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## THE MANAGEMENT OF UNUSUAL TYPES OF SCOLIOSIS

### REPORT OF FOUR ILLUSTRATIVE CASES

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UNUSUAL types of scoliosis present many challenges in regard to management. Often there are no guide lines for the physician. Each case must be carefully analyzed and categorized according to the following classification described by Cobb<sup>1</sup> and by Ponseti and Friedman.<sup>2</sup>

- I. Postural
- II. Structural
  - A. Myopathic
    - Muscular dystrophy, etc.
  - B. Neuropathic
    - a. Poliomyelitis
    - b. Congenital
    - c. Syringomyelia
    - d. Neurofibromatosis
    - e. Friedrich's ataxia
    - f. Cerebral palsy

- C. Osteopathic
  - a. Congenital vertebral anomalies
  - b. Thoracogenic after thoracoplasty
  - c. Osteochondrodystrophy, etc.
- D. Idiopathic
  - a. Main lumbar curve
  - b. Thoracolumbar curve
  - c. Main thoracic curve
  - d. Combined thoracic and lumbar curve
  - e. Cervicothoracic curve

The most common type of scoliosis is idiopathic. It occurs most often in girls and demonstrates characteristic spinal curve patterns. The cause is not known. The other types of scoliosis are manifestations of underlying diseases or anatomic abnormalities and do not demonstrate characteristic spinal curve patterns. Certain types require early recognition and treatment in order to prevent severe deformities.<sup>3</sup> The four cases reported here are examples of: (1) combined neuropathic and osteopathic curve in a child who has multiple vertebral, rib, and spinal cord anomalies; (2) a neuropathic curve in a spastic adolescent; (3) an osteopathic curve in an adult with a congenital vertebral anomaly; and (4) an osteopathic curve after dorsal laminectomy in an adolescent. The use of Harrington instrumentation and the halo apparatus is described. Rib osteotomy, costotransversectomy, and neural arch osteotomy are employed as adjuncts of operative treatment.

#### REPORT OF ILLUSTRATIVE CASES

**Case 1.** A six-year-old girl was admitted to the Cleveland Clinic Hospital in October, 1964, because of multiple rib and vertebral anomalies. At six days of age, she underwent surgical closure of a thoracic meningocele defect, and, despite an early guarded prognosis, she recovered and grew into an intelligent child. A severe right thoracic scoliosis and pelvic obliquity developed secondary to the vertebral, rib, and spinal cord abnormalities (*Fig. 1*). A Risser localizer jacket was worn for several months and was unsuccessful in preventing progression of the scoliosis; the spinal curvature increased from 38 degrees in September, 1963, to 60 degrees in October, 1964. The pelvic obliquity also increased, resulting in subluxation of the left hip.

Examination in October, 1964, revealed a severe kyphoscoliosis. There was no sensor or significant motor loss. The left hip was hypermobile and subluxated. There was apparent shortening of the left leg. A large myelocoele sac was present over the midthoracic area. Roentgen examination disclosed a rigid curve of 60 degrees from the seventh cervical vertebra to the sacrum (*Fig. 2*). There was no evidence of diastematomyelia on roentgen examination.

In October, 1964, the first surgical procedure was performed; the left iliac crest was released. The rib deformities of the left posterior thorax were multiple and appeared to be fused into two major segments. An osteotomy was performed on the ribs and a Harrington distraction rod was inserted from the facet of the seventh cervical vertebra to a trans-sacral bar. Moderate correction of the curve and pelvic obliquity ensued. No attempt was

