Greetings from AORA !!

This newsletter’s theme of 'Brachial Plexus Blocks above the Clavicle' is going to refresh your anatomy and enrich your knowledge from basics to advanced techniques of brachial plexus blocks. You can learn as to how the brachial plexus block evolved over time to the present approaches and techniques. We should be grateful to all the innovators in this field who made our, as well as the patient’s life, easy. You will find a quiz on this newsletter’s theme too. Pat your back if you have answered the questions right and we will be happy that the articles published were well understood. I thank all the contributors for taking their valuable time out of tight schedules to contribute for the newsletter. Hope to see you all for the 3rd AORA annual conference in Pune.

Happy reading!!!

Dr Guruprasad N
Message from the President

Dear Colleagues,

Belated New Year Greetings!

I thank Dr Guruprasad for his efforts in bringing out this informative newsletter.

I kindly urge all of you to share your experiences and difficult case scenarios with us, and we shall strive hard to disseminate information in regional anaesthesia to all our members.

The website aoraindia2012.com is still active with all the conference lectures loaded and our website www.aoraindia.com has new videos, please do visit these sites and give your valuable inputs.

On behalf of the Organising Committee of the 3rd National Conference of AORA 2013, I invite all of you to be with us in Pune on the 7th, 8th & 9th of June, 2013 and immerse yourself in the vast academic pool.

Looking forward to meeting you in Pune,

With best regards,

Dr. J. Balavenkat,
President, AORA INDIA
Foreword from the Academic Director

The supraclavicular brachial plexus block is referred to as the ‘spinal of the upper limb’ owing to the fact that, with a single injection, almost the entire upper limb is anaesthetized for a variety of surgical procedures. The compact proximity of the three trunks of the brachial plexus in this location ensures rapid onset, predictable duration and quality of nerve blockade. Though the first percutaneous supraclavicular block was performed by Kulemkampff in the year 1911 in Germany, reportedly on himself in the sitting position, the fear of pneumothorax and subclavian arterial puncture denied popularity. It was only with the advent of objective guidance devices, Peripheral Nerve Stimulation (PNS), and later, of Ultrasound, that this approach to the brachial plexus was rejuvenated. Thereafter, this approach to the brachial plexus literally received a ‘shot in the arm’.

In an editorial of the British Journal of Anaesthesia in 2005, the authors, NM Denny and William Harrop-Griffiths wrote thus, ‘regional anaesthesia always works – provided you put the right dose of the right drug in the right place’. In order to achieve this rather over simplified goal, the three requisites for successful blockade are ‘nerve location, nerve location and nerve location’. This edition of the AORA newsletter, painstakingly compiled by the editor, Dr Guruprasad (the Guy from Gadag), with contributions from select authors, reviews the history and evolution, approaches, indications, and techniques of supraclavicular brachial plexus blocks. It is hoped that this information will benefit the readers in their clinical practice.

Happy and safe blocking!!

T. V. S. Gopal
History of Brachial Plexus Block

Compiled by Dr. Guruprasad

Brachial plexus block was one of the first regional anaesthetics ever administered. It was less than a year after the report by Koller in 1884 of the anaesthetic properties of cocaine that Halsted injected the roots of the brachial plexus with cocaine after surgically exposing it under local infiltration. This procedure ensured complete surgical anaesthesia of the upper extremity. Later, in 1897, Crile utilised a similar technique in which the brachial plexus were exposed under local anaesthesia, just behind the sternocleidomastoid muscle, to inject cocaine to the nerve trunks under direct vision. Since these technique involved surgical exposure, they never came into widespread use.

