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Case Series

Aneurysm of the Inferior Vena Cava: Imaging Findings

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Abstract

Aneurysms of the İnferior Vena Cava (IVC) are very rare. An IVC aneurysmmay be discovered incidentally in asymptomatic patients on imaging studies performed for other reasons. Its clinical presentation is variable. Ultrasonography (US), Computed Tomography (CT) and Magnetic Resonance İmaging (MRI) are the modalities of choice for diagnosis. In this report, we describe two cases with a large fusiform aneurysm of the infrahepatic IVC. Despite being rare, IVC aneurysm should be remembered in patients with right upper abdominal quadrant pain and lower extremity swelling. It can be easily diagnosed by non-invasive cross-sectional imaging methods such as US and MSCT.

Keywords: Aneurysm; Computed tomography; Inferior vena cava; Ultrasonography

Introduction

Inferior Vena Cava (IVC) aneurysm is quite a rare vascular lesion. It may manifest with a variety of signs and symptoms. While it may be complicated by thromboembolism, it may also remain clinically silent. These aneurysms can be easily diagnosed by Ultrasonography (US), Computed Tomography (CT), or Magnetic Resonance Imaging (MRI) [1-3]. This case report presents the findings of ultrasonography and Multi Slice Computed Tomography (MSCT) in a rare case of IVC aneurysm with a review of the relevant literature.

Case 1

A 76-year-old woman presented with blunt pain confined to right upper abdominal quadrant for about two years. On physical examination she had modest pain on right upper abdominal quadrant and swelling at the same localization as her pain, but her physical examination was otherwise normal. Her laboratory tests also revealed normal results. She had not undergone any previous surgical or interventional procedure. Ultrasonography and Color Doppler US (CDUS) examinations showed a retroperitoneal vascular mass of 7 cm in diameter, which shifted right kidney. The mass was located to IVC region above renal veins, from where it liver parenchyma and extended to right renal vein (Figure 1A&B). In order to determine the extent of the mass and detect other possible concurrent pathologies, abdominal computed tomography imaging was performed at delayed arterial and venous post-contrast phases with a 16-detectorMSCT device (Brilliance 16, Philips Medical Systems, Best, Netherlands) and evaluated on axial, sagittal and coronal planes. The lesion was detected to be a large saccular aneurysm of the intrahepatic-suprarenal IVC. There were areas of heterogeneous density due to turbulence within the lesion, but no intraluminal filling defects. Intrahepatic veins were also dilated, and dilatation continued up to the right heart. The right kidney and adrenal gland were displaced inferiorly, and the left lobe of the liver was compressed (Figures 2A&B). Dilatation and tortuosity of splenic vein and subcutaneous vascular structures on the anterior abdominal wall were considered secondary to the intrahepatic pressure increase. Multimodality imaging confirmed the diagnosis of IVC aneurysm. No pathology was found in other organs and venous systems, including both renal veins.

Case 2

A 50-year-old man followed-up for chronic obstructive pulmonary disease, pulmonary hypertension, and right heart failure for 10 years was admitted to our hospital's intensive care unit with abdominal pain and right leg swelling. Contrast-enhanced thoracic and abdominal CT examinations were performed with a 64-detector MSCT (Aquilion, Toshiba Medical Systems, Tokyo, Japan), and, revealed a fusiform aneurysm of the IVC, measuring 22x15x15 cm, starting at the level of the celiac trunk down to the right iliac vein (Figure 3A&B and Figure 4). IVC segments proximal to the lesion

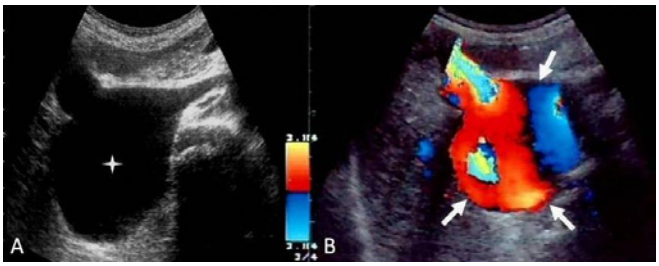

Figure 1: **(A)** Gray-scale (asterisk) and **(B)** color Doppler ultrasonography (arrows) images show an aneurysmal dilatation of the inferior vena cava.

