A Tender Pulsatile Epigastric Mass is NOT Always an Abdominal Aortic Aneurysm: A Case Report and Review of Literature

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ABSTRACT

Of greatest concern in the assessment of a patient with a tender pulsatile abdominal mass is the possibility of a leaking or ruptured Abdominal Aortic Aneurysm (AAA). Other serious abdominal pathologies may demonstrate the same clinical signs but require entirely different treatments. Even amongst patients with proven abdominal aortic aneurysms CT imaging findings may influence the timing and nature of surgery and provide useful prognostic information. We present a case in which a large abdominal tender pulsatile mass was not aortic in origin. The patient had a significantly large tender congested liver associated with right side heart failure due to progressive tricuspid valve regurgitation. We have also discussed the differential diagnoses which may mimic abdominal aneurysms and discussed the role of imaging in resolving these problems.

CASE REPORT

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A 77 year old woman admitted with a three day history of increasing upper abdominal pain and nausea. She also described a three month history of increasing shortness of breath and bilateral ankle swelling. She had had a significant past medical history; including ischemic heart disease, aortic valve replacement (porcine), tricuspid valve regurgitation, atrial fibrillation, previous left lung lower lobectomy for bronchogenic carcinoma with no known metastasis. Her medications included Warfarin. Nevertheless, the lady lived by herself and she did not need any sort of supportive care.

On initial clinical assessment, she was alert but anxious with a respiratory rate of 24 at rest, tachycardia of 128 beats/min, blood pressure of 134/84 mmHg. She had raised jugular venous pressure (JVP) and bilateral ankle pitting oedema. Abdominal examination revealed a large visible and tender palpable pulsating mass; involving the epigastrium and extending to both right and left upper quadrants. There were palpable pulses peripherally throughout her limbs. Blood investigations were unremarkable except for slight hypoxia saturating at 94% on room air, and mildly raised urea of 12 (2.5 - 7.8 mmol/L) and a serum lactate of 2.3 (0.5-1.7 mmol/L). Her Haemoglobin was 15.5 gm/dl (11.5-16.0 g/dl).

Urgent computerised tomography (CT) of the abdomen and pelvis was performed. The CT protocol comprised; 120mls of iohexol (Omnipaque, GE Healthcare) intravenous contrast given at 3mls per second, with bolus tracking to determine timing of the arterial phase and approximately 120k V, 200mAs (subject to dose modulation), 1.5mm collimation with 3mm reconstruction at 1.5mm increments. CT revealed a normal calibre non-leaking abdominal aorta, and also revealed a significantly enlarged liver (Fig.1). Maximum liver dimensions were 19.8cm transverse, 13.5cm antero-posterior and 14.7cm cranio-caudal.

The CT scan also showed cardiomegaly and distension of the Intrahepatic Inferior Vena Cava (IVC) and hepatic veins, with considerable contrast in keeping with cardiac insufficiency (Fig.2). Following cardiology review a diagnosis of right sided heart failure due to progressive tricuspid valve regurgitation was made. This had causing acute congestion of the liver and hepatomegally. The patient was treated conservatively with diuretics and Angiotensin Converting Enzymes Inhibitors (ACEI). She was discharged home two weeks later after her condition improved and was clinically well, with an outpatient follow up appointment arranged with the cardiology team.

DISCUSSION

Whilst tender pulsatile abdominal masses are a common clinical scenario; their clinical signs are insensitive and may fail to reveal the diagnosis or identify serious co-morbidities in patients with confirmed aneurysms [1]. This case shows that even an enlarged left lobe of the liver can present like an aortic aneurysm patient. Adult liver size is related to height, body mass index, age and liver disease. A recent ultrasound study of 2080 subjects suggested that the mean AP diameter of the liver at the midclavicular line is 13.5cm +1.7cm for adult females [2]. Although our patient's diameter of 14.7cm is at the upper limit of this range; the range is an average for all adult females in the study and probably does not reliably relate to our small built elderly patient.

