immunisation had been discontinued (table III). Nor was there a significant difference in the incidence of whooping cough between the immunised and non-immunised children (table IV), even when the isolated children were excluded. Tables III and IV, of course, mainly compare younger children with older ones. It has been suggested that the effect of pertussis immunisation decreases with time. This effect was not apparent in this study. In fact, in the 3½- to 5-year-old age group six of the seven immunised children developed whooping cough, compared with 46 of the 85 immunised children as a whole.

Since none of the children under 3 years 3 months had been immunised, this study gives no information about the possible benefits of immunisation in this group. Jenkinson[5] reported an incidence of whooping cough in immunised children of only 5·7%. Possibly some of the 16 affected infants in my study would have been protected by immunisation. None of the three seriously ill infants, however, was over 6 months of age. Immunisation starting at this age would therefore hardly have benefited them. They might have received good protection from immunisation starting at 4 months, which is now recommended in Scotland. The infants received no apparent protection from the immunisation of their older siblings, who spread the epidemic via the schools and preschool playgroup.

The whooping-cough outbreak confirms the relative mildness of the illness now, at least in a rural community composed chiefly of people in social classes I to III. The disease was unpleasant and prolonged and caused concern to both doctor and parents, but no child needed hospital admission, and apparently none suffered permanent damage.

Benefits of immunisation must be measured against deleterious effects of the procedure. In my study one child started having convulsions on the night of his second triple inoculation in 1969 and required antiepileptic treatment until 1976. He developed whooping cough in the 1977 outbreak.

The results of this small study in a rural practice can be used only in conjunction with those elsewhere to assess the value of pertussis immunisation in the country as a whole. The newer vaccines may be more effective in producing herd immunity in the child population. My findings, however, do not support the routine use of pertussis immunisation in rural Shetland today.

I thank Dr Janet Ditchburn, who collected much of the data, and Professor Gordon Stewart, of the department of community medicine, University of Glasgow, for encouragement and the statistical analysis.

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(*Accepted 4 April 1979*)

SHORT REPORTS

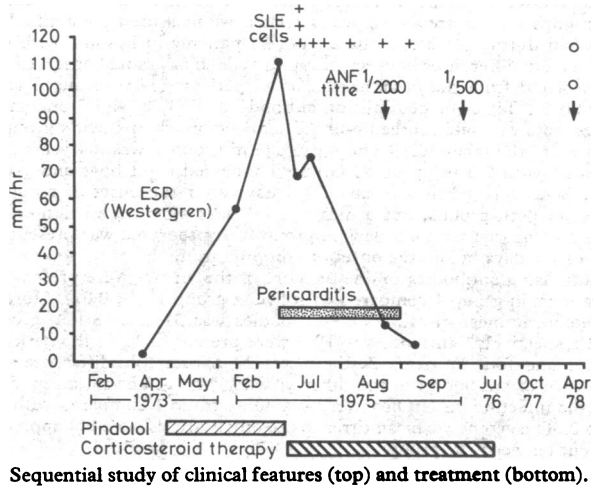
Systemic lupus erythematosus syndrome induced by pindolol

Several drugs, particularly hydrallazine and procainamide, may induce an illness resembling idiopathic systemic lupus erythematosus (SLE). Adrenergic beta-blocking agents have also been implicated since the first report by Raftery and Denman[1] concerning practolol and one possible case reported by Harrison *et al*[2] concerning propranolol. We report the case of a patient who developed an SLE syndrome while being treated with pindolol.

Case report

A 63-year-old man affected by pneumoconiosis had an inferolateral myocardial infarction in February 1973. He was treated with heparin and fluorophenylindanedione. In April 1973 he was admitted to hospital with severe angina. Pindolol 5 mg three times a day by mouth was added to his treatment. His clinical course (figure) was uneventful until February 1975, when he was thought to have a postmyocardial infarction shoulder-hand syndrome and was treated with phenylbutazone. At the end of June 1975 he was readmitted with fever (38·5°C), severe chest pain, and complaining of symmetrical polyarticular arthralgias affecting mainly the fingers, hands, shoulders, wrists, and, to a lesser extent, the knees and ankles. Values for serum enzymes were within normal limits. The red blood cell count was $3{\cdot}9 \times 10^{12}$/l (3 900 000/mm^3), the white blood cell count $3{\cdot}2 \times 10^9$/l (3200/mm^3), and ESR (Westergren) 112 mm in the first hour. Blood concentration of urea nitrogen was 14·5 mmol/l (40·6 mg/100 ml) (normal 2·5-6·5 mmol/l (7-18 mg/100 ml)) and serum creatinine concentration 141 μmol/l (1·5 mg/100 ml) (normal 80-115 μmol/l (0·9-1·3 mg/100 ml)). There was neither proteinuria nor haematuria. At the beginning of July 1975 a loud pericardial friction rub was heard and the ECG showed widespread T-wave inversion. Chest *x*-ray examination showed changes suggestive of pericardial effusion. Systemic lupus erythematosus was suspected. This was confirmed by the presence of large numbers of lupus erythematosus (LE) cells in the blood, while the latex test for rheumatoid factor was negative.

A diagnosis of drug-induced SLE seemed probable. Among the drugs taken by the patient pindolol appeared most likely to be responsible. It was stopped. Methylprednisolone 80 mg was given intravenously daily. In August 1975 bilateral pleural effusions appeared. Large numbers of LE cells continued to be found in the blood and the test for antinuclear antibody detectable by immunofluorescence was positive at a titre of 1/2000. The test for antibodies to denaturated (single-stranded) DNA detectable by the Farr technique (Peltier *et al*[3]) gave an index of 0·22. The test for antibodies to native (double-stranded) DNA gave an index of 0·04 (the test is positive when the index is more than 0·10). Methylprednisolone by mouth was continued at an initial dose of 1 mg/kg/day and then gradually reduced. The temperature fell to normal after a few days and the ESR was 14 mm in the first hour at the end of August 1975. Chest *x*-ray examination at the beginning of September showed resolution of the pleural effusions and a normal heart size. The patient was discharged in the middle of September without any symptoms. Corticosteroid treatment was continued up to July 1976. The clinical course was then uneventful up to April 1978. An immunological study at that time showed a positive response of the blastic transformation of lymphocytes in the presence of pindolol.



Sequential study of clinical features (top) and treatment (bottom).

Comment

This case may be considered as one of drug-induced SLE-like syndrome. After the withdrawal of the suspected drug the clinical

symptoms disappeared and laboratory tests became normal, although corticosteroid treatment was required for one year. There was no renal disease and the test for antibodies to denaturated DNA was positive.

We thank Dr E B Raftery for his help.

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Departments of Cardiology and Immunohaematology, Hôpital Dupuytren, 2 Avenue Alexis Carrel, 87 000 Limoges, France
JULIEN BENSAID, MD, cardiologist
JEAN-CLAUDE ALDIGIER, MD, cardiologist
NORBERT GUALDE, MD, immunologist

Croup associated with parainfluenza type 1 virus: two subpopulations

Croup is a heterogeneous childhood condition of respiratory obstruction invariably affecting the larynx and occasionally the lower airways. It is often associated with virus infection, most commonly parainfluenza (PF) virus types 1 and 3.[1]

Patients, methods, and results

When an adequate history was available one of us (DHK) subdivided patients with croup into two groups according to the prodromal illness. Those in group 1 had croup of sudden onset, either without prodromal coryza or, if present, of less than 24 hours' duration. Those in group 2 had had coryza for 24 hours or longer before the onset of croup. Because PF and mumps viruses are antigenically related we measured the antibodies in sera taken during the acute phase from 24 patients in hospital with croup to detect any differences between croup of sudden or gradual onset. PF1 had been isolated from the nasopharynx of all patients (14 in group 1 and 10 in group 2). Titres of neutralising antibody to PF1, 2, and 3 and mumps viruses were estimated in acute-phase sera[2] before the patient's group was disclosed to the laboratory. The mean age in group 1 was 2·4 years (table) compared with 2·3 in group 2. Group 1 included eight boys and group 2 seven. Sera were taken a mean of 1·4 days after the onset of croup (not coryza) in both groups, but a mean of 1·4 days after the earliest signs in group 1 compared with 4·5 days in group 2. A prodrome was present for a mean of 3·1 days before the onset of croup in group 2.

Neutralising antibodies to one or more of the viruses were present in all the patients in group 1 compared with five in group 2 ($P < 0.01$). Moreover, the geometric mean titre of total antibodies was 31 and 18·1 in groups 1 and 2 respectively. Antibodies to PF3 were present in 11 of the patients in group 1 and four in group 2; there was no appreciable difference in the prevalence of antibodies to the other viruses. The geometric mean titre to PF1 (the infecting virus), however, was 40 in group 1 compared with 10 in group 2. The geometric mean titres to the other viruses were not appreciably different between the groups.

