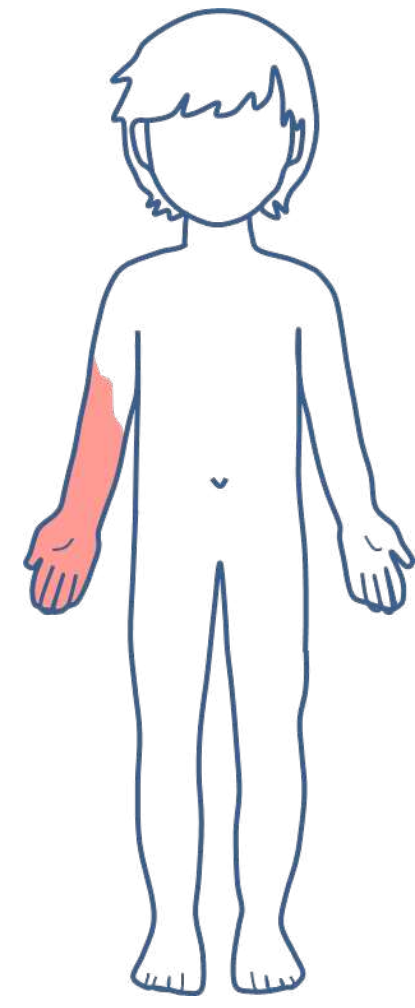
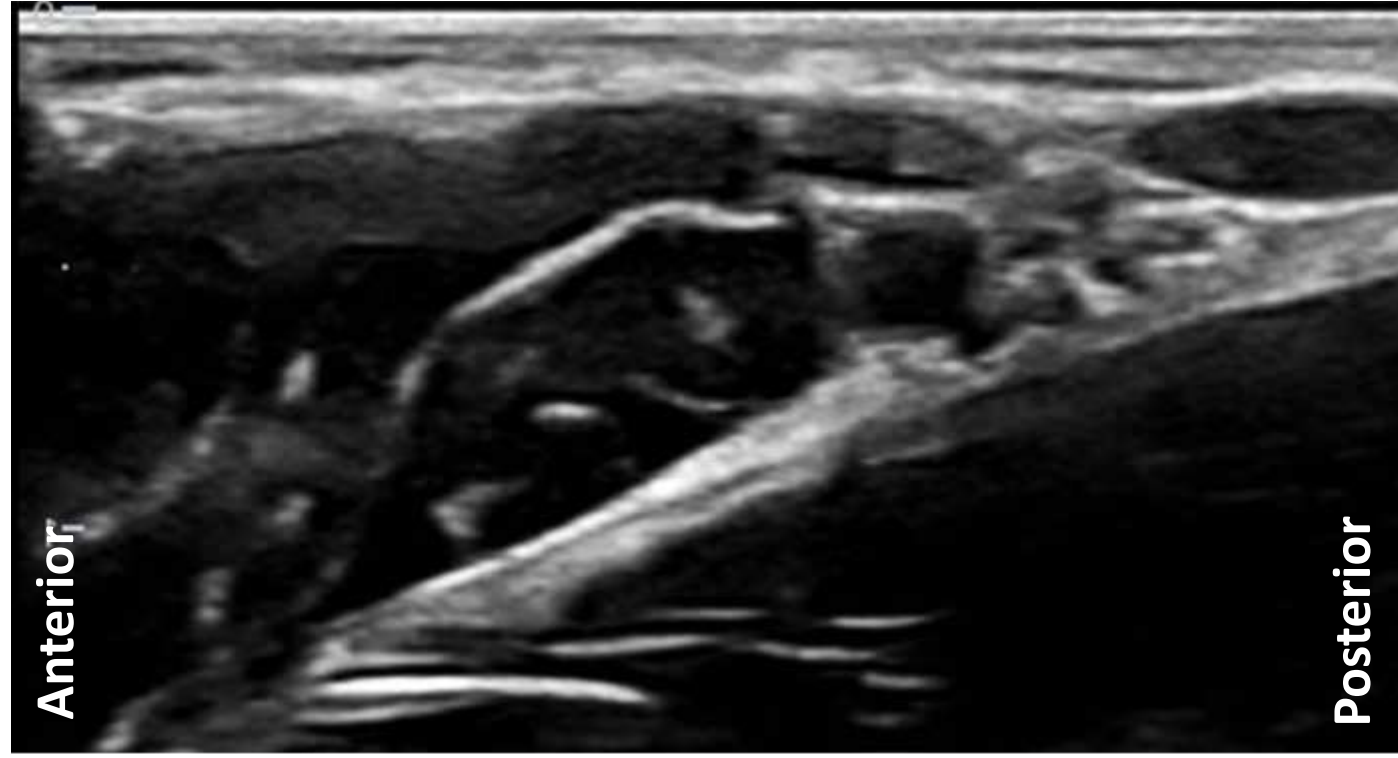
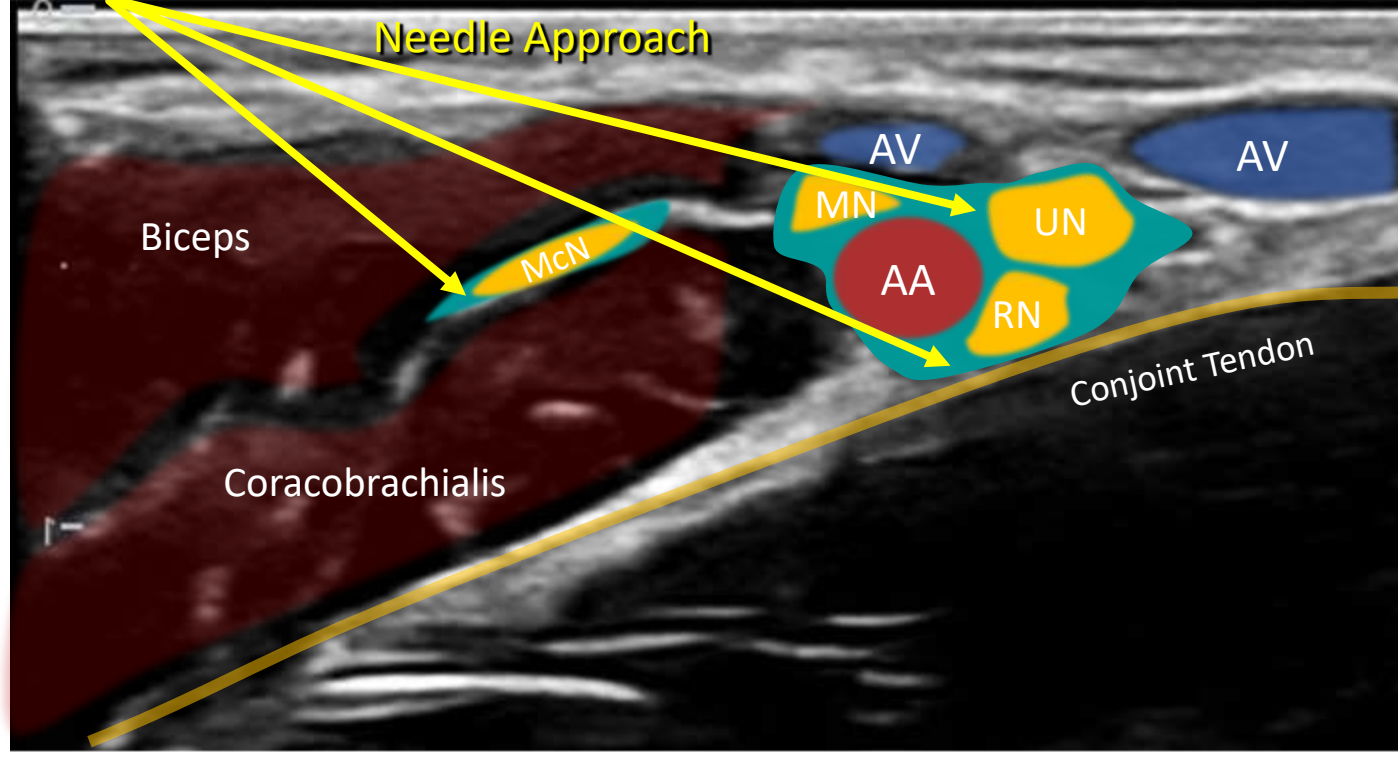
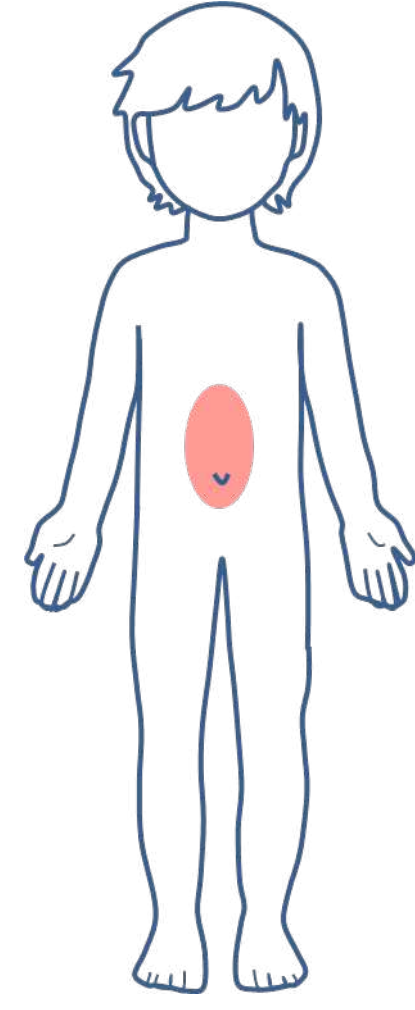
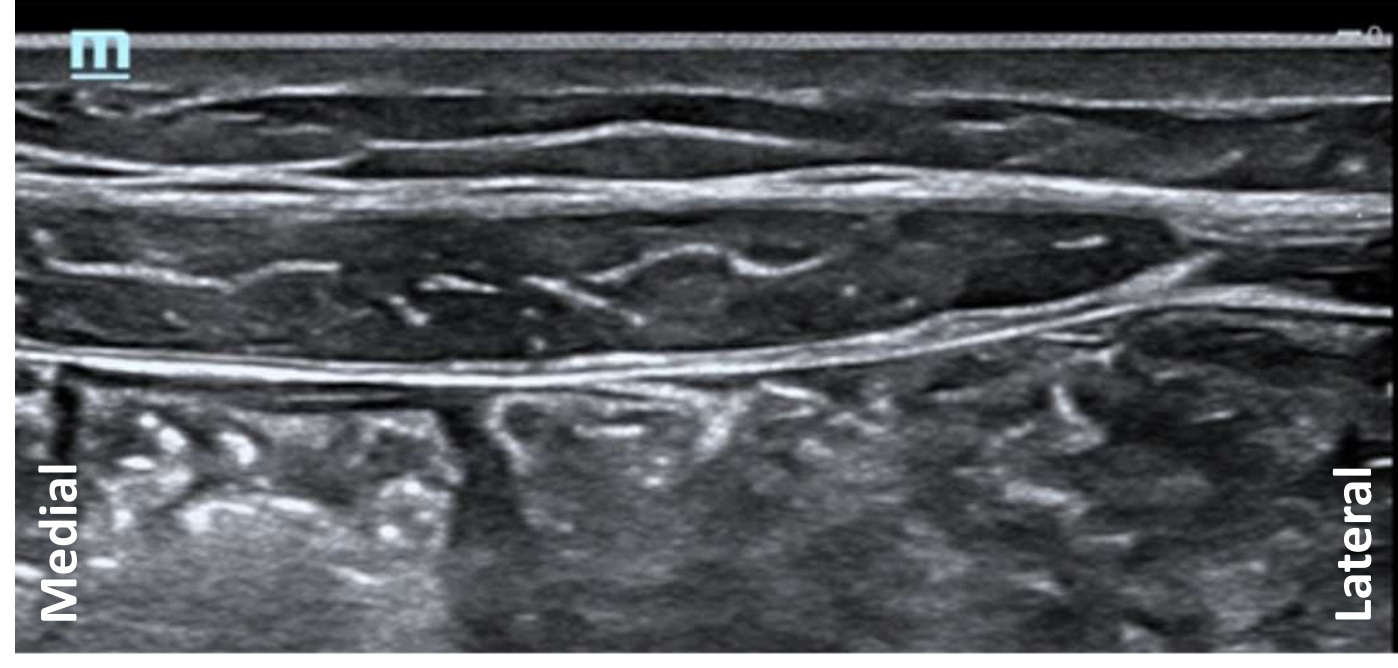
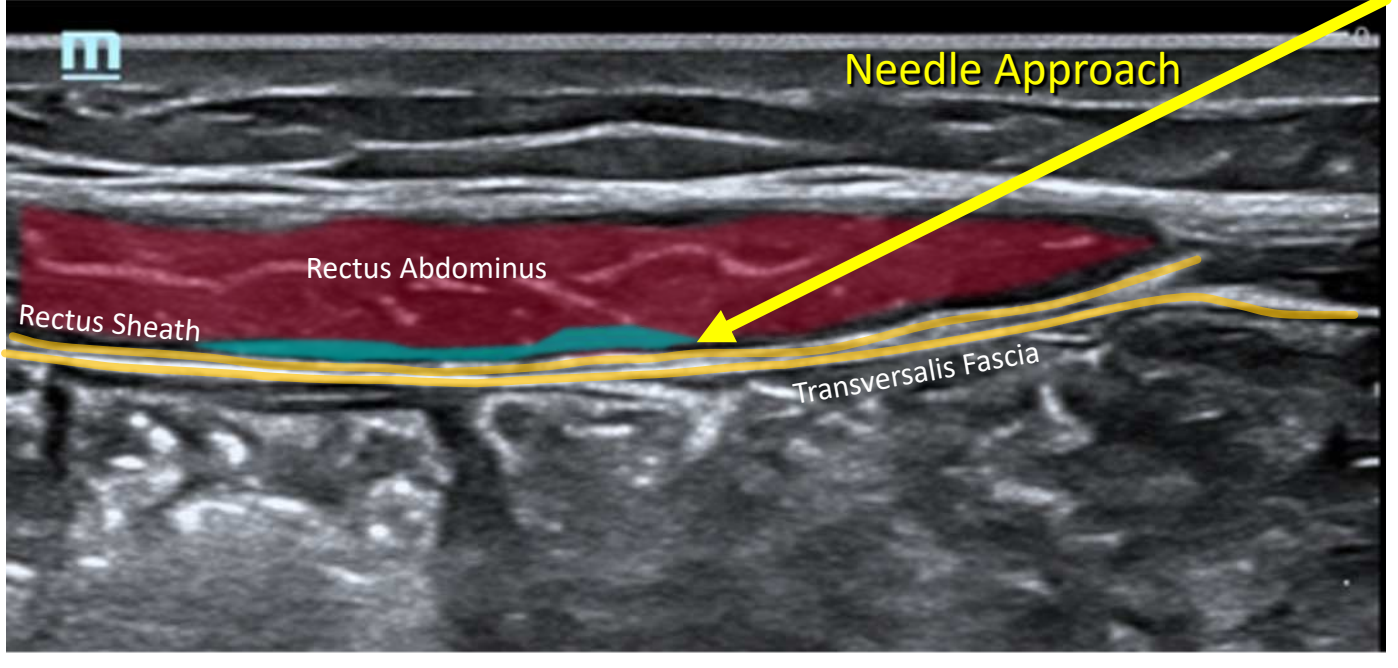
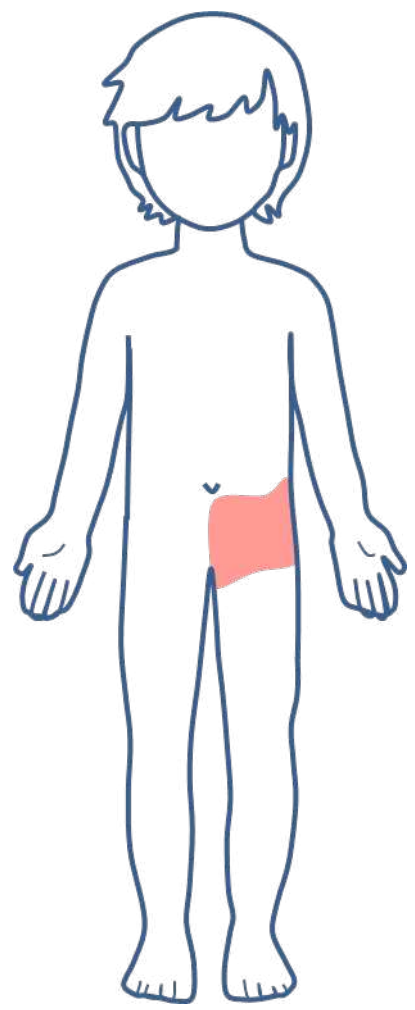
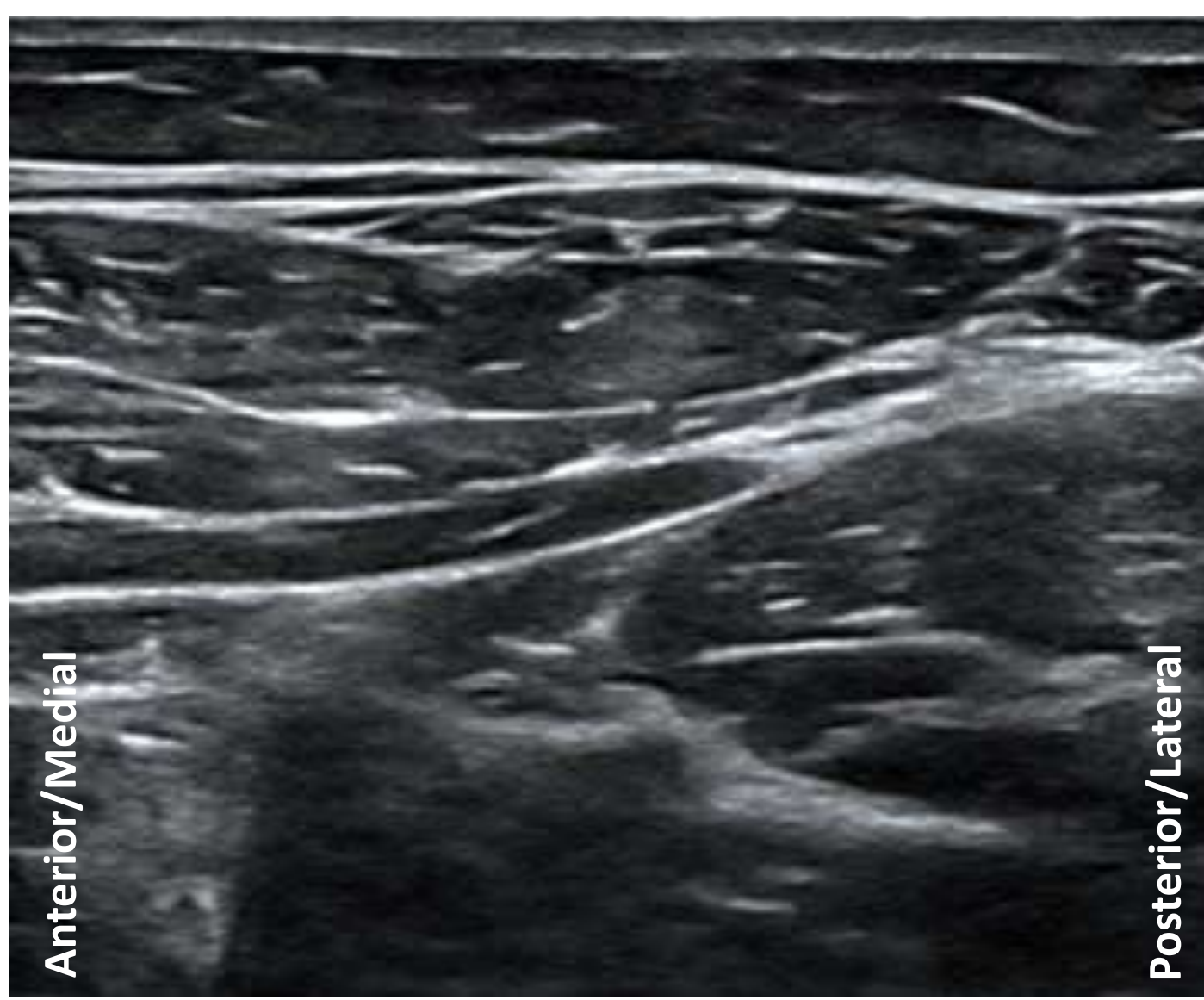
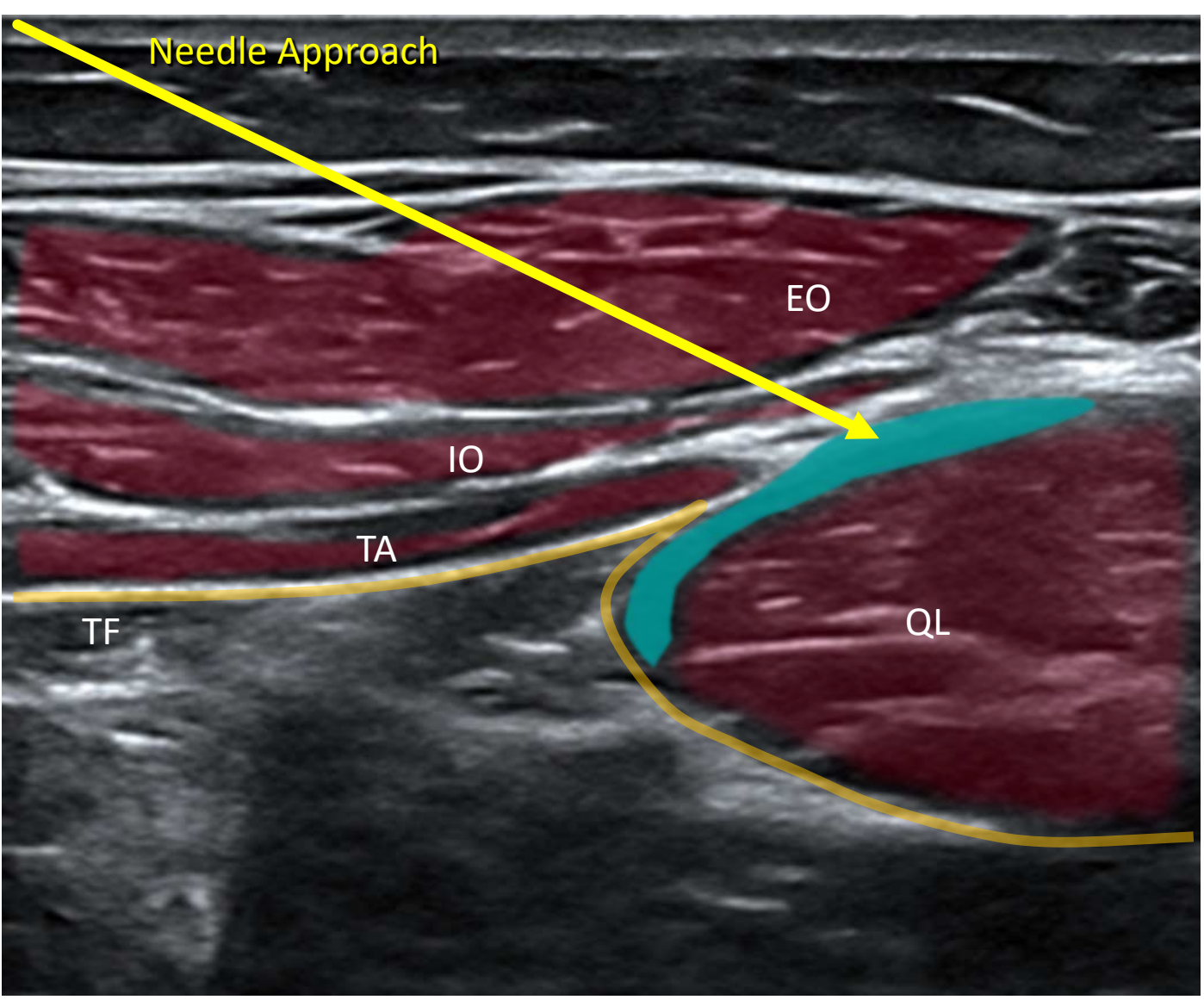
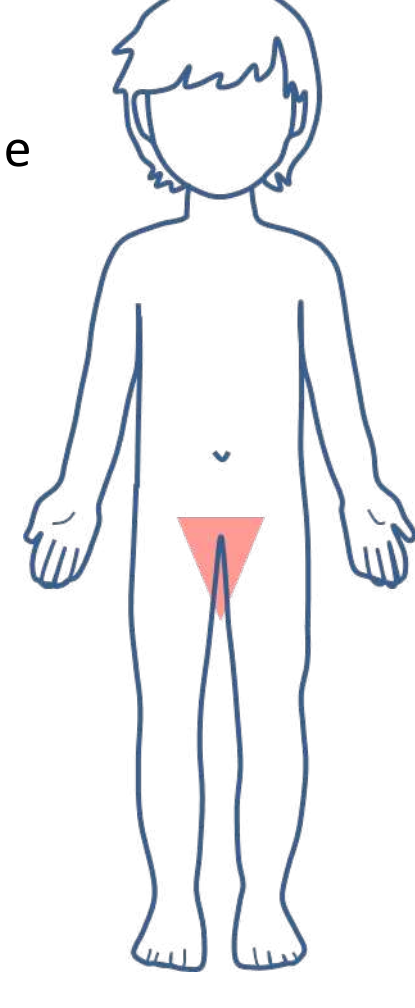
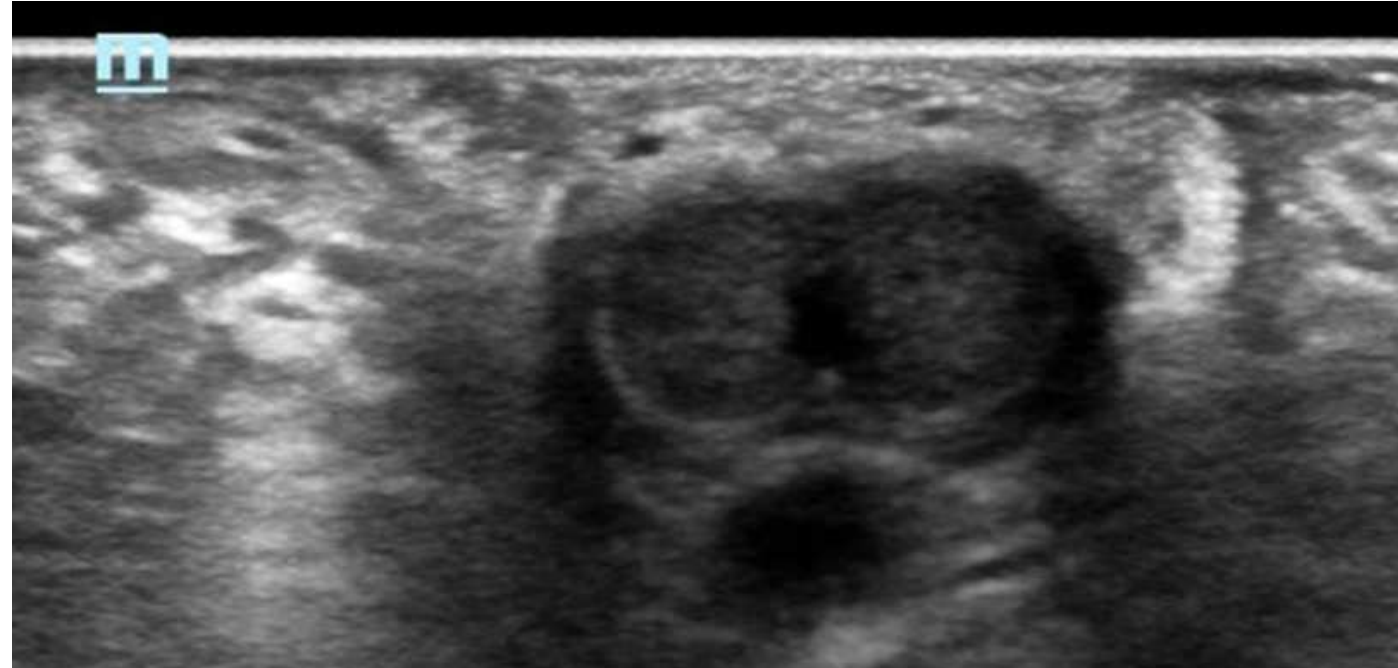
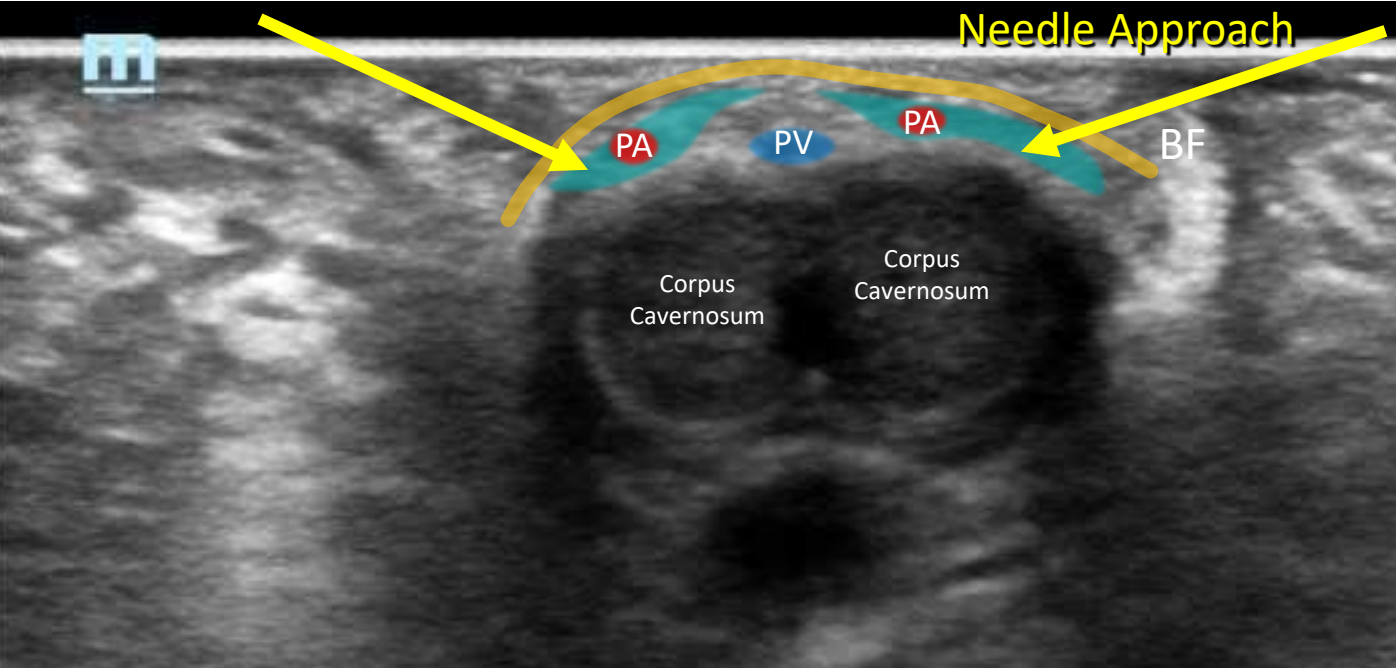
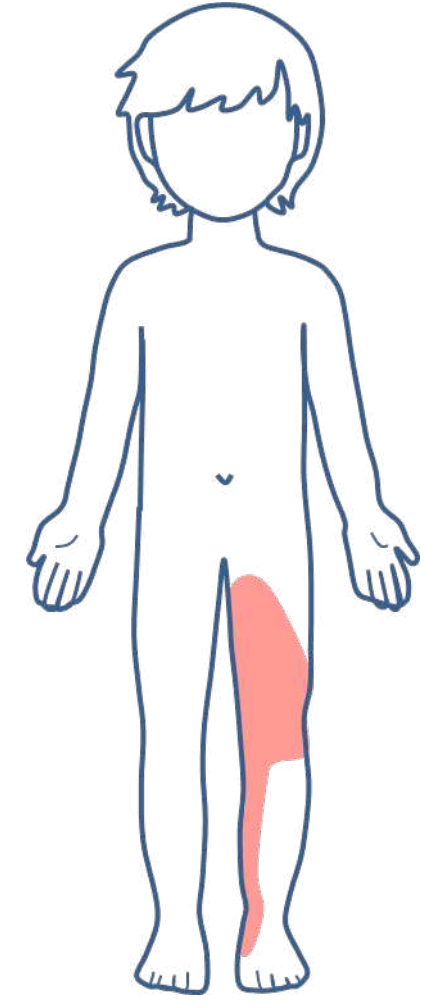
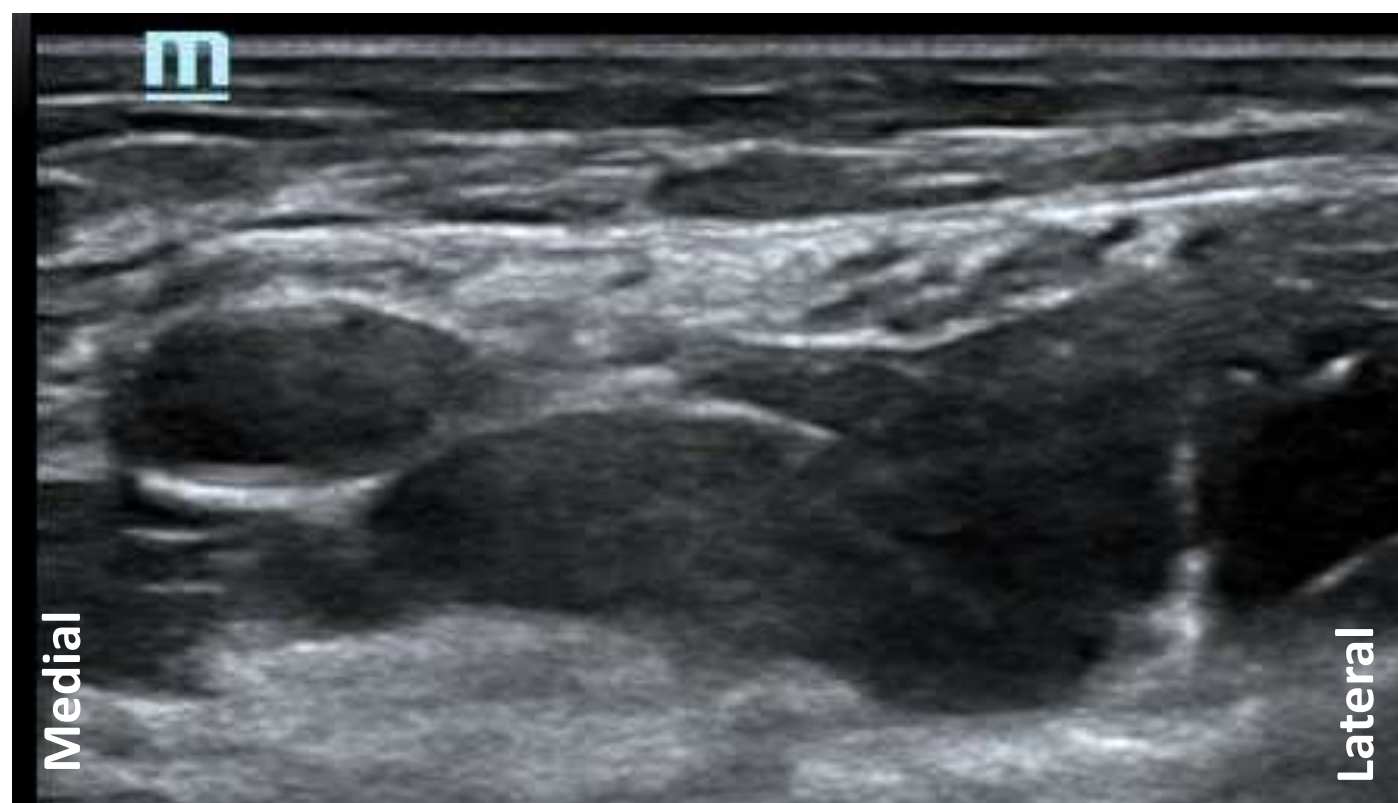
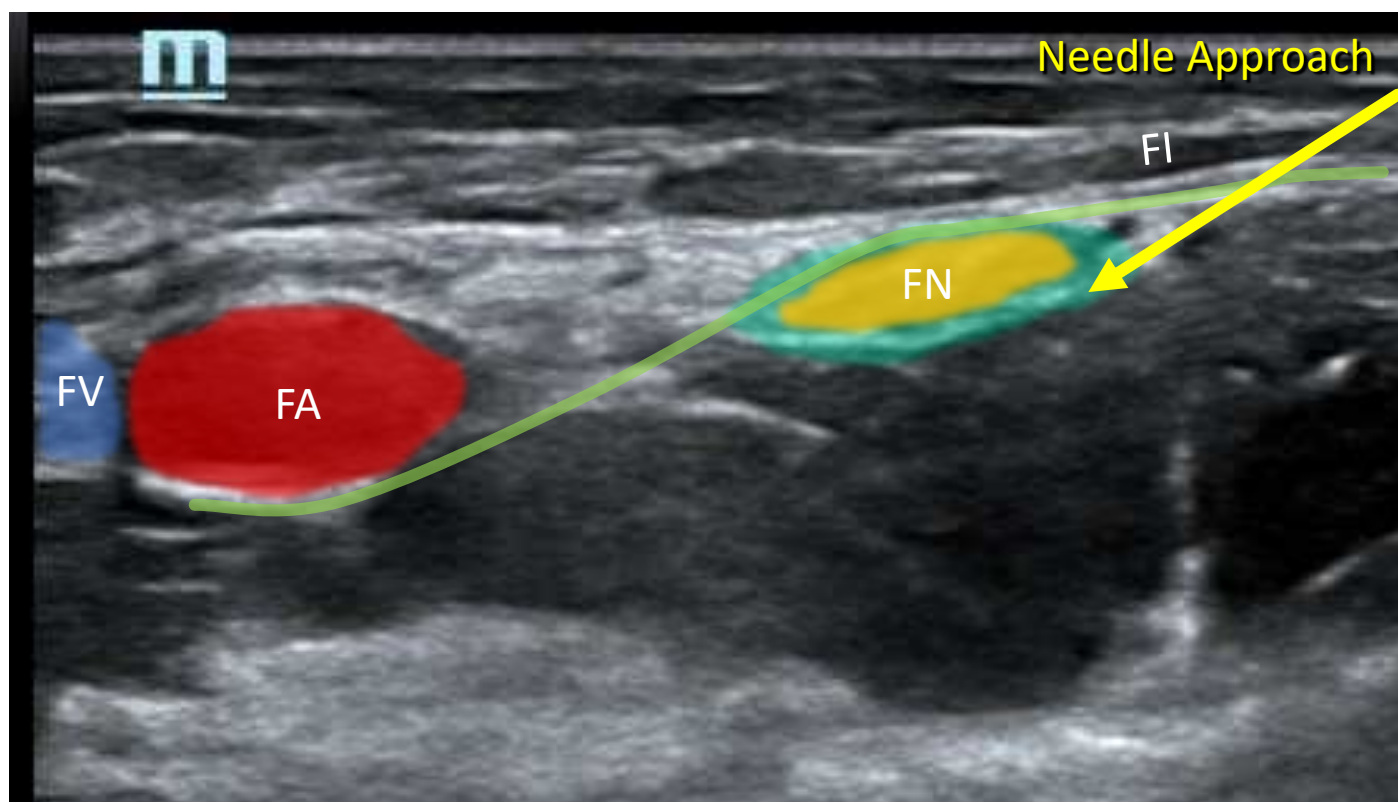
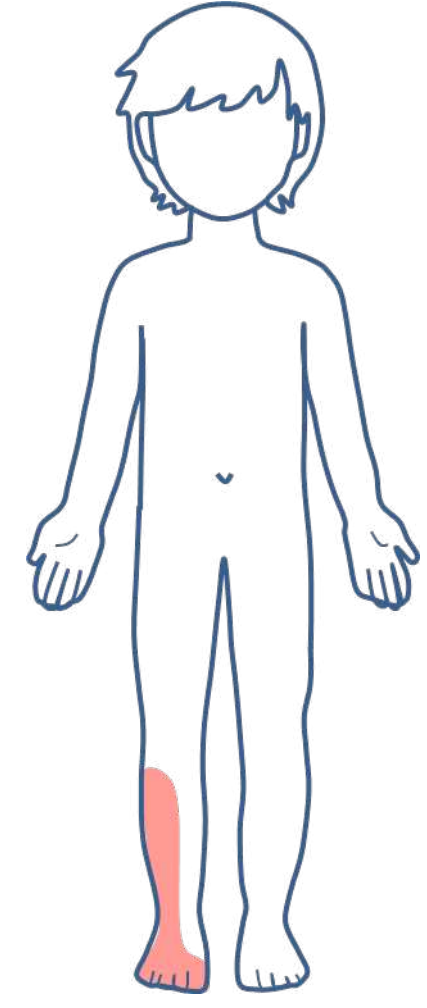
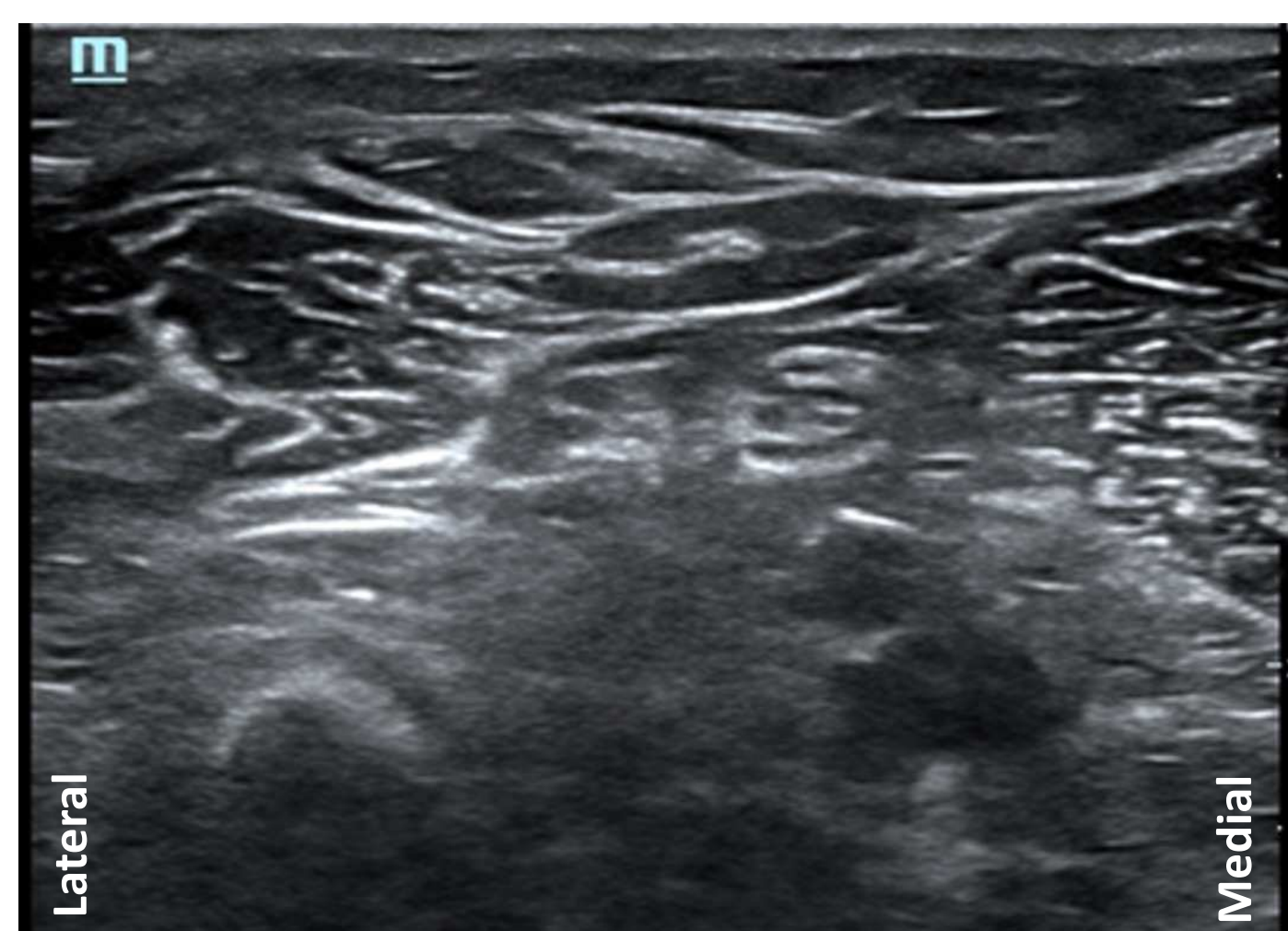
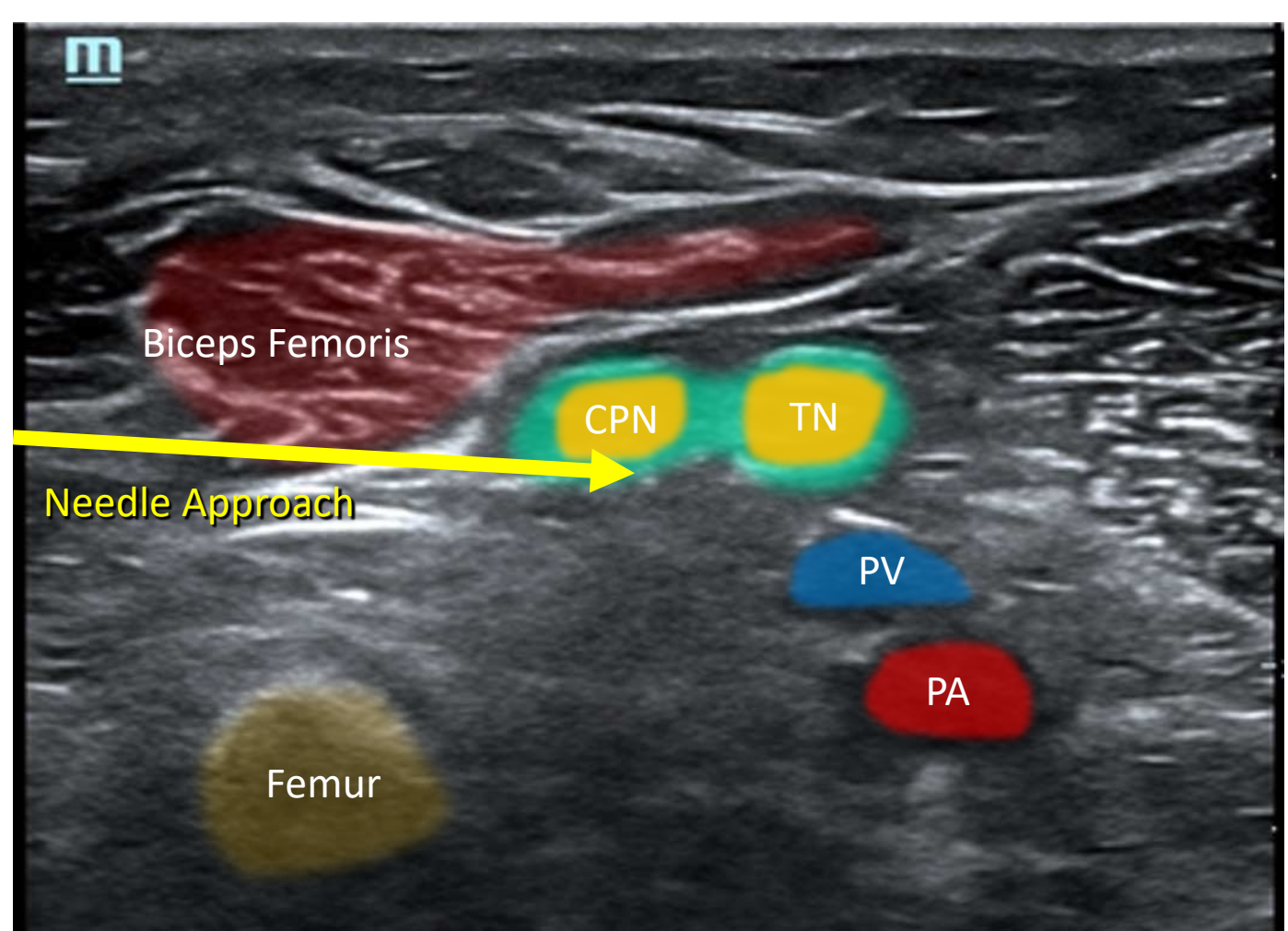
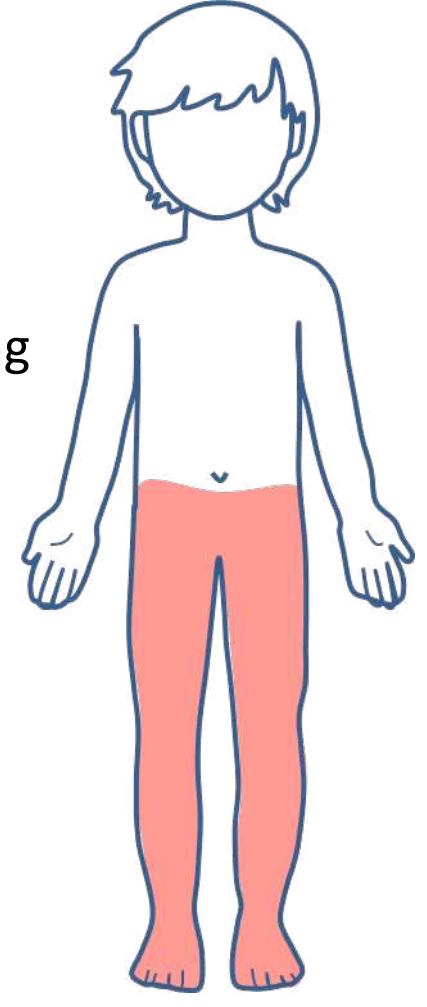
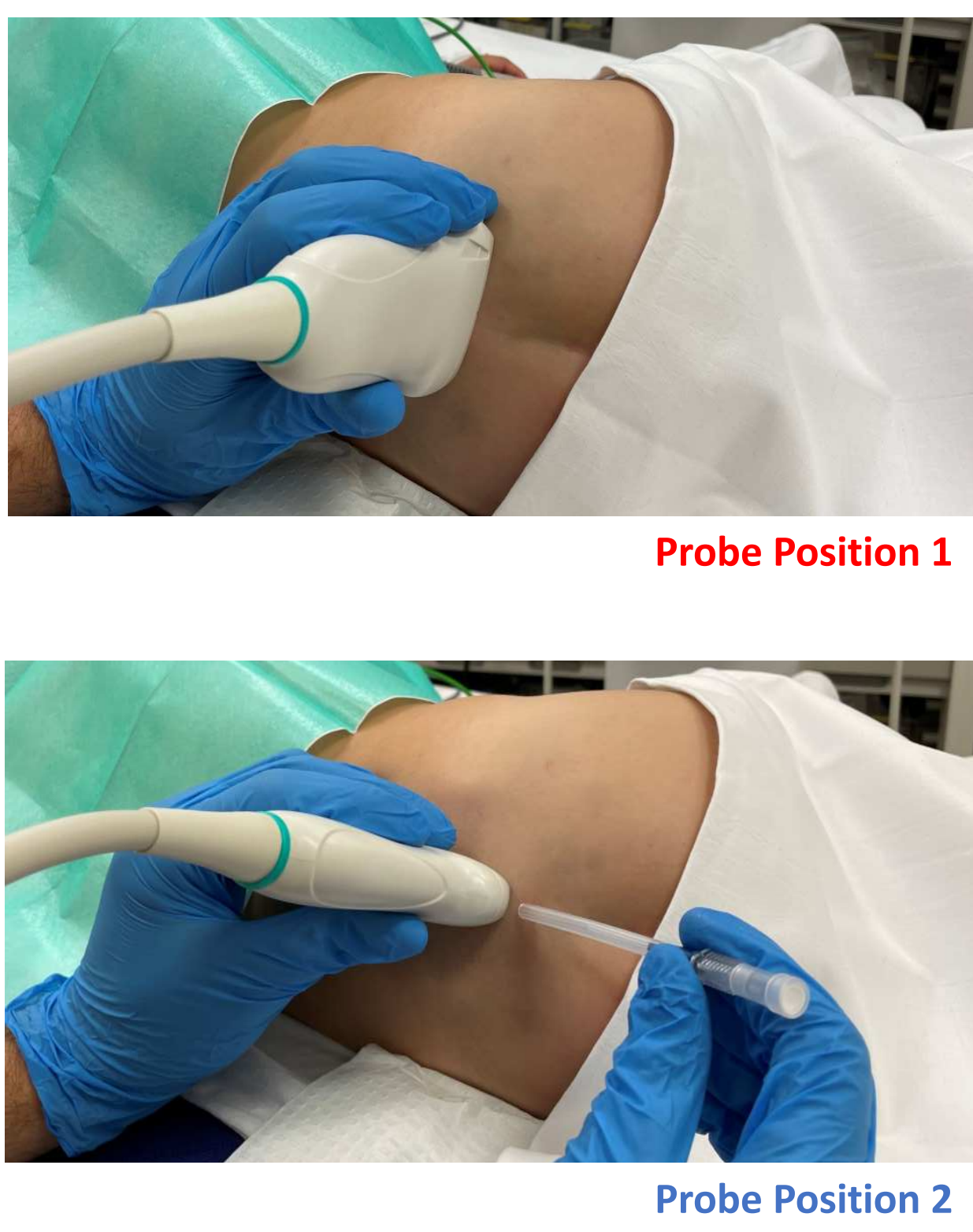
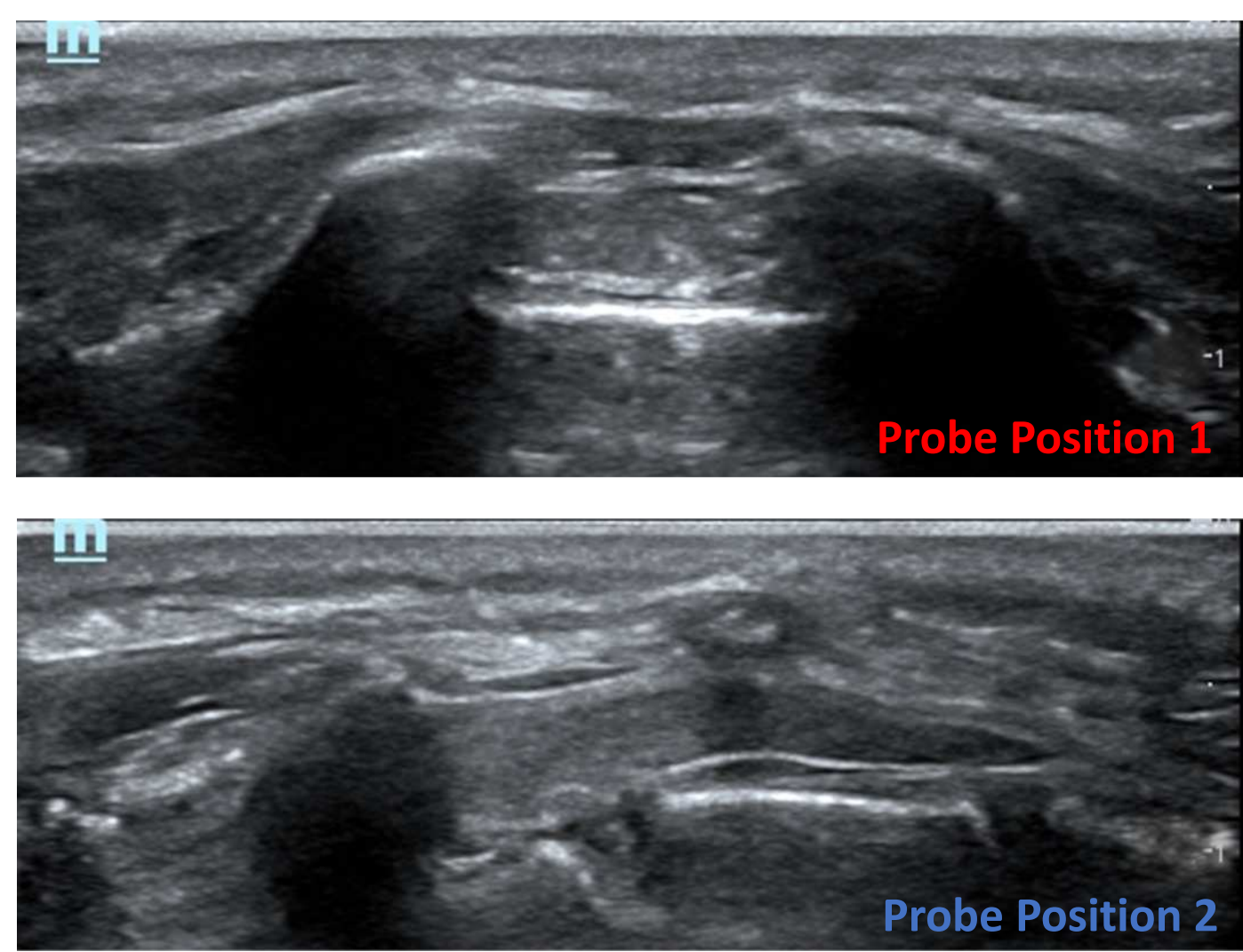
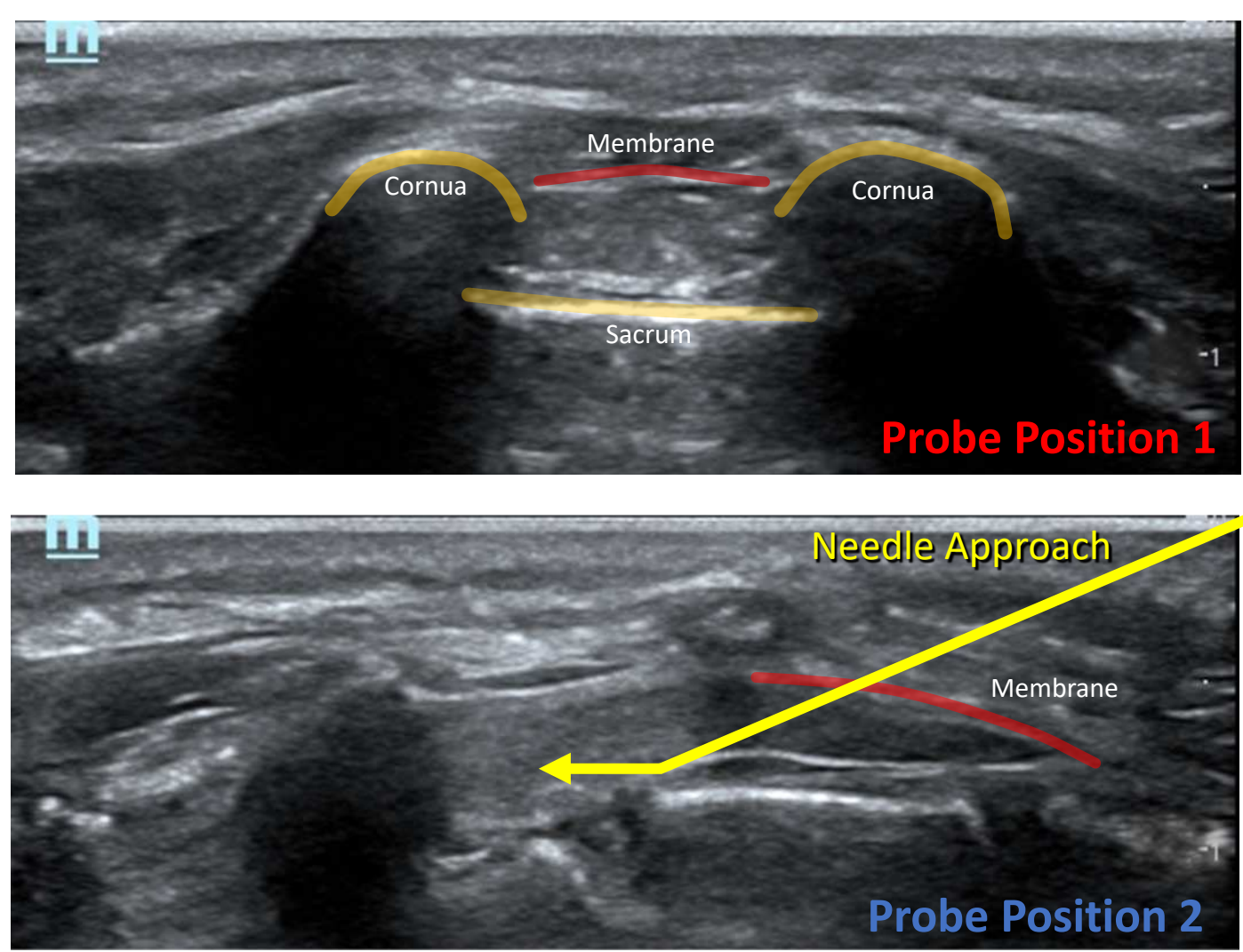
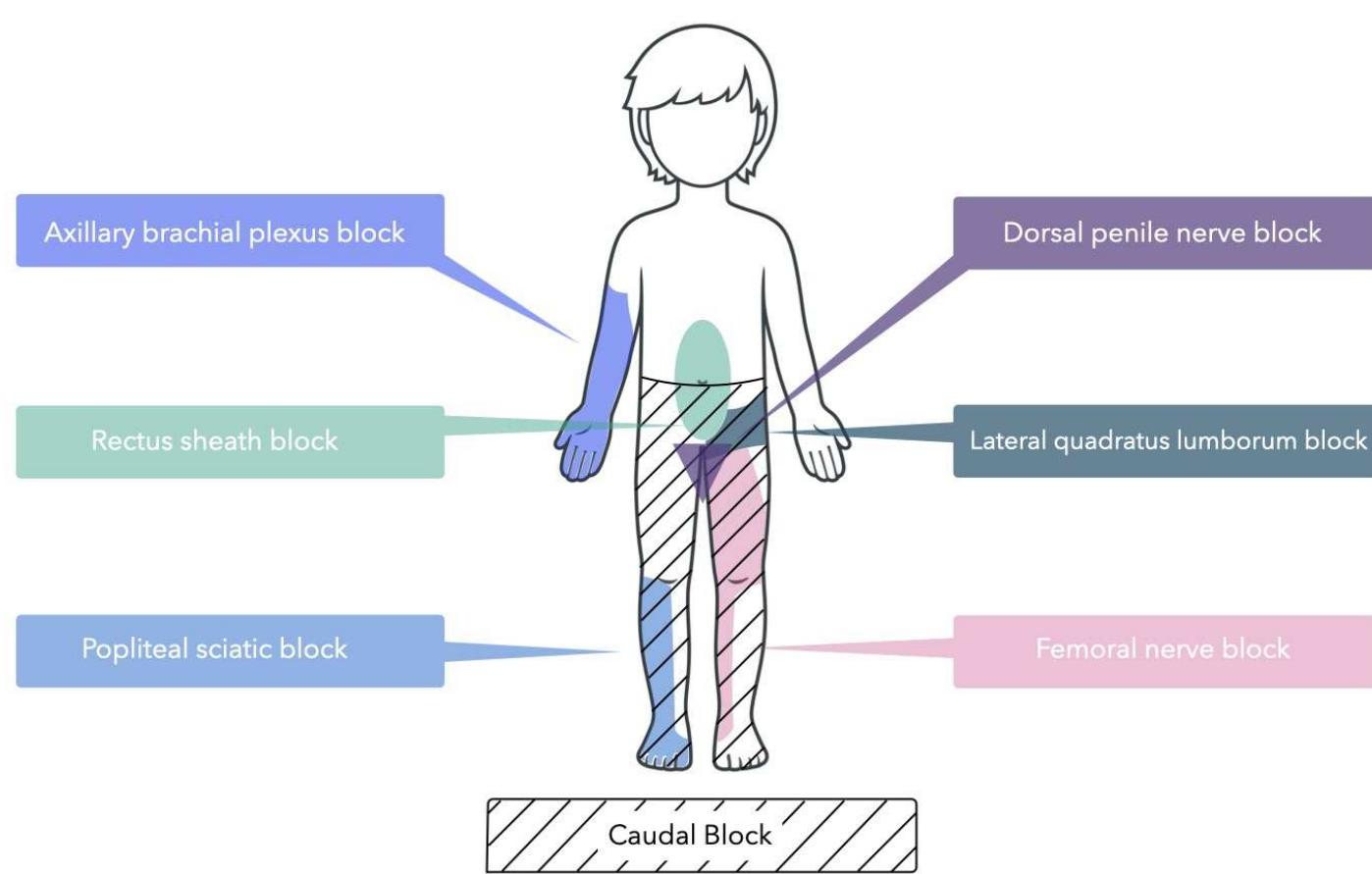


UPPER LIMB & TRUNK

PAEDIATRIC PLAN A BLOCKS

	PROBE POSITION	ULTRASOUND IMAGE	ULTRASOUND ANATOMY
AXILLARY BRACHIAL PLEXUS BLOCK Indications: Elbow, forearm & hand surgery Positioning: Supine, abduct arm 90° Depth: 0.1-4cm Needle: 22G 50mm Volume: 0.2-0.5ml/kg 0.25% L-Bupivacaine to max 20ml  Abbreviations AA / AV = Axillary Artery / Vein MN = Median Nerve UN = Ulnar Nerve