



## SUBCLAVIAN PERIVASCULAR APPROACH FOR BRACHIAL PLEXUS BLOCKADE IN UPPER EXTREMITY SURGERY

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**SUMMARY :** *Subclavian perivascular approach has been attempted for brachial plexus block for upper extremity surgery in 160 consecutive cases. In eight patients the approach could not be used since paraesthesia could not be elicited. Twelve patients needed peripheral nerve block supplementation. Four patients needed general anaesthesia with an overall success rate of 85 per cent. There were no complications attributable to the technique. This is our anaesthetic technique of choice for upper extremity surgeries.*

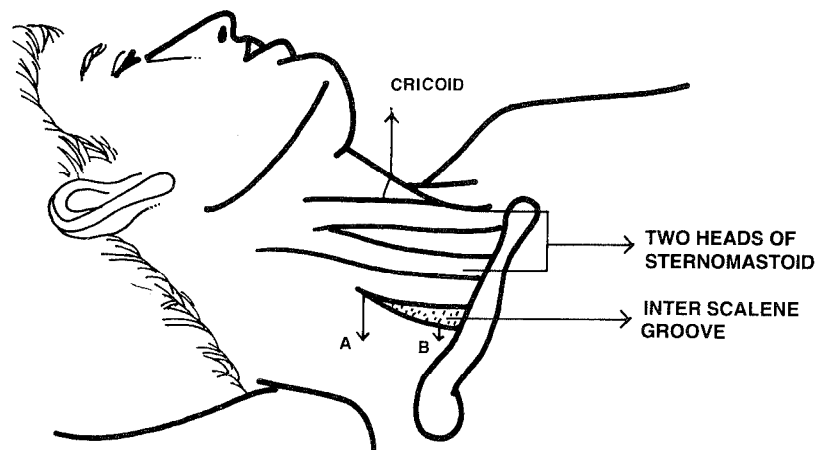
### INTRODUCTION

Brachial plexus block is the anaesthetic technique of choice in upper extremity surgery. The plexus can be approached by various routes - the interscalene, the parascalene, subclavian perivascular, supraclavicular and axillary. This paper discusses our experience with the subclavian perivascular approach.

### TECHNIQUE OF BLOCK

The patient lies supine with the head resting on a pillow and turned 30-40 degrees to the opposite side. Exaggerated positioning will make the identification of landmarks difficult. The lateral border of sternomastoid is then palpated. If it is not obvious the patient is asked to lift the head off the pillow. This makes sternomastoid prominent. A

finger is placed on the lateral border of sternomastoid in line with the cricoid cartilage. The patient is then asked to relax completely. The finger now lies on the scalenus anterior. The finger is moved laterally until the groove between scalenus anterior and medius is felt. The interscalene groove can be made prominent by asking the patient to sniff several times. Once the groove is found it is followed downward as far as the subclavian artery (Fig 1). A finger is placed in the lower end of the groove. A 22 gauge 4 cm long needle is inserted immediately above the finger and advanced slowly in a caudal direction. If the subclavian artery is palpable, the needle is directed tangential to the artery. If the artery is not palpable the needle is inserted over the anterior surface of scalenus medius muscle till paraesthesia in the limb is elicited.



(Fig - 1) Diagram showing the patient position and the landmarks for subclavian perivascular block. The groove is identified at Point A and the finger runs caudally along the groove till Point B where the needle is inserted.

If paraesthesia is not elicited and the needle has struck the first rib, the needle is withdrawn and directed either anteriorly or posteriorly (never medially or laterally as it increases the risk of pneumothorax). If the subclavian artery is punctured the needle is withdrawn and inserted more posteriorly. Once paraesthesia is elicited 20-40ml of local anaesthetic solution is injected with intermittent aspiration. Either lignocaine 1-2% with adrenaline or bupivacaine 0.25-0.5% can be used depending on the duration of surgery, taking care that the safe dose of local anaesthetic agent based on body weight is not exceeded.

In patients who underwent surgery in the arm the intercosto brachial nerve was blocked with 5-7 ml of local anaesthetic solution by infiltrating the skin and subcutaneous tissue superficial to the axillary artery. In other patients it was not blocked.

To obtain successful block it is necessary to elicit paraesthesia radiating to the arm or hand. Paraesthesia in any other distribution indicates that the suprascapular, supraclavicular or long thoracic nerves have been stimulated and it is likely that the needle lies outside the sheath. Success with the subclavian perivascular approach is dependent on eliciting paraesthesia. So, if it cannot be evoked after several attempts, an alternative approach should be considered.

#### FINDINGS

We tried subclavian perivascular approach for brachial plexus blockade in 160 consecutive patients. Paraesthesia was not elicited in 8 patients, and hence axillary approach was used in them. Table 1 shows the region of surgery. This includes 12 patients who underwent microsurgical replantation or major reconstructive procedures lasting more than 6 hours.

**Table 1**

Site of Surgery	No. of Cases
Hand	136
Wrist	4
Forearm	12
Elbow	4
Arm	4

Most patients felt paraesthesia in the region of the elbow. In patients who had paraesthesia radiating to the hand, the onset of block was noticed even as the needle was withdrawn. The onset is heralded by weakness of the shoulder muscles. In about 112 cases (82.4%) the onset of block was within 5 minutes with lignocaine and 10 minutes

with bupivacaine. In the remaining cases there was delay in the onset of the block. The block was complete by 10-15 minutes in about 96 cases (70.6%). In 40 cases (29.4%) the block was complete in 30 minutes. Ulnar nerve block was often delayed. In 20% of cases ulnar nerve block was carried out at the supra condylar level with 5 ml of 0.25% bupivacaine. In 18 cases subclavian artery was punctured. The needle was withdrawn, repositioned and blockade was successful.

