

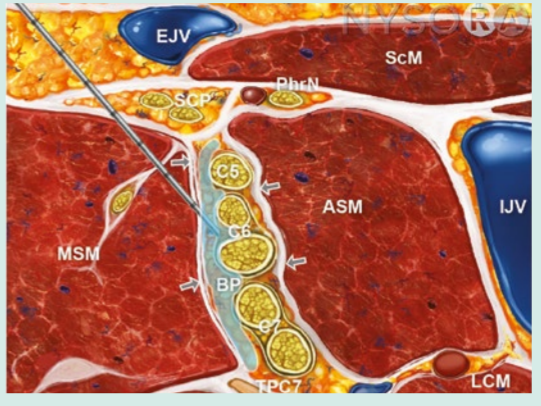
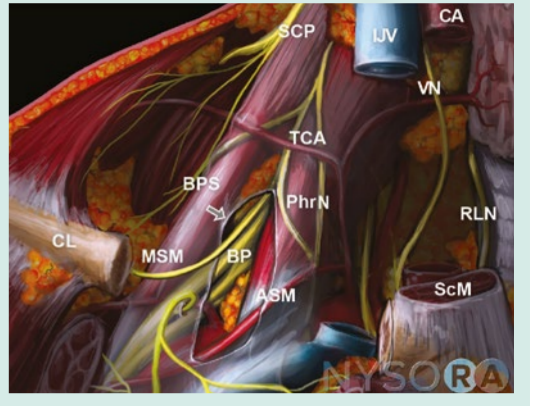


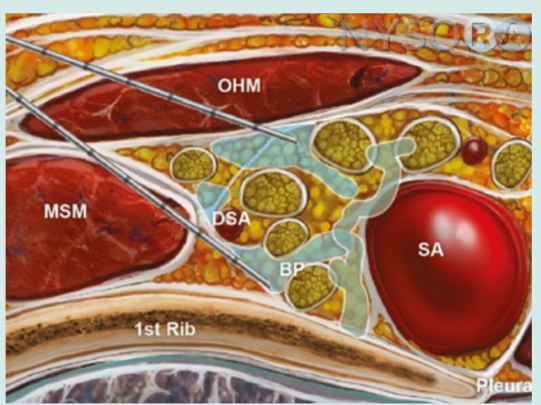
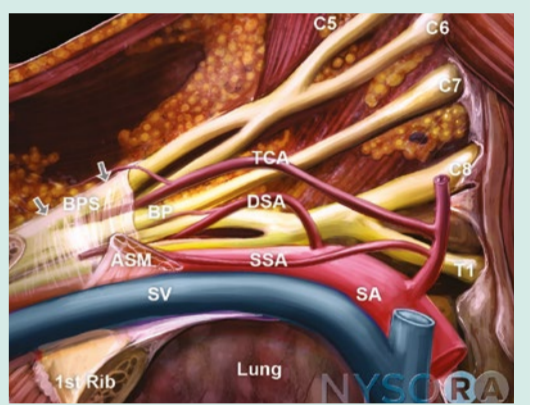
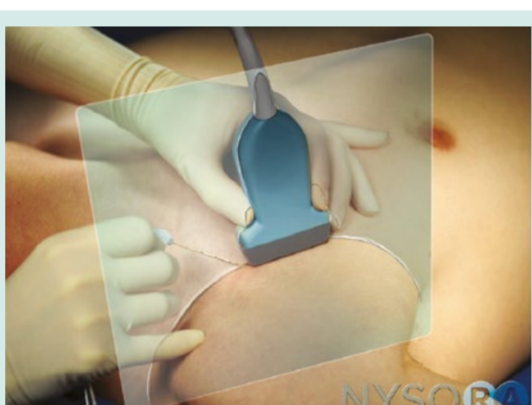
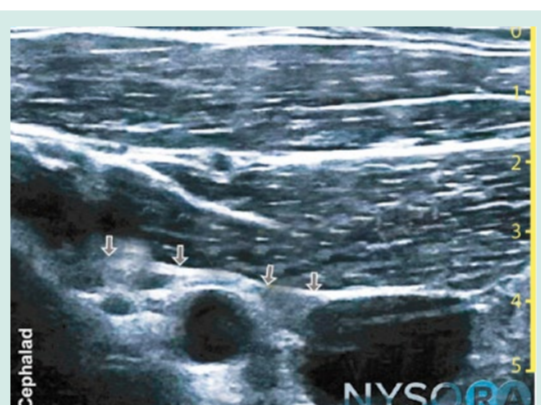
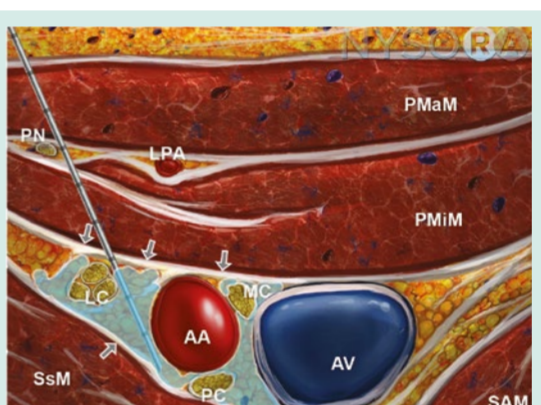
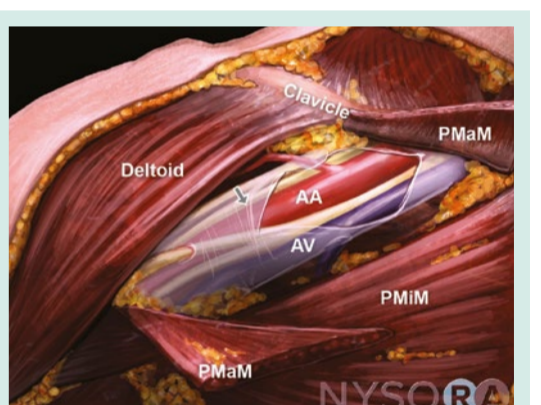


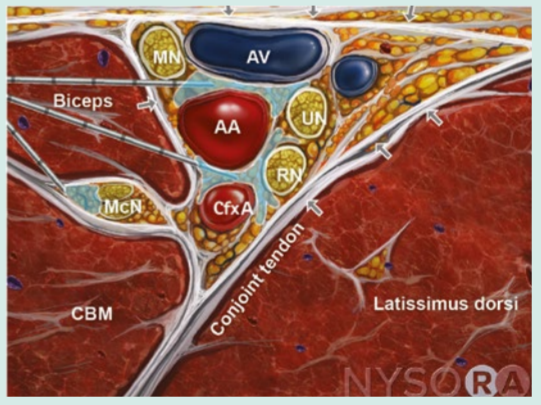
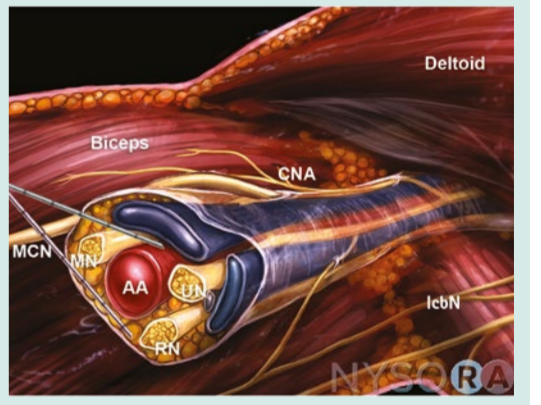


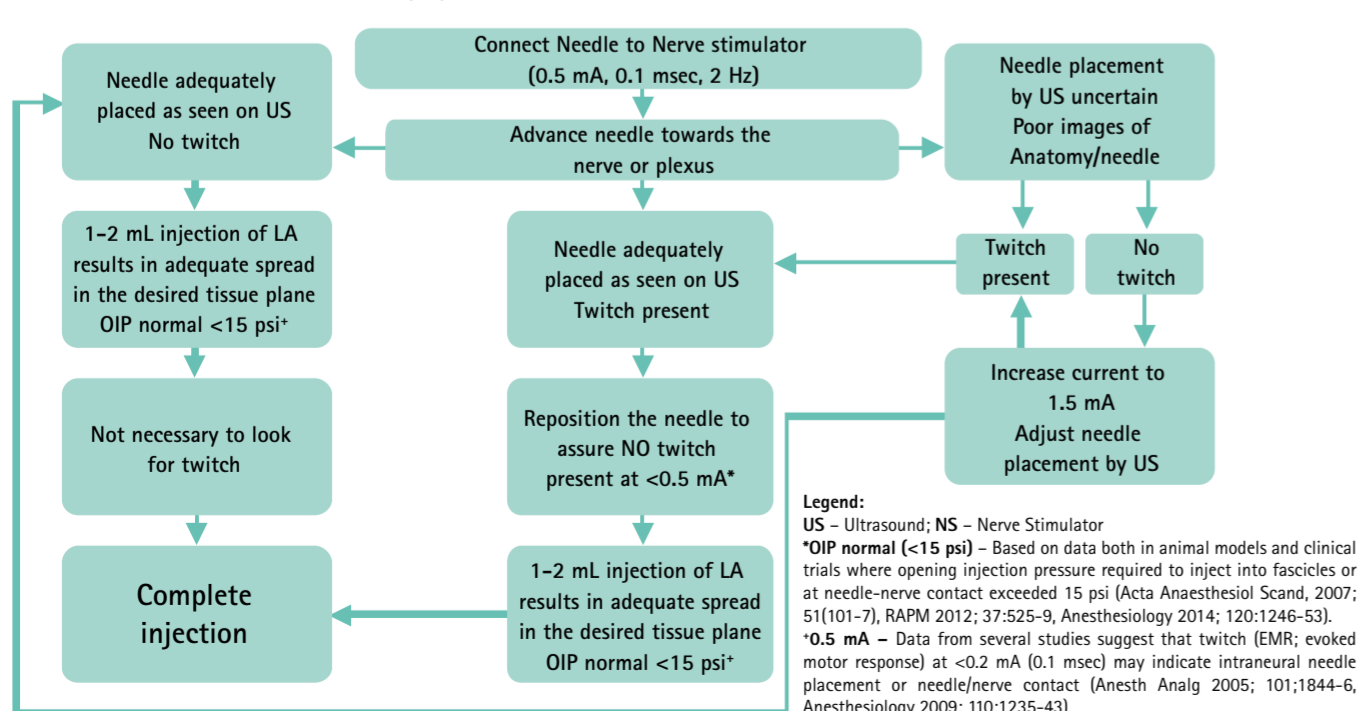
Upper Extremity Nerve Blocks

International Standardized Techniques, 2nd Edition 2015©

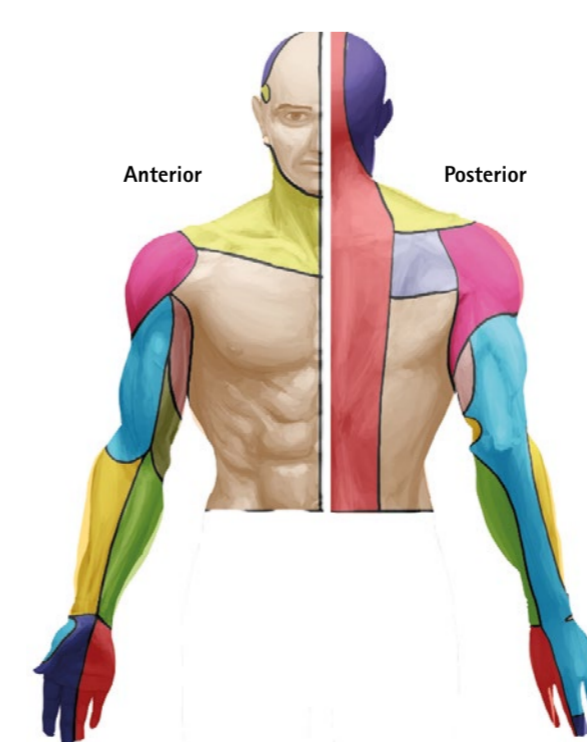
Brachial Plexus Approach	Transducer Placement	Ultrasound Image	Reverse Ultrasound Anatomy™	Anatomy																																				
<p>Interscalene</p> <p>Indications: Anesthesia and analgesia for surgery on shoulder, distal clavicle and proximal humerus.</p> <p>Patient position: Supine or semi-sitting, head facing to contralateral side.</p> <p>Transducer: Linear.</p> <p>Needle: 22G, 5 cm short bevel.</p> <p>Common EMR obtained: Deltoid response.</p> <p>LA: 10-15 ml.</p> <p>Abbreviations</p> <table border="0"> <tr><td>ASM</td><td>Anterior Scalene Muscle</td><td>LA</td><td>Local Anesthetic</td></tr> <tr><td>BP</td><td>Brachial Plexus</td><td>MSM</td><td>Middle Scalene Muscle</td></tr> <tr><td>BPS</td><td>Brachial Plexus Sheath</td><td>PhrN</td><td>Phrenic Nerve</td></tr> <tr><td>BORe</td><td>Bolus Observe Reposition</td><td>RLN</td><td>Recurrent Laryngeal Nerve</td></tr> <tr><td>CA</td><td>Carotid Artery</td><td>SCM</td><td>Sternocleidomastoid Muscle</td></tr> <tr><td>EMR</td><td>Evoked Motor Response</td><td>SCP</td><td>Superficial Cervical Plexus</td></tr> <tr><td>EJV</td><td>External Jugular Vein</td><td>TPC7</td><td>Transverse Process C7</td></tr> <tr><td>IJV</td><td>Internal