The pain and tenderness in the epigastric area were due to stretching of the liver capsule. Other causes should therefore be considered. Careful history taking and clinical examination, combined with the appropriate imaging choice are vital as it may be difficult to establish the diagnosis of an abdominal aneurysm [3].

We have summarised the differential diagnosis of a pulsatile upper abdominal mass in (Table 1). These mainly involve structures and viscera that lie in the epigastrium. By far the most common differential diagnosis is an aneurysm of abdominal aorta (fig.3), rarely superior mesenteric artery [4]. Also, tumours overlying the aorta and transmitting its pulse, like lymphoma, gastric cancer, pancreatic cancer, hepatocellular carcinoma (hepatoma), liver haemangioma and mesenteric lipoma [5]. Pancreatic pseudocysts (fig.4) represent an example of an inflammatory mass overlaying the aorta and transmitting its pulse [5].

Infrequently an enlarged congested liver due to tricuspid valve regurgitation and congestive heart failure (our case report), portal hypertension, arterio-venous fistula may convincingly mimic a leaking aneurysm, this is summarised in (Table 2). Other potential causes include splenomegaly, hepatomegaly, renal mass, mesenteric cyst, hvdronephrosis, urinary bladder, and diverticular mass [6].

A prominent pulsatile aorta is a frequent normal finding in thin patients with elongated left lobe of the liver, and in elderly thin patients with scoliosis and tortuous aorta [5].

Role of CT

In patients with symptomatic pulsatile abdominal masses, and in the absence of hypovolemic shock, the preferred initial diagnostic study is abdominal CT scan. It is an accurate and safe procedure [7].

The need for immediate definitive diagnosis of this abdominal catastrophe outweighs the concerns regarding ionizing radiation. The effective dose for CT scan is usually expressed in Sieverts (Sv). This dose provides only an approximation of the true risk on the patient from radiation [8]. For risk estimation, the organ dose is the preferred quantity. Organ doses from CT scanning are considerably larger than those from corresponding conventional radiography. A conventional abdominal x-ray examination results in a dose to the stomach of approximately 0.25 mSv, which is at least 50 times smaller than the corresponding an abdominal CT scan [8]. From our own experience, it is approximately 3.50mSv (range 1.7- 7.9mSv) or equivalent to 1.3 years background radiation in the United Kingdom or approximately 150 chest radiographs (This is a data from a recent internal study done in our centre, which is not published yet). Similar figures were documented in a recent study by White et al 2010 [9].

CT also necessitates the administration of iodinated contrast agents that can adversely affect renal function. Patients with abdominal aneurysms tend to already have poor renal function due to diseased renal arteries caused by atherosclerosis or hypoperfusion in the case of ruptured aneurysms. Many will subsequently receive further renal insults at surgery. Endovascular aneurysm repair (EVAR) of abdominal aortic aneurysms is an established treatment for patients with anatomically suitable unruptured aneurysms. A recent randomized trial recognized that endovascular repair of abdominal aortic aneurysm was associated with a significantly lower operative mortality than open surgical repair. However, no differences were seen in total mortality or aneurysm-related mortality in the long term [10].

CT permits rapid accurate endograft sizing and assessment of the sealing zones and the calibre and quality of access vessels needed for safe stent graft delivery and deployment. Many studies have shown that multiple detector row CT angiography (CTA) in AAA assessment, is superior to single detector row CTA owing to its faster examination time, higher spatial resolution, and reduced contrast utilization. In addition, the new Advanced Vessel Analysis (AVA) software has been developed for easy, semiautomatic measurement of the length and diameter of complex vascular anatomies from CTA [11].

Reliable detection of other conditions enables their appropriate further management and avoids unnecessary or inappropriate surgery. Even in patients with proven aneurysm pre-operative diagnosis of adverse anatomical features or complications such as inflammatory aneurysms or aortocaval fistula allows better planning of surgery.

