

of academic teaching provided in modules of two or three weeks by the contributing university departments of social and community medicine; between modules they take part in the work of the region, area, district, or academic department to which they are attached in such a way as to gain the widest possible experience of the specialty. There is, however, no obligation for trainees in community medicine to follow either of these patterns of early specialist training, and a few may successfully prepare themselves for the first part of the membership examination without full-time academic help of this type.

Nevertheless, the university courses, and in particular the MSc courses at the London School of Hygiene and Manchester University, already have great experience in training community physicians. The new university and consortium schemes are now beginning to overcome their teething problems and should soon be making their contribution. A broad indication of the content of training and experience during the three years of higher specialist training (senior registrar) is set out in the second report of the Joint Committee on Higher Medical Training. Senior registrar posts in two regions in England have now been approved by the JCHMT, and a number of other applications are being considered.

Though experience is still short, it seems that doctors who have fulfilled only the minimum requirement of the Faculty of Community Medicine of one year's postregistration clinical experience before entering early specialist training may be at a disadvantage compared with those who have spent a longer time in clinical posts. A period in general practice seems valuable, as does possession of some proof of ability through a higher qualification such as MRCP or MRCPG.

## Awareness during anaesthesia

Thirty-four years after the introduction of curare into clinical anaesthesia reports of patients being awake yet paralysed during surgery continue to appear. The principal occasions when consciousness may supervene are associated with those procedures which demand a very light level of general anaesthesia.

For example, during general anaesthesia for obstetric delivery any drug which depresses maternal respiration or circulation may have an adverse effect on fetal mortality. However, a technique using unsupplemented nitrous oxide and oxygen and paralysis for the maintenance of anaesthesia has produced<sup>1</sup> an incidence of some degree of awareness as high as 25%, and the use of premedicants with amnesic properties, such as hyoscine, makes little difference. Subsequently, the addition of low concentrations of volatile anaesthetic agents has decreased this incidence. Moir<sup>2</sup> used light halothane anaesthesia and paralysis and claimed that this abolished awareness yet led to an improvement of the status of the infant at birth. On the other hand, Crawford<sup>3</sup> reported an incidence of awareness of 6.25% using trichlorethylene and 1.85% with methoxyflurane. Clearly the combination of nitrous oxide and oxygen alone is insufficient to produce the desired level of unconsciousness in obstetric patients, and if general anaesthesia is required it must be supplemented by some additional agent (volatile or intravenous) capable of producing unconsciousness with minimal effects on the fetus. Fortunately,

the increasing popularity of epidural anaesthesia has lessened the size of the problem.

Cardiopulmonary bypass operations present a similar challenge for the anaesthetist. Most anaesthetic agents depress myocardial activity in proportion to the dose. In many instances the oxygenator may alter the plasma concentration of the anaesthetic agent quite rapidly, especially if volatile agents are used. Some patients have been reported to suffer severe anxiety states with repeated nightmares in the days after their operation.<sup>4</sup> Recently Blacher<sup>5</sup> in the United States has described a traumatic neurotic syndrome in these patients characterised by nightmares, irritability, and preoccupation with death. Four out of five of the patients described had recently undergone cardiac surgery. Blacher stressed that the patients were unsure if they really had been awake during surgery and were relieved of their symptoms when their suspicions were confirmed. Again this unacceptable incidence of awareness can be eliminated only by using either intravenous agents to supplement anaesthesia or by improving the efficiency of the control of anaesthetic vapours in the oxygenator.

Other instances of awareness are fortunately sporadic and are usually due to faulty technique such as the nitrous oxide cylinder running out in the very lightly anaesthetised patient. Clearly it would be helpful to anaesthetists if a simple and reliable apparatus were available to detect the presence of awareness; but the interpretation of electroencephalography and of sensory-evoked cortical responses has proved unreliable, even in expert hands.<sup>6</sup> Observation of the well-known clinical signs of anaesthesia which has become too light has also proved unsatisfactory, for the reflex phenomena on which the signs rely can be abolished by agents without any anaesthetic potency.

