AIN SHAMS UNIVERSITY
FACULTY OF MEDICINE.

Surgical treatment of paralytic scoliosis

Essay

Submitted in partial fulfilment for MSc degree in orthopaedics

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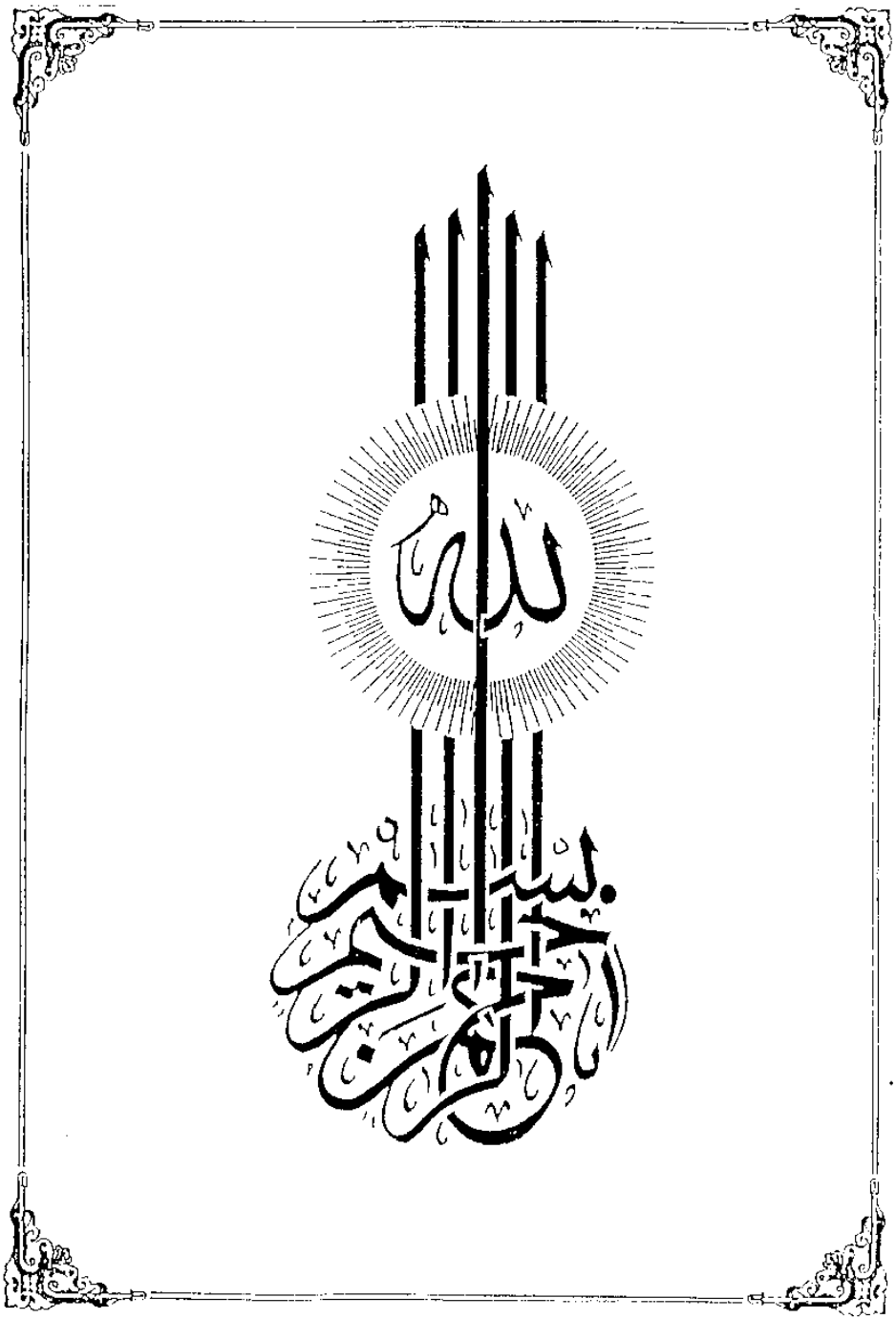

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CHAPTER I

Historical Review

(I) HISTORICAL REVIEW

Scoliosis (from the Greak word "Skolios" meaning (twisting) is by definition a three dimensional deformity which is tradionally studied and measured in one plane only (Houghton, G.R. 1984).It is adisease known throughhout most of the recorded history, and it has stimulated innumerable attempts at treatment from the time of Hippocrates to the present day in a desire to alleviate such a deforming condition. (James, J.I.P. 1967) B.C. similarly, Hippocratic manuscripts refer to the association between spinal disease and deformity and paralysis. A notable figure was (Robert Chessber) of Leicesters hire (c.1751) who treated spinal deformities by first relaxing contracted or spastic muscles by fomentation, friction, and machinary. To large extent this is what we do today. (In 1646 Hildanus) Fig. 1 illustrated a scoliotic spine, and in (1707 Merg) observed the presence of vertebral rotation in scoliosis and attributed this to unequal muscle lenght. (In 1836 Stromyer) attributed lateral curvature to asymmetric rib pressure secondary to weakness of the respiratory muscles and (Hauter 1862) thought that unequal growth of the spine and the thorax was the cause.(In 1872 Dravas)attributed scoliosis to asymmetrical muscle growth and (Enlenberg 1876)considered scoliosis to be due to unequal action of back muscle. Many techniques of