TEACHING POINT

Abdominal aortic aneurysms are the commonest cause of pulsatile tender epigastric masses but may be mimicked by other serious conditions. Objective clinical and imaging assessment is vital in ensuring appropriate management.

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FIGURES

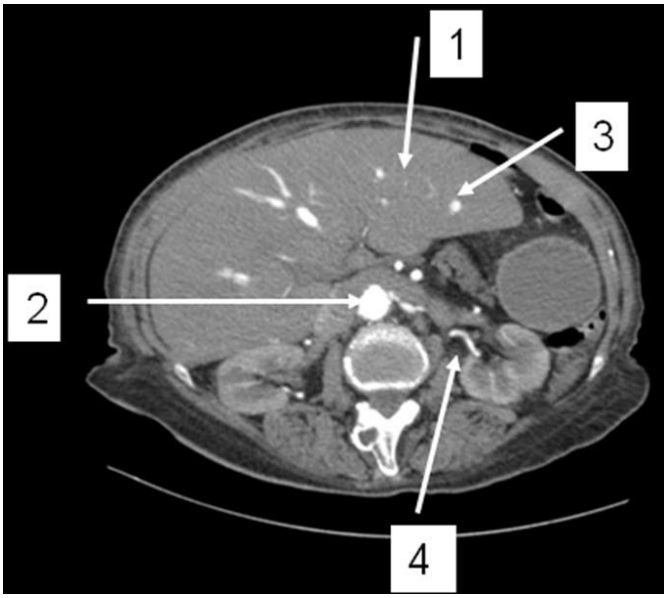

Figure 1: A 77 year old female with right heart failure due to progressive tricuspid regurgitation causing liver congestion presenting as a pulsatile epigastric mass. [Contrast enhanced Computed Tomography (CT) examination-axial image. 16 Slice MX8000 CT scanner, Philips medical systems. 200mAs, 120kVp (subject to dose modulation). Contrast 120mls Iohexol (Omnipaque, GE healthcare) at 3mls per second with bolus tracking to determine timing of arterial phase, 1.5mm collimation with 3mm reconstruction at 1.5 mm increments]. An Enlarged left lobe of liver overlying a normal sized abdominal aorta. Early contrast filling of hepatic vein tributaries due to tricuspid regurgitation. Arterial phase enhancement of hepatic and renal arteries. 1 = Left lobe of the liver; 2 = Abdominal aorta; 3 = Hepatic vein; 4= Left renal artery

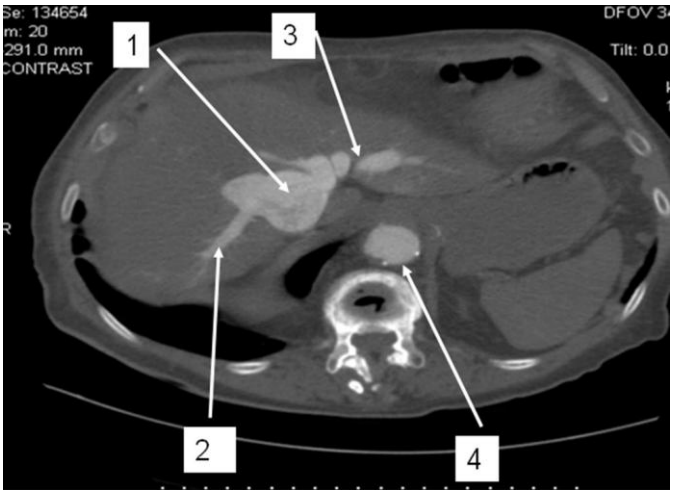

Figure 2: A 77 year old female with right heart failure due to progressive tricuspid regurgitation causing liver congestion presenting as a pulsatile epigastric mass.Contrast enhanced Computed Tomography (CT) examination-axial image .16 Slice MX8000 CT scanner, Philips medical systems. 200mAs, 120kVp (subject to dose modulation). Contrast

