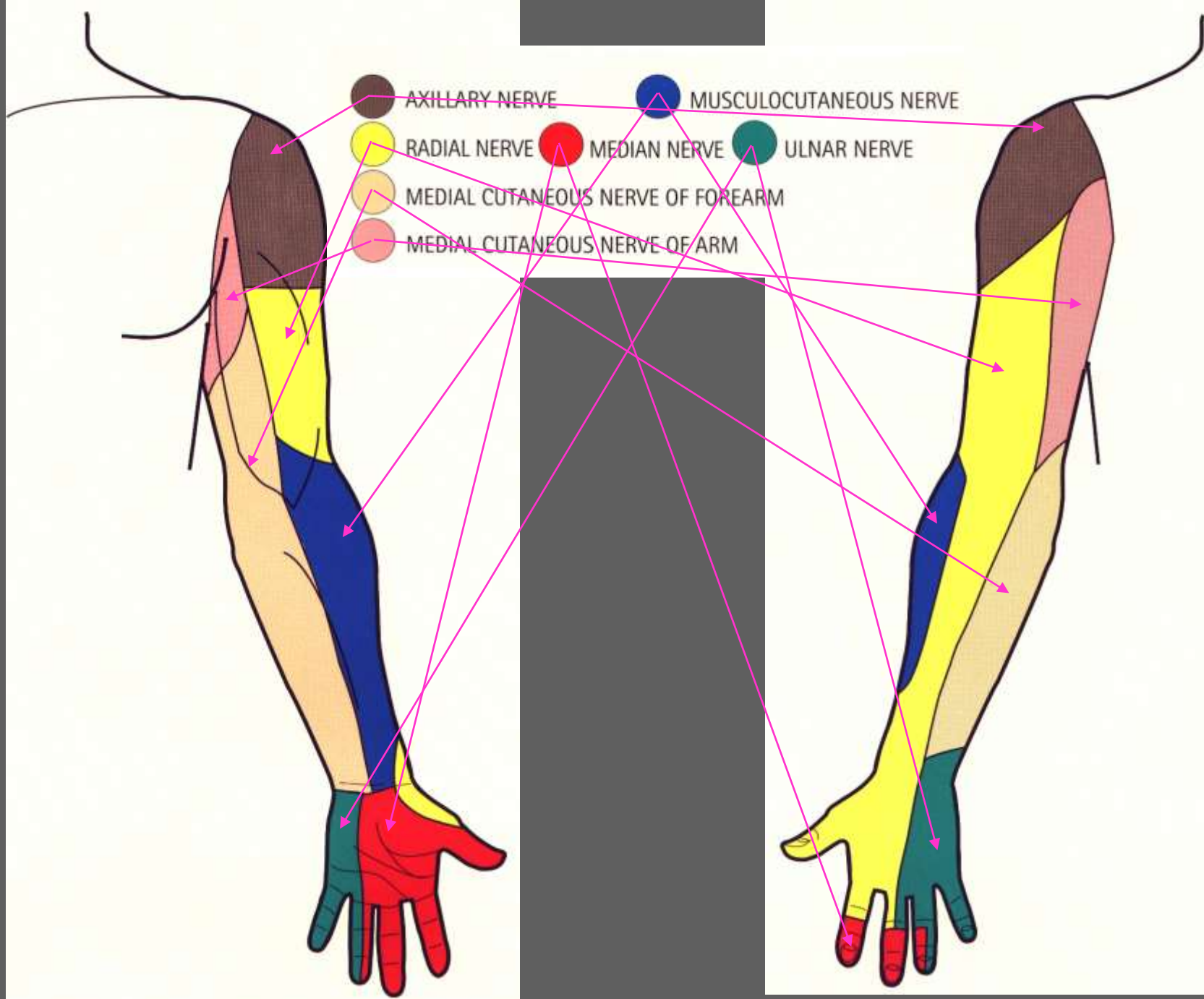
inguina L₁

perineum S₁₋₄



MANAGEMENT OF LA

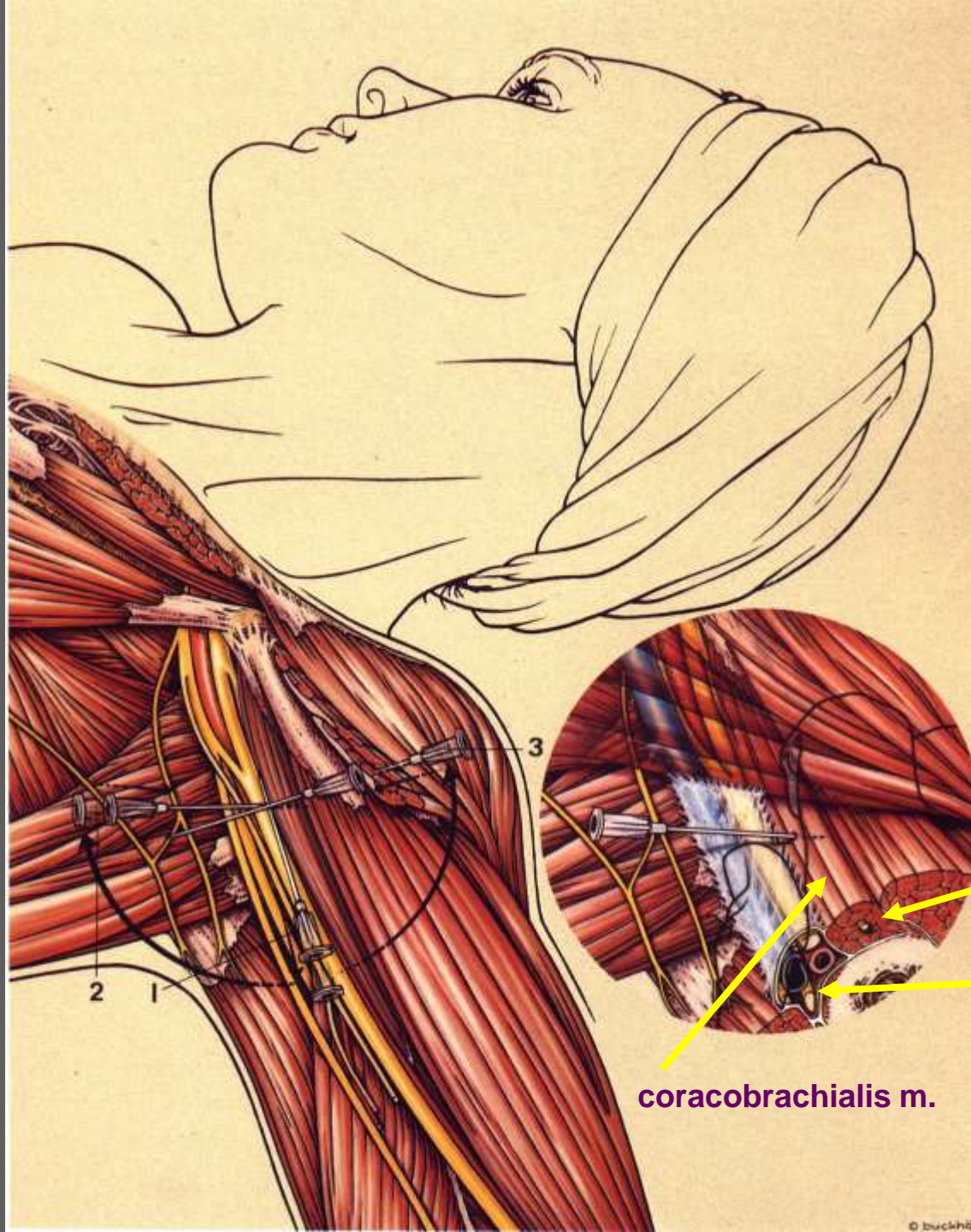
- Premedication
- Explanation and cooperation of pts
- Conscious patient
- Sedation and combine with GA
