RADIOLOGICAL STUDY OF COLLAPSED VERTEBRA

A THESIS

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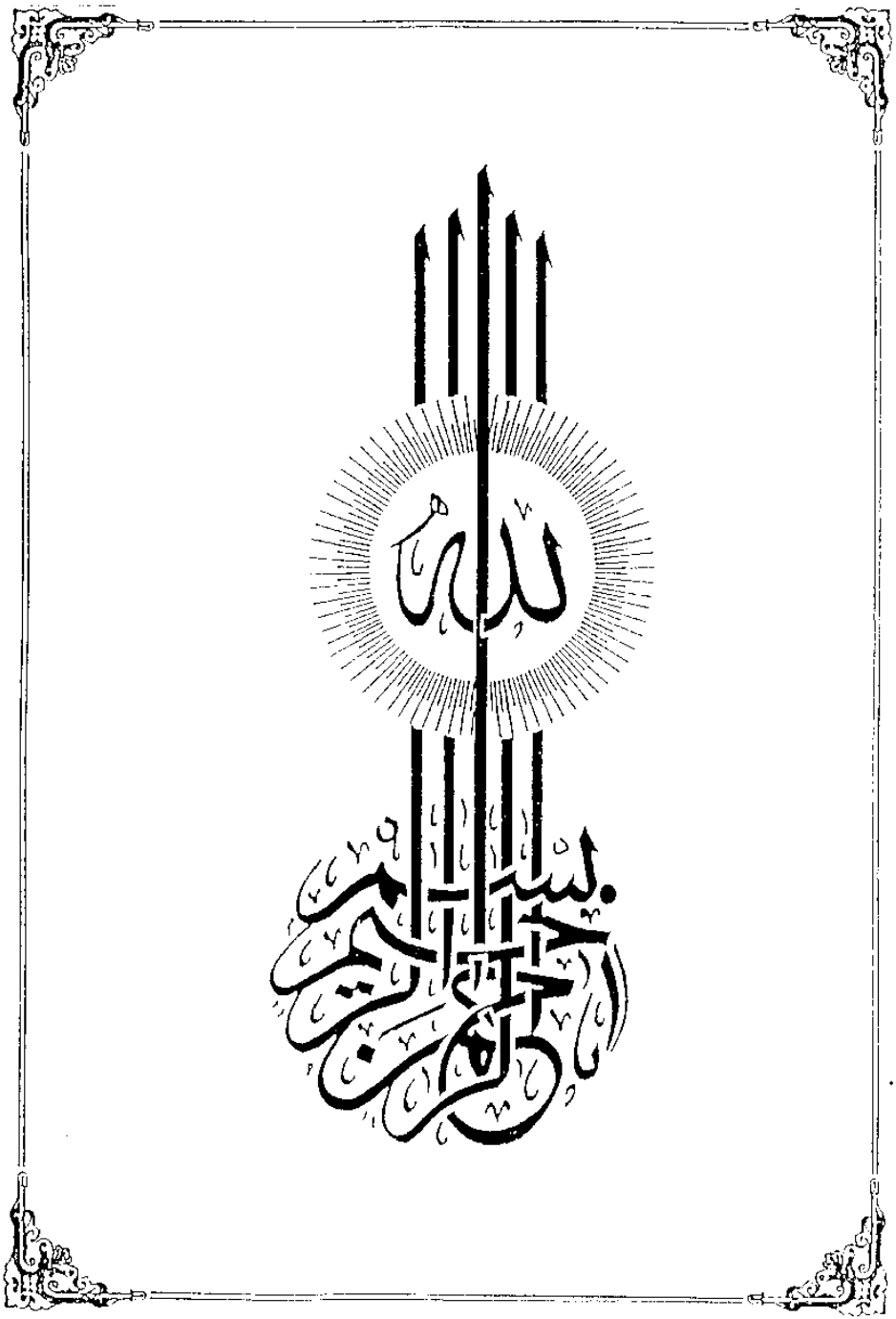

C O N T E N T S

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INTRODUCTION
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Collapsed vertebra means diminution of the size of vertebral body and alteration of its shape and bone density with or without affection of the intervetebral disc space.

The condition affects any age group and is detected in any part of the vertebral column especially the cervical, thoracic and lumbar regions. It has been found to be associated with many pathological lesions, including traumatic, congenital, infections, tumours and tumour like lesions endocrinal, metabolic, reticulosis and haemopoietic disorders .

The aim of this work is to show the value of radiological examination in the diagnosis of collapsed vertebra and to draw the attention to the possible etiological factors.

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RADIOLOGICAL ANATOMY OF VERTEBRAL COLUMN

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The vertebral column is the central axis of the body. It consists of a number of independent irregular bones termed the vertebrae, so it provides a considerable range of movement of the trunk. It protects the spinal cord, supports the skull and indirectly the upper limbs and transmits the weight of the body to the lower limbs. The normal spine consists of 33 vertebrae, grouped according to their situation as follows ;

7	Cervical
12	Thoracic
5	Lumbar
5	Sacral [Fused into the sacrum]
4	Coccygeal [Fused into the coccyx.] [Last,1973].

The curves of the vertebral column :

The vertebral curvature in the embryo presents a simple curve due to the ventriflex posture in the uterus.

However, when the infant after birth reaches the stage of assuming the upright position, the vertebral column comes to form a sigmoid curve. This curvature helps to prevent

direct impact upon the brain in case of a fall, since it functions as a buffer to protect the head. [Yokochi,1971].

