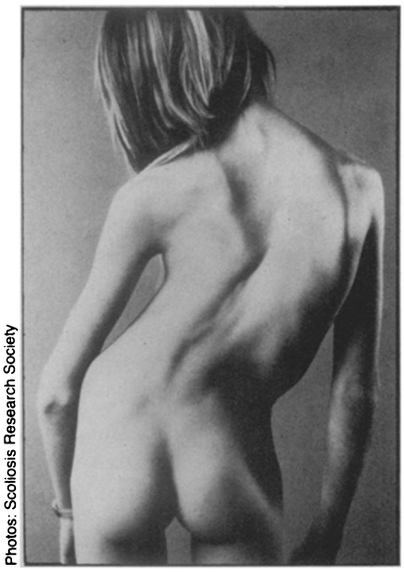
Preventing the Curve



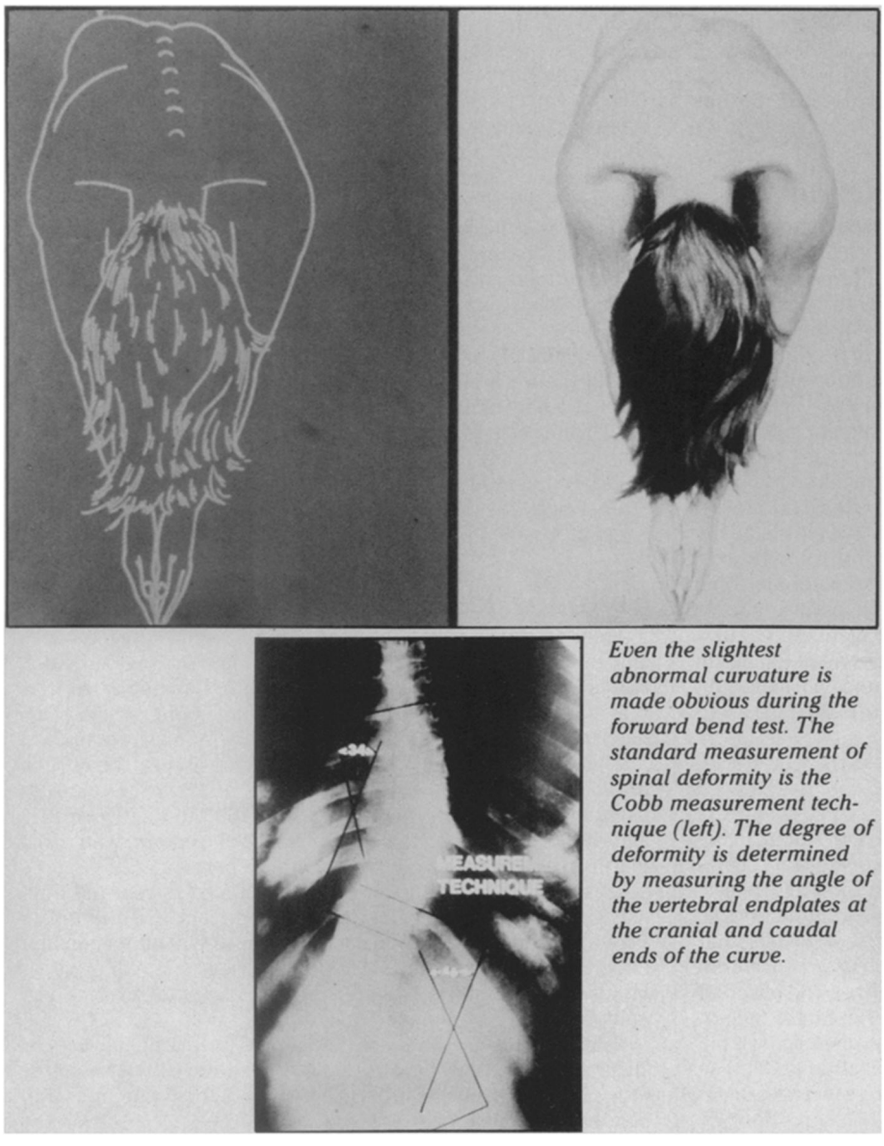
Photos: Scoliosis Research Society

Scoliosis cannot be cured, but if detected in its early stages, the deformity it causes can be prevented

