CHEST WALL DEFORMITIES

Protocol of an essay presented for the partial fulfillment of the degree of Master of Surgery.

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1994

In the name of God, most gracious,most merciful.

Aknowledgment

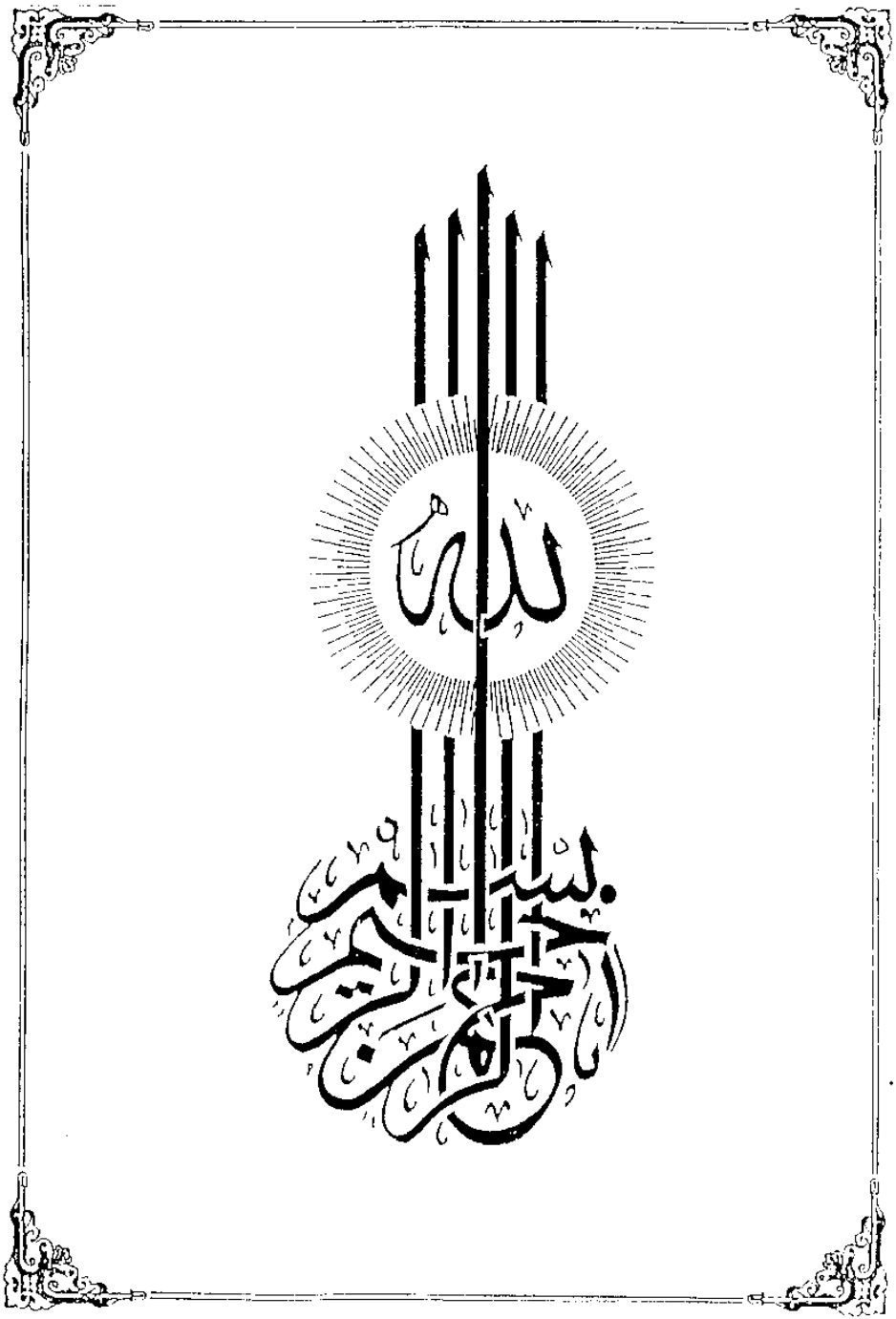
Words will never express my gratitude or dept for the tutorship and guidance I experienced during my work with Professor Mohamed Bassiouny, Professor of cardiothoracic surgery.