The benefits to the patient of light anaesthesia in combination with the muscle relaxants are undisputed, but the anaesthetist bears a moral responsibility to the patient to ensure that awareness does not occur. Until some simple and suitable monitoring apparatus is available this problem can be eliminated only by very careful attention to technique.

<sup>1</sup> Crawford, J S, *British Journal of Anaesthesia*, 1971, **43**, 179.

<sup>2</sup> Moir, D D, *British Journal of Anaesthesia*, 1970, **42**, 136.

<sup>3</sup> Crawford, J S, and Davies, P, *British Journal of Anaesthesia*, 1975, **47**, 482.

<sup>4</sup> Meyer, B C, and Blacher, R S, *New York State Journal of Medicine*, 1961, **61**, 1255.

<sup>5</sup> Blacher, R S, *Journal of the American Medical Association*, 1975, **234**, 67.

<sup>6</sup> Robson, J G, *British Journal of Anaesthesia*, 1969, **41**, 785.

## Chemotherapeutic routes in meningitis

To a great extent the ease with which meningitis may be treated depends on the route by which the selected antibiotic has to be administered. Intravenous or intramuscular injection is the choice for benzyl-penicillin and ampicillin, since these reach adequate concentrations in the cerebrospinal fluid when the meninges are acutely inflamed. Relapse may, however, occur as inflammation subsides in *Haemophilus influenzae* infections treated with ampicillin, with the paradoxical result that clinical improvement may demand increased dosage or even a change of treatment. When the antibiotic indicated is chloramphenicol the problem is at its simplest, since this drug attains higher concentrations in the cerebrospinal fluid relative to those in

the blood than any other antibiotic. Both sulphonamides and trimethoprim also cross the blood-brain barrier well, and co-trimoxazole has been used successfully in various forms of meningitis, though mainly in countries other than Britain. At the other end of the scale, in no circumstances do aminoglycosides such as streptomycin and gentamicin attain adequate concentrations in the CSF after parenteral injection, and intrathecal doses are imperative.

Intrathecal injections of antibiotics are usually given by the lumbar route, but even this may not be adequate. Cerebrospinal fluid is formed in the choroid plexuses and passes from the ventricles to the meninges. It is not to be expected that substances introduced into the subarachnoid space will flow in the opposite direction: so that if the inflammatory process should affect the ventricles as well it may be untouched by intrathecal medication. Lorber and his colleagues<sup>1</sup> pointed out that ventriculitis is a common complication of spina bifida and other congenital abnormalities of the central nervous system (and even more so if a ventricular shunt has been established), and according to Salmon<sup>2</sup> ventriculitis often occurs in infants with meningitis in the absence of congenital lesions. These authors and others have treated the condition successfully by direct intraventricular injection of antibiotics.

A recent report on the treatment of enterobacterial meningitis by Kaiser and McGee<sup>3</sup> of the Vanderbilt University School of Medicine, Nashville, Tennessee, is of interest. Of their five patients treated with intraventricular injections, three had a *Klebsiella* and one each *Escherichia coli* and *Pseudomonas stutzeri* infection; three were recovering from surgery, one from trauma, and one had immune deficiency. All had positive blood cultures, thus requiring parenteral treatment, but all also had positive cultures from ventricular as well as lumbar fluid. They were therefore treated with either gentamicin or tobramycin by both parenteral and ventricular routes, and the infection was eliminated in all of them, four recovering and one dying of surgical causes with sterile meninges. The main interest of the report is its elaborate study of the distribution of these antibiotics after administration by different routes. After parenteral injection alone the level in cerebrospinal fluid from any site was always less than 1 µg/ml. To follow the effects of local injections means were devised requiring the establishment of subcutaneous reservoirs for obtaining serial specimens of fluid from different sites; as many as ten assays were performed in 24 hours on fluid from a single site. After lumbar injection of either 5 or 10 mg of either gentamicin or tobramycin the lumbar fluid contained up to 80 µg/ml, this concentration falling slowly with a half-life of six hours. Meanwhile the concentration in the cisternal fluid rose slowly to a peak of about 14 µg/ml at 12 hours, suggesting that intrathecal diffusion is even slower than many may have thought. In the graph illustrating these findings the ventricular concentration is shown flat near the base line. After intraventricular injection of 5 mg the concentration there was 40 µg/ml; this fell and the lumbar concentration rose until equilibration between them at about 20 µg/ml was reached in two hours, both then falling slowly together and still being at 5 µg/ml after 24 hours. These results are as would be expected and point to the intraventricular route as achieving the best distribution, as well as presumably being a necessity if the ventricles are implicated in the infection.

