Secondary drowning in children

SIR,—The article by Dr John H Pearn on secondary drowning in children (25 October, p 1103) highlighted the potentially serious postimmersion respiratory condition which could occur in an apparently well child following a near-drowning incident.

The subject of drowning is so poorly taught in the medical undergraduate curriculum that inexperienced casualty officers and general practitioners could easily be lulled into a sense of complacency when treating an apparently well victim. In 1978 18 children died of drowning aged under 15 years.¹ We would like to report our experience from this children's hospital.

Between 1969 and 1979 22 children with a diagnosis of near-drowning were admitted to this hospital. When these case records were reviewed special attention was focused on the initial condition of the patients following rescue and the resuscitation attempts provided. There were 20 boys and two girls. Twelve children were less than 5 years of age; seven were 5-10 years, and two were older than 10 years. Twenty-one children suffered freshwater and one seawater drowning. In the freshwater drowning group four children were rescued from the public swimming pool and 14 from the river, and in two children the accident occurred in the bath tub.

Prompt resuscitation was provided at the scene of the incident for 17 patients, and 16 children who were initially comatose regained consciousness. Tachypnoea (81%) was the commonest presenting feature. None of the children required mechanical ventilation. One patient who was submerged for about 10 minutes but responded to resuscitation at the rescue site required high-concentration inspired oxygen because of hypoxaemia. All our children survived.

Although most near-drowned children survive without any ill effects,² an awareness of the condition of secondary drowning and the application of intensive cerebral resuscitation³ to severely near-drowned victims may further lower the incidence of neurological sequelae. Undoubtedly prevention remains the primary concern in attempting to reduce the incidence of drowning in children.

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¹ Registrar General for Scotland. *Annual report part 1: Mortality statistics*. Edinburgh: HMSO, 1978.

² Pearn JH. *Lancet* 1977;i:7-9.

³ Conn AW, Edmonds JF, Barker GA. *Pediatr Clin North Am* 1979;26:691-701.

Mode of delivery and survival in babies weighing less than 2000 g

SIR,—The conclusion drawn by Dr M L Smith and others in the above article (25 October, p 1118)—namely, that small breech babies are most safely delivered by caesarean section—is not necessarily supported by the facts as presented.

Mortality among vaginally delivered breech infants must be compared with mortality among breech-presenting infants delivered operatively, and not with mortality among all infants delivered by caesarean section, before any comment can be made regarding the protective nature of caesarean section for small

breech-presenting fetuses. As Cruikshank and Pitkin¹ have stated, it is also necessary to demonstrate that other methods of management fail to afford the same degree of protection, and to show an acceptable risk-benefit ratio, before adopting a policy of routine caesarean section for all small breech babies.

We are reporting on the management of 838 singleton breech-presenting infants delivered at the Royal Berkshire Hospital from July 1974 to June 1979 (unpublished observations). In this series there is no evidence that routine caesarean delivery is of benefit after 32 completed weeks, and the value of routine section from 28 to 31 weeks (1000 to 1499 g) remains debatable. Provision of epidural analgesia and continuous fetal heart rate monitoring, in association with prompt caesarean delivery for specific indications, may be as beneficial to the infant as routine caesarean section and is certainly safer for the mother.

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¹ Cruikshank DP, Pitkin RM. *Obstet Gynecol* 1977;50:367-9.

SIR,—Dr M L Smith and others (25 October, p 1118) advocate delivery of all preterm breeches by caesarean section and ignored a recent similar retrospective study¹ which clearly showed that immediate caesarean section benefited only the footling breech and not the frank or complete breech. Karp *et al*¹ found that head entrapment was entirely confined to the footling breech and that cord prolapse was virtually limited to this group, which confirms a previous study.² Dr Smith and his colleagues did not describe such clinical features and therefore their findings do not add strong support to a recommendation of caesarean section for all infants of 26-34 weeks' gestation.

Major congenital anomalies occurred in 18% of Karp's series, of which 75% were not compatible with life. Similar figures were reported by Braun³ and Brenner.⁴

The risks of caesarean section and anaesthesia are real and may affect a subsequent pregnancy. Caesarean section does not guarantee atraumatic delivery of the preterm infant.⁵⁻⁷

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¹ Karp, LE, *et al*. *Obstet Gynecol* 1979;53:88-92.