- Monitoring during LA
 - (pulse, NIBP, ecg, respiration, SpO₂, mental functions, blood losses)



INNERVATION UP EXTR

AXILAR BLOCK

problematic
nerves
in low volumes
dosage of LA

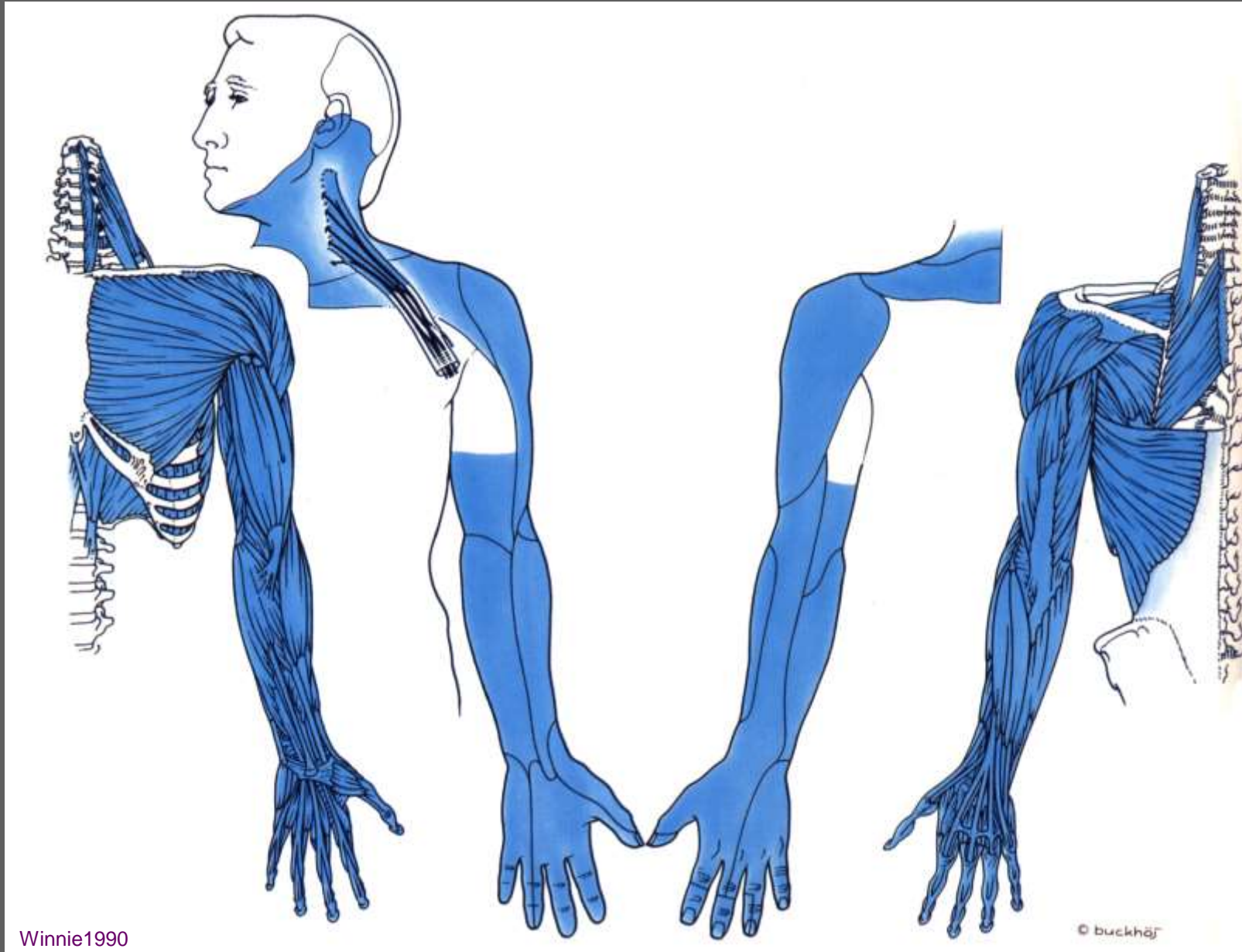


musculocutaneus n.

