SONOGRAPHIC EVALUATION OF ABDOMINAL AORTA AT DIFFERENT AGE GROUPS AND RELATION TO LIPOPROTEINS

THESIS
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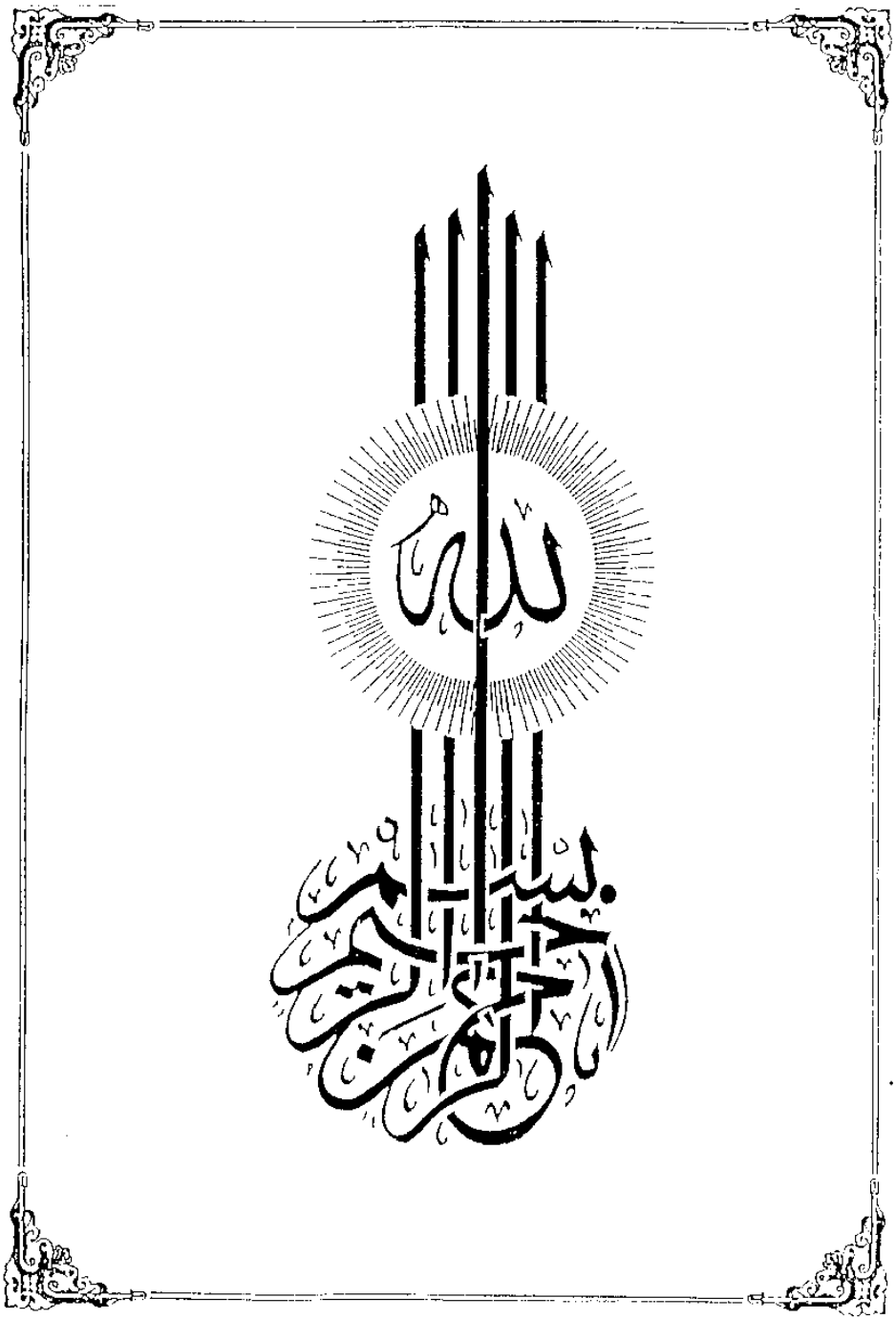

INTRODUCTION

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The abdominal aorta is the major blood vessel which carries the blood to the different abdominal organs. It is the direct continuation of the thoracic aorta. It ends by bifurcation into the two common iliac arteries.

