Interscalene block

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Anatomy

The ventral rami of the C5- T1 nerve roots form the brachial plexus. There may be contribution from C4 (pre-fixed), or T2 (post-fixed). After emerging from the intervertebral foramina the roots of the brachial plexus join together between the anterior and middle scalene muscles to form the upper (C5+C6), middle (C7) and lower (C8+ T1) trunks. The interscalene groove lies approximately beneath the lateral border of the sternocleidomastoid muscle when the patient has his/her head turned away from the side to be blocked.

Indications

Shoulder, lateral clavicle, acromioclavicular joint, proximal humerus and elbow surgery

 Territories blocked

The upper (C5 + C6) and middle (C7) trunks are usually blocked well. The lower (C8 + T1) trunk which is more posterior may be incompletely blocked.

Equipment

- 8-10MHz linear probe + ultrasound machine
- Sterile ultrasound gel
- Sterile probe cover
- 22G 50mm nerve block needle
Local

Prior to the practice of Ultrasound Guided Regional Anaesthesia, volumes of local anaesthetic of up to 40mls would be recommended. However, studies using ultrasound have demonstrated good block characteristics with as little as 5 mls. In our institution we use 10mls of 0.5% Bupivicaine.

Approach

There are proponents of both the in-plane and out-of-plane approach. The in-plane approach is usually carried out with the needle directed from posterior to anterior, but this may expose the long thoracic and dorsal scapular nerves to damage as the needle traverses the middle scalene muscle. The out-of-plane approach has the disadvantage of a lack of direct visualisation of needle tip and shaft.

The patient should be positioned supine, with a slight head up angle of 10-30o and the patient’s head rotated away from the side to be blocked. Standard monitoring and intravenous access in the contralateral arm should be instituted.

1. In-plane needle and probe orientation on patient

2. Out of plane needle and probe approach on patient
It is useful to perform a “pre-scan”? 

After application of ultrasonic gel the probe is positioned over the midline of the neck at the level of the cricoid cartilage with the long axis of the probe parallel to the clavicle. The midline structures of the trachea and thyroid gland should be identified and the probe moved laterally to visualise the carotid artery pulsating with a compressible internal jugular vein lateral to it. Overlying these structures is the muscle belly of sternocleidomastoid.

3. Brachial plexus at interscalene groove
Deep to the lateral edge of sternocleidomastoid is found the anterior scalene muscle. Lateral to this will be found the interscalene groove and the middle scalene muscle in sequence. Within the interscalene groove will be found between 2 and 5 round or oval hypoechoic structures with hyperechoic outer rings. These are the roots and trunks of the brachial plexus. You may need to move the probe inferiorly from the level of C6 to get a clearer image.

Once you are satisfied with the image, apply colour doppler to check for blood vessels in the intended approach path. The 50mm block needle should be attached to the local anaesthetic syringe and the needle primed with local anaesthetic.

Clean and prep the area and apply a sterile cover to the probe taking care to expel any air between the probe and cover. Apply sterile ultrasonic gel to the area to visualised and obtain the image as before.

In the in-plane approach local anaesthetic is applied subcutaneously at the lateral border of the ultrasound probe. The 50mm nerve block needle is inserted through the anaesthetised skin parallel to the long axis of the probe.
to view the entire structure of the needle. The needle should be advanced through the middle scalene muscle directed towards the area of C5 and C6 nerve roots (most important for shoulder surgery).

5. In plane interscalene sonoimage

The needle will enter the interscalene groove posteriorly with a “click” as it goes through the fascia overlying the middle scalene muscle. Once through this fascial layer you should ask your assistant to aspirate and inject approx 1 ml of local anaesthetic.

If local anaesthetic can be seen as a hypoechoic filling around the nerve roots on the screen, the injection may continue with frequent aspirations. The needle may need to be redirected to bathe the other nerve roots in the interscalene groove.

6. LA spread around the roots of the brachial plexus
In the out of plane approach, the interscalene groove and target nerves are visualised such that they should appear in the middle of the image. This corresponds to the middle of the probe. The skin around the middle of the probe should be anaesthetised with local anaesthetic as above. The depth of the target nerves should be noted. The block needle should then be inserted taking care to avoid the external jugular vein. The block needle may not be seen discretely in the ultrasound image. The movement of the tissue and hypoechoic needle shadow should be carefully observed until the interscalene groove is entered; it is preferable to enter the interscalene groove at the posterior border. Do not advance the needle any more than the depth of the target nerves, noted earlier. Once you are happy with the estimated position of the needle, ask your assistant to aspirate and inject a small volume of the local anaesthetic. If the needle tip is correctly positioned this will lead to spread of hypoechoic filling of the interscalene groove and the nerve root visibility will improve.

The needle may be adjusted deeper to target the area immediately surrounding the roots of the lower trunk (C8+ T1). Care must be taken in this circumstance not to damage the cervical pleura which can be visualised by increasing the depth of ultrasound penetration. Also, avoid injecting local anaesthetic immediately adjacent to the transverse process which will increase the risk of accidental epidural or spinal anaesthesia, and is in close proximity to the vertebral artery.
References