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A case of duplicated inferior vena cava with bilateral iliac vein compression

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ABSTRACT

Duplicated inferior vena cava with bilateral iliac vein compression is extremely rare. We report a case of an 87-year-old man presented with bilateral lower extremity swelling, who was noted to have duplicated inferior vena cava, as revealed by computed tomography angiography (CTA). This revealed bilateral iliac vein compression caused by surrounding structures. Anticoagulant treatment combined with stent implantation completely alleviated this chronic debilitating condition during the follow-up of 2 months with no recurrence.

1. Background

Venous compression syndromes are caused by the extrinsic venous compression of anatomical structures. This compression leads to venous hypertension in the lower extremities, which can cause painful swelling, skin discoloration, and even ulcer formation.[1] Left-sided common iliac vein (CIV) compression by the right common iliac artery and lumbosacral spine can induce left-sided CIV thrombosis, a condition known as May-Thurner syndrome (MTS).[2] Duplicated inferior vena cava (IVC) occurs when symmetrical pairs of cardinal veins fail to fuse during the fourth to eighth week of gestation.[3] Here, we report a rare case of successful bilateral iliac vein stenting for venous decompression in a patient with lower limb edema and a duplicated inferior vena cava (IVC).

2. Case presentation

An 87-year-old man presented with persistent bilateral lower extremity swelling that had persisted for several weeks. Despite conservative measures, the swelling progressed to the point of developing left-sided blisters. (Fig. 1. A). The patient had a history of hypertension for more than 10 years and regularly received calcium antagonists. He had no surgical history, except for a strangulating bowel obstruction 8 years prior, which led to abdominal surgery. The patient had no family history of venous thromboembolism or hypercoagulation. Computed tomography angiography (CTA) of the abdomen with intravenous contrast revealed a duplicate inferior vena cava (IVC). The patient also had left external iliac vein (LEIV) stenosis caused by compression of the left external iliac artery and surrounding iliopsoas. Additionally, right common iliac vein (CIV) stenosis was caused by compression from the right common iliac artery, as well as compression from the fifth lumbar vertebral body. To further clarify this, fluoroscopic angiography was performed in the operating room, which confirmed these findings. After catheterization of the femoral vein following the Selinger technique under local anesthesia with 1% lidocaine, angiography of the left and right femoral veins was performed, and the anterior and posterior diameters of the bilateral external iliac veins were narrowed (Fig. 1. A). Two bilaterally symmetrical inferior vena cava (IVCs) ascended along the right and left sides of the anterior artery. The left IVC joins the left renal vein (RV) to form a common trunk that crosses anteriorly to the aorta and ends at the right IVC. A vein[interiliac vein (IiV)] connects the IVCs at the aortic bifurcation. The IiV was formed by the union of one tributary from the IVCs and a tributary from the bilateral internal iliac veins (IIV) (Fig. 2). The stenotic lesion was treated using conventional balloon catheter angioplasty (12 × 60 mm). Complete venography revealed residual stenosis. As our practice for venous angioplasty is to stent only for residual stenosis or recurrent lesions, we believe that the patient was suitable for stent implantation. Left- and right-sided residual stenoses were successfully treated by implantation of a 12 mm × 60 mm and a 12 mm × 80 mm Wallstent (Boston Scientific), respectively, in the affected veins. The patients were injected with subcutaneous low-molecular-weight heparin 4000IU twice daily during hospitalization, and the oral anticoagulant rivaroxaban (15 mg once daily)was administered for 12 months and after discharge. One week later, his swelling significantly decreased and the blisters healed (Fig. 1. B). Repeat CTA showed a patent bilateral external iliac stent (Figure Fig. 2B). At the 1-month follow-up, the patient's swelling had resolved and the flow in his lower limb veins remained preserved.

