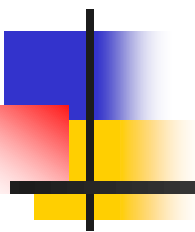


LOCAL ANESTHETICS AND REGIONAL ANESTHESIA



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Local Anesthetics- History

- 1860 - cocaine isolated from *erythroxylum coca*
- Koller - 1884 uses cocaine for topical anesthesia
- Halsted - 1885 performs peripheral nerve block with local
- Bier - 1899 first spinal anesthetic





Local Anesthetics - Definition

A substance which reversibly inhibits nerve conduction when applied directly to tissues at non-toxic concentrations

- Local anesthetics block generation, propagation, and oscillations of electrical impulses in electrically excitable tissue.
- Mainly by acting on Na channels.



PHARMACOLOGY AND PHARMACODYNAMICS



Clinically used local anesthetics consist of lipid-soluble, substituted benzene ring linked to amine group via alkyl chain containing either an amide or ester linkage.

- Type of linkage separates local anesthetics into either aminoamides (metabolized in liver) or aminoesters (metabolized in liver or by plasma cholinesterase).

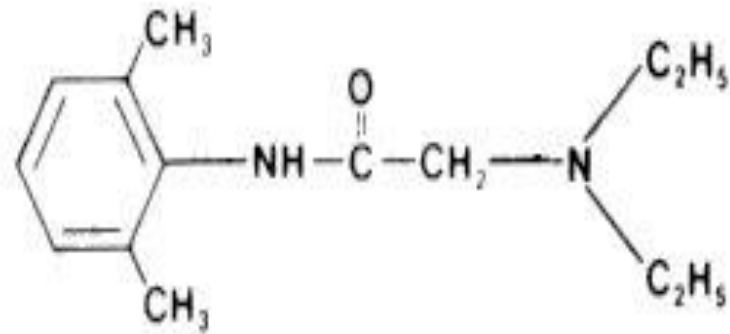


Local Anesthetics - Classes

Amides

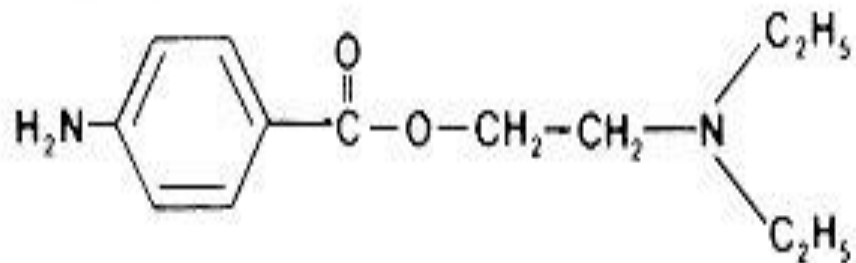
Lidocaine

Xylocaine, etc



Procaine

Novocain





Local anesthetics - Classes

Esters

Cocaine

Chloroprocaine

Procaine

Tetracaine

Amides

Bupivacaine

Lidocaine

Ropivacaine

Etidocaine

Mepivacaine



Local anesthetics - Formulation

Biologically active substances are frequently administered as very dilute solutions which can be expressed as *parts of active drug per 100 parts of solution (grams percent)*

Ex.: 2% solution =

$$\frac{2 \text{ grams}}{100 \text{ cc's}} = \frac{2000 \text{ mg}}{100 \text{ cc's}} = \frac{20 \text{ mg}}{1 \text{ cc}}$$





Local anesthetics - vasoconstrictors

Ratios

Epinephrine is added to local anesthetics in *extremely* dilute concentrations, best expressed as a ratio of grams of drug:total cc's of solution. Expressed numerically, a 1:1000 preparation of epinephrine would be

$$\frac{1 \text{ gram epi}}{1000 \text{ cc's solution}} = \frac{1000 \text{ mg epi}}{1000\text{cc's solution}} = \frac{1 \text{ mg epi}}{1 \text{ cc}}$$





Local anesthetics - vasoconstrictors

Therefore, a 1 : 200,000 solution of epinephrine would be

$$\frac{1 \text{ gram epi}}{200,000 \text{ cc's solution}}$$

=

$$\frac{1000 \text{ mg epi}}{200,000 \text{ cc's solution}}$$

or

$$\frac{5 \text{ mcg epi}}{1 \text{ cc solution}}$$





Bupivacaine

Amide

- Infiltration: Dose: 2mg/kg
- Concentration : 0.25 % or 0.5 %

Example a 50 kg patient, how much 0.25 % Bupivacaine can I use for infiltration to excise lipoma in the forearm?