RN = Radial Nerve McN = Musculocutaneous Nerve		 Probe position: Transverse across junction of biceps and pectoralis muscles Needle approach: In plane, lateral to medial towards posterior aspect of AA Best view: AA lying on conjoint tendon. MN, UN and RN around artery. McN between biceps and coracobrachialis (or within CB) Technique: Local below then above AA to surround it, LA will lift AA off conjoint tendon. Separate injection to McN <i>5-year-old child, consent obtained for photos and images</i>	 Spread of LA: Around AA, isolating individual nerves Tips: Apply and release pressure to visualize blood vessels or use Doppler. The RN can lie behind the artery and can be harder to locate on scan. MN may appear as two separate structures. McN can be bundled with the MN ● = Local Anaesthetic Spread
RECTUS SHEATH BLOCK Indications: Midline/paramidline surgery Positioning: Supine Depth: 0.1-5cm Needle: 22G 50mm Volume: 0.1-0.3ml/kg 0.25% L-Bupivacaine each side to max 20ml  Abbreviations EO = External Oblique IO = Internal Oblique TA = Transversus Abdominus		 Probe position: Transverse on abdomen above umbilicus Needle approach: In plane, lateral to medial (shallow), aim between rectus muscle and posterior rectus sheath Best view: Identify linea alba, then move lateral to identify rectus muscle, and EO/IO/TA