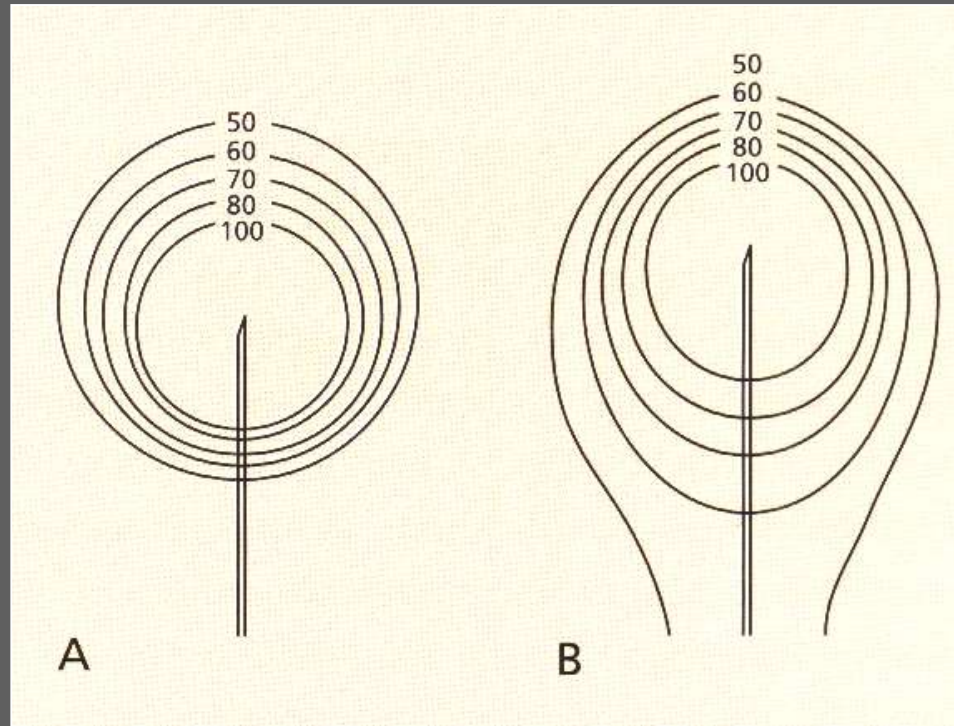
radial n.

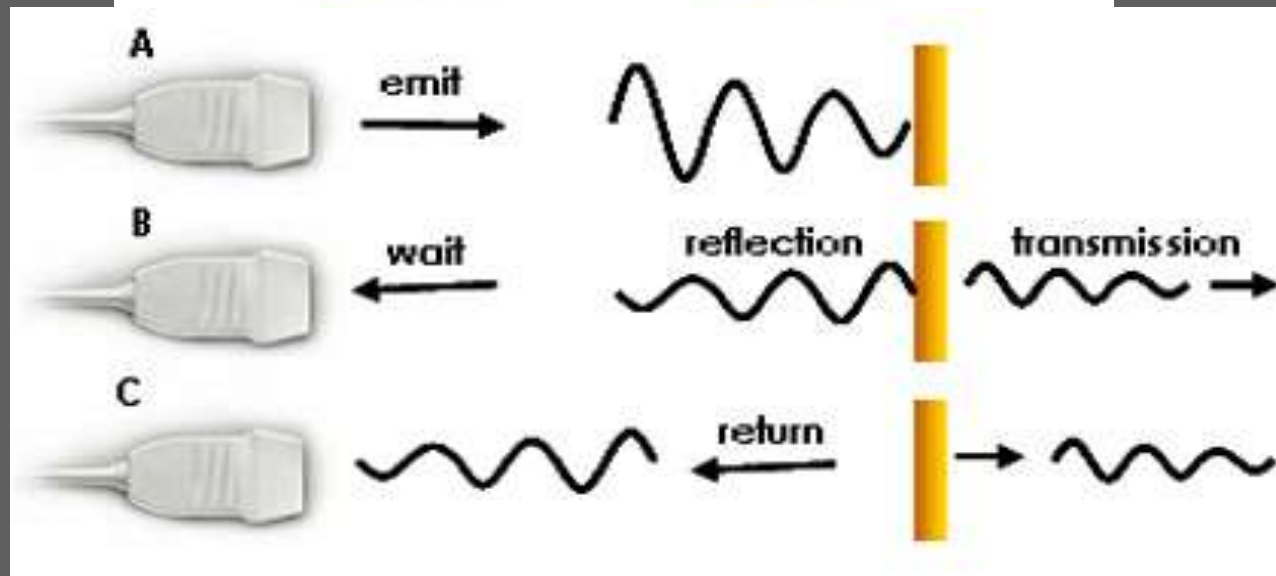
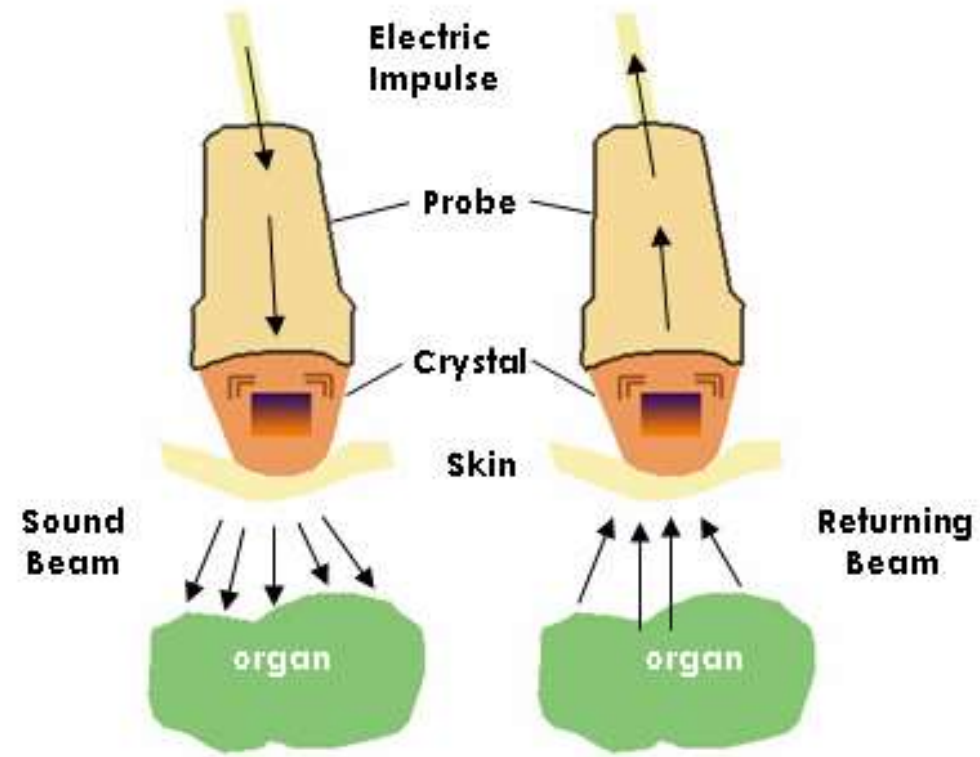
coracobrachialis m.

