Acknowledgement

First and foremost, I thank ***God*** *for helping and guiding me in accomplishing this work.*

I would like to express my sincere gratitude to ***Prof. Mahmoud Sobhy Khattab,*** *Professor of General & Vascular Surgery, Faculty of Medicine, Ain Shams University, firstly for giving me the honor to be his student and for his great support and stimulating views.*

I would like to thank ***Prof. Sherif Mohamed Essam*** *Assistant Professor of General & Vascular Surgery Faculty of Medicine, Ain Shams University, his active, persistent guidance and other whelming kindness have been of great help through this work.*

Also I would like to extend my warmest gratitude to ***Dr. Atef Abdelhameed Desouki,*** *Lecturer of General & Vascular Surgery, Faculty of Medicine, Ain Shams University, his hard and faithful efforts have helped me to do this work.*

I am also very grateful to all staff members and all my colleagues in the department of ***Vascular Surgery,*** *Faculty of Medicine-Ain Shams University.*

Also I would like to thank my ***Family*** *who stood behind me to finish this work and for their great support.*

Ehab Ali Mohamed Elashaal

بسم الله الرحمن الرحيم

﴿ قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْحَكِيمُ ﴾

صدق الله العظيم **سورة البقرة آية (32)**

INTRODUCTION

The infra-renal abdominal aorta and the iliac arteries are among the most common sites of chronic obliterative atherosclerosis in patients with symptomatic occlusive disease of the lower extremities ***(DeBakey et al., 1985).***

Indeed, atherosclerotic narrowing or occlusion of these vessels, most commonly located at the aortic bifurcation, occurs to various degrees in most patients with symptoms of arterial insufficiency severe enough to require surgical revascularization. Because atherosclerosis is commonly a generalized process, obliterative disease in the aortoiliac segment frequently coexists with disease below the inguinal ligament. Despite its generalized nature, however, the disease is usually segmental in distribution and is thereby amenable to effective surgical treatment. Even in patients with several levels of disease, successful correction of hemodynamic impairment in the aortoiliac inflow system often provides satisfactory clinical relief of ischemic symptoms. In addition, careful assessment of the adequacy of arterial inflow is important even in patients whose primary difficulty located in the femoropopliteal or tibial outflow segment if good and durable results of distal arterial revascularization are to be obtained ***(Brewster, 1997).***

Since the introduction of the initial reconstructive methods of thrombo-endarterectomy and homograft replacement in the late 1940s and early 1950s, great progress has been achieved in the surgical management of aorto-iliac occlusive disease. Currently, a variety of methods exist for accurate evaluation of the extent and hemodynamic severity of the disease process. In addition, improvements in the preoperative assessment of patient risk have helped to clarify the decision about the optimal management in individual patients.

Endovascular intervention for chronic lower limb ischemia has matured significantly in recent years. Catheter-based management of a wide variety of lesions has evolved from the stage of mere clinical feasibility to the level of reliability and durability required to become an integral tool in the treatment of occlusive disease. Today's vascular surgeon is in a unique position to combine his or her classical surgical training with their catheter-based interventions. Certainly, the potential advantages of percutaneous therapy as compared to surgical reconstruction are significant: No General anaesthesia or lengthy operations, shorter hospitalization, lower morbidity and mortality, earlier intervention in the course of the disease, and less complicated reapplication in the event of disease recurrence ***(Rutherford, 2005).***

AIM OF THE WORK

This thesis aims to discuss the feasibility of endovascular techniques with its indications, limitations, advantages and disadvantages in the management of aortoiliac occlusive diseases in patients with chronic lower limb ischemia.