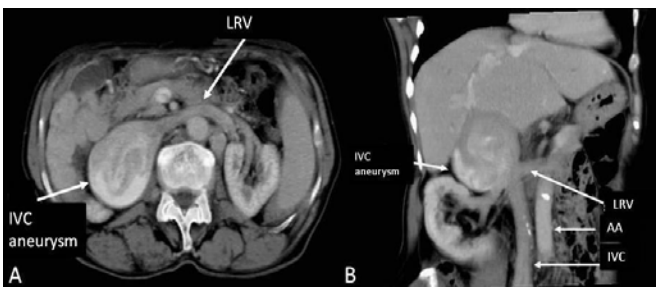

Figure 2: (A) Axial and (B) oblique-coronal post-contrast delayed arterial phase computed tomography show a fusiform aneurysmal dilatation of the intrahepatic-suprarenal inferior vena cava. (IVC: Inferior vena cava, LRV: Left renal vein, AA: Abdominal aorta).

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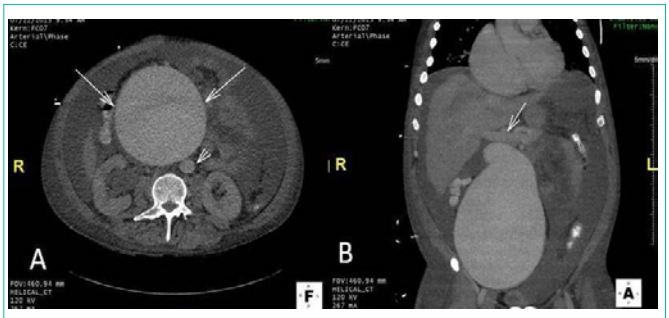

Figure 3: (A) Axial and **(B)** coronal post-contrast phase computed tomography show a fusiform aneurysmal dilatation of the inferior vena cava, starting at the level of celiac trunk (long arrows: IVC aneurysm; short arrow: abdominal aorta).

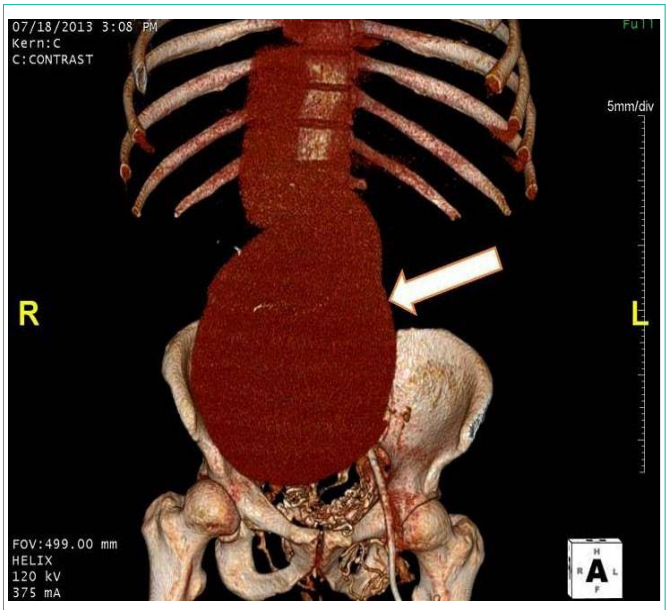

Figure 4: Three-dimensional CT venography shows a fusiform aneurysmal dilatation of the inferior vena cava (arrow).

were tortuous. In addition, hepatic veins were dilated and there was free fluid in the abdominal cavity. Thoracic CT examination revealed dilatation of right heart chambers and the suprahepatic segments of the IVC.

Both patients refused to undergo operation; however, no change was observed in the size and extension of IVC aneurysms during a 2-year follow-up period.