Evolution of axillary brachial plexus block:

In 1911, Hirschel described the first percutaneous technique for blocking the brachial plexus in the axilla and reported its successful use. He made separate injections above and below the axillary artery with a 4 inch needle directed towards the apex of the axilla. In his original report, Hirschel forced a hard rubber ball as far up under the pectoral muscles as possible and fixed it to the shoulder and chest with two elastic bandages in an effort to attain a higher level of anaesthesia. In 1917, Capelle in Germany described a technique that must be considered as the forerunner of the axillary perivascular technique. In 1921, in France, Reding described a technique that was virtually identical to the axillary perivascular technique of today. Gaston Labat highlighted the importance of accidental intravascular injection by advising frequent aspiration of LA during injection. In 1946, Hingson described a technique wherein LA was deposited above and below the axillary artery with a separate injection into biceps muscle for musculocutaneous nerve. It was 1949, Accardo and Adriani replicated Hingsons technique but highlighted the elicitation of paresthesia as part of the technique. In 1958, while repairing a deep lacerated wound at the apex of the axilla in a child, Preston Burnham, an orthopaedic surgeon was impressed by the compactness of the nerves at this level, closely about the artery, and enveloped in a fascial investment. Thus, the neuromuscular sheath was rediscovered 37 years after it was described by Reding. In 1959, Hudon& Jaques presented their technique where they placed two separate needles above and below the axillary artery prior to injection of drug. The precise relationship between volume and anaesthesia was reported by De Jong in 1961, who carried out multiple anatomical dissections to determine the diameter of the axillary sheath and the neurovascular bundle contained therein. He found that the diameter of the axillary sheath was approximately 3 cms. Assuming equal proximal and distal spread of local anaesthetic from the site of injection in the axilla he calculated that 42 mls of anaesthetic solution must be injected in a healthy adult male to achieve a good block to reach the level at which musculocutaneous and axillary nerves leave the sheath. One year later (1962), Ericsson introduced the use of a tourniquet applied distal to the needle in an effort to prevent the distal spread of the local anaesthetic down the sheath during the injection. However, in clinical practice, the use of a tourniquet is not effective in preventing retrograde flow of the drug.
Evolution of supraclavicular brachial plexus block:

In 1911, Kulenkampff described the first percutaneous supraclavicular approach by injecting the local anaesthetic at a point where the plexus just emerged from the scalene triangle. In fact, the first attempt of this technique was on himself in which he used 5 mls of Novocain and experienced paresis of the arm. In 1922, Labat published the first significant modification of the Kulenkampff's technique by advocating multiple injections if paresthesia was not elicited. In 1940, Patrick described a technique that represented a complete departure from previously described technique. He made no attempt to identify either the fascia or the plexus, but instead chose to "lay down a wall of anaesthetic" through which the plexus should pass in its course over the first rib. He used the multiple injection technique (5-6 times) in different planes directed towards the first rib and deposited 60-70 mls of local anaesthetic. The local anaesthetic was undoubtedly placed outside the fascial sheath in this technique. But he claimed high success rate (probably due to large volumes of local anaesthetic). In 1949, Bonica and Moore described a technique utilising the classical landmarks and direction of needle insertion and stressed on the elicitation of paresthesia while 'walking on the first rib' prior to injection of local anaesthetic.

Evolution of interscalene perivascular brachial plexus block:

Kappis developed a technique by blocking the spinal nerves in the cervical area as they emerged from the vertebral column which he named as 'paravertebral conduction anaesthesia'. This was done by a posterior rather than a lateral approach. In 1917, Mulley described a technique that must be considered to represent the first lateral paravertebral approach, if not the first interscalene approach. In 1925, July Etienne in Paris described a technique which was similar to the interscalene approach practised today. It consisted of simply inserting a needle at the level of the inter-cricothyroid space, half way between the lateral border of sternocleidomastoid and the anterior border of the trapezius, and advancing it towards the opposite shoulder parallel to the table. But he didn't attempt to elicit paraesthesia. In 1946, the famous American surgeon-anaesthesiologist, Pitkin stated that the lateral paravertebral approach yielded a high percentage of satisfactory anaesthesia. No references to fascial investment of the plexus were made. In 1953, Bonica described a technique wherein a small pillow was placed under the shoulder to make the transverse processes of the cervical spines more prominent. Then, the transverse process of C5 was identified and a skin weal was raised. A 22 gauge 8 cm needle was introduced through the skin weal to contact the transverse process of C5 and 5 mls of local anaesthetiwc was injected. Then, the needle was withdrawn till the skin and redirected towards the C6, C7 & C8 transverse processes one after another, and about 5-7 mls of local anaesthetic were injected at each level. In 1976, Sharrock and Bruce recommended that patients be asked to breath deeply and slowly to facilitate location of the interscalene groove, since the scalene muscles are accessory muscles of respiration and are activated by slow, deep inspiration. In 1979, Vongvise and Panijayanond approached the brachial plexus in the interscalene compartment 1.5-2 cms above the clavicle.