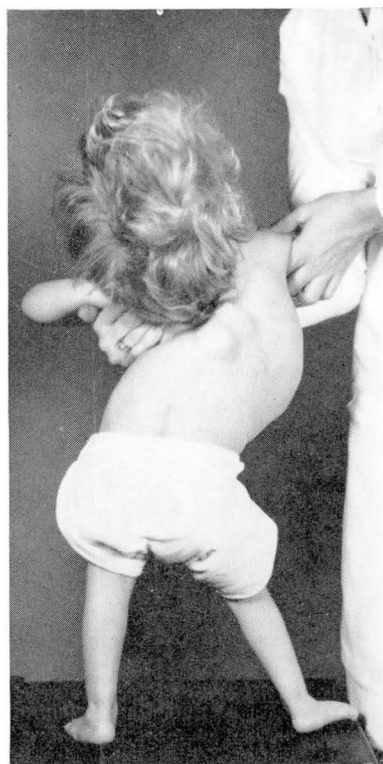


Fig. 1. Case 1 (January, 1962). Posterior view of spine, erect, of four-year-old patient.

made to perform a fusion (Fig. 3). The postoperative course was complicated by a hemo-pneumothorax. A Risser localizer jacket was applied two weeks postoperatively.

In January, 1965, a second operation was performed to release the soft tissues of the left iliolumbar area and iliac crest for further correction of the pelvic obliquity. Added distraction forces were applied to the Harrington rod, and a left skeletal femoral pin was incorporated into a spica cast (Fig. 4).

In March, 1965, a longer Harrington distraction rod was inserted and fusion was accomplished with Bopant graft material. The postoperative course was complicated by prolonged drainage of cerebrospinal fluid. A localizer cast was applied in May, 1965, and the patient remained recumbent until September, 1965. The extruding sacral pin was withdrawn and subsequently the Harrington apparatus was removed. The patient was placed in walking body cast. The fusion appeared to be solid (Fig. 5).

*Comment.* This case illustrates that multiple anomalies may be encountered in a young scoliotic patient. Radical release of the iliac crest was required before correction of a severe pelvic obliquity was possible. Rib osteotomy was utilized as a means of allowing greater correction of the scoliotic curve. The Harrington apparatus with a transsacral bar proved to be a most useful tool to correct both the scoliosis and the pelvic obliquity.

**Case 2.** A spastic 14-year-old girl was admitted to the Cleveland Clinic Hospital in June, 1965, because of an extremely severe right thoracic scoliosis. In infancy the patient contracted meningitis, and central nervous system spasticity ensued. The scoliosis was thought to be



Fig. 2. Case 1 (October 12, 1964). Spinal curve 60 degrees from the seventh cervical vertebra to the sacrum.

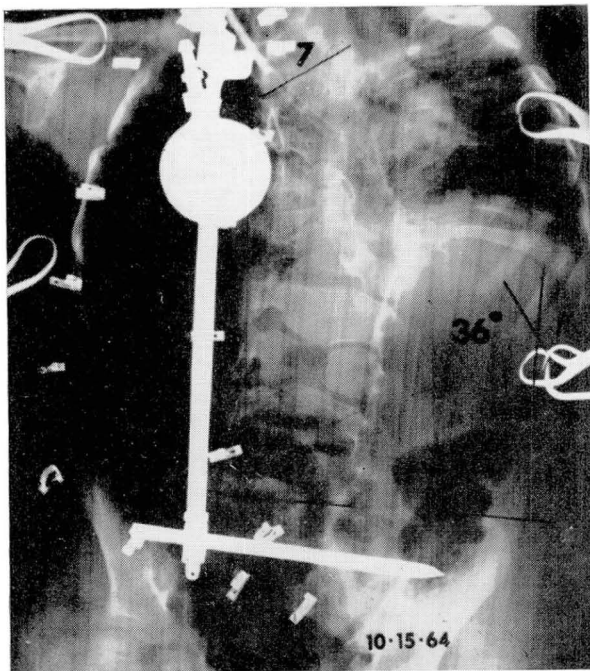


Fig. 3. Case 1 (October 15, 1964). Operative roentgenogram; spinal curve 36 degrees; with Harrington distraction rod and sacral bar.

