AORTOCAVAL FISTULA UNMASKED: A CASE REPORT SPOTTING THE SILENT THREAT IN EMERGENCY VASCULAR IMAGING

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ABSTRACT:
Aortocaval fistula (ACF) constitutes a rare but severe vascular complication of abdominal aortic aneurysm (AAA), characterized by the formation of an anomalous arteriovenous communication between the aorta and the inferior vena cava. This report presents the case of a 67-year-old male with underlying cardiovascular comorbidities who presented with progressive abdominal pain and hemodynamic compromise. Computed tomography angiography (CTA) revealed a large infrarenal AAA with synchronous contrast opacification of the aorta and inferior vena cava, consistent with an ACF. Definitive management via open surgical repair was undertaken, resulting in a favourable postoperative course. This case report aims to explore the various imaging modalities used in the detection of aortocaval fistula (ACF) and their clinical applicability. Among the available imaging modalities, CT angiography remains the gold standard due to its rapid acquisition, broad accessibility, and high sensitivity and specificity.

Keywords: aortocaval fistula, aortic abdominal aneurysm, aortic rupture

INTRODUCTION

Aortocaval fistula (ACF) is a rare yet serious sequelae of abdominal aortic aneurysm, involving an abnormal connection between the aorta and inferior vena cava. ACF occurs in 2-7% of abdominal aortic aneurysm [1]. Singh et al (2) reported that aortocaval fistula (ACF) is seen in about 4% of surgeries for ruptured aneurysms. It can occur spontaneously in 1% of patients or along with rupture in 4% of patients. Men in the sixth to seventh decade are commonly affected. Krishna et al [3] reported that ACF accounts for 3-6% of all ruptured AAA cases. Most commonly linked to ruptured aneurysms, ACF may also result from trauma, iatrogenic injury, or malignancy. Its variable presentation often delays diagnosis, increasing the risk of mortality. This case report aims to explore the various imaging modalities used in the detection of aortocaval fistula (ACF) and their clinical applicability.

CASE REPORT

Herein we present a case of a 67 year old man with underlying hypertension, and ischemic heart disease, who presented to the emergency department for 5 days of worsening abdominal pain, radiating to the back. He denied chest pain, shortness of breath or fever. No syncopal attack or body weakness. In the emergency department, he was alert and conscious however there was haemodynamic instability with blood pressure of 64/51 mmHg requiring inotropic support. No radial-radial delay. No radial-femoral delay. Cardiovascular assessment reveals dual heart sounds with regular rhythm, no murmurs detected. Abdominal examination reveals a pulsatile epigastric mass. Bedside ultrasound in ED shows abdominal aortic aneurysm with mural thrombus, hence CTA thoracic and abdominal aorta was requested to rule out leaking AAA. CTA thoracic and abdominal aorta shows a large infra-renal fusiform dilatation of abdominal aorta measuring 8.2 x 8.8 cm (AP x W), extending until bilateral common iliac arteries, seen in Figure 1. The superior border of the AAA is seen 3.0cm from the left renal artery. There was synchronous enhancement of the IVC and aorta in the arterial phase, with communication seen in between these vessels, suggestive of an aortocaval fistula. Non-opacification of the bilateral proximal external iliac veins extending to the visualized common femoral veins, most likely attributable to a left-to-right shunt. Extensive mural thrombus is present, with a crescent-shaped hyperdensity on non-contrast imaging, raising concern for an impending rupture. No evidence of active contrast extravasation or pooling of contrast is observed in the delayed phase. There is no evidence of peri-aortic collection, stranding, para-aortic or retroperitoneal hematoma, draped aorta sign, or intimal flap to suggest aortic dissection. The visualised descending thoracic aorta is well opacified and normal in calibre. There is normal opacification of the celiac trunk, superior mesenteric artery (SMA) and both renal arteries. The SMA branches are well opacified. The patient underwent open aneurysmectomy with inlay bifurcated graft and left lower limb angiogram and embolectomy. He was discharged well 5 days post operation. He was seen well in the vascular clinic 1 month after discharge.

