Surface Landmarks for Supraclavicular Block of the Brachial Plexus

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A study was done on 136 (100 Male, 36 Female) patients of different ages who underwent upper limb surgeries were given supraclavicular brachial plexus block by lateral approach. In this technique a 5 cm long 22 SWG needle was inserted from a point 1 cm above the injection of inner 2/3 and outer 1/3 of clavicle directed medically, inwards and parallel to clavicle at an angle of approximately 20^0 to the skin. All the patients had pressure paraesthesia and immediate pain relief after 20 ml solution of mixture of 10 ml of 2% lignocaine, 6 ml of 0.5% bupivacaine and 4 ml normal saline was injected. Average onset and duration of analgesia was minutes and 180-200 minutes respectively. Average onset and duration of motor loss was 6-8 minutes and 120-150 minutes, respectively. 6% cases had vessel puncture but no serious complications were noticed. Quick and complete analgesia and motor loss with no serious side effect were the main features of this approach.

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Introduction

Brachial plexus blocks are frequently used for surgery on the upper extremities, particularly in emergency operations. Common techniques for brachial plexus block include axillary,[1] infraclavicular,[2,3] supraclavicular[4] and interscalence[5] approaches. The supraclavicular approach has several advantages including the fact that abduction of the arm is not required as with the maxillary approach. furthermore, it is not difficult to block C-8 or T-1, and the local anesthetic solutions cannot spread inside the epidural or subarachnoid spaces, as has been reported with the interscalene technique the.[6,7] Pneumothorax is, however, a possible complication of the supraclavicular approach. The incidence of pneumothorax following supraclavicular block averages 0.5% to 6.00%,[8] decreasing with experience.

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Since the first description of the supraclavicular approach by Kulenkamp and persy[4] in 1911 many improvements have been suggested, including those by MacIntosh and Mushin,[9] Lamoureux and Bourgeois-Gavardin,[10] Winnine and Collins,[11] and more recently Vongvises and Panujayanond[12]. Whatever the technique, three points continue to be a source of concern, especially for neophytes (a) the subclavian arterial pulse can often be felt but the artery cannot always be located accurately, (b) if the first introduction of the needle does not elicit paresthesias, while seeking the first rib the needle can slop over it and pierce the pleura and lung parenchyma, and (c) the 22-gauge, 4 or 5 cm long needle currently so often used is too long to be used so near the pleura. To avoid these problems, we have developed a technique based on readily recognized surface land-marks (13) and now report our experience with 136 cases.

Anatomic Considerations

The supraclavicular fossa or posterior cervical triangle[14] consists of the area enclosed by the posterior margin of the sternocleidomastoid muscle, the middle third of the clavicle, and the anterior edge of the trapezius muscle. The subclavian artery and the trunks of the brachial plexus lie on the floor of the triangle.

The brachial plexus is formed by the anterior roots of the fifth, sixth, seventh and eighth cervical and first thoracic spinal nerve with occasional twigs from the fourth cervical and second thoracic nerves. The roots emerge between the anterior and middle scalence muscles in the lower part of the posterior triangle of the neck to unite and form three trunks (upper, middle, and lower). As these branches pass downward and laterally behind the clavicle, they are assembled into cords (lateral, medial and posterior) which divide into the great nerves of the upper extremities.

