during the operation. Infants with left sided diaphragmatic hernia often have a mild degree of left ventricular hypoplasia.⁶ Their cardiac output is likely to be reduced, so it is not surprising that surgery is poorly tolerated. These infants could probably be helped by the use of dopamine started preoperatively, as used by Nair *et al.*³

There was a coincidental increase in the use of abdominal wall grafts in infants treated by delayed surgery. It was our impression that their use benefited a few infants by facilitating ventilation. From autopsy evidence, however, we consider that only one infant not so treated would have benefited from a graft. It is therefore very unlikely that the improved survival was the result of the increased use of grafts.

We recommend that critically ill infants with congenital diaphragmatic hernia who present shortly after birth are stabilised before operation. If with this treatment the acidosis persists, with a pH < 7.20, it is very unlikely that surgery will help.

We thank Miss M J Mayell for allowing us to study patients under

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Neonatal typhoid fever

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SUMMARY Three infants of Pakistani immigrant mothers developed typhoid fever in the neonatal period. All three survived, but two became chronic excretors of *Salmonella typhi*. The risk of an outbreak of typhoid fever in a maternity unit or special care baby unit is emphasised.

Typhoid fever is rare in neonates.^{1 2} The public health problems it poses, however, are great. This report describes three neonates with typhoid fever born in two maternity hospitals in Birmingham over the past nine years.

Case reports

Case 1. After a normal birth and 24 hour discharge from Marston Green Hospital, Birmingham, a full term Pakistani girl presented at this hospital, very ill, shocked, and hypothermic at the age of 3 days. She had a 12 hour history of increasing lethargy and poor feeding.

After admission, she had a cardiorespiratory arrest and subsequently needed assisted ventilation for 48 hours because of attacks of apnoea. She also had episodes of clonic seizures and hypoglycaemia. A chest radiograph showed bilateral patchy consolidation. The blood culture grew *Salmonella typhi* phage type E₁ after incubation for three days. Results of lumbar puncture were normal. Repeated stool and urine cultures yielded negative results. Treatment with antibiotics was changed from ampicillin and gentamicin to trimethoprim when the results of the culture were known. Trimethoprim was given for two weeks, during which time she had neither fever nor diarrhoea. At 6 months the infant has microcephaly and neurodevelopmental delay. Multiple stool cultures from the mother and her family have remained negative for *S. typhi*. No cross infection occurred while the baby was nursed in the intensive care unit where a strict hand washing policy was operated, although the baby was not isolated.

Case 2. After three days of intermittent fever a

Pakistani mother who had been in Pakistan three months earlier delivered a boy at 36 weeks' gestation at Marston Green Hospital. She had a postpartum fever (40.8°C) and rigor and was treated with intravenous ampicillin. *S. typhi* of phage type D₅ was isolated from her blood, stools, and urine. Her stool cultures remained positive for four months.

The infant was feverish immediately after birth and developed clinical and radiological signs of respiratory distress syndrome. He needed continuous positive pressure ventilation for 48 hours. On the fifth day the mother and baby were transferred to the infectious diseases unit at this hospital. Ampicillin was given parenterally for one week and orally for another two weeks. Apart from jaundice, intermittent fever, and frequent watery green stools between the fifth and eighth day, the natural history was uneventful. *S. typhi* phage type D₅ was isolated only from the infant's stools. No babies or staff of the special care baby unit were infected. The same organism was isolated, however, in stool specimens from the father and an aunt. At 7 months the infant was still excreting the bacteria. Furthermore, two mothers who had babies at around the same time in the maternity hospital were believed to have acquired *S. typhi* from the index case. A total of six children from these two families had *S. typhi* phage type D₅ isolated from their stools. Two of these children were admitted to hospital with clinical infection.

Case 3. At 48 hours of age a Pakistani boy of 36 weeks' gestation who was born in Dudley Road Hospital, Birmingham, developed a temperature of 37.5°C and had several blood stained mucousy stools. The father had been in Pakistan a month earlier. A stool culture grew *S. typhi* phage type E₁. Blood and urine cultures yielded negative results. The mother was later found to be an asymptomatic excretor of *S. typhi* of the same phage type. The infant was isolated. Intravenous ampicillin was given for seven days followed by oral trimethoprim for another week. The infant was well apart from transient fever (37.5°C) and some loose stools. At 4 weeks of age, however, he was still excreting *S. typhi*. His brother was also found to be an asymptomatic excretor. Stool cultures were not obtained from staff or patients. No cross infection was known to have occurred.