Jugular Vein</td><td>VA</td><td>Vertebral Artery</td></tr> <tr><td>LCM</td><td>Longus Coli Muscle</td><td>VN</td><td>Vagus nerve</td></tr> </table>	ASM	Anterior Scalene Muscle	LA	Local Anesthetic	BP	Brachial Plexus	MSM	Middle Scalene Muscle	BPS	Brachial Plexus Sheath	PhrN	Phrenic Nerve	BORe	Bolus Observe Reposition	RLN	Recurrent Laryngeal Nerve	CA	Carotid Artery	SCM	Sternocleidomastoid Muscle	EMR	Evoked Motor Response	SCP	Superficial Cervical Plexus	EJV	External Jugular Vein	TPC7	Transverse Process C7	IJV	Internal Jugular Vein	VA	Vertebral Artery	LCM	Longus Coli Muscle	VN	Vagus nerve	 <p>Initial transducer placement: Over external jugular vein, approximately 3 cm above clavicle. Alternatively, start at supraclavicular fossa and scan proximally toward the plexus.</p> <p>Initial depth setting: 3 cm.</p>	 <p>Landmarks: ASM and MSM, 2 or 3 round hypo-echoic structures (roots or trunks) between the ASM and MSM.</p> <p>Ideal view: C5 C6 C7 nerve roots.</p>	 <p>Technique: Needle Insertion in plane (most common), lateral to medial; alternatively out of plane.</p> <p>Ideal spread of LA: Within the interscalene space inside the sheath.</p> <p>Number of injections: Based on spread; typically 1-2. BORe.</p>	 <p>Tips: Use PD to detect and avoid blood vessels on the needle path. Reconsider in patients with history of significant respiratory disease. Use short acting LA through catheter in such patients; extend block through catheter if initial block tolerated well.</p>
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<p>Supraclavicular</p> <p>Indications: Anesthesia and analgesia for surgery on humerus, elbow, forearm and hand.</p> <p>Patient position: Supine or semi-sitting, head facing to contralateral side.</p> <p>Transducer: Linear.</p> <p>Needle: 22G, 5 cm short bevel.