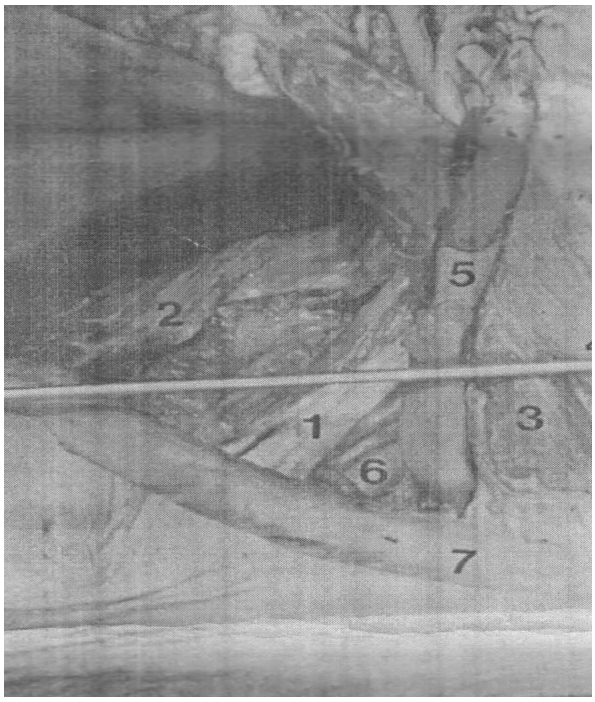

Fig 1. Anatomy. 1. brachial plexus; 2. Trapezius muscle; 3. clavicular head; 4. sternal head (3 and 4 comprise the sternocleidomastoid muscle); 5. external jugular vein; 6. subclavian artery; 7. clavicle; 8. fossa supraclavicular minor.

Using a cadaver place in the proper position for a supraclavicular block, we observed, after dissection and retraction of the platysma (Fig 1) that a line drawn between the internal clavicular insertion of trapezius muscle and the top of supraclavicular minor fossa[15] (the triangle formed by clavicle and the clavicular and sternal heads of sternocleidomastoid muscle) crosses the external jugular vein just in from of the brachial plexus. The be more precise, the brachial plexus lies under the skin at a depth of 1 or 2 cm slightly lateral to the perpendicular projection of the crossing point. These anatomic findings suggest that surface land-marks consisting of eh external jugular vein, the sternocleidomastoid muscle, and the clavicular insertion of the trapezius muscle can be used for supraclavicular blocks of the brachial plexus.

Methods

136 patients of both sexes who wee posted for upper limb surgeries were administered brachial plexus block by this technique. A well explained written consent was obtained on the hospital consent form, from all the patients.

Position - The patient lies in the dorsal recumbent position with a small pillow under the head. The head is turned in the opposite direction, with the arm resting at the side.

Landmarks - The patient is instructed to raise his head, bringing the clavicular and sternal heads of sternocleidomastoid muscle into view. The location of the top of the supraclavicularis minor fossa is marked on the skin with ink. The anesthesiologist moves his index finger laterally along the upper board of clavicle until the internal clavicular insertion of the trapezius muscle is palpated. This point is marked with ink. A line is drawn on the skin, between the two points. Trendelenburg's position or asking the patient to cough helps locate the external jugular vein. An "X" is marked at the intersection of the vein with the previously traced line (Fig 2).

Procedure - After aseptic preparation of the area, the anesthetist, standing at the head of the table, makes a skin wheal at the X mark. A 23-gauges, 2.5cm needle fitted to a syringe filled with local anesthetic solution is inserted through the skin wheal and advanced slowly caudad, slightly lateral and forward, avoiding puncture of the external jugular vein. All along this insertion, the operator's hand should rest upon the auricle of the ear (Fig 3). When a paraesthesia is elicited, local anesthetic solution consisting of 15 to 20 ml of lidocaine 1% mixed with 15 to 20 ml of bupivacaine 0.5% is injected after careful aspiration. If no paraesthesia is elicited, redirection and reinsertion of the needle is attempted, but never with a needle longer than 2.5cm in length.

Results

In our department, 136 blocks using "surface's landmarks" have been performed in 18 months for emergency and routine surgery of the upper extremities.

Paraesthesia

Paraesthesia in upper limb was elicited in all the patients. Almost all the patients complained of severe pain in am during drug deposition (pressure paraesthesia).

Sensory block

Majority of patients had pain relief immediately after injection of drug. 88% patients has complete analgesia within 3 minutes. Average duration of analgesia was 180-200 minutes. 15 patients (6%) complained about tourniquets pressure pain after 120 minutes but surgery could be performed after deflation of the cuff. 5 patients who had grade I analgesia required ketamine supplementation.