We did not encounter pneumothorax in any case. There was no incidence of phrenic nerve palsy or hoarseness of voice due to recurrent laryngeal nerve palsy. In 12 cases Horner's syndrome was noticed. Reinforcement was done in two patients intraoperatively since the duration of surgery lasted for 8 hours and 12 hours. None of the patients complained of tourniquet pain even at the end of two hours.

#### DISCUSSION

In 1954 Burnham<sup>1</sup> described the concept of perivascular anaesthesia of the brachial plexus. In 1964 Winnie and Collins<sup>2</sup> described the same concept. There is a continuous fascial sheath from the transverse processes of the cervical vertebrae to several centimetres beyond the axilla i.e from the roots of the plexus to the major nerves of the upper arm. The space may be entered at any level i.e inter scalene, subclavian perivascular, or axillary. The extent of the block is determined by the volume of the solution injected. The local anaesthetic diffuses within the sheath and blocks the various parts of the plexus rather than the anaesthesiologist having to find the nerves with multiple needle pricks. The single injection technique of subclavian perivascular block minimizes the skill and experience required to perform a successful block. It also reduces the time required to perform it and enhances safety by reducing complication of intravascular injection and post injection neuropathies.

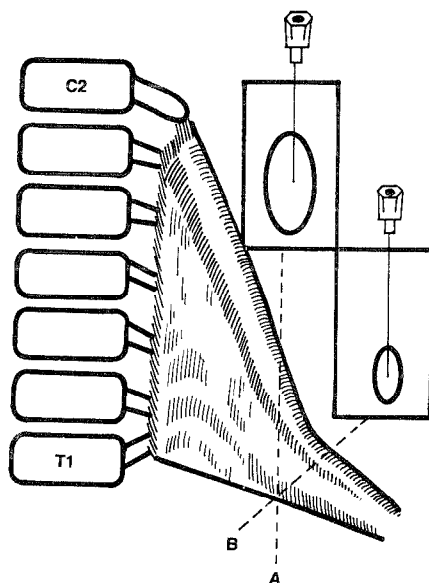
The subclavian perivascular block is easy to perform once the landmarks are located. A specific advantage in trauma patients is that the limb is kept by the side of the patient contrary to the axillary block technique where the limb is kept abducted and externally rotated. Small volumes of local anaesthetic provide excellent anaesthesia. 20 ml in subclavian perivascular space give the same extent of anaesthesia as 40 ml in axillary perivascular space, providing anaesthesia in the brachial plexus and lower part of cervical plexus.

The subclavian perivascular space has a very narrow anteroposterior dimension when viewed laterally

and is triangular in shape when viewed from the front (Fig 2). The currently used supraclavicular approaches enter this space at the lateral angle of the triangle where the width and depth are the least. Even the slightest movement during injection at this point may cause the needle to leave the space. With multiple injections this possibility is increased. With the subclavian perivascular technique the needle enters the space where the depth and width are greater and allows much greater movement of needle without leaving the space.

Ramamoorthy<sup>3</sup> has stated that since this block provides excellent anaesthesia so easily, he has difficulty in convincing trainees to learn any other approach once they are exposed to the subclavian perivascular approach.

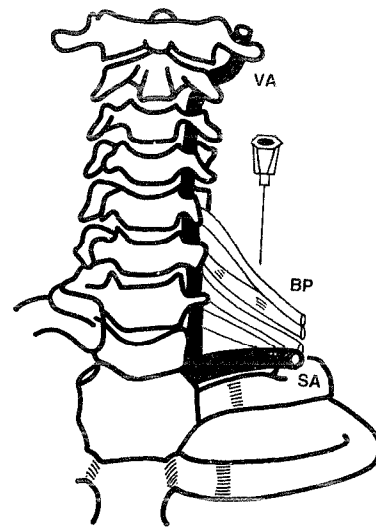
Complications of this technique include phrenic



(Fig - 2) Schematic diagram showing the perivascular sheath. A shows the subclavian perivascular approach and B shows the route of the conventional supraclavicular approach.

nerve block, recurrent laryngeal nerve block and pneumothorax. Subarachnoid, epidural and vertebral artery injections are practically impossible (Fig 3). Phrenic nerve block is rare. Symptomatic phrenic nerve block occurs in 2% cases<sup>4</sup>. Treatment is only reassurance. In our series there was no incidence of phrenic nerve block. Recurrent laryngeal nerve block is seen in 1% of cases<sup>4</sup>. It occurs only on the right side since the recurrent laryngeal nerve loops around the subclavian artery on the right and arch of aorta on the left.

Pneumothorax is extremely rare. The needle should be directed caudally, neither medially nor laterally. The needle goes along the scalene muscles and will hit against the first rib into which these muscles



(Fig - 3) BP - Brachial plexus SA - Subclavian Artery and VA - Vertebral Artery. With subclavian perivascular approach vertebral artery injection and subarachnoid injections are virtually impossible.

are inserted.

## CONCLUSION

In our experience we found the subclavian perivascular approach to brachial plexus a simple technique. The success rate was 85 per cent and the block provided surgical analgesia in the whole of the upper extremity. There were no complications attributable to this technique.

## References

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