Imaging of Abdominal Aortic Aneurysm And Its Role In Management

An essay submitted for the partial fulfillment of

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Dedication

To my father ,my mother and my wife.

Amr A.Rahim

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List of abbreviations

Abbreviation	Meaning
AAA	abdominal aortic aneurysm
ED	emergency department
AE	aorto-enteric
LLQ	left lower quadrant
AV	aorto-venous
US	ultrasound
CT	computed tomography
CTA	computed tomography angiography
MRA	magnetic resonance angiography
EVAR	endovascular aneurysm repair
IVUS	intravascular ultrasound
DSA	digital subtraction angiography
MIP	maximum intensity projection
MPR	multiplanar reconstruction

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Introduction

Abdominal aortic aneurysms (AAAs) account for approximately 15,000 deaths each year in the United States and rank as the 13th leading cause of death.[7,8]

From an incidence perspective, AAA is found in 2% of the elderly population (age > 65 years), with a higher incidence in males vs. females (9:1).

Rupture of an AAA usually is a lethal event, carrying an overall mortality rate of 80-90%;[9,10] a significant percentage of these patients die before arrival to the hospital. Among those who reach the operating room, the mortality rate is still 50%.[11,12]

Fortunately, prompt diagnosis and surgical repair before rupture can reduce the mortality rate; the operative survival rate of patients undergoing elective repair is reported to be about 95%.[12]

Recently, significant technologic advances have been made in imaging of abdominal aortic aneurysm(AAAs).

Ultrasonography, with its wide availability and low cost, remains the principle tool for diagnosing suspected

aneurysms and monitoring the progress of known aneurysms.

Over the years, the use of aortography has changed significantly. In the past , it has been used extensively in the preoperative evaluation of AAAs.

Most recently aortography has been used more selectively to address specific clinical issues not resolved by less invasive means such as the presence of other nearby vessel stenosis (e.g., renal , mesenteric ,or iliac lesions) that might alter plans for surgical repair.

In addition, aortography now has a role in the use and placement of endovascular stent grafts for repair of AAAs.

Recently, aortography has been replaced with less invasive technologies such as computed tomography (CT) and magnetic resonance imaging(MRI).

While MRI has a limited role in the preoperative work-up of AAAs because of its higher cost, limited availability and susceptibility to artifact, CT technology has emerged as the most commomly used imaging modality.

Advancements in CT technology, such as the advent of helical CT and CT angiography, will likely increase the role of CT imaging in the evaluation and treatment of AAAs.

Aim of study

The study aims to evaluate different modalities of imaging of AAA and their application in management of AAA whether by surgical or endovascular intervention.

The advantages and disadvantages of each modality will be discussed as well as their role in following up patients postoperatively to evaluate the outcome and complications.

Anatomy of the Abdominal Aorta

(Aorta Abdominalis)

The abdominal aorta begins at the aortic hiatus of the diaphragm, in front of the lower border of the body of the last thoracic vertebra, and, descending 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. As it lies upon the bodies of the vertebræ, the curve which it describes is convex forward, the summit of the convexity corresponding to the third lumbar vertebra (Fig.1)

Relations:

The abdominal aorta is covered, anteriorly, by the lesser omentum and stomach, behind which are the branches of the celiac artery and the celiac plexus; below these, by the splenic vein, the pancreas, the left renal vein, the inferior part of the duodenum, the mesentery, and aortic plexus.