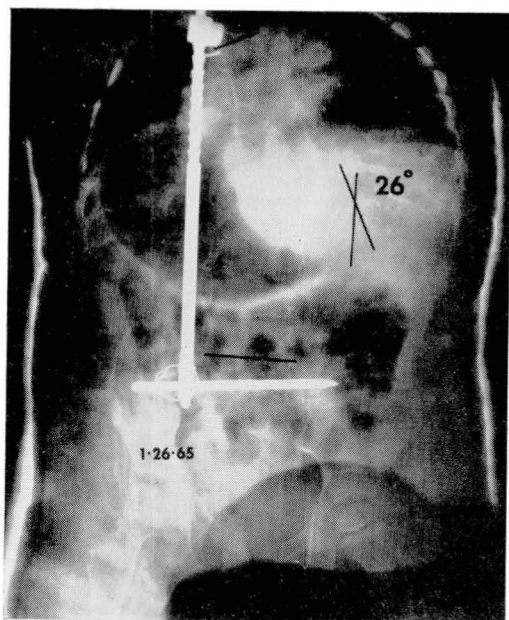


Fig. 4. Case 1 (January 26, 1965). Postoperative cast; spinal curve 26 degrees; further correction of the pelvic obliquity.

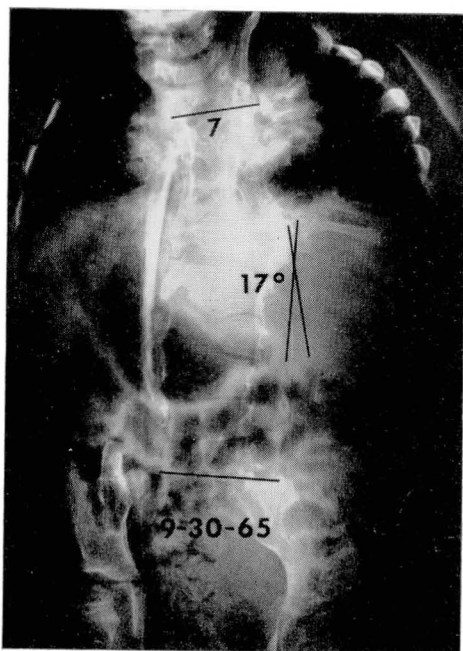


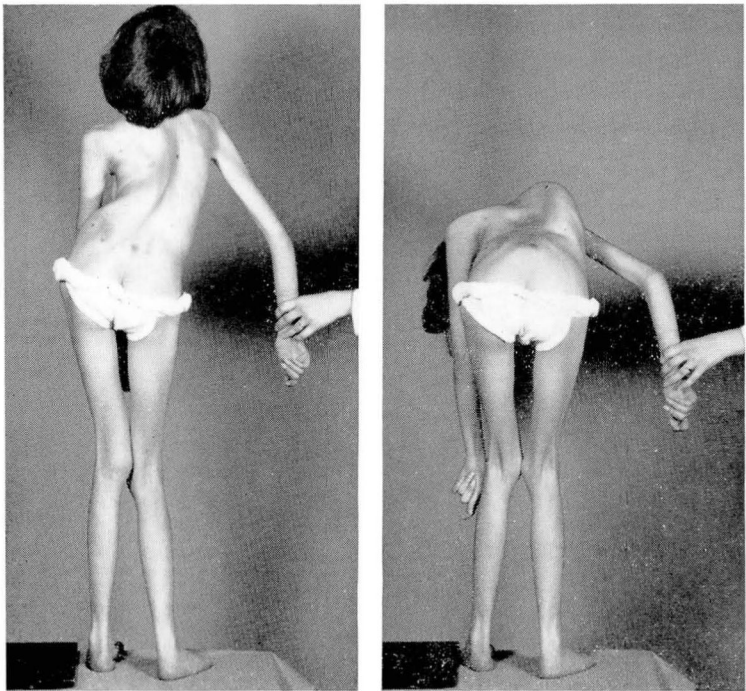
Fig. 5. Case 1 (September 30, 1965). Harrington apparatus removed; spinal curve 17 degrees; one graft material along concavity of the curve.

