

Short reports

Immediate effects of albumin infusion in ill premature neonates

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SUMMARY Ten normotensive premature infants with idiopathic respiratory distress syndrome, and albumin concentrations of less than 30 g/l were given 5 ml/kg of 20% salt poor albumin by infusion. Concentrations measured six hours after infusion had increased significantly and these were associated with significant reduction in weight and improvement in urine output.

Sick premature infants are often oedematous in spite of being hypovolaemic.¹ It is likely that this is a consequence of hypoalbuminaemia because leaks of protein have been described in neonates with respiratory distress,² possibly as a result of the high histamine concentrations that affect capillary permeability.³ In such infants hypotension has been effectively treated by infusions of albumin, which have been associated with improvement in colloid osmotic pressure, circulating plasma volume, and glomerular filtration.^{1,4}

The present study was designed to find out whether infusions of albumin were effective in treating hypoalbuminaemia in normotensive sick infants.

Patients and methods

Infants less than 2 weeks of age, except those receiving peritoneal dialysis and those with chest drains in situ (both of which interfere with weighing) were eligible for the study. Babies given albumin infusions for the emergency treatment of hypotension were also excluded.

Ten infants entered the study. Their mean birth weight was 1390 g (range 560-3315 g) and mean gestational age 29 weeks (range 24-36). The post-natal age at the time of infusion ranged from 24 hours to 5 days, mean age 1.7 days. All had a clinical diagnosis of respiratory distress syndrome and were receiving artificial ventilation by a Sechrist ventilator. They were ventilated at peak inspiratory pressures ranging from 14-32 cm H₂O. Five of the

infants were paralysed before and during the study. All 10 infants had albumin concentrations of <30 g/l, with peripheral oedema.

The content of fluid to be given to each baby was decided daily. On the first day 40 ml/kg were given and this amount was not increased if the infant gained weight during the first three days.

Urea, electrolytes, and albumin concentrations were measured daily in all babies, and infants who were hypoalbuminaemic (<30 g/l) were entered into the study. A solution of 5 ml/kg/20% salt poor albumin was then infused, and the volume subtracted from the total daily fluid requirement. Before the transfusion and at the end of the six hours after it the infant was weighed, and urea, electrolytes, and albumin concentrations measured again. For six hours before and after the infusion urine output was measured. Manual expression was not used and urine was collected that had been voided spontaneously in the two six hour periods.¹ During a similar period blood pressure was recorded hourly as the mean of the systolic and diastolic pressures using an intra-arterial transducer, and reported as the average for each six hour period.

During the 12 hours of the study period no other alteration was made in the infant's fluid input, nor was there any change made in the type of incubator or the use of overhead heaters. Twelve hours was chosen as the study period as it was the longest over which the fluid intake of sick infants on ventilators could be guaranteed to be constant. Treatment with phototherapy was recorded.

To assess any effects of the albumin infusion, albumin and electrolyte concentrations, blood pressure, weight, and urine output were compared before and after the infusion.

Ethical permission was granted by the hospital ethical committee.

The significance of differences before and after albumin infusion were assessed by the paired Student's *t* test.

Results

No changes were made in the quantity of fluid or the

Table *Measurements before and after infusion of albumin in 10 infants. Figures are given as mean (range)*

	<i>Before infusion</i>	<i>After infusion</i>
Albumin (g/l)	27 (21-30)	32 (29-36)
Weight (g)	1504 (784-3210)	1463 (776-3094)
Urine output (ml/6 hrs)	11.5 (1.3-23)	21.2 (0.7-37)
Blood pressure (mm Hg)	36.1 (29-62)	38.5 (30-56)
Sodium (mmol/l)	138 (131-149)	139 (130-149)
Urea (mmol/l)	5.8 (0.7-10.1)	5.5 (0.8-9.7)

amount of phototherapy given to any infant during the period of the study. There were no significant changes in the urea and electrolyte concentrations or in the blood pressure readings after the albumin infusions (table). Albumin concentrations rose ($p < 0.01$) and weight decreased significantly in all 10 infants ($p < 0.01$). The mean urinary output of the study group increased following infusion ($p < 0.05$), but in two infants it decreased (20 to 15.4 ml and 1.3 to 0.7 ml, respectively). Though no positive correlation was found between peak inspiratory pressure at the start of the study and the response to the albumin infusion, the two infants whose urinary output decreased were both paralysed and had severe respiratory distress syndrome (peak inspiratory pressures 26 and 32 cm H₂O respectively).

Discussion

The concentration of albumin of < 30 g/l that we used was considerably lower than that used in a previous study,¹ but was the lowest concentration of albumin recorded in the first 24 hours of life in a group of 30 infants treated in our neonatal intensive care unit whose gestational age was > 28 weeks.

Albumin given to normotensive infants with hypoalbuminaemia increased circulating albumin levels, and this was followed by improvement in urinary output, reduction in weight, and a subjective decrease in peripheral oedema. In two infants whose urinary output decreased slightly despite increased albumin concentrations weight loss did occur and may therefore have reflected an increased insensible water loss. Though this occurred in two paralysed infants with severe respiratory distress syndrome, which may in itself have influenced urinary output, infants in a similar clinical condition did increase their urine output in response to the albumin infusion. This difference may be explained by our method of urine collection. Urine was only measured after it had been spontaneously voided, and incomplete bladder emptying may have occurred in the two paralysed infants. The clinical policy of

our unit, however, is not to express the bladder if the infant is passing urine and we felt that it was important that this practice should not be altered.

In infants with the respiratory distress syndrome a diuresis has previously been associated with improvement in respiratory function.⁵ Theoretically an increase in the colloid osmotic pressure resulting from the albumin infusion could reduce pulmonary oedema and have a similar effect, but this has so far not been proved.⁴ It is possible that replacement of albumin might aggravate leaks of protein but in our study serum albumin concentrations six hours after infusion remained raised, suggesting that this was either not the case, or if it was that the leak was gradual.

In a previous study only a poor correlation was found between the degree of oedema and concentrations of albumin.⁶ In that study, however, the infants were suffering from a variety of disorders and were of different postnatal ages, so in such a heterogeneous group there could be several explanations for the oedema. The present report described a group of infants with similar respiratory problems and management, in whom low albumin concentrations were associated with oedema that lessened after infusion of albumin. This clinical observation was supported by the significant weight loss.

We conclude that in these normotensive infants who are in the acute phase of the respiratory distress syndrome, albumin infusions do improve urinary output.

AG's post (senior lecturer) was endowed by the Children National Medical Research Fund, and Sister Frances Greenall was generously supported by Penlon Ltd. We thank the nursing and medical staff of Frederic Still Ward, King's College Hospital, for their help and support and Mrs Angela McPherson for secretarial assistance.

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Accepted 28 October 1987