Chapter (1)

ANATOMY

Anatomy of The abdominal aorta

The abdominal aorta is the largest artery in the abdominal cavity. As part of the aorta, it is a direct continuation of the descending aorta (of the thorax).The abdominal aorta (Fig.1) begins at the aortic hiatus of the diaphragm in front of the lower border of the body of the last thoracic vertebra and descend in front of the vertebral column, ends on the body of the fourth lumbar vertebra, commonly a little to the left of the middle line, by dividing into the two common iliac arteries. It diminishes rapidly in size, in consequence of the many large branches which it gives off ***(De Graaff and Van, 1998).***

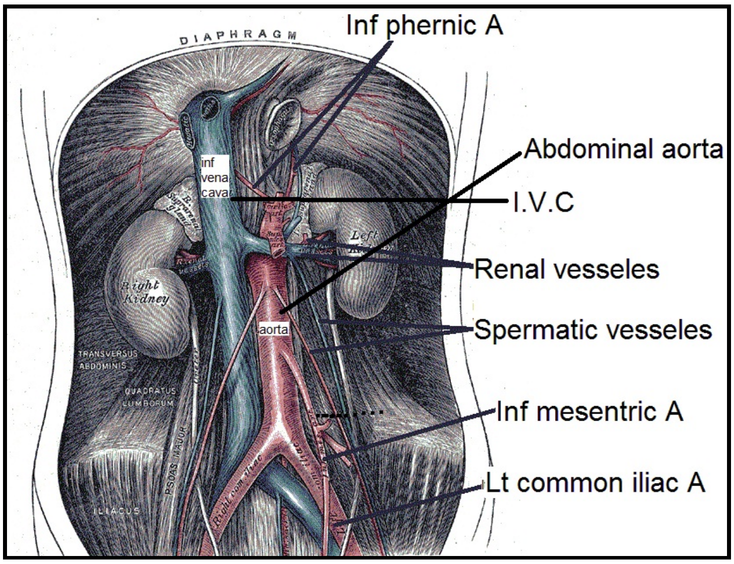

Fig. (1): The abdominal aorta and its branches ***(Quoted from De Graaff and Van., 1998).***

Relations:

Anteriorly The abdominal aorta is covered by the lesser omentum and stomach, the branches of the celiac artery and the celiac plexus, the pancreas, the left renal vein, the inferior part of the duodenum, the mesentery, and aortic plexus ***(De Graaff and Van, 1998).***

Posteriorly it is separated from the lumbar vertebra and intervertebral fibrocartilages by the Ant. longitudinal ligament and left lumbar veins ***(De Graaff and Van, 1998).***

On the right side it is in relation above with the azygos vein, cisterna chyli, thoracic duct, and the right crus of the diaphragm. The inferior vena cava is in contact with the aorta below ***(Tortora and Gerard, 1994).***

On the left side are the left crus of the diaphragm, the left celiac ganglion, the ascending part of the duodenum, and some coils of the small intestine ***(De Graaff and Van, 1998).*** (fig. 1)

Collateral Circulation:

It carried on by the anastomoses between the internal mammary and the inferior epigastric. By the free communication between the superior and inferior mesenteric, if the ligature were placed between these vessels or by the anastomosis between the inferior mesenteric and the internal pudendal, when the point of ligature is below the origin of the inferior mesenteric and possibly by the anastomoses of the lumbar arteries with the branches of the hypogastric ***(Tortora and Gerard, 1994).***

Branches:

- Visceral.
- Parietal.
- Terminal.

Common Iliac Arteries

The abdominal aorta divides, on the left side of the body of the fourth lumbar vertebra, into the two common iliac arteries .Each is about 5 cm. in length. They diverge from the termination of the aorta, pass downward and lateralward, and divide, opposite the intervertebral fibrocartilage between the last lumbar vertebra and the sacrum, into two branches, the external iliac and hypogastric arteries; the former supplies the lower extremity; the latter, the viscera and parietes of the pelvis ***(Standring, 2005).***

The Right common iliac artery is somewhat longer than the left, and passes more obliquely across the body of the last lumbar vertebra. In front of it are the peritoneum, the small intestines, branches of the sympathetic nerves, and, at its point of division, the ureter. Behind, it is separated from the bodies of the fourth and fifth lumbar vertebræ, and the intervening fibrocartilage, by the terminations of the two common iliac veins and the commencement of the inferior vena cava.