neurogenic in origin (*Fig. 6*). Despite a brace, the curve slowly progressed and by May, 1965, was 128 degrees from the fourth thoracic to the twelfth thoracic vertebrae (*Fig. 7*). A halo apparatus was applied and bilateral femoral traction was continued for 19 days (*Fig. 8 and 9*). The halo apparatus was then incorporated into a localizer cast (*Fig. 10*). The correction was excellent, but severe pressure sores developed over both iliac crests, and the halo apparatus and cast were removed in July, 1965.

*Comment.* This case illustrates the severe degree of spinal curvature and deformity that may result from a neuropathic type of scoliotic curve. The halo apparatus combined with skeletal traction is a most effective mechanism for correcting extreme fixed curvatures. This type of traction allows daily observation of the patient, and nursing care is less complex than with a Risser localizer cast.

**Case 3.** A 41-year-old woman was admitted to the Cleveland Clinic Hospital in November, 1964, because of right thoracic scoliosis and a two-year history of severe left-sided thoracic burning pain. An intercostal nerve block had provided temporary relief and a Hoke corset gave partial relief of pain. Investigative studies, including Pantopaque myelography, revealed no evidence of cord tumor, nerve root compression or neurofibromatosis. The patient had noted a spinal curvature in adolescence and was thought to have an idiopathic right thoracic scoliosis. The pain had progressed and was incapacitating.

Examination revealed an uncompensated sharp right thoracic scoliosis 80 degrees from the sixth to the twelfth thoracic vertebrae with rotary rib changes (*Fig. 11*). At operation a single fused transverse process was found at the eighth and ninth thoracic vertebrae at the



**Fig. 6.** Case 2 (June, 1965). Neurogenic spinal curve in a spastic adolescent girl.

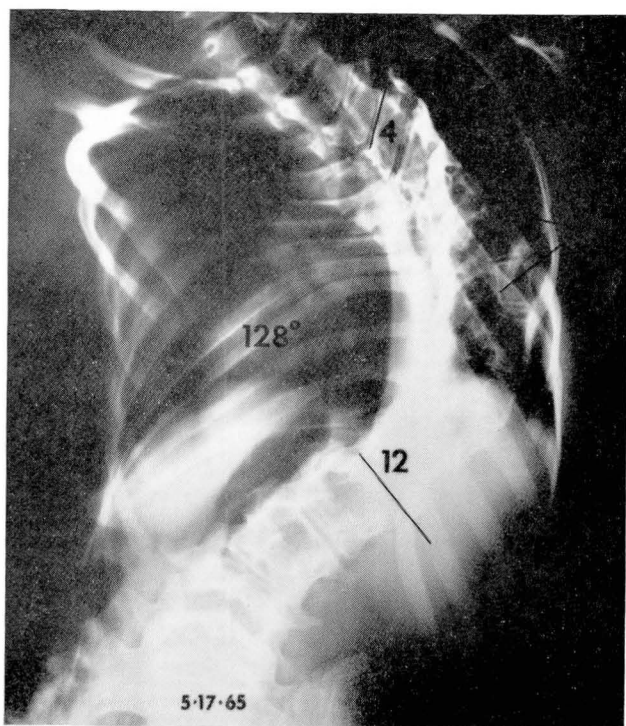


Fig. 7. Case 2 (May 17, 1965). Anteroposterior view of right thoracic spinal curve of 128 degrees, from the fourth to the twelfth thoracic vertebrae.

