SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK USING A NERVE STIMULATOR AND AN INSULATED NEEDLE

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SUMMARY
A technique employing a nerve stimulator and an insulated needle was used for supraclavicular brachial plexus block in 71 patients using 0.5% plain bupivacaine 15–20 ml. The mean minimal stimulating current to produce paraesthesia was 0.09 mA. The plexus was identified at a mean depth of 27 mm below the skin. The block was successful in 98% of patients when the stimulation was felt in the index, middle or ring finger, but was often incomplete when felt in the thumb or little finger.

METHODS
Seventy-one patients undergoing operative procedures (table I) on the upper limb were studied. A ground electrode (an electrocardiograph plate) was attached to the opposite limb, and connected to the output pole of a Digital (M.E.C., M.E.–6211) stimulator. A 23-gauge insulated needle (Pole injector), 50 mm long, was connected to the other pole with an alligator clamp (fig. 1).

A marker was placed 3 cm from the tip of the needle and the plexus was located using the supraclavicular approach (Moore, 1976). When paraesthesia or shock-like sensations were elicited, the distribution was noted, the needle was fixed and the depth of the tip from the skin was measured. The stimulating current (initially 0.2 mA for 5 ms at 1 Hz) was then decreased to determine the minimum current which would produce paraesthesia. If this current was less than 0.15 mA, 0.5% plain bupivacaine 15–20 ml was injected.

RESULTS
The minimal stimulating current required was 0.09 ± 0.007 mA (mean ± SEM) and the plexus depth was 27.1 ± 0.8 mm. The procedure took 13 ± 1 min and operative analgesia was established in 21 ± 1 min after injection. The operative procedures lasted between 35 min and 10 h 25 min. In two patients undergoing surgery for severed fingers, the blockade following a single injection was inadequate.

Table II shows the distribution of paraesthesiae in relation to the success of the local anaesthetic injection. Successful blocks to both radial and ulnar sides of the hand and the forearm were produced in 98% of patients experiencing paraesthesia of index, middle or ring fingers. The success rate was low when paraesthesia was felt in the thumb or little finger. Usually paraesthesia of the thumb led to unsuccessful analgesia of the little finger and vice versa.

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Since there are no other published data on the minimal current required when a nerve stimulator is used to identify the correct point of injection in brachial plexus block, we determined the mean minimal current required to produce muscle twitch of the fingers by direct stimulation of the plexus in five patients undergoing radical mastectomy. Under halothane anaesthesia the minimal current was $0.12 \pm 0.004$ mA. The stimulating current in our conscious patients was $0.09 \pm 0.007$ mA and this indicates that our injections were made very close to the plexus.

### TABLE II. Relationship between distribution of paraesthesia and successful blockade

<table>
<thead>
<tr>
<th>Distribution of paraesthesiae</th>
<th>No. of successful blocks</th>
<th>No. of unsuccessful blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thumb</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Index finger</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Middle finger</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>Ring finger</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Little finger</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Hand</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Elbow</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>9</td>
</tr>
</tbody>
</table>

Normaly, two techniques are employed to ensure completeness of brachial plexus block. A larger volume of local anaesthetic may be injected, as recommended by Winnie (1970) using the interscalene approach. For supraclavicular block, Moore (1976) states that paraesthesia of all digits should be obtained and separate injections made for each. Our results suggest that both these may be unnecessary if paraesthesia of the middle three digits is obtained.

Pneumothorax is a major complication of the supraclavicular technique. Using our technique we found that patients described a knife-like pain, or electric sensation, in the lateral chest wall, or breathing difficulties when the needle approached the pleura, as has been reported by Wright (1969). Our findings of the depth of the plexus should be a warning against inserting the needle much more than 3 cm below the skin, a further safeguard. No pneumothorax or evidence of neural damage occurred in this series.

### DISCUSSION

Since there are no other published data on the minimal current required when a nerve stimulator is used to identify the correct point of injection in brachial plexus block, we determined the mean minimal current required to produce muscle twitch of the fingers by direct stimulation of the plexus in five patients undergoing radical mastectomy. Under halothane anaesthesia the minimal current was $0.12 \pm 0.004$ mA. The stimulating current in our conscious patients was $0.09 \pm 0.007$ mA and this indicates that our injections were made very close to the plexus.

### ACKNOWLEDGEMENT

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REFERENCES


BLOCAGE DU PLEXUS BRACHIAL SUPRACLAVICULAIRE A L’AIDE D’UN STIMULATEUR DE NERF ET D’UNE AIGUILLE ISOLEE

RESUME

On a appliqué une technique basée sur un stimulateur de nerf et une aiguille isolée pour bloquer le plexus brachial supraclaviculaire de 71 patients, à l’aide de 15-20 ml de bupivacaine pure à 0,5%. Le courant de stimulation minimal moyen pour produire une paresthésie a été de 0,09 m ampère. Le plexus a été identifié à une profondeur moyenne de 27 mm au-dessous de la peau. Le blocage a été satisfaisant dans 98% des cas, lorsque la stimulation a été ressentie dans l’index, le majeur ou l’annulaire, mais il a été souvent incomplet lorsque la stimulation a été ressentie dans le pouce ou l’auriculaire.