Use of a Peripheral Nerve Stimulator in Regional Anaesthesia.
Clinical Evaluation

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Introduction

Halsted performed the first dental nerve block in 1884 and the first brachial block (under direct exposure) in the neck in 1889. Hirschel described the first percutaneous brachial plexus block in 1911. It is not easily understood how nowadays regional anaesthesia is not a technique of choice in many centres. Possible reasons may be 1) lack of consistent success 2) the time necessary to perform the block 3) the limited duration of the block 4) fear of complications 5) unfamiliarity with various techniques available.

Successful regional anaesthesia depends on accurate placement of local anaesthetic in close proximity to the nerve trunks. In most peripheral somatic nerve block the eliciting of parasthesia helps in identifying the correct spot for injection. This has led to the dictum ‘No parasthesia, no anaesthesia’. This may however cause nerve damage either directly by the needling or during intra-neural injection of anaesthetic agent. Parasthesiae are subjective feelings and uncooperation by the patient may severely sabotage such a technique. Difficulty in identifying landmarks by thick subcutaneous fat may also hamper accurate regional block placement. The use of a nerve stimulator may help overcome these problems. Its use was first described in 1912 by von Perthes. The patient is spared a lot of discomfort as the eliciting of twitching by stimulating a motor nerve requires a lower electrical stimulus than that to cause parasthesiae in a sensory nerve. It also makes cooperation by the patient to a large extent superfluous.

This study was undertaken to confirm these assertions and to note the success rate, the minimum stimulating current needed, the presence of parasthesiae and any complications. No particular selection of blocks was made.

Apparatus

The nerve stimulator used was Neurotrace® (HDC Corporation, Mountain View California USA). It is battery operated (9 volts) and may be re-sterilized by ethylene oxide. Current output ranges from 0.18 to 3 mAmperes. Stimulation is for 1ms every second. A green LED flashes with each pulse. A 10ml syringe can be fitted directly to it. If a larger amount of agent is required an extension tubing is recommended to be fitted to the largest syringe to facilitate handling of the needle. The needle is insulated all the way except at the tip. One lead is attached to the hub of the needle and the other (ground) to an ECG electrode placed somewhere distally on the limb to be blocked.

HDC needles come in different sizes:

- 25G 1½ inches
- 23G 1½ inches
- 22G 3 inches
- 22G 5 inches long

The first two are ‘short level’ while the others are ‘pencil point’ both are rather blunt to reduce risk of nerve damage and to improve the feel of the needle as it crosses various tissue planes.
Method

At the pre-operative visit, the advantages of the technique are explained to the patient and consent obtained. Diazepam 10mg, Meperidine 50mg and Atropine 0.5mg were prescribed as premedication up to 1 hour before surgery.

The local anaesthetic used was Lignocaine 1% or 2% or Mepivacaine 2%. In later cases Bupivacaine 0.5% was used. Adrenaline 1:200 000 was used with each agent.

The block is performed in the induction room with all necessary resuscitation equipment at hand. Monitoring includes ECG and automatic non-invasive BP. An i.v. infusion is set up beforehand as a precaution.

The site and landmarks of the proposed block were identified and marked by skin pencil. Povidone iodine was used to prepare the skin. A skin nick was made by a blood lancet to facilitate the entry of the larger needle and a wheal raised just under the epidermis. The current was set at maximum and moved in the direction of the nerve to be blocked. When a twitch was seen the current was progressively reduced till a good muscle contraction was obtained with the minimum of stimulation. After the obligatory aspiration test, the local agent was injected. Dose was related to age and body weight, number and size of nerves to be blocked and with an eye on the maximum acceptable dose for each agent. After a few minutes the block was tested, patient positioned and sedatives given as necessary.

Results

183 blocks were attempted in 156 patients. Of these 175 were successful (95%). See table for comparison with other authors. The various blocks took from 6 to 20 minutes to perform. Minimal stimulating current was 0.2 mAmps. The operative procedures took between 35 minutes to a maximum of 7 hours. Patients ranged from 15 to 70 years and from 35 to 90kg in body weight. 67% were males.

No difference was seen in the success rate between sedated and non-sedated patients. Parasthesiae was elicited in 5 patients. Motor twitches surprised some patients but were not considered painful. The only complication was accidental femoral artery puncture. No neurological sequelae were observed after one year follow up.

Comparison of Different Series of Blocks with Neurostimulation

<table>
<thead>
<tr>
<th>Block Type</th>
<th>Success Rate(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supravclavicular brachial plexus</td>
<td>100</td>
</tr>
<tr>
<td>Supravclavicular brachial plexus</td>
<td>71</td>
</tr>
<tr>
<td>Interscalene brachial plexus</td>
<td>60</td>
</tr>
<tr>
<td>Supravclavicular brachial P. Axillary brachial plexus</td>
<td>68</td>
</tr>
<tr>
<td>Median/Radial/ Ulnar Nerves</td>
<td>14</td>
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<tr>
<td>Sciatic Anterior/ posterior Femoral Tibial Anterior/ Posterior</td>
<td>134</td>
</tr>
</tbody>
</table>

Discussion

Like Magora, we believe that the best technique for peripheral nerve blocks is the one which ensures easy but accurate placement of the needle with minimal discomfort to the patient and lowest risk of complications. The eight failures resulted despite adequate muscular twitches being obtained.

While it has been said that insulated needles are unnecessary as 30% of the current supplied to a non-insulated needle exists through the tip, recent studies show that the use of such needles may miss the nerve by up to 0.8cm especially in deeply placed blocks where a longer part of the needle is in contact with tissue.

It is probably true to say that the nerve stimulator does not add to the success rate of an anaesthetist experienced in regional anaesthesia, but it is certainly useful to the trainee as an objective method whereby he can gradually gain confidence.

References


26. Smith B.L. Efficacy of a nerve stimulator in Regional Anesthesia; Experience in a Resident training programme. Anaesthesia 1976; 31: 77-78.