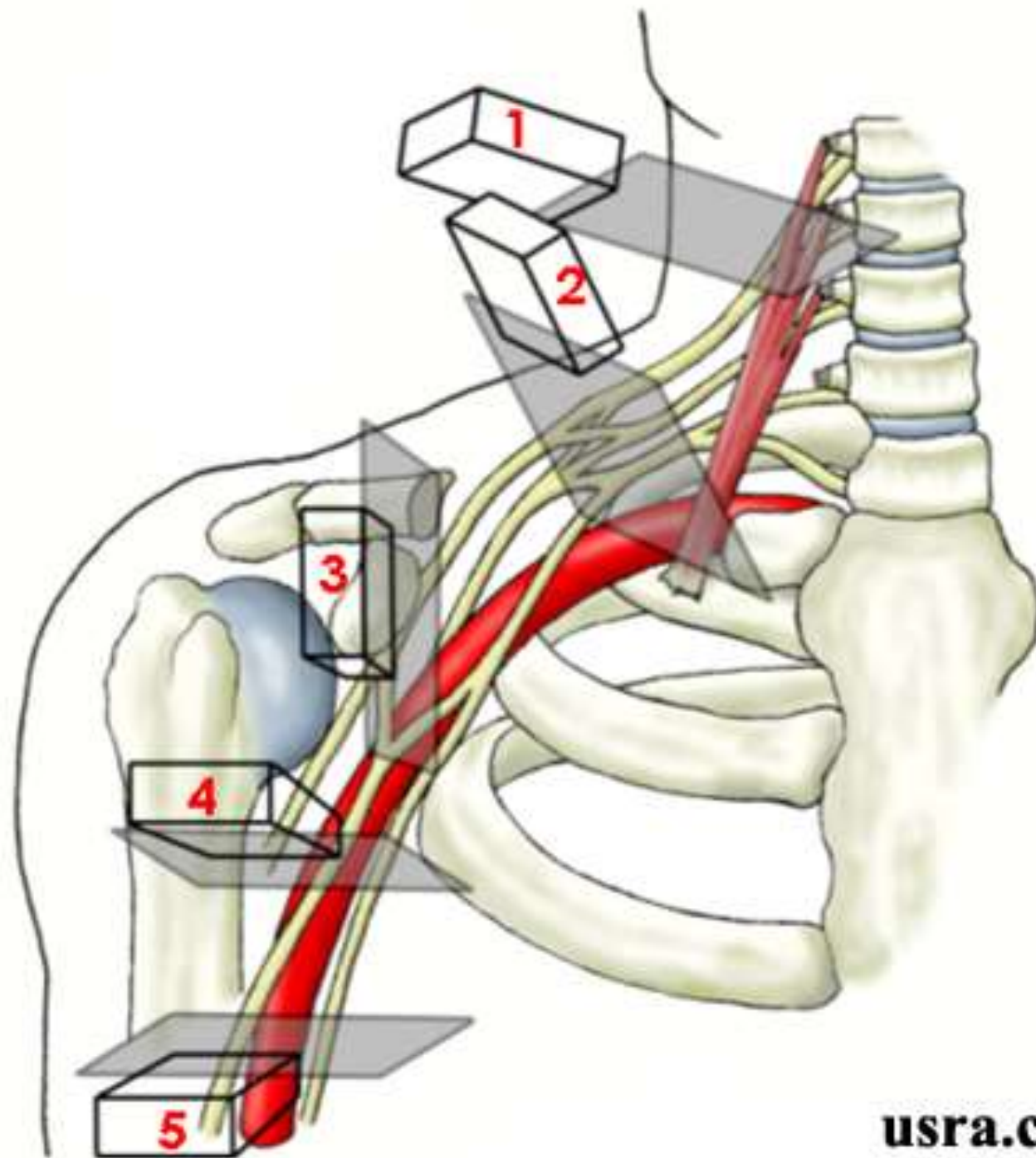
INFRACLAV. BLOCK 40 ml

