Commentary**N RUTTER***Department of Child Health, Queen's Medical Centre, Nottingham*

Most infants born before 36 weeks' gestation have a serum albumin concentration below 30 g/l; this is a concentration which in a child or adult would be classed as hypoalbuminaemia.¹ Most of these infants have varying degrees of oedema too, but there is poor correlation between serum albumin concentration and the amount of oedema, and neither relate well to the presence or absence of respiratory disease. The implication is that hypoalbuminaemia is normal for the preterm infant, perhaps because the low systemic blood pressure (and therefore the capillary hydrostatic pressure) makes a high colloid osmotic pressure unnecessary. A common finding, however, in a preterm infant is not necessarily normal.

This interesting study by Greenough and her colleagues seems to suggest that hypoalbuminaemia of prematurity is abnormal as albumin infusion is associated with a diuresis, weight loss, and possible reduction of oedema. These are the findings one would expect from the infusion of albumin into a child with the nephrotic syndrome. Disappointingly though, the study lacks a control group of infants with respiratory distress who did not receive albu-

min. This means that the association might be a chance one, with the change in urine output and weight being related to time rather than albumin. Most preterm infants studied at this age would be in the process of losing up to 20% of their birth weight, at least in part via their urine output. Alternatively, the association might be causal, but unrelated to hypoalbuminaemia—albumin infusion might act as a mild diuretic by increasing renal blood flow.

Before neonatologists reach for the albumin bottle to treat this 'disease', we need to know more. Is it albumin infusion that is responsible for the diuresis? If so, is it temporary and does the fluid soon reaccumulate? More importantly, does it improve the infant's respiratory disease? Frusemide, which produces a much more impressive diuresis and weight loss has not been shown to alter the course of respiratory distress syndrome.²⁻⁴

References

- ¹ Cartlidge PHT, Rutter N. Serum albumin concentrations and oedema in the newborn. *Arch Dis Child* 1986;**61**:657-60.
- ² Savage MD, Wilkinson AR, Baum JD, Robertson NRC. Frusemide in respiratory distress syndrome. *Arch Dis Child* 1975;**50**:709-13.
- ³ Marks KH, Berman W, Friedman Z, Whitman V, Lee C, Maisels MJ. Furosemide in hyaline membrane disease. *Pediatrics* 1978;**62**:785-8.
- ⁴ Yeh TF, Shibli A, Leu ST, Ravel D, Pildes RD. Early furosemide therapy in premature infants (2000 g) with respiratory distress syndrome: a randomised controlled trial. *J Pediatr* 1984;**105**:603-9.

Management of uncomplicated meconium ileus with T tube ileostomy

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SUMMARY Five neonates with uncomplicated meconium ileus were successfully managed by laparotomy and T tube ileostomy. This method seems to offer advantages over other surgical techniques used in the management of uncomplicated meconium ileus that fails to respond to decompression by Gastrografin enema.

Since Haitt and Wilson's first description of the successful surgical management of meconium ileus in 1948,¹ improvements in the surgical care of neonates, together with a variety of techniques to

deal with the intraluminal obstruction, have led to greatly improved survival rates.²⁻³ Improved dietary and medical management have also given more hopeful long term prognosis.⁴⁻⁵ T tube ileostomy as advocated by Harberg *et al*,⁶ seems to offer important advantages over surgical techniques previously described for the management of uncomplicated meconium ileus that fails to respond to decompression by sodium meglumine diatrizoate (Gastrografin) enema.