It is one of the important structures to be examined by ultrasonagraphy. Because of its pulsating nature, relative superficial position, and its elastic walls property.

It is possible, nowadays, with modern high-resolution gray -scale static and dynamic ultrasound scanners to visualize the abdominal aorta with most of its branches (Kristensen.J.K, 1980).

Ultrasonic scanning has become primary method of evaluating patients with abdominal aortic aneurysms (Barter.S.J, 1985).

Ultrasonic scanning is particularly valuable in the examination of patients for whom radiocontrast methods are contraindicated (Megrelishvili R.I, 1980)

Ultrasonography gives better results as a screening method, since it renders a definite diagnosis possible in about 98% of cases and unnecessary arteriography can be avoided. (Binswanger.R.D, 1977).

A well known fact is the relation of high blood lipids level especially hypercholestrolemia to increased

incidence of atherosclerosis, a disease affecting large and meduim sized arteries, and for which the aorta is a frequent and common site to affect.

In the aorta, the abdominal part is particularly affected, as well as coronary, cerebral arteries (Thomson A.D., 1983).

The basic lesion is the atheroma or fibrofatly plaque. Complicated lesions i.e. complicated plaques show calcification, ulceration, superimposed throm bosis, haemorrhage and aneurysms. The important complications of these plaques in the aorta are large mural thrombi, aneurysmal dilatation or rupture of cholestrol [included in plaques formation] into the blood stream (Robbins S.L, 1979).

REVIEW OF LITERATURE

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INTRODUCTION

Arteries are generally divisible into elastic muscular types, although the media of most arteries contains some of both types of tissue. Elastic tissue allows the wall of an artery to be distended by the sudden thrust of blood from the heart and then to contract again. The large arteries near the heart typically contain a great deal more elastic tissue than do the smaller, more distal ones, for in general the greater the pressure in an artery the more elastic tissue there is

In the larger arteries, particularly the aorta, most of the strength of the wall is provided by elastic tissue. If this undergoes degenerative changes or is destroyed by a disease, the arterial wall may bulge, somewhat like an inner tube protruding through the broken casing of tire. Such a widening in the arterial lumen is an aneurysm and always involves the danger that the weakened wall may burst, with almost immediate death ensuing if the vessel is large.

As the branches of the aorta are traced distally the relative amount of elastic tissue becomes less and the relative amount of smooth muscle more (W.Henry Hollinshead, 1974).

The arteries main function, especially the large and meduim sized ones is to conduct blood from the heart to the capillaries where exchange of

nutrients and waste products can occur between the tissue cells and the blood. The larger arteries also form an elastic reservoir which stores part of the energy of cardiac contraction and so help to complete intermittent systolic ejection from the heart into a steady flow of blood through capillaries.

The smallest arteries [arterioles] act in conjunction with the precapillary sphincter to form a variable resistance which controls the rate of blood flow through the tissue. (Kelman, 1972).

ANATOMY

The abdominal aorta is the direct continuation of the thoracic aorta (W. Henry, Hollinshead).

It is the main trunk of the arterial tree that transports oxygenated blood from the heart to the tissues (Holm, 1975).

Course

After traversing the thorax it enters the abdominal cavity through the posterior part of the diaphragm (Holm, Hancks, 1975).

The aortic opening lies at the level of T12 (henry, Hollinshead).

Then it takes a caudal retroperitoneal course along the anterior border of the vertebral column slightly to the left of midline. About 1 - 2 cm below the umbilicus it divides into the two common iliac arteries which convey blood to the pelvic organs and the lower extremities (Holm & Hancks, 1975).

Relations

It lies behind the pancreas, the third part of the duodenum, the root of the mesentery and coils of small intestine (W.Henry, Hollinshead 1974).

Anterior and proximally the coeliac and superior mesenteric arteries arise from the aorta below this area, the left renal vein, the body of pancreas with its posterior splenic vein cross obliquely. Below the

level of the 2nd lumbar vertebra, the I.V.C. is located to the right of the aorta. On the left side of the aorta are the duodenojejunal flexure, ascending duodenum and visceral arteries. The normal aorta, in thin patients is very close to the anterior abdominal wall (Nasser Hassani, 1976).

