The Battle with Bracing

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Dr. Fisk's introduction to polio came in the early 1970s when he was a U.S. Army orthopedic surgeon in Korea for two years and saw acute polio firsthand. He travels annually to Central and South America to work with children with polio.

In post-polio survivors the incidence of scoliosis has been estimated at 30%, a rather large number. Factors contributing to scoliosis are the severity of the weakness at the time of the acute illness and the region of the spine affected (the curve location may be dependent on those muscles that are weak). However, there are individuals who have significant spinal deformities with very little demonstrable trunk weakness — only lower extremity problems. The factor important, in this instance, is the age at which the paralysis occurred. The younger the age, the longer the growing period of the individuals and, consequently, the greater the likelihood the progression of curvature.

In post-polio survivors, the iliotibial band, that thick bank of tissue that goes from the side of the pelvis down to the knee, frequently becomes tightened and contracted and can cause the pelvis to tilt. Once a spine is out of balance in a growing individual, scoliosis can progress and develop.

There are different curve types. The classic, paralytic curve not only typical of polio, but also of cerebral palsy, muscular dystrophy, and some of the other spinal cord lesions, is the long C curve. Other curve patterns may also be present in these cases.

A frequently problematic curve is the lumbar curve — the lower curve that causes obliquity (not level) of the pelvis. Pelvic obliquity can impact the level of function. Someone with a pelvis at a 45 degree angle who is a full-time sitter, in reality sits all day on one cheek. It is a significant problem, not only with sleepiness in the skin, but with pressure sores and actual discomfort.

School screening done now for most of our children is a major priority of the Scoliosis Research Society. It began in 1962 in Delaware and Minnesota looking for residual deformities of polio. They soon found that scoliosis was not only due to polio but due to other causes, primarily idiopathic (cause unknown) scoliosis.

In 1956, Jip James, MD, felt that the curve was due to a weak side. If muscles are imbalanced, the spine is going to become crooked. Considered an oversimplification, we now know one of the underlying causes of idiopathic scoliosis may be very subtle spinal cord abnormalities and abnormalities in the balancing mechanism.

How are these deformities treated today?

What about bracing? A modern Milwaukee brace is much different than the old one. Bracing by a new Milwaukee is only effective in individuals who are not yet through growing. Bracing of spinal deformities in a skeletally mature individual as an adult is of real questionable benefit. Certainly, one cannot straighten the spine or prevent it from progressing. However, one may be able to slow that process of progression.

A modern Milwaukee brace

Frequently braces simply cover up what is underneath. To illustrate, consider an African lady who wore copper rings around her neck as a ritual of beauty. Women wore this adornment unless they were adulterous, in which case it was taken off. Frequently, the neck was so weak the head fell over and the individual died. *National Geographic* found a lady who had her rings taken off and compared her x-ray with a normal x-ray. They showed that the neck did not change at all. It was only a deformity of the ribs that occurred to give it the appearance of an elongated neck. The point being — this is what braces may do.

Braces have to push on something and when the curve is too severe, they will push on the ribs and deform the ribs much more than they will control the curve. For treatment in growing individuals, we observe curves from zero to 20 degrees, we brace curves between 20 and 40 degrees, and we operate on curves over 40 degrees. The effectiveness of the brace has been better defined within the last 10 to 15 years to be for a very small range of severity, such as curves with proven progression with the above defined limits in an individual with at least two years of remaining growth.

Treatment is quite different, however, in the adult. Traction has been proposed, but is fraught with complications such as osteoporosis and the loss of mineral con-

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tent from immobilization. These, as well as phlebitis, may result from the prolonged bed rest necessary for the traction.

The development of the halo allows us to apply traction in a sitting position, or even in a walking position, and thus prevent osteoporosis, facilitate pulmonary function, and allow a period of time of convalescence for individuals with severe pulmonary problems.

In a series of patients from Minnesota, halo traction was offered to 20 patients with severe deformities between 90 and 200 degrees. Fifteen had severe pulmonary function with a lung capacity in the range of 25% of normal. Whereas 15 of the 20 opted to try the halo traction, only nine of them were able to go on for surgery. In the nine who were able to tolerate the process, the blood arterial oxygen went from 55 mmHg to 64mmHg. After surgery, the $C0_2$ came down from 52mmHg to 43mmHg. Vital capacity almost doubled by improving the chest wall deformity. (mmHg — millimeters of mercury; measurement of pressure of oxygen in blood)

Who should have surgery? It is a question about which all of the experts would disagree. Here are some guidelines. Surgery may be indicated if one has curve progression, has pain, or pulmonary compromise. There are many factors that affect pulmonary function so it is a soft indication.

The last criteria is osteoporosis or the softness of the bones. Good bone structure is needed to anchor hooks and wires and hold the spine straight. (My oldest patient has been 55 years. Some will operate on age 60, but it becomes very individual based on bone stock.)

Surgery is much safer than it used to be and every year is getting more safe. A cell saver that will recapture blood after surgery, cleanse it, and return it to the patient is now used, significantly diminishing the need for blood transfusion. Spinal cord monitors are also used during the surgery to help insure that the spinal cord is not injured.

A representative patient. A 45-year-old post-polio gentleman had a curve measuring 90 degrees inside his corset. He knew he had a spinal curvature, but felt quite erect. Without the corset, he could not sit for more than 30 minutes without getting back pain. His pelvis was at 45 degrees. Not knowing whether he was stable, having minimal symptoms, or whether he was progressing and having difficulties, we followed him. A year later he had progressed 18 degrees. We proceeded with pulmonary function studies and other appropriate tests and operated giving him a level pelvis. He will be the first to tell you that it was not easy. He was advised he would be out of work for six months. And indeed he was. He is now a year following surgery and quite comfortable. His vital capacity went from 61% to 73% of normal. His ability to cough and create a good expiratory effort went from 57% to 79% of normal. He no longer wears a corset and, most importantly, his energy and stamina are greatly improved.

Accurate diagnosis is important. In the case of scoliosis, there are other things besides post-polio syndrome, and frequently it is simply degenerative changes in adulthood. The number one thing the medical profession can provide is education and understanding. Then patients can make the decisions for the proper approach to treatment.

Rest with judicious exercise, and in the case of extremity involvement, new orthotics are offering a great deal to post-polio survivors. However, in the spinal deformity area, I am cautious about recommending braces.

There is treatment available. The approach is one of appropriate evaluation, not simply rushing because something must be done. ❐

Resources: The Scoliosis Association, P.O. Box 811705, Boca Raton, FL 33481-1705 (407/994-4435); Scoliosis Research Society, 6300 N. River Rd., Suite 717, Rosemont, IL 60018; The National Scoliosis Foundation, 72 Mount Auburn St., Watertown, MA 02172 (617/926-0397).

The presentation of Glenn Ham-Rosebrock, CO, during the session The Battle with Bracing, will be featured in the next issue of Polio Network News, *Vol. 11, No. 3.*

New Insights into ALS and the Impact on Post-Polio Research

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For over 10 years I have been the Director of a NIH-funded Program Project entitled "Motor Neuron Diseases," which focuses on amyotrophic lateral sclerosis (ALS; Lou Gehrig's disease) and post-polio syndrome. One of the premises of this grant is that the mechanisms by which motor nerve cells die may be shared by varied diseases, i.e., we may learn more about post-polio syndrome by learning more about ALS and vice versa. In this article I will discuss new knowledge about ALS and how it may impact on our understanding of post-polio syndrome.

When I took over as Director for the Program Project, I thought it most valuable to try to take advantage of the new powerful technologies in use in genetics in order to learn more about how motor neurons die. For this