LETTERS TO THE EDITOR

Incubator oxygen concentrations during free flow oxygen treatment

EDITOR,—In developing countries where resources are limited, oxygen is usually given straight into the incubator without blending, whereas in modern neonatal intensive care units nasal cannulas are more usual, as well as oxygen blenders and servo control systems.^{1,2}

Oxygen concentrations were measured in four different models of incubators including Air Shields Isolette C2H2-1, ISIS Mediprema, Air Shields C100-200, and Air Shields Neocare 142 at oxygen flow rates of 1–15 l/minute at Gazi University Hospital neonatal intensive care unit. Measurements were made using an SLE T-801 oxygen monitor (Specialised Laboratory Equipment Ltd, UK) which was calibrated daily when there were no patients in the incubators. Oxygen flow rates, starting from 1 l/min up to 15 l/min were studied with 1 l/min increments after a stabilisation period of 15 minutes. For each flow rate, oxygen concentrations in the incubators were measured five to eight times, and mean values were taken. Unblended free flow oxygen was delivered into the incubator through the upper hole of the incubator. The sensor probe of the oxygen monitor was placed into the incubator through the side port and was left on the corner, at the level of the mattress, at the maximum distance from the oxygen tubing.

The lowest oxygen concentration at 1 l/min flow rate was 30% in Air Shields Neocare 142 and ISIS Mediprema, and the highest oxygen concentration was 87% at 15 l/min flow rate in Air Shields C100-200 incubators. The oxygen concentrations were above 40% at 4 l/min flow rate in all incubators.

Excess oxygen has well known adverse effects on tiny babies. The inspired oxygen concentration must be known, not only to help avoid retinopathy of prematurity,³ but also for the planning of decisions about the transmission of infants from incubator to crib. Our small study serves as a reminder to neonatal units that do not measure oxygen concentration that although the estimated oxygen concentration ranges for different flow rates are indicated on most incubators, these ranges are often too wide, making it difficult to fine tune the oxygen treatment.

Even with low flow rates of oxygen into incubators, the measured oxygen concentration may be higher than expected. Even in neonatal units with limited resources a simple oxygen concentration monitor for use in the incubator is a high priority purchase.

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- 1 Medoff-Cooper B. Transition of the preterm infant to an open crib. *J Obstet Gynecol Neonatal Nurs* 1994;23:329–35.
- 2 Dennison F, Brudno S, Lain D, Kremenchugsky V. Bench evaluation of the servo2 oxygen-control system. *Respir Care* 1996;41:724–7.

3 Martin R, Fanaroff A, Klaus M. Respiratory problems. In: *Care of the High-Risk Neonate*. 4th Edn. Philadelphia: WB Saunders Company, 1993: 228–38.

Increased aldehyde lipid peroxidation products in premature infants with chronic lung disease

EDITOR,—The paper by Ogihara *et al*¹ adds to our understanding of the pathogenesis of chronic lung disease (CLD) associated with high plasma concentrations of aldehyde lipid peroxidation products on the first day of life in preterm infants, a common complication of neonatal intensive care. Specifically, plasma concentrations of heptanal ≥ 500 nM, 2-nonenal ≥ 150 nM, and 4-hydroxynonenal (HNE) ≥ 200 nM were associated with odds ratios for the development of CLD of 6.0, 16.0, and 32.0, respectively. The authors point out that HNE might induce the expression of fibrogenic cytokines, such as transforming growth factor β , as well as an increased transcription and synthesis of collagen.¹

Two distinct clinical forms of CLD have been described.² Chest x-ray pictures of infants with CLD type 1 show diffuse bilateral haziness without evidence of emphysema whereas the radiographic findings in infants with CLD type 2 are more consistent with the classic appearance of Northway's stage 4 disease.³ Histologically, CLD type 1 is characterised by marked interstitial fibrosis without airway lesions. In contrast, marked airway lesions and alveolar emphysema occur in CLD type 2.⁴ Air leaks frequently precede the development of CLD type 2,⁵ suggesting that volutrauma has an important role in its pathogenesis. Oxygen free radical induced injury, on the other hand, might be more important in the development of CLD type 1.

Perhaps the authors could provide more information on the radiographic and clinical presentation of CLD patients in their study? A predominance of CLD type 1 would further support the contention that free radical induced lipid peroxidation products can cause fibrotic changes in lungs of preterm infants.

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Clinical and radiological diagnosis of spinal cord birth injury

EDITOR,—The diagnosis of spinal cord injury is often delayed and/or missed in neonates.¹ Non-invasive imaging, such as ultrasonography and magnetic resonance imaging, is important to confirm the diagnosis.