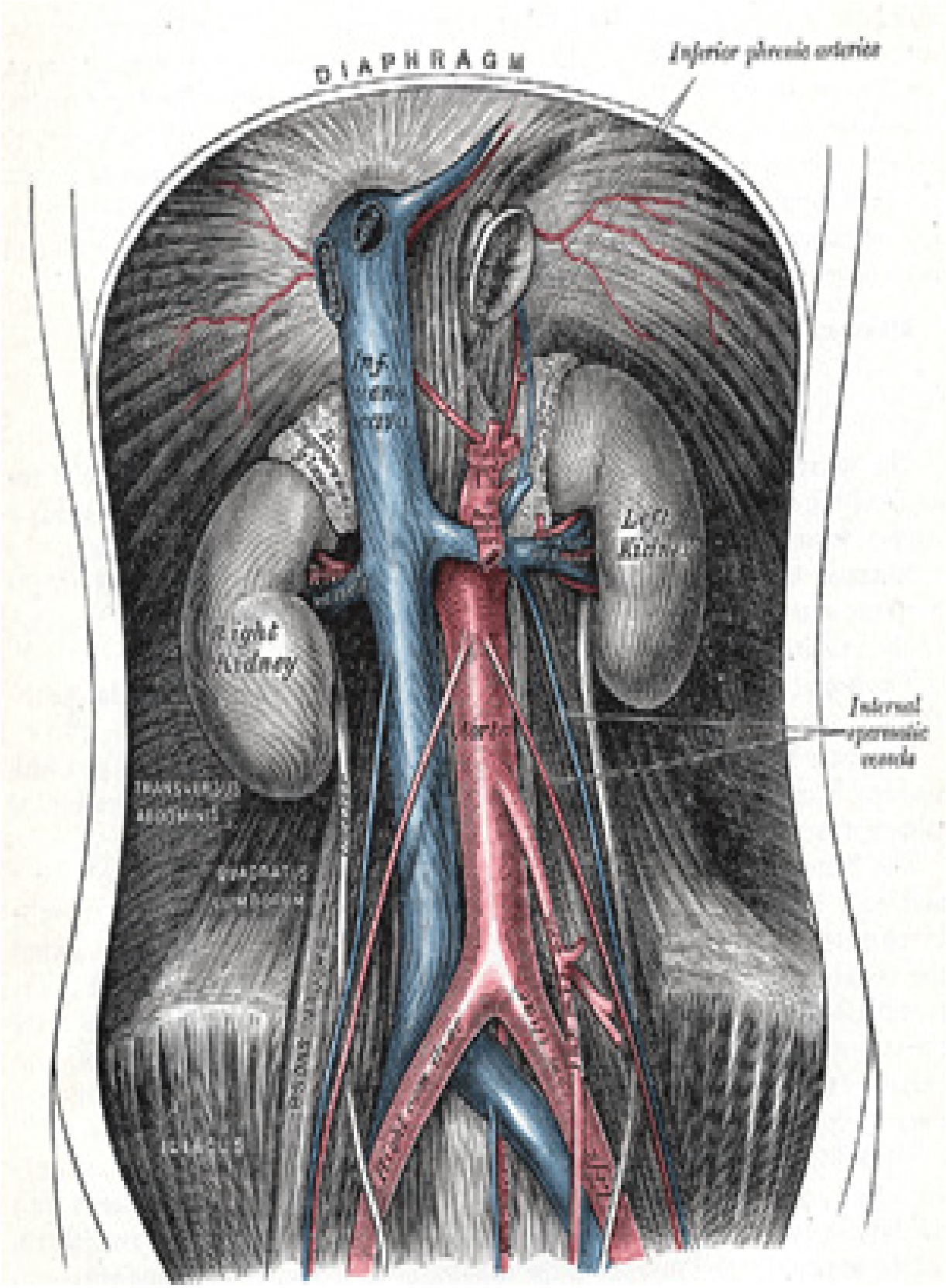

FIG. 1– The abdominal aorta and its branches.

Posteriorly, it is separated from the lumbar vertebræ and intervertebral fibrocartilages by the anterior longitudinal ligament and left lumbar veins.

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 last separating it from the upper part of the inferior vena cava, and from the right celiac ganglion; the inferior vena cava is in contact with the aorta below.

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.

Branches:

The branches of the abdominal aorta may be divided into three sets: visceral, parietal, and terminal.

Visceral branches include celiac, superior mesenteric, inferior mesenteric, middle suprarenals , renals,internal spermatics,ovarian(in the female)

Parietal branches include inferior phrenics,lumbar and middle sacral.

Terminal branches: the common iliacs

Of the visceral branches, the celiac artery and the superior and inferior mesenteric arteries are unpaired, while the suprarenals, renals, internal spermatics, and ovarian are paired.

Of the parietal branches the inferior phrenics and lumbars are paired; the middle sacral is unpaired. The terminal branches are paired.

Anatomy of the main branches :

The celiac artery (a. cæliaca; celiac axis)

It is a short thick trunk, about 1.25 cm. in length, which arises from the front of the aorta, just below the aortic hiatus of the diaphragm, and, passing nearly horizontally forward, divides into three large branches, the left gastric, the hepatic, and the splenic; it occasionally gives off one of the inferior phrenic arteries (Figs. 2,3).