</p> <p>Common EMR obtained: Forearm, hand response.</p> <p>LA: 20-25 ml.</p> <p>Abbreviations</p> <table border="0"> <tr><td>BP</td><td>Brachial Plexus</td><td>MSM</td><td>Middle Scalene Muscle</td></tr> <tr><td>BPS</td><td>Brachial Plexus Sheath</td><td>OHM</td><td>Omohyoid Muscle</td></tr> <tr><td>BORe</td><td>Bolus Observe Reposition</td><td>PD</td><td>Power Doppler</td></tr> <tr><td>CL</td><td>Clavicle</td><td>SA</td><td>Subclavian Artery</td></tr> <tr><td>DSA</td><td>Dorsal Scapular Artery</td><td>SSA</td><td>Suprascapular Artery</td></tr> <tr><td>EMR</td><td>Evoked Motor Response</td><td>SV</td><td>Subclavian Vein</td></tr> <tr><td>LA</td><td>Local Anesthetic</td><td>TCA</td><td>Transverse Cervical Artery</td></tr> </table>	BP	Brachial Plexus	MSM	Middle Scalene Muscle	BPS	Brachial Plexus Sheath	OHM	Omohyoid Muscle	BORe	Bolus Observe Reposition	PD	Power Doppler	CL	Clavicle	SA	Subclavian Artery	DSA	Dorsal Scapular Artery	SSA	Suprascapular Artery	EMR	Evoked Motor Response	SV	Subclavian Vein	LA	Local Anesthetic	TCA	Transverse Cervical Artery	 <p>Initial transducer placement: In supraclavicular fossa, lateral to clavicular head of SCM, tilted caudally.</p> <p>Initial depth setting: 3 cm.</p>	 <p>Landmarks: Subclavian artery, brachial plexus sheath (arrows), first rib and pleura.</p> <p>Ideal view: Brachial plexus and subclavian artery above first rib (pleura should be visualized).</p>	 <p>Technique: Needle Insertion in plane, lateral to medial. Assess the depth of the BP, insert needle with shallow angle and adjust accordingly.</p> <p>Ideal spread of LA: Within BP fascial sheath lateral to the SA but superficial to the first rib.</p> <p>Number of injections: 2-3. BORe.</p>	 <p>Tips: Visualize the pleura (if unable, consider other technique). Use PD to detect and avoid TCA, DSA. Consider an alternative technique when large vessels are present within the sheath. Injection of LA should fill BPS. Reduce transducer pressure before injection of LA to facilitate spread.</p>								