Patients and methods

Since 1982 five neonates have been admitted to the

Red Cross War Memorial Children's Hospital, Cape Town, with uncomplicated meconium ileus. In three, unsuccessful attempts were made to relieve the obstruction by Gastrografin enemas. After the diagnosis had been confirmed at laparotomy, a 14F T tube catheter with multiple holes cut in both limbs was prepared, each limb being 3 to 4 cm long. The tube was inserted through an enterotomy into the dilated and hypertrophied ileum about 3 cm proximal to the distal narrowed segment, and secured with a double purse string suture. It was immediately irrigated with saline and 5% acetyl cystine or Gastrografin to loosen the compacted distal inspissated pellets and proximal viscid meconium. The T tube was brought out through a stab incision in the right iliac fossa and the enterostomy was secured to the anterior abdominal wall. Starting the day after operation, the T tube was gently irrigated twice daily with a solution of 5% acetyl cystine or diluted Gastrografin until complete decompression had been achieved. Parenteral nutrition was given until normal bowel function had returned, after which replacement of pancreatic enzymes was introduced orally and milk feeds were started. The T tube was removed 18–21 days after the operation.

Results

All patients survived without morbidity (table). Spontaneous closure of the fistula occurred within two days in all five, and one patient developed a small granuloma which responded to application of caustic. Full bowel function had returned in all

infants by the tenth postoperative day. There were no adverse long term sequelae noted at follow up examination six months to five years later. One patient required laparotomy for obstruction by inspissated stools and adhesions at the age of 2, but the area of the T tube ileostomy was not responsible for the obstruction. All five have developed pulmonary signs of cystic fibrosis, but are progressing well.

Discussion

Meconium ileus is a comparatively infrequent cause of intestinal obstruction in neonates. Referral is usually delayed and obstruction well established at presentation. When complications such as volvulus, atresia, or perforation had been excluded on clinical and radiological grounds an attempt was made to relieve the obstruction by Gastrografin enemas. With terminal ileal obstruction, however, we were unable to achieve satisfactory decompression. Our previous experience with other surgical techniques (table) indicates notable morbidity and mortality.

The use of the T tube has several advantages. The operation is less extensive than others and requires minimal handling of the bowel. Resection of the distended but viable segment of ileum is not necessary and there is no intraperitoneal suture line. Immediate postoperative irrigation may be performed safely and the T tube may be removed by simple extraction when appropriate. Spontaneous closure of the fistula occurs rapidly. We therefore recommend this operation for uncomplicated meconium ileus when Gastrografin enemas have failed to alleviate the obstruction.

Table *Surgical management of meconium ileus in 17 neonates* 1967–1986*

Operation	No of cases	Morbidity and mortality
Distal chimney enterostomy with resection	10	Sepsis at ileostomy site (n=4) Formal closure required (n=9) Second attempt at closure required (n=3) Intraperitoneal leak and death (n=1)
Proximal chimney enterostomy with resection	1	Formal closure required
Resection with primary anastomosis	1	Adhesive bowel obstruction when 10 months and 21 months old; died after second laparotomy
T tube ileostomy	5	None

*Several Gastrografin enemas failed to relieve the obstruction in four.

References

- 1 Haitt RB, Wilson PE. Celiac syndrome: therapy of meconium ileus, report of 8 cases with review of the literature. *Surg Gynecol Obstet* 1948;**87**:317–27.
- 2 Noble H. Meconium ileus In: Ravitch MM, Welsh KJ, eds. *Pediatric Surgery* vol II, 3rd ed. Chicago: Year Book Medical Publishers Inc, 1979.
- 3 Mabongunje OA, Wang Chun-I, Mahour H. Improved survival of neonates with meconium ileus *Arch Surg* 1982;**117**:37–40.
- 4 Schwachman H. Meconium ileus: ten patients over 28 years of age. *J Pediatr Surg* 1983;**18**:570–5.
- 5 Phelan P, Hey E. Cystic fibrosis mortality in England and Wales and in Victoria, Australia 1976–80. *Arch Dis Child* 1984;**59**: 71–3.
- 6 Harberg FJ, Senekjian EK, Pokorny WJ. Treatment of uncomplicated meconium ileus via T-tube ileostomy. *J Pediatr Surg* 1981;**18**:61–3.

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