

Short Note

The History of Spinal Deformity

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Scoliosis is a complex three - dimensional spinal deformity that results from both known and unknown causes in patients of all ages. Scoliosis can be classified by etiology: idiopathic, congenital, or neuromuscular. Idiopathic scoliosis is the diagnosis when all other causes are excluded, and comprises about 80% of all cases. Idiopathic scoliosis progression is dependent on the patient's skeletal maturity, the curve pattern, and the curve magnitude, while the other forms of childhood scoliosis can have an unpredictable course, with most being progressive [1]. Idiopathic scoliosis, a common disorder of unknown etiology, is characterized by a 3 - dimensional curvature developed from the spinal vertebrae and discs that occurs in two stages, initiation and progression [2,3]. A vicious cycle prevails as once an initial spinal curvature creates an asymmetric compressive load on a vertebra in AIS patients, an asymmetric impedance of growth of that segment results, and a wedge - shaped vertebra is formed, which further perpetuates the spinal curve with consequent progressive asymmetric loading on it and other spinal segments [3].

The care of patients suffering with scoliosis has a long and varied history extending over two thousand years. The treatment of scoliosis with longitudinal traction was first described by Hippocrates in the 5th century BC [4]. Traction was a crude treatment method that required painful, prolonged sessions which yielded little benefit. For more than five centuries there was little modification to Hippocrates' technique until Galen added direct pressure in combination with traction [5]. Galen's technique, while rudimentary, is somewhat similar in theory to the modern techniques of today. The first supportive braces used to treat spinal deformity were developed by a French army surgeon Ambrose Paré (1510-1590), who was considered one of the pioneers of modern surgery. He described a method of using extension and directed pressure to reduce spinal deformity, which he believed to result from "dislocation of the spine" [6].

After Paré, the method of treatment of scoliosis did not change for another two hundred years. In the late 1800's, Lewis Albert Sayre, a staff physician at Bellevue Hospital in New York City, NY, introduced the hypothesis that musculoskeletal imbalance is the primary cause of deformity and that treatment should center on "gymnastic exercises" to strengthen the muscles on the convex side of the deformity [7]. Sayre was the first person to hold the title Professor of Orthopaedic Surgery in America [8]. Sayre was renowned for his writings on the treatment of spinal disorders, especially with regard to the study of scoliosis. During this time, the study of idiopathic scoliosis was still in its infancy and its

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Submitted: 28 July 2016

Accepted: 28 July 2016

Published: 29 July 2016

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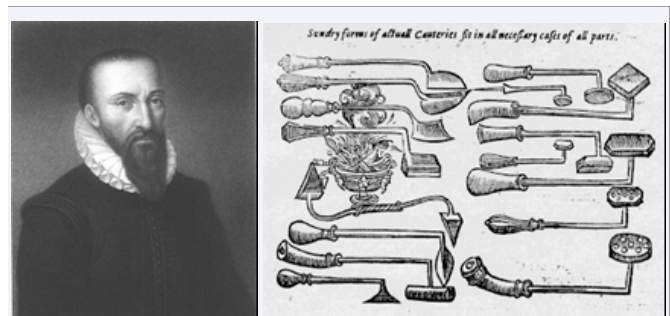


Figure 1 Ambrose Paré (1510-1590) - A set of Ambrose Paré's cauterizing instruments as shown in: *The Works of that Famous Chirurgion Ambrose Parey*, London: 1624

*Images from Yale University, Harvey Cushing/John Hay Whitney Medical Library [10].



Figure 2 Russell Hibbs, MD, New York, 1869-1932

*SRS The Hibbs Society [16].

etiology widely debated, with corset use being popularly criticized [9]. Sayre is best known, however, for his 1874 description of the use of traction in conjunction with a plaster cast to correct and hold spinal deformity.

The most important development in the treatment of deformities was in the early 1900's with the discovery of "x - rays"

by Wilhelm Conrad Roentgen [11,12]. Radiographic imaging revolutionized the study of scoliosis, in that doctors were able to see skeletal anatomy without dissection of the tissue. In the early 20th century with the spread of tuberculous and polio, the understanding of the different etiologies of scoliosis began to emerge [13]. In 1911, Russell Hibbs performed the first posterior spinal fusion at the New York - Presbyterian Hospital for a patient with a severe torsion - scoliosis deformity resulting from a tuberculous infection [14]. By 1914, Hibbs used this technique routinely to treat patients with scoliosis. For eight weeks after surgery, patients were either placed back in bed traction or were made to wear a corset, both attempted to immobilize the spine in order to promote fusion [15].

Joseph Risser, an orthopedic surgeon at the New York Orthopaedic Dispensary and Hospital, along with Hibbs, pioneered the use of the turnbuckle cast in the treatment of scoliosis. In 1931, Hibbs, Risser, and Ferguson published their work on the use of cast immobilization with posterior spinal fusion for the treatment of 360 patients with scoliosis. Their results were excellent in comparison to other available treatments: nearly 70% of patients experienced improvement or maintenance of their preoperative curvature. Surgery for scoliosis has evolved dramatically over the past century compared to early days of poor deformity correction and high pseudarthrosis rates with prolonged bed rest and casting [17]. Current treatment options are physiotherapy for mild deformities, while bracing and surgery are indicated for moderate and severe scoliosis respectively [18].

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Cite this article

Serhan H, Kuhn M (2016) The History of Spinal Deformity. *Ann Orthop Rheumatol* 4(3): 1072.