Massive pulmonary haemorrhage of the newborn is a terminal event arising in a variety of clinical situations, suggesting a mixed aetiology. It is not a common cause of death ; a primary necropsy incidence of 0·6 per 1,000 total births was reported in the British Perinatal Mortality Survey (Butler and Bonham, 1963), and the same incidence was found on reviewing the 1963–7 necropsy findings at Queen Charlotte's Maternity Hospital. In this latter series there were three stillbirths, 10 first-week neonatal deaths, and two late neonatal deaths. The main associated findings were hyaline membrane disease (five cases), intrapartum anoxia (three cases), pneumonia with a significant purulent exudate (two cases), lethal congenital malformations, polycystic disease, and urethral obstruction (two cases), and single instances of bullous emphysema, thrombocytopenic purpura, and isoimmunization, as well as the Coxsackie virus infection reported here. Seven of the babies weighed less than 2,500 g., but none was regarded as small for the dates (though in one such case in 1968 death occurred from massive pulmonary haemorrhage).

Many conditions have been described in association with pulmonary haemorrhage, ranging from anoxia and bleeding diatheses to cold injury and oxygen administration (recent review by Parker *et al.*, 1968), but the exact aetiological importance of the various conditions is difficult to evaluate. The main predisposing factors, however, appear to include anoxia, coagulation defects, prematurity, congestion, and infection of the lungs.

ROSALINDE HURLEY, M.D., M.C.PATH.
A. P. NORMAN, M.D., F.R.C.P.
J. PRYSE-DAVIES, M.D., M.C.PATH.

Queen Charlotte's Maternity Hospital, London W.6.

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Intermittent Positive-pressure Ventilation in Chicken-pox Pneumonitis

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Although normally a mild disease, fatalities from fulminant chicken-pox are well recognized (Foley and Perrin, 1967) and are often associated with coexisting disease or treatment with steroids or antimetabolite drugs (Cheatham, 1953 ; Cheatham *et al.*, 1956 ; Hayes *et al.*, 1965). A viral pneumonia may occur in up to 33% of cases and when severe it carries a mortality of up to 20% (Knyvett, 1966). We report a case of severe chicken-pox with pneumonia and respiratory failure, requiring intermittent positive-pressure ventilation (I.P.P.V.) for 28 days. The patient was receiving methotrexate and prednisolone, which may have influenced the severity of her illness.

CASE REPORT

The patient, a 26-year-old housewife, was a known case of atopic eczema and had been treated with prednisolone for the preceding three years. Three weeks before admission the family doctor, considering the skin lesions to be suggestive of psoriasis, reduced her prednisolone from 10 mg. to 5 mg. daily, and started methotrexate 5 mg. daily. Shortly after this the patient's two children developed mild chicken-pox, and 12 days later she herself developed chicken-pox, having received a total of 70 mg. of methotrexate. The rash became profuse and haemorrhagic (Fig. 1), and she was referred to hospital.

On admission she was disorientated and had numerous lesions in the mouth and pharynx and pronounced oedema of the face and neck. Initially her general condition was fair, though diffuse moist sounds could be heard throughout both lungs. The chest *x*-ray picture (Fig. 2) showed discrete areas of consolidation suggestive of varicella pneumonitis with some possible secondary infection.

Over the next 24 hours she deteriorated, becoming semicomatose and oliguric, and showing all the signs of severe peripheral circulatory failure. Her initial fluid requirements had been considerably underestimated and some improvement followed from the infusion of plasma and saline. Transfer to a self-contained isolation cubicle in the intensive therapy unit was arranged, where she was barrier-nursed. The central venous pressure was monitored after direct subclavian puncture (Hardaway, 1968), and further rapid infusion of intravenous fluids maintained a satisfactory arterial blood pressure and urinary output. Continuous oxygen therapy maintained the Sa_{O_2} at 95%.

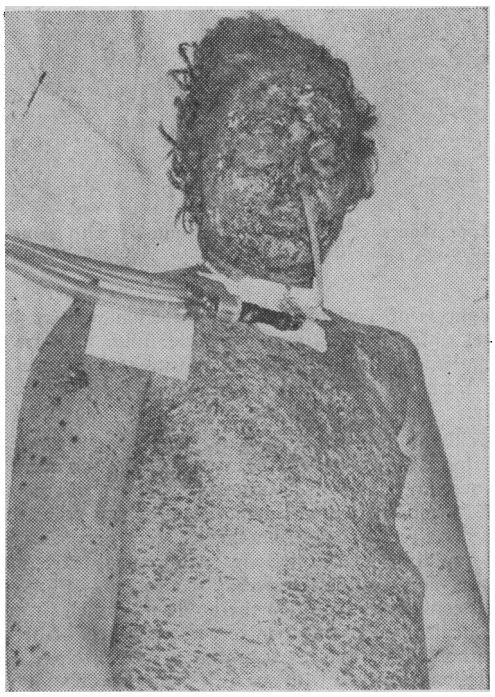

FIG. 1.—Distribution and severity of skin lesions (14th day of admission and start of I.P.P.V.).

The day after transfer tracheostomy was performed under general anaesthesia, as despite an adequate Sa_{O_2} there was a danger of upper respiratory obstruction and a lack of improvement in her chest condition. A cuffed tracheostomy tube was inserted and she was allowed to breathe spontaneously. With continuous oxygen via a blower humidifier and T-piece (Marshall *et al.*, 1967) the Pa_{CO_2} and Sa_{O_2} remained within normal limits for the next 11 days. In spite of physiotherapy and a "no-touch" technique for tracheal

suction, sputum cultures persistently grew *Pseudomonas pyocyanea*. This secondary infection was treated by the intermittent nebulization of carbenicillin by means of the micronebulizer of the Bennett ventilator.

