Aust. paediat. J.
(1974) 10: 273-276

A NEW SYNDROME: POLIOMYELITIS-LIKE ILLNESS ASSOCIATED WITH ACUTE ASTHMA IN CHILDHOOD

I. J. HOPKINS

From the Department of Paediatrics, University of Melbourne

Although occasional epidemics of poliomyelitis are still reported in affluent Western communities (Weinstein, 1973), poliomyelitis infection even of sporadic distribution has become very rare in Australia. No proven cases were identified in 1973 (Williams, 1974). However, patients with a paralytic illness resembling poliomyelitis but not due to poliovirus are seen from time to time. This report is of 10 children seen between 1968 and 1974 with an acute illness of poliomyelitis type in which there was an additional feature of special interest. This was the presence in all patients of an acute asthmatic illness preceding the onset of paralysis by 4-7 days.

Clinical Features

A typical case history is given for one patient, and the clinical features of all patients are summarised in Table I.

Case 1. (R.C.H. U.R. 219394). A 2½-year-old boy was admitted to hospital with asthmatic bronchitis. He was discharged well 2 days later, but on the second day after discharge was readmitted with paralysis of the right leg.

The patient had suffered from recurrent wheezing episodes since the age of one year. A severe attack at the age of 2 years had required admission to this hospital for several days. A further episode at 2½ years of age commenced with rhinorrhoea and cough 36 hours before admission, and for 12 hours there was wheezing and respiratory distress of increasing severity. Examination revealed slight cyanosis and mild irritability. His temperature was 38°C and respiratory rate 60 per minute. There was mild intercostal and suprasternal retraction with inspiration. Generalised rhonchi and basal crepitations were present. He was treated with ethyl noradrenaline 0.5 ml I.M., aminophylline suppositories, crystalline penicillin 250,000 units I.M. 6 hourly, erythromycin 125 mg 6 hourly and ephedrobarbitone elixir 5 ml t.d.s. He rapidly improved and 2 days later was discharged to continue a course of oral penicillin and erythromycin at home.

His mother noted some irritability and unsteadiness of gait on the day after discharge, and on the next day he was readmitted because of paralysis of the right leg. Examination at this time revealed flaccid paralysis of the right leg, sparing only the flexors of the hip; knee and ankle jerks were absent. Sensation was normal. The patient was alert, and had no neck stiffness or evidence of muscle pain.

Investigations. CSF contained 75 polymorphs and 25 lymphocytes per cmm and protein 25 mg/dl. Viral cultures (throat swab, urine, faeces and CSF) were negative. There was no significant rise in polio-neutralising antibodies in 2 specimens obtained 5 weeks apart.

Course. No significant recovery of muscle strength occurred while the patient was in hospital, and several years later his general practitioner reported that he had a flail right leg with weakness and wasting typical of "old polio".

The clinical features of all 10 patients are summarised in Table I. All were less than 10

TABLE 1
Clinical Features and CSF Findings

Patient No.	1	2	3	4	5
Age	2 years	4 years	7 years	3 years	4 years
Sex	M	M	F	F	M
Year and season	1968 Winter	1968 Winter	1972 Autumn	1972 Autumn	1972 Autumn
Previous immunization	Salk	Salk	Salk and Sabin	Sabin	Sabin
Days between onset of wheezing and paralysis	4	4	7	5	5
Drugs given during preceding asthmatic episode	Ethyl noradrenaline, aminophylline, ephedrobarb, crystalline penicillin, erythromycin.	Crystalline penicillin, prednisolone, ampicillin.	Orciprenaline, aminophylline, theophylline, ephedrine, phenobarbitone, prednisolone.	Ampicillin	Calcium aspirin, ephedrine, phenobarbitone, trimethoprim with sulphamethoxasol
Meningusmus	—	+	—	—	±
Muscle pain	—	+	—	+	+
Neurological findings in acute phase	Paresis right leg, absent reflexes in right leg.	Paresis right leg, absent reflexes in right leg.	Paresis right leg, slight weakness left leg, absent reflexes in right leg.	Paresis left leg, left knee jerk absent, ankle jerk depressed.	Proximal weakness left leg, absent left knee jerk
CSF					
Polymorphs/ cmm	75	5	1	7	No cells
Lymphocytes/ cmm	25	19	7	10	
Protein mg. %	25	46	61	16	33
Residual weakness	Severe	Severe	Severe	Moderate	Moderate