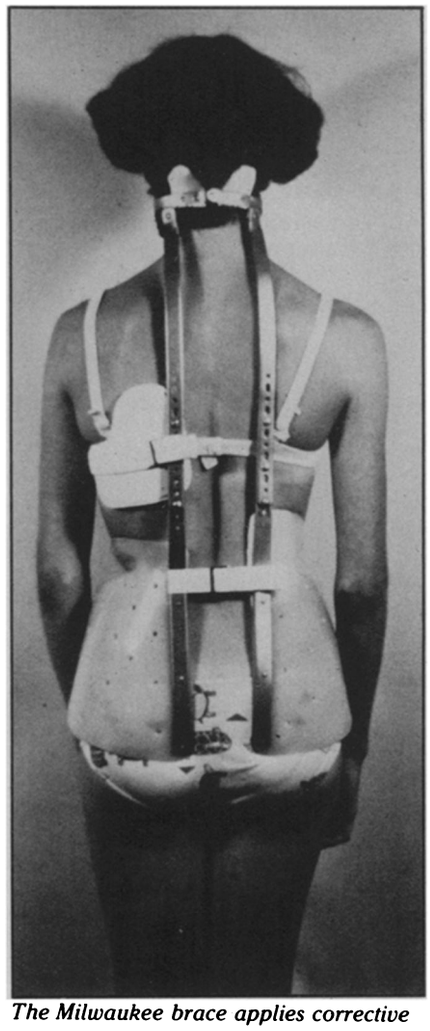
BY ROBERT J. TROTTER

"An unacceptable deformity" is one way of describing it; "hunchback" is another. But no matter what it's called, it almost always causes numerous physical and psychological problems for those seriously afflicted. And until recently it has also caused problems for those who attempted to explain or treat it.

"Scoliosis," the term coined in the 2nd century A.D. by Galen to signify lateral curvature of the spine, has been a medical enigma since ancient times. Hippocrates described various abnormal spinal curves 500 years before Galen and suggested forcible traction (on a machine similar to the basic torture-chamber rack) as a remedy. It didn't work. The various body distraction frames, steel corsets and exercise regimes applied throughout history didn't work either. In fact, very little progress was made in explaining, preventing, treating or correcting the condition until well into



Even the slightest abnormal curvature is made obvious during the forward bend test. The standard measurement of spinal deformity is the Cobb measurement technique (left). The degree of deformity is determined by measuring the angle of the vertebral endplates at the cranial and caudal ends of the curve.



The Milwaukee brace applies corrective pressure.

this century. And even then, with the help of roentgen rays to give medical scientists a better look at the problem, the prognosis remained poor. In 1941, for instance, the American Orthopaedic Association reported on a review of 425 cases of scoliosis. Of those treated with exercise and bracing, 60 percent got worse, 40 percent were unchanged. Spinal fusion, which often caused serious side effects, was also relatively ineffective, with 29 of 214 patients in one study losing all correction.

Considering this dismal background, it is almost surprising that the future now actually looks bright for scoliosis victims. Corrective surgical procedures and bracing techniques have been refined during the past 30 years to such an extent that some degree of success can be assured in most cases. But perhaps even more encouraging are the results of an ongoing, large-scale screening program that some researchers suggest might eventually prevent most severe forms of scoliosis and do away with the need for spinal surgery.

In the Middle Ages scoliosis was considered by some to be a form of divine punishment. More enlightened thinkers accused (but never proved guilty) poor posture. It is now known that scoliosis is not a single entity and that curvature of the spine can be caused by a variety of factors. Functional scoliosis is a curvature that develops as a result of another abnormality, such as a defective hip or a short leg. Structural scoliosis is the result of a fixed (sometimes congenital) deformity of the vertebral column. In addition to these, scoliosis can also be associated with muscular diseases, including cerebral palsy, muscular dystrophy and poliomyelitis. The cause of the spinal curvature in such cases is not completely understood but may be the result of paralysis of the trunk muscles.

The most common form of scoliosis, however, is ideopathic — its cause is unknown. Ideopathic scoliosis, which accounts for more than 85 percent of all cases of lateral spinal curvature, usually occurs in youngsters between the ages of 10 and 13 years, the time of the adolescent growth spurt. Recent findings suggest that perhaps as many as 10 percent of the children in that age group have scoliosis. For most, the curvature is minor, usually goes undetected and causes no serious problems. For some (one or two percent of the population, and 85 percent female), the curvature is significant and can be expected to become worse throughout the normal growth period and in some cases into adulthood if not actively treated.

