The interscalene approach to block of the brachial plexus

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Summary

One hundred consecutive cases of interscalene brachial plexus block are presented. The technique is reliable, safe and easy to perform. Interscalene block of the brachial plexus gives more extensive analgesia than other brachial block techniques and allows certain operative procedures on the shoulder to be performed. Multiple injections are not necessary. The technique is also highly acceptable to the patient.

Block of the brachial plexus for surgical procedures on the upper limb is not new. Halsted described chemical anaesthesia of the upper limb in 1884 after exposing the brachial plexus by neck dissection and applying a solution of cocaine to the nerve roots. In 1911 Hershey described a percutaneous approach to the axillary nerve, and shortly thereafter Kulenkampf described a percutaneous technique whereby the brachial plexus was approached above the clavicle. In 1921 Reding emphasized the importance of the fascial sheath around the brachial plexus as a definite space into which analgesics could be injected. This appeared to be ignored until Burnham described the axillary perivascular technique in 1958. In 1964 Winnie and Collins demonstrated the brachial plexus sheath by the injection of radio-opaque dye and introduced the single-injection axillary approach. They also described a subclavian perivascular technique, utilizing the relationship of the brachial plexus to the subclavian artery, entering the sheath superior to the clavicle. In 1970 Winnie described the interscalene approach whereby a needle is inserted at right angles to the skin in all planes at the level of C6 between the scalenus anterior and scalenus medius muscles. In 1979 Vongvises and Panijayanond described the parascalenue approach, similar to the interscalene approach but entering the sheath more distally nearer the clavicle.

The three commonly used techniques for analgesia of the brachial plexus are the axillary approach, the supracavicular approach to the brachial plexus as it crosses the first rib, and the interscalene approach. This article describes the first 100 cases of interscalene brachial plexus block performed by the author.

Patients

The patients were all inpatients at Ga-Rankuwa Hospital, Pretoria, and were aged between 16 and 80 years. The majority had sustained trauma to an upper limb and the remainder were scheduled to undergo elective surgery. Examples of procedures considered suitable for interscalene brachial plexus block were suturing of tendons (flexor or extensor), insertion of wires into fractured phalanges or metacarpals, closed reduction of forearm fractures, open reduction of fractured elbows, reduction of a dislocated elbow or shoulder, and excision of ganglia. Most of the operations were performed under a bloodless field produced by an upper arm tourniquet.

Before preparing for the block the procedure was explained to the patient, with special reference to the facts that the patient would not be able to move the arm once it was blocked, and that although he or she might feel that the surgeon was working no pain would be felt. The block would last 4 - 6 hours and then start wearing off. The patient would not see the operation.

When the needle was inserted, the patient was to tell the anaesthetist without moving head or arms where any strange sensation was felt. This was usually reported by the patient as either sharp pain in the arm, sometimes associated with twitching of the forearm muscles, or as 'something walking down the arm'.

Method

When the patient had consented to the block the gown was taken off the shoulders and arms, and a butterfly needle inserted into the uninjured forearm to secure an open vein. A pillow folded double was placed under the shoulder and a second pillow supported the head. This produced the required position — the patient should be supine with a well-extended neck. The anaesthetist stood on the side of the patient opposite the injured limb. Using an aseptic technique the patient's neck was cleaned with Hibitane solution. With the patient looking up at the ceiling the cricoid cartilage (C6) was identified. The patient's head was then carefully turned to face away from the injured arm, thus stretching the skin over that side of the neck. The palpating hand was drawn posteriorly in line with the cricoid cartilage and the anterior and then the posterior borders of the sternomastoid were identified. If these could not be clearly felt, the anaesthetist's other hand was placed on the patient's forehead and the patient asked to lift his head. This enabled the posterior border of the sternomastoid to be identified in all cases. The palpating hand was then moved laterally over the scalenus anterior, and the groove between the anterior and middle scalene muscles palpated. If this could not readily be identified the patient was asked to inhale deeply and hold his breath, thus bringing the scalene muscles and the groove between them into prominence. A useful landmark is the external jugular vein, which crosses the interscalene groove at the point where the needle is to be inserted (level of C6) in most cases (Fig. 1). A 21G intravenous infusion (butterfly) needle 19 mm in length was then inserted at right angles to the skin in all planes at the point defined above. Once the needle had pierced the skin, the direction was altered to aim slightly more caudally in order not to miss the ulnar branches of the plexus (C8, T1) and the needle was then advanced slowly, the patient being questioned at the same time regarding paraesthesiae below the elbow. When these were elicited an assistant took the cap off the back of the extension from the needle and the
Results

The results are shown in Table I, which also compares these results with those of some other reported series. Success meant that the surgeon could carry out the planned procedure under the block. Included as successes were 5 patients in whom the ulnar nerve had to be blocked at the elbow as it had not been successfully blocked by the interscalene approach. Complications were few (Table I), and all had worn off by the time the block had worn off. The convulsion was terminated within 30 seconds by diazepam 10 mg intravenously. Homer's syndrome, although not considered a complication, occurred in 28% of cases.