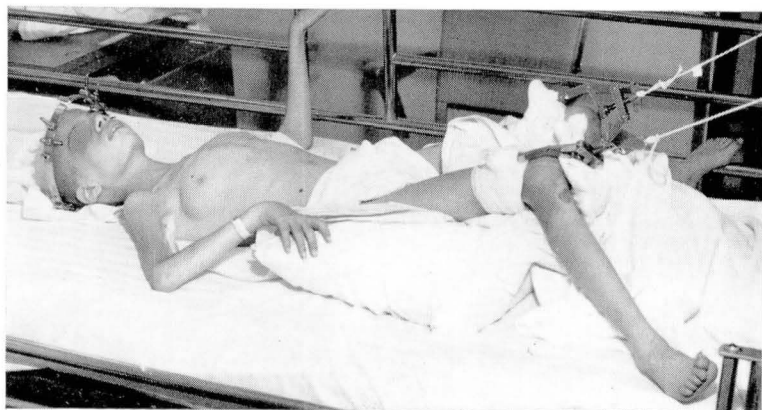
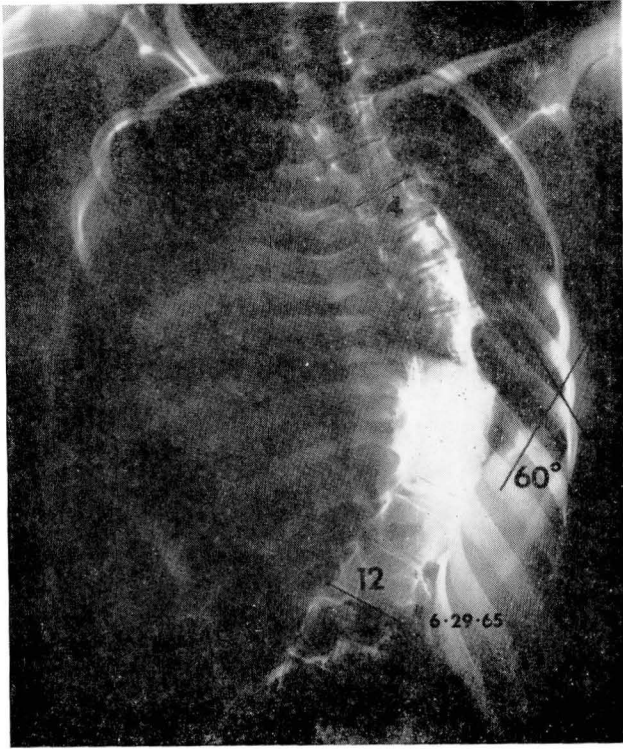


Fig. 8. Case 2 (June, 1965). Halo apparatus and femoral skeletal traction in use.



**Fig. 9.** Case 2 (June 29, 1965). Curve correction to 60 degrees after halo and femoral traction for 19 days.



**Fig. 10.** Case 2 (June, 1965). Halo apparatus incorporated into a localizer cast.

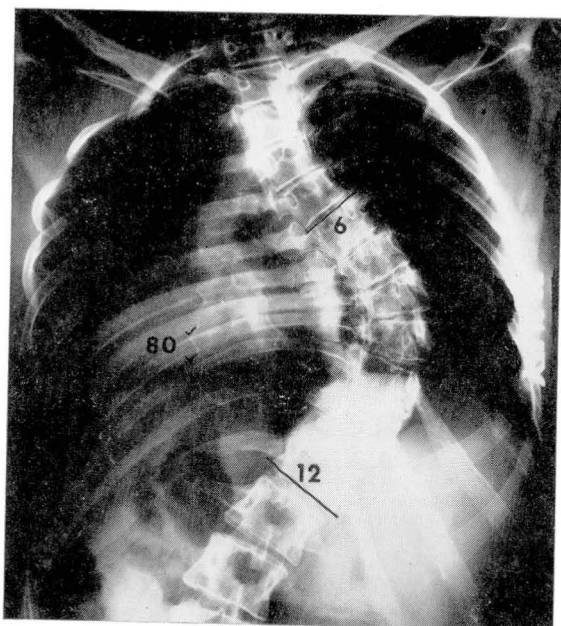


Fig. 11. Case 3 (November, 1964). Anteroposterior view of right thoracic curve, 80 degrees, from the sixth to the twelfth thoracic vertebrae.