120mls Iohexol (Omnipaque, GE healthcare) at 3mls per second with bolus tracking to determine timing of arterial phase. 1.5mm collimation with 3mm reconstruction at 1.5 mm increments]. Grossly dilated confluence of hepatic veins and intrahepatic IVC (36mm) with contrast reflux due to tricuspid regurgitation. Normal sized abdominal aorta. (Windowing adjusted to demonstrate contrast filled vessels). 1 = Confluence of hepatic vein; 2 = Right hepatic vein; 3 = Left hepatic vein; 4 = Abdominal aorta

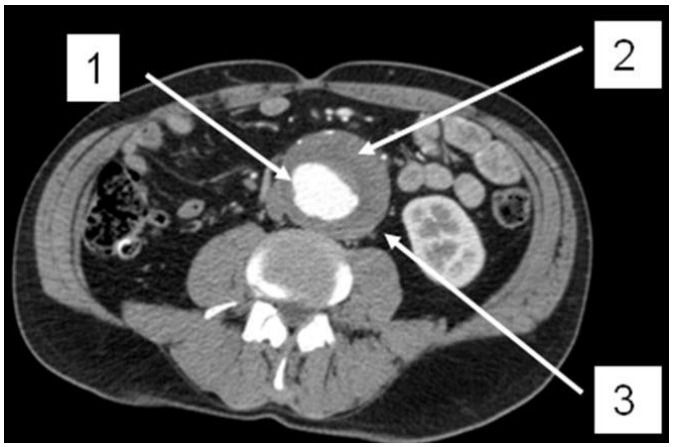

Figure 3: A 79 year old man with 5cm diameter unruptured infra-renal abdominal aortic aneurysm. [Contrast enhanced Computed Tomography (CT) examination-axial image .16 Slice MX8000 CT scanner, Philips medical systems. 200mAs, 120kVp (subject to dose modulation). Contrast 120mls Iohexol (Omnipaque, GE healthcare) at 3mls per second with bolus tracking to determine timing of arterial phase. 1.5mm collimation with 3mm reconstruction at 1.5 mm increments]. Contrast enhancement of irregular central aortic lumen with a large volume of surrounding thrombus. Clearly defined aortic margins and clear peri-aortic fat planes with no features of aneurysm rupture. 1 = Aortic lumen; 2 = Aortic thrombus; 3 = Periaortic fat

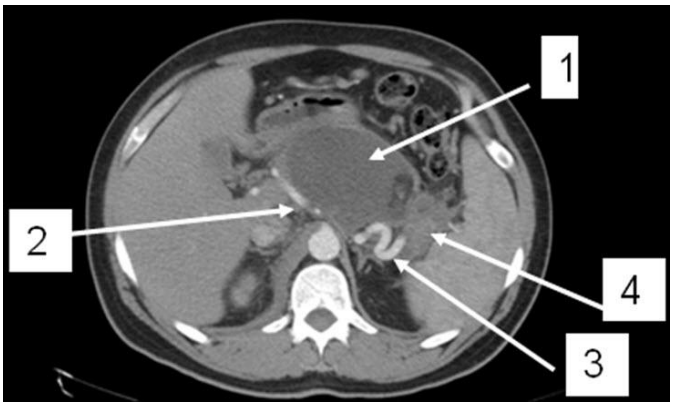

Figure 4: A 40 year old male with a large pancreatic pseudocyst. [Contrast enhanced Computed Tomography (CT) examination-axial image .16 Slice MX8000 CT scanner, Philips medical systems. 200mAs, 120kVp (subject to dose modulation). Contrast 120mls Iohexol (Omnipaque, GE healthcare) at 3mls per second with bolus tracking to determine timing of arterial phase. 1.5mm collimation with 3mm reconstruction at 1.5 mm increments]. Large (87 mm transverse by 72 mm antero-posterior) non-enhancing pancreatic pseudocyst overlying the abdominal aorta. Enhancing hepatic artery passing posterolaterally towards the liver with highly tortuous splenic artery extending laterally behind the pancreatic tail. 1 = Pancreatic pseudocyst; 2 = Hepatic artery; 3 = Splenic artery; 4 = Pancreatic tail