beyond Technique: Insert needle tip posterior to rectus abdominis and above the posterior rectus sheath <i>5-year-old child, consent obtained for photos and images</i>	 Spread of LA: Observe muscle peeling off posterior rectus sheath with injection Tips: Intramuscular = Too Superficial. Between posterior sheath and peritoneum = Too Deep. LA can be diluted in neonates to increase volume and spread. Large footprint linear probe can assist sufficiently lateral needle insertion for shallow trajectory. Use doppler to identify and avoid epigastric vessels. Use longitudinal parasagittal view to assess LA spread ● = Local Anaesthetic Spread
LATERAL QUADRATUS LUMBORUM BLOCK Indications: Inguinal, groin and lower abdominal wall surgery Positioning: Lateral tilt or lateral decubitus with roll under flank Depth: 1-5cm Needle: 22G 50-80mm Volume: 0.2-0.5ml/kg 0.25% L-Bupivacaine to max 20ml  Abbreviations EO = External Oblique IO = Internal Oblique TA = Transversus Abdominus TF = Transversalis Fascia QL = Quadratus Lumborum		 Probe position: On flank above iliac crest in axial plane Needle approach: In plane, anterior or posterior to probe Best view: Identify posterior aponeurosis of TA Technique: Insert needle deep to IO aponeurosis but superficial to TA aponeurosis at the lateral margin of QL <i>5-year-old