Discussion

A venous aneurysm refers to a limited dilatation of a vein. The first report of a venous aneurysm was published in 1928.Visceral venous aneurysms (including IVC aneurysm) are quite rare. Calligaro et al. [4] reported abdominal venous aneurysms in 32 patients (Eighteen were located on portal veins, 7 on the IVC, 4 on the superior mesenteric vein, 2 on the splenic vein, and 1 on the internal iliac vein).

The true incidence of aneurysms of the inferior vena cava is unknown. The first case report of localized IVC aneurysmal dilatation was published by Oh et al. in 1973. IVC aneurysms rarely co-occur with congenital anomalies. Since thrombosis, rupture, and pulmonary embolism are common complications, IVC aneurysms are clinically important entities. Nevertheless, the majority of IVC aneurysms is clinically asymptomatic and diagnosed by chance [5-7].

Although the etiology of venous aneurysms is not entirely clear, Thompson and Lindenauer [6] grouped IVC aneurysms in three groups as congenital, acquired, and arteriovenous fistula-dependent. Acquired aneurysms may develop as a result of congenital IVC anomalies, trauma, proximal stenosis or obstruction of IVC, prolonged right heart failure, or immune disorders creating injury in venous wall. IVC aneurysms are typically saccular true aneurysms in the sense that all wall layers are present, although fusiform dilatation may occur, as in the cases we reported [1-5, 7-10].

In addition to the classification of Thompson and Lindenauer, Gradman and Steinberg [8] classified IVC aneurysms in 4 groups based on their anatomic and embryological properties:

Type I: Suprahepatic IVC aneurysm without venous obstruction,

Type II: Aneurysms with concurrent IVC interruption below or above the level of hepatic veins.

Type III: Aneurysms confined to infrarenal IVC without any concurrent venous anomaly.

Type IV: Mixed lesions.

In our first case, the aneurysm was located to intrahepatic region above renal veins. This IVC aneurysm was therefore identified as a type II aneurysm. For the second case, no classification of the aneurysm was possible owing to its large size and extension.

The majority of IVC aneurysms reported in the literature are saccular type III aneurysms. Our detailed literature scan retrieved 44 cases of IVC aneurysm reported between 1973 and 2015 [1-3,9,10-17].

Imaging plays a pivotal role in the management of vascular aneurysm. Indeed, gray-scale or duplex Doppler US, CT, venography, and magnetic resonance imaging can be used for the diagnosis.

The differential diagnosis of IVC aneurysms should include retroperitoneal masses such as primary IVC tumors including leiomyosarcoma and leiomyoma, enlarged conglomerate lymph nodes, neurogenic tumors, and renal carcinoma. The anatomic origin of a mass lesion is helpful in the differential diagnosis. MSCT examination, with delayed arterial or venous phases and the acquisition of coronal, sagittal, and three-dimensional volumetric images, can delineate the origin and relationship with other structures. MSCT is also helpful in the detection of the character of an aneurysm. When the lumen of an aneurysm is filled by thrombus, however, it would be difficult to differentiate it from other solid tumors originating from IVC. In such instances, MRI can be used as a problem solver because it can demonstrate blood and blood degradation products inside a mass. MSCT, thanks to its rapid image acquisition ability, has an important role in making early diagnosis and therapeutic decisions in patients with a vascular pathology. By virtue of its rapid scanning properties, it enables simultaneous evaluation of vascular structures and adjacent organ parenchyma. It also allows imaging of many successive systems by its rapid data acquisition properties [1–4,7-11].

A high rate of thromboembolism, intestinal hemorrhage and

pain secondary to fistula development, rupture, and compression of neighboring organs has been reported in the literature. Since IVC aneurysms are rare, their clinical course is largely unknown and there is no consensus as to their standard therapy. Their treatment usually consists of complete resection, or in particularly saccular or narrow neck aneurysms, partial resection [1-6]. Embolization of an IVC aneurysm was reported in a pediatric patient [8].

Conclusion

Despite being rare, IVC aneurysm should be remembered in patients with right upper abdominal quadrant pain and lower extremity swelling. It can be easily diagnosed by non-invasive cross-sectional imaging methods such as US and MSCT.

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