Bupivacaine



50 Kgmax 2mg/Kg

$50 \times 2 = 100 \text{ mg}$

0.25%2.5 mg/ml

So maximum mls for infiltration is

$100 / 2.5 = 40 \text{ ml}$





Bupivacaine

- Epidural anesthesia: Use 0.5-0.75%, moderate onset, 2- to 5-hr duration, max dose 175 mg (225 mg with epinephrine)
- Spinal anesthesia: Use 0.5-0.75%, fast onset, 1- to 4-hr duration, max dose 20 mg
 - levo (-) bupivacaine less cardiotoxic than racemic bupivacaine, same





Lidocaine

Amide

- Infiltration: use 1% or 2 %, fast onset, 2- to 8-hr duration, max dose (5 mg/Kg without Epinephrine and 7 mg/Kg with Epinephrine)

- Why Epinephrine increase safety margin ?





Lidocaine

- Epidural anesthesia: use 1.5-2%, fast onset, 1- to 2-hr duration, max dose 300 mg (500 mg with epinephrine)
- Spinal anesthesia: use 1.5-2%, fast onset, 0.5- to 1-hr duration, max dose 100 mg
 - Topical anesthesia: use 4%, fast onset, 0.5- to 1-hr duration, max dose 300 mg
 - IV regional: Use 0.25-0.5%, fast onset, 0.5-1 hr duration, max dose 300 mg





Local Anesthetics - Allergy

- True allergy is very rare
- Most reactions are from ester class - ester hydrolysis (normal metabolism) leads to formation of PABA - like compounds
- Patient reports of “allergy” are frequently due to previous intravascular injections





Local Anesthetics - Toxicity

Tissue toxicity - Rare

- Can occur if administered in high enough concentrations (greater than those used clinically)
- Usually related to preservatives added to solution

Systemic toxicity - Rare

- Related to blood level of drug secondary to absorption from site of injection.
- Range from lightheadedness, tinnitus to seizures and CNS/cardiovascular collapse





Local anesthetics - vasoconstrictors

Vasoconstrictors should not be used in the following locations

- Fingers
- Toes
- Nose
- Ear lobes
- Penis



SPINALS, EPIDURALS AND CAUDALS

DR Mahmoud Al-mustafa



Introduction

Two main types of anaesthesia – general and regional.

- REGIONAL anaesthesia – Drugs administered directly to the spinal cord or nerves to locally block afferent and efferent nerve input.
- Indications
- Contraindications
- Equipment
- Technique
- Complications



Definitions

Regional anaesthesia – The use of local anaesthetic either alone or to supplement general anaesthesia aiming to prevent or reduce nerve conduction of painful impulses to higher centres.

- **Spinal anaesthesia** – Injection of a local anaesthetic directly into the CSF within the sub-arachnoid space.
- **Epidural anaesthesia** – Injection of a local anaesthetic into the potential space *outside* the dura.
- **Caudal anaesthesia** – Injection of local anaesthetic into the caudal canal producing block of the sacral and lumbar nerve roots.



