POSTOPERATIVE ANALGESIA FOLLOWING BRACHIAL PLEXUS BLOCK

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SUMMARY

The time from the end of surgery to the administration of the first post-operative analgesic has been measured in 86 patients following brachial plexus block with bupivacaine, lignocaine, mepivacaine or prilocaine. A significant increase in time occurred with bupivacaine; the combination of regional and general anaesthesia significantly increased the time when compared with general anaesthesia in the same patient. In children, the use of regional anaesthesia almost removed the need for analgesia after surgery.

Advances in surgical treatment of acute and chronic hand conditions have led to an increasing number of patients with these conditions presenting for anaesthesia. Many of these patients have associated medical conditions, such as diabetes, hypertension and myocardial ischaemia, which constitute a relative contraindication to general anaesthesia, provided an acceptable alternative can be found. This has led to an increasing use of regional anaesthesia combined with either i.m. or i.v. sedation or light general anaesthesia.

Personal experience with these techniques gave the impression that these patients had a reduced requirement for analgesia after surgery, and that at a later time than following general anaesthesia, an impression shared by Moore (1975).

This is a report of a study of postoperative analgesia following regional block, with the commonly used local anaesthetic agents, to determine more precisely the duration of analgesia and whether or not differences existed between the agents.

METHODS

For the duration of the study all patients presenting for surgery to the upper limb were included.

To enable comparison with previous general anaesthesia and to provide a constant base-line sedation, the patients were given routine premedication with a pethidine-promethazine-hyoscine combination (Pamergan SP 50) until it ceased to be available; thereafter a similar dose of pethidine and promethazine was used; 11 patients received no premedication. Premedication was followed by a light general anaesthetic using a dose of thiopentone sufficient to obtund the eyelash reflex, 50% nitrous oxide in oxygen and halothane 0.5%.

Regional block with the selected agent was performed before the induction of general anaesthesia. In small children and in some adults, the block was performed after the patient had been anaesthetized.

Following surgery, the patients were returned to the recovery ward with a prescription for a postoperative analgesic and a request that the time at which this was administered be recorded. No other instructions were given, in the expectation that these patients would be treated in a manner similar to those recovering from conventional general anaesthesia.

Brachial plexus block

Three methods of blocking the plexus were used during the study. The majority of blocks were performed using the axillary route, and this was the choice in children and in those adults in whom general anaesthesia was induced before regional block. The transmitted pulsation of the brachial artery was used as the index of correct placement of the needle.

In these patients adequacy of the block was assessed by the response to the initial surgical stimulus; if required, a supplementary block was carried out by the operator.

During the series a change in management of Dupuytren's contracture occurred. This required skin grafting, the skin usually being cut from the forearm in the cutaneous distribution of the musculocutaneous nerve. It was found that a number of patients who...
TABLE I. Combined regional and light general anaesthesia. Distribution of blocks. Mean ± SEM operative, tourniquet time, time to first analgesic requirement and percentage of patients requiring no analgesia after operation

<table>
<thead>
<tr>
<th>Method</th>
<th>Bupivacaine</th>
<th>Lignocaine</th>
<th>Mepivacaine</th>
<th>Prilocaine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axillary (69)</td>
<td>22</td>
<td>20</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>Supraclavicular (13)</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Interscalene (3)</td>
<td>2</td>
<td>62 ± 5.9</td>
<td>52 ± 5.2</td>
<td>385.8 ± 75.1</td>
</tr>
<tr>
<td>Ulnar (1)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation time</td>
<td>74.2 ± 7.7</td>
<td>61.4 ± 10.3</td>
<td>59 ± 5.9</td>
<td>62.2 ± 11.7</td>
</tr>
<tr>
<td>Tourniquet time</td>
<td>66.7 ± 5.6</td>
<td>58.5 ± 6.7</td>
<td>52 ± 5.2</td>
<td>54.2 ± 7.9</td>
</tr>
<tr>
<td>Time to first analgesia</td>
<td>405.3 ± 60.1</td>
<td>341.9 ± 67.6</td>
<td>385.8 ± 75.1</td>
<td>381.9 ± 139.4</td>
</tr>
<tr>
<td>No analgesia</td>
<td>8/25 (32%)</td>
<td>7/28 (25%)</td>
<td>3/15 (20%)</td>
<td>5/18 (27%)</td>
</tr>
</tbody>
</table>

had received an axillary block had incomplete anaesthesia of this area and a change was made to the use of supraclavicular block. A few interscalene blocks were tried, but these seemed to offer no advantages over the more conventional supraclavicular approach. Supraclavicular block was found to offer better anaesthesia of the radial and musculocutaneous distribution but, unfortunately, was less reliable for the ulnar distribution, some patients requiring a supplementary block at the elbow or wrist.