Differential Diagnosis	CT features
Abdominal aortic aneurysm (AAA)	Ruptured • Retroperitoneal haematoma with extension into perirenal and pararenal/psoas spaces. • Contrast extravasation • Draped aorta sign if the posterior wall of aorta is not distinct from adjacent structures Unruptured • Increased diameter size of aorta (>150% normal) • Mural thrombus and calcification • Hyperattenuating crescent sign
Tumours	• Varied appearances • Discrete mass or diffuse organ infiltration/invasion • Associated lymphadenopathy • Metastatic lesions in liver, lungs and skeleton
Pancreatic pseudocyst	• Large cyst cavity in and around the pancreas • Multiple cysts may be present • May appear irregular or have calcifications rarely. • Pseudoaneurysms of the splenic artery, bleeding into a pseudocyst, • Splenic vein thrombosis • Biliary and enteric obstruction may be complicating features
Heart failure	• Diffuse liver enlargement • Contrast reflux into IVC and hepatic veins • Associated signs of heart failure, cardiomegaly, pleural effusion, pulmonary oedema. • Associated signs of portal hypertension, splenomegaly, porto-systemic shunts
Other causes	• Varied appearances mandating systematic image evaluation • Splenic enlargement • Dilatation of renal pelvicalyceal systems • Colonic diverticula with peri-colic inflammation and fluid collection
Normal finding	• Normal aortic appearances, usually slim elderly patients

Table 1: Differential diagnoses table of pulsatile abdominal mass [12]

Aetiology	Tricuspid insufficiency refers to the failure of the heart's tricuspid valve to close properly during systole. As a result, with each heart beat some blood passes from the right ventricle to the right atrium opposing the normal direction.
Incidence	Occurs in roughly less than 1% of people and is usually asymptomatic.
Gender Ratio	Equal
Age Predilection	Usually elderly
Risk Factors	Include left heart failure, pulmonary hypertension, and right ventricular infarction.

Imaging features	• Chest radiography
	  ○ Cardiomegaly
	  ○ Pleural effusions.
	  ○ Ascites
	  ○ Pulmonary arterial and venous hypertension
	• Echocardiography
	  ○ Right ventricular dilatation.
	  ○ Paradoxical motion of the ventricular septum
	  ○ Prolapse of the tricuspid valve, endocarditis, rheumatic heart disease, or Ebstein .

Treatment	Treatment of the underlying condition, e.g. antibiotics for endocarditis. Treatment of associated arrhythmias. Reduction of volume overload with diuretics and salt restriction. ***Surgery:*** Surgery is required if right heart failure or low cardiac output are not adequately controlled by medical treatment. Surgery is usually performed in combination with mitral and/or aortic valve disease repair. For tricuspid valve replacement, the risk of thrombosis is significant and warfarin therapy is advised. Percutaneous balloon valvuloplasty is successful, unless there is significant associated tricuspid regurgitation
Prognosis	Prognosis is generally good but dependent on the prognosis of the underlying disease, associated other heart abnormalities and associated arrhythmias.

Table 2: Summary table of tricuspid regurgitation

ABBREVIATIONS

AAA: abdominal Aortic Aneurysm
ACEI: angiotensin converting enzymes inhibitors
CT: computerised tomography
IVC: inferior vena cava
JVP: jugular venous pressure
PP: pancreatic pseudocyst

KEYWORDS

Pulsatile abdominal mass, Computed Tomography, CT Scan, Abdominal aortic aneurysm

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