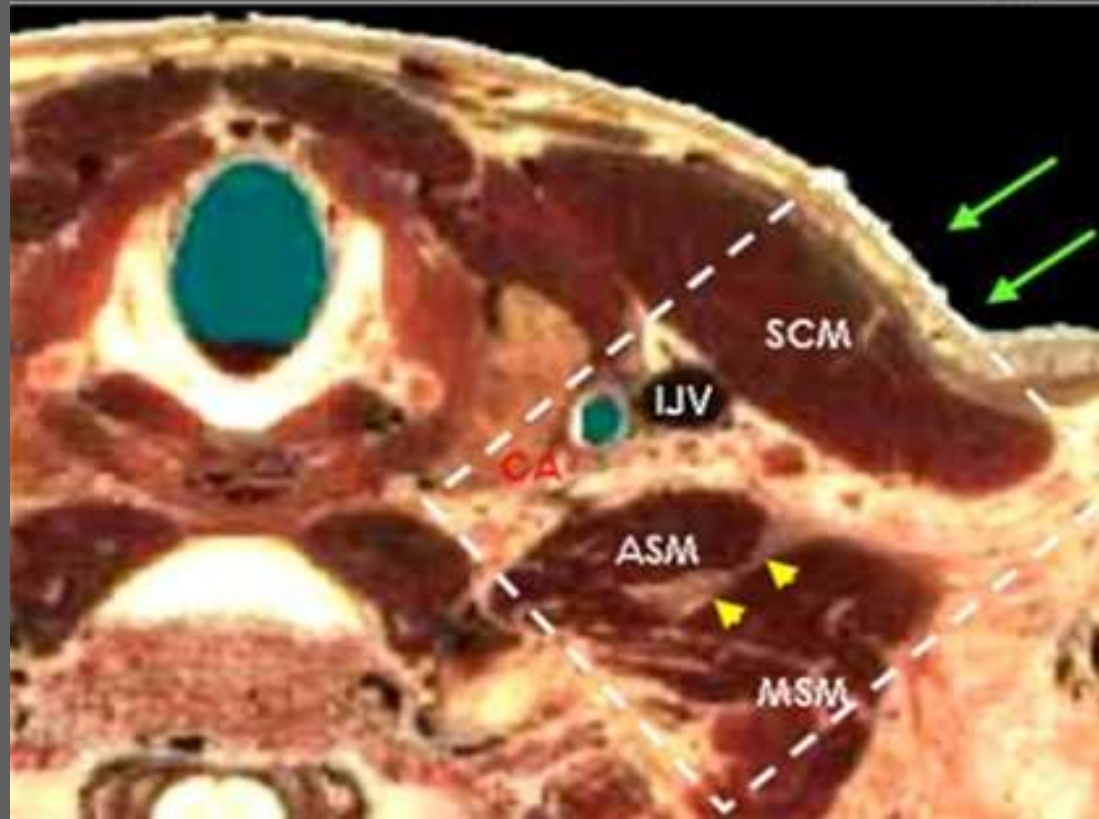
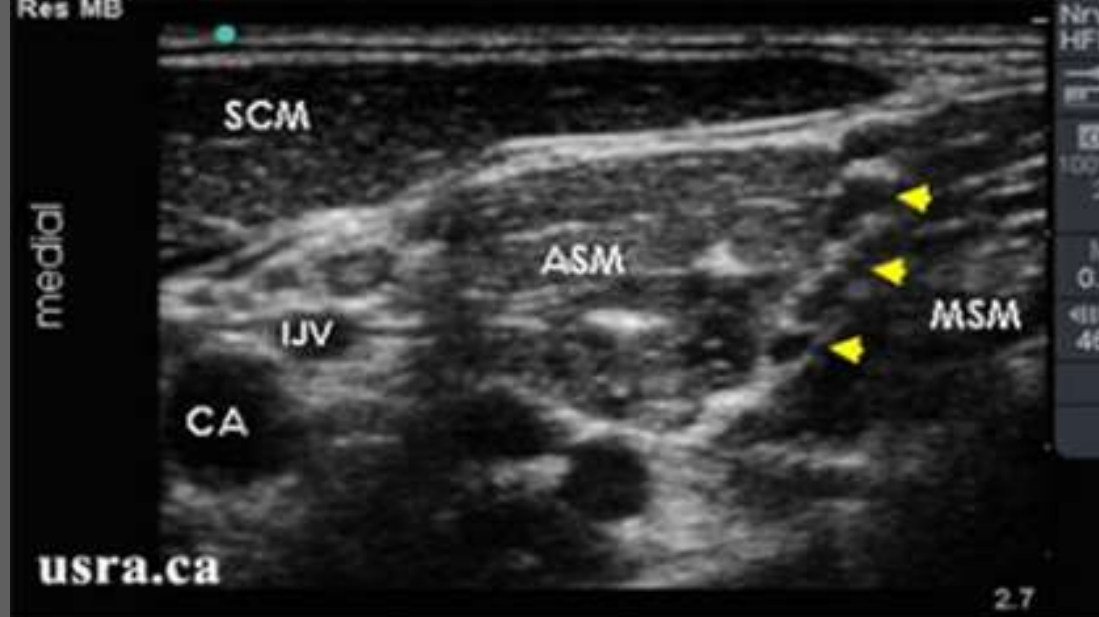