Source: Plexus Anaesthesia- Perivascular Techniques of Brachial Plexus Block by Alon P. Winnie
Anatomy of Brachial Plexus

Dr. R. Silamban

Roots: The plexus is formed by the anterior primary rami of C5 to C8 nerves along with the bulk of T1 nerve. Occasionally, there may be a contribution from C4 or T2 nerves leading to the formation of pre-fixed or post-fixed plexus. The roots emerge from the respective intervertebral foramina to enter the perivascular sheath.

Trunk: Sandwiched between the scalenus anterior and medius muscle, the roots combine to form the trunks. The C5 and C6 roots combine to form the upper or superior trunk, C7 continues as the middle trunk and C8 and T1 combines to form the lower or inferior trunk.

Formation of the Plexus:

Divisions: Behind the clavicle, the trunks divide into anterior (flexor) and posterior (extensor) divisions, and stream into the axilla.

Cords: Inferior to the clavicle, the six divisions combine to form lateral, medial and posterior cords. The lateral cord is formed by the union of anterior division of the upper and middle trunks. The medial cord is the continuation of the anterior division of the lower trunk. The posterior cord is due to union of the posterior divisions of all the three trunks

Terminal branches: Lower down in the axilla, the cords give rise to terminal branches, namely the ulnar, median, radial and musculocutaneous nerves.

Relationship of the brachial plexus:

Roots: These lie between the scalenus anterior and medius muscles and above the second part of the subclavian artery. The classical interscalene approach to the brachial plexus blocks is at the level of the roots.
**Trunks:** These lie in close relationship to the subclavian artery above the clavicle. Here also, they are sandwiched between the scalene muscles. The trunks extend up to the lateral border of the first rib. The subclavian perivascular approach blocks the plexus at this level.

**Divisions:** They start at the lateral border of the first rib and lie behind the clavicle. The rib hitching technique causes blockade at this level.

**Cords:** The divisions unite to form cords at the upper part of the axilla. They remain grouped around the axillary artery. The infraclavicular approach causes blockade at the junction of cords and divisions.

**Terminal Branches:** They are formed lower down in the axilla. The reorganization of the cords to form the terminal branches occurs at the lateral border of the pectoralis minor muscle. The axillary approach causes blockade at this level.

**Anatomical Considerations**

The anatomic factors which determine the success and complications of the brachial plexus blockade are

- The perivascular sheath
- The vertical arrangement of the cervical roots
- The interconnections – This is owing to combination, division, recombination and division of the original five cervical roots.
- The relationship of the site of needle entry to vital structures.
Perivascular Sheath – Its Importance

The perivascular sheath is a fibrous sheath covering the brachial plexus in its entirety. It extends from the origin of the scalene muscles down to middle of upper arm. The potential space formed by this sheath can hold up to 80-100 ml of local anaesthetic. This sheath gives a classical ‘Pop Off‘ feeling when pierced by the needle. This sheath is the single most important factor in determining the success of brachial plexus blockade. The plexus can be blocked by introducing a needle at any point along the sheath. But the site of needle entry determines which components are preferentially blocked and which components are spared. However, this can be overcome to a certain extent by increasing the volume of the local anaesthetic and by applying proximal or distal digital pressure. It has been suggested that the covering is discontinuous with septa subdividing the space into separate compartments that clinically prevent the spread of local anaesthetic. However, these septal divisions are more prominent in the axilla than above. This probably is the reason for frequent sparing of the radial and musculocutaneous nerves during axillary blockade. As the septa are more prominent in the lower part, there may be more sparing in the infraclavicular approach than in the supraclavicular approach. The perivascular sheath may also be discontinuous leading to spillage of drug outside the sheath.