For those with a serious curvature, the problem is much more than cosmetic. In addition to the psychological factors with which the young person will have to cope, there may be extensive physical consequences. Scoliosis can lead to degenerative arthritis of the spine, which produces increasingly severe back pain and disability. Other problems include disc disease and sciatica, which result from abnormal stress on the spine. As the curvature progresses (usually to the right, although there are several types of abnormal curvature) the ribs attached to the convex side of the spine are forced into what is called a rib hump. The ribs on the concave side are crowded down and prevented from expanding properly. The lungs and respiratory system can thus be severely affected. Difficulty with breathing and early death are common results of severe curves in the thoracic area.

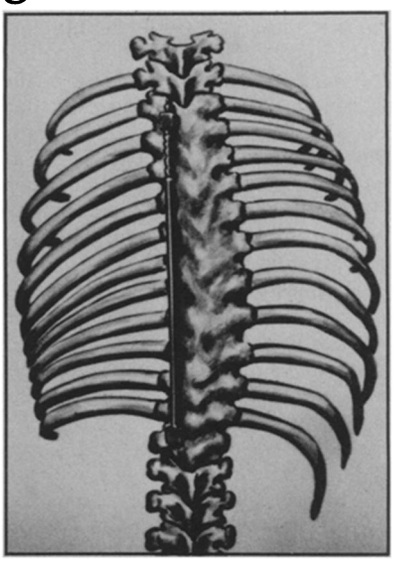
What can be done about ideopathic scoliosis? Cures often depend on finding causes, but most cases of scoliosis are as much of a mystery to today's researchers as they were to Hippocrates. Only a few clues exist: Ideopathic scoliosis tends to run in families and most victims are female — but there are not enough data to yield a satisfying genetic or chromosomal explanation.

Even without an explanation, it turns out that much of the deformity and disability caused by scoliosis can be avoided if the curvature is detected in its early stages. For this reason the Scoliosis Research Society (located in Chicago) is urging that massive screening programs be undertaken to examine all children in the at-risk age group. The examination is relatively simple and is currently being done in hundreds of schools by nurses and physical education teachers. The exam-

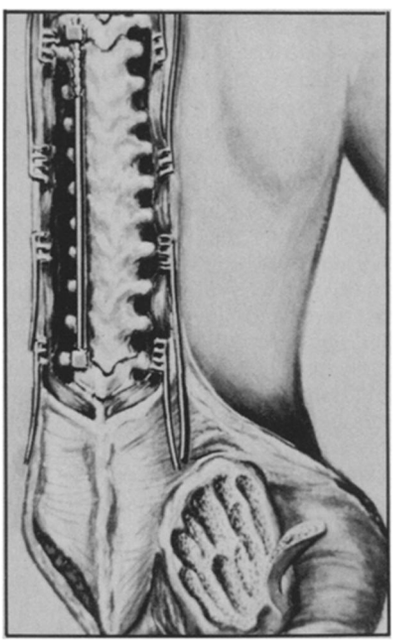
Continued on page 302

The Harrington Rod

Paul R. Harrington took responsibility for nine patients when he went to work for the National Foundation for Poliomyelitis in Houston in 1945. Six months later an epidemic struck — and continued to strike each spring and summer for ten years, accounting for approximately 4,000 polio patients in Houston by 1957. The problem of spine deformity, which developed in many polio patients, became a landmark in the life of Harrington, an orthopedic surgeon.



At the time, curvature of the spine in growing children suffering from paralytic polio was a problem with no solution. Stabilization of the spine by fusion was a useful procedure, but the magnitude of the operation often jeopardized the life of the patient. The restrictive body cast that had to be worn following surgery further compromised patients already deficient in respiratory functioning. "Therefore," explains Harrington, "an internally applied metallic implant became the answer to stabilize and correct the curving spine."



After a two-year study of the mechanisms of the spine, Harrington worked for five years with Thorkild J. Engen at the Texas Institute for Rehabilitation and Research on the design of the necessary spinal instrumentation. Forty-seven varieties of hooks and metal accessories were tested before the work began to pay off.

