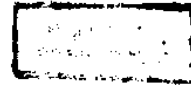


**RADIOLOGICAL AND IMAGING  
MANIFESTATIONS  
OF AORTIC ANEURYSM**

**THESIS**

Submitted in partial fulfilment for  
The Master Degree of Radio-Diagnosis

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INTRODUCTION AND AIM OF WORK

## INTRODUCTION AND AIM OF WORK

The diagnosis of aortic aneurysm is generally based on clinical examination, aortography and in recent years, ultrasonography and computed tomography.

Information on extent of the aneurysm, involvement of great vessels, and presence of thrombus or dissection are of great importance in planning vascular surgery.

There is a minimal but definite morbidity associated with aortography. In ultrasonography the abdominal aneurysm can be detected with great accuracy [ Segal et al, 1966, Leopold et al,1972.] but is inferior to aortography in demonstrating vascular anatomical details and in the detection of thoracic aneurysm. CT has demonstrated high sensitivity in the evaluation of aortic aneurysm [Gomes et al,1978,Andersen and Lorentzen,1983] MRI is no doubt providing a wide scope for evaluation of aortic aneurysm in many planes as well as it is non invasive modality, allowing safe, frequent follow-up examination.

The aim of this work to illustrate the manifestations of the aortic aneurysm by the different radiological and imaging modalities and to highlight the role, the limitations and the possible complications of each of these methods.

ANATOMY OF THE AORTA.

## ANATOMY OF THE AORTA

The aorta is the main trunk of the system of vessels. It begins at the upper part of the left ventricle, where it is about 3cm in diameter, and after passing upwards and to the right for about 5cm, arches backwards and to the left, over the root of the left lung. It then descends within the thorax on the left side of the vertebral column, gradually inclining towards the median plane, and enters the abdominal cavity through the aortic hiatus in the diaphragm [ fig.1 ]. It ends a little to the left of the median plane, at the level of the lower border of the fourth lumbar vertebra, by dividing into the right and left common iliac arteries. The aorta is described in several portions, ascending, the arch, and descending, the last being divided into thoracic and abdominal parts [Warwick and Williams,1973 ].

### THE ASCENDING AORTA. [fig.2 ]

It is about 5cm long. It begins at the base of the left ventricle, on a level with the lower border of the third costal cartilage, behind the left half of the sternum, it passes obliquely upwards, forwards, and to the right, behind the sternum as high as the upper border of the second right costal cartilage, describing a slight curve in its course. At its origin there are three small dilatations called the aortic sinuses. At the continuation of ascending aorta as the aortic arch the caliber of the vessel is slightly increased, owing to a bulging of its right wall. This dilatation is termed the bulb of aorta [warwick and Williams 1973 ]

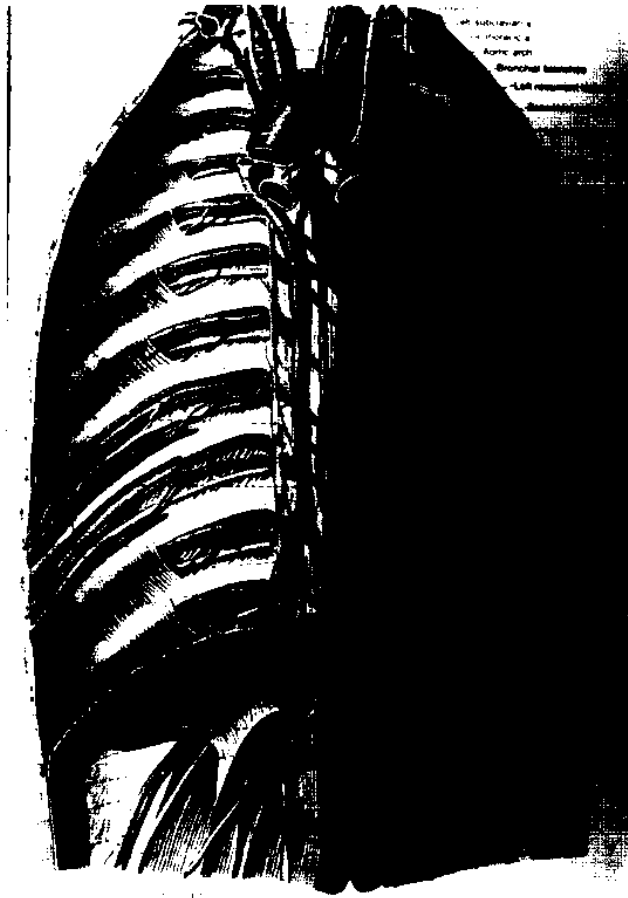


Fig 1. Anatomy of the aorta  
(adapted after Moore & Staubess d 1973)



#### RELATIONS [fig. 3 ]

Anteriorly, its lower part is related to: the infundibulum of the right ventricle, the commencement of the pulmonary trunk, and the auricle of right atrium; higher up it is separated from the sternum by the pericardium, the right pleura, and the anterior margin of the right lung.