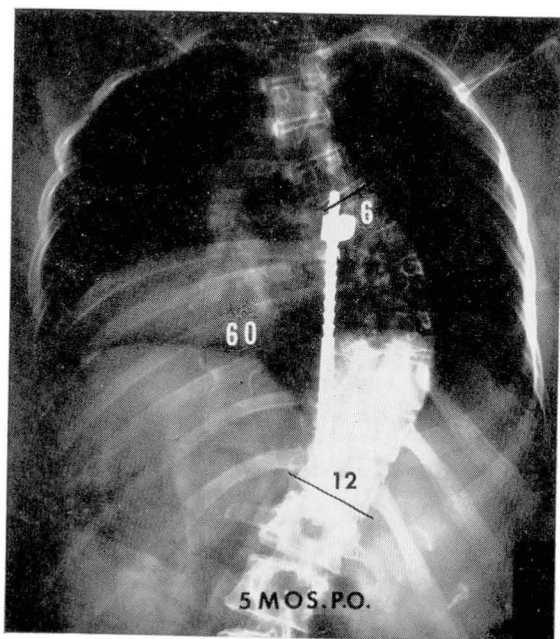


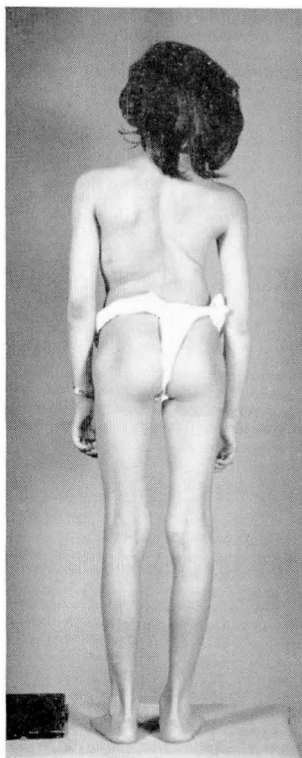
Fig. 12. Case 3 (April, 1965). Five months after operation, correction to 60 degrees with Harrington distraction rod.

apex of the concavity of the curve. Costotransversectomy was performed at the levels of the seventh, the eighth, and the ninth thoracic vertebrae. A Harrington distraction rod was then placed from the sixth to the twelfth thoracic vertebrae, and correction to 60 degrees was obtained. A spinal fusion was performed with autogenous iliac bone graft material. The patient has remained pain free and early solid fusion has occurred (*Fig. 12*).

*Comment.* This patient was thought to have idiopathic scoliosis but subsequently an unrecognized vertebral anomaly, a fused transverse process at the apex of the curve, was discovered. Costotransversectomy was utilized to provide a release of this single fused transverse process and also to allow for further correction at the apex of the fixed spinal curve. It is unusual to operate on a scoliotic adult, but in this instance cosmetic relief as well as a functional improvement was achieved by means of Harrington instrumentation, costotransversectomy, and release of a congenital vertebral anomaly. Preoperatively a careful search must be made of all roentgenograms to discover previously unrecognized congenital anomalies.

**Case 4.** An 11-year-old girl was admitted to the Cleveland Clinic Hospital in May, 1965 because of left thoracic scoliosis. In July, 1954, a dorsal laminectomy was performed for adhesive arachnoiditis at the level of the fifth and sixth thoracic vertebrae. Despite application of a corset and brace the left thoracic scoliosis slowly progressed during the decade.

