synthesis, 11-deoxycorticosterone concentration being increased in both groups receiving etomidate, but significantly higher in those receiving the single bolus dose (Sear, Atherden and Edwards, 1985). As our previous study showed an effect of infusions of etomidate on 11ß-hydroxylase (Moore et al., 1985), this effect on 11-deoxycorticosterone indicated a second, and probably dose-related, inhibition on early pathway synthesis (for example cholesterol side-chain cleavage).

Why are our results different from those of Duthie and colleagues? It may relate to the magnitude of the surgical stress, a uniform induction time avoiding diurnal variations in hormone concentrations, or a sex difference (all Duthie’s patients being male). In our studies, 15 of the patients receiving etomidate had cortisol concentrations at the end of surgery below the normal laboratory limits of 280–690 nmol litre⁻¹. Although our previous study (Moore et al., 1985) showed a significant and comparable increase in ACTH concentration in patients receiving either thiopentone or etomidate by infusion, the results presented here do not agree with the view of Duthie and colleagues that the effect of a bolus dose of etomidate is to cause partial inhibition of the 11ß-hydroxylase enzyme without significant adrenocortical suppression.

J. Sear
Oxford

REFERENCES


Sir,—Thank you for allowing us the opportunity to reply to the letters of Drs Fassoulaki, Sear, and Byrne and Yeoman.

The response of cortisol to adrenocorticotrophic hormone (ACTH) is rapid and concentrations of the two hormones quickly attain equilibrium. Therefore, differential changes in concentration of the type suggested by Dr Fassoulaki would not have been apparent in the sampling regimen we used. Also, our regimen would not detect changes occurring only at 3 h after induction of anaesthesia.

It is difficult to make a quantitative comparison of the surgical "stress" imposed on our patients and those of Dr Sear, since plasma ACTH concentrations were variable in ours and not reported in theirs. However, the much higher plasma cortisol concentrations after surgery reported by Dr Sear suggest that the differences between the reports may be explained by differences in surgical “stress”.

The locus of action of etomidate is not in dispute. We presented unequivocal evidence of an inhibition of 11ß-hydroxylase activity and allude in our discussion to other studies which suggest that etomidate may have additional effects earlier in the steroid biosynthetic pathway. These effects would not have been apparent from the assays we performed, but have been detailed elsewhere (Vanden Bossche et al., 1984).

D. J. R. Duthie
Sheffield
R. Fraser
Glasgow

REFERENCE


INTRATEHAL MORPHINE AND MULTIPLE FRACTURED RIBS

Sir,—Intrathecal morphine has been used extensively to provide pain relief both in the postoperative period, and in patients with cancer. It has not been, however, to date been used in the treatment of thoracic injuries.

This case report illustrates the satisfactory use of intrathecal morphine in a patient with thoracic as well as abdominal injuries.

A 63-year-old woman was admitted to Casualty after falling down the stairs at home. She had a ruptured stomach, and multiple fractured ribs on her left side, with a flail segment.

There were no other associated injuries, and she was not severely shocked. Following initial resuscitation in Casualty, and surgical repair of her ruptured stomach in theatre, the trachea was extubated and the patient was transferred to the intensive care unit with a urinary catheter, an arterial cannula, a central venous catheter, and peripheral venous cannula in position. On arrival in the intensive care unit she was haemodynamically stable. Fluid restriction was used, humidified oxygen was administered by a face mask, and arrangements were made with the physiotherapy department for intensive chest physiotherapy. It was decided to use intrathecal morphine as the method of pain relief instead of intercostal nerve block, extradural morphine, or extradural bupivacaine.

Lumbar puncture was performed under strict aseptic conditions, with the patient in the lateral position. L3-4 and L4-5 spaces were chosen on alternate days. Following identification of the subarachnoid space with a 25-gauge spinal needle, 1 mg (1 ml) of preservative-free morphine was injected with physiological saline 4 ml through a bacterial filter. Following injection, the patient was kept supine for at least 1 h, and her respiratory and cardiovascular systems were monitored.

The patient experienced excellent pain relief throughout the 7-day period. Onset of analgesia usually took 15–20 min, and was complete in 45–60 min. The quality of the pain relief was such that the ends of the fractured ribs could be moved against each other without any discomfort whatsoever. The patient was able to cough, take deep breaths, and tolerate frequent vigorous chest physiotherapy. She was able to sit out of bed quite soon after her operation, and was ambulant at a very early stage.