Posteriorly, it is related successively to the left atrium, the right pulmonary artery and the right main bronchus.

On its right side, it is related to the superior vena cava and right atrium, the former lying partly behind it. On its left side, first it related to the left atrium and at higher level, to the pulmonary trunk .

#### BRANCHES

They are the right and left coronary arteries which start from the aortic sinuses [Warwick and Williams, 1973 ].

#### THE ARCH OF THE AORTA.

It begins behind the manubrium sterni at the level of the upper border of the second right sterno-costal articulation, and runs at first upwards, backwards and to the left in front of the trachea, then it directs backwards on the left side of the trachea. Finally it passes downwards on the left side of the body of the fourth thoracic vertebra, at the lower border of which it is continuous with the descending aorta. Its termination corresponds to the sternal extremity of the second left costal cartilage.

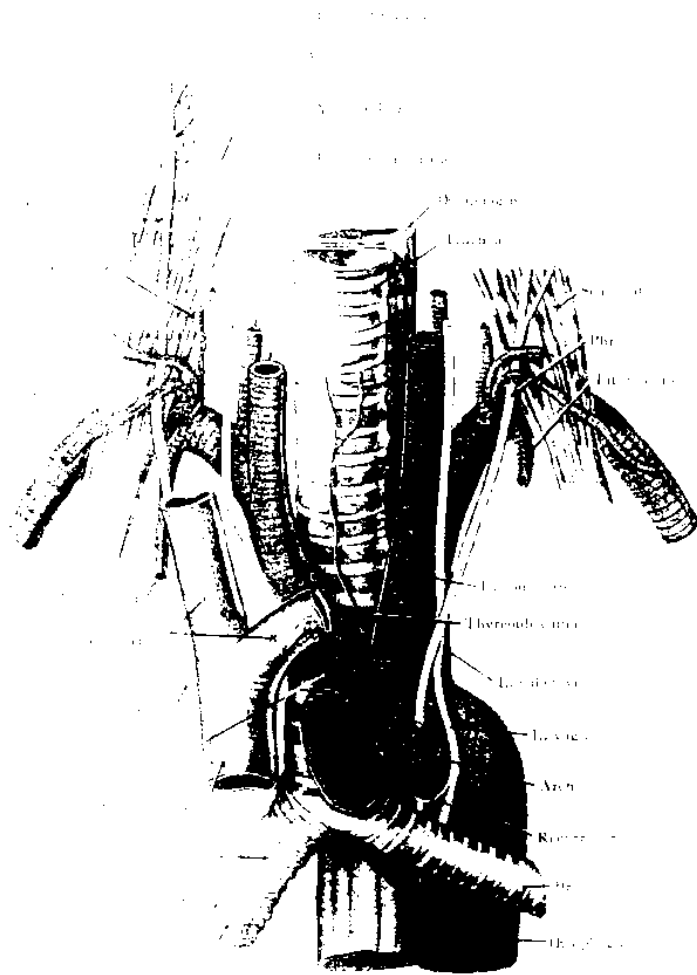


Fig. 4, relations of the arch of the aorta  
 (Quoted after Jamieson, 1947 )