DISCUSSION

Aortocaval fistula (ACF) was first described by Symes in 1831 [5]. It is a rare complication of a chronically eroding abdominal aortic aneurysm in which an arteriovenous connection between the aorta and the inferior vena cava develops [1]. There are various risk factors for ACF formation including atherosclerosis, infective aortitis (mycotic aneurysm), syphilis, polyarteritis nodosa and connective tissue disorders like Marfan syndrome and Ehlers–Danlos syndrome contributes to ACF formation [2]. Atherosclerotic disease leading to intima-medial fat deposition is the most common cause of loss of integrity of an otherwise intact vessel wall. With the high pulsatile intravascular pressures, this phenomenon gradually leads to aneurysmal growth. The weakened aortic wall allows abnormal radial transmission of pulsatile pressure to the surrounding soft tissues. This abnormal force causes pressure necrosis and adhesive granulation

tissue between the aorta and a periaortic hollow or solid organ, resulting in a fistula [4]. The most frequent causes of ACF are (ruptured) aortic abdominal aneurysm (80%), traumatic injury (15%), and iatrogenic lesion (5%; e.g., exploratory laparotomy and lumbar laminectomy). A minority of cases is related to mycotic aneurysms, connective tissue diseases and Takayasu's arteritis [1]. Rarely, IVC dissection or IVC filters have been reported to result in an aortocaval fistula [6]. Various clinical presentations of ACF depend upon the acuteness of the condition and other associated findings, like rupture and dissection. A palpable pulsatile mass with a continuous bruit in a haemodynamically stable patient suggests an unruptured AAA, whereas a ruptured aneurysm presents with severe abdominal pain, hypotension and shock [2]. Other symptoms include shortness of breath, cold extremities, cyanosis, haematuria and pulmonary oedema. Long-standing fistulas often present with features of high output cardiac failure [2]. The AAA usually ruptures to the retroperitoneum space or peritoneal cavity; rarely do they rupture into the IVC forming an aortocaval fistula [3]. A definitive diagnosis of aortocaval fistula can be difficult because the classic signs are present in only 20–50% of cases [7]. Multidetector CT angiography with multiplanar reconstruction is the examination of choice for diagnosis of ACF [4]. The synchronous enhancement of the aorta and inferior vena cava (IVC), the dilatation of the lower IVC, and the demonstration of a communication between the aortic lumen and that of the IVC are the keys of the diagnosis of aortocaval fistula [8]. In case of compression of the IVC from an AAA and no obvious fistulous tract, contrast in iliac or renal veins on arterial phase and loss of aortocaval fat plane may be indicative of an aortocaval fistula [6].

Helical CT scanning with three-dimensional reconstruction is superior to ultrasonography in demonstrating the surgically relevant vascular anatomy. Multi slice helical CT scanning has largely replaced conventional angiography as the gold standard for the imaging of aortic pathology [9]. MR angiography has limited use in emergent settings but can be a viable imaging option for patients with renal insufficiency who cannot tolerate iodinated contrast medium. Use of phase-contrast MR angiography to quantify flow through a fistula has been reported [4]. Gadolinium-enhanced MR angiography is a non-invasive fast imaging method that allows an accurate diagnosis of ACF and is particularly suited for patients suffering from renal insufficiency [10]. MR angiography can provide the same information as CTA, but can be costlier, and less widely available and has longer imaging times. But this is especially useful in young patients due to lack of ionizing radiation and in situations where intravenous contrast is contraindicated, such as allergic reactions to intravenous contrast and renal failure [11]. Dynamic, time-resolved single-station MRA is also a viable alternative in making the diagnosis of ACF and may have allowed for more accurate localization of the fistula [12]. Although conventional angiography is rarely the initial imaging modality used in cases of ACF, it may be performed to delineate the arterial anatomy better, to detect bleeding rates as slow as 0.5 mL/min, and for dynamic assessment of vascular pressure gradients [4]. Ultrasound examination can be the initial imaging modality to diagnose AAA but has a very limited role in diagnosing ACF [2]. Doppler imaging can delineate the arterial flux in the IVC and perivascular artifacts in color Doppler imaging but rarely depicts the fistula itself [9]. Woolley in 1995 reported the first case of aortic exclusion used in the treatment of an intraoperatively diagnosed ACF [5]. Open surgical repair or endovascular repair forms the mainstay of treatment. Endovascular repair has the advantage of less blood loss as compared to the open repair with equal success [2]. Combination of a bifurcated endograft and a vascular occluder can be a good option for the treatment of aortocaval fistula complicating abdominal aortic aneurysm [5]. A 2022 meta-analysis revealed that of 110 cases of aortocaval fistula secondary to AAA rupture, 78% of cases were treated with an open approach, while the remaining 22% were treated endovascularly. Although 30-day survival