Laterally, it is in relation, above, with the inferior vena cava and the right common iliac vein; and, below, with the Psoas major. Medial to it, above, is the left common iliac vein ***(Standring, 2005).***

The Left common iliac artery is in relation, in front, with the peritoneum, the small intestines, branches of the sympathetic nerves, and the superior hemorrhoidal artery; and is crossed at its point of bifurcation by the ureter. It rests on the bodies of the fourth and fifth lumbar vertebræ, and the intervening fibrocartilage. The left common iliac vein lies partly medial to, and partly behind the artery; laterally, the artery is in relation with the Psoas major (Fig. 2) ***(Standring, 2005).***

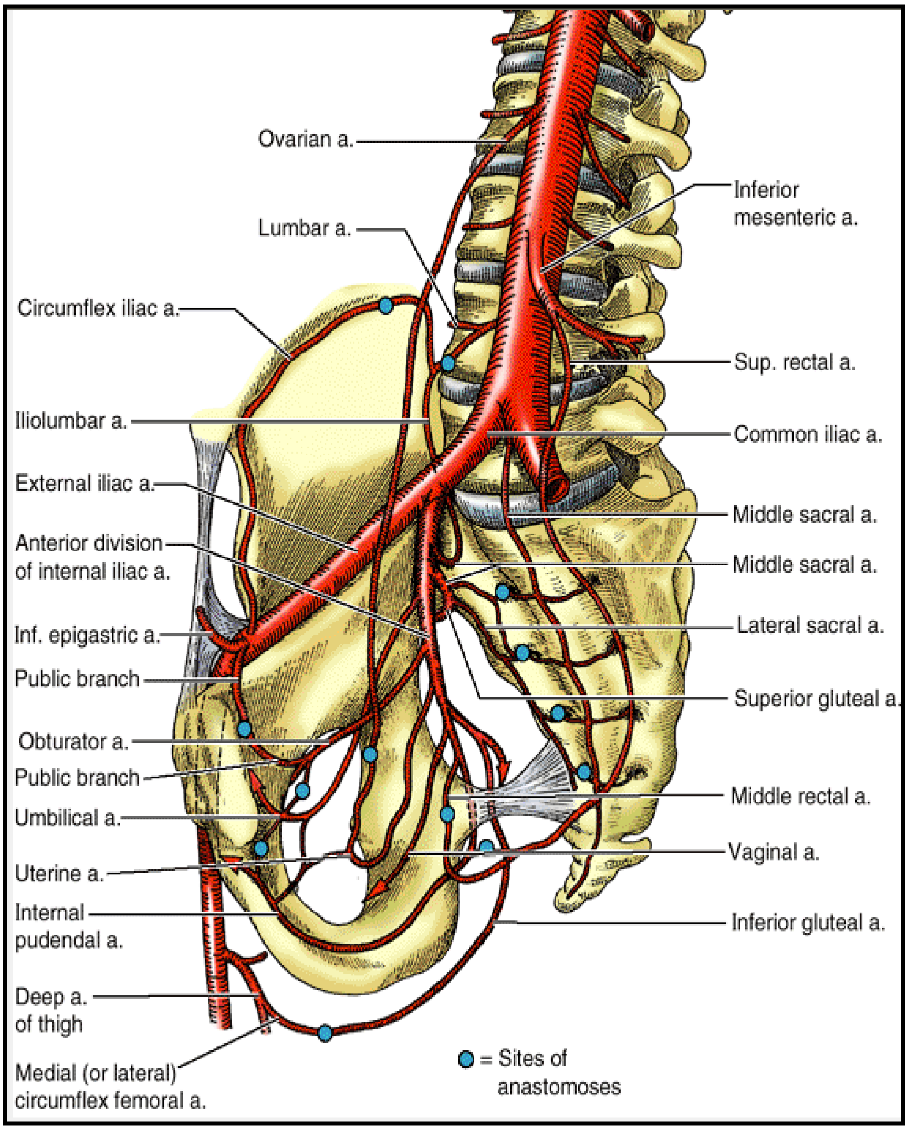

Fig. (2): Common iliac artery and branches.

