PostScript

LETTERS

Predictors of clinical outcome for infants transferred for extracorporeal life support consideration

The only large randomised controlled trial of extracorporeal life support (ECLS) was conducted in the UK in 1996 and recruited 185 infants with severe respiratory failure (oxygenation index >40); those transferred to an ECLS facility exhibited a markedly reduced risk of death or disability at one year compared with those who remained at their local centre.¹ Factors that influence the decision to start ECLS include the potential reversibility of the disease process, anticipated clinical course and a perceived high risk of death.²

Although historically the oxygenation index has been used to guide referral, there are no standardised criteria for initiating transfer for ECLS consideration. We aimed to determine whether any clinical, ventilatory or laboratory surrogates of outcome can assist decision making with regard to suitability for ECLS. A retrospective case note review of the West of Scotland Neonatal Transport Database was carried out for the period from March 2003 to March 2006. At the point of referral extensive epidemiological data were collected: sex, gestational age, birthweight, age, diagnosis, ventilation mode and settings, arterial blood gas parameters, oxygenation index, mean blood pressure, use of inhaled nitric oxide, and number of inotropes used. On arrival at the ECLS centre, based at Glasgow's Yorkhill Hospital, paired data were collected. We analysed the data with SPSS Version 12.0, and bivariate correlation was used to identify factors that significantly influenced survival. Significance was assumed at $\alpha = 0.05$.

A total of 52 infants were referred for consideration of ECLS. Three infants were assessed by the transport team to be unsuitable for transfer and were excluded from further analysis. For the 49 infants transferred (20 girls, 29 boys; see table 1 for characteristics of the infants at the time of referral), the referral diagnoses included persistent pulmonary hypertension of the newborn ($n = 17$), meconium aspiration syndrome ($n = 16$), congenital diaphragmatic hernia ($n = 7$), septicemia ($n = 5$), respiratory distress syndrome ($n = 2$) and congenital heart disease ($n = 2$). Thirty infants (61%) subsequently received ECLS.

Overall, of the 49 infants transferred, 42 (86%) survived to discharge (90% of those who received ECLS, 79% of those who did not receive ECLS). Overall there were no significant differences between the characteristics of the infants in the different diagnostic groups (data not shown). All infants with a diagnosis of meconium aspiration syndrome survived, 69% of whom needed ECLS, highlighting the excellent prognosis for this subset of infants, provided a prompt referral is made. No clinical or laboratory factors at referral significantly predicted survival. In particular, indices of oxygenation at the time of referral did not predict survival (oxygenation index (OI): $r = 0.04$, $p = 0.76$; fractional inspired concentration of oxygen (FiO_2): $r = 0.10$, $p = 0.94$; arterial partial pressure of oxygen (PaO_2): $r = -0.11$, $p = 0.46$). The paired counterparts of these indices at arrival at the ECLS centre again did not predict survival (OI: $r = -0.004$, $p = 0.98$; FiO_2 : $r = 0.21$, $p = 0.14$; PaO_2 : $r = -0.42$, $p = 0.78$).

In summary, we advocate early communication with the ECLS service to minimise mortality. Numerical predictors of illness severity, such as the oxygenation index, are poor determinants of survival following ECLS. The condition of the infant, based on clinical experience, must remain the best indicator of need for transfer.

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- 2 Dalton HJ, Rycus PT, Conrad SA. Update on Extracorporeal Life Support 2004. *Semin Perinatol* 2005;29:24–33.

Malposition of endotracheal tube: association with pneumothorax in ventilated neonates

The incidence of pneumothorax in neonates has decreased with use of antenatal steroids in women at risk of preterm delivery, surfactant treatment and new modes of respiratory support.¹ We reviewed the records of ventilated neonates with a diagnosis of pneumothorax, born between September 1997 and September 2003, to identify its risk factors. A group of concurrently born, ventilated neonates of same gestation and birth weight who did not have pneumothorax served as the control group. The characteristics studied were positive end expiratory, peak and mean airway pressures, oxygen requirement, blood gases and surfactant doses. Diagnosis of pneumothorax, its laterality and the position of the endotracheal tube (ETT) were determined by reviewing the x rays. ETT displacement or malposition was defined as movement of the tube either to or beyond the carina after its initial correct placement had been confirmed radiographically.

The clinical characteristics and initial respiratory support of both groups were comparable. Of the ventilated neonates who developed pneumothorax, 76% (22/29) were preterm and 52% (15/29) were born at less than 28 weeks' gestation. The mean age of development of pneumothorax was 24 hours and 93% (27/29) occurred within 96 hours after birth. The ETT was displaced in 16/25 (64%) babies with pneumothorax compared with only 5/27 (18.5%) in the control group ($p = 0.0008$). Pneumothorax occurred mostly (72.5%) on the right side; in 67% of cases this was associated with the ETT in the right main bronchus. In babies with left-sided pneumothorax, the ETT was either in an appropriate position or at the carina. No baby in the comparison group had ETT displacement beyond the carina.

Development of pneumothorax in ventilated neonates is associated with underlying lung disease and high peak inspiratory pressure and inspiratory time. Despite modern practice of less aggressive ventilation, pneumothorax occurs in ventilated neonates,² suggesting that other factors contribute to its development. We found ETT displacement was significantly higher in the group with pneumothorax. An ETT is generally secured at the lip or the angle of the mouth by an adhesive tape. However, because of the loose musculature of the preterm neonate there may be inward and outward movement of the tube. Head movements, suctioning, secretions and patient handling can cause displacement of the tube. We believe that by properly stabilising an ETT with holders or other measures, and by paying close attention to other factors that lead to ETT displacement in preterm neonates, the incidence of pneumothorax in this population may be further reduced.

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Table 1 Characteristics of the infants at referral

	Mean	SD	Minimum	Maximum
Gestation (weeks)	39.08	2.87	33	52
Birth weight (kg)	3.28	0.73	1.84	5.30
Blood pressure (mm Hg)	46.35	10.24	27	77
Airway pressure (cm H ₂ O)	16.43	4.18	8	35
FiO_2	0.96	0.07	0.77	1.00
PaO_2 (kPa)	7.21	3.20	2.22	21.40
Oxygenation index	32.06	12.99	7	65

FiO_2 , fractional inspired concentration of oxygen; PaO_2 , arterial partial pressure of oxygen