was higher in the patients that were treated with an endovascular approach (97.6% vs. 87.5%), the reintervention rate was higher in those treated minimally invasively (35.7% vs. 2.5%) [6]. Endovascular repair is the first choice of treatment. However, a high incidence and persistence of endoleak with the endovascular approach requires caution and a close long time follow up [13].

CONCLUSION

In conclusion, aortocaval fistula (ACF) is an uncommon but serious complication of abdominal aortic aneurysm (AAA) that carries significant mortality risk. Timely and accurate diagnosis is essential to facilitate appropriate surgical or endovascular intervention. Among the available imaging modalities, CT angiography remains the gold standard due to its rapid acquisition, broad accessibility, and high sensitivity and specificity.

CONFLICTS OF INTEREST

The authors have declared no conflicts of interest.

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FIGURE LEGENDS:

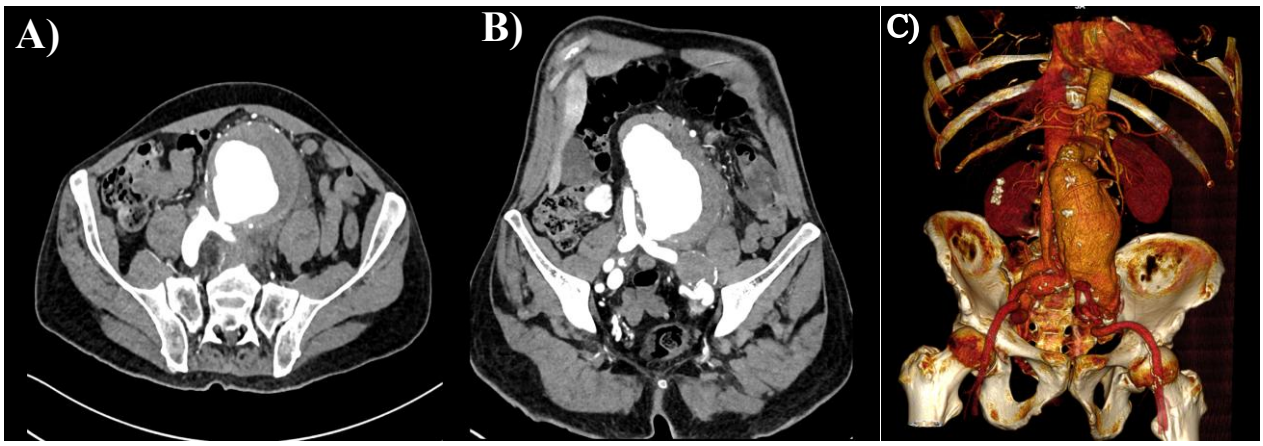

Figure 1: Axial (A) and (B) coronal contrast enhanced CTA abdominal aorta shows fistulous communication between aorta and inferior vena cava (IVC) with simultaneous contrast enhancement on arterial phase. There is disappearance of the fatty planes between vena cava and aorta. C) Volume rendering 3D CT image shows a large abdominal aortic aneurysm distal to the renal arteries and the approximate location of the aortocaval fistula.