

Feasibility of Bedside Ultrasound-Guided Inferior Vena Cava Filter Implantation in COVID-19 Patients with Deep Venous Thrombosis

Running title: Bedside Ultrasound-Guided IVC Filter Implantation in COVID-19

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Learning Point for Clinicians:

Deep venous thrombosis (DVT) in the lower extremity is one of the commonest complications in patients with its infection- COVID-19, especially in severe and critical cases. Our cases highlights the safeness, cost-effectiveness and convenience of the life-saving, bedside ultrasound-guided inferior vena cava (IVC) filter implantation in COVID-19 patients.

Case description:

Case 1: A 40-year-old male had a sudden fall with four-limb twitching and confusion at home on February 13, 2020. He regained full consciousness several seconds afterwards, but became unable to move his two lower limbs and had backache. He had no cough, fever and dyspnea recently, but COVID-19 nucleic acid test for SARS-Cov-2 returned a positive result in a local district hospital. Magnetic resonance imaging showed C12 and L1 vertebral compression fracture while chest computed tomography (CT) demonstrated typical bilateral distribution of patchy shadows and ground glass opacity (Figure 1A). The patient was transferred to our hospital. 3 day later, he complained of discomfort in the left sacrum, and bedside ultrasound revealed left iliac vein thrombosis (Figure 1B). In order to prevent acute pulmonary embolism, bedside ultrasound-guided IVC filter implantation was performed. A portable, diagnostic ultrasound Doppler system was used. The scan first determined the position of the (lowest) right renal vein entrance to the IVC with the patient supine. Body surface marking corresponded to the right renal vein entrance to the IVC inside the abdomen (Figure 1C). The right femoral vein was then punctured under local anesthesia, and a Cook Celect Vena Cava

filter was introduced via a PE conveyor. The tip of the filter was placed 0.5 ~ 1.0 cm below the entrance. A sulfur-hexafluoride-filled microbubble contrast agent was injected to further clarify the tip position. Then, the filter was released. The filter expanded well and the position was satisfactory (Figures 1D-F). The patient reported no discomfort during or after surgery. He is currently in good condition.

Case 2: A 70-year-old male was admitted to our hospital with "right lower extremity pain, bruising for 25 days, and a diagnosis of coronavirus pneumonia for 10 days." He was diagnosed to have COVID-19 based on positive nucleic acid test results and typical CT findings (Figure 2A). Thrombosis in the right iliac artery and vein, and deep veins in the lower extremity were diagnosed by ