naline may also be seen in the number of patients subsequently needing hospital treatment. The salbutamol doses used in this study seemed to be safe—there were no cardiovascular side effects and muscular tremor occurred in only two out of 26 children. Inhaled salbutamol seems to be the treatment of choice in childhood asthmatic attacks.

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Neonatal herpes simplex pneumonia

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SUMMARY A neonate with herpes simplex pneumonia is described. Herpes simplex infection should be considered in the differential diagnosis of pneumonia in newborn infants, even in the absence of clinically apparent herpes in the mother.

Accompanying the recent interest in maternal genital herpes infection, attention has also been focussed on herpes simplex virus infection in the newborn.¹ At the Grady Memorial Hospital, Atlanta, USA the number of identified cases of neonatal herpes simplex virus infection, estimated at 1 in 7500 births in 1970, has doubled in the past five years to 1 in 3750.² In Britain, however, the illness seems to be much less common and only 98 cases with 24 deaths were reported to the Public Health Service Laboratories in the last 10 years before 1981. (Young S, Communicable Disease Surveillance Centre (PHLS) personal communication 1983). This is probably an underestimate of the true incidence. We describe a neonate with an atypical presentation of disseminated herpes simplex virus infection. This infant presented with pneumonia. Since treatment is now available for herpes simplex infection³ it is important that it should be considered in the differential diagnosis of infants with pneumonia, especially those who fail to respond to antibiotics.

Case report

A 17 year old primigravida had two days of

suprapubic pain, dysuria, and nausea at 33 weeks' gestation. A midstream urine culture was negative. At 38 weeks she developed a fever of 38°C and urinary frequency; two days later spontaneous onset of labour occurred. She was febrile (38°C) on admission and after 6½ hours labour a boy weighing 3.2 kg was born by normal vaginal delivery. The membranes had been ruptured for two and a half hours. The infant's temperature was 38°C at birth but settled over a few hours. A full blood count taken shortly after delivery was unremarkable (white blood cells $9.3 \times 10^9/l$, neutrophils $5.9 \times 10^9/l$, bands $0.3 \times 10^9/l$, ratio of bands:total neutrophil count 0.05) and blood cultures were negative.

On the fourth day the infant's temperature rose again to 38°C, he was mildly jaundiced, but had no other abnormal signs. A blood count showed white blood cells $5.9 \times 10^9/l$, with neutrophils only $1.7 \times 10^9/l$, and a band count of $1.4 \times 10^9/l$ giving a noticeably increased ratio of 0.5 (normal ratio less than 0.2). The platelet count was normal. Chest radiograph showed diffuse changes which were most pronounced in the left lung and the right upper zone (Figure, left). After further cultures intravenous penicillin (60 mg/kg, 6 hourly) and gentamicin (3 mg/kg, 8 hourly) were begun.

Apart from the fever the infant remained asymptomatic until the sixth day when he became tachypnoeic. Chest radiograph now showed dense consolidation over the whole left lung and right upper zone (Figure, right). On the seventh day he required supplemental oxygen (F_{iO_2} 0.38) but was not acidotic. His neutrophil count remained low and the band count ratio was grossly raised. Although additional

Figure Left, chest radiograph on day 4 of life showing diffuse changes throughout the left lung and right upper zone, and right, chest radiograph on day 6 showing dense consolidation.

antibiotics were started, the infant's condition deteriorated noticeably; he became hypotensive and there was laboratory evidence of disseminated intravascular coagulation. Despite intensive supportive treatment including artificial ventilation, transfusion of fresh frozen plasma and granulocytes, an exchange transfusion, and inotropic support he became increasingly hypotensive, acidotic, and developed overt bleeding. He died aged 10 days.

The infant's mother was intermittently febrile during the week after delivery but she did not develop herpetic lesions at any time and her only symptom was dysuria on the fifth day. A full blood count, blood cultures, and vaginal and cervical swabs were negative for bacteria and chlamydia.

