A SURVEY OF FORTY-SEVEN CASES OF ANTerior POLIOMYELITIS.

MARGARET S. FERGUSON, M.D.
from Knightswood Infectious Disease Hospital, Glasgow.

The appearance in epidemic form of a disease which is normally uncommon makes it desirable that as much clinical information should be obtained from the cases as possible. The present paper does not attempt to do more than provide a picture of the kind of case which has comprised the present epidemic.

Table 1.

| Types of Virus Infections                      | No. of Cases |
|-----------------------------------------------|--------------|
| Encephalitis associated with acute specific fever | 5            |
| Primary encephalitis                          | 3            |
| Infectious polyneuritis                       | 1 (1)        |

Figure in parenthesis denotes a death.

Although it did not become evident until July, 1947, that the incidence of anterior poliomyelitis was rapidly increasing, consideration of admissions to Knightswood Hospital during the latter part of 1946 and early 1947 revealed a slightly more frequent occurrence of neuroviral manifestations. Study of Table 1 shows that eight patients with encephalitis were treated in the wards, in three of whom no recent history of infectious disease could be obtained. The ages of these eight patients ranged from three years to thirty years, and in each case a complete recovery was obtained. One further case was of unusual interest:

The patient was a man of 43 years who gave a history of an influenza-like illness four weeks prior to admission. He received treatment with penicillin for this and appeared to progress satisfactorily until three to four days before removal to hospital, when an increasing weakness of both arms developed. The patient also experienced difficulty in swallowing. On examination he was found to have a complete flaccid paralysis of his left arm and left side of face and paresis of his right arm. The deep reflexes were brisk on both arms but normal on the legs. Abdominal reflexes were absent. Both plantar responses were flexor. There was no loss of sensation. Except for slight pes cavus on the right foot no other abnormal findings were noted. Lumbar puncture produced a clear fluid under slightly increased pressure. There was no evidence of a block. No pleocytosis was found but protein was 150 mg. per cent. Sugar content was normal. A blood Wassermann test
was negative. Examination of throat and nose swabs for *C. diphtheriae* also proved negative. The patient's condition remained unchanged for two days. Difficulty in swallowing continued and the paralysis showed no improvement. On his third day in hospital he began to experience breathless attacks during which the extreme cyanosis was not relieved by the administration of oxygen. Respiratory muscles, however, seemed intact. An attempt to lumbar puncture, at this point, had to be abandoned. During one of these attacks death occurred. Unfortunately no post-mortem was permitted, but the clinical findings suggest that this was a case of infectious neuritis of the Guillain-Barré type, *i.e.*, with dissociation between the number of cells and the amount of protein in the cerebro-spinal fluid.

The occurrence of the foregoing cases (which is an unusual proportion of the normal admissions) may indicate that some environmental or other circumstance was inducing either an increase in the neurotropism of the viruses commonly present or a decrease in the resistance of the host. The appearance of an outbreak of anterior poliomyelitis might be connected with this increased incidence of viral infection.

In this epidemic, as in previous ones, the majority of patients were children. Of forty-seven confirmed cases admitted to this hospital all but eleven were under 16 years (Table 2) and more than half of these were 5 years of age or less. Although twelve abortive cases were observed, only one of them was over 15 years of age. This seeming absence of abortive cases in the older age-groups may not be a real one, for it seems probable that in a working-class area an adult, unless overwhelmed by paralysis, might be unlikely to call on medical assistance. Indeed, study of the average day of admission in each age group reveals that adults and very young babies who were unable to voice their complaints tended to be admitted only after paralysis had become evident whereas the school child gained admission to hospital much more speedily.

### Table 2.

| Years. | No. of Cases. | Deaths. | Average day of illness on admission. |
|--------|---------------|---------|-----------------------------------|
| 0—2    | 12 (2)        |         | 7.5                               |
| 2—5    | 8 (3)         |         | 6.3                               |
| 5—10   | 9 (3)         | 1       | 4.1                               |
| 10—15  | 7 (3)         | 1       | 4.3                               |
| 15—30  | 5             |         | 7.6                               |
| 30+    | 6 (1)         | 2       | 9.3                               |
| Total  | 47            | 4       | 6.5                               |

Figures in parenthesis shew abortive cases.
With regard to the symptoms the majority of cases complained of a headache, sickness and cervical or lumbar pain three to four days before the actual onset of paralysis. Several patients stated that they suffered from generalised muscular aches and pains and felt as if they were developing 'flu.' The onset of paralysis in those patients who could give a history appeared to be fairly sudden. The leg muscles were most frequently the site of paralysis (Table 3), and this was often accompanied by weakness of back and abdominal muscles. Only in three patients were both arm and leg muscles involved at one time. Of the five cases of diaphragmatic involvement, three occurred in pure bulbar infections, and although nursed in an artificial respirator of the Drinker type died within 6-36 hours. A fourth case with bulbar infection died of central cardiac arrest without previous involvement of the respiratory muscles. It is of interest to note that two of these deaths were in men of over 40 years of age.

