THE INCIDENCE AND TREATMENT OF SCOLIOSIS IN CEREBRAL PALSY

G. A. BALMER, LANCASTER, ENGLAND, and G. DEAN MACEWEN, WILMINGTON, DELAWARE, UNITED STATES OF AMERICA

From the Alfred I. duPont Institute of the Nemours Foundation, Wilmington

There is little in the English literature on the incidence of scoliosis in cerebral palsy. James (1967) reported two cases of scoliosis in children with cerebral palsy in a series of 3,000 cases of scoliosis. Robson (1968) screened 152 adolescents and young adults with cerebral palsy and found structural scoliosis in 15.2 per cent; in 4 per cent the condition was considered moderately severe.

A radiological review of 100 consecutive cases of children with cerebral palsy attending the out-patient clinic at the Alfred I. duPont Institute, Wilmington, Delaware, revealed twenty-one with structural scoliosis of more than 10 degrees (Table I). These children were all over the age of four: seven were under ten years and fourteen were ten or over. Fifteen of the curves measured less than 30 degrees, four between 30 and 60 degrees, and two more than 60 degrees (Table II). Although this is a small series, it suggests that the incidence of scoliosis in cerebral palsy is higher than in the general population.

**TABLE I**

<table>
<thead>
<tr>
<th>Incidence of Scoliosis in Cerebral Palsy</th>
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<tr>
<td>Number of children</td>
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<tr>
<td>Number with scoliosis of more than 10 degrees</td>
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<td>Incidence</td>
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**TABLE II**

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<thead>
<tr>
<th>Scoliosis in Twenty-one Children with Cerebral Palsy</th>
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<td>Degrees of curve</td>
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<td>Under 30 degrees</td>
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<td>30-60 degrees</td>
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<td>60-95 degrees</td>
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Shands and Eisberg (1955), in their review of 50,000 chest radiographs taken in the course of mass miniature radiography in the State of Delaware, found 936 with evidence of scoliosis—an incidence of 1.9 per cent. Of these, 0.2 per cent had curves of over 35 degrees compared to our 6 per cent in children with cerebral palsy with curves of over 30 degrees.

In many of the patients with cerebral palsy scoliosis was not suspected until a radiograph had been taken. Figure 1 shows the curve found in a fifteen-year-old girl who had not previously been suspected of having scoliosis although she had attended several clinics for treatment of cerebral palsy.

Children with cerebral palsy appear usually to have been excluded from the surgical treatment of scoliosis because of their inability to tolerate corrective plasters or even simple
immobilisation in plaster. This appears particularly to have applied to those with evidence of associated mental retardation. Treatment with the Milwaukee brace seems to have proved difficult if not impossible in these cases. There are three main reasons for this possible difficulty. 1) Mental retardation often prevents the full cooperation by the patient that is so essential in treatment with the Milwaukee brace. 2) A proper regime of back exercises in conjunction with the brace is important (Blount and Bolinske 1967), but it is often impossible to carry it out in these children, either because of physical disability or because of failure of cooperation. 3) Children with cerebral palsy are unusually prone to develop pressure sores during effective treatment of scoliosis, particularly those with the athetoid type of cerebral palsy.

This left a small but definite group of patients with severe scoliosis without a good programme of treatment. In these, Harrington instrumentation combined with spinal fusion seemed to offer a suitable method. Ten patients with cerebral palsy and scoliosis have now had such treatment and have been followed for at least one year.

**TECHNIQUE**

The Harrington rods were placed along the spine in the routine manner used in treating idiopathic scoliosis (Harrington 1962). The facets were fused throughout the length of the curve, and autogenous iliac cancellous bone was laid along the rawed areas of the laminae and spinous processes on either side.

After operation six of the ten patients were allowed to lie free in bed for ten days. A well padded plaster was then applied, extending from the chin to the thighs. In three other cases no plaster at all was used after operation because the children were unable to tolerate it. These patients were kept recumbent in bed for eight to ten months. The tenth child had a plaster applied but the chin piece had to be removed because he could not tolerate it. When plaster was used it was maintained for six to eight months, after which the child was allowed up, wearing a body plaster for a further two to three months.

**ILLUSTRATIVE CASE REPORTS**

**Case 1**—A boy had cerebral palsy of the ataxic type. Scoliosis was first noted at the age of six years. He was treated during the next nine years firstly in a double localiser plaster and then in a Milwaukee brace, but the curve continued to increase until at the age of seventeen he had a left thoracic curve of 49 degrees and a right thoraco-lumbar curve of 78 degrees (Fig. 2). Fusion was carried out when he was seventeen years of age. It extended from the fifth thoracic vertebra to the sacrum. A Harrington distraction rod was used. Treatment after operation was with a plaster in the manner described and one year later he was walking with the curve much improved. Three years after operation the upper curve measures 50 degrees and the lower one 40 degrees (Fig. 3). The patient leads as active a life as his moderately severe ataxia permits.

**Case 2**—A boy first attended the Alfred I. duPont Institute in 1966, when he was eighteen and a half years of age. Cerebral palsy of the athetoid type had been recognised early in his childhood. Scoliosis was first noted at the age of thirteen, and he wore a spinal support from that time. He had a severe right thoraco-lumbar curve of 127 degrees (Fig. 4), and was confined
Case 1. Figure 2—Radiograph of a boy of 16 years and 11 months with cerebral palsy of the ataxic type, showing a left thoracic curve of 49 degrees, and a right thoraco-lumbar curve of 78 degrees. Figure 3—Radiograph taken three years after operation, showing the upper curve to be 50 degrees and the lower one 40 degrees.

Case 2. Figure 4—Radiograph of an 181-year-old boy who had cerebral palsy with severe athetosis, showing a right thoraco-lumbar curve of 127 degrees. Figure 5—Radiograph taken eighteen months after operation, showing the curve reduced to 61 degrees.
to a wheel chair. Athetosis totally prohibited the use of any type of plaster. He was therefore treated initially at the Institute by halo-femoral distraction, followed a few weeks later by spinal fusion from the third thoracic to the fourth lumbar vertebra using a Harrington distraction rod. Halo-femoral distraction was continued after operation. A pin-track infection caused difficulty and repeated breaking of the femoral pins occurred because of the severe athetosis. It was never possible to immobilise him with plaster. However, the curve decreased so much with traction that the Harrington rod became loose, and it was necessary to explore the site of operation again. This was carried out six months after the original operation. A pseudarthrosis was found at the apex of the curve and further grafting of this area was performed. A Harrington rod was reinserted. After the second operation no traction or plaster was used. He was kept flat in bed for six months. He was allowed up one year after the original surgery using a walking aid, and is now able to walk with two canes. He is an intelligent boy and has been able to continue his studies. Radiographs taken two years after operation showed good correction of the curve and no evidence of pseudarthrosis (Fig. 5).

SUMMARY

1. Ten children with scoliosis and cerebral palsy of various types have been reviewed. All underwent operation for correction and stabilisation of the spinal curve, and spinal fusion.
2. Three of the ten patients required supplemental surgery in the form of regrafting, with or without reinsertion of Harrington rods. All have shown considerable correction of the curve, and in all cases the fusion appears to be consolidated. Operation has given these children stable spines which are compensated. Their ability to sit, and in some cases to stand, has improved.
3. In many such cases of scoliosis complicating cerebral palsy Harrington instrumentation and spinal fusion is the only feasible effective form of treatment.

REFERENCES