

## SCOLIOSIS RESEARCH SOCIETY

The Scoliosis Research Society held its Sixth Annual Meeting in Hartford, Connecticut, September 8, 9, and 10, 1971. Summaries of the papers presented follow:

**Analog Studies of Scoliotic Spines.** DR. A. SCHULTZ and DR. J. GALANTE, Chicago, Illinois, and DR. H. LA ROCCA, New Orleans, Louisiana, reported on their investigation of the changes necessary to bring a normal spinal column into the configuration characteristic of idiopathic scoliosis using a mathematical analog of the human vertebral column. Their conclusions were:

1. Asymmetrical growth of vertebrae does not seem to play a role in the initiation of idiopathic scoliosis.
2. Changes in the anterior soft tissues do not seem to play any role in the initial stages of idiopathic scoliosis.
3. Changes in the lengths of the longitudinal anatomical structures which run along the transverse processes and in the lengths of the structures in the region of the deep back muscles appear to be involved in the production of the geometrical configuration of the scoliotic deformity.
4. The rotations in the frontal and horizontal plane that occur in scoliosis tend to bring the tips of the spinous processes into a straight line as they are seen on an anteroposterior view of the column.
5. Mild scoliotic configurations can be produced by motions which are within the normal range of movement of the joints of a normal spine, without any alteration of the vertebrae themselves.

The authors hypothesized that tethering caused by the extreme posterior anatomical structures plays an important role in the production of mild idiopathic scoliotic curves.

**Kinematics of the Normal Spine as Related to Scoliosis.** DR. AUGUSTUS A. WHITE III, New Haven, Connecticut, reported on his studies of the kinematics of the normal spine using two techniques: an analysis of motion of the thoracic spine using electrical recording devices and a mathematical analysis of the data obtained by a three-dimensional roentgenographic technique which demonstrated the movements of larger segments of the thoracic spine. The data were expressed in terms of a helical axis concept which allows a precise three-dimensional description of the motion between rigid bodies without having to be concerned with the variable size and shapes which are frequently a problem with biological materials. Comparisons of the axial rotation of the vertebrae, with and without their posterior elements, revealed considerably more motion about the vertical axis after the posterior elements had been removed.

Coupling of the rotations in the horizontal and in the frontal plane was reviewed and the pattern of this coupling in the normal spine was compared and contrasted with the positional rotation of the thoracic vertebrae in a scoliotic spine. It was pointed out that while the predominant pattern in the normal spine is for the vertebral body to rotate toward the concavity of the physiological curve, in some instances these vertebrae could be noted to rotate slightly into the convexity. The theoretical implications of these findings and those relevant to the change in rotation were discussed.

**A Model for Electrical Monitoring of Spinal Cord Function in Scoliosis Patients Undergoing Correction.** DR. CLYDE L. NASH, JR., DR. JERALD S. BRODKY, and DR. THOMAS J. CROFT, Cleveland, Ohio, stated that the development of more effective techniques for the correction of scoliosis has increased the risk of damage to the spinal cord, particularly with the patient under anesthesia but to date there has been no way to monitor the function of the cord during application of corrective forces. These authors had conducted experiments in which spinal cord function, both motor and sensory, had been monitored in anesthetized cats under-

going progressive, controlled, localized, and reversible spinal cord trauma by recording the averaged evoked potentials transmitted across the cord and monitored over the scalp. This method had also been used in several patients. The authors reported on their findings in both the animal experiments and their patients.

**The Surgical Correction of Kyphosis of the Spine Associated with Ankylosing Spondylitis.** DR. EDWARD H. SIMMONS, Toronto, Ontario, Canada, stated that severe fixed kyphosis of the spine is a well recognized and disabling sequela of ankylosing spondylitis. He described the principles and the technique of surgical correction of kyphotic deformities in the lumbar and cervical spine and reported on the results.

Kyphosis of the thoracolumbar spine is the most common deformity. Surgical correction should be carried out with the patient in the lateral recumbent position and in one stage using local anaesthesia and Innovar to avoid the complications of general anaesthesia.

Kyphosis of the cervical spine which may restrict the field of vision and limit opening of the mouth is best corrected with the patient in the sitting position under local anaesthesia by osteotomies between the seventh cervical and first thoracic vertebrae.

A halo unit is used during and following the procedure to maintain the correction until union is complete.

**Operative Experience with Increased Dorsal Kyphosis (Analysis of Eleven Cases with One to Eight Year Follow-up).** DR. THEODORE A. WAGNER, DR. MARR P. MULLEN, and DR. JAMES W. TUPPER, Seattle, Washington, reported on the surgical treatment of dorsal round back using two Harrington compression rods with six to eight hooks above and below the apex of the curve and posterior fusion. Preliminary skeletal traction had been used in a few cases. The patients had been kept recumbent four to six months and then had worn supportive apparatus for about one year after operation.

**The Surgical Treatment of Spine Deformity in the Childhood and Adolescent Myelodysplastic.** DR. JOHN C. BROWN, DR. CHARLES A. BONNETT, DR. JACQUELIN PERRY, and DR. JERROLD M. SHERMAN, Downey, California, reviewed the results of spine stabilization in twenty myelodysplastic patients, aged four to seventeen years. All patients were incontinent of urine and feces and had hip-flexion contractures. Thirteen had sensory and motor deficits at the second lumbar segment or above and seven had deficits at the fourth lumbar segment or below. Eighteen were either wheel-chair bound or were bedridden with pressure sores. Only two were independent walkers.

Lordosis, present in eleven patients, ranged from 70 to 118 degrees. Scoliosis was present in seven patients and ranged from 43 to 142 degrees. Kyphosis, so common in the infant and child with myelodysplasia, was present as the primary deformity in only two patients.

The treatment program was highly individualized and depended on the primary deformity and the surgical techniques available at the time treatment was initiated. Flexion body casts, Harrington instrumentation with and without anterior excision of the intervertebral discs, and trans-sacral bars were all employed at different times. Halo-pelvic fixation was used in one patient. The greatest correction was achieved in the lordotic patients and averaged 55 per cent. Scoliosis was corrected only 33 per cent on the average.

Pseudarthroses developed in five patients in whom human bank bone was used as a graft material. Two patients had postoperative wound infections requiring débridement and three had skin breakdown over previously inserted Harrington instruments. However, no patient had chronic drainage. The aim of treatment was to preserve functional independence at as high a level as possible. Five patients who were either bedridden or wheel-chair bound became functionally independent using a wheel-chair. Of the two independent walkers, one was able to manipulate a wheel-chair following surgery and the other maintained her preoperative status.

In the treatment of lordosis, which was considered the most disabling deformity, posterior Harrington distraction instruments and fusion with or without preoperative halo-femoral traction produced the best results. However, the ease of correcting the pelvic obliquity and hyperlordosis from the anterior approach makes anterior spine instrumentation and fusion increasingly attractive.

**The Possible Etiology of Idiopathic Scoliosis—A Case Report.** DR. PAUL R. HARRINGTON, Houston, Texas, noted that it has been suggested that changes in the intervertebral discs may be more significant than the changes in bone in the production of the malalignment of idiopathic scoliosis and cited the work of Kazmin who had demonstrated by discography that the nucleus was in an eccentric position in the apical intervertebral disc space in idiopathic curves. From a study of numerous roentgenograms of spines with idiopathic scoliosis, Dr.