child, consent obtained for photos and images</i>	 Spread of LA: Needle is advanced until tip penetrates the posterior aponeurosis of IO muscle. LA is injected in the plane between the aponeuroses of IO and TA muscles at the lateral border of the QL muscle ● = Local Anaesthetic Spread
DORSAL PENILE NERVE BLOCK Indications: Penile surgery Positioning: Supine, retract penis in caudal direction Depth: 0.1-3cm Needle: 22G 50mm Volume: 0.1ml/kg 0.25% L-Bupivacaine per side to max 5ml each side  Abbreviations BF = Buck's Fascia SP = Symphysis Pubis PV/PA = Penile Vein/Artery		 Probe position: Often landmark only or probe transverse at base of dorsal penis Needle approach: Either side of midline (10 and 2 o'clock) distal to inferior rami pubic bone, advance in medial/caudal direction until seen to pop through fascia Best view: Visualise Buck's fascia avoiding dorsal paired arteries and vein Technique: Directly visualise needle passing through fascia lateral to dorsal arteries, as two separate injections in-plane <i>5-year-old child, consent obtained for photos and images</i>	 Spread of LA: Under Buck's fascia on either side of suspensory ligament Tips: Ensure negative aspiration (vascular structures). Dorsal penile nerves run either side of suspensory ligament in two spaces that rarely communicate. Spread