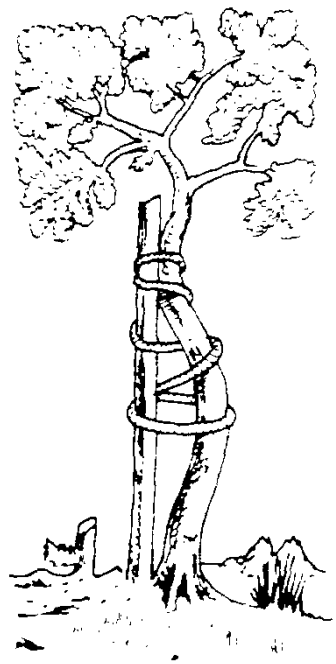

Fig. I

Pricnicple of horizontal pressure

(From Roaf, R. 1977)

correction which date from the time of Hippocrate had no chance of yielding a good-long term results until (Russle Hibbs 1911) introduced spinal fusion as a mean of immobilizing vertebrae in a fixed position (Dickson, et al.,1984a). This was done but without correction (James J.I.P.1967), and it is performed for the first time in New York orthopaedic hospital on June 23, 1914 (Moe, et al 1980). The use of Fascial grafts described by (Lowman 1973) for the treatment of paralytic scoliosis has almost ceased, the effect upon scoliosis is extreemly doubtful (Jame ,J.I.P. 1967). Since the mid 1940's Risser types of wedging plaster correction followed by a posterior Fusion including long term immobilization was the method of treatment (Hirsch, C. 1973). Then, (In 1955, Allan) Pioneered two techniques using rods and are technically much less developed than Harrington instrumentation. (Allan) was devised the first longitudinal tension apparatus and was developed by (Kasmin). Then the most commonly used is that of Harrington (Roaf, R. 1977). The Harrington instrumentation procedure which was first reported in 1962, and then modified through 1968 represents a remarkable progress made in the last few decades by using a distraction rod on the concave side of the curve (Dickson, J.H., and Harrington, P.R. 1973).(Roaf, R. 1963) has practised lateral epiphyseodesis. His belief's that the curve will straighten if the epiphyses are fixed or excised on the convex side,

leaving the concave side to continue its growth slowly and correct the curve. Recently in 1966 he has described a modified operation, anterolateral epiphyseodesis is now done to overcome the lordosis considered to be present and to be a precursor of the curvature (James, J.I.P. 1967). The present goal for the operative treatment of scoliosis are partial correction and stabilization of the corrected spine by arthrodesis.

In 1960s Dwyer has been developed and clinically realized the principle of V.D.S."ventral derotation spondylodesis" and the disadvantage of this method have become obvious to Dwyer himself.

The elastic connection of the Dwyer's implants was prone to breakage of the cable or screws with subsequent pseudoarthrosis and loss of correction. (Griss, P.,Harms, J. and Zielke, K. 1984).

In recent years anterior approach to the spinal column have become to play an important role in the management of scoliosis and it is more widely appreaciated (Bradford, D.S. 1984). Now most auther accept the use of Dwyer instrumentation in paralytic scoliosis. (Louis,C.H. 1982).

In August (1967 Dr. Luque) evolved to L-Shaped rods attached to the spine at every segment by sublaminar wires. segmental spinal instrumentation is the msot recent, widely accepted technique for internal fixation of the spine. (Allen, B.L.Jr. 1984).

The concept of securing a metal rod to the spine with wires is not new, but remained non competitive with other systems of instrumentation until (Luque and Cardoso 1977) refined the tendique. Dr. Eduardo Luque and his collaegues began the use of sublaminar wires passed around the Harrington rod to strengthen fixation of the spine (luque, E.R. 1982).

A new technique used as a method of pelvic fixation of Lower Lumber paralytic scoliosis associated with pelvic opliquity is the Galveston technique. This was initiated by Dr. Luque who had used an L-rod instrumentation. Allen and Ferguson had evolved it, to be with a triangular base, and transverse bar (Allen, B.L. and Ferguson, R.L. 1984). This brief history shows that there are no new ideas, but new techniques of investigations and surgical treatment enable one to apply the old ideas in a more effective way. Above all, modern emphasis is on the early detection and preventionof the disease (Roaf, R. "1977").