A nasopharyngeal swab taken from the infant on the fifth day was cultured for viruses and after a further five days, that is the day on which he died, herpes simplex virus, type 2 was isolated. At necropsy there was bronchopneumonia and histology of the lungs, liver, and adrenal glands showed areas of haemorrhage and necrosis and a few multinucleate cells which contained nuclear eosinophilic inclusions. Immunofluorescence and immunoperoxidase staining of the lung, liver, and adrenal glands were positive for herpes simplex virus. The maternal herpes antibody titre showed that the neutralising antibody titre increased from less than 1/10 both in the second trimester and at delivery to greater than 1/100 three weeks postpartum, confirming a primary maternal herpes simplex virus infection. Antibody was absent in the infant.

Discussion

The mother's primary infection was not suspected as

although she was examined on several occasions, herpetic lesions were not seen either before delivery or in the postpartum period. Absence of lesions is not unusual; only 10% of mothers of affected infants have clinically apparent herpes simplex virus at the time of delivery.⁴ A history of previous herpes simplex genital infection may be found in 13% of mothers and in the sexual partner in 20% but this information is unlikely to be obtained unless specifically sought.

In contrast to previously described cases of neonatal herpes simplex virus infection,² this infant presented with pneumonia and only developed features of disseminated infection several days later. He was initially thought to have a bacterial pneumonia on the basis of the widespread patchy consolidation on the chest radiograph and haematological findings characteristic of bacterial infection. With clinical deterioration in spite of antibiotic treatment a non-bacterial cause of pneumonia was actively sought. Since only 30% of infants with disseminated herpes simplex virus infection or encephalitis have mucocutaneous lesions at presentation, their absence does not exclude the diagnosis.⁵ An early clue to the non-bacterial origin of this infant's pneumonia might have been his initial appearance of well being in the presence of widespread abnormalities on the chest radiograph.

Herpes simplex virus may be identified by direct isolation from a lesion or from urine, cerebrospinal fluid, or swabs from the throat, mouth, eye, or rectum but this is likely to take 24 to 48 hours. The time interval may be extended if the specimen is suboptimal or if only a small amount of virus is present. More rapid diagnosis may be made by immunofluorescence or by detecting herpes par-

ticles on electron microscopy. In this infant a good nasopharyngeal or tracheal aspirate might have enabled us to identify the virus and start antiviral treatment more rapidly. In retrospect, cervical or vaginal swabs from the mother taken specifically for viral culture might have led to an earlier diagnosis.

This case highlights some of the difficulties in the early diagnosis of herpes simplex infection in the newborn. In most affected infants the infection in the mother is unrecognised and at presentation only a third of infants with generalised disease have mucocutaneous lesions. In infants who seem to have a bacterial infection but fail to respond to antibiotics, evidence of herpes simplex virus must be actively sought.

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Betaxolol and propranolol in glucagon stimulation of growth hormone

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SUMMARY Both betaxolol and propranolol, beta blockers with different pharmacological properties, increase the reliability of somatotrophic testing with glucagon. The combination of glucagon and betaxolol, however, is much better tolerated than that of glucagon and propranolol. The use of a beta₁ cardioselective adrenoceptor block for growth hormone testing is recommended.

A large number of growth hormone stimulating tests are used in children. One of the safest and most practical is the glucagon test but the discovery of non-responders to this test¹ has resulted in the use of propranolol as an adjunct.² Although this drug enhances the growth hormone response to glucagon by blocking the central beta adrenoceptors, it also increases such side effects as fatigue, pallor, sweating, and malaise³ which may be a reflection of chemically induced hypoglycaemia.⁴ The alternative use of the cardioselective beta blocker, betaxolol (available in the UK as Kerlone) has been proposed because, unlike propranolol, betaxolol does not

alter the time course of the metabolic response to insulin induced hypoglycaemia.⁵

Patients and methods

A total of 420 children presenting with retarded growth and scheduled for growth hormone testing were studied. Patients with hypopituitarism, established by two negative tests, were excluded from the study. There were 250 boys and 170 girls with a mean age of 10.9 years (range 18 months to 16 years). The height of children included in the study was more than two standard deviations less than the age based norm.

The trial was designed as an open study comparing the safety and reliability of growth hormone testing in three parallel groups of children tested with glucagon only (n=70), propranolol and glucagon (n=125), or betaxolol and glucagon (n=225). Informed parental consent was obtained.

Venous blood was drawn 90, 120, 150, and 180 minutes after an intramuscular injection of 1 mg of glucagon (glucagon only group) together with oral administration of propranolol (1 mg/kg) (proprano-