Examination in March, 1965, revealed a severe left thoracic scoliosis with rib cage deformities and decompensation (*Fig. 13 and 14*). In May, 1965, surgical treatment was under-



**Fig. 13.** Case 4 (March, 1965). Osteopathic curve in adolescent girl.

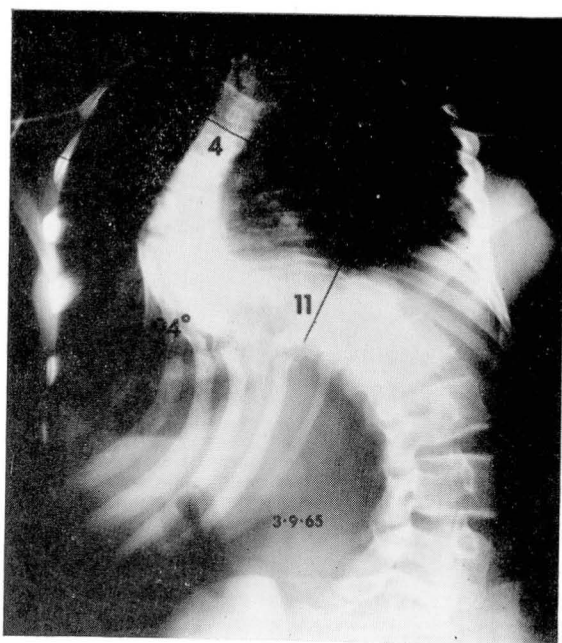


Fig. 14. Case 4 (March, 1965). Anteroposterior view of left thoracic curve, 94 degrees, from the fourth to the eleventh thoracic vertebrae.

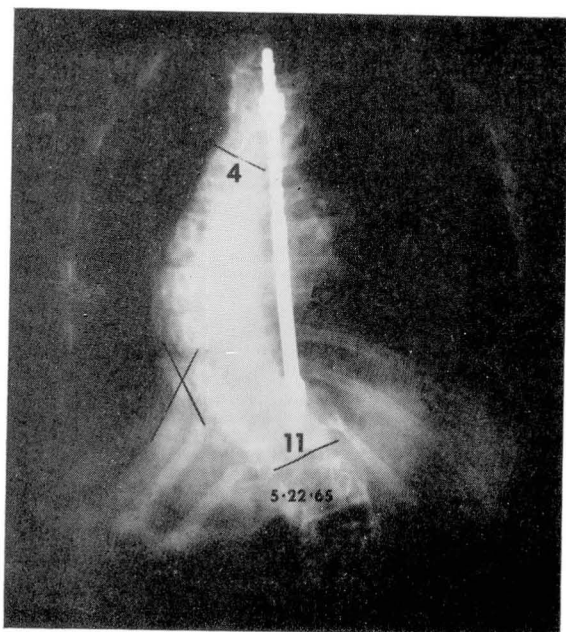


Fig. 15. Case 4 (May 22, 1965). Postoperative correction to 52 degrees with the Harrington distraction rod.

taken, and at the time, fusion of the posterior neural elements at the fifth, sixth, and seventh thoracic vertebrae was noted. Osteotomy of the fused area was performed and the distraction rod was placed from the third to eleventh thoracic vertebrae. Fusion was performed with autogenous iliac bone graft (*Fig. 15*). A Risser localizer jacket was applied postoperatively.

*Comment.* This case illustrates an unusual type of neurogenic scoliosis. Osteotomy of the posterior fused neural elements was required to allow partial correction of the severe scoliotic curve. One must be aware that such a complication is possible after dorsal laminectomy in infancy.

#### SUMMARY

The special problems encountered in the management of the unusual types of scoliosis are many, and one must be prepared to deal with unusual situations. Harrington instrumentation has been a useful contribution to the surgical treatment of certain neuropathic and osteopathic curves. Utilization of the halo apparatus for traction has aided further correction of severe and rigid spinal curves. Occasionally rib osteotomy, costotransversectomy, and posterior neural arch osteotomy are necessary adjuncts of the surgical treatment of the uncommon types of scoliosis.

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