What is the difference between spinal anesthesia and epidural anesthesia

Level of insertion

Site of insertion

Catheter use

Onset of action

Nature of effect (sensory, motor, sympathetic)

Type of surgery

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Contraindications to regional techniques

ABSOLUTE

- Patient refusal
- Anticoagulation / coagulopathy
- Local anaesthetic allergy
- Localised infection
- Untreated hypovolaemia

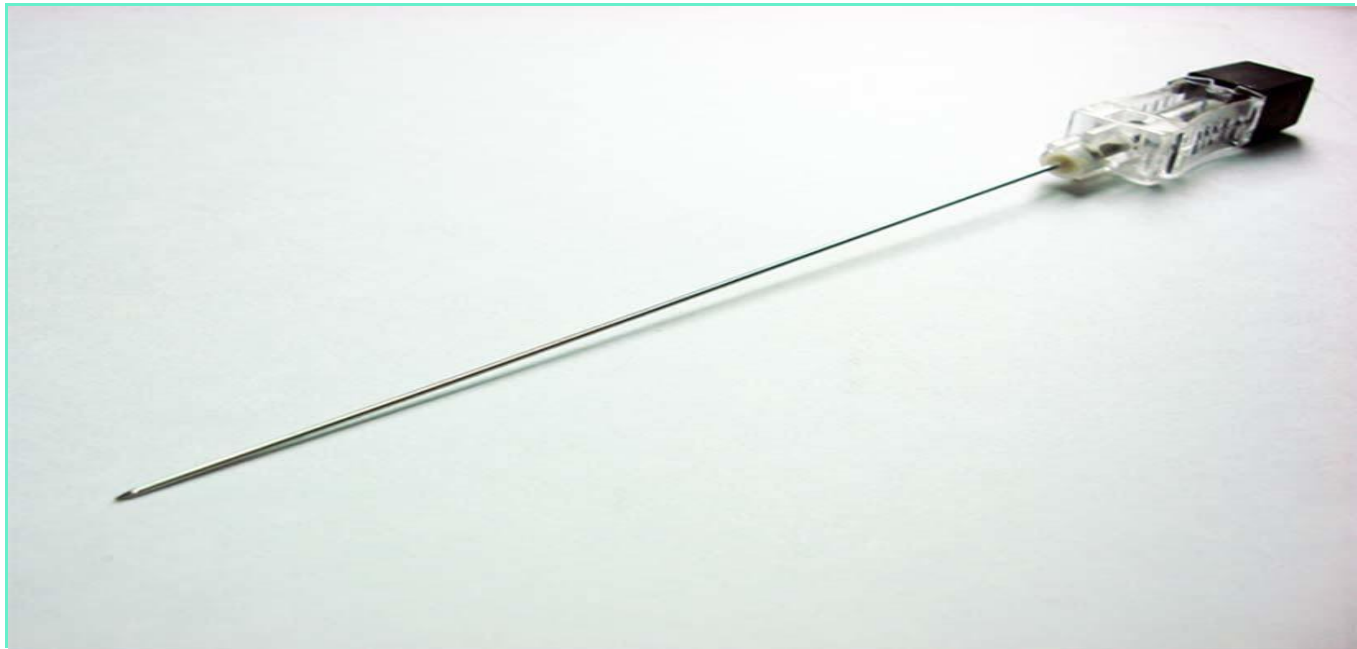
Fixed cardiac output state
eg aortic stenosis