Vertical arrangement of roots: This arrangement of the brachial plexus assumes significance in the classical interscalene approach. Here the needle is applied close to the C5 and C6 nerve roots. As the roots are vertically arranged the local anaesthetic will have to travel caudally to reach C8 and T1 level. If the caudal travel of the local anaesthetic is deficient then these roots may be spared leading to poor analgesia in the ulnar nerve distribution. In the infraclavicular approach sparing of the ulnar nerve is rarely seen.

The interconnections: The interconnections between the original five cervical roots means that the cutaneous distribution of the individual nerve territories differs from the myotomal and dermatomal pattern and that the muscular and other deep structures do not underlie the sensory distribution of that nerve. For example blockade of the ulnar nerve at the elbow, produces sensory loss on the ulnar side of the hand but motor loss of the flexor muscles on the anterior aspect.

Site of needle entry and complications (landmark based technique):
- If site of needle entry is at the C6 level, the chances of epidural and subarachnoid injections are more. The chances of vertebral artery puncture, phrenic and recurrent laryngeal nerve paralysis are also higher.

- If the site of needle entry is close to the clavicle the chances of pneumothorax and subclavian artery puncture are more.

- If the site of needle entry is below the clavicle as in the infraclavicular approach, complication rate is much less than in the above routes but the chances of incomplete blockade are more.

- In the axillary site, apart from accidental artery puncture, other complications are less but chances of incomplete blockade increases.

### Interscalene Block (PNS Guided)

Dr. Ashit Mehta

It is a percutaneous technique of injecting local anaesthetic into the groove between the anterior and middle scalene muscle at the level of the cricoid cartilage.

**Indications:** It is well suited for surgical procedures involving shoulder, lateral two thirds of the clavicle and the proximal humerus and shoulder joint.

**Contraindications:** Patients refusal, local infection, chronic obstructive airway disease, contralateral paresis of the phrenic or recurrent laryngeal nerves.

**Anatomy:** Interscalene block entails anesthetizing the brachial plexus at the level of the nerve roots of C5, C6 or superior trunk as it lies between the anterior and medial scalene muscle in the neck. This potential space between the anterior and middle scalene muscle is occupied by the nerve elements of the plexus, as well as the subclavian artery. This space lies just posterior to the lateral most extent of the clavicular head of sternocleidomastoid muscle and is well appreciated when the patient turns the head to the contra lateral side of the block. This groove between the anterior and middle scalene muscle is palpable. In the interscalene space the roots of C5-T1 coalesce to form the superior, middle and inferior trunks which proceed laterally and inferiorly towards the space between the clavicle and first rib and then into the axilla.

**Technique:** The essence of this technique is to gain an appreciation of the topical anatomy of the muscles of the neck. The first muscle to locate is the sternocleidomastoid which lies in the anterolateral neck extending from the mastoid process to the sternum medially and on the clavicle laterally. The belly of the sternocleidomastoid should be located with the index finger and now lies in the groove between the sternocleidomastoid anteriorly and the anterior scalene posteriorly. The most common error in performing interscalene block is to assume this as the interscalene groove. The belly of the anterior scalene is usually ½ to 1 cm wide.
The finger is then rolled posteriorly over the anterior scalene to rest in narrow groove between the anterior and middle scalene muscle. To verify this groove, one can ask the patient to take deep breath which highlights the groove as the scalene muscles are accessory muscles of respiration and contract during deep inspiration. Once the groove is located the block can be performed with insertion of the needle at the tip of the groove with elicitation of stimulation of the pectorals, biceps, or of the deltoid muscles.

**Drugs & Dosages:** It is a high volume block. 35-40 mls of the drug is required. A combination of drugs like lignocaine 2%, lignocaine with adrenaline 2% or/bupivacaine 0.5% can be used as per the need of the surgery.

**Assessment of the Block:** Within minutes, the patient cannot raise the arm against gravity and shortly thereafter the elbow cannot be flexed. The ability to move the finger is retained for much longer time.

**Side Effects:** Diaphragmatic paralysis occurs in almost all patients. There is a temporary chemical sympathectomy of the head and neck which results in unilateral Horner’s syndrome. Most patients also develop a hoarseness in voice to a variable extent.