Discussion

Brachial plexus block has been shown to produce more stable cardiovascular and respiratory parameters than light general anaesthesia. If adrenaline 1:200 000 is used with the local anaes-

![Fig. 1. Landmarks for interscalene brachial plexus block. X marks the site of insertion of the needle at the point where the external jugular vein (dotted line) crosses the interscalene groove.](image)
The complications in this series are listed in Table 11. Recur­
A parascalene technique of brachial plexus
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anesthesia.

Serious implications in a patient with respiratory disease the
or peridural
vascular injection. Phrenic nerve palsy can occur with all supra­
above the pulsation. In this series the subclavian artery was
preparing for this to a landmark, inserting the needle 1 cm
palpable, it is a useful landmark.
The success rate of this series compares with that of other
authors using this and other (supraclavicular, subclavian peri­
vascular and axillary) techniques (Table I). Many of the failures
could be attributed to a communication problem, the anae­
thesiologist not being able to speak the patients’ home language.
An interpreter was therefore needed. Questioning after the proce­
dure suggested that some failures were due to the patient inter­
preting the anesthesia as pain. Certain patients who had sustained
trauma to the upper limb replied in the affirmative to questions
regardless of where the needle point was. In the case of many of
the blocks which failed in the first 50 patients the solution was
reduced, and this contributed to the lower failure rate in the last
50 cases.
The complications in this series are listed in Table II. Repeat­
lyrageal nerve palsy, phrenic nerve palsy, convulsions and
vascular puncture have all previously been described with brachial
plexus block. Inadvertent bilateral block with motor paraly­
sis, without peridural or subdural block, has not been described
before. The convolution was probably due to inadvertent intra­
vascular injection. Phrenic nerve palsy can occur with all supra­
clavicular approaches to the brachial plexus, and because of its
serious implications in a patient with respiratory disease the
anesthetist should always be aware of this possibility.
Other complications described with this technique, although
rare, are the following: permanent neurological damage to the
brachial plexus1 (this can occur with any technique); subdural2
or peridural3,4 blockade at the cervical level; and carotid bruit.5
Stellate ganglion block was not considered a complication; this
is because certain authors regard the higher incidence of
Horner’s syndrome to be due to the interscalene or parascalene
techniques6 because of the close proximity of the stellate gangl­
ion to the brachial plexus at this level. In all cases stellate
ganglion block had worn off by the time the brachial plexus block
started to wear off. The stellate ganglion, however, supplies some
of the sympathetic fibres to the bronchial musculature, and block
of these may lead to bronchospasm in the asthmatic.6 Caution
should therefore be exercised when performing this block on an
asthmatic.
The main advantage of this technique is that in most cases of
surgical procedures on the upper limb only one injection is
needed for adequate analgesia. The supraclavicular approach
often requires more than one injection, and two are required with
the axillary approach unless very large volumes (50 ml) are used
or only the forearm needs to be blocked. In forearm blocks using
the axillary approach a volume of 25 ml is frequently insufficient
to block the musculocutaneous branch of the plexus which
supplies the skin over the lateral aspect of the forearm. If the site
of operation is an area of skin supplied by T2 (axilla) then this nerve will have to be blocked separately with any brachial plexus block technique. In the 5 cases in which the ulnar nerve was not adequately blocked by the interscalene technique, probably because of insufficient caudal direction of the needle, the nerve was blocked in the ulnar groove at the elbow.

Another advantage of this technique is that the patient can lie
fairly comfortably without having to move his or her injured arm.
Whereas when the axillary approach is used the injured arm
is abducted to 90°, which often causes discomfort. The para­
scalene approach also employs a single-injection technique, but the incidence of subclavian arterial puncture and pneumothorax is
reported to be higher than that associated with interscalene blocks.

For very lengthy procedures or when local postoperative anal­
gesia is required a cannula with a stylet can be inserted instead of
the winged intravenous infusion needle; once within the sheath
the stylet is removed and the cannula left in place. Sterility is
important and the cannula should be treated aseptically.

Patient acceptance of the technique was high. Only 1 patient in
whom the block was successful said that he would prefer not to
have the technique repeated if a subsequent arm operation was
needed. This was a 17-year-old boy who was disturbed by the
paralysis of the arm, which was still present after the operation.
He experienced anxiety about return of normal function despite
an explanation of the duration of the block before the procedure
was undertaken. All the other patients agreed to have another
interscalene block if another operation on the upper limb was
required.

The interscalene technique has been shown to be a safe, useful,
easy and acceptable means of producing analgesia for operations
on the upper limb, especially in a busy emergency theatre complex.

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