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.

The use of a portable nerve stimulator increases the success of regional nerve blocks (Greenblatt and Denson, 1962; Koons, 1969; Wright, 1969), and provides a precise, safe method of identifying the brachial plexus by the supraclavicular route. Using this technique we decided to study the minimum stimulating current required, the depth of the plexus beneath the skin and the relationship of the completeness of blockade to the distribution of paraesthesia elicited following insertion of the needle.

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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FIG. 1. To show the nerve stimulator and insulated needle, with marker, used in this study.

<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>

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

Normally, 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

ACKNOWLEDGEMENT

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REFERENCES

SUPRAKLAVIKULARE BRACHIALPLEXUS-BLOCKIERUNG MITTELS NERVENREIZMITTEL UND EINER INSULIERTEN NADEL
ZUSAMMENFASSUNG
Eine Methode unter Verwendung eines Nervenreizmittels und einer insulierten Nadel wurde bei 71 Patienten für eine supraklavikulare Brachialplexus-Blockierung durch 0,5% reines Bupivacain 15–20 ml verwendet. Der mittlere Wert eines minimalen stimulierenden Stroms zur Hervorrufung von Parästhesie betrug 0,09 m amp. Der Plexus wurde in einer mittleren Tiefe von 27 mm unter der Haut identifiziert. Die Blockierung war bei 98% der Patienten erfolgreich, wenn der Reiz im Zeige-, Mittel- oder Ringfinger spürbar war, war aber oft unvollständig, wenn der Reiz im Daumen oder im kleinen Finger spürbar war.

RESUME
On a appliqué une technique basée sur un stimulateur de nerf et une aiguille isolée pour bloquer le plexus brachial supraklavicalaire 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 paraesthesie 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.

SUMMARY
Se usó una técnica en base a un estimulador de nervios y una aguja aislada para el bloqueo braquial supravacular en 71 pacientes, administrándose 15–20 ml de bupivacaina normal al 0,5%. La corriente estimuladora mínima media requerida para producir la parestesia era de 0,09 m amp. Se identificó el plexo a una profundidad media de 27 mm por debajo de la piel. Fue exitoso el bloqueo en el 98% de los pacientes cuando sentían la estimulación en el índice, el dedo cordial o el anular, pero fue a menudo incompleto cuando la sentían en el pulgar o el dedo meñique.