The fraternal and sincere guidance of Professor Ikram Saif, Assisstant Professor of Plastic surgery, will forever be remembered.

They have enlightened me with their experience along the road of science and life .

God help us show our gratitude.

Hassan Nagi Ahmed Nagi



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Summary and aim of the work

CHEST WALL DEFORMITIES

The congenital and acquired deformities of the chest wall, especially the sternum, often involve either or both, physiological and psychological effects.

Surgery offers a safe and efficient solution for this problem.

The congenital deformities include pectus excavatum , pectus carinatum , Poland's syndrome , and sternal clefts.
Congenital deformities are easily diagnosed , and surgical correction is optimaly done between 4 and 5 years.

In pectus excavatum , subperiosteal resection of the lower five costal cartilages , and wedge osteotomy of the anterior table of the sternum at the upper level of the depression is done . In pectus carinatum the pectoral muscles are reflected then reefing of the perichondrial beds is done, followed by removal of the deformed cartilages .

The acquired deformities are due to neoplasms, or trauma to the chest - wall.

Acquired deformities caused by neoplasms may necessitate excision of the neoplasm with a wide safety margin . Chest wall defect may occur, needing reconstruction , which can be done using autogeneous material , as bones or ribs , or heterogeneous material as teflon , or Gore-tex.

Aim of the Study

The aim of this study is to discuss the deformities of the chest wall , and the management of such cases, with review of recent trends in management.

Emberyology

Emberyology

The end of the second intrauterine month witnesses the development of the ribs as mesodermal condensations in the somatopleura. Chondrification starts and is followed almost immediately by ossification,which starts at the back of the rib and spread anteriorly. An unossified part persists forming the costal cartilage. The ribs grow ventrally from the vertebral column and their anterior ends are united on each side by a bar of cartilage. The protruding pericardium at first prevents these bars from fusing at the begining of the fourth fetal month, later they meet in front of the pericardium and form the cartilagenous body of the sternum (Last,1986).

The begining of the fifth fetal month witnesses the development of the manubrium from the mesoderm of the pectoral girdle. A continuous plate is formed and five bony centers (often double) appear in this plate from above downwards during the fifth to the ninth fetal month. The upper center forms the manubrium. The lower centers form seperate bones, the sternebrae, which fuse with each other from below upwards during adolescence. The body of the sternum, fusing into one plate of bone,but normally never fusing with the manubrium, even in advanced age. The two are united by a secondary cartilagenous joint. During childhood each costal cartilage articulates anteriorly with two sternebrae, with a seperate synovial joint for each sternebra, while the posterior end of the rib articulates with two vertebrae. The sternebrae fuse togather and the two adjacent synovial cavities coalesce. At the sternal angle no fusion occurs between the manubrium and the body of the sternum, and two cavities persist. The xiphoid process develops as a caudal extension of the sternal bar (Blevins,1989).

ANATOMY OF THE THORACIC WALL

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BONY SKELETON

The bony structure of the thoracic wall includes, the ribs and their costal cartilages laterally, the sternum anteriorly, and the thoracic vertebrae with their intervening discs posteriorly.

The bony structure of the thoracic wall forms a sort of cage, with an inlet and an outlet, the inlet is related to the base of the neck, and the outlet is related to the abdominal cavity (Warwick, 1980).

The thoracic inlet is formed by the manubrium sternii in front, the first rib on each side, and the first thoracic vertebrae posteriorly. The anterior border lies about one inch below the posterior border. The thoracic cavity is roofed above the lung apices by bilateral thickened endothoracic fascia (Sibson's fascia, or suprapleural membrane) and subjacent parietal pleura which project upward into the base of the neck (Last, 1986).

