COMPARATIVE STUDY OF THE DIFFERENT MODALITIES IN THE MANAGEMENT OF SPONDYLOLISTHESIS

Thesis
Submitted to the Faculty of Medicine
Ain Shams University
in partial fulfillment of
M.D.
In Medical Sciences of Neurosurgery

By
Magdy Mohamed Mohamed Shalaby
M.B.B.Ch., M.S. (General Surgery)

Supervisors

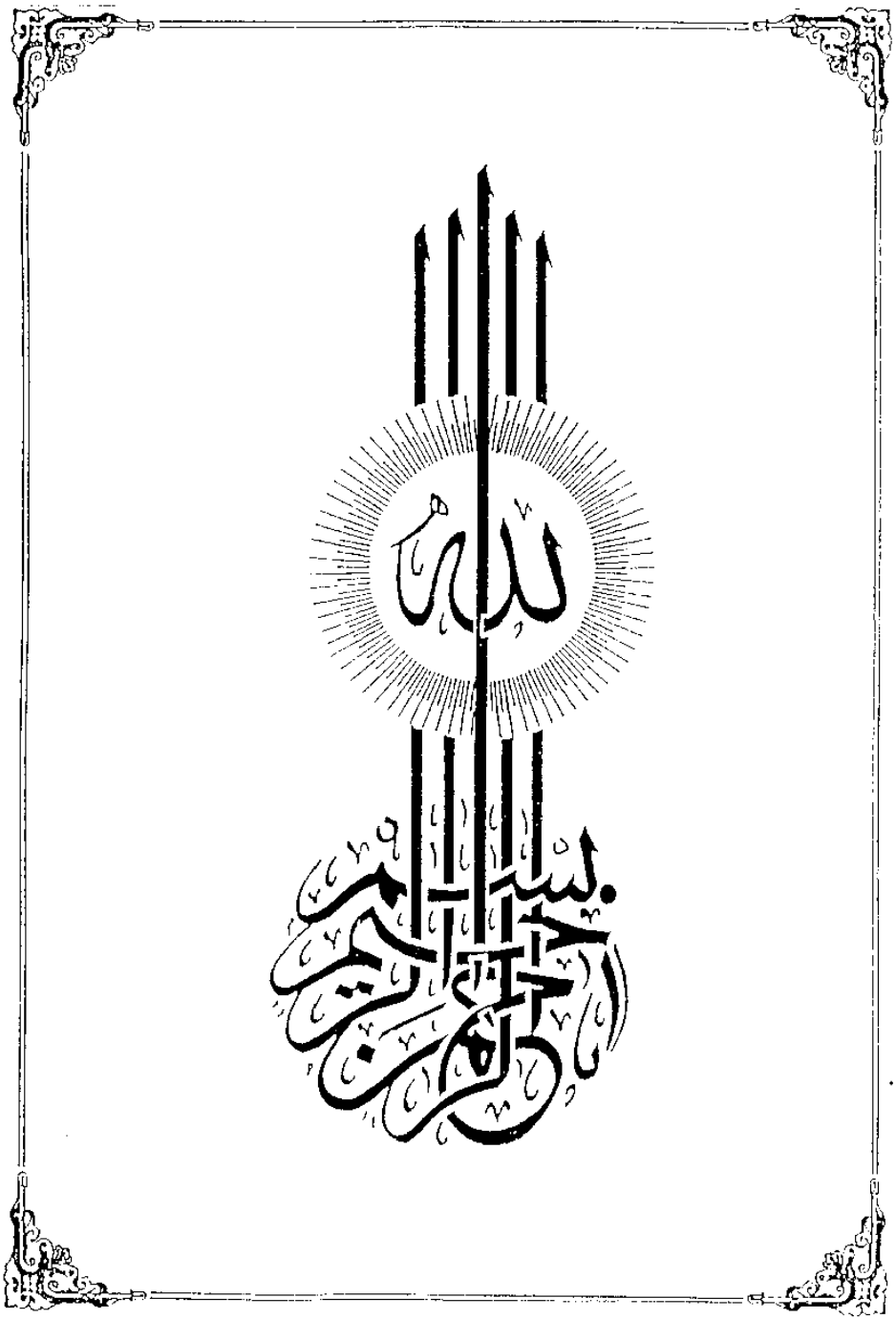
Prof. Dr. Hassanien El-Sherif
Professor of Neurosurgery
Faculty of Medicine - Ain Shams University