RELATIVE

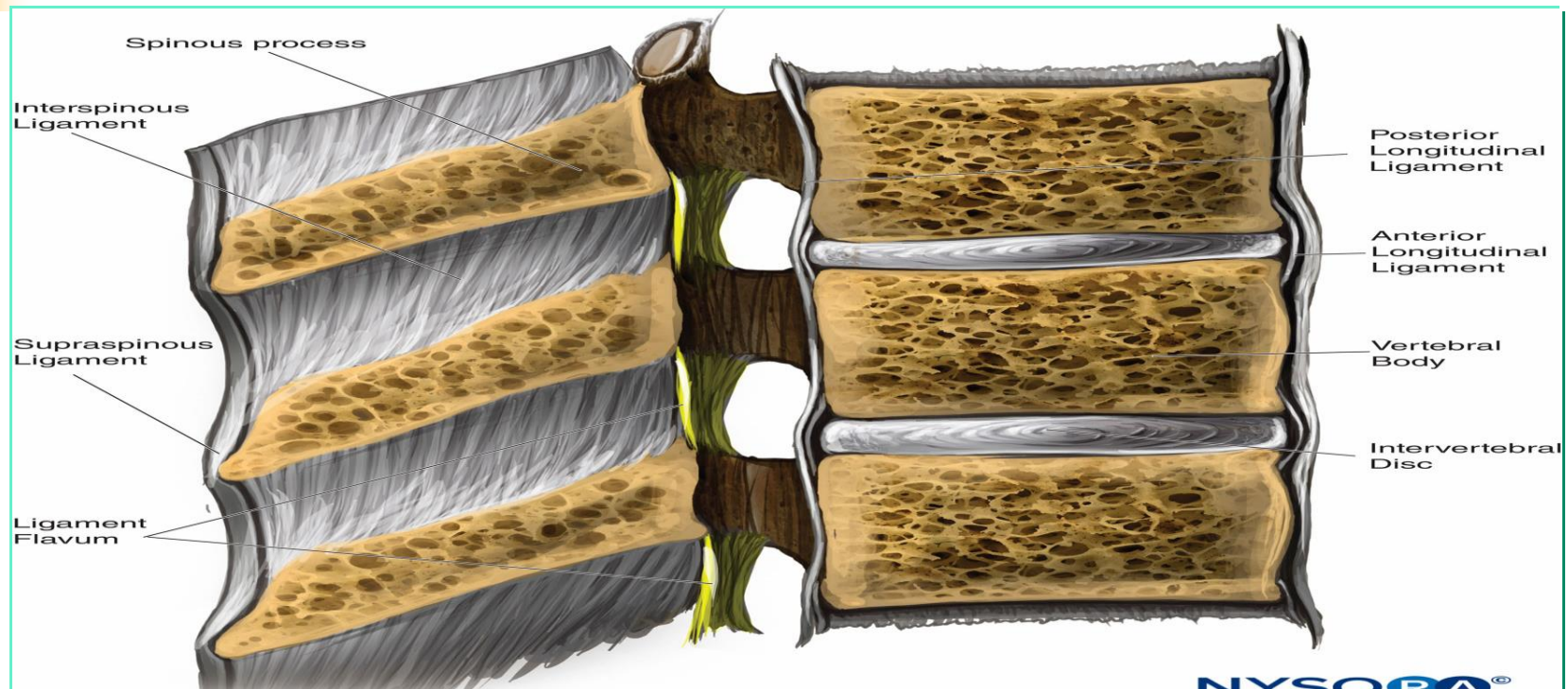
- Systemic sepsis
- Raised ICP
- Skeletal anomalies
- Neurological disease
- Previous local surgery
- Unco-operative patient



Spinal needle



Layers to reach CSF





Identification of epidural space

Loss of resistance technique

Role of U/S



Complications of neuroaxial anesthesia





Needles



Equipment



<u>Complications</u>	<u>Estimated frequency</u>	<u>Comments</u>
Direct nerve damage	1:10,000 – 1:30,000	No effective treatment
Spinal Haematoma	1:150,000 – 1:220,000	Requires urgent evacuation
Spinal infection	1:100,000 – 1:150,000	Aggressive Abs +/- evacuation
Drug error	Unknown	Avoidable, may be fatal
Systemic toxicity	Unknown	May be fatal without treatment
Respiratory depression	Unknown	Especially using opioids
Hypotension	Common	Early treatment needed
Confusional states	Common in elderly	Especially using opioids
Pruritis / nausea / urinary retention	Up to 16% incidence	Treat effectively
Technical failure	5-25%	Accept failure Consider alternative





CSF

Production
Volume





Complications

Post dural puncture headach
Hypotension



Factors affect the incidence of PDPH

Age

Gender

Length

Type of needle

Size of needle

Experience

.....





Peripheral nerve block

Plexuses (Brachial or Lumbar)
Nerves (Median, Ulnar, femoral, ...)