Motor loss

Average onset time for complete motor loss was 6-8 minutes, with an average duration of 120-150 minutes. Few patients moved the hand especially fingers initially but later on complete motor loss was present in 86% cases.

Complications

6% cases had vessel puncture during the procedure but block could be performed successfully in these patients once pressure stopped the bleeding.

No serious complications like pleural puncture, pneumothorax or any other cardio respiratory side effects were observed during the procedure. All the patients had a follow up of 6 months but no infection or neurovascular deficit was reported.

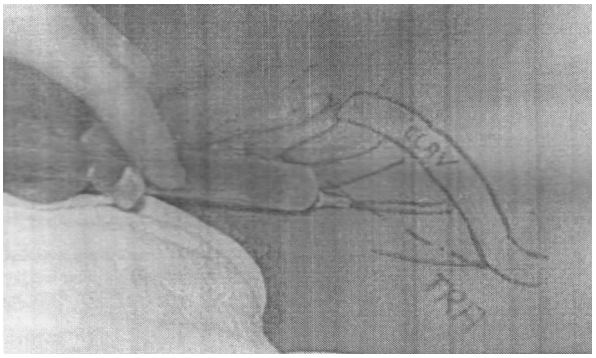

Fig 2. Surface landmarks. From top of supraclavicular fossa [triangle formed by clavicle (CLAV) and the two heads of sternocleidomastoid muscle (SCM)] a line is draw down to edge of external clavicular insertion of trapezius muscle (TRA). Where this line intersects with external jugular vein "X" is drawn.

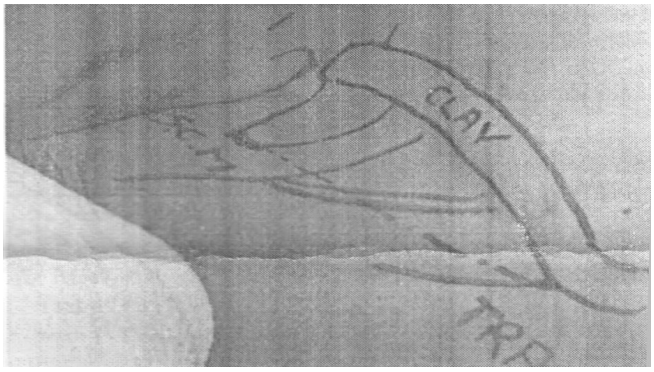

Fig 3. Placement and direction of needle. Inserting needle, operator's hand rests upon auricle of ear. CLaV, Clacicle; TRA, trapexius muscle; SCM, sternocleidomastoid muscle.

Discussion

Using the landmarks described above, no pneumothorax was observed in 136 cases and the rate of failure of the blocks performed by inexperienced anesthesiologists was only 2.2%. In a previous series of 217 brachial plexus blocks by experienced practitioners, using the supraclavicular approach described by Moore,[8] there was a failure rate of 8.1% and a 1.5% incidence of pneumothorax.[19]

The use of short needle even in obese patients may explain the absence of pneumothorax. Yasudat et al[17] suggested inserting needles no more than 3 cm below the skin. Moore[8] recommends using a rubber market set 2.5 cm from the point of the needle. The best solution is not to use needles longer than 2.5cm besides, our technique avoids the practice of "walking" the rib.

Out landmarks are superficial and easily located just under the skin. They do not require, as with other current techniques, location of the subclavian artery, a relatively deep landmark, deeper than the plexus as shown on Fig. 1.

Are our landmarks reliable? The sternocleidomastoid and trapezius muscle have no important anatomic variations, which is not true of the external jugular vein. However, although there are many variations in the origin and the termination of this vein, the part involved in our landmarks seems to be quite consistent.[18] Other authors[2,8,9] have advocated use of he jugular vein as a landmark. Using these landmarks, paresthesias have been always elicited, a necessity for a high success rate.[8,11]

Conclusion

Hence it can be concluded that surface lan mark is a good guide for supraclavicular brachial plexus block by lateral approach is safe and effective with higher success rate.

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