Introduction

Each classic paper in this chapter reports a novel development that has had a major impact on the field of pediatric critical care. In the area of respiratory support, pediatric critical care has been a fertile source of ideas that have had applications in adults. Gregory et al. introduced ‘continuous positive airway pressure’ to meet the specific need for lung recruitment of surfactant-deficient premature infants, babies below the size limit for safe and atraumatic mechanical ventilation at that time. This technology led to the development of ventilator weaning modes for patients of all ages. Bartlett et al. modified operating room technology to introduce extracorporeal membrane oxygenation (ECMO) into the ICU. It has now been shown that ECMO reduces mortality in neonates. A limited number of centers offer such support to adults. Surfactant deficiency ultimately proved treatable by exogenous surfactant administration – Fujiwara et al. pioneered that approach in 1980. Surfactant therapy has not yet been shown to be effective in the surfactant dysfunction state of acute respiratory distress syndrome (ARDS), but there are enthusiasts who believe it will play a role in adult intensive care. Halothane anesthesia was borrowed from the operating room for the treatment of asthma in the pediatric ICU by Crone et al. in 1982. Other inhalational anesthetics have followed. In 1988, McCulloch et al. presented the first convincing evidence that lung recruitment protects the atelectasis-prone lung from trauma during mechanical ventilation. Their report focused on high frequency oscillatory ventilation, but the principle they espoused is relevant to all lung protective strategies. Kinsella et al. introduced inhaled nitric oxide into critical care for the treatment of persistent pulmonary hypertension of the newborn. Although not yet approved for use in adults, NO has potential adult applications. It is noteworthy that FDA approval of new drugs usually bypasses pediatric efficacy testing. Surfactant, NO, and HFOV earned pediatric approval at the outset. So did prostaglandin E-1 (PGE-1) for dilation of the ductus arteriosus (Heymann et al.), a drug that has changed the nature of pediatric cardiology and infant heart surgery.

Pediatrics has its unique challenges. We have virtually stamped out Reye’s syndrome, thanks in part to the report of Starko et al., and hope to greatly reduce the incidence of the shaken baby syndrome, thanks largely to its easy recognition (Caffey 1974). And when we improve therapy, Pollack et al. have shown that we can measure it with physiological acuity scales like the PRISM score.
Title

*Treatment of the idiopathic respiratory-distress syndrome with continuous positive airway pressure*

Author

Gregory GA, Kitterman JA, Phibbs RH, Tooley WH, Hamilton WK

Reference


Abstract

Not available

Summary

These authors were the first to report the use of continuous positive airway pressure (CPAP) to treat infants with ‘idiopathic respiratory-distress syndrome’ (IRDS). Up to 12 mmHg of CPAP was delivered during spontaneous breathing, either by endotracheal tube or by using a chamber placed around the infant’s head. Arterial oxygen tension increased in all 20 infants, reducing oxygen requirement by an average of 37.5% within 12 hours. Although minute ventilation decreased, there was little effect on arterial carbon dioxide tension, pH, arterial blood pressure, or lung compliance. Sixteen infants survived, including seven of 10 weighing <1500 g at birth.

Citation count 710

Related references


Key message

The pathophysiology of the idiopathic respiratory distress syndrome had not, at the time, been completely defined. Yet Gregory *et al.* devised a physiological recruitment strategy that coped effectively with the surface tension abnormality of surfactant deficiency by increasing alveolar radius and reversing atelectasis. At the time of this publication, mechanical ventilation for IRDS was, at best, a high-risk undertaking. Ventilators of the time were ill-equipped to cope with the small, stiff, friable lung of the premature infant. CPAP, as it came to be called, separated the need to ventilate from the need for alveolar recruitment.

Why it’s important

This publication illustrated the independent value of lung recruitment in treatment of IRDS, a strategy which turned out to be equally important for other forms of low functional residual capacity lung disease. It laid a foundation for open lung strategies to come.