Her cardiovascular and respiratory systems remained relatively stable (table 1), her respiratory rate varying between
CORRESPONDENCE

TABLE 1. Daily high and low values for PaO2, PaCO2, and respiratory rate

<table>
<thead>
<tr>
<th>Day</th>
<th>PaO2 (kPa)</th>
<th>PaCO2 (kPa)</th>
<th>Respiratory rate (b.p.m.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(High)</td>
<td>(Low)</td>
<td>(High)</td>
</tr>
<tr>
<td>1</td>
<td>10.97</td>
<td>10.31</td>
<td>6.21</td>
</tr>
<tr>
<td>2</td>
<td>11.07</td>
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<td>11.71</td>
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</tr>
<tr>
<td>5</td>
<td>11.54</td>
<td>10.79</td>
<td>5.48</td>
</tr>
<tr>
<td>6</td>
<td>12.36</td>
<td>10.95</td>
<td>5.23</td>
</tr>
<tr>
<td>7</td>
<td>11.96</td>
<td>11.02</td>
<td>5.13</td>
</tr>
</tbody>
</table>

17 and 26 b.p.m., her PaO2 between 10.31 and 12.36 kPa, her PaCO2 between 4.14 and 6.21 kPa, and her arterial pressure between 110/60 and 140/90 mm Hg. Her colour remained good throughout, and she showed no signs of respiratory distress.

There are many arguments for and against tracheal intubation and mechanical ventilation in the treatment of thoracic injuries. However, in this case, it was decided not to ventilate the lungs, and the trachea was extubated following the surgical procedure in keeping with the criteria of Richardson, Adams and Flint (1982). Instead, our efforts were directed towards fluid restriction, humidification, pain relief, chest physiotherapy, and having the patient mobile as soon as possible after surgery.

Many techniques have been described for the management of fractured ribs, including intercostal nerve blockade, extradural bupivacaine and extradural morphine. Each technique has its own disadvantages. The disadvantage of intercostal nerve blockade is its relatively short duration of action, and the potential complication, albeit rare in experienced hands, of pneumothorax. Extradural morphine and extradural bupivacaine both carry the risk of damage to the thoracic segment of the spinal cord. Extradural bupivacaine also carries the risk of hypotension. On the other hand, systemic analgesic drugs may depress respiration as well as the cough reflex.

The potential complications of intrathecal morphine are well known. Its main risk is the development of delayed profound respiratory depression, which in unselected patients outside an intensive care unit tends to militate against its use. However, in selected cases, in an intensive care unit, provided that adequate care is given to patient selection, dosage and the avoidance of systemic opiates, this potential complication can be guarded against by careful monitoring of the respiratory system by vigilant medical and nursing staff. Other potential complications include urinary retention (10%), pruritus (2–5%), nausea, vomiting, anxiety or hallucinations, and meningitis, especially in cases of repeated administration. Even though all these potential complications have to be weighed up in each individual patient before a final decision is reached, I still feel that intrathecal morphine may have a place in the treatment of selected patients with multiple fractured ribs.

B. M. KENNEDY
Dublin

ELECTRICAL ACTIVITY DURING INDUCED HYPOTENSION

Sir,—It seems odd to me that a conclusion of the paper entitled, "Electrical Activity of the Cerebral Cortex During Induced Hypotension in Man" (Thomas et al., 1985) is that a simple measure of total EEG power or filtered EEG voltage envelope (CFM) was shown to be a more useful monitor of cerebral electrical activity during controlled hypotension than measurements of power distribution in different frequency bands. I wondered if the authors could provide any evidence that, during anaesthesia where temporary hypotension is induced, any measure of EEG power correlates with patient outcome after anaesthesia. Not seeing such in their article, and not knowing of such myself, I believe that their conclusions are not merited by their data. Is there any correlation at all—not only asleep, but also awake—between CFM changes and patient tolerance of hypotension from a standpoint of neurological function outcome? Furthermore, their statement that “this implies that direct cerebral monitoring is mandatory, should it become necessary to decrease arterial pressure below this value (60 mm Hg)” is not based on fact, but on an assumption, which has never, to my knowledge, been proven true. Could they share their data showing that this is true with us?

Further, how can editors allow such intermediate variables to be extrapolated to outcome variables? Don’t you worry that allowing speculation the respectability of appearing as fact in such a respected journal as yours may mislead the naive reader?

M. F. ROIZEN
San Francisco

REFERENCE


Sir,—Thank you for allowing us to reply to the letter from Dr Michael Roizen.

Dr Roizen’s views on the importance of relating clinical variables studied to outcome, on the avoidance of assumptions from intermediate variables and of the responsibilities of editors are well known (Litt and Roizen, 1984; Roizen, 1984).

Our study had two specific objectives: primarily to investigate whether the electroencephalographic differences between hypotension produced by sodium nitroprusside and...