Correspondence

Early use of sodium nitroprusside in respiratory distress syndrome

Sir,

The management of respiratory distress syndrome (RDS) with continuous positive airways pressure and intermittent positive pressure ventilation (IPPV) is well established. Sometimes these measures are insufficient to maintain adequate oxygenation. A report from Liverpool (Abbott et al., 1978) described the comparatively late use of sodium nitroprusside in a baby with RDS. We describe the early use of sodium nitroprusside in a baby with severe RDS.

A baby boy, son of a 21-year-old Kenyan-Asian, was born at 28 weeks' gestation and weighed 1.1 kg. His mother had been admitted 8 days before delivery with spontaneous rupture of membranes. 24 hours before delivery she had become pyrexial and been treated with cephadine. Dexamethasone and ritodrine were given during labour, and delivery was assisted by Wrigley's forceps. The baby needed IPPV for 15 minutes after birth and rapidly developed severe RDS which required ventilation within 2 hours of delivery. \( P_{aO_2} \) was initially maintained at 10 kPa (75 mmHg), but at 6 hours it had fallen and could not be maintained above 4 kPa (30 mmHg). At this stage the ventilator settings were: ratio inspired:expired (I:E) 4:1, pressures I:E 25/5 cm H\(_2\)O, \( F_{IO_2} \) 0.9, ventilator rate 40/min.

Sodium bicarbonate infusion (2 mmol/kg per 24 hours) was begun at 4 hours, and sodium nitroprusside (120 \( \mu \)g/
kg per hour) at 6 hours. Fresh donor blood, total 50 ml, was transfused to maintain the systolic blood pressure above 50 mmHg. At 8 hours the baby's condition began to improve with an increase in Pao2, and at 15 hours, Pao2 could be maintained at 12 kPa (90 mmHg) with the following ventilator settings: ratio I:E 1:0.5:1, pressures 1: 18/2 cm H2O, FIO2 0.3, ventilator rate 36/min.

The sodium nitroprusside infusion was continued for 24 hours after which time the dose was logarithmically reduced every 12 hours until it was finally stopped at 72 hours. During the next 12 hours the blood pressure rose from 50/40 to 90/60 mmHg but it returned to normal 24 hours after discontinuing the infusion. The infant's progress in the first 24 hours of life is shown in the Figure.

The baby continued his difficult neonatal period with a respiratory tract infection on day 5 and a Gram-negative septicaemia on day 14. He was discharged home on day 56 and to date, at 3 months, shows normal development.

In RDS there is often very pronounced right-to-left shunting (Strang, 1966). Sodium nitroprusside is a direct-acting vasodilator (Tinker and Michenfelder, 1976) and its action on the pulmonary vascular bed reduces pulmonary vascular resistance, thereby increasing pulmonary blood flow. This decreases right-to-left shunting and results in an increased Pao2.

Compared with the case in Liverpool, we gave sodium nitroprusside at a very early stage in the illness. The fact that this was followed by such a rapid improvement is convincing evidence of its therapeutic value. Thus sodium nitroprusside infusion may have an important role in the management of babies with severe RDS who deteriorate in spite of mechanical ventilation.

Attention has recently been drawn to the possible toxic effects of sodium nitroprusside (British Medical Journal, 1978). Our observation that 50 ml blood (about 57% of blood volume) was needed to maintain systolic blood pressure indicates that sodium nitroprusside should be used only if there are adequate facilities for biochemical and blood pressure monitoring.

References


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Weaning very low birthweight infants from mechanical ventilation using intermittent mandatory ventilation and theophylline

Sir,

We read with interest the paper by Barr (Archives, 1978, 35, 598), and should like to report our recent experience with aminophylline in two very low birthweight infants.

Case 1

This infant born at a gestational age of 30 weeks weighing 1190 g was severely asphyxiated at birth and required mechanical ventilation for the first 4 days of life. At age 4 weeks, 48 hours after the introduction of nasojejunal feeds, he developed necrotising enterocolitis and required a 40 cm small bowel resection. At the same time, mechanical ventilation was recommended because of recurrent apnoea and bradycardia: initial ventilator settings were: peak pressure 25 cm H2O, positive end expiratory pressure 5 cm H2O, and frequency 28 cycles/min.

During the next 6 days attempts to wean him from the ventilator by decreasing the rate to 16 cycles/min resulted in episodes of bradycardia and cyanosis with the capillary Pco2 increasing from 4.7 to 7.9 kPa (35 to 59 mmHg). In view of this, aminophylline was administered with a loading dose of 3.3 mg/kg intravenously followed by a maintenance dose of 3 mg/kg per day in three divided doses. Serum aminophylline level 48 hours after starting treatment was 8 mg/l (therapeutic range 6-11 mg/l, 11 mg/l, Shannon et al., 1975).

24 hours after the introduction of aminophylline, capillary Pco2 had fallen to 5.3 kPa (40 mmHg); there had been no change in the ventilator settings. The infant was then successfully weaned from the ventilator.

Case 2

This infant was also born at 30 weeks' gestation and weighed 1150 g. At age 12 days he began to have episodes of apnoea and bradycardia. Capillary blood gases at this stage showed a Pco2 of 8.9 kPa (67 mmHg). Biochemical and infective causes for the apnoea were excluded while the chest x-ray was compatible with early chronic lung disease of prematurity. A loading dose of 3.8 mg/kg aminophylline was given intravenously followed by a maintenance dose of 3.1 mg/kg per day in three divided doses. Serum aminophylline level 48 hours after starting treatment was 6.5 mg/l. 24 hours after the loading dose of aminophylline, the capillary Pco2 had fallen to 6.3 kPa (47 mmHg) with no recurrence of the apnoea.

Our results support Barr's observations that aminophylline may be an aid in the weaning of infants from mechanical ventilation and, like caffeine (Aranda et al., 1977), will reduce the Pco2 probably by increasing the ventilatory effort and thereby increasing alveolar ventilation.