

supportive counselling from speech therapists.⁴ There was no difference between the two groups at follow up, suggesting that speech therapists might perform for aphasic patients the role Voltaire ascribed to physicians who "successfully entertain their patients while nature effects a cure." Notwithstanding Voltaire's cynicism, he describes an important aspect of a good physician's care⁵: patients value an expert's guidance through the frightening terrain of an unfamiliar illness even if there is no clearly effective treatment—as neurologists should know.

Like Wertz *et al*, David *et al* also showed that volunteers, guided by speech therapists' assessments, achieved results similar to professional therapists.⁶ This finding has been interpreted as confirming the usefulness of speech therapists' assessments.⁷ In the United States speech therapists are called speech pathologists, emphasising their diagnostic role in the rehabilitation of aphasic patients. In general, casual assessment of speech (by doctors and nurses as well as relatives) will underestimate the degree of comprehension difficulties. This occurs even when the speech problem is obvious, as in Broca's aphasia, but especially in those with fluent aphasia, who are often thought to be "confused."⁸

The response of many speech therapists to these crude studies of their work resembles that of many doctors (particularly surgeons) to "negative" controlled trials. Each published report is followed by protests that the groups studied were too heterogeneous and the treatments used were inadequate, too short, delayed, and so on. More seriously, some speech therapists have argued that the randomised controlled trial is the wrong instrument to test speech therapies, advocating instead single case designs.^{9,10} Certainly these are useful for developing different treatments but are inadequate to test the general application of treatments in the real world. This is especially so with aphasia, with its variable tendency to

spontaneous recovery.¹¹ The rehabilitation of patients with aphasia is a complex process of re-education, the efficacy of which will be harder to assess than that of streptomycin in tuberculosis.

Speech therapists should not therefore be discouraged by a few negative trials. But neither should they shoot the methodological messenger by rejecting properly controlled randomised trials.¹² Health authorities certainly should not truncate the services of speech therapists simply because their treatments are only variably effective. But we do need more controlled trials that have the statistical power to show which speech therapy regimens can improve on the natural recovery of aphasia. The best guess is that these will show that we need many more speech therapists to provide a proper and effective service.

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Extracorporeal membrane oxygenation

Britain needs units equipped to perform the procedure and a controlled trial

Extracorporeal membrane oxygenation is a technique for providing prolonged extracorporeal circulation and gas exchange, by using extrathoracic cannulation, in patients with acute, potentially reversible cardiac, pulmonary, or cardiopulmonary failure. The procedure was first used in adults, principally in those with the adult respiratory distress syndrome.¹ Although it was effective in supporting pulmonary function, it did not improve survival² and so was largely abandoned. Bartlett and coworkers, however, continued their research and showed that extracorporeal membrane oxygenation was an effective treatment for selected, mature neonates with respiratory failure, particularly when associated with persistent fetal circulation. Other groups have since found similar results.³⁻¹¹

Pulmonary vascular resistance and pulmonary artery pressure are normally raised at birth. Asphyxia, the meconium aspiration syndrome, and diaphragmatic hernia may prevent normal adaptation and lead to persistent fetal circulation. Hypoxia, hypercapnia, and acidosis cause pulmonary vasoconstriction, leading to a further rise in pulmonary vascular resistance and pulmonary artery pressure. This causes right to left shunting through the patent ductus arteriosus and across the patent foramen ovale (fetal circulation) and further hypoxia, thus establishing a vicious circle. Conventional treatment is with mechanical ventilation and pharmacological

support, but 2-5% of neonates fail to respond. Failure may in part be due to the complications of high pressure mechanical ventilation, such as low cardiac output, pneumothoraces, and bronchopulmonary dysplasia. With extracorporeal membrane oxygenation cardiac output, oxygenation, and carbon dioxide removal can all be guaranteed. Provided that the underlying respiratory condition is reversible the pulmonary hypertension will resolve.

But do we need extracorporeal membrane oxygenation treatment in Britain? A recent editorial in the *Lancet* emphasised the differences in the incidence of the meconium aspiration syndrome and persistent fetal circulation between Britain and North America and highlighted the morbidity associated with the procedure and the lack of controlled trials.¹² The editorial also mentioned an unreferenced study from Vancouver, which indicated that patients who fulfilled the selection criteria for extracorporeal membrane oxygenation might survive without it.