Prof. Dr. Mohamed Gamal El-Din Azab
Professor of Neurosurgery
Faculty of Medicine - University of Alexandria

Prof. Dr. Mamdouh Mohamed Salama
Professor and Head of Neurosurgery Department
Faculty of Medicine - Ain Shams University

1994

بسم الله الرحمن الرحيم



ACKNOWLEDGEMENTS

I wish to express my deep gratitude and sincere thanks to ***Prof. Dr. Hassanien El-Sherif****, Professor of Neurosurgery, Faculty of Medicine, Ain Shams University for his kind encouragement, valuable observations and help to put this work into reality.*

I would like to express my deepest gratefulness and indebtedness to ***Prof. Dr. Mohamed Gamal El-Din Azab****, Professor of Neurosurgery, Faculty of Medicine, University of Alexandria, for his encouragement, generous supervision, helpful criticism and unlimited support.*

I would like to express my deepest gratitude and cordial thanks to ***Prof. Dr. Mamdouh M. Salama****, Professor and Head of Neurosurgery Department, Faculty of Medicine, Aim Shams University, for his adequate and beneficial supervision and guidance to put this work in its best way.*

INTRODUCTION

INTRODUCTION

HISTORY

In 1782, Herbiniaux, a Belgian obstetrician, published a few clinical cases in which the foetal head was prevented from passing down into the pelvic canal. Judging from Herbiniaux short description. One of these may have been a case of spondylolisthesis (Friberg, 1939)

About fifty years later, Rokitansky described two pelvic specimens in which the fifth lumbar vertebra was displaced ventrally. He believed that the dislocation was due to congenital deformity in one case and to an acquired disease in the lumbosacral disc in the other (Friberg, 1939).

Other anatomic specimens were described by Kiwisch (1851), Seyffert (1953) and Spaeth (1957); they believed that systemic diseases in the bones and joints could be excluded and, by climination, came to agree with Rokitansky that it was a question of congenital deformity although they had no justifiable reasons for this conception (Friberg, 1939).

Kilian, in 1853, believed that a pathologic process in the disc could bring about a displacement of L_5. As the processes progressed, and involved

the 19th century i.e. he was only able to discover very pronounced deformities (Friberg, 1939).

Throughout this century, an increasing interest in the subject of spondylolisthesis has been developed. The improved methods of examination have meant that spondylolisthesis has not become just anatomic and orthopaedic curiosity but rather a relatively common disease whose treatment must be taken into consideration. The multitudes of methods of treatment of spondylolisthesis point to the conclusion that, up to this moment, spondylolisthesis is an unsolved problem both from the etiological and therapeutic aspects, and more efforts are still needed in these respects.

REVIEW OF LITERATURE

Anatomy of the Spine

REVIEW OF LITERATURE

Anatomy of the Spine

The human spinal column is an articulated segmental structure that serve the dural purposes of protection and motion.

The vertebral column is composed of 33 vertebrae arranged in longitudinal fashion and articulating with one another. The vertebral column is divided into areas, the cervical with 7 vertebrae, the dorsal with 12, the lumbar with 5, 5 sacral and 4 coccygeal vertebrae. Other than at the 2 extremes of the vertebral column, namely the first and second cervical vertebrae and the sacrum and coccyx, the remaining vertebrae although differ in shape and size have the basic general characteristic osseous structure.

The vertebrae may be anatomically divided into 2 elements, an anterior called the body and a posterior element formed by the vertebral arch which surrounds the spinal canal.

The lumbar vertebrae are the largest vertebrae of the spine. The bodies are often wedge-shaped, being wider anteriorly than posteriorly. The body is kidney-shaped in cross section as opposed to the typical thoracic vertebrae

which is heart-shaped. The posterior surface is flatter than that of dorsal vertebrae. The discs between lumbar vertebrae are wedge-shaped and these are primary responsible for the normal lordosis that is characteristic of the lumber spine.

The vertebral arch is composed of two pedicles which project backwards from the dorsal aspect of the body and two laminae which project postero-medially from the pedicle and meet in midline. The pedicles are short and thick and have constrictions on the top and bottom forming a shallow superior and deep inferior vertebral notch. These notches when combined in the articulated vertebrae form the intervertebral foramen through which the spinal nerves run.