**Complications:** Since the vertebral and carotid artery along with the internal and external jugular vein are in close proximity of the injection site, intravascular injection of local anaesthetic is a dreaded complication. Injection close to the intervertebral foramina can result in epidural or subarachonoid block which is rare. Infection, haematoma, nerve injuries are other possible complications.

**Summary:** Interscalene nerve block is one of the most commonly used and most clinically applicable nerve block techniques. This block gives predictable success, excellent anaesthesia and superb postoperative analgesia. Continuous interscalene block is used to extend the advantages of single injection interscalene block well into postoperative period.
Introduction:

The subclavian perivascular block is a supraclavicular approach to the brachial plexus. Unlike the traditional Kulenkampff technique, this is a distal *interscalene* block, but aiming to anaesthetize the 3 trunks of the brachial plexus as they cross the first rib rather than the nerve roots as they emerge between the scalene muscles. This is the point at which the brachial plexus is at its most compact. As a result, it is possible to block the majority of the brachial plexus with one injection and with the lowest volume of local anaesthetic. At the level of the first rib, the trunks are invested in a sheath (formed from the anterior part of the middle scalene muscle sheath and the posterior part of the anterior scalene sheath), which also includes the subclavian artery – hence the term *subclavian perivascular*.

Anatomy:

- The first rib runs approximately antero-posteriorly at the point where the trunks of the brachial plexus cross it.
- The plexus crosses the first rib between the insertions of the anterior scalene muscle (in front) and the middle scalene (behind).
- The brachial plexus lies posterior to the subclavian artery.
- The trunks are “stacked” – upper, middle and lower – but not necessarily in a straight vertical relationship.
- The lower trunk may lie *under* the subclavian artery.
- The subclavian *vein* is anterior to the anterior scalene muscle.

![Subclavian Perivascular Block Anatomy](image_url)

**Figure 1.** Subclavian Perivascular Block Anatomy: brachial plexus viewed from above

What is blocked?

- The trunks of the plexus, especially upper and middle.
- The sympathetic nerve supply to the upper limb.
- The lower trunk may be missed in 5% of blocks.
- The intercostobrachial nerve, which carries cutaneous sensation from the inner aspect of the upper arm, is missed in 70% of blocks as it arises from T2, which does not contribute to the brachial plexus.
Indications:

- Good for humeral, elbow, forearm and hand surgery, especially areas supplied by the median and radial nerves, and the lateral and posterior cutaneous nerves of forearm.
- Possibly not the logical choice of brachial block for surgery confined to the medial side of the elbow, wrist and hand, or the little finger (because of the occasional failure to block the lower trunk of the plexus).

Technique:

- The plexus may be identified using muscle stimulation.
- Using muscle stimulation, a twitch should preferably be elicited in muscles below the elbow i.e. flexors / extensors of wrist or fingers. Rotators of the forearm are less reliable.
- Ensure that any movement below the elbow is not simply “referred” from shoulder / upper arm muscle twitches.
- The highest success rate follows flexion of the fingers and thumb (Figure 2). Extension of the thumb alone is associated with poor block success.

**Figure 2.** Finger and Thumb Flexion - the ideal response to nerve stimulation

- Use a 3-5 cms 22G insulated needle.
- Using the nerve stimulator, start at 1 mA ONLY (2 Hz, 0.1 msec. pulse duration). The muscle twitches evoked using a higher current may be uncomfortable for the patient.
- Ideally a muscle twitch should still be apparent at a current of 0.3 - 0.5 mA. Withdraw slightly if a twitch is still present at 0.2 mA.
- Can accept if a current threshold of 0.8 mA elicits good quality of the twitch (i.e. good finger flexion).
- The twitches do NOT need to be in the proposed surgical area.
- With the patient lying flat, and the head turned only 30° to the opposite side, identify the interscalene groove (as for the interscalene approach). This is often a shallow dimple, not a deep chasm. Follow the groove down to the root of the neck. The subclavian artery is palpable in 50% of patients in this position.
- Insert the needle at the lowest point of the interscalene groove (where the skin is beginning to flatten out over the supraclavicular fossa), in the posterior part of the groove, and posterior to the subclavian artery if palpable (Figure 3).
Figure 3. Needle insertion for Subclavian Perivascular Block