A fall in Sao_2 and a rising respiratory rate led us to start I.P.P.V. Intermittent nebulization of carbenicillin with the addition of hydrocortisone was continued. I.P.P.V. with an East Radcliffe Ventilator was necessary for the next 25 days, and only during the last part of this period was any sustained improvement noted.

At an early stage after her admission 4 g. of pooled human gammaglobulin and 1·5 g. of specific convalescent varicella gammaglobulin were given. A variety of antibiotics were used systemically as appeared indicated by bacterial sensitivities, and two further injections of pooled human gammaglobulin were given at weekly intervals. Despite attempts to maintain a high-protein, high-calorie intake by mouth, a pronounced fall in plasma protein level with some degree of peripheral oedema occurred. This responded well to the intravenous administration of Aminosol and human albumin.

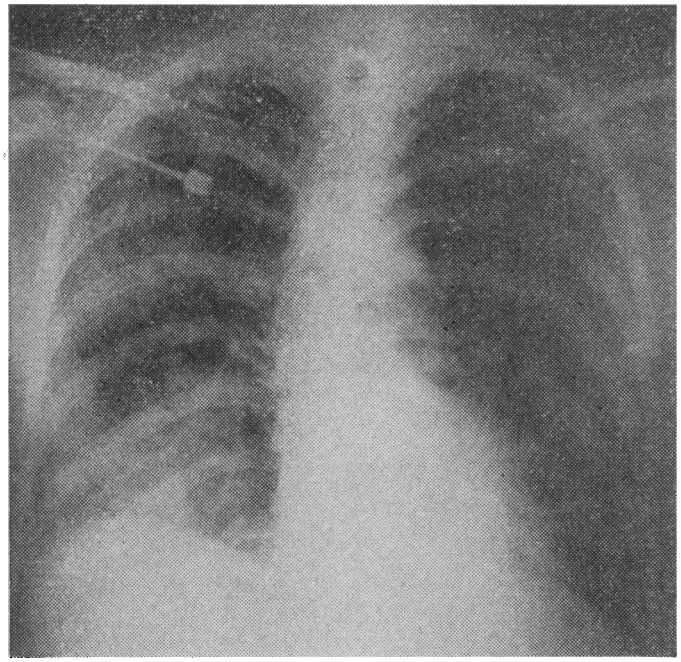

FIG. 2.—Appearances of chicken-pox pneumonia with some secondary bacterial infection (fifth day of admission). Note cannula for C.V.P. measurements.

The diagnosis of a varicella/zoster infection was confirmed by a positive gel diffusion test on the vesicle fluid, and the varicella/zoster complement fixation test was positive in a titre of 1:128. Scrapings from scabs showed varicella virus particles on electron microscopy.

Towards the end of the fifth week the patient was weaned from the ventilator. Periods of spontaneous respiration were gradually increased over a number of days until adequate spontaneous respiration for a 24-hour period was achieved, at which point the tracheostomy tube was removed. From this moment her general condition improved rapidly; hydrocortisone was replaced by maintenance prednisolone, and antibiotics were discontinued. Forty-eight days after admission to the intensive therapy unit she was transferred to a general medical ward and then to convalescence. She was finally discharged home on a maintenance dose of prednisolone 6 mg. daily. The skin lesions resolved with some degree of scarring, but the chest *x*-ray picture still showed changes, particularly in the right lower zone.

COMMENT

The use of I.P.P.V. in the treatment of severe chicken-pox pneumonia appears to have been reported only once (Tidstrom, 1967). In view of the high mortality from this complication it is surprising that it has not been more widely used. Although chicken-pox in patients receiving corticosteroid therapy may be less dangerous than was originally feared (Girsh *et al.*, 1966) this may well have contributed to the severity of our patient's illness, and, in particular, to the prolonged duration of the viral pneumonia. The role of methotrexate is also uncertain, but this drug is well known to depress the immune response (Berenbaum, 1965). R. Y. Calne and D. B. Evans (personal communication, 1969) reported the case of a patient who developed chicken-pox following contact with herpes-zoster on the thirty-fifth postoperative day after renal transplantation. The patient, receiving steroid and azathioprine therapy, died three days later from a fulminating viraemia with acute heart failure.

The increasing use of corticosteroids and immunosuppressive drugs, particularly in the field of transplant surgery, makes it important that the potential danger of chicken-pox in these patients is appreciated.

We are grateful to the Colindale Public Health Laboratory for a liberal supply of the specific convalescent chicken-pox gammaglobulin. We would like to thank Professor R. Y. Calne and Dr. D. B. Evans for permission to include details of the patient under their care. We would also like to thank all those members of the medical, nursing, and ancillary staffs of this hospital who assisted us in the management of this difficult case. We are grateful to Mr. Dun for the photographs.

J. R. HARPER, M.A., M.R.C.P., D.C.H.,
Consultant in Paediatrics and Infectious Diseases.

R. D. MARSHALL, M.B., B.S., F.F.A.R.C.S.,
Consultant Anaesthetist.

M. S. PARKINSON, M.B., CH.B., D.C.H.,
Registrar in Paediatrics and Infectious Diseases.

Intensive Therapy Unit, General Hospital, Northampton NN1 5BD.

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