

The History of Spinal Deformity

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Abstract

The description and history of the treatment of spinal disorders have evolved from very early Grecian and Hindu times through to today's complex techniques. An emphasis on renowned figures from throughout the world who have contributed greatly to our understanding and care of spinal deformities is provided. Knowledge of the past provides significant input to our understanding of the current problems and enhances the development of future modalities of care.

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Introduction

This brief history of spinal deformity outlines what transpired from the days of ancient Egypt to the current techniques of complex derotation, translation, distraction, compression, and resection. This is not meant to be an exhaustive description but instead a chronological progression of the treatment of scoliosis. As Billroth, a famous surgeon from Zurich, Switzerland, once stated, “Only the man who is familiar with the art and science of the past is competent to aid in its progress in the future” [1].

Antiquity Writings, 3000 BC–AD 1000

Smith, in his explorations of Egypt, discovered papyrus papers from 1550 BC describing 48 cases of injury, diagnosis, and treatment, including closing with sutures [2].

The *Edwin Smith Papyrus* is a textbook on surgery that details anatomical observations and the “examination, diagnosis, treatment, and prognosis” of numerous ailments. It was probably written around 1600 BC but is regarded as a copy of several earlier texts. Medical information in it dates from as early as 3000 BC. Imhotep in the third dynasty is credited as the original author of the papyrus text and founder of ancient Egyptian medicine. The earliest known surgery was performed in Egypt around 2750 BC [3].

In 1910, the Egyptologist Ruffer described tuberculosis of the spine in the mummy of Nesperehan with all of the

indications of Pott's disease, including angular kyphosis caused by the collapse of the thoracic vertebrae [4]. Although Aristotle (4th century BC) is credited with founding the basis of comparative anatomy, it is apparent that Ancient Greek physicians read these Egyptian works and traveled to Egypt to study its medical techniques.

Hippocrates is considered the father of spinal deformity treatment. Through acute observation and logical reasoning,



Figure 1. This illustration of the “Boxing Boys” from 1600 BC clearly reflects rigid abnormalities, the likely cause being spinal deformity [5].

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Figure 2. A drawing from the 16th century displaying the correction of a spinal deformity using a Hippocratic board [5].

he was led to accurate conclusions for the structure of the spine and for its diseases (Fig. 1) [5]. Hippocrates was the first to describe the use of corrective casts. Patients were immobilized in casts formed by blood-soaked bandages [6]. Figure 2 clearly shows the correction of what was probably a tuberculous kyphosis using his traction table, which is not all that dissimilar from that used during my early years of practice. Hippocrates also introduced the words kyphosis and scoliosis, as well as performed trepanation. He described the blood supply to the spine and described normal spinal curvatures [5,6].

In his book *On Nature of Bones*, Hippocrates describes that the function of the bones, and particularly of the spine, is to maintain the erect position of man and to form the shape of the human body [7]. He describes the anatomy and the diseases of the spine and suggests treatments for patients with spinal deformities. This is the first systematic presentation of anatomy and pathology of the spine in medical history. He realized that the spine was held together by means of intervertebral discs, ligaments, and muscles, permitting him to describe the normal curvatures of the spine [5]. This remarkable knowledge of anatomy derived from cadavers in battlefields, from observations of athletes exercising in the gymnasiums, and from dissections of animals, because dissection of human bodies was prohibited.

Galen, also a Greek, described scoliosis, lordosis, and kyphosis in depth, and provided etiologic implications. He employed the same principles as Hippocrates for their management, while his studies shaped the treatment of spinal deformities for more than 1,000 years. He also described the exiting nerve roots and experiments on animals on spinal cord transection [8]. Galen's dedication to the human anatomy and treatment of diseases led to the production of a voluminous collection that became the foundation of the Galenic system of medicine. This system relied more on logical theories than observation and experience, and remained the accepted method of medicine until the Renaissance [9].

From the time of Hippocrates to the Middle Ages, a somewhat clouded period in history, surgery consisted of bloodletting, bone setting, and trephining. In the bright days of the Middle East, including the Arab world, Persia and Turkey contributed. Abbas in Persia, more than 1,000 years ago, talked of spinal trauma. Ibn Seru (980 BC–AD 5) discussed axial traction as did Somuncuoglu (1385–1468) [10].

Early “Modern” Spinal Knowledge, 1600–1900

Leonardo DaVinci (1452–1519) was the first to describe anatomy of the spine and its biomechanics in any detail [11]. He detailed the number of vertebrae as well as the relationship of various curvatures and articulations between the vertebrae. Giovanni Alfonso Borelli (1608–1679) wrote the first text on biomechanics entitled *De Motu Animalium* [12].

Bracing

Nicolas Andry de Bois-Regard (1658–1759), a French physician, is credited with using the term *orthopedics*, which literally means “straight child” and is known for his illustration of a crooked tree strapped to a straight stake [13]. The line diagram is intended to show backbone deformities and now is the symbol of orthopedic surgery. Andry believed that skeletal deformities were caused by an imbalance of the vertebral muscles and/or poor sitting posture.

Jacques Mathieu Delpuch (1777–1832) published a two-volume atlas titled *De L'orthomorphie*. He described the different ideologies of scoliosis and introduced subcutaneous tenotomy in 1818 [14]. He founded a rehabilitation facility that emphasized exercise in the treatment of postural back pain and deformity [15].

Traction

Francis Glisson (1597–1677) from Britain, a physician and pathologist, introduced the Glisson sling for the correction of scoliosis [16]. This consisted of a bandage strapped from under the axilla, above the head and under the chin. The patient's arms were translated dorsally with a rod placed anteriorly to the arms and pressing against the posterior thoracic spine. The patient would then be suspended in the air. This apparatus attempted to provide corrective forces to the apex of the deformity.

Francois LeVacher later described a skull cap distraction device to correct deformity [17]. This was applied with the patient in the upright position. Jean-Andre Venel (1740–1791), a Swiss, founded the first hospital for crippled children [18]. The hospital specialized in spinal deformity. He advocated the use of braces and appreciated the concept of the three-dimensional balance of the spine.

Surgery

The first recorded spinal surgery is by Paul of Aegina in the late 7th century [19]. He performed a laminectomy on a slave who was struck across the back with a staff. History does not record the outcome, but given that 90% of the soldiers in World War I who were rendered paraplegic died within 1 year, it is unlikely that this victim of the 7th century survived long.

The founder of modern surgery was Ambroise Paré (1510–1590), a barber-surgeon [20] who, during the 1537 siege of Turin, rejected the Galenic system of medicine and

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