Stimulation needles isolated and unisolated









COMPLICATIONS & REACTIONS

- Vasovagal faint
- Allergy (esters)
 - procaine
- Toxicity (amides)
 - Brain (lidocaine)
 - Myocardium (bupivacaine)

CONTRAINDICATIONS

Absolute:

- Local infection
- Allergy
- Hypovolaemia*
- Abnormal blood clotting*
- Increased ICP*

Relative:

- Patient refusal
- Neurological disease*

* Neuraxial blockade

TREATMENT OF HYPOTENSION

1. Administration of cristalloids and/or colloids
2. Ephedrine 5-10 mg iv repeatedly
3. Trendellenburg position
4. Dopamine
5. Adrenaline infusion

Major complications

Descending order of severity,
ascending order of frequency

Major complications of regional anaesthesia in descending order of severity and ascending order of frequency

Complications in order of frequency	Estimated frequency	Comments
1= Direct nerve damage	1:10,000 – 1:30,000	No effective treatment Most improve over 1–6 months
1= Spinal haematoma	1:150,000 – 1:220,000	Requires urgent evacuation May cause paraplegia
1= Spinal infection	1:100,000 – 1:150,000	Evacuation and aggressive antibiotic therapy required. May cause paraplegia
4= Drug error	Unknown	Avoidable. May be fatal
4= Systemic toxicity	Unknown	May be fatal unless treated promptly
6= Respiratory depression	Unknown	Beware neuraxial opioids
6= Hypotension	Common with epidural/spinal	Treat effectively to avoid complications (see text)
8 Confusional states	Common in the elderly	Beware neuraxial opioids
9 Pruritus/urinary retention/nausea	Up to 16% incidence	Treat effectively
10 Technical failure	5–25% for different techniques	Consider alternative strategy

Management of hypotension, bradycardia & „total spinal“

Management of physiological hypotension, bradycardia and the 'total spinal'

Physiological hypotension and bradycardia

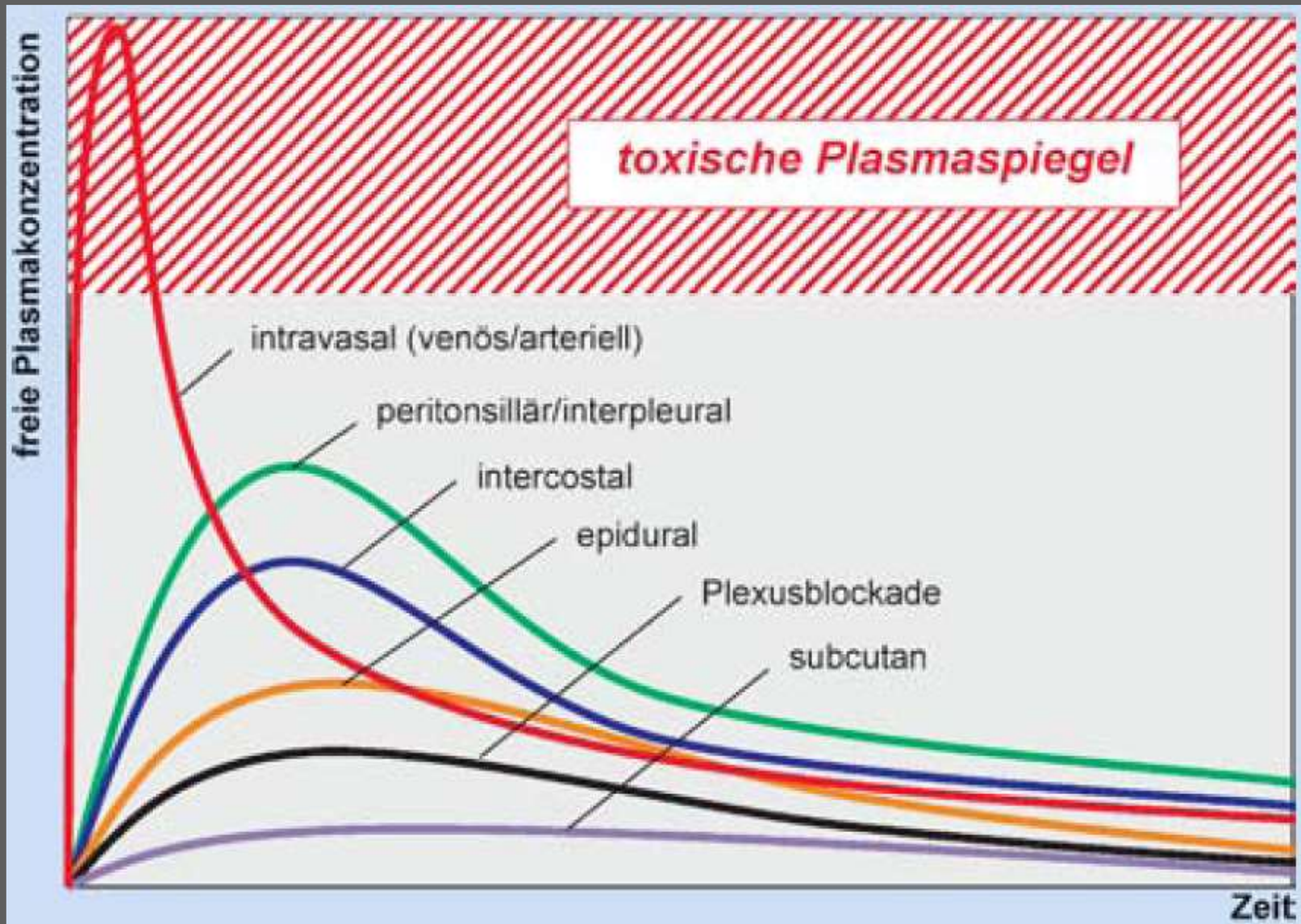
<i>Treatment</i>	<i>Timing</i>	<i>Duration</i>
Crystalloid, 500–1000 ml	When block is performed	15–20 min
Crystalloid, 500–1000 ml	As block develops	20–30 min
Colloid, 500–1000 ml	During surgery	Dependent on blood pressure
Ephedrine, 3 mg boluses: total 30 mg	As block develops	Dependent on blood pressure
Atropine, 0.3 mg boluses or Glycopyrrolate, 200 µg boluses	If heart rate < 50 beats/min	Dependent on heart rate