### Table 3.
Frequency of involvement of muscle groups in 47 cases of anterior poliomyelitis.

| Arm.       | Leg. |   |
|------------|------|---|
| Right      |     | 5 |
| Left       |     | 5 |
| Abdominals |     | 11|
| Back muscles|   | 8 |
| Diaphragm  |     | 5 |
| Intercostals |   | 3 |
| Pure bulbar|     | 4 |
| Miscellaneous |   | 4 |
| No paralysis|   | 13|

### Table 4.

| Examination                  | Range.                        | Mean Value. |
|------------------------------|-------------------------------|-------------|
| Pleocytosis per cubic millimetre | 2—426 per cu.mm.            | 60          |
| C. S. F. protein in mgs.%     | 10—70 mgs.%                  | 40          |
| Blood leucocyte count         | 3,200—16,400 per cu.mm.      | 8,270       |
Examination of the cerebro-spinal fluid (C.S.F.) and blood yielded no new information (Table 4). In the C.S.F., protein values and cell counts were usually raised but not excessively. The cells were mainly lymphocytes. There appeared to be no correlation between the C.S.F. findings on admission and the subsequent extent of the paralysis. Leucocyte counts lay within normal limits but there was a tendency, as in other virus diseases, for the percentage of polymorphs to decrease as the day of illness advanced.

Progress after admission to hospital was usually satisfactory. Even in the short time in which the patients remained with us improvement was obvious in most cases and excellent in many. Only in four cases could no amelioration in the paralysis be detected. Each was a child with severe paralysis of both legs. To illustrate the improvement which may occur in four weeks I have chosen one case, a girl of 18, who was admitted with severe involvement of both legs, one arm, the back and the abdominal muscles. A study of Table 5 shows clearly that power was slowly but surely returning to the majority of muscles.

Since both the patient and the relations were apt to be unduly depressed by the severe paralysis of the initial stage, it was important

| Muscle Group                  | Right.          | Left.           |
|------------------------------|-----------------|-----------------|
|                              | Degree of       | Degree of       | Degree of       | Degree of       |
|                              | Contraction     | Contraction     | Contraction     | Contraction     |
|                              | on Admission.   | on Dismissal.   | on Admission.   | on Dismissal.   |
| Deltoid                      | Normal          | —               | Fair            | Good            |
| Trapezius                    | Normal          | —               | Good            | Normal          |
| Serratus Anterior            | Normal          | —               | Poor            | Good            |
| Rhomboids                    | Normal          | —               | Fair            | Good            |
| Biceps                       | Good            | Normal          | Good            | Normal          |
| Triceps                      | Normal          | —               | Good            | Normal          |
| Deep Flexors of Neck         | Poor            | Fair            | Poor            | Fair            |
| Abdominal Muscles            | No Power        | Fair            | No Power        | Fair            |
| Ilio Psoas Muscles           | Good            | Good            | Good            | Good            |
| Sartorius                    | Good            | Good            | Good            | Good            |
| Tensorfascia, Lata           | Normal          | —               | Good            | Good            |
| Hip Adductors                | Normal          | —               | Good            | Good            |
| Quadriceps                   | No Power        | Fair            | No Power        | Good            |
| Hamstrings                   | Normal          | Normal          | Trace           | Fair            |
| Tibialis, Anterior           | Good            | Normal          | Fair            | Good            |
| Tibialis, Posterior          | Normal          | Normal          | Good            | Good            |

Normal = Against gravity plus normal resistance.
Good = Against gravity plus slight resistance.
Fair = Against gravity only.
Poor = Keep in horizontal plane.
to realise that much of the early damage was not due to cell destruction, and that with proper management much effective muscle control would later develop.

Treatment was carried out on orthodox lines. In the acute stage when the severe pain and tenderness in the affected muscle groups prevented much handling, limbs were supported in the optimum position by sand bags. Shell splints were applied later and mild active and passive exercises begun as general improvement indicated. From four to six weeks after admission the patients were transferred if necessary to an orthopaedic unit for more intensive physiotherapy.

In this, as in all epidemics, a number of cases admitted with a diagnosis of anterior poliomyelitis proved to be suffering from a variety of other illnesses. These have provided us with a rather varied differential diagnosis of anterior poliomyelitis (Table 6). It is clear that pathological conditions of limbs other than paralysis along with upper respiratory infections constitute fully 50 per cent of these cases.

**Table 6:**

Differential Diagnosis of Anterior Poliomyelitis.

| Final Diagnosis                                      | Frequency of Occurrence |
|------------------------------------------------------|-------------------------|
| Traumatic lesions                                   | 4                       |
| Mild respiratory illness                            | 3                       |
| Tonsillitis                                          | 3                       |
| Congenital abnormality of limb                       | 2                       |
| Hysteria                                             | 2                       |
| Rheumatic manifestations                             | 2                       |
| Acute osteomyelitis                                 | 1                       |
| Meningitis (pyogenic)                               | 1                       |
| Pericarditis with effusion                           | 1                       |
| Cerebral haemorrhage                                 | 1                       |
| Phlebosclerosis                                      | 1                       |
| Severe hypochromic anaemia                           | 1                       |
| Neuro-syphilis                                       | 1                       |

**ACKNOWLEDGMENT.**

I wish to express my thanks to Dr. Thomas Anderson for his helpful criticism.