of local anaesthetic can be seen on US but will need two injections to cover both sides. The ilioinguinal and genitofemoral nerves may supply the base of the penis, subcutaneous infiltration around the base of the penis may be required to complete the block for some procedures ● = Local Anaesthetic Spread

LOWER LIMB PAEDIATRIC PLAN A BLOCKS

	PROBE POSITION	ULTRASOUND IMAGE	ULTRASOUND ANATOMY
FEMORAL NERVE BLOCK Indications: Hip joint, femur, knee, anterior thigh surgery Positioning: Supine, leg straight and externally rotated Depth: 0.1-5cm Needle: 22G 50mm Volume: 0.2-0.5ml/kg 0.25% L-Bupivacaine to max 20ml Abbreviations FN = Femoral Nerve FI = Fascia Iliaca FA = Femoral Artery 		 Probe position: Transverse along inguinal crease Needle approach: In plane, lateral to medial Best view: Femoral artery and vein medially, FN lateral to artery under FI. FN typically triangular/oval in shape. Ensure you are proximal to the origin of the profunda branch of the femoral artery, may need to scan cephalad to inguinal crease Technique: Needle insertion lateral to FN, below FI <i>5-year-old child, consent obtained for photos and images</i>	 Spread of LA: Below FI, surrounding FN Tips: Lymphatic tissue above FI can mimic FN. Tilt probe slightly cranially/caudally to optimise FN. Pressure optimises FN but may collapse veins. If FN remains difficult to visualise, deposit LA under FI ● = Local Anaesthetic Spread
