Resuscitation of the Newborn

A.D.

Anthony D.

Milner

Department of Pediatrics and Neonatology, St. Thomas' Hospital, London, UK

Prof. Anthony Milner. MD, Department of Pediatrics and Neonatology, St. Thomas' Hospital, Lambeth Palace Road, London SE1 7EH (UK)

The first requirement in the provision of a neonatal service must be to ensure that the best possible facility for resuscitation is set up. It will always be impossible to prevent asphyxial damage even occurring before delivery: our aim must be to eliminate damage from asphyxia after delivery.

Our information on how best to resuscitate babies is limited and has largely evolved from historical practice. Initial studies [1] suggested that term babies generated negative intra-thoracic pressures in the region of 30 cm H₂O for the first breath and that this produced an inspiratory volume of approximately 40 ml, of which half remained in the lung to form the initial functional residual capacity. However, our standard method of resuscitation [2], using similar pressures for up to 1 s, produces much less lung expansion and rarely leads to a functional residual capacity. More recent measurements [3] on how babies commence breathing spontaneously, using techniques to ensure that the oesophageal pressure-measuring devices were correctly positioned, indicated that babies generate relatively high negative intrathoracic pressures (mean 50 cm H₂O) for short periods (mean 0.3 s). Improved exchange can be achieved by prolonging the first inflation for up to 3 s [4] or by copying the normal infant pattern [5] and using higher inflation pressures for brief periods. The standard bag and mask systems rarely produce adequate tidal exchange as they produce too low inflation pressures for too short a time [6]. Performance can be improved by selecting self-inflating bags with a volume of at least 500 ml as this permits the inflation pressure to be maintained for longer. An alternative approach is to use a face mask/ T piece device and the pressure-limiting valve system [7]. Where funds are restricted, simple pressure-limiting systems including bottles of water, weight-loaded, and spring-loaded devices can be used.

Recent research on newborn animals and babies [8] has shown that resuscitation can be effectively carried out using air rather than oxygen, and may even be advantageous, limiting oxygen free radical damage. Some units are adopting a compromise and resuscitating babies with 40% oxygen. Simple mouth tube face mask systems have now been produced

210

Biol Neonate 1996;69:165-212

International Symposium on Recent Advances in Neonatal Medicine

for use [9] in developing countries. Although there were some initial problems over the design, prototypes have been tested in Bombay and Dar es Salaam and found to compare favourably with more expensive and more difficult to use bag and mask systems.

Data on the resuscitation of preterm babies is even more limited. Although there is one publication claiming that mortality can be reduced by electively intubating and resuscitating all very preterm babies, subsequent studies have challenged this but the aim must always be to prevent or limit any birth asphyxia as rapidly as possible in these infants. Although some infants can be resuscitated with relatively low inflation pressures, others require high pressures to achieve adequate tidal exchange [10].

References

Saunders RA, Milner AD: Pulmonary pressure and volume relationships during the last phase of delivery and the first postnatal breaths in human subjects. *J Pediatr* 1978;93: 669-673.

Boon AW, Hopkin IE, Milner AD: Lung expansion, tidal exchange and formation of the functional residual capacity during resuscitation of asphyxiated neonates. *J Pediatr* 1979; 95:1031-1063.

Vyas H, Field D, Hopkin IE, Milner AD: Determinants of the first inspi-ratory volume and functional residual capacity at birth. *Pediatr Pul-monol* 1986;2:189-193.

Vyas H, Hopkin IE, Boon AW, Milner AD: Physiological responses to prolonged and slow rise inflation in the resuscitation of the asphyxiated newborn infant. *J Pediatr* 1981;99:635-639.

Upton C, Milner AD: Endotracheal resuscitation of neonates using an anaesthetic rebreathing bag. *Arch Dis Child* 1990;66:39-42. Field DJ, Hopkin IE, Milner AD: Efficiency of manual resuscitators at birth. *Arch Dis Child* 1986;61:300-302.

Hoskyns EW, Hopkin IE, Milner AD: A simple method of face mask resuscitation at birth. *Arch Dis Child* 1987;62:376-379.

Ramji S, Ahula S, Rootwelt T, Rooth G, Saugstad OD: Resuscitation of asphyxic newborn infants with room air or 100% oxygen. *Pediatr Res* 1993;34:809-812.

Milner AD, Upton C. Green J, Stokes GM: A device for domiciliary neonatal resuscitation. *Lancet* 1990;335:273-274.

10 Hoskyns EW, Boon AW. Vyas H, Milner AD: Endotracheal resuscitation of preterm infants at birth. *Arch Dis Child* 1987;62:376-379.

Extended Abstracts

BiolNeonate 1996;69:165-212