Paraesthesia was sought in all unanaesthetized subjects and was recorded in approximately 70% of adults.

RESULTS

The records of 86 patients were available for analysis. The distribution of the different anaesthetic agents and the methods of achieving the regional block are shown in table I.

The majority of the blocks (69) were performed using the axillary route. Seventeen blocks were performed using either the supraclavicular or the interscalene route. One ulnar nerve block in a patient who did not require an upper arm tourniquet was included.

Mean operation and tourniquet times (table I) were similar for each anaesthetic agent. The table shows also the mean time before sedation was administered, and the percentage of patients who received no sedation after operation. A total of 23 patients, 26.7% of the series, required no analgesia after operation.

In an attempt to differentiate between the anaesthetic agents, an arbitrary time limit of 400 min was set, each series being divided into two groups, those requiring sedation before, or after, this time limit (table II). Two patients have been omitted from the bupivacaine series for this comparison as they had been given an oral analgesia for discomfort at their graft sites, groin and leg, before they appreciated any discomfort in the hand.

<table>
<thead>
<tr>
<th>Analgesia</th>
<th>No analgesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bupivacaine</td>
<td>5</td>
</tr>
<tr>
<td>Lignocaine</td>
<td>15</td>
</tr>
</tbody>
</table>

$\chi^2 = 5.26; 0.05 < P < 0.02$.  

Bupivacaine was found to produce a significantly greater duration of analgesia after operation than lignocaine ($\chi^2 = 5.26; 0.05 < P < 0.02$)—the difference between bupivacaine and prilocaine or mepivacaine was not statistically significant.

In nine patients (five female, four male), it was possible to compare a previous conventional general anaesthetic with regional anaesthesia plus light general anaesthesia. Five of these patients were undergoing operative procedures for rheumatoid arthritis, three for tendon grafts and osteotomy following trauma, and one a fasciectomy for Dupuytren’s contracture.

The axillary route was used in seven instances and the supraclavicular in two. Three patients received lignocaine, four mepivacaine and two bupivacaine.

All patients required analgesia following general anaesthesia, but following the combination of regional
TABLE III. Nine patients received combined regional analgesia and general anaesthesia following a previous general anaesthetic. Mean ± SEM operative, tourniquet time, time to first analgesia. Percentage requiring no analgesia

<table>
<thead>
<tr>
<th>Operation time (min)</th>
<th>Tourniquet time (min)</th>
<th>Time to first analgesia (min)</th>
<th>No analgesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional</td>
<td>67.2 ± 8.9</td>
<td>64.4 ± 9.6</td>
<td>271.7 ± 140</td>
</tr>
<tr>
<td>General</td>
<td>87.7 ± 10.9</td>
<td>87.7 ± 10.4</td>
<td>161.1 ± 206.8</td>
</tr>
</tbody>
</table>

and light general anaesthesia three patients required no further analgesia (table III).

In only one instance was analgesia required earlier in the combined group. A 32-yr-old female required analgesia immediately following capsulotomy of metacarpophalangeal joints. Previously she received analgesia 30 min after a synovectomy at the wrist, the anaesthetic on that occasion including pethidine 40 mg 20 min before the conclusion of the procedure.

Applying the same arbitrary time limit of 400 min, a significant difference ($\chi^2 = 3.998$, $0.05 < P < 0.02$) was found between the two groups (table IV).

TABLE IV. Patients receiving combined regional analgesia and general anaesthesia showed a significantly increased time interval before analgesic requirement compared with after a previous general anaesthetic

<table>
<thead>
<tr>
<th>Analgesia before 400 min</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Previous general anaesthesia alone</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>

$\chi^2 = 3.998$; $0.05 < P < 0.02$.

Seven children aged 5–14 yr were anaesthetized by this method, only two requiring analgesia after operation. One of them, an 8-yr-old girl with syndactyly, required analgesia because of discomfort in the groin from which a full thickness skin graft had been taken. When seen 120 min later, she was experiencing no further discomfort. The other child required analgesia at 280 min following a tendon graft. Two of the children had experienced previous surgery under general anaesthesia and had required early postoperative analgesia at 25 and 40 min respectively; neither required analgesia on the second occasion.