POPLITEAL SCIATIC BLOCK Indications: Surgery below the knee Positioning: Lateral decubitus or supine with raised foot (or prone) Depth: 1-5cm Needle: 22G 50mm Volume: 0.2-0.3ml/kg 0.25% L-Bupivacaine to max 20ml Abbreviations TN = Tibial Nerve CPN = Common Peroneal Nerve 		 Probe position: Transverse at popliteal fossa measured depth of nerve. Can be out of plane Needle approach: In plane, lateral approach at measured depth of nerve. Can be out of plane Best view: Identify popliteal artery and more superficial TN. Scan proximally until CPN joins TN Technique: Block at point where TN/CPN just separate when still within common sheath <i>5-year-old child, consent obtained for photos and images</i>	 Spread of LA: Observe separation of TN and CPN and confirm proximal spread of LA on USS Tips: Improve image with increased pressure and tilt towards feet. The see-saw sign can be used to visualise the nerves rocking as the foot is dorsiflexed and plantar flexed ● = Local Anaesthetic Spread
CAUDAL BLOCK Indications: Procedures below the umbilicus including bilateral lower abdominal and limb Positioning: Lateral decubitus Depth: 1-5cm Needle: 22G wingless cannula e.g. Abbocath or Caudal needle Volume: up to 1ml/kg 