- **Direct the needle parallel to the floor and directly caudad** – i.e. straight down towards the patient’s feet.
- **THERE MUST BE ABSOLUTELY NO MEDIAL INTENT AS THE NEEDLE ADVANCES** otherwise the needle may penetrate pleura.
- If no twitches are elicited, withdraw the needle almost to skin and redirect fractionally more anteriorly or posteriorly. Only very small adjustments of angle should be made each time. It is easy to miss the plexus on either side if changes in angle are gross.
- If the subclavian artery is entered withdraw the needle and redirect fractionally posteriorly. You will almost certainly encounter the plexus.
- The *Transarterial Technique* is NOT successful in this approach to the brachial plexus.
- If the needle misses the brachial plexus, it is likely to insert on to the first rib. If so, walk antero-posteriorly along the rib.

**DOSE**

- This block needs about 0.5 ml/kg of LA solution.
- Many people use 0.5% bupivacaine for the total dose. This is well above the 2 mg/kg ceiling stipulated on the data sheet, but does not seem to cause problems. However anaesthesia may last 16-24 hours or more, which is worrying for the patient and the anaesthetist.
- Lidocaine 1.5% with adrenaline provides anaesthesia for 4 to 6 hours.

**COMMON MISTAKES**

- **Selecting the groove between the sternomastoid and the anterior scalene.** The anterior scalene muscle then separates the needle from the brachial plexus. The needle will be far too anterior. Many beginners cannot believe how posterior the insertion point is, and therefore use the very obvious sternomastoid-scalene groove.
- **Advancing the needle with medial intent** even very minor medial angulation of the needle risks slipping off the medial edge of the first rib into the pleura.
SIDE EFFECTS

- *Horner's syndrome* is common because of block of the sympathetic chain.
- *Numbness and flail limb*. As with all limb nerve blocks, the limb will be anaesthetic immediately afterwards; and muscle power will be lost. This is important if the patient is going home post-operatively, as the limb may be accidentally damaged if it is not well protected in a sling.
- *Phrenic nerve block and recurrent laryngeal nerve block*. Phrenic nerve block is not as inevitable as with the interscalene block, but may still occur in around 50% of patients. Recurrent laryngeal nerve block is rare with this block.

PROBLEMS

- The *intercostobrachial nerve* is frequently not blocked, since it arises from the second thoracic nerve root, and therefore does not usually pass through the brachial plexus. Because it supplies cutaneous sensation to the inner aspect of the upper arm, it is important to block the nerve separately by raising a skin weal if a tourniquet is to be used.
- This may be carried out with a subcutaneous injection of 10 mls. of a short-acting local anaesthetic, e.g. lidocaine 1%, in the upper arm just distal to the axilla.
- *Block failure*. The ulnar nerve (lower trunk) is the most frequently missed, and may be related to the lower trunk lying under the artery.
- *Pneumothorax*. This is still possible, but is much less likely than with the Kulenkampff approach.
- *Haematoma*. If the subclavian artery is entered, it is difficult to apply pressure. This block is therefore not recommended in patients with a bleeding diathesis.

IMPORTANT POINTS

- This approach is a good block for humeral, elbow, fore-arm and hand surgery.
- Direct the needle parallel to the floor (with the patient lying flat) and directly caudad – no MEDIAL intent.
- Pneumothorax is a potential complication. An additional intercostobrachial block is likely to be needed to cover tourniquet pain.
Various approaches to brachial plexus block can be followed and the choice depends on the surgical site. The anatomical composition and course of the brachial plexus make it unique as far as the methodology and selection of the block for a given case is concerned. The vascular structures and the nerves travel together in this region and therefore the vascular structures serve as a landmark for nerve identification, under ultrasound guidance.

**Interscalene Block**

**Indications**: Interscalene block is indicated for surgeries on the lateral two thirds of the clavicle, shoulder, proximal humerus and shoulder joint.

**Relevant Anatomy**: The superior, middle and inferior trunks of the brachial plexus descend between the scalenus anterior and scalenus medius muscles. They are ‘stacked’ one on top of other in the space between the two scalene muscles.