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<p>Infraclavicular</p> <p>Indications: Anesthesia and analgesia for surgery on humerus, elbow, forearm and hand.</p> <p>Patient position: Supine with arm abducted and flexed at elbow.</p> <p>Transducer: Linear.</p> <p>Needle: 22G, 8-10 cm short bevel.</p> <p>Common EMR obtained: Forearm, hand.</p> <p>LA: 20-25 ml.</p> <p>Abbreviations</p> <table border="0"> <tr><td>AA</td><td>Axillary Artery</td><td>MC</td><td>Medial Cord</td></tr> <tr><td>AV</td><td>Axillary Vein</td><td>PD</td><td>Power Doppler</td></tr> <tr><td>BORe</td><td>Bolus Observe Reposition</td><td>PC</td><td>Posterior Cord</td></tr> <tr><td>CV</td><td>Cephalic Vein</td><td>PMaM</td><td>Pectoralis Major Muscle</td></tr> <tr><td>EMR</td><td>Evoked Motor Response</td><td>PMIM</td><td>Pectoralis Minor Muscle</td></tr> <tr><td>LA</td><td>Local Anesthetic</td><td>PN</td><td>Pectoral Nerve</td></tr> <tr><td>LC</td><td>Lateral Cord</td><td>SAM</td><td>Serratus Anterior Muscle</td></tr> <tr><td>LPA</td><td>Lateral Pectoral Artery</td><td>SsM</td><td>Subscapular Muscle</td></tr> </table>	AA	Axillary Artery	MC	Medial Cord	AV	Axillary Vein	PD	Power Doppler	BORe	Bolus Observe Reposition	PC	Posterior Cord	CV	Cephalic Vein	PMaM	Pectoralis Major Muscle	EMR	Evoked Motor Response	PMIM	Pectoralis Minor Muscle	LA	Local Anesthetic	PN	Pectoral Nerve	LC	Lateral Cord	SAM	Serratus Anterior Muscle	LPA	Lateral Pectoral Artery	SsM	Subscapular Muscle	 <p>Initial transducer placement: Parasagittal, below the clavicle, medial to coracoid process.</p> <p>Initial depth setting: 5 cm.