0.25% L-Bupivacaine to max 15ml. US can guide max volume by observing dermatomal level of spread of LA Consider additions e.g. clonidine 1-2mcg/kg for increased duration Special info: Spread more predictable <2 years. Ultrasound reduces number of attempts and complications (e.g. vascular or subcutaneous placement) 		 Probe position: Transverse across sacral cornua initially, then turn sagittally Needle approach: Between cornua at 45 degrees to sacrum in cranial direction. Once through sacrococcygeal membrane, flatten the angle of the needle and advance, taking care not to go too deep <i>2-year-old child, consent obtained for photos and images</i>	 Best view: Start with probe transverse to confirm position and then rotate to sagittal for in-plane advancement and observation of injectate. Technique: Ensure all lubricant is removed from needle insertion point. Characteristic pop through ligament. Observe injectate with 0.5-1ml saline, then once position confirmed, switch to LA and monitor height of LA spread
LEARN MORE https://www.ra-uk.org/index.php/plan-a-blocks-home   Paediatric Plan A Editorial Adult Plan A Editorial REFERENCES Pearson, A.M.E., Roberts, S. and Turbitt, L.R. (2022), New blocks on the kids: core basic nerve blocks in paediatric anaesthesia. Anaesthesia. https://doi.org/10.1111/anae.15876 