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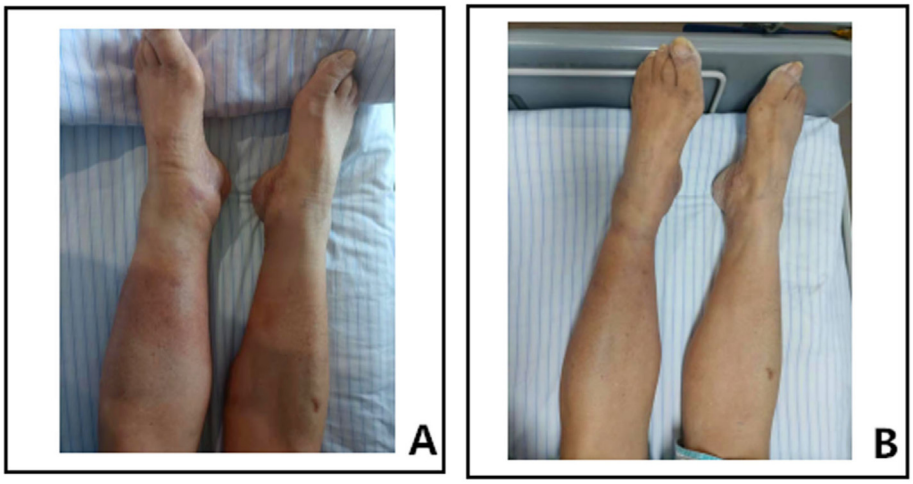

Fig. 1. A: Significant lower extremity swelling associated with blisters. B: Resolution of swelling and blisters was observed after treatment with a venous stent.