Patient No.	6	7	8	9	10
Age	5 years	1½ years	3 years	8 years	6 years
Sex	M	M	M	M	F
Year and season	1973 Spring	1973 Spring	1973 Spring	1973 Summer	1973 Summer
Previous immunization	Sabin	Sabin	Sabin	Sabin and Salk	Sabin
Days between onset of wheezing and paralysis	4	5	5	5	6
Drugs given during preceding asthmatic episode	Ethyl noradrenaline, aminophylline, salbutamol, choline theophyllinate with guaiphenesin	Methyl prednisolone aminophylline, salbutamol penicillin, theophylline, guaiphenesin.	Prednisolone, theophylline, ephedrine, phenobarbitone, ampicillin, trimeprazine tartrate.	Prednisolone, sod. cromoglycate, orciprenaline, aminophylline, theophylline, guaiphenesin.	Aminophylline, orciprenaline, prednisolone, salbutamol, penicillin
Meningusmus	+	—	—	±	+
Muscle pain	+	+	—	+	—
Neurological findings in acute phase	Paresis left arm, especially proximal muscles. Absent left biceps and triceps reflex.	Paresis right leg with absent reflexes in right leg.	Paresis right arm, absent reflexes in right arm. Proximal weakness left arm.	Paresis right leg and absent reflexes in right leg. Transient right extensor plantar.	Mild weakness left arm, severe generalised weakness right leg, proximal weakness left leg. Absent reflexes left arm and right leg.
CSF					
Polymorphs/ cmm	6	2	No cells, protein 40. A repeat two days later — polymorphs 60, lymphocytes 13, protein 46	63	—
Lymphocytes/ cmm	4	495		80	18
Protein mg. %	55	50		48	37
Residual weakness	Severe	Severe	Severe	Moderate	Moderate

years of age and boys predominated. Two were seen in the winter of 1968, 3 in the autumn-winter of 1972, and 5 in the spring and summer of 1973-1974. All patients had been immunised with Salk and/or Sabin vaccine. There was no case to case contact, and none of the patients lived in the same neighbourhood. They all developed paralysis 4 to 7 days after the onset of a bout of asthma. It was the first wheezing episode for one boy, but he has subsequently had further typical bouts of asthma. The other patients had a history of previous episodes of wheezing, and the immediately preceding attacks were generally of moderate severity without significant hypoxia. However patient No. 10 was significantly hypoxic, with a brief respiratory arrest and severe cyanosis occurring immediately before arrival in hospital. She was disoriented for some hours thereafter. A great variety of drugs were given to the patients for their asthma; 5 patients received corticosteroids in the immediately preceding attack; other drugs included aminophylline, orciprenaline, theophylline, ethyl noradrenaline, salbutamol, sodium cromoglycate, guaiphenesin, ampicillin, penicillin, erythromycin and trimeprazine. No single drug had been given to all patients. Weakness evolved rapidly and in most patients involved one lower limb. However, in 3 patients there has been patchy weakness of wider distribution. Two patients seen on the day of onset of weakness had extensor plantar responses, but this finding lasted for only 24 hours. Meningeal signs and muscle pain or tenderness were less conspicuous than in poliomyelitis although some degree of neck or spine stiffness was present in half the patients.

Residual weakness of the involved muscle groups has generally been severe although some recovery occurred in less severely affected muscles.

The cerebrospinal fluid was abnormal in all patients. The cell count was normal soon after the onset of paralysis in 2 patients, although in one of these there was a later pleocytosis. Either lymphocytes or neutrophils predominated. The highest cell count was 495 lymphocytes/cmm, although in most instances the total cell count was less than 50/cmm. CSF protein was mildly elevated in most patients, with the highest level being 61 mg/dl.

Virological studies were carried out in all patients. Satisfactory specimens, including faeces, throat swab and urine, were available in 9 patients and were studied with various lines of tissue culture. In patient No. 4 only cerebrospinal fluid was available for virological studies. Specimens from 6 of the patients were inoculated into suckling mice. The only viruses isolated were adenovirus type 9 from the faeces of patient No. 3 and ECHO 18 virus from a third faecal specimen of patient No. 7 obtained 3 weeks after the onset of paralysis. Examination of earlier faecal specimens from this patient were negative. Only a limited number of serological studies were obtained. There was no rise in antibody titre to poliovirus in seven patients in whom serial specimens were available. There was no evidence of recent infection with mycoplasma pneumoniae in 5 patients assessed serologically.

