School screening for scoliosis: cohort study of clinical course

ROBERT A DICKSON, PETER STAMPER, ANNE-MARIE SHARP, PAUL HARKER

Summary and conclusions

A visual examination of 1764 Oxford schoolchildren for scoliosis was followed by low-dose radiography of the spine in those who showed evidence of asymmetric body topography; radiography was repeated a year later to assess progression. Forty-four children had curves of 10° or more. Two had a congenital abnormality and the remaining 42 were classified according to the type of curve: sacral tilt (compensatory), spinal (idiopathic), or combined (sacral tilt and spinal). Progression occurred in 8 (14%) children, none of whom had only a sacral tilt.

These results suggest that only by measuring sacral tilt can benign compensatory curves be differentiated from true idiopathic scoliosis.

Introduction

Without careful scrutiny of the community most children with progressive scoliosis remain undetected, only to present in later life with permanent disability.1 Progression can, however, be prevented by early detection and effective conservative treatment while the deformities are mild and flexible.4 Only 10% of curves detected by screening are progressive, most being non-progressive lumbar curves. The characteristics of deformities that progress and those that are benign are not clear, but compensatory non-progressive scolioses are commonly produced by a tilt of the sacrum secondary to inequality in the length of the legs.3 This cohort study of the clinical course of scoliosis is based on the observation that in many cases of benign scoliosis detected by school screening the curve is compensatory to a tilt of the sacrum but that this tilt is a result of an inherent developmental problem of the pelvis itself rather than any inequality in the length of the legs.

Patients and methods

A senior physiotherapist experienced in spinal disorders screened 1764 13 and 14 year olds in five Oxford schools for the presence of a spinal deformity by visual inspection with the patient standing erect and leaning forward (the “one-minute school screening test”).6 Those showing evidence of asymmetric body topography were examined with low-dose spinal radiography7 in the erect position. The radiographs were measured by Cobb’s method,6 and those children with scolioses of 10° or more were examined clinically to exclude a musculoskeletal disease as a cause of the deformity. One year later these children were re-examined and radiographs taken using the low-dose technique in the presence of two of us (RAD and PS) to eliminate postural variation.

Examination of the initial standing radiograph showed that many children seemed to have a sacral tilt with reference to the horizontal fluid level in the stomach included in the same radiograph (fig 1). The low-dose spinal radiograph taken at follow-up therefore included a contrast-medium spirit-level placed on the skin between the lumbar regions. The size and magnitude of any scoliosis and the sacral tilt were recorded from these films. These data were compared with those of the initial low-dose radiograph to detect progression of the curve (a curve reaching 20° or more). Significances of differences in the mean size of the curves were confirmed statistically using Student’s t test. The relation between magnitude of sacral tilt and magnitude of scoliosis was confirmed by deriving the correlation coefficient, r. Observations concerning proportions of type of scoliosis in different sites in the spine and observations concerning progression were confirmed using the χ² test.

Results

Of the 1764 children screened 147 (8.3%) showed evidence of asymmetry of body topography and 121 of these (6.9%) had radiographic evidence of a scoliosis. Seventy-seven children (4.5%) had curves of less than 10° but 44 (2.5%) had scolioses measuring 10° or
more. The mean age of these 44 children (32 girls, 12 boys) was 14 years, 2 months (range 13 years, 4 months to 15 years, 2 months). One child had a double structural curve, and therefore the 44 children had 45 curves among them.

SITE AND AETIOLOGY OF THE SCOLIOSES

Eight curves were thoracic, 11 were thoracolumbar, and 26 were lumbar. In two children the scoliosis was a result of congenital bony abnormality of the spine (unilateral failure of segmentation) but in the remaining 42 children no vertebral abnormality could be detected radiographically. Twenty-six children (62% of the non-congenital cases) had a tilt of the sacrum in the direction of the convexity of the curve. In the remaining 18 cases the upper border of the sacrum was horizontal and the scoliosis was inherent to the spine itself. Three types of scoliosis could therefore be distinguished: sacral tilt, spinal, and combined (sacral tilt and spinal) (table 1). In nine of the children with a sacral tilt there was no discrepancy in the length of the legs and the obliquity of the upper border of the sacrum was entirely due to pelvic asymmetry (fig 2). In six the obliquity of the sacrum was a result of a combination of pelvic asymmetry and a leg-length discrepancy. The sacral tilt in the children in the combined group was either because of pelvic asymmetry, leg-length discrepancy, or a combination of the two.

Discussion

The prevalence of scoliosis in Oxford schoolchildren was similar to that noted in other series. The one-minute school screening test proved an effective method of examining for a scoliosis with only 18% of false-positives when submitted to radiographic confirmation. The radiographic screening of schoolchildren, however, raises important ethical questions,
particular in relation to the dosage to the breasts and gonads. By taking the spinal radiograph in the posteroanterior direction and incorporating an air gap the breast dose to the adolescent girl is reduced by a factor of 50, a dose which is similar to the annual background dose received in many parts of Britain. This is particularly important when radiographically monitoring those with progressive curves.

Previous screening programmes have produced high prevalence rates of scoliosis. Most cases are usually classified as idiopathic, even though very few actually progress. This study explains this finding by showing that a substantial proportion of scolioses are entirely, or partially, a result of a tilt of the sacrum in the direction of the convexity of the curve. Scoliosis did not progress in any of the children with curves caused solely by a sacral tilt. The compensatory lumbar scoliosis commonly produced by a tilt of the sacrum secondary to inequality in the legs is never progressive. Children with this problem present because of their unequal leg lengths, and their compensatory scoliosis is noted as an associated feature on clinical examination. Patients in this study whose scoliosis was a result of a sacral tilt would not have presented clinically because the tilt of the sacrum is a function of asymmetry of the pelvis rather than unequal leg lengths.

Before the introduction of school screening programmes analysis of patients presenting for treatment of a scoliosis showed a large preponderance of girls over boys, almost consistent progression, and relatively large numbers of thoracic curves. With the advent of screening, many small non-progressive lumbar curves of little importance have been detected with a female: male sex ratio approaching 1:1. Further cohort studies should include a horizontal radiographic level so that minor, non-progressive curves, as a consequence of a pelvic tilt, can be identified.

References

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