Total spinal anaesthesia

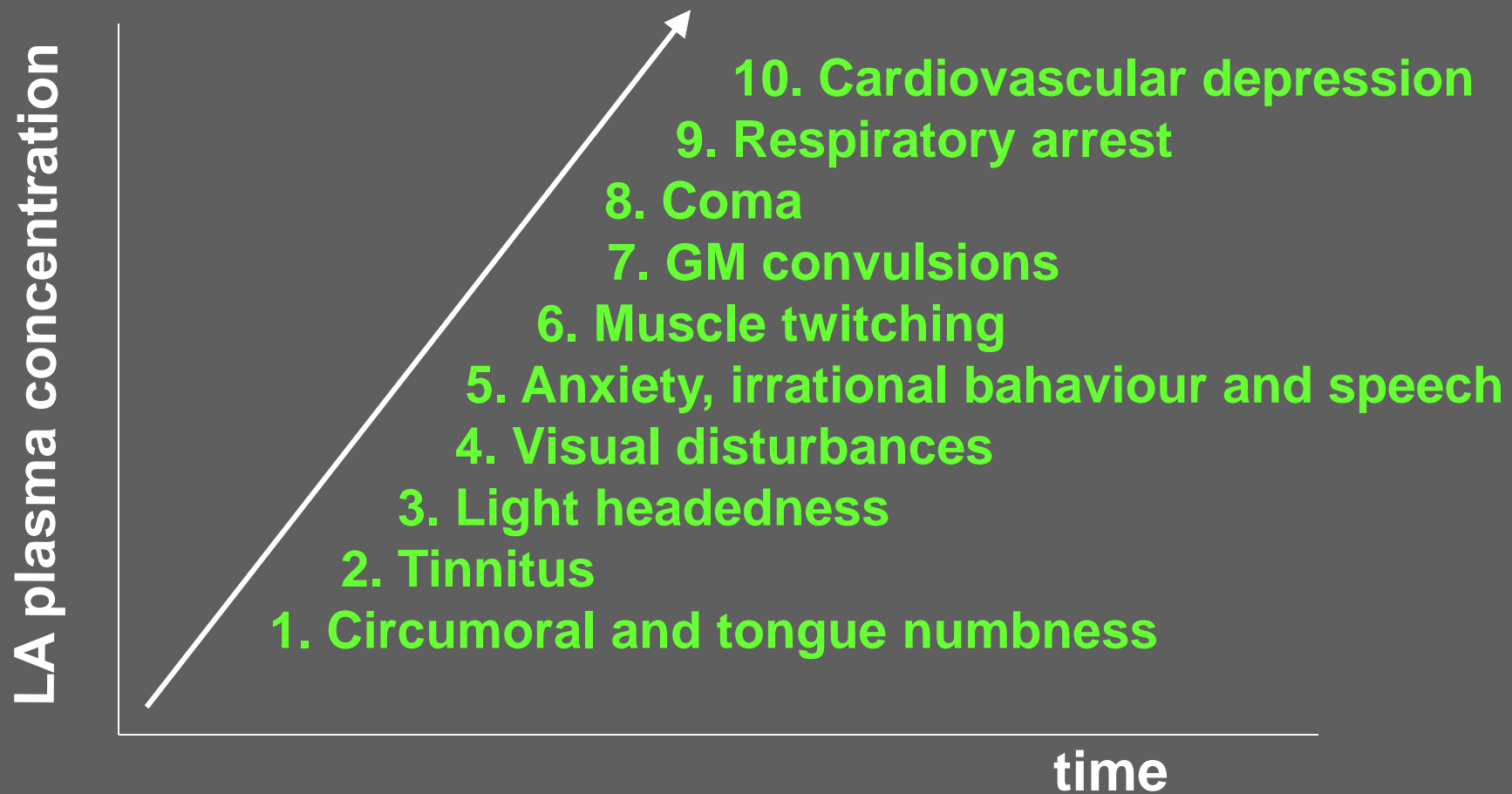
- Intravenous fluids as above but over shorter timescale. Rapid administration of crystalloid, 1000 ml, then colloid, 500 ml. Repeat as necessary to maintain systolic pressure > 100 mm Hg
- Respiratory support (100% oxygen via a face mask progressing to assisted manual ventilation)
- Tracheal intubation if unconsciousness occurs
- Atropine, increments of 0.3 mg, used to treat bradycardia
- Ephedrine, 10 mg increments to a total of 30 mg, to restore systolic pressure > 100 mm Hg
- Intravenous infusion of epinephrine may be necessary to maintain this level of blood pressure until the block begins to wear off
- Slight head-down tilt (10–20°) and slight lateral tilting may be used to maximize venous return
- Maintain supportive measures, until level of spinal block regresses