Fig. 5, relations of the descending thorathic aorta

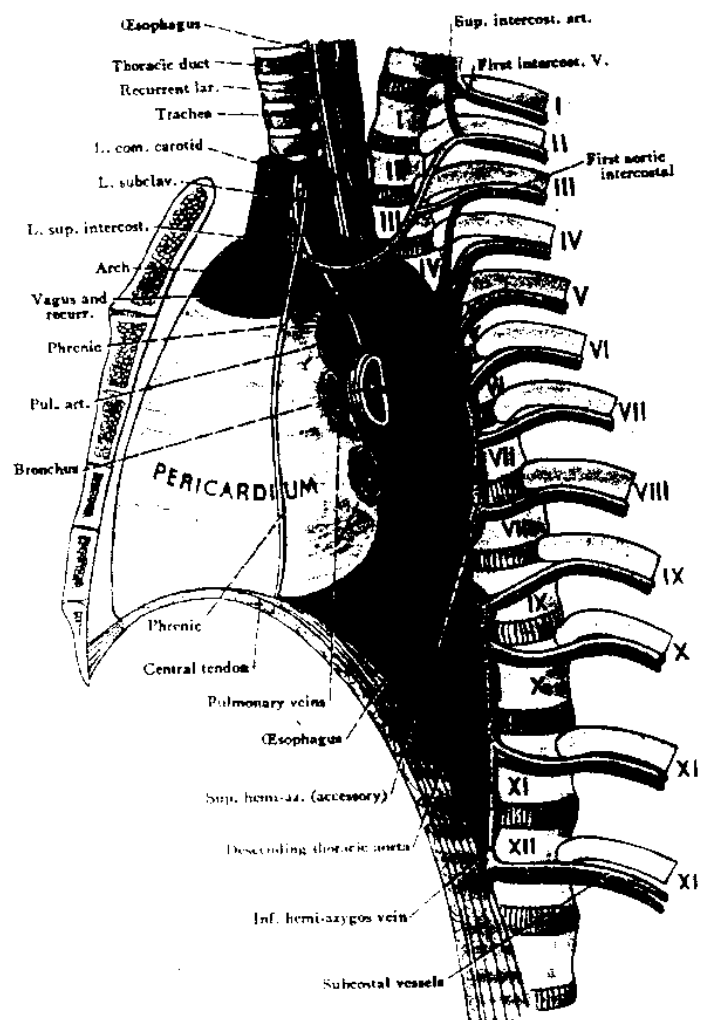


Fig. 5, relations of the descending thoracic aorta  
(Quoted after Jamieson, 1947 )

vertebra at the aortic opening in the diaphragm. At its origin it is situated on the left of the vertebral column; as it descends it approaches the median plane, and at its termination lies in front of the column, [fig 5] . [Warwick & Williams, 1973]

#### RELATIONS; [ fig 5 & 6 ]

Anteriorly, from above downward, it relates to the root of the left lung, the pericardium separating it from the left atrium, the oesophagus and diaphragm.

Posteriorly, it relates to the vertebral column and the hemiazygos veins

On the right side, with the azygos vein and thoracic duct and, in the lower part of its course, with the right pleura and lung. On the left side, with the left pleura and lung. The oesophagus, with its accompanying plexus of nerves, lies on the right side of the aorta above, but at the lower part of the thorax is placed in front of it, and, close to the diaphragm, is placed anteriorly and to its left side [Warwick & Williams, 1973]

#### THE ABDOMINAL AORTA.

It begins in the median plane at the aortic hiatus of the diaphragm, in front of the lower border of the last thoracic vertebral body and it descends in front of the vertebral column, ending at the level of the body of the 4th lumbar vertebra, a little to the left of the midline, by dividing into the two common iliac arteries. It diminishes rapidly in size, because such large branches arise from it [Warwick & Williams, 1973]

RELATIONS. [ fig 4 & 5 ]

Anteriorly and to the left. It is crossed by four nerves, from before backwards these are: the left phrenic, the lower of the cervical cardiac branches of the left vagus, the superior cervical cardiac branch of the left sympathetic and the trunk of the left vagus. As the left vagus crosses the arch it gives off its recurrent laryngeal nerve which hooks around below the arch. The left superior intercostal vein runs obliquely upwards and forwards on this surface of the arch. The left lung and pleura separate all these structures from the chest wall. Posteriorly and to the right, the trachea and the deep cardiac plexus, the left recurrent laryngeal nerve, the oesophagus, the thoracic duct and the vertebral column are successively in relation to the vessel.

Above, the brachiocephalic, left common carotid and left subclavian arteries arise from the convexity of the arch and are crossed in front close to their origins by the left brachiocephalic vein.

Below, the arch is related to the bifurcation of the pulmonary trunk, the left main bronchus, the ligamentum arteriosum and the left recurrent laryngeal nerve [Warwick and Williams, 1973].

#### THE THORACIC AORTA.

It is that part of the descending aorta which is confined to the posterior mediastinum. It begins at the lower border of the fourth thoracic vertebra, where it is continuous with the aortic arch, and ends in front of the lower border of the 12th thoracic