Discussion

Neonatal typhoid fever is usually acquired at birth. Vertical transmission of the infection is suggested in two of our infants by the concordant *S. typhi* phage type in mother and baby. The third infant (case 1) is

also likely to have acquired the infection from the mother, despite the lack of a positive maternal stool culture.³

The clinical diagnosis may be more difficult to make than in adults. The classical 'rose spots' are not evident, especially in dark skinned infants.⁴ The incubation period is shorter and is usually only about 48 hours, although it may be up to seven days.² Of eight neonates with enteric fever described by Duggan and Beyer, all had diarrhoea, but only one was febrile, while the others were afebrile or hypothermic.¹ The clinical features in our infants are in keeping with these descriptions.

There is no ideal drug for the treatment of neonatal typhoid fever. Experience is limited to chloramphenicol and ampicillin.² The risk of aplastic anaemia and the emergence of chloramphenicol-resistant *S. typhi* have led, however, to the search for alternative antibiotics. In children and adults co-trimoxazole or trimethoprim⁵ when given parenterally are of proven efficacy. Our infant with septicaemia responded to trimethoprim given intravenously. Infants with mild *S. typhi* enteritis do not require treatment. The duration of diarrhoea or carrier state is not shortened by treatment with oral antibiotics.⁶ Two of our infants remained asymptomatic excretors despite treatment with oral antibiotics.

Our report highlights the health hazards that undetected asymptomatic *S. typhi* excretor mothers can bring to any maternity and baby unit. Only in case 2 was the possible spread of infection pursued vigorously. All the nursing and medical staff and patients in the labour, postnatal, and special care baby unit had stool cultures performed. The organism was isolated in two other mothers, who were discharged, and their families. It was fortuitous that a larger outbreak did not occur. As screening for excretion of *S. typhi* in pregnant mothers is not feasible we suggest that great care is taken when looking after infants with fever and diarrhoea, especially if their mothers are from developing countries.

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Fluoride treatment in corticosteroid induced osteoporosis

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SUMMARY Severe osteoporosis with multiple vertebral fractures occurred in two girls receiving prolonged high dose corticosteroids for relapsing dermatomyositis. Sodium fluoride, supplemented with calcium and vitamin D, helped control secondary osteoporosis in one case and should be considered as part of the curative treatment of corticoid induced osteoporosis.

Sodium fluoride is now used in idiopathic osteoporosis of aging adults,^{1,2} as it should be able to increase bone mass. Prolonged high doses of treatment with corticosteroids may produce severe osteoporosis in children. The histomorphometric and histodynamic method³ represents a quantitative approach to the evaluation of bone disease under treatment with fluoride.

Case reports

Case 1. A 10 year old, prepubertal girl was treated for dermatomyositis. From August 1980 to December 1982 she received the following treatment and dosages: prednisone 0.6-2 mg/kg/day, with calcifediol 100 µg/day up to November 1981 and then alfalcidol 0.5-1 µg/day up to December 1982, and also hydrochlorothiazide 75 mg/day. No height gain was observed from January 1981 to December 1982. At this time her height was 128 cm and dermatomyositis was stable, but treatment with corticosteroids induced a severe osteoporosis and multiple vertebral fractures (D6, D7, D10, D12, and L5).

From December 1982 to April 1984 she received prednisone 0.6-1.1 mg/kg/day on alternate days with alfalcidol (0.5 µg/day), calcium carbonate (1.5 g/day), and hydrochlorothiazide. Sodium fluoride was given at a dose of 1 mg/kg/day for 16 months.

The height gain during this treatment was 10 cm and the girl remained impubertal. No other vertebral fractures occurred, and bone x ray profile has improved.

Case 2. This 7 year old girl presented with dermatomyositis in March 1981. She received an average dose of prednisone 1.4 mg/kg/day with alfalcidol 0.25-0.75 µg/day and hydrochlorothiazide 75 mg/day without calcium supplementation because of hypercalciuria. In October 1982 her height was 123 cm and the presence of multiple vertebral fractures (eight vertebrae) revealed a severe osteoporosis associated with renal lithiasis. From June 1983 to May 1985 the dermatomyositis relapsed and treatment included prednisone 1.1 mg/kg/day in conjunction with sodium fluoride 1 mg/kg/day, alfalcidol 0.5 µg/day, and hydrochlorothiazide 75 mg/day. During this time, the x ray profile of the spine improved and no other vertebral fractures occurred. At the end of the study the girl remained prepubertal and her height was 135 cm.

In both cases, after tetracycline double labelling, a bone biopsy specimen was taken before and after treatment with fluoride. The histomorphometric and histodynamic variables were compared (Table).

Discussion

In both children the natural history and bone radiology during extended treatment with corticosteroids for dermatomyositis seemed typical of corticosteroid induced osteoporosis. We could not study bone photon absorptiometry, but bone biopsy specimens were contributive: appreciable decrease of trabecular bone volume with decrease of the calcification rates and increased trabecular resorption