DEPENDENCY OF SYSTEMIC TOXICITY

1. Dose
2. Site of injection
3. Drug used to LA
4. Speed of injection
5. Addition of adrenalin



SIGNS & SYMPTOMS OF TOXICITY



TREATMENT OF TOXICITY

1. Immediate cessation of the injection
2. Administration of oxygen
3. Maintenance of the airway & ventilation
4. Diazepam 0.1 mg/kg or thiopentone 1-3 mg/kg
5. Inotropes or antiarrhythmic agents
6. Intralipid 20% 100 ml as rapid infusion
7. CPR, defibrillation, adrenaline, atropine...

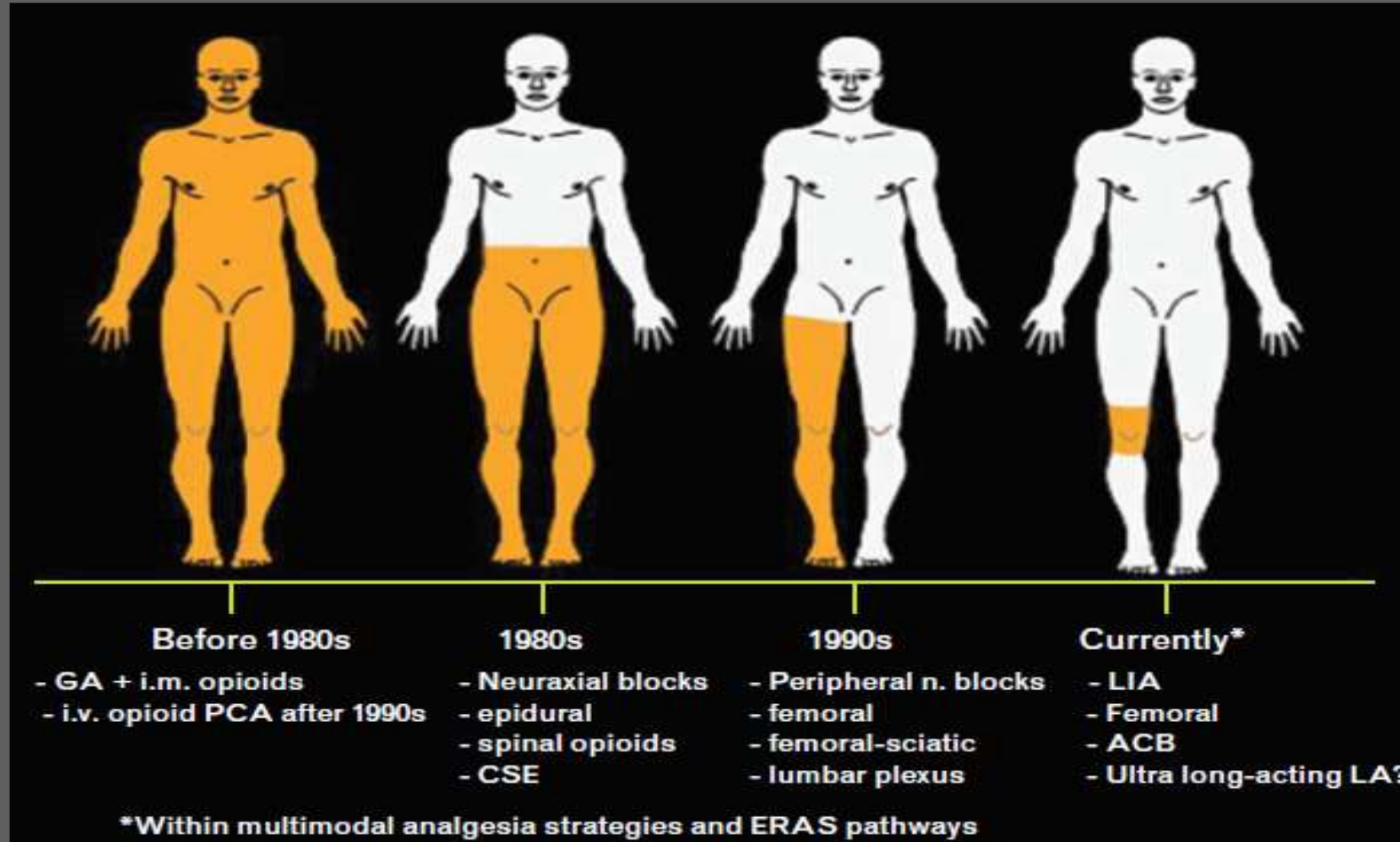


boiled crayfish

R_x ALLERGY - ANAPHYLACTIC

1. Immediately interrupt the application
2. Oxygen application
3. Hydrocortison 200 - 500 mg iv
4. Adrenalin 0,5 mg i.m. (1 mg 500 ml F1/1)
5. Airway management
6. CPR, defibrillation, adrenalin, atropin...

HOW POSTOPERATIVE ANALGESIC TECHNIQUES FOR KNEE SURGERY HAVE EVOLVED OVER TIME



ACB, adductor canal block; CSE, combined spinal and epidural; ERAS, enhanced recovery after surgery; LA, local anaesthetic; LIA, local infiltration analgesia.