Techniques

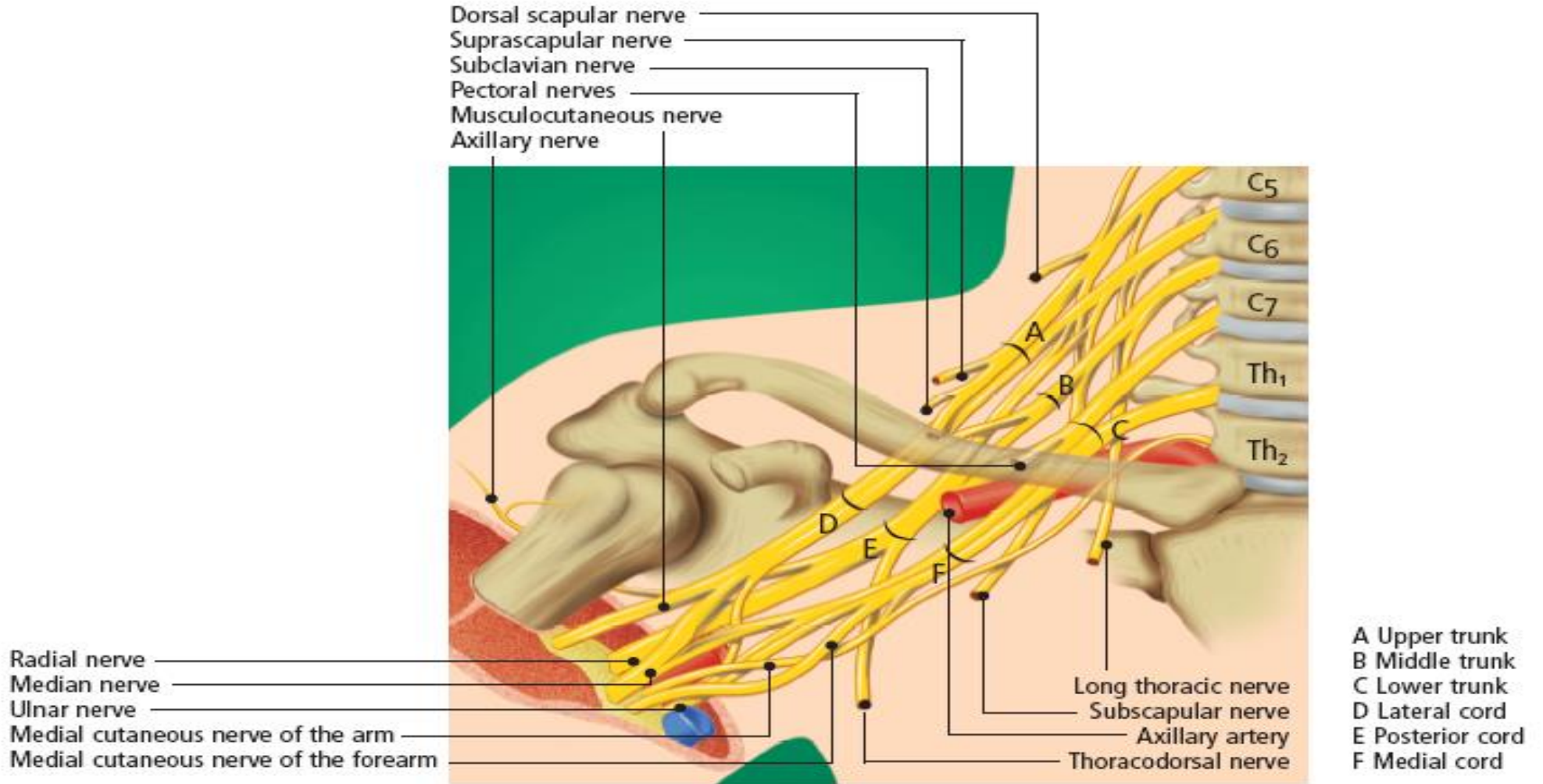
Blind

Nerve stimulator

Ultrasound



ANATOMY of BRACHIAL PLEXUS:



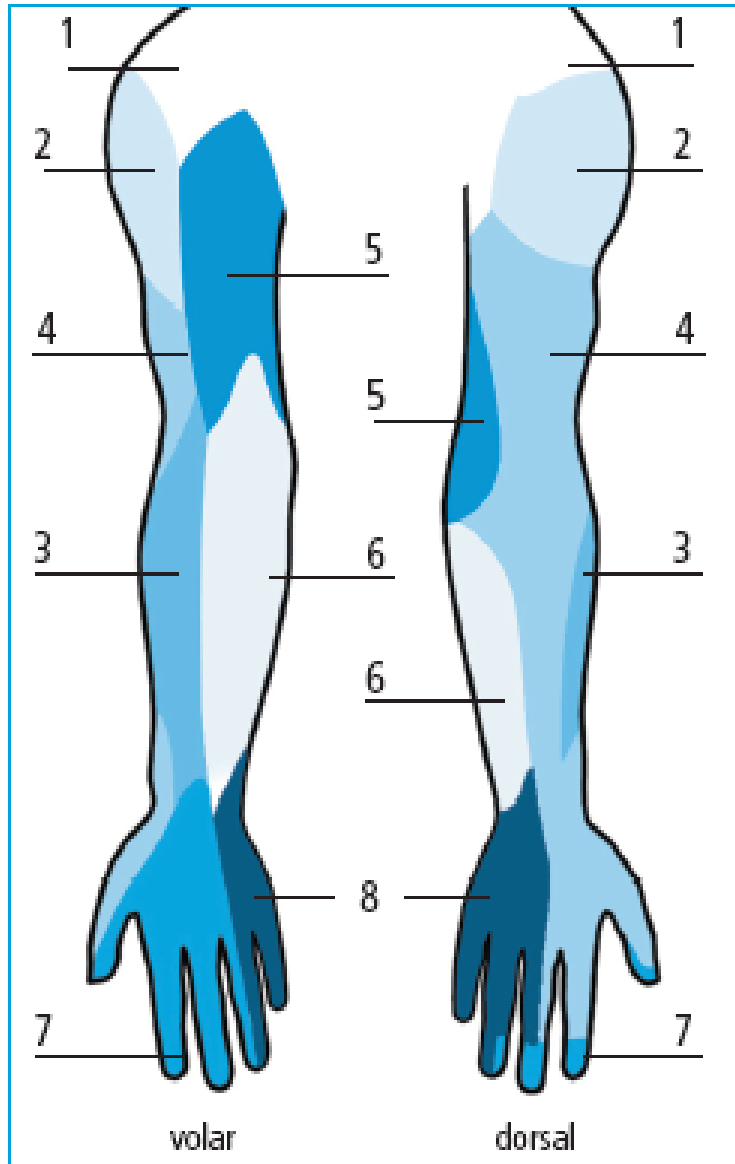
[VIDEO](#)



Motor supply areas

Peripheral nerve	Muscle	Function
Suprascapular nerve	Supraspinatus/ infraspinatus muscles	Forms parts of the rotator muscles
Axillary nerve	Deltoid muscle	Abduction of the arm in the shoulder joint
Musculocutaneous nerve	Biceps brachii muscle Brachial muscle Flexor pollicis brevis muscle	Bends the elbow in supination Pronates the forearm (flexes proximal phalanx of thumb)
Median nerve	Flexor carpi radialis muscle Flexor digitorum profundus muscle (I-III)	Flexes and abducts wrist radialward Flexes and adducts the thumb, flexes fingers I-III
Radial nerve	Triceps brachii muscle Extensor carpi radialis (brevis) muscle Extensor digitorum muscle	Extends elbow Extends and abducts wrist radialward Extends and flexes the hand dorsally Extends and spreads the fingers
Ulnar nerve	Flexor carpi ulnaris muscle Flexor digitorum profundus muscle (IV-V)	Flexes and abducts wrist ulnarward Flexes fingers (IV-V)





- 1 Supraclavicular nerves (from the superficial cervical plexus)
- 2 Axillary nerve
- 3 Musculocutaneous nerve
- 4 Radial nerve
- 5 Medial cutaneous nerve of the arm
- 6 Medial cutaneous nerve of the forearm
- 7 Median nerve
- 8 Ulnar nerve