**Block Procedure**: The patient is positioned supine with neck turned away from the side of the block. The probe is held transversely at the level of or below the cricoid cartilage in the posterior triangle of the neck with the orientation marker facing laterally as shown in the Figs. 1 and 2.

**Fig 1 Probe and Needle Placement for Left Interscalene Block: in an adult**

**Fig 2 Probe and Needle Placement for Left Interscalene Block: in a child**
Ultrasound Scan: The most prominent structure in the scan is the IJV which appears as a circular or oval, compressible, anechoic structure which shows colour flow in the lumen when colour doppler is applied. The sternocleidomastoid muscle is seen anterior to the IJV and both these structures occupy the medial most aspect of the transverse scan. The scan is traced laterally to visualize the anterior and middle scalene muscles (Fig. 3). The nerve trunks are localized in between the two scaleni. Nerve trunks in the interscalene groove appear as hypoechoic round structures with hyperechoic rim. The middle scalene muscle is visualized lateral to the three nerve trunks. The scanning can be extended inferiorly by sliding the probe towards the base of the neck, in the supraclavicular region to locate the subclavian artery and the perivascular brachial plexus. This manoeuvre can be performed the other way round to trace the brachial plexus from subclavian perivascular to interscalene region in case the trunks in the interscalene region are indistinct.

![Fig 3: Transverse scan showing brachial plexus, in relationship with the subclavian artery. This is evident when the probe is moved lower down in the neck. SCM = Sternocleidomastoid muscle.](image)

Probe and Needle Relationship: The needle is inserted ‘in-plane’ to the ultrasound beam. It can be introduced from the medial or lateral aspect of the probe. Nevertheless, the author prefers the lateral approach in order to avoid accidental trauma to the IJV. The needle tip and shaft are appreciated very well in this block because the nerve trunks are very superficial in this area.

The Needle Insertion Path: The needle insertion starts from the laterally placed orientation marker of the probe with the depth of the needle guided by the scan. Remember that our target is very superficial (approximately 1 cm in child and 1.5 to 2 cm in an adult). Under real time guidance, the needle tip is guided towards the interscalene groove to lodge in between any two of the trunks. This is followed by injection of local anesthetich drug. A correct spread should typically distend the groove in a vertical anechoic image.
Supraclavicular Brachial Plexus Block

The divisions of the brachial plexus are identified and blocked in the supraclavicular region by ultrasound guidance.

**Indication:** Suitable for elbow, forearm and hand surgeries.

**Relevant Anatomy:** In the supraclavicular region (in the interscalene triangle), the subclavian artery is placed anterior to the brachial plexus. The brachial plexus in this region comprises of the upper (C5-6), middle (C7) and lower (C8-T12) trunks and divisions.

**Block procedure:** The patient is placed supine with the neck turned away from the side of the block. The probe is placed in a coronal plane in the supraclavicular fossa (**Fig. 4 and 5**). The orientation marker points towards the lateral aspect of the neck.

**Fig. 4: Probe and Needle Position a Child (Right Supraclavicular Block)**

**Fig. 5: Probe and Needle Position in an Adult (Right Supraclavicular Block)**
Ultrasound Scan: A transverse section of the brachial plexus band the subclavian artery is seen in the scan. The subclavian artery is appreciated distinctly as a pulsating vessel above the first rib (Fig. 6). Colour doppler may be used to confirm and demarcate the subclavian artery. The brachial plexus is seen on the cephalic (anterior) and lateral aspects of the subclavian artery as, hypoechoic shadows surrounded by hyperechoic rims akin to a “bunch of grapes”.

Needle and Probe Relationship: The needle is inserted ‘in-plane’ with the ultrasound beam.

Needle Insertion Path: The insertion point is immediately next to the lateral aspect (outer end) of the probe. The needle is inserted from the lateral to medial side towards the brachial plexus under real time guidance. The needle tip is placed adjacent to the “bunch of grapes”. This is followed by the local anaesthetic injection.

Fig. 6: Transverse Scan of the Supraclavicular Area. SA = Subclavian Artery