Branches

The abdominal aorta gives rise to :

I Branches to the viscera :

A) Three branches to the digestive tract arise from the front of the abdominal aorta.

1. Coeliac trunk

Which through three major branches supplies upper abdominal organs (stomach, duodenum, liver and pancreas, spleen). These branches are :

i. The left gastric artery

ii The hepatic artery

iii The splenic artery

II Superior mesenteric artery

It partly overlaps the distribution of the coeliac trunk but supplies especially almost all the small intestine except the commencement of the duodenum and much of the large intestine as it supplies the caecum, ascending colon appendix and the greater part of the transverse colon.

III Inferior mesenteric artery

i It gives branches to the terminal part of the transverse colon and to the remainder of the large intestine as far as the anal canal.

ii Branches to viscera more initimally connected with the posterior abdominal wall.

I The renal arteries (paired)
run almost horizontally to the hilum of each kidney. each artery gives a branch to the suprarenal gland.

II The testicular or ovarian arteries
to the sex glands of male and female.

iii Lumbar arteries (paired)
arise in the lumbar (lower back) region.

iv The middle sacral artery
arises at the bifurcation of the aorta and descends on the front of the sacrum

v Common iliac arteries (paired) The aorta ends in the lower part of the abdominal (at the level of the fourth lumbar vertebra) by bifurcating into paired common iliac arteries

vii The inferior phrenic arteries (paired)
pass to the under surface of the diaphragm, each gives a small branch to the suprarenal gland.

ULTRASONIC AORTOGRAPHY

Ultrasonic aortography is a highly sensitive method of investigating the possible presence of disease of the abdominal aorta. It is particularly good for showing the presence of aneurysms wall thickness. Coupled with the advantage of being non-invasive it should gain popularity as the investigation of choice especially as radiographic contrast aortography is not without hazards (Metrewili, 1978).

Because of its composition and location, the abdominal aorta quite readily lends itself to ultrasonic study. The elasticity of its walls and its blood filled luman produce on abrupt change in acoustic impedence which renders it the most recognizable soft tissue structure within the abdomen. Under normal conditions, its position which is just anterior to and slightly to the left of the spine is remarkably constant. Since recognition of the spine is a key feature in interpretation of nearly all transverse echograms, the aorta should almost be visualised as well, (leopold, 1975).

Goldberg (1977) established the uses of aortosonography as follows:

1- Detection of a normal aorta
2- Determination of an aneurysm (diffuse or localized)
3- Determination of its size, including both internal and external diameters.
4- Evaluation of internal echo-patterns (clot or dissection)

5- Detection of lumen narrowing or occlusion.

6- Determination of aneurysm extension into the iliacs or thoracic aorta

7- Evaluation of the major branches of the aorta

8- Demonstration of other vessels such as the vena cava and portal vein as well as their branches.

9- Detection and differentiation of masses misdiagnosed as aneurysms.

10-Serial evaluation of aneurysms not having surgery to detect any change in size or internal pattern.

EXAMINATION METHODS

Initial approximate localisation of the aorta was made by manual palpation (Hagen S.L. Ansert 1987) The supine position is routinely used since the prone studies place the aorta within the shaddow of the vertebral body (Leopold and Asher 1975).

TECHNIQUES

Transducer

A- 2.5 MHZ probe can be used with thin patients but 1.5 MHZ is indicated for those who are thick set or obese (Metreweli, 1978)

B- Scan (two dimensional) mode of display is the modality of choice because it provides information about the entire contour of the vessel that is of almost importance (undimensional) point readings are helpful in measuring the exact lumen, size approximate wall thickness and over-all diameter. A-mode readings are obtained both anteriorly and laterally by appropriate positioning of the transducer (Goldberg, 1975).

Although the diameter can be measured directly from the B-scan tracing, the accuracy is usually improved if an A-mode measurement is made at this point. (Leopold and Asher 1975).

An A-mode ultrasonic display shows the aortic wall motion.

The real - time-sonography as an evident non invasive procedure is of high significance in the vascular diagnostics apart from the usual diagnostic