Meanwhile the polio foundation's purpose was achieved with the successful development of the Salk vaccine. This reduced the patient population but did not mean that Harrington's work had been in vain. The Harrington rod instrumentation system has proved effective as a corrective treatment for ideopathic scoliosis as well as for other spinal deformities and injuries. Its continued use around the world with little or no basic change and thousands of cases performed annually has proved its value. □

. . . Scoliosis

iner looks for several things: an obvious spinal curve, elevation of one shoulder, prominence of the scapula, asymmetry of the waist, prominence of the hip, trunk shifted out of balance. Of greatest importance, however, is the forward bend test. Scoliosis in its early stages is most easily detected when the youngster bends forward, which causes an otherwise undetectable rib hump to become visible.

If abnormal spinal curvature is detected, there are three options, depending on the severity of the curve. For a minor curve, observation without further treatment is called for. If the curve is not seen to progress during follow-up exams every three to six months throughout the growth period, the scoliosis probably will not progress and will cause no problems.

Slight to moderate spinal deformities can usually be treated effectively by various bracing techniques (the Milwaukee brace is the one most commonly used). The brace, which must be worn for a minimum of one year, stretches, or distracts, the spine while applying constant pressure to the apex of the curve. This treatment, along with a rigorous physical therapy program, can halt the progression of the curve and correct the deformity.

The third option — for moderate to severe deformities — is surgical correction, and the most commonly performed procedure for scoliosis is the Harrington rod implant. A stainless steel rod with an adjustable hook at the top is attached to the posterior spinal column above and below the curve. The hook is adjusted upward until the spine is elongated as much as possible to correct the curve. The implant is permanent, but most patients achieve a fairly normal level of physical activity within one year.

Jesse H. Dickson, orthopedic surgeon at the Institute for Rehabilitation and Research in Houston, Tex., performs as many as 100 spinal operations per year. He describes his work as "a cross between ditch digging and eye surgery," and hopes that early detection through screening programs eventually will make the spinal correction operation unnecessary.

A thorough screening program could "obviate the need for surgery," says William J. Kane, professor of orthopedic surgery at Northwestern University and president elect of the Scoliosis Research Society. With the help of the society, the state of Delaware is already screening 100 percent of its school children, and several other states are reaching 60 percent to 75 percent of school children. Kane is optimistic that within several years all states will begin to take the scoliosis screening program seriously and that ideopathic scoliosis — although still an incurable enigma — will no longer have to result in unacceptable deformity. □

. . . Off the Beat

ence is with him all the way. How can you not love him? He explains the world with a child's freshness. Bobbing about on stage, he acts out his "six basic forces" of nature — axial, orbital, torque, inside-out, expansion and precession. The audience laughs, claps, nods. He scorns scientists who say they can't explain things "because they don't have a model." They're like your favorite uncle, he says, who, in answer to the inquisitive child, leaves the room saying, "I've got to get a cigar." They love it. He pulls out the typical schoolroom world map, which "shows Greenland as bigger than South America and Europe thousands of miles from Asia." He discards it disdainfully, and replaces it with Fuller's undistorted map of the world. They eat it up.

"By converting all our resources from weaponry to 'live-nry,'" he says, "in 10 years . . . we can phase out fossil fuels and atomic energy and live on our energy income." Standing ovation. "But you know," he confides wickedly, "it would be devastating to the economy to have humanity be a total success." More applause.

Then he begins his work in earnest — explaining the world as a triangle. The basic unit of nature is the triangle, he says, because "nature always works with minimum effort." If the square were the basic unit of nature, then it should be the most stable unit. But it isn't, he shows with his models. A cube cannot stand freely. He kicks it aside in disgust. A tetrahedron can. Voila — nature must be built on the noble triangle. A square is really two triangles; squaring should be called triangling; cubing should be tetrahedroning. "And saying triangling is the difference between whether we're going to make it or not." "Triangling," shouts the audience. The geodesic dome, based on triangles, is the strongest, most resource-conserving structure. The screen flashes with geodesic radar stations, geodesic homes, geodesic auditoriums until you believe they are as much a part of nature as a tree.

And how can you not believe it? He is Mr. Wizard. In the flash of color and light on stage he is the only real thing. In the midst of Erhard's meaningless mush of words, Fuller alone makes sense. And he is handing you the key to the universe.

He is tearing apart one of the geodesic spheres now, talking all the while. He pauses, holds up a single, bright red tetrahedron pulled from deep within the sphere. "This," he says, "is a quark."

"Wow," says a woman behind me.

He is est's secret weapon.

—Susan West