SCOLIOSIS IN JUVENILE CHRONIC ARTHRITIS

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Structural scoliosis occurs more commonly in patients with juvenile chronic arthritis than in the normal population. We have reviewed 32 patients with both juvenile arthritis and a scoliosis and suggest that structural curves may arise from postural curves associated with asymmetrical involvement of lower limb joints.

Juvenile chronic arthritis affects approximately one child per thousand. A significant number of these develop scoliosis, but the characteristics and behaviour of the curves are poorly understood. Two previous papers have reviewed a total of 28 patients, most of whom had major structural curves and severe functional limitation. Rombouts and Rombouts-Lindemans (1974) noted that a common feature was severe protracted disease and suggested that long curves were caused by muscle imbalance, while short curves were due to asymmetrical involvement of the apophyseal joints. Svantesson, Marhaug and Haeffner (1981) suggested that the disordered growth seen in long-standing juvenile arthritis combined with asymmetrical hip contractures and pelvic tilt were other possible causes of spinal curvature; they were also the first to suggest a connection between long-standing postural curves and the development of a structural scoliosis.

In an attempt to clarify the relationship between scoliosis and juvenile arthritis, we have reviewed 32 patients in whom both conditions were present.

PATIENTS AND METHOD

The clinical records and radiographs of 32 patients (29 girls and three boys) with a scoliosis as well as juvenile chronic arthritis were analysed retrospectively. All patients satisfied the EULAR criteria (1977) for the diagnosis of juvenile chronic arthritis (Table 1); their physical ability ranged from virtually normal to severely handicapped. All modes of onset of the arthritis were represented (pauciarticular, polyarticular and systemic). The age of onset for seronegative disease ranged from 1 to 7 years (mean 2.8 years) and for seropositive disease (four patients) from 9 to 12 years (mean 9.5 years). The age at review of seronegative patients with postural curves was from 7 to 21 years (mean 14.4 years) and of those with structural curves 17 to 23 years (mean 19.6 years): the four with seropositive disease were seen between 11 and 24 years of age (mean 17.4 years).

The angulation of the spine in the coronal and sagittal planes was assessed radiologically using the method described by Cobb (1948). Vertebral rotation was estimated using the technique of Nash and Moe (1969).

RESULTS

Sixteen patients had postural and 16 structural curves. Four patients confined to a wheelchair had a long single right-sided thoracolumbar curve involving most of the spine; three were structural and one postural. The interval between the onset of the arthritis and the identification of a structural scoliosis ranged from 10.3 to 14 years (mean 12.2 years).

Postural curves. This type of curve (without vertebral rotation) was found in 16 of the patients we reviewed; the
convexity was on the side of the shorter leg. Radiographs were available for 12 patients and revealed eight curves of less than 10°, three ranging from 10° to 20°, and one greater than 20° (24°); 11 were thoracolumbar curves and involved between three and eight vertebral segments; one was a single long thoracolumbar curve (T5–L5, 24°). Five curves were right-sided and seven left-sided.

The causes of the leg-length inequality producing these postural curves are shown in Table II.

**Structural curves.** The remaining 16 patients had a structural scoliosis; these were of three types.

*Type I.* Eight patients had Type I curves (Fig. 1), that is, short lumbar or thoracolumbar curves involving between four and eight vertebral segments and a Cobb angle ranging from 14° to 49° (mean 32°). Rotation was present in each case and was greatest in the curves with the highest Cobb angles (40° and 49°). The presence of asymmetrical disease in the lower limbs (hip contractures in six patients and physeal overgrowth in two) had resulted in tilting of the pelvis, with the high hip on the opposite side to the convexity of the lumbar curve. All the curves were painless and all the patients were able to walk. Two patients with Type I curves underwent surgery to release adduction contractures of the hips; this equalised their leg-lengths. During the year after operation, both curves decreased in size, one by 31% (from 35° to 24°) (Figs 2 to 4) and the other by 75% (from 24° to 6°). In each case, despite the reduction in Cobb angle, the vertebral rotation was unchanged.

*Type II.* Three patients had Type II curves (Fig. 5). They each had a long single thoracolumbar curve involving the whole spine, similar to that seen in paralytic disorders. All were girls with severe seronegative disease of polyarticular onset and profound disability, and all were unable to walk independently. Rotation was less marked than in the Type I curves but the Cobb angle was greater (50° to 78°). In one patient, there had been considerable osteoporotic collapse of the upper part of the thoracic curve, resulting in a 140° kyphosis.

*Type III.* Four patients had Type III curves (Fig. 6). These were thoracic curves extending over seven or eight segments; three were right-sided and one left-sided. Rotation was minimal in all cases. In three patients the curve measured between 50° and 65°, in the fourth it was 26°. One patient was seropositive. Asymmetry of the pelvis and leg-length inequality were absent.

**Table II.** Causes of leg-length inequality in 16 patients (number of affected patients shown in parentheses)

<table>
<thead>
<tr>
<th>Real</th>
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<td>Physeal overgrowth (5)</td>
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<th>Apparent</th>
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<tr>
<td>Adduction contracture of one hip (6)</td>
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<tr>
<td>Painful equinus deformity of one ankle (1)</td>
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<tr>
<td>Asymmetrical hip and knee contractures (4)</td>
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One girl developed a curve at the age of 10 which was unrelated to the arthritis; the disease had been very mild and predominantly monoarticular. No leg-length inequality was present and the onset of the curve was five years earlier than in any other patient with a thoracic curve.

**DISCUSSION**

In some children juvenile chronic arthritis is an asymmetrical disease causing leg-length inequalities. If these children can walk, they do so with a limp and with a compensatory short thoracolumbar postural scoliosis. If they are unable to walk, they spend much of their time seated and habitually adopt the same position for comfort which generates a long single thoracolumbar postural curve. In both instances a sustained postural curve exists for many years in the presence of juvenile arthritis, a condition that is well recognised as producing abnormalities of growth (Ansell and Bywaters 1978). During this latent period, the spine grows in a manner influenced by the position it has been forced to adopt. It is possible that the presence of a postural scoliosis causes localised compression of the growing epiphyses, thereby retarding their growth and creating structural change. The growth and development of the facet joints may be influenced by their constant postural asymmetry and by adaptive changes in the surrounding muscles and...
The regression of a Type I curve after adductor tenotomies.

A Type II curve.

A Type III curve.
ligaments. Vertebral rotation and the Cobb angle both increase in the long-standing curves.

While accounting for Type I and Type II curves, this fails to explain the aetiology of the Type III curve, and we have been unable to find any evidence either to support or refute the theory that it may be caused by asymmetrical involvement of the apophyseal joints (Rombouts and Rombouts-Lindemans 1974).

We found a strong correlation between a history of polyarticular disease in girls (resulting in severe functional disability and the need for a wheelchair) and the presence of a Type II structural curve. We could find no clinical or radiological features among those with Type III curves which suggested their cause.

Two patients had a high thoracic kyphosis, associated in each case with severe osteoporosis resulting from immobility or from the effects of steroid therapy.

Rarely a patient with juvenile arthritis will develop an adolescent idiopathic curve of more than 20°. The one such child we saw had a very mild monoarticular arthritis and presented with a typical adolescent idiopathic curve which was treated by posterior fusion and Harrington instrumentation.

A prospective study is needed in which particular attention should be paid to the examination of the spine in children with juvenile arthritis. If a postural curve is present, appropriate conservative measures should be taken to correct it. When considering surgery for deformities causing leg-length inequality in juvenile arthritis, the possible effects of a long-term postural curve should be taken into account.

REFERENCES