² Galloway WH, *et al*. *Am J Obstet Gynecol* 1967;99:975-84.

³ Braun FHT, Jones KL, Smith DW. *J Pediatr* 1975;86:419-21.

⁴ Brenner WE, Bruce RD, Hendricks CM. *Am J Obstet Gynecol* 1974;118:700-12.

⁵ Johnstone MJ. *Br Med J* 1979;ii:1222.

⁶ Hopper M St C. *Br Med J* 1979;ii:1074.

⁷ Calvert JP. *Br Med J* 1979;ii:274-5.

Transplants—are the donors really dead?

SIR,—To define the role of the electroencephalogram (EEG) in establishing "brain death" requires consideration of a number of factors. There are good *a priori* reasons for the use of the EEG as a non-invasive technique in monitoring cerebral function and therefore in the establishment of the diagnosis of "brain death," or the exclusion of "brain life."

The function of the cerebral hemisphere in the living brain requires, of course, the electrical activity of a large number of neurones and their

processes, chiefly in the cerebral cortex. These summated impulses are detected on the scalp as the EEG, the amplitude and frequency of whose activity (alpha, theta, delta waves) varies with the level of consciousness or arousal. The recording of a flat or "isoelectric" trace implies that no changes in potential (measured in microvolts) can be detected on the scalp. The implication of this, therefore, is that very few or no neuronal impulses are occurring intracerebrally. Provided that recordings have been made from an adequate number of sites and over a sufficient period of time, it could therefore be predicted that the brain is incapable of further organised neuronal activity. If we exclude conditions like hypothermia and the presence of certain drugs, this incapacity is likely to be irreversible.

Although its role as a monitor of cerebral function is well known, it has been stated by Dr C Pallis (18 October, p 1064) that the EEG need not be recorded because it will not give an answer, in "brain-stem death," to a specific question concerning the prognosis of heart beat—that is, will heart beat or respiration continue spontaneously when support has ceased? This hypothesis has itself not been tested, however. Even if confirmatory evidence for this assumption were available it is likely that special EEG techniques could be modified or developed to provide an answer.

A situation might arise where the cerebral hemispheres are functionally intact with cognition, perception, and volition possible but, because the brain stem has been damaged, with partial recovery of function in the reticular formation a limited recovery of consciousness might occur. The vital functions of heart beat and respiration, however, might have to be artificially maintained. Under these conditions the EEG could reveal traces of semi-normal or even normal activity which might be an indication that overall brain death had not yet supervened but would occur once artificially maintained cerebral oxygenation had ceased to provide the metabolic requirements of the neurones. The possibility that such a state could be revealed by recording the EEG would appear to make such recordings mandatory when the question of organ donation arose. Without such recording would it be satisfactory to declare that the organs of a patient were no longer required, that by "dying" in the sense that control of cardiorespiratory function had been lost the remainder of the brain had given up "rights" over the rest of the somatic organs when the cerebral hemispheres evinced summated electrical activity of their constituent neurones? The amount of functional cerebral tissue remaining in "brain-stem death," when such cardiorespiratory function might be impaired by brain-stem lesions but the centrifugal processes of the reticular formation might be more or less intact, could be monitored by the EEG—although it would seem that investigations on the lines indicated by Dr E W Poole (1 November, p 1213) are most certainly needed.

These problems may be stated in terms of signal detection theory (I am indebted to discussion with Mr Mark A J O'Callaghan); and positive signs of cerebral life, including clinical signs of brain-stem activity, can be postulated. Then the absence of these signs will constitute true negative signs of life—that is, cerebral death. Both true- and false-positive and negative signs are logically possible. False-negative signs of life might cause a wrong decision to be made, terminating life support before it is necessary to do so. Recording the EEG, however, would be more likely to give (by showing some potential changes) a false-positive sign than a false-negative sign, causing the wrong decision to be made in continuing life support after it had ceased to be necessary, but at least such an error would not be irreversible. A false-negative, an isoelectric EEG in the presence of other signs indicating life, could readily be reinvestigated.

Finally, it is unnecessary to emphasise that in coming to a decision as much information as possible should be reviewed. This surely includes the non-invasive investigations which in the last analysis are merely extensions of the process of clinical investigation itself. The logistics and availability of the investigation are surely secondary to the establishment of the