Branches:

The common iliac arteries give off small branches to the peritoneum, Psoas major, ureters, and the surrounding areolar tissue, and occasionally give origin to the iliolumbar, or accessory renal arteries ***(Standring, 2005).***

Collateral Circulation:

The principal agents in carrying on the collateral circulation after the application of a ligature to the common iliac are: the anastomoses of the hemorrhoidal branches of the hypogastric with the superior hemorrhoidal from the inferior mesenteric, the uterine, ovarian, and vesical arteries of the opposite sides, the lateral sacral with the middle sacral artery, the inferior epigastric with the internal mammary, inferior intercostal, and lumbar arteries, the deep iliac circumflex with the lumbar arteries of the iliolumbar with the last lumbar artery, the obturator artery, by means of its pubic branch, with the vessel of the opposite side and with the inferior epigastric ***(Standring, 2005).***

Important collateral arterial pathways around the aortic bifurcation and common iliac segments are the intercostal and lumbar arteries to circumflex iliac and iliolumbar arteries, the superior to inferior epigastric arteries, and the superior and inferior mesenteric arteries to rectal and internal pudendal arteries (Fig. 2) ***(Reddy et al., 2006).***

Radiological anatomy and application:

The iliac bifurcation is best seen angiographically with a 20° right or left anterior oblique (RAO or LAO) view. Evaluation of the anatomy of the aortic bifurcation and common iliac arteries is important when considering a crossover technique. The two most common reasons for failure are an acutely angled aortic bifurcation or diffusely diseased and calcified common iliac arteries ***(Jenkins 2005).***

When the iliac arteries are tortuous, the extra turns the catheter must pass through usually make the hook of the catheter point to the ipsilateral side. Tortuosity also makes the catheter head less responsive to turns performed at the catheter hub ***(Schnieder, 2008).***

Disease at iliac and femoral bifurcations often requires visualization with oblique views. The common iliac bifurcation and posterior wall external iliac disease are best delineated using a contralateral anterior oblique projection (Fig. 3) ***(Schnieder, 2008).***

Fig. (3): CIA common iliac artery EIA external iliac artery IIA internal iliac artery CFA common femoral artery.

Chapter (2)

PATHOLOGY OF AORTOILIAC DISEASE

The following brief review of the functional microanatomy of the wall indicates the range and limits of artery wall adaptability.

I. Intima:

The intima, the innermost layer of the artery wall, extends from the luminal surface to the internal elastic lamina. The luminal surface is lined by the endothelium, a continuous monolayer of flat polygonal cells. Between the endothelium and the internal elastic lamina intima is normally very narrow, with the endothelium lying directly on the internal elastic lamina and containing only a few scattered leukocytes, smooth muscle cells, and connective tissue fibers. It is in this region that atherosclerotic lesions develop ***(Glagov, 1994).***

II. Media:

The media extends from the internal elastic lamina to the adventitial, although an external elastic lamina demarcates the boundary between the media and adventitia in many vessels, a distinct external elastic lamina may not be present, particularly in vessels with a thick and fibrous adventitial layer ***(Traub and Berk, 1998).***

The aorta and its immediately proximal, larger branches are called elastic arteries because of the prominence of their elastic fibers. In such vessels, the elastic fiber systems of the musculoelastic fascicles are thick and closely packed, resulting in an appearance on transverse cross section of elastic lamellae alternating with smooth muscle layers. Thicker, crimped, type I collagen bundles are woven between adjacent large elastic lamellae ***(Traub and Berk, 1998).***

The smaller caliber muscular arteries contain relatively less collagen and elastic and more smooth muscle cells than elastic and can therefore alter their diameter rapidly by constricting or dilating the media of the proximal aorta and that of the major brachiocephalic arteries contain. The proximal major vessels are therefore more compliant than the abdominal aorta but are also fragile and prone to tear when sutured ***(Traub and Berk, 1998).***

Medial smooth muscle cells, in addition to synthesizing the collagen and elastic fibers that determine the mechanical properties of the aortic wall, are actively engaged in metabolic processes that contribute to wall tone and may be related to susceptibility to plaque formation ***(Pomerantz and Hajjar, 1989).***

Under conditions of increased pulse pressure, wall motions, and wall tension, such as exist proximal to an aortic coarctation; medial smooth muscle cell wall metabolism is higher, as is plaque formation. Conversely, when wall motion pulse pressure and smooth muscle cell metabolism are decrease, as in areas distal to a severe arterial stenosis intimal, plaque