The outlet is formed by the xiphoid process , the fused costal cartilages of the seventh to the tenth ribs, the anterior portion of the eleventh ribs, the shafts of the twelfth ribs, and the body of the twelfth thoracic vertebrae. The anterior margin of the outlet is at the level of the tenth thoracic vertebrae, the lateral limits at the level of the second lumber vertebrae, and the posterior at the level of the twelfth thoracic vertebrae. It is seperated from the abdominal cavity by the diaphragm (Belvins, 1989).

THE RIBS

Ribs are divided into typical and non-typical, according to their relation to the vertebrae. The non-typical ribs include the first two and the last three ribs on each side. The typical ribs include the third to the ninth ribs, articulating with two vertebrae each.

The first rib is the shortest, broadest, strongest, and the most fixed rib. It has a small head with one facet, articulating with a circular facet on the body of the first thoracic vertebrae. It is flattened from above downwards, thus having an upper and a lower surface, and an outer and inner border. The upper surface has a prominent scalene tubercle for the insertion of the scalene

muscle, a groove in front for the subclavian vein, and a groove behind for the subclavian artery. The lower surface is smooth and related to the pleura (Williams and Warwick,1980).

The second rib is twice as long as the first rib. Its surfaces are intermidiate between the direction of the first rib, which is upper and lower, and the surfaces of the typical rib, which is inner and outer. It is characterised with a broad and rough tubercle at the middle of its outer surface

The typical rib has an anterior end , a posterior end , and a shaft. the costal cartilage joins the anterior end . The shaft is long, flattened with two borders, upper and lower, two surfaces,inner and outer, an angle, and a costal groove. The costal groove contains the neurovascular bundle. The posterior end consists of a head, neck, and a tubercle.

The tenth rib is transitional, its head may have two small articular facets, as the ninth rib ,or it may have only one facet. Its tubercle is small,and may or may not have an articular facet.

The eleventh rib has a large rounded head with one facet. It has neither neck, nor tubercle, and usually no angle.

The twelfth rib is short as the first rib, with a large rounded head. It has no neck, no tubercle, no angle, and no costal groove (Williams and Warwick, 1980).

The upper seven ribs are anteriorly inserted into the sternum, as their costal cartilages join the sternum directly. The lower five ribs do not join the sternum directly. The eightfth, ninth,and the tenth cartilages, join the cartilage of the rib above, while the cartilages of the last two ribs end in the abdominal muscles (Last, 1986).

THORACIC MUSCLES

The ribs growing out from the primitive vertebral arches, tend to position themselves between the muscle somites (myotomes), dividing the muscles into three morphological layers, external,intermediate, and innermost (Last,1986).

A- THE EXTERNAL LAYER

The external thoracic muscle layer is formed by the external intercostal muscles, and appear also to include the two small serratus posterior muscles, the superior and the inferior muscles,which are weak accessory respiratory muscles. There are eleven external intercostal muscles on each side. These muscles are attached to the tubercles of the ribs, where they blend with the posterior fibers of the superior costotransverse ligaments, almost to the cartilage of the ribs in front, were their insertion is carried

on to the sternum as the external intercostal membrane. The muscle fibers of each muscle are directed downwards, obliquely, and laterally at the back of the thorax, and directed downwards, forwards, and medially at the front (Williams and Warwick, 1980).

B- THE INTERMEDIATE LAYER

The intermediate layer is formed by the internal intercostal muscles. There are eleven muscles on each side. They are attached anteriorly to the sternum, in the interspaces between the cartilages of the true rib, and to the anterior extremities of the cartilages of the false ribs. They extend backwards as far as the posterior costal angles, being replaced by the internal intercostal membrane. The muscle descends from the floor of the costal groove and the corresponding costal cartilage, and is inserted into the upper border of the lower rib. The fibers are directed obliquely and almost at right angles to the fibers of the external intercostal muscles (belvins, 1989).