extensive radiographic survey in both families failed to provide evidence of the disease.

Temperley *et al.* reported a case with raised immunoglobulins in 1972. There have since been few reports. Both our cases showed raised immunoglobulins. Particularly remarkable were the IgA and IgM levels. We believe that a virus infection during intrauterine or early neonatal life may be the cause of infantile cortical hyperostosis.

Summary

Two cases of infantile cortical hyperostosis are reported. Both had raised immunoglobulins. Particularly remarkable were the IgA and IgM levels, a finding infrequently reported.

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V. RAMCHANDER and R. RAMKISSOON

Department of Paediatrics, General Hospital, Port-of-Spain, Trinidad, WI.

Correspondence to Dr V. Ramchander.

Peripheral pulmonary artery stenosis

We report an infant with persistent cyanosis from birth, who was found to have anomalies of the small pulmonary arteries.

Case report

A male infant was born at 40 weeks' gestation weighing 2040 g. His mother was aged 39, para 2 + 0, and had 2 healthy children born at term. During this pregnancy she had severe pre-eclamptic toxæmia and it was thought that the fetus was small-for-dates for much of the pregnancy. There was no history of rubella contact. After spontaneous rupture of membranes, fetal distress necessitated lower segment caesarean section and the infant required resuscitation with intermittent positive pressure ventilation from birth. Grunting was noticed at 15 minutes and he was transferred to the special care baby unit. On admission he was cyanosed in 50% oxygen with grunting, tachypnoea, nasal flaring, and intercostal recession but had a lusty cry.

Blood pressure was 60/25 mmHg, heart sounds and peripheral pulses were normal. Chest x-ray and electrocardiogram were normal at this time and initial arterial blood gas measurements were $F_{I}O_2$ 50%, $P_{a}O_2$ 53 torr, $P_{a}CO_2$ 51 torr, and pH 7.15. Despite increases in ambient oxygen, constant positive airways pressure, and then intermittent positive pressure ventilation, the blood gas tensions remained virtually unchanged. At age 18 hours the baby was remarkably active and the lungs were easily inflated with low pressures; on auscultation, there was good air entry. 24 hours after birth a marked bradycardia occurred which was persistently unresponsive to inflation of the lungs with 100% oxygen and the $P_{a}O_2$ was 10 torr with $P_{a}CO_2$ 73 torr. The baby died at age 26 hours.

Necropsy findings. Abnormalities were restricted to the respiratory and cardiovascular systems. The upper airways were normal. The lungs weighed 16 and 12 g, right and left respectively (expected combined weight 47 g) and were small but well aerated. The heart weighed 22 g (expected weight 16 g). There was marked right ventricular dilatation with hypertrophy of the wall. The foramen ovale was valvular. The ductus arteriosus was widely patent, measuring 0.6 cm diameter. Valves were healthy and there were no abnormal communications.

Histological examination of the lungs showed areas of collapse associated with mucus plugging of small bronchi and bronchioles. The large branches of the pulmonary artery showed generalised endothelial proliferation and localised, thicker endothelial cushions containing fine elastic fibres. In many medium-sized pulmonary arteries, localised nodular lesions protruded into the lumen reducing it to a crescentic slit. They arose from the vessel wall and were covered by endothelium. Immediately

beneath the endothelium there was a dense elastic lamina, the core composed of finer elastic fibres, in some cases arranged parallel to the surface, in others rather haphazardly arranged (see Fig.). Step sections through the blocks confirmed the localised nature of the lesions which were not associated with arterial bifurcations. These lesions were present in several arteries in all lobes of the lungs. Antemortem thrombi were present in a few small pulmonary arteries. Radial alveolar counts were performed on sections from all of seven lung blocks. A mean count of 2.8 ± 0.10 SE was obtained, all counts being below the normal mean of 4.4 ± 0.17 for term infants, being similar to those found at 30–32 weeks' gestation (Emery and Mithal, 1960).

Fig. The lumen of this medium-sized artery is reduced to a crescentic slit by a polypoid lesion. The nodule is covered by an intact internal elastic lamina. H & E $\times 40$.

Discussion

An initial diagnosis of hyaline membrane disease was made on the observations of grunting, recession, tachypnoea, and cyanosis. This was doubted when PaO_2 did not rise despite effective mechanical ventilation, while PaCO_2 remained unchanged. Although right-to-left shunting is a recognised feature of hyaline membrane disease it was a suspicious finding at a time of good clinical air entry and active behaviour on the infant's part. Repeated chest x-rays did not confirm the initial diagnosis and the extent of pulmonary aeration seemed incompatible with the extent of the cyanosis if this was caused by hyaline membrane disease. Other diagnoses were therefore sought, and despite normal chest x-ray and electrocardiogram, cyanotic heart disease was considered the most likely.

Had the infant's condition not deteriorated so rapidly cardiac catheterisation would have excluded gross cardiac anomalies and ciné-angiography might have shown reduced pulmonary flow. The necropsy findings of right ventricular hypertrophy and pul-

monary hypoplasia suggested that the pulmonary arterial abnormalities had been present for many weeks or months of intrauterine life and that reduced pulmonary blood flow may have retarded lung growth, as the lung weight was reduced when compared with that expected in a term infant of normal weight, in an infant of the same weight, or in one of similar brain weight (Schultz *et al.*, 1962).