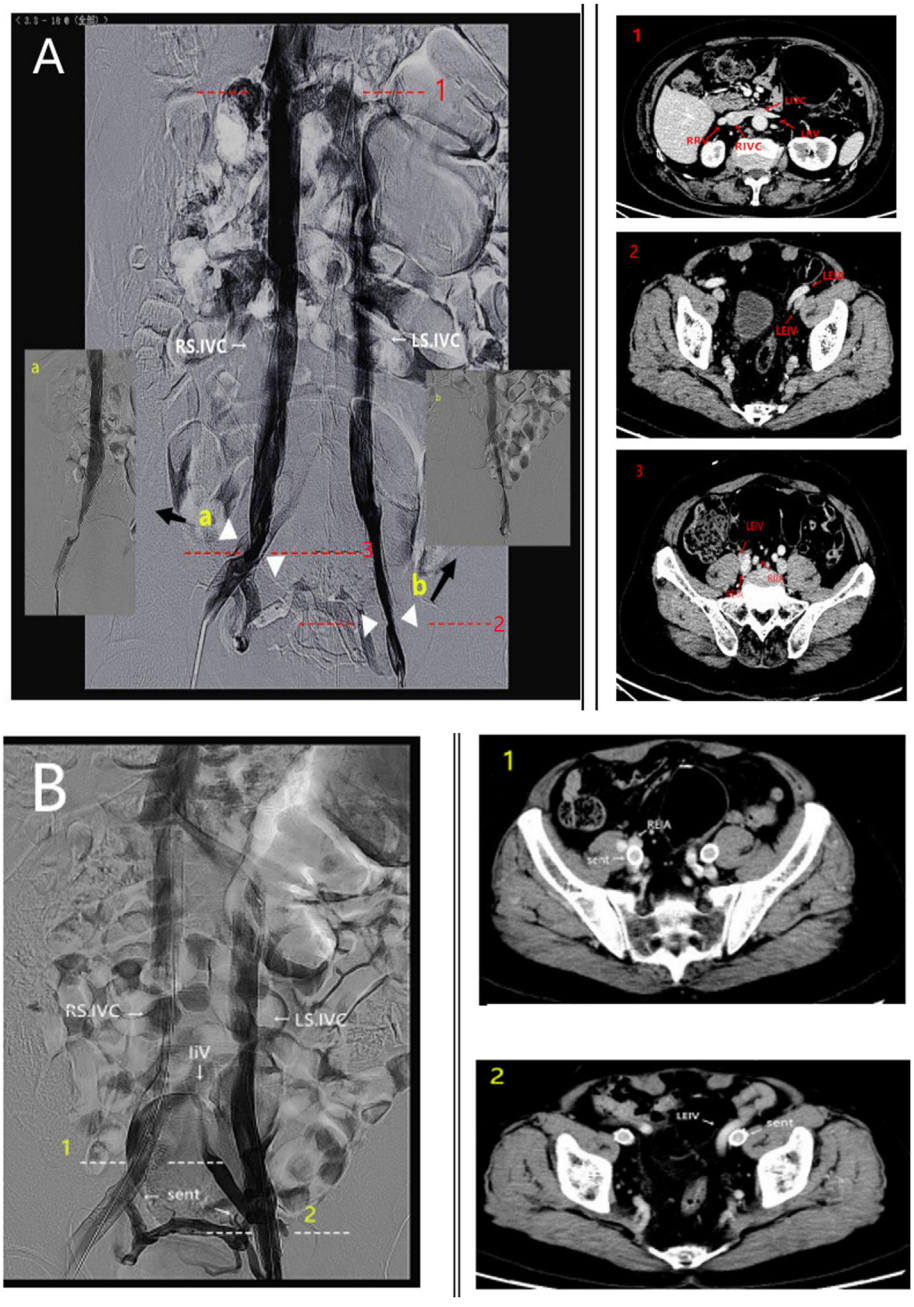

Fig. 2. A: Contrast-enhanced CT and Intraoperative venography. Of note, the right IVC is entrapped with the right CIV. The left IVC is merged between the SMA and aorta (dotted line 1). LEIV stenosis is caused by compression from the left external iliac artery and surrounding iliopsoas (dotted line 2; arrowhead b). The right CIV is approximately 50% compressed between the right common iliac artery and the fifth lumbar vertebral body (dotted line . 3; arrowhead a). B: Successful deployment of the stent in the affected segment with a resolution of stenosis.
CIV, common iliac vein; IVC, inferior vena cava; Ls, left side; Rs, right side; SMA, superior mesenteric artery. LEIV, left external iliac vein.

3. Discussion

There is a wide range of anatomical characteristics of a double IVC, including its position, diameter, and course. Duplicated IVC is mostly discovered incidentally, and its prevalence is estimated as 0.3%–0.4%.[3] This unique case demonstrates that double venous compression by a duplicated IVC can result in lower limb edema. Fortunately, the confirmed diagnosis of bilateral venous compression was not delayed as the patient did not present with thrombosis related to the lower extremities. A previous paper by Mukai et al. found that double venous compression due to a duplicated inferior vena cava can induce right-sided common iliac vein thrombosis.[4] Here, double venous compression caused by a duplicated IVC rendered the venous flow stasis more complicated. The case is unique, as our patient was a male in his late 80s and had significant compression of the bilateral iliac veins. Consequently, the vein walls thicken and eventually stenosis develops, causing venous hypertension. It is possible to develop mural fibrosis, thickening, or webs that prevent antegrade blood flow from thin-walled veins over time due to repeated arterial pulsations. We demonstrated that venous disease is not an issue exclusively in young females and is restricted to the unilateral iliac vein.

A combination of imaging techniques, such as Doppler ultrasound, computed tomography venography, and single-plane venography, may help diagnose veno-occlusive disease. In a previous study, Liu and Mousa reported that IVUS and single-plane venography were more sensitive for diagnostic testing, but were not available in our service.[5,6] Compared to conventional angiography, multidetector CT is less expensive, less invasive, easily applicable, and more reliable in identifying abdominal vascular structures if suspected. Balloon angioplasty is often used in combination with stent placement and may be the first choice for the effective management of iliac vein compression syndrome. Several studies have demonstrated the safety and efficacy of common iliac vein stenting. At the 3- to 5-year follow-up, nonthrombotic lesions treated with stents exhibited primary patency ranging from 90% to 100%, with estimated complication rates of less than 1%.[1,7,8]

In the present study, the patient experienced swelling in both lower limbs for several weeks. Computed tomography angiography revealed obvious iliac vein stenosis. The patient underwent a bilateral iliac vaginoplasty and stent implantation. The swelling of his bilateral legs was largely alleviated after the intervention, and he was in good condition without chronic symptoms of iliac vein compression syndrome during a two-month follow-up period.

Ethical approval

The study was approved by the ethics committee of the Gaochun People's Hospital. All clinical practices and observations were conducted in accordance with the Declaration of Helsinki.

Patient consent

Written informed consent was obtained from the patient for publication of the case report and any accompanying images.

Author contributions

H Xu: Writing - original draft, S Hu: Writing - review & editing, S Yao: Investigation, L Yang: Writing - review & editing. H Xu and L Yang contributed to the study conception and design. H Xu and L Yang collected and analyzed the clinical data and wrote the manuscript. S Yao and S Hu submitted and revised the manuscript. The final version of the manuscript was read and approved by all authors.

Declaration of competing interest

The authors declare that there is no conflict of interest.

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