Puncture site, Technique: [Video1](#)

•Ant. Approach

Anatomical landmarks

Superior thyroid notch, sternocleidomastoid muscle (posterior scalene gap)

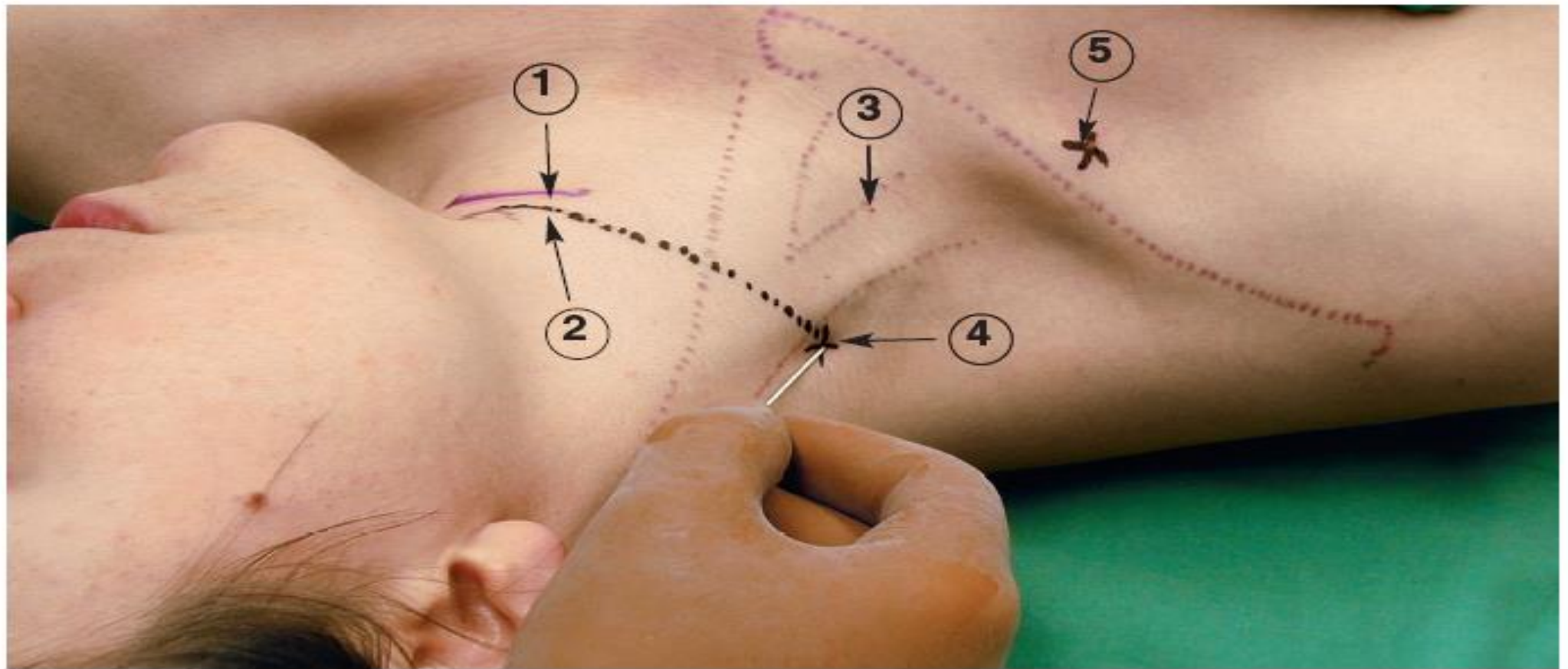
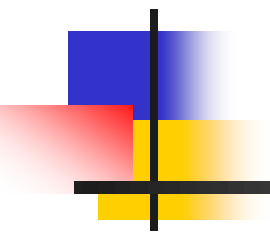


Fig. 11: Interscalene nerve block: Modification according to G. Meier

1. Cricoid
2. Superior thyroid notch
3. Sternocleidomastoid muscle
4. Puncture site for anterior access
5. Vertical, infraclavicular puncture site







Thank you