Relations:

The celiac artery is covered by the lesser omentum.

On the right side it is in relation with the right celiac ganglion and the caudate process of the liver; on the left side, with the left celiac ganglion and the cardiac end of the stomach

Below, it is in relation to the upper border of the pancreas, and the splenic vein.

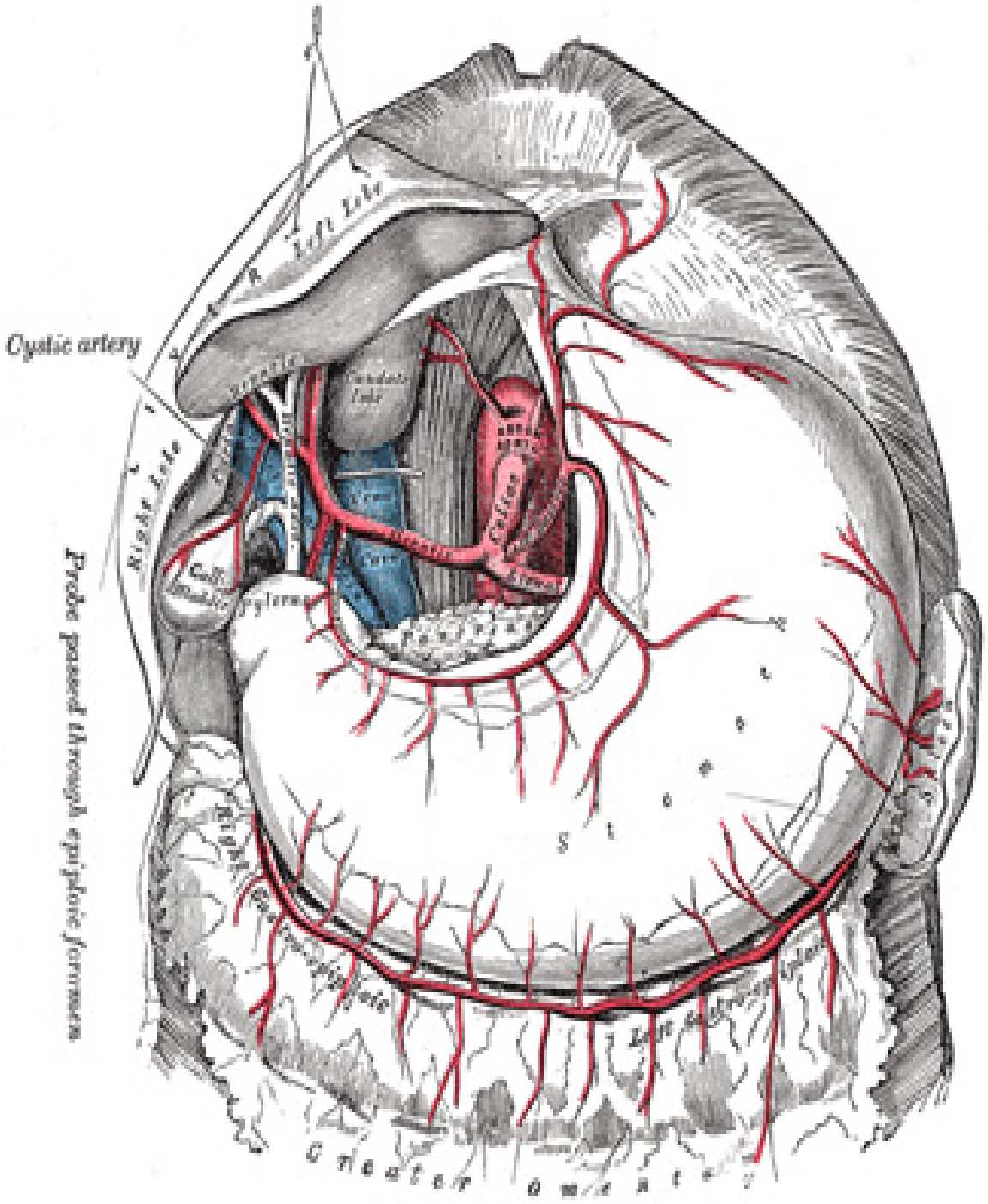

FIG.2– The celiac artery and its branches; the liver has been raised, and the lesser omentum and anterior layer of the greater omentum removed.