Electrophysiological studies were only carried out in 2 patients. Motor nerve conduction velocity of relevant nerves was normal in patient No. 3 and sensory potentials were of normal amplitude. However, the evoked motor response was of markedly diminished amplitude. In patient No. 10, motor conduction velocity of the left ulnar nerve was slightly reduced (44 metres/second compared with 50 metres/second in the right ulnar nerve).

DISCUSSION

The clinical features and cerebrospinal fluid findings of these 10 patients during the paralytic phase of their illness very closely resembles those of the paralytic phase of poliomyelitis, suggesting that the site of the neurological pathology is the anterior horn cell. Axonal damage would be an alternative possibility. The patchy distribution of the lesions and the absence of sensory changes makes a demyelinating peripheral neuropathy most unlikely. Electromyography and nerve conduction studies were only obtained in 2 patients, but normal motor conduction velocity in one patient and minimal slowing in the other is also evidence against a peripheral nerve lesion, al-

though quite consistent with either patchy anterior horn cell or axonal damage.

The truly unique clinical feature of these patients was the preceding asthmatic illness, occurring several days before the paralytic episode. Although this raised suspicion of a viral pathogen producing asthmatic attacks in susceptible children, and several days later causing anterior horn cell damage, no likely pathogen has been isolated from these patients. The adenovirus type 9 isolated from patient No. 3 was from a specimen of faeces obtained 3 days after admission, and as this virus is known to be common among patients and staff in this hospital, its significance is very doubtful. Also the ECHO 18 virus isolated from patient No. 7 3 weeks after admission to hospital is almost certainly of no significance, as virological studies of 2 earlier faecal specimens were negative. However, as in all patients the neurological illness did not commence until at least 4 days after the onset of the respiratory illness the failure to isolate a virus at the later paralytic stage does not exclude the possibility of viral infection. Poliovirus infection does seem to have been adequately excluded as this virus should have been readily isolated from faecal specimens and all patients had been previously immunised. Also, there was no rise in antibody titres for the 7 patients in whom serial serum specimens were available for polio antibody studies.

Hypoxia cannot be entertained as a likely cause of neuronal damage in these patients, as only in patient No. 10 was the attack of asthma of sufficient severity to produce significant hypoxia.

Many different drugs were administered to these patients, but as no single drug was given to all patients it seems unlikely that the paralytic illness could be a side effect of drug therapy. Corticosteroids had been given to only half the group. The time interval between the onset of the respiratory and neurological phases of the illness raises the possibility of a hypersensitivity reaction, although it is somewhat shorter than is seen in other hypersensitivity reactions involving the nervous system, e.g. Guillian-Barré syndrome. No experimental studies have been conducted on these patients to examine this possibility. An acute paralytic disease due to noninflammatory changes in anterior horn cells has been described in Mexican children by Ramos-Alvarez, Bessudo and Sabin (1969). They carried out post mortem studies on 57 Mexican children who died after acute lower motor neurone paralytic disease. After excluding cases of poliomyelitis and Guillian-Barré syndrome, they reported 15 cases in which there were degenerative changes of anterior horn cells, some involving cytoplasmic structures and others with nuclear changes. However, none of these patients was reported as having a preceding asthmatic illness. Thus, although the aetiology of the paralytic disease in these Mexican children remained obscure, it seems unlikely that they are relevant to the cases reported here.

SUMMARY

Ten children are described who have had a poliomyelitis-like illness occurring 4-7 days after the onset of a bout of acute asthma. All were previously immunised against polio, and viral studies failed to incriminate poliovirus or other viruses. The aetiology of this paralytic illness remains obscure.

ACKNOWLEDGEMENTS

The author is grateful to Mr. Ian Jack and Dr. Ian Gust for carrying out virological studies, to Dr. L. K. Shield for his assistance in this study, and to Drs. T. G. Maddison, P. Phelan, R. G. Birrell, G. Gillam, H. E. Williams, B. W. Neal and B. Spence for referring patients.

REFERENCES

Ramos-Alverez, M., Bessudo, L. and Sabin, A. (1969). Paralytic syndromes associated with non inflammatory cytoplasmic or nuclear neuropathy. *J.A.M.A.*, **207:** 1481-1492.

Weinstein, L. (1973). Poliomyelitis — a persistent problem. *N. Engl. J. Med.*, **288:** 370-372.

Williams, S. W. (1974). Personal communication.

Dr. I. J. Hopkins,
Department of Paediatrics,
University of Melbourne,
Royal Children's Hospital,
Melbourne, 3052.