CORACOID BLOCK—A SAFE AND EASY TECHNIQUE

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SUMMARY
A method of blocking the brachial plexus using an infraclavicular approach is described. Compared with the supraclavicular approach, pulmonary complications do not occur and compared with the axillary approach a higher level of analgesia can be obtained and a potentially septic area is not traversed. However, the level of anaesthesia is at a lower level than that obtained from the supraclavicular approach.

The high frequency of pneumothorax and phrenic nerve paralysis which accompanies the standard supraclavicular approach to the brachial plexus is disadvantageous (Lee, 1968; Bonica, 1969; Wylie and Churchill Davidson, 1972), although in the healthy patient these complications may not be serious problems. However, since brachial plexus block is frequently indicated in poor-risk subjects any form of respiratory embarrassment may produce serious consequences. Therefore, any technique which permits blockade of the brachial plexus without the risk of pulmonary complications would be advantageous.

METHOD
At the level of the coracoid process the three divisions of the brachial plexus form the lateral, posterior and medial cords. These three structures, and the axillary artery and vein, are encased in the axillary sheath and the intercosto–brachial nerve runs in close proximity to this sheath (Johnston and Whillis, 1954; Boileau Grant, 1956). This would appear to be a logical site at which to block the brachial plexus.

At this level the skin, pectoralis major and pectoralis minor muscles collectively form a thick tissue layer. In Boileau Grant’s Atlas of Anatomy the axillary sheath and its contents appear to be far from the coracoid process. However, if the shoulder is depressed and the arm abducted, the axillary sheath and contents could be brought closer to the coracoid process.

Preliminary studies
A feasibility study was undertaken on anatomical specimens in the dissection room, and it became apparent that the brachial plexus could be safely approached from the anterior aspect of the axilla.

In order to determine if the plexus could be blocked high in the axilla, without appreciable risk of pulmonary complications, the proposed coracoid block was performed on fresh cadavers. A solution of methylene blue was used and its site of deposition and route of injection were subsequently dissected to determine the accuracy of placement of the solution. It was found that a large area of the axilla was stained by the dye, and that the cords of the brachial plexus could be bathed readily with methylene blue solution.

The next step was to assess the risk of penetrating the thoracic cavity and, using this approach, deliberate attempts were made to penetrate the cavity, but it proved impossible to penetrate. In addition, the phrenic nerve could not be blocked accidentally. Following this evaluation in cadavers a trial was undertaken on volunteers who gave informed consent.

Patients
This technique was used on 40 patients all of whom were adult muscular males involved in a labouring capacity in heavy industry. Informed consent was obtained from each patient.

Technique
The patient lay supine with the head turned to the side opposite to that on which the block was to be performed. The relevant shoulder was depressed and the arm abducted approximately 45° from the chest wall (fig. 1). The midpoint of the clavicle was identified and the subclavian artery

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palpated. The artery was followed laterally until it disappeared under the clavicle and this point was marked with a skin pen (X1, fig. 2).

The coracoid process was identified and marked with a skin pen. The axillary artery was palpated with the index finger as high as possible in the axilla. The thumb was placed on the anterior surface of the chest wall over the site at which the index finger palpated the axillary artery. This point was marked with a skin pen (X2, fig. 2). In most instances this point will be found to lie in the deltopectoral groove, just below the head of the humerus. The depth at which the axillary sheath and contents lie could then be gauged by estimating the distance between the thumb and the index finger and gave an indication of the depth to which the needle had to be inserted. Points X1 and X2 were joined by a line with the skin pen. It was noted that in most cases this line passed immediately inferior and medial to the coracoid process.

The skin over the coracoid process was cleaned and, using a 21-gauge 51-mm needle attached to a 20-ml syringe, the skin was punctured inferiomedial to the coracoid process and the line joining X1 and X2 transected at the depth which had previously been estimated by the distance between the thumb and index finger. The needle was usually at right angles to the skin. Because of the depth at which the axillary sheath and contents lie it was often necessary to insert the needle almost up to its hub.

After aspiration, approximately 12 ml of local anaesthetic agent was injected. The needle was withdrawn 1 cm and the procedure of aspiration and injection repeated. This manoeuvre was repeated twice in a muscular person (36 ml total volume) and once in an ectomorphic patient (24 ml). This distributed the local anaesthetic solution around the neurovascular bundle. When doubt existed about striking the axillary sheath and contents with the first injection, the needle was withdrawn until the bevel lay just beneath the surface of the skin, and it was then advanced in a slightly angled direction either inferiorly to the first injection, or superiorly to the first injection, depending upon where the plexus was thought to lie. The procedure of withdrawal, aspiration and injection was carried out as described previously. Care was taken not to exceed the total calculated safe dose of local anaesthetic drug.

The area infiltrated by this procedure can be clearly seen in the x-ray photograph which was obtained by adding Conray 250 to the local anaesthetic agent. It will be seen that the local anaesthetic has spread to involve the whole axilla (fig. 3). There is a layer of muscle between the chest wall and axilla but in no patient in whom this technique
has been used was this muscle infiltrated. The cords of the brachial plexus can be seen in the axilla, illustrating that the whole of the axilla and its contents have been bathed in the local anaesthetic agents.