Ventricular puncture is fairly simple and safe in skilled hands. If the fontanelle is open the needle can be inserted through it; if not preliminary trephining is required, and this had to be performed in all these patients. Kaiser and McGee recognized nevertheless that treatment by this route is not

to be undertaken lightly and defined indications for it. If the causative organism is and remains sensitive to chloramphenicol this drug should be given in large parenteral doses; they describe another patient with a *Klebsiella* infection in whom this treatment eventually succeeded despite extension of the infection to the ventricles. If an aminoglycoside is indicated, and if treatment with it by parenteral and lumbar routes fails, the intraventricular route should be considered—possibly even at an earlier stage.

<sup>1</sup> Lorber, J, Kalhan, S C, and Malgrete, B, *Archives of Disease in Childhood*, 1970, 45, 178.

<sup>2</sup> Salmon, J H, *American Journal of Diseases of Children*, 1972, 124, 35.

<sup>3</sup> Kaiser, A B, and McGee, Z A, *New England Journal of Medicine*, 1975, 293, 1215.

## Caesarean section and respiratory distress syndrome

Perinatal mortality is higher when babies are born by caesarean section. The second report of the British Perinatal Mortality Survey,<sup>1</sup> using a standard mortality ratio of 100, found that when section was done before the woman was in labour the SMR was 275 and when done during labour it was 181. At that time the nationwide incidence of caesarean section was 2.7% of all births; but there is evidence now that it is rising<sup>2</sup> to about 5%. With nearly 36 000 caesarean sections being performed annually in England and Wales, with an increased perinatal mortality rate, and a maternal mortality of about 1 per 1000, it is imperative to know whether it is the operation which contributes to these deaths and, if so, by how much; or alternatively whether it is the disorder for which the operation is done which is the killer.

That question arises because of an article originally written in 1970 and now published again. Reis *et al*<sup>3</sup> have claimed that by taking care with the arrangements for and technique of caesarean section they have almost eliminated the respiratory distress syndrome among babies over 34 weeks of gestation. They emphasised the need for two senior doctors to be present at the operation, one of whom would give his attention to the baby; and they argued that the baby should be delivered fairly quickly. Hence their induction of anaesthesia is by thiopentone; no time is taken in draping the abdomen with sterile towels; the fetal head is delivered through the incision, where its nose, mouth, and pharynx are cleared by suction; ergometrine is given; and the uterus then pushes the body of the baby out of the incision. This has the effect of squeezing the fetal chest, just as in normal labour, and fluid can be seen to be forced from the nose and mouth. The article says nothing of whether the cord is clamped early or late or whether the baby is held below the level of the placenta to obtain some transfusion of blood.

Almost certainly these authors are mistaken in believing that it was operative technique which made their results enviable—11 perinatal deaths in 200 sections. Whenever a condition is not understood there is a tendency to make non-specific technical alterations in management and to think that successes are due to them. But it was not till Gluck *et al* in 1971<sup>4</sup> showed the value of the amniotic levels of lecithin and sphingomyelin in predicting fetal lung maturity that the mechanism of the respiratory distress syndrome became clearer.<sup>5</sup> It is precisely at 35 weeks of gestation that