Multiple segmental stenoses of main and lobular pulmonary arteries have been identified radiologically (Arvidsson *et al.*, 1955), and by dissection and histological examination where symmetrical reduction of the lumen to a centrally sited pin hole is described (MacMahon *et al.*, 1967) in children with pulmonary hypertension. Multiple plexiform lesions have been described in both children and adults with pulmonary hypertension secondary to congenital heart disease and in primary hypertension (Wagenvoort and Wagenvoort, 1970).

Multiple peripheral pulmonary vascular abnormalities have been described in 4 infants dying in the neonatal period and in 1 stillborn infant by Rubin and Strauss (1961). 3 of the 5 had congenital heart disease and all had other congenital abnormalities. 4 of the 5 were of low birthweight as was the infant described here. Intimal proliferation and focal disruption of the internal elastic lamina of large pulmonary arteries were present in their cases and interpreted as evidence of pulmonary hypertension *in utero*. Similar changes in the main pulmonary arteries in the case described here and additional right ventricular hypertrophy in the absence of congenital heart disease support this suggestion.

That these lesions were developmental defects and not recanalised thrombi is supported by the finding of a well-defined internal elastic lamina beneath the endothelium of the intraluminal lesions. The demonstration of reduced radial alveolar counts indicating pulmonary immaturity and not merely small size secondary to reduced blood flow, is evidence of anomalous developments of the lung bud, which may influence local arterial development.

Obstruction to the pulmonary circulation has been described in rubella embryopathy. Several abnormalities have been described in this condition: valvar stenosis, hypoplasia of the pulmonary trunk, supralvalvar stenosis, and multiple stenoses of main and lobular arteries (Arvidsson *et al.*, 1955). The distribution of these anomalies is different from those described here which are more peripheral, occurring in vessels arising at a later stage of development.

Detailed examination of pulmonary vasculature is recommended at post-mortem examination of newborn infants who were persistently cyanosed in life and in whom evidence of major congenital abnor-

malities, hyaline membrane disease, and pulmonary infection are absent.

Summary

A term infant, born by caesarean section for fetal distress, developed grunting and cyanosis by 15 minutes of age. Ventilation at low pressures was achieved without difficulty but did not improve blood gas levels, and he died at 26 hours. Necropsy examination showed large heart and small lungs; histologically the lungs showed multiple obstructive lesions at medium size pulmonary artery level.

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- 1976). In some patients with nephrotic syndrome associated with atopy, relapses are precipitated by episodes of hay fever (Hardwicke *et al.*, 1959; Reeves *et al.*, 1975). Disodium cromoglycate (DSCG) prevents bronchial, nasal, and perhaps gastrointestinal atopic symptoms. In one atopic patient with SRNS described below, DSCG appeared to prevent relapse during the hay fever season. We therefore studied a possible preventative role of this drug in SRNS by a double-blind trial.

Case report

A 12½-year-old boy presented with nephrotic syndrome in July 1972, associated with upper respiratory tract symptoms. There was no history of atopic disease but skin prick testing was strongly positive for mixed grass pollens and spring flower pollens. Remission of the nephrotic syndrome was induced with prednisolone 2 mg/kg per day. Relapses occurred in June 1973 and May 1974, the latter associated with the onset of hay fever. His HLA type was A2 A3:B7 B12. Serum total IgE was 52 IU/ml (normal <150 IU/ml), but specific IgE antibody to Timothy grass pollen allergen was raised as measured by the radioallergoabsorbent test (RAST).

Remission of the nephrotic syndrome was again induced with prednisolone and the hay fever treated with intranasal DSCG. Prophylactic DSCG was given four times daily for 6 months from March 1975 as oral inhalation 20 mg by spinhaler, nasal insufflation 10 mg to each nostril, and oral capsules 40 mg with meals. The hay fever recurred in June 1975 and he was given a single intramuscular injection of methylprednisolone 20 mg. His urine was tested daily with Albustix, and was consistently negative, apart from a trace reaction on one day 3 weeks later. He has been symptom free from both hay fever and nephrotic syndrome throughout the past 2 years without treatment.

Patients and methods

The 21 children studied had had at least 3 relapses of the nephrotic syndrome and responded to prednisolone treatment. They were in remission on a maintenance dose of prednisolone for at least 2 weeks before entry into the trial. All were over 4 years of age and capable of co-operating with the methods of drug administration. Diagnostic criteria for nephrotic syndrome and relapse are described elsewhere (Barratt and Soothill, 1970). The children were not selected for atopic features, but were consecutive clinic attenders who fulfilled criteria for entry to the trial.

Controlled trial of disodium cromoglycate in prevention of relapse of steroid-responsive nephrotic syndrome of childhood

The aetiology of steroid-responsive nephrotic syndrome (SRNS) is not known, but allergy is implicated: atopic features are more frequent in children with SRNS than in healthy ones, especially if they have tissue type HLA B12 (Thomson *et al.*,

D. M. SALISBURY and J. W. KEELING

Paediatric and Pathology Departments, John Radcliffe Hospital, Headington, Oxford OX3 9DU.

Correspondence to Dr J. W. Keeling.