From 1990 to 1997, we observed four spinal cord injuries in neonates. Three of these infants had a cephalic presentation and needed instrumental delivery using forceps.

The other infant was a breech presentation and was born vaginally without instrumentation. The infants were depressed at birth, with no spontaneous breathing, and they all needed tracheal intubation. Two infants remained totally unresponsive throughout their course, whereas a suck reflex and opening of the eyes were noted 24 hours after birth in the two other infants. All the infants developed bladder distension. The four infants had spinal sonographic (transducer of 10 or 7.5 MHz; HDI 3000 TM, ATL or Hitachi EUB 415) and magnetic resonance imaging (MRI) (1.5 Tesla, Magnetom vision TM, Siemens or Signa General Electric) evaluation in the first week of life. In two infants ultrasonography showed an hyperechogenic well delimited mass (haematomyelia) within a normal hypoechogenic cervical spinal cord. Another patient had a thoracic vertebral dislocation, confirmed on plain films, with an hyperechogenic area in the underlying thoracic cord. The fourth infant had increased echogenicity of cerebrospinal fluid space surrounding the cervical cord which itself was hyperechoic at the level C1–C2 spreading into the inferior brain stem (fig 1).

One of the infants with cervical haematomyelia on ultrasonography had an enlarged

Figure 1 Midline sagittal T1 weighted magnetic resonance image showing an enlarged cervical cord but with a normal signal (A). Spinal sonogram showing an hyperechogenic mass (haematomyelia) (arrow) into the cervical cord (B).

cervical cord on T1 images with heterogeneous signal in T2 studies (fig 1). The other patient with a haematomyelia on ultrasonography had a normal MRI scan. The infant with a thoracic vertebral dislocation had surgical fixation of the vertebrae T3 to T5 two days after birth. This infant is still alive, at the time of writing, with a persistent paraplegia and long term oxygen dependency. The others did not improve their neurological status at any time and died between 10 and 15 days after birth.

Infants with spinal cord injury usually present at birth with apnoea and flaccid paralysis.¹ Many have other traumatic lesions such as skin haematomas or fractures.² Despite the history of a difficult delivery, the diagnosis of spinal cord injury is often delayed for several days or weeks. Ultrasonography is performed at the bedside, with a high frequency transducer, and the patient in a lateral decubitus position. Ultrasonography using a high frequency transducer shows the intra- and extra spinal lesions observed in this condition, such as haematomyelia, spinal disruption, extraspinal haematoma, and malalignment. MRI is helpful for tissue characterisation and facilitates differential diagnosis between oedema, ischaemia, or haemorrhage, factors that influence prognosis. In two of our infants, however, MRI showed non-specific enlargement of the cervical cord in one case and in the other a normal spinal cord. In the second infant MRI was performed on day 4, when haemorrhage can still appear isoechoic to spinal tissue. McKinnon *et al* have already reported a false negative result using MRI.¹ Ultrasonography is the recommended diagnostic method in neonates at the acute stage of the injury.²

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Maternal-fetal conflict, Moses Maimonides, and the Christian Church

EDITOR,—In his elucidative series Perinatal Lessons from the Past, Professor Peter Dunn concludes that, according to Moses Maimonides, in the case of the conflict between the life of a woman and her fetus, the life of the mother should take precedence and that this advice was in contrast to the teaching of the Christian Church.¹

No doubt, Christianity firmly opposed the rather loose Roman ethics concerning induced abortion. Quite revolutionary for these times, the fetus was valued as an animate creature, an *imago Dei*, and abortion or embryotomy equated to homicide. However, some differentiation evolved between the Eastern and the Western Christian world attitudes. In the Eastern Christian world abortion was stigmatised by both early church fathers such as Saint Basil the Great (4th century AD) and secular historians such as Procopius (5th century).^{2 3} However, if the mother's life was endangered, abortion or embryotomy might be performed. Meticulous instructions were given by Aetius of Amida (6th century) and Paul of Aegina (7th century). The latter emphasised that embryotomy should be undertaken only if the physician was fairly sure that the mother would survive; if not, he should decline the operation.⁴

Paul of Aegina's instructions were reproduced by Rhazes, Haly Abbas, Albucasis and Avicenna (9th to 11th centuries) and it was with Averroës (12th century) that Moses Maimonides studied philosophy and medicine. Despite their very different cultural background, all these eminent physicians seemed to share a similar understanding of the maternal *vs* fetal rights and to favour the mother's interests. The opposite view, on which Professor Peter Dunn comments,¹ was more dominant in the Western Christian world and was based on the belief that the priority was for the unborn child to be brought to life and baptised.⁵ Accordingly, all pregnancies had to go to term; if the mother died in labour, the child's life could be saved by a postmortem caesarean section.

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