CHAPTER II

Anatomy Of The Spine

(II) ANATOMY OF THE SPINE

THE VERTEBRAL COLUMN

It is the backbone which serve a double function of support and propulsion (Last, R.J. "1978"). It comprises great strength with great flexibility, becuase it has so many joints so close together(Gardener, E., Gray, D.J., and O'Rahilly, R. "1975"), and it has five parts:cervical, thoracic, lumbar, sacral and coccygeal (Anderson, P.D. "1976"). Fig. 2.1. The vertebral column comprises 37 vertebrae connected together by ligaments and discs of fibrocartilage to form a flexible curved support for the trunk (Romanes, G.J. "1981"). It varies in length but is about 70 cm in length in a man and 60 cm in women, with the discs account for one fourth of the total length. The vertebral body increases in size from the skull downwards, to the point where the weight of the body is passed from the sacrum to the pelvic girdle and then diminishes rapidly (Hollinshead W.H. "1974"). A common faeture to most vertebrae is the presence of a large, anterior, weight bearing body, and a posteriorly placed vertebral arch which surrounds a vertebral foramen. The vertebral arch consists of 2 pedicles, and 2 laminae which meet in the midline posteriorly and continues with the spinous process. At the site of meeting of each pedicle and lamina, a transverse process, and 2 articular processes, one supperior and one inferior arise (Last, R.J. "1978").Fig. 2.2 A & B.

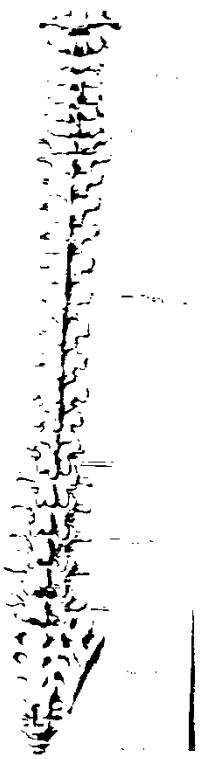

Fig. 2.1

Parts of the vertebral column

(From Romanes., G,J 1981)

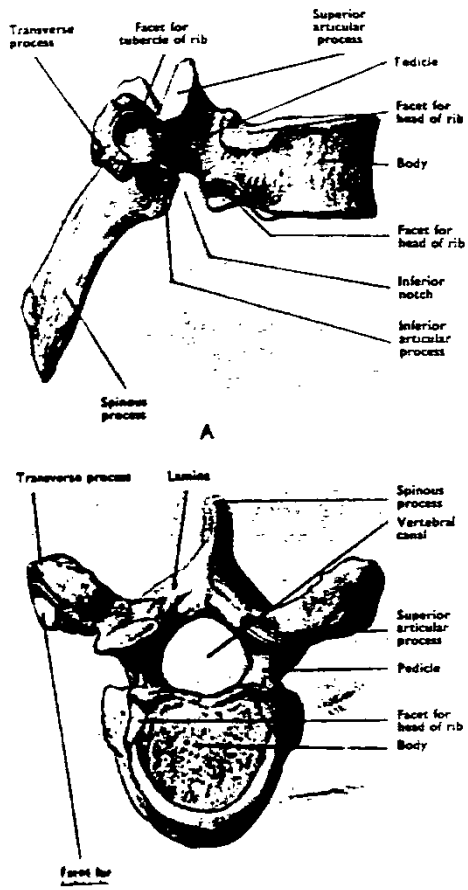

Fig. 2.2 A & B

Features Common to most vertebrae
(From Romanes G.J1981)

Ossification and development of vertebrae

Vertebrae develop from the paraxial mesoderm, which becomes divided by transverse clefts into mesodermal somites, the ventromedial part of it will form a membranous sheath of the vertebral column around the neural tube, and this is followed by cartilagenous stages which lead to ossification. Most of the epiphyseal centers of the vertebrae, ribs and pelvis donot appear unitl the puberty and fuse about the age of 25 years. The back therefore continue to grow after the limb bones have ceased, for these usually fuse before the 21 st year. The 1 ry Center for the body is doubled but rapidly fused. Failure of one half results in hemivertebra, which causes an abnormal lateral curvature of the column (Scoliosis) (Romanes, G.J. "1981").

The end plates also provide for growth and ossification of vertebral bodies and are the sites of insertion of the fibers of the annulus fibrosus. During growth years the end plates are formed by a layer of hyaline cartilage overlying a growth plate. Endochondral growth and ossification occure uniformely across the entire vertebral body until ossification centers appear in the outer region of the end-plates at around the age of twelve years. The resulting epiphyseal ring is totally ossified and Joined to the body of the vertebra by the age of 17-25 years. This coincides with the cessation of growth, although hyaline cartilage persists in the central portion