Attached to the vertebral arch are several projections the name of which save for the attachment of muscles and ligaments and other for articulation with other vertebrae. The articulated longitudinal arrangement of the vertebral column is supported by various ligament and form 4 basic curves, namely the cervical lordotic curve, a thoracic kyphotic curve, a lumbar lordotic and sacral kyphosis (Finneson, 1973).

II. Joints and Ligaments :

The spine contains each of the three major types of joints : synarthrosis, diarthrosis and amphiarthrosis. Together they allow various intersegmental motions (Gordon, 1984):

A. ***Synarthrosis*** : such as the neurocentral synchondrosis, is an immobile joint in which two bones are joined by a thin cartilaginous plate.

B. ***Diarthrosis*** : are synovial joints of the gliding variety (arthrodial) such as the lumbar facet joint.

C. ***The amphiarthrosis*** : slightly movable non synovial joints, are of two types : *symphysis* and *syndesmosis*. The fibrocartilage of the intervertebral disc is typical of a symphysis type of amphiarthrosis. Ligamentous connections between the vertebrae constitute the syndesmotic type of amphiarthrosis.

The vertebral bodies are limited by anterior and posterior longitudinal ligament and by intervertebral discs of fibrocartilage.

The anterior longitudinal ligaments :

It is a broad strong band of fibers, extending along the anterior surfaces of the vertebral bodies. It is broader below than above, thicker and narrower in the dorsal-region than in the lumbar region. It consist of 3 layers of dense fibers all running in longitudinal direction. The most superficial fibers are the longest and extend over 4 or 5 vertebrae. The middle layer

extends between 2 or 3 vertebrae. The innermost layers extends from one vertebra to the next, adhering intimately to the intervertebral discs and the outer raised bony rim of the vertebral body but not to the mid-portion of the bodies where it is thicker (Snell, 1987).

The posterior longitudinal ligament :

It lies within the vertebral canal, extending along the posterior surface of vertebral bodies. It consists of two layers, the superficial layer extending over 3 or 4 vertebrae, and a deep layer extending between adjacent vertebrae. The fibers are attached to the intervertebral disc and to the margins of the vertebral bodies, but are separated from the middle parts of the bodies by the emerging basivertebral veins. In the dorsal region the ligament is broad but in the lower dorsal and lumbar regions it presents a denticulated appearance, being narrow over the vertebral bodies and broad over the discs.

The intervertebral discs :

They are interposed between the adjacent surfaces of the bodies of the vertebrae. They form the chief bonds of connection between the vertebrae. They are of nearly uniform in thickness in the dorsal region, while they are thicker in front than behind in the lumbar region. The discs are thin in the upper dorsal regions but gradually increase in thickness from these downwards.

Each intervertebral disc consists of an avascular gelatinous nucleus bordered above and below by the cartilaginous vertebral end plate and peripherally by the annulus fibrosus which has very secure fibrous attachment to the vertebral body margins. The annulus is reinforced by a broad and very substantial anterior longitudinal ligament and by a much narrower and weaker posterior longitudinal ligament.

The annulus fibrosus is composed of concentric lamellae with the fibers of one layer running at an angle to those of the preceding layer.

The gelatinous nucleus enclosed within a fibrocartilagenous annulus is an excellent elastic shock absorber (Kaufer, 1975).

It is composed of a loose network of fibrous tissue within a mucoprotein gel. In its normal state it has a gelatinous consistency and is semitransparent. The degenerated nucleus is denser, more fibrous and completely opaque.

The laminae, spines and transverse process are connected by the following ligament :

- Ligamenta flava.
- Supraspinous ligaments.
- Interspinous ligaments.
- Intertransverse ligaments.

The intertransverse ligament :

Are interposed between the transverse process. In the lumbar region they are flat membranous bands. They are relatively weak and unimportant as bonds of union.

Spinal stability :

The vertebral body articulations rely for their stability upon the immensely strong annulus fibrosus, and the anterior and posterior longitudinal ligaments. The neural arch, with its associated processes, capsule and ligaments limits and controls the extent and direction of motion at each level. The neural arch is largely responsible for spinal stability (Kaufor, 1975)

The vertebral arch articulations are responsible by the capsule of the posterolateral apophyseal joints, by the intraspinous and supraspinous ligaments and by the ligamenta flava. It is upon this complex group of ligaments that the stability of the spine largely depends (Holds, 1963). The shape and direction of the articular process in the lumbar regions act also as stabilizing factor.