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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References

- 1 UK Collaborative ECMO Trial Group. UK collaborative randomised trial of neonatal extracorporeal membrane oxygenation. *Lancet* 1996;**348**:75–82.
- 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

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References

- 1 Henderson-Smart DJ, Bhutta T, Cools F, *et al*. Elective high frequency oscillatory ventilation versus conventional ventilation for acute pulmonary dysfunction in preterm infants. *Cochrane Database Syst Rev* 2003;(4):CD000104.
- 2 Harbor JD, Badger GJ, Carpenter JH, *et al*; Members of the Vermont Oxford Network. Trends in mortality and morbidity for very low birth weight infants, 1991–1999. *Pediatrics* 2002;110:143–51.

Variations in practice among paediatric consultants when referring unexpected neonatal deaths to a coroner

Despite advances in perinatal care, a few babies die unexpectedly at or soon after birth. The most likely cause is perinatal hypoxia. Sometimes the reason for this hypoxia is clear (such as antepartum haemorrhage or obstructed labour). In other instances there may be no explanation for the event and questions may be raised whether the death could have been prevented. Although it is the norm for all centres to discuss all perinatal deaths in mortality and morbidity meetings, more recently, anecdotally it seemed that many units have been choosing to refer such cases to the coroner. These referrals can be stressful for the obstetric and paediatric teams as they may lead to a coroner's inquest and extensive media scrutiny.

We conducted a survey of the practices of different neonatal units across the country with regard to referral to a coroner of unexpected neonatal death. An email questionnaire was sent to the lead consultants of 221 neonatal units in the UK, asking if they had referred any case of unexpected death to the coroner in the past five years, and if there was a lowering of the threshold for such referrals. The questionnaire included two clinical scenarios of unexpected neonatal death associated with birth asphyxia (box 1), and the respondents were asked if they would refer these deaths to a coroner. Two

reminders were sent over a six-week period to those who did not respond.

A total of 62 consultants (28%) responded, of whom 60% had referred an unexpected neonatal death to the coroner in the past five years. Just over half (51%) felt that there had been a lowering of threshold for making such referrals. With regard to the clinical scenarios, 42% and 45% would have given a cause of death in cases 1 and 2, respectively, whereas 30% and 27%, respectively, would have referred the cases to the coroner. Twenty-one per cent were unsure about the answer in both cases, and 7% did not answer the case questions. The causes of death that the respondents would have given were intrapartum asphyxia, perinatal or peripartum asphyxia, birth asphyxia, hypoxic ischaemic encephalopathy or neonatal encephalopathy.

The results of our questionnaire survey represent the practices of just under a third of the neonatal units in the country. Even from these relatively small numbers, it is clear that there is confusion about what was expected in the case scenarios. Some respondents commented that they feared medicolegal consequences and litigation and this pushed them to make the referral. Others were concerned about the additional distress to parents when such referrals are made. There is clearly a need to determine what is best practice and disseminate these guidelines to all neonatal teams across the UK.

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BOOK REVIEW

Practical neonatal endocrinology

Edited by Amanda Ogilvy-Stuart and Paula Midgley. Published by Cambridge University Press, Cambridge, 2006, £35.00 (paperback), pp 228. ISBN 0-5218-3849-5.

Interpretation of endocrine function in the newborn period can be difficult, and it is often an area of confusion. This book certainly clears the muddy waters. It offers concise and practical guidelines, and acts as a handbook with a hands-on, how-to approach.

The book itself is small and thin, and therefore not daunting. Unfortunately, the cover is somewhat unexciting and offers the only, if slightly mundane, photographs. The layout inside the book cannot be faulted. Each chapter covers a different endocrine problem. There are 25 of these in total, and they have a similar, clear format.

The first section in each chapter is "Clinical presentation". Here each problem is listed in bullet points with a short explanation. The next is "Approach to the problem". This has a useful and practical paragraph outlining the order in which things should be done and also prioritises the clinical problems. This is followed by "Differential diagnosis" and "Investigations". The next section is "Management", which is usefully broken down into short, intermediate and long-term management. Each paragraph is clear and concise. "What to tell the parents" comes next. For me this is the most appealing section. Set-out in a clear manner, the authors emphasise the important points to relay to parents. It also includes useful links to other areas in the book and lists support groups or relevant websites. Finally each chapter has a "Further reading" section.

Most chapters include a flow chart. These charts clarify the pathway of investigation and management in what can be a fairly complex area. Again they are clearly set out and easy to read. Some chapters have additional sections relevant to the problem being discussed. These include "Management at home", which gives extremely useful and practical advice.

At the back of the book are five appendices. The first explains how to calculate the glucose infusion rate from both intravenous fluids and milk. This is shown in a graph format in addition to the calculation. The second appendix describes the dynamic tests. This is an invaluable section. Not only do the authors list the indication for certain tests but they also explain how the patient should be prepared for the test, how the procedure is performed, and how to interpret the results. Normal ranges are given in Appendix 3. Again a useful section, as neonatal ranges are rarely given by hospital laboratories. Appendix 4 is "Biochemistry samples". I am a little doubtful about using this as a reference as I think each laboratory differs, not only in the amount of blood required, but also in the turn-around times. I would not take this information at face value, and would certainly recommend contacting one's own hospital laboratory to confirm what sort of sample is required. The authors do emphasise that the table is only for guidance; in which case I wonder if it was necessary to include it. The final appendix is a formulary. This includes drugs required for dynamic tests as well as treatment doses, and is a useful addition.

Practical Neonatal Endocrinology does exactly what it aims to do. It is a clear, concise and extremely practical handbook which should be available not only in neonatal units but also in all general paediatric departments.

Katie Malbon

Box 1 Cases included in the questionnaire

• Case 1

A 30-year-old multigravida is admitted in labour and delivers a term baby within 30 min of admission. The baby is born in poor condition and cannot be resuscitated. The cord pH is 6.7. There is no evidence of antepartum haemorrhage.

• Case 2

A 30-year-old primigravida is admitted in labour at 1400 hours. At 1900 hours the CTG [cardiotocograph] is found to be sub-optimal. The baby is delivered via emergency LSCS [lower segment caesarean section] after failed forceps. Time of birth is 2000 hours. The baby is born in poor condition and cannot be resuscitated. The cord pH is 6.7. There is no evidence of antepartum haemorrhage.

CORRECTION

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A Trotter, L Maier, M Kron, *et al*. Effect of oestradiol and progesterone replacement on bronchopulmonary dysplasia in extremely pre-term infants (*Arch Dis Child Fetal Neonatal Ed* 2007;92:F94–8). The legend in figure 2 of this paper was published incorrectly. The filled bars are actually the ESTRA-PRO group and the open bars are the placebo group. Also, "bonchopulmonary dysplasia" is misspelt and should be "bronchopulmonary dysplasia". Finally, "ITT survivors" should have been amended to "ITT population (survivors)". We apologise for these oversights.