endotracheal tube is inserted in the correct position.

Based on this evidence, and to avoid problems arising from technical difficulties during blind nasotracheal intubation, we have successfully used an x-ray image intensifier to guide the introduction of the tracheal tube between the vocal chords.

We place the patient in a supine position, the head resting on a pillow 8-10 cm above the plane of the operation table. After good topical anaesthesia, the image intensifier is positioned so as to obtain a lateral x-ray view of the oropharyngotracheal aerogram. In this manner it is easy to identify basic anatomical structures such as hyoid bone, epiglottis, Morgagni's ventricles and the trachea. Once these elements are recognized on the screen, the endotracheal tube is inserted in the correct position.

We consider that this technique can be useful during difficult blind nasal intubation.

F. GONCALVES
P. ANDRADE
Caracas, Venezuela

REFERENCE

0.75% BUPIVACAINE

Sir,—I write in full support of the Editorial views expressed by Dr Scott in your May (1984) issue, and also to comment on the paper from Thorburn and Moir in the same issue.

In this hospital we used 0.75% bupivacaine for Caesarean section for approximately 1 year following general availability of the solution in this country. After that time we abandoned its use because we were not satisfied that it provided a sufficiently superior standard of analgesia to compensate for some apparently related drawbacks, as detailed below. However, reception of the curt notice, from the distributors of the drug, to the effect that 0.75% bupivacaine was stigmatized as being contraindicated for use in obstetric practice was greeted with incredulity and (in common with Dr Scott and many others) resentment. There had been no consultation with those members of our specialty who are actively involved in this field. Furthermore, there has, as far as I am aware, been no instance of cardiac arrest—fatal or non-fatal—relating to the use of 0.75% bupivacaine in U.K. obstetric practice. There have been convulsions resulting, but they have been successfully treated in the orthodox manner. Perhaps, the female in the U.S.A. responds to high-dose bupivacaine differently from her British counterpart (and that is a possibility—remember the contrasting response to skeletal muscle relaxants).

Detailed in Table I are data respecting the dose of bupivacaine administered to mothers undergoing elective Caesarean section, categorized in respect to the time elapsing between injection of the first and last top-up dose before the start of operation, and the concentration of drug solution used.

Of the 439 mothers who received 0.5% bupivacaine, one was rendered drowsy (150 mg in 70 min) and another disorientated (115 mg in 33 min). Of the 167 mothers who received 0.75% bupivacaine, one developed slurred speech (525 mg in 76 min) and another became drowsy (150 mg in 70 min) and another disorientated (115 mg in 33 min). Of the 439 mothers who received 0.5% bupivacaine, one was rendered drowsy (150 mg in 70 min) and another disorientated (115 mg in 33 min). Of the 167 mothers who received 0.75% bupivacaine, one developed slurred speech (525 mg in 76 min) and another became drowsy (225 mg in 48 min). One further mother, not included in the table, convulsed after an injection, through the extradural cannula, of 75 mg (0.75% solution). That was undoubtedly an i.v. injection—the mother recovered rapidly and neither she nor her infant came to harm.

Additionally, eight (4.8%) of the mothers given 0.75% bupivacaine required ephedrine to correct hypotension—an unacceptably high incidence. Three mothers (0.7%) given 0.5% bupivacaine received ephedrine.

In view of the higher incidence of CNS complications and hypotension, we abandoned the use of the stronger solution. However, our experience with the 0.5% solution suggests that Thorburn and Moir are rather over-cautious in their advocacy. I have not related the dose received by each mother to her weight, but it is infrequently that we temper the volume of solution injected to the stature of the patient. In only a small minority of our patients does their weight at term lie outside the range 70-90 kg.

Assuming a mean weight of 80 kg, the average dose—using the 0.5% solution—administered during the period 45-75 min, was 22 mg kg⁻¹ h⁻¹. Although I do not wish to suggest that anaesthetists can be profligate in their use of bupivacaine, I do contest that, in British practice at least, its bounds of safety are considerably greater than those intimated by the manufacturers.

J. SELWYN CRAWFORD
Birmingham

Sir,—We are grateful for the opportunity to comment on Dr Selwyn Crawford’s letter. Most of his letter concerns the editorial by Dr Scott, and the manner in which the recommendation of use of 0.75% bupivacaine in obstetric anaesthesia was withdrawn, and we do not propose to comment on this aspect.

Like Moore and his colleagues (1977), Dr Crawford believes that the manufacturer’s recommended maximum dose of bupivacaine is too restrictive, and to practise within those limits

### Table I. Dose of bupivacaine (mean and range) administered to mothers undergoing elective Caesarean section, categorized in respect to the time elapsing between injection of the first and last top-up dose before the start of operation, and the concentration of drug solution used

<table>
<thead>
<tr>
<th>Interval first–final pre-delivery dose (min)</th>
<th>Bupivacaine dose (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>0.5% Solution</td>
<td></td>
</tr>
<tr>
<td>&lt;45</td>
<td>195</td>
</tr>
<tr>
<td>45–75</td>
<td>159</td>
</tr>
<tr>
<td>&gt;75</td>
<td>85</td>
</tr>
</tbody>
</table>

| 0.75% Solution                             |      |           |
|                                            | 97   | 201.8-300 |
|                                            | 38   | 263.7-532.5 |
|                                            | 32   | 303.7-525 |