Comment

These serological differences support the division of cases of croup into subpopulations of sudden and gradual onset. The PF1 titres in group 1 were contrary to those expected if these antibodies resulted only from the current infection. An accelerated response resulted from previous infection with either PF1 or one of the other paramyxoviruses. PF3 is the most likely candidate because of its endemicity compared with the biennial appearance of PF1 virus.[1 3] In support of this, 56 out of 115 (49%) PF3 infections in this hospital between 1964 and 1976 occurred in infants aged under 1 year compared with 20 (13%) of 152 PF1 infections.[3] We consider that there may be different pathogenic mechanisms between croup of sudden and gradual onset, the former resulting from prior PF3 infection and a subsequent hypersensitivity reaction to PF1 virus. A relevant observation is that 30% of children with PF3 infections have croup compared with 63% of those with PF1 infections.

Because of different opinions about the efficacy of steroid treatment in croup[4 5] we believe that a double-blind trial based on the historical distinction between subpopulations may be of value, while further laboratory studies should investigate the pathogenesis.

Comparison of patients with PF1 infection and croup of sudden or gradual onset

	Group 1	Group 2
Onset	Sudden	Gradual
Total No of patients	14	10
Mean age (years)	2·4	2·3
Mean No of days sera taken:		
After croup	1·4	1·4
After onset of prodrome	1·4	4·5
No of patients with neutralising antibody to PF1, 2, 3 or mumps	14	5 ($P<0.01$)
GMT of all antibodies	31	18·1
No of patients with neutralising antibody to PF3	11	4
GMT of antibodies to PF1	40	10

PF = Parainfluenza.
GMT = Geometric mean titre.

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Regional Virus Laboratory and University Department of Infectious Diseases, Ruchill Hospital, Glasgow G20 9NB
G E D URQUHART, MB, FRCPATH, consultant in clinical virology
D H KENNEDY, MB, MRCP, consultant in infectious diseases
J P ARIYAWANSA, MB, DIPBACT, registrar (now consultant virologist at Medical Research Institute, PO Box 527, Colombo 8, Sri Lanka)

Diuretic escape and rebound oedema in renal allograft recipients

Dependent oedema occurs often in renal allograft recipients, particularly during rejection episodes. Clinicians often prescribe potent diuretics to get rid of the excess salt and water. We have found that patients soon become dependent on the diuretics. We have therefore examined this problem in five patients who received cadaveric renal transplants.

Patients, method, and results

We analysed the records of four patients in whom daily collections of urine were made while frusemide was administered. All showed diuretic escape. We therefore studied an additional patient prospectively. Frusemide was prescribed at 40 mg daily when the patient had clinical oedema. The dosage was increased to 80 mg daily after about two weeks and continued for about four weeks before being abruptly withdrawn. Spironolactone was then introduced after five days and continued for about three weeks. Twenty-four-hour urine collections were made daily. Creatinine, sodium, and potassium concentrations were measured in aliquots by standard methods. Blood (5 ml) was taken for estimations of plasma creatinine and sodium concentrations, the frequency of sampling varying from daily to weekly. Blood pressure, weight, and the presence or absence of oedema were recorded whenever blood was taken. Salt and water intakes were not restricted, and data were recorded for about 90 days. Throughout the study the patient's creatinine clearance was largely stable.

The figure shows the diuretic regimen, 24-hour urinary excretion of sodium, and plasma creatinine concentrations. Before treatment the 24-hour urinary sodium excretion was about 175 mmol (mEq). This increased sharply to a peak of above 300 mmol when frusemide was introduced, the increase lasting for about 10 days and returning to baseline levels at 14 days despite continued administration of frusemide. When the frusemide dosage was increased sodium excretion rose further to peak values above 400 mmol in 24 hours, only to return to baseline levels again after two weeks. The second spurt in sodium excretion probably resulted from oscillations in balance between the diuretic and the patient's salt-retaining mechanism. When frusemide was stopped abruptly urinary sodium excretion fell to below 20 mmol and the patient gained 2 kg overnight. Sodium excretion increased to baseline levels in six days and a further rise was induced by