**Drugs and equipment**

Premedication consisted of flunitrazepam 1 mg i.m. 1 h before operation. Equal volumes of 2% lignocaine and 0.5% bupivacaine in 1:200000 ephedrine were used. Doses did not at any time exceed lignocaine 7 mg kg\(^{-1}\) or bupivacaine 2 mg kg\(^{-1}\). A maximum dose calculated on a weight basis was drawn up for each patient.

Three 20-ml syringes and one 51-mm, 21-gauge medium bevel needle were required. (The usual 38-mm, 21-gauge needle is not sufficiently long for the procedure described.)

The usual volumes used were 0.5% bupivacaine 30 ml (150 mg) and 2% lignocaine 30 ml (600 mg). Out of this total volume of 60 ml only 40 ml was usually used.

**RESULTS**

The axillary artery was punctured in 50% of patients, but there was no discernible evidence of spasm or haematoma formation. Sensory block occurred readily, but motor blockade was not easily obtained unless 2% lignocaine was used.

The technique failed in three patients and this was ascribed to a faulty identification of landmarks and faulty technique.

Sensory block occurred in every successful case from C5-6 to T2. (The whole of the axilla was anaesthetized and it was not necessary to block the intercostobrachial nerve.) The use of a tourniquet applied to the upper arm in order to produce a bloodless field caused no discomfort to the patients.

The onset of analgesia was slightly longer than experienced using the normal supraclavicular approach, the average time being 10–20 min.

**DISCUSSION**

Montgomery and colleagues (1973) described a technique in which the brachial plexus was blocked using an infraclavicular approach. Their method required many more landmarks and that the arm be abducted to 90°. Using their technique the depth at which the plexus lies is not determined and use must be made of a nerve stimulus to identify the plexus. A different technique is described here in which the brachial plexus can be blocked at a high level in the axilla using the "coracoid" approach. This is a simpler approach and does not require stimulation of the nerve. An
advantage of the coracoid approach is that pulmonary complications do not occur.

The block obtained was at a level sufficiently high to apply a constrictive tourniquet without discomfort to the upper arm and in no patient was it necessary to block the intercostobrachial nerve as a separate procedure (Lee, 1968; Wylie and Churchill Davidson, 1972).

The injection appeared to be less distressing to the patient than the supraclavicular approach. In addition, the method has an advantage over the axillary approach to the plexus in that the introduction of local anaesthetic solution through a potentially septic area is avoided.

The coracoid approach offers all the advantages of the supraclavicular approach without any of the major disadvantages. However, the level of the block is lower than that obtained from a supraclavicular block, but the level of anaesthesia is higher than that obtained from an axillary block (Bonica, 1969; Wylie and Churchill Davidson, 1972).

Careful identification of landmarks and strict attention to the technique described is important to avoid failure. A slightly higher concentration of local anaesthetic agent appears to be necessary than that needed for supraclavicular block, presumably because of the thickness of the axillary sheath, and the block is slightly longer in onset; the thick axillary sheath is probably responsible.

Adequate sensory block occurs readily, but motor blockade is not complete unless a stronger concentration of anaesthetic agent is used.

Infraclavicular block of the brachial plexus would appear to be the method of choice for surgery to the forearm and hand. Also, bilateral blocks may be carried out without fear of producing bilateral phrenic nerve paralysis.

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REFERENCES


BLOCAGE CORACOIDE—TECHNIQUE SUR ET FACILE

RESUME

Une méthode de blocage du plexus brachial par une voie infraclaviculaire est décrite dans cet article. Par comparaison à la voie supraclaviculaire il ne se produit aucune complication pulmonaire, et par rapport à la voie axillaire, on obtient une meilleure analgésie. Ceci évite de traverser une zone susceptible de devenir septique. Quoiqu’il en soit, le niveau d’anesthésie est inférieur à celui que l’on obtient par la voie supraclaviculaire.

SICHERE UND EINFACHE METHODE DER BRACHIALPLEXUS-BLOCKIERUNG

ZUSAMMENFASSUNG

Eine Methode zur Blockierung des Brachialplexus auf infraclavikulärem Wege wird beschrieben. Verglichen mit der supraclavikulären Methode treten dabei keine Lungenkomplikationen auf, und verglichen mit der axillären Methode wird stärkere Analgesie erzielt und keine potentiell septische Stelle überquert. Allerdings ist die so erzielte Narkosetiefe geringer als die, die mit der supraclavikulären Methode erzielt wird.

BLOQUEO CORACOIDEO—UNA TECNICA SEGURA Y FACIL

SUMARIO

Se describe un método de bloqueo del plexus braquial usando un método infraclavicular. En comparación con el método supraclavicular, no tienen lugar complicaciones pulmonares y en comparación con el método axilar puede obtenerse un mayor nivel de analgesia, no pasando así por una zona potencialmente séptica. Sin embargo, el nivel de anestesia es de un nivel inferior al obtenido mediante el método supraclavicular.