Analgesia

In the initial stages of the trial conventional opiate analgesics were prescribed after operation, but later it became apparent that non-opiate preparations, such as pentazocine were adequate and these or simple analgesics are now prescribed in the majority of cases.

DISCUSSION

Many advantages can be claimed for the use of regional analgesia where this is acceptable to the patient and the surgeon. There is minimal toxicity from the anaesthetic agents, rapid recovery, less nausea after operation and reduced theatre contamination by anaesthetic agents. In this series all patients received a light general anaesthetic; normally it is the author's practice to offer the patient the choice of either generous i.v. sedation or light general anaesthesia combined with regional anaesthesia. Patients with rheumatoid arthritis are often more comfortable with light general anaesthetic supplementation because the enforced immobility on a hard operating table produces discomfort and pain in other affected joints. Recovery from operation with this regime is often more rapid than after the use of i.v. sedatives and narcotics.

An additional advantage of the use of regional anaesthesia is the prolonged period of analgesia after surgery, and a reduced requirement for potent analgesic drugs. In this series a significant difference was found when conventional general anaesthesia was compared with regional anaesthesia in the same patient. This finding was especially marked in children, only two requiring non-opiate analgesia after operation; one for discomfort at a graft site remote from the regional block. Two of these children had required analgesics at 25 and 40 min following a previous operation.

Bupivacaine was shown to have a significant advantage over lignocaine, but not over the other agents. This finding must be balanced against the greater certainty of rapid, successful block with lignocaine.

Wildsmith and others (1977) have suggested that prilocaine should be the drug of choice for
Interscalene blocks because of the lower plasma concentrations and the reduced risk of central nervous system toxicity, reserving bupivacaine for those cases in which a prolonged period of surgical anaesthesia is required.

As prilocaine and lignocaine produce similar periods of analgesia after operation, the plasma concentrations following block could be the determining factor in the choice of agent, especially when large volumes of solution are required.

REFERENCES


ANALGESIE POSTOPERATOIRE APRES BLOCAGE DU PLEXUS BRACHIAL

RESUME

On a mesuré sur 86 malades le temps qu'il a fallu depuis la fin de l'intervention chirurgicale jusqu'à l'administration du premier médicament analgésique après blocage du plexus brachial à l'aide de bupivacaïne, de lignocaine, de mépivacaïne ou de prilocaina. Il s'est produit une importante augmentation de temps avec la bupivacaïne; la combinaison de l'anesthésie générale et de l'anesthésie locale a augmenté le temps d'une manière conséquente par rapport à une anesthésie générale sur le même malade. Chez les enfants, l'usage d'anesthésie locale a presque éliminé la nécessité de procéder à une analgésie après une intervention chirurgicale.

POSTOPERATIVE ANALGESIE NACH BRACHIAL-PLEXUSBLOCKIERUNG

ZUSAMMENFASSUNG

Die Zeit vom Operationsende bis zur Verabreichung der ersten postoperativen Schmerzlinderung wurde bei 86 Patienten nach einer Brachial-Plexusblockierung mit Bupivacain, Lignocain, Mepivacain oder Prilocain gemessen. Mit Bupivacain ergänzt sich eine wesentliche Verlängerung der Zeit; die Kombination aus lokaler und allgemeiner Narkose erhöhte die Zeit wesentlich im Vergleich mit allgemeiner Narkose beim selben Patienten. Bei Kindern wurde durch Verwendung regionaler Anästhesie der Bedarf für Schmerzlinderung nach der Operation fast eliminiert.

ANALGESIA POSTOPERATORIA SIGUIENDO UN BLOQUEO AL PLEXO BRAQUIAL

SUMARIO

Se ha medido el tiempo transcurrido entre la finalización de la cirugía y la administración del primer analgésico postoperatorio en 86 pacientes tras el bloqueo del plexo braquial con bupivacaína, lignocaina, mepivacaína o prilocaina. Con bupivacaína se produjo un significativo aumento en el tiempo. La combinación de anestesia regional y general aumentó significativamente el tiempo al compararlo con anestesia general en el mismo paciente. En niños, el empleo de analgesia regional casi eliminó la necesidad de analgesia después de cirugía.