Viewed laterally, the adult vertebral column has 4 antero-posterior curves :

1. Cervical lordosis, secondary curve, convexity forwards, starts from C_1 to T_2 vertebra.

2. Thoracic kyphosis, primary curve, concavity forwards, starts from T_2 to T_{12} vertebra .

3. Lumbar lordosis, secondary curve, convexity forwards, starts from T_{12} vertebra to lumbosacral angle .

4. Pelvic curve, primary, concavity faces downwards and forwards, starts from the lumbosacral angle to the lower end of the coccyx. [Meschan, 1959].

Movements of vertebral column :

The movements permitted between two adjacent vertebrae are limited due to the connection between the bodies of vertebrae by the intervertebral discs. However, the summation of the movements between the vertebrae will give a wider range of movement in the column as a whole.

The movements allowed in the column are :

1. Flexion and extension :

Free in the cervical and to a less extent in the lumbar region. Restricted in the thoracic region [especially upper] so as not be interfere with movements of respiration

2. Lateral flexion [side bending] :

Occurs in all parts of column. However, it is free in the cervical and lumbar regions.

3. Rotation:

Practically limited in the cervical and lumbar regions. Occurs freely in the thoracic region. [Mahran et al., 1971].

General characteristics of a typical vertebra :

Except for the atlas and the axis, the movable presacral vertebrae have many common characteristics.

A typical vertebra is made up of :

I . Body, the ventral strong part .

II. Vertebral [neural] arch, dorsal part behind the

body, has a pair of pedicles and a pair of laminae.

III. Seven processes diverge from the arch.

a] Spinous Process :

One in mid line posteriorly .

b] Transverse processes :

Two project laterally one on each side .

c] Articular Processes :

Four, [two superior and two inferior] carrying articular facets .

I. THE BODY :

Strong and cylindrical forming the weight bearing portion of the vertebra. Therefore the size of body increases as we go downwards towards the lumbar region. Its upper and lower surfaces are flattened. However, its peripheral margin has an elevated rim of smooth cortical bone, formed from the fusion of the secondary ossification centre of the vertebral end-plate to the body. These end-plates give strong attachment to the fibro-cartilaginous intervertebral discs, which bind the vertebral bodies together. The sides of the vertebral body are slightly concave anteriorly and laterally, while posteriorly they are relatively flat.

II. THE VERTEBRAL ARCH :

A. The Pedicles, are a pair of short, thick and rounded bars one on each side projecting backwards from the vertebral body between its posterior and lateral surfaces. At its attachment inferiorly, there is the deep inferior vertebral notch. When two adjacent vertebrae are articulated, [in the articulated vertebral column] the superior notch of the vertebra below and the inferior notch of the vertebra above will form the intervertebral foramen through which pass a spinal nerve and vessel.

B. The Laminae, two broad flat plates projecting backwards and medially from the pedicles. The two laminae meet posterioly in the midline at the spinous process thus completing the vertebral foramen through which pass the spinal cord and its meninges .

III. THE PROCESSES OF THE VERTEBRAL ARCH :

A. The Spinous process :

Projects backwards and downwards at the meeting of the two laminae. It is the only part of the vertebra which could be felt subcutaneously. It is variable in size, shape and direction. Serves for the attachment of muscles and ligaments and acts as lever for the movements of the

column particularly extension.

B. The transverse processes :

Project laterally from the vertebral arch at the junction of pedicles and laminae. Serve for attachments of muscles and ligaments and act as levers for rotatory and side movements of the column.

C. The articular processes :

Are 2 superior and 2 inferior. Attached to the neural arch at the junction of pedicles with laminae. The superior is prominent, projects upwards, its articular surface is oval and faces backwards. The inferior projects downwards its articular surface locks forwards. In the articulating vertebrae, the superior articular facet of the lower vertebra articulates with the inferior facet of the vertebra above. [Warwick and Williams, 1975].

Articulations between vertebrae :

The vertebrae are articulated to one another by a series of cartilaginous joints between the vertebral bodies and synovial joints and ligaments between the vertebral arches.

A. Articulations between the vertebral bodies :

1. The intervertebral disc :

A plate of fibrocartilage which is placed between the bodies of adjacent vertebrae from the axis till the sacrum. Thickness of disc is variable in regions of column In cervical and lumbar, thicker in front, therefore they share in the formation of the convexity in these regions. In thoracic, uniform in thickness. There is a progressive change in the radiographic appearnce of the normal intervertebral disc from infancy to old age, in the six month foetus the cartilage space is almost as wide as the body. In the adults, the discs form approximately 20% of the length of spinal column.

The normal disc is composed of 3 parts:

a. The Disc Plates , are 2 thin layers of hyaline cartilages which lie over the central perforated area of each vertebrae. They enclose the nucleus pulposus.

b. The Nucleus Pulposus, a middle mass which is elastic, rounded and firm. In the embryo it lies in the centre of the disc, while in the adults it lies more to the posterior.

c. The annulus fibrosus, consists of lamellated fibrocartilage bounded by fibrous tissue and arranged annularly in the periphery.

2. Anterior longitudinal ligament :

Extends from the C_1 to the sacrum. It is firmly united to the vertebral bodies, but is free over the intervertebral discs.

3. Posterior longitudinal ligament :

Lies inside the vertebral canal on the posterior surface of the bodies of the vertebrae from C_2 to the sacral canal. It is firmly bound to the intervertebral discs, but separated from the vertebral bodies by venous plexus.

B. Articulation between the vertebral arches and processes :

Adjacent vertebral arches and processes are articulated by apophyseal joints and ligaments :

1. The apophyseal joints :

Are between the articular facets of the adjacent vertebrae. Attached not to the margins of the facets, but to the outer surfaces of the articular processes of these