Infected Aneurysm Complicated with AV Fistula and Thrombosis of the Iliac Veins and Inferior Vena Cava: a case demonstrated with Computed Tomography

Shi-Zuo Liu  Soa-Min Hsu  Hui-Lun Zhan  Chin-Hwa Chen  Tzu-Lung Ho

Department of Radiology, Kuang Tien General Hospital

Infected aneurysm of the abdominal artery has been found occasionally, but being accompanied with arteriovenous fistula detected by CT angiography has rarely been reported. A preoperative clinical diagnosis of infected aneurysm and arteriovenous fistula is difficult. We report a case of infected aneurysm of right common iliac artery, with the complication of arteriovenous fistula, causing thrombosis of the bilateral iliac veins and inferior vena cava. This case showed the peri-arterial abscess extension with partial thrombosis of iliac veins and inferior vena cava, which was not mentioned before in the literature. A contrast-enhanced 64-row multiple detector CT scan with three-dimensional CT angiography is an effective, non-invasive method to detect the presence of aneurysm and its associated complications.

CASE REPORT

A 78-year-old male had past history including hyperlipidemia, coronary artery disease, and a minor stroke. He also had recto-sigmoid colon cancer post-surgery about 10 years ago and was regularly followed up at our outpatient department for 4 years.

He suffered from chills and fever and was admitted to our hospital with medical treatment by antibiotics, and then was discharged for outpatient
follow-up. Seven days later, he was brought to our emergency room due to high fever, chills, and mild lower abdominal discomfort. Upon arrival, his body temperature was 38 degree celsius. The physical examination revealed no obvious palpable abdominal mass. Vital signs showed a blood pressure of 100/60 mmHg and a sinus tachycardia of 118 beats/minute. Routine blood tests revealed leukocytosis and a high CRP of 20.17 mg/dl (normal: 0–0.5). Urine analyses were within normal limits. A chest X-ray showed bilateral basilar ground-glass infiltration without an obvious pneumonia patch.

Because he was diagnosed with sepsis with an unknown infectious source, he was admitted to our ward for further treatment. Abdominal CT scan was arranged to check if there was any intra-abdominal abscess. Initial contrast-enhanced CT scan (collimator = 10 mm, rotation time = 1 sec, HiSpeed, GE) showed mild fat stranding in lower abdomen and abnormal soft tissue lesion (Fig. 1a-1d) with encasement of the right common iliac artery, close to the right iliac vein and posteromedial invasion or compression of the right iliac vein, resulting in partial thrombosis of the inferior vena cava and the right iliac vein. According to the clinical symptoms and initial CT scan findings, an infected aneurysm was suspected and then he received antibiotic medical treatment in our ward. A blood culture yielded Gram-negative bacilli, Klebsiella pneumoniae, which confirmed the diagnosis.

**Figure 1.** a-d: Sequential axial contrast-enhanced CT images, displayed from cephalad (a) to caudal (d) at 1 cm intervals, show ground-glass fat stranding and periaortic complex soft tissue (arrow), and suspected encasement of the right common iliac artery, close to the right iliac vein, and direct invasion or compression of the right iliac vein, resulting in partial thrombus of the inferior vena cava and the right iliac vein.

**Figure 2.** a-d: Sequential axial contrast-enhanced CT images obtained five days later, displayed from cephalad (a) to caudal (d) at 1 cm intervals, show enlargement of the para-aortic complex soft tissue (arrow), aneurysm formation (*), and thrombosis of the inferior vena cava and bilateral iliac veins.
Five days later, repeat contrast enhanced 64-row MDCT (collimator = 0.5 mm, rotation time = 0.40 sec, Aquilion 64, Toshiba) of the abdomen was performed to evaluate the disease status. Arterial phase CT angiography was also performed. A total of 100mL of nonionic contrast medium (350mg I/mL) was administered through an antecubital vein at a flow rate of 3mL/s, with an acquisition delay of 25 seconds after the start of contrast medium infusion. The CT scan showed enlargement of the para-aortic complex soft tissue (Fig. 2a-2d). CT angiography was performed on a dedicated 3D workstation, and showed a saccular aneurysm (Fig. 3a) that developed from the right common iliac artery. The oblique view of thick-slab Maximal Intensity Projection showed a fistula between the right common iliac artery and the right iliac vein (Fig. 3b) leading to the diagnosis of an early arteriovenous (AV) fistula (Fig. 4a-4b). And there is a channel extending from the aneurysm to the right iliac vein, with accompanying thrombosis of the bilateral iliac veins and lower inferior vena cava. The clinical symptoms, laboratory data, and radiological images all confirmed the presence of an infected aneurysm with complications. However the patient asked to be transferred to another hospital for surgery. He received emergent resection of necrotic tissue, repair of aneurysm and arterial graft replacement from right common iliac artery to external iliac artery there and his postsurgical condition was stable.

Figure 3. a-b: a. The 3D reconstruction CT angiography shows a saccular aneurysm (arrow) arising from the right common iliac artery. b. The oblique view of thick-slab Maximal Intensity Projection shows a fistula (arrow) between the right common iliac artery and the right iliac vein.

Figure 4. A coronal reconstruction of an enhanced arterial phase CT scan shows a fistula (arrow) between the right common iliac artery and the right iliac vein, with thrombosis in inferior vena cava and the bilateral common iliac veins.
DISCUSSION

Infected aneurysms are uncommon, but can affect any artery [4]. The true prevalence of infected aneurysms is unknown, but the prevalence of infected aortic aneurysms is 0.7%–1% of surgically treated cases [5]. About 7% to 24% of infected aortic aneurysms demonstrate free rupture, and a further 47% to 61% demonstrate contained or impending rupture at presentation. Freely ruptured infected aortic aneurysms have a 63% to 100% mortality rate [5]. Iliac arterial aneurysms are uncommon, and most are atherosclerotic in nature. AV fistula between common iliac artery and common iliac vein are even rarer. The pathophysiology of infected aortic aneurysm has been reported previously by several authors [6]. The arterial infection results from direct invasion of the intima, with septic emboli affecting the vasa vasorum or extension from a contiguous septic focus. The infection causes wall destruction, development of aneurysm and even rupture. Staphylococcus and streptococcus species are the most common causes of infected aneurysms [2].

The most common site of fistulization affected from the aorta is the inferior vena cava, and the most common location of aortocaval fistula is at the level of the distal aorta, just superior to the iliac venous confluence located at the right posterolateral portion of aortic aneurysm. The mechanism of spontaneous AV fistula formation is attributed to the periaortic inflammation that had adhesion to and even more pressure erosion of the wall of IVC [7]. Diagnosis of infected aneurysm depends heavily on clinical history and image studies. In general, infected aneurysms have a poor natural history, with fatality from hemorrhage or fulminating sepsis. Abdominal infected aneurysms may manifest as abdominal pain with or without a pulsatile mass [5]. An image study is necessary to establish the diagnosis and to localize, characterize, and assess the number of infected aneurysms. Diagnostic modalities include ultrasonography, CT, magnetic resonance image and more invasive methods such as selective angiography [8, 9].

CT angiography is now the imaging modality of choice for the evaluation of suspected infected aneurysms. With the utilization of 3D reconstruction of vascular anatomy, effective surgical or endovascular treatment can be planned, in addition to simultaneous identification of any associated complications [10]. The conventional CT imaging findings that are highly suspicious for infected aortic aneurysm include saccular aneurysm (especially lobulated), rapid expansion or development, adjacent soft-tissue mass, ground-glass fat stranding, and/or fluid in an unusual location. Gas and vertebral body changes are helpful features, although they occur infrequently [2]. Ruptured infected aortic aneurysms show active extravasation of contrast medium upon CT, and hematoma formation adjacent to the aneurysm can occur [11]. It is also necessary to identify associated complications, to map relevant vascular anatomy for treatment planning, and provide follow-up to determine the treatment effect and to detect any new infected aneurysms. The specific management of an infected aneurysm must be individualized and is dependent on the characteristics of the aneurysm, the patient condition, and available expertise.

An abdominal infected aneurysm complicated with inferior vena cava thrombosis and early AV fistula have rarely been reported or presented with CT evidence before. Compared to the references, this case showed peri-arterial abscess extension with partial thrombosis of IVC. The AV fistula may also be diagnosed with CT scan by early enhancement of the venous system due to rapid contrast flow from the arterial to venous system. Other possible related CT findings include distention of the venous structure and retrograde flow to the renal and iliac veins [12, 13].

If an AV fistula is present, prompt surgery is necessary to prevent fatal cardiac failure and to reduce surgical morbidity and mortality. Surgery is indicated in all cases of aortocaval fistula since survival without operation is usually less than two months. Preoperative diagnosis of AV fistula is also important for the surgeon because pulmonary embolism and massive venous bleeding are known complications of the AV fistula [12, 14].

The 64-row MDCT data acquisition provides isotropic, high-resolution volume images during a single breath hold [5]. These features enhance the ability of two and three dimensional image reconstruction, providing the benefit of angiogram-like images in multiple projections. The contrast-enhanced 64-row MDCT can easily provide diagnostic information regarding any aortic anomaly and its relationship with other anatomy. We demonstrate that CT angiography by 64-row MDCT is an effective, non-invasive image modality for detecting infected aneurysm and its associated complications.
REFERENCES

細菌性動脈瘤併發腸骨靜脈及下腔靜脈血栓和動靜脈瘻管：病例報告及在電腦斷層影像表現

劉時佐、徐守民、詹慧倫、陳慶華、何子龍

光田綜合性醫院 放射線科

腹部動脈的細菌性動脈瘤偶爾會被發現，但是合併動靜脈瘻管及其在電腦斷層影像的表現很少被報告。手術前臨床診斷細菌性動脈瘤合併動靜脈瘻管是很困難的。我們報告一位右腸骨動脈的細菌性動脈瘤，併發動靜脈瘻管及引起雙邊的腸骨靜脈和下腔靜脈的血栓。使用顯影劑的電腦斷層及三維的電腦斷層血管影像是一種有效、非侵襲性的方法，可被用來診斷及證明細菌性動脈瘤和它相關的併發症。