Anecdotal reports suggest that the meconium aspiration syndrome and persistent fetal circulation are less common in Britain than in the United States. Infants with both these conditions often suffer appreciable peripartum hypoxia and may be considered not suitable for intensive care. Diaphragmatic hernia has an incidence of about 1 in 3000 births.¹³ Increased detection of diaphragmatic hernia in utero with

subsequent termination may well reduce the number of infants presenting with this condition; alternatively, early surgery in cases found on prenatal scanning may improve survival by conventional treatment. Nevertheless there remain a few infants for whom extracorporeal membrane oxygenation would seem to have a place. One study of a geographically defined British population identified three potential recipients (1 in 2500 births),¹⁴ and a more recent study of the entire Trent region identified 15 (1 in 3700 births) (D J Field, unpublished data).

The major debate over extracorporeal membrane oxygenation concerns the selection criteria. The contraindications are immaturity (less than 35 weeks' gestation, weighing less than 2000 g), prolonged high pressure ventilation for more than seven days, intracranial haemorrhage, and congenital heart disease. The treatment is indicated in two groups of patients. Firstly, for those babies with a rapidly progressive downward course despite maximal medical treatment extracorporeal membrane oxygenation is a last resort. A clinical trial in this group is neither necessary nor ethical. Secondly, there is a larger group of infants who are stable but still hypoxic with maximal medical treatment. Criteria have been derived from historical data on alveolar arterial oxygen gradients, response to treatment, and the effects of barotrauma associated with mechanical ventilation that will predict an 80% mortality in this group,³⁻¹⁰ and these criteria form the basis for decision making in North American centres. Because survival after medical treatment continues to improve not all paediatricians accept these criteria, so in this group there is a need for a randomised controlled trial.¹⁵

In addition to neonates a smaller number of children who have unusual problems and have potentially reversible cardiac or pulmonary failure could be considered for extracorporeal membrane oxygenation.^{7,15,16} In adults, too, the place of extracorporeal membrane oxygenation may have to be re-appraised as improvements in technology may have made it more effective.¹⁷⁻¹⁹ Devices for intravenous oxygenation have recently been introduced that are undergoing experimental evaluation, principally for use in adults.²⁰

The conventional method of cannulation for neonates has been venoarterial, with venous drainage from the right internal jugular vein with pump return to the right common carotid artery, which is ligated distally. Although overt complications of carotid artery ligation in mature neonates seem to be uncommon, this route is obviously undesirable. More recently venovenous bypass has been found to be effective in the presence of normal cardiac function.^{21,22} This may be performed with drainage from the right internal jugular vein and pump return to a femoral vein or with a double lumen catheter inserted through the right internal jugular vein. The double lumen catheter technique is particularly attractive as it avoids ligating both the carotid artery and the femoral vein.

Bleeding is the most feared complication during extracorporeal membrane oxygenation as the patient needs systemic heparin. Much less heparin is needed than during open heart surgery, however, with activated clotting times in the range of 180-200 seconds (open heart surgery requires a value greater than 400 seconds). As a result such complications have become less common. Heparin bonding of cannulas, tubing, oxygenators, and heat exchangers is now possible. Extracorporeal membrane oxygenation will therefore probably soon be available with little or no systemic heparin,²³ when it may be suitable for premature infants, who are currently excluded because of the inevitability of intracranial haemorrhage.

The Extracorporeal Life Support Organisation (University of Michigan, Ann Arbor) maintains a register to which most

centres performing the technique (over 60 world wide) report.¹⁰ So far 3369 neonates have received support with extracorporeal membrane oxygenation, and reported survival rates are 92.5% in those with the meconium aspiration syndrome, 83.2% in those with the respiratory distress syndrome, 62.5% in neonates with congenital diaphragmatic hernia, and 86.8% in those with persistent fetal circulation. Even given the variations in referral criteria, these results are impressive.

The effectiveness of extracorporeal membrane oxygenation in providing temporary support for the heart or lungs, or both, is beyond doubt. The selection of patients for treatment is more difficult and remains controversial in Britain. The technique is expensive and labour intensive and is not required in every neonatal unit. One to five units should be enough in the United Kingdom to assess the potential impact of the technique, and an essential part of the assessment should be a controlled trial. Without this, arguments over the role of extracorporeal membrane oxygenation will continue.

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