We consider that this technique can be useful during difficult blind nasal intubation.
CORRESPONDENCE

is over cautious. We too have exceeded the recommended dose, but the purpose of our case reports was to draw attention to the fact that we had observed convulsions in two patients who received a total dose of 0.5% bupivacaine, following extradural analgesia in labour using 0.375% bupivacaine, which exceeded the manufacturer’s recommended maximum of 2 mg kg\(^{-1}\) h\(^{-1}\). One disturbing aspect of the cases reported was the total absence of premonitory warning signs or symptoms; neither drowsiness or slurring of speech was a feature. This suggests that perhaps the only guide to the possible onset of toxic reactions is the total dose injected.

It is quite clear that the manufacturer’s maximum dose has been exceeded by a considerable margin in some patients, but it is the boundary, below which it is safe for all patients, that is difficult to define. We no longer feel that the manufacturer’s recommendation can be exceeded with impunity, and that the risk is greater when the patient has already received continuous extradural analgesia in labour. This risk may be reduced by using concentrations of 0.25% bupivacaine or less during extradural analgesia in labour.

The use of a low concentration in labour and a high concentration for subsequent Caesarean section will minimize the total exposure to bupivacaine.

J. THORBURN
D. D. MOIR
Glasgow

REFERENCE


SIR,—I was concerned to read the report of two patients who had grand mal convulsions after receiving large amounts of extradural bupivacaine for Caesarean section (Thorburn and Moir, 1984). Whilst a strong advocate of the extradural technique originally described by Thorburn and Moir (1980), whereby part of the total dose of local anaesthetic is given with the patient sitting and a further dose (or doses) given with the patient lying down, I feel that some other method rather than simply adding more and more local anaesthetic should be used in the case of “recalcitrant” extradurals which are difficult to extend high enough for Caesarean section, although others similarly (Crawford, 1980) have advocated very large doses of bupivacaine.

A likely anatomical explanation for the difficulty in extending some extradural blocks has been elegantly shown by Husemeyer and White (1980), whose polyester resin studies in cadavers showed in some cases a remarkable tendency to “compartmentalization” in the extradural space. If the extradural catheter is inadvertently placed in one of these “compartments”, spread of local anaesthetic solution can only occur to other parts of the extradural space with a degree of difficulty which depends on the ease of escape of the solution from the “compartment”. This may be the explanation why, in some patients, very large volumes of solution may eventually be successful in achieving the required extent of spread.

A more rational approach to the problem of these “difficult” extradurals would seem to be to move the catheter tip to a site where it may be more effective. This can sometimes be achieved by withdrawing the catheter slightly and this writer would often do this before injecting a relatively modest third or fourth dose of local anaesthetic with the patient head-down (difficulty in cephalic spread being the usual problem). If these measures do not produce the required extension of the block, one of two more reliable (and safer from a toxicity viewpoint) techniques are used.

(1) A thoracic extradural may be carried out at a level physically above the apparent block to the spread of analgesic solution, for example if there is difficulty in extending the block above T11, an extradural would be performed at the T8-9 or T9-10 level. For those anaesthetists who habitually use the paramedian approach to the lumbar extradural space, the change from the lumbar to the thoracic region presents only a minor change in technique (Carrie, 1977). As the local anaesthetic is then deposited in the centre of the area where analgesia is required, a relatively small increment of solution, for example 5-6 ml of 0.5% plain bupivacaine invariably completes the analgesia.

(2) Subarachnoid block may be added. While this writer would probably use a 26-gauge spinal needle through the extradural needle using 0.5% plain bupivacaine (Carrie and O’Sullivan, 1984), those less familiar with this method could use a more conventional hyperbaric spinal technique. The dose of local anaesthetic required is so small that it adds almost nothing to the risk of toxicity. This technique would be preferred to the thoracic method in patients in whom the extent of blockade obtained by the lumbar extradural was so limited as to make it seem unlikely that the required extent of analgesia could be completed with a small dose of local anaesthetic in the thoracic extradural space.

Most obstetric patients, having made the decision to have their Caesarean section awake, are most disappointed if failure to achieve adequate blockade necessitates general anaesthesia, and they are only too willing to accede to one of the above additional regional techniques. Given a patient who is willing to persevere (as she usually is), an anaesthetist who is willing and able (as he or she should be) and a surgeon who will wait (as he must, if general anaesthesia is to be avoided), it should be possible to provide regional analgesia for any Caesarean section without running the risk of local anaesthetic overdose. Whilst there may be argument as to what is a safe dose of bupivacaine and to what amount this can be increased as the period of time over which it is given is extended, if the manufacturer’s recommendation of a maximum dose of 2 mg kg\(^{-1}\) in a 65-70 kg adult given over a 4-h period is to be taken as a reasonable guide, with the above techniques it should seldom need to be exceeded.

Drs Thorburn and Moir are to be thanked for their frankness in reporting these cases, and it is to be hoped that their communication will prevent others from falling into the same local anaesthetic “toxicity trap”.

L. E. S. CARRIE
Oxford

REFERENCES