</p>	 <p>Landmarks: Axillary artery and fascia of pectoralis minor muscle (arrows).</p> <p>Ideal view: Axillary artery and vein below the fascia of pectoralis minor muscle, lateral, medial, posterior cords periarterially.</p>	 <p>Technique: Needle insertion in plane, cephalad to caudad. Release transducer pressure before injection to detect AV and CV and decrease the risk of intravenous injection. Use PD to identify vascular structures.</p> <p>Ideal spread of LA: periarterially (J-shaped).</p> <p>Number of injections: 1-2. BORe.</p>	 <p>Tips: Ensure sufficient lateral placement of the transducer to avoid chest cavity. A single injection of LA is made where all cords are visible lateral to the artery, or posterior to the artery.</p>				
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<p>Axillary</p> <p>Indications: Anesthesia and analgesia for surgery on forearm and hand.</p> <p>Patient position: Supine with arm abducted and flexed at elbow.</p> <p>Transducer: Linear.</p> <p>Needle: 22G, 5 cm short bevel.</p> <p>Common EMR obtained: Hand or fingers.</p> <p>LA: 15-20 ml.</p> <p>Abbreviations</p> <table border="0"> <tr><td>AA</td><td>Axillary Artery</td><td>IcbN</td><td>Intercostobrachial N</td></tr> <tr><td>AV</td><td>Axillary Vein</td><td>LA</td><td>Local Anesthetic</td></tr> <tr><td>BORe</td><td>Bolus Observe Reposition</td><td>McN</td><td>Musculocutaneous Nerve</td></tr> <tr><td>CBM</td><td>Coracobrachialis Muscle</td><td>MN</td><td>Median Nerve</td></tr> <tr><td>CfA</td><td>Circumflex Artery</td><td>RN</td><td>Radial Nerve</td></tr> <tr><td>CNA</td><td>Cutaneous Nerve of Arm</td><td>UN</td><td>Ulnar Nerve</td></tr> <tr><td>EMR</td><td>Evoked Motor Response</td><td></td><td></td></tr> </table>	AA	Axillary Artery	IcbN	Intercostobrachial N	AV	Axillary Vein	LA	Local Anesthetic	BORe	Bolus Observe Reposition	McN	Musculocutaneous Nerve	CBM	Coracobrachialis Muscle	MN	Median Nerve	CfA	Circumflex Artery	RN	Radial Nerve	CNA	Cutaneous Nerve of Arm	UN	Ulnar Nerve	EMR	Evoked Motor Response			 <p>Initial transducer placement: Perpendicular to humerus in the axillary fossa, at intersection between pectoralis and biceps muscles.</p> <p>Initial depth setting: 3 cm.</p>	 <p>Landmarks: Axillary artery and Brachial Plexus fascial sheath (arrows).</p> <p>Ideal view: MN, UN, RN scattered around AA, McN between the biceps and coracobrachialis muscles.</p>	 <p>Technique: Needle Insertion in plane or out of plane. Injections: one above the artery, one between artery and conjoint tendon. McN is blocked separately. LA deposit: 8 ml posterior and 8 ml anterior to the artery, 4 ml for McN.</p> <p>Ideal spread of LA: around AA.</p> <p>Number of injections: 2+McN. BORe.</p>	 <p>Tips: For extensive elbow surgery consider more proximal technique. Variations of McN are common. McN may be attached to the MN. Pre-scan to look for common anatomical variations. Reduce transducer pressure before injection of LA to facilitate spread and to decrease the risk of intravascular injection.</p>								
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Suggested Standard Monitoring For Nerve Blocks

Ultrasound + Nerve Stimulation + Opening Injection Pressure (OIP)



Dermatomes



- Occipital C2
- Supraclavicular C3-C5
- Suprascapular C5-C6
- Subclavicular C5-C6
- Long thoracic C5-C7
- Subscapular C5-C6
- Axillary C5-C6
- Intercostal T3-T12
- Primary nerve branches
- Intercostobrachial T2
- Cutaneous brachii medialis C8-T1
- Musculocutaneous C5-C6
- Median C5-C6
- Ulnar C8-T1
- Radial C6-T1
- Cutaneous antebrachii medialis C8-T1

Osteotomes