Suresh S., Ecoffey C., Bosenberg A., et al (2018), The European Society of Regional Anaesthesia and Pain Therapy/American Society of Regional Anesthesia and Pain Medicine Recommendations on Local Anesthetics and Adjuvants Dosage in Pediatric Regional Anesthesia. Regional Anesthesia & Pain Medicine. http://dx.doi.org/10.1097/AAP.0000000000000702	Blocks Overview 	General Tips: - Perform the most peripheral block possible - Central neuraxial blocks carry an increased risk compared to peripheral blocks - It is recommended to perform paediatric regional blocks under deep sedation or general anaesthesia - Ultrasound increases success rate, duration of block, and facilitates shortened block performance times with fewer needle passes - Ultrasound reduces the volume of local anaesthetic needed. The smaller the child, the greater the benefit to using ultrasound	Local Anaesthetic Dosing: - Max dose levobupivacaine = 2.5mg/kg (1ml/kg 0.25%) for infants and children - Max dose levobupivacaine = 2mg/kg (0.8ml/kg 0.25%) for neonates - Infants < 6 months (including neonates) at increased risk of LA toxicity - Due to incomplete myelination, lower concentrations of LA are as effective as higher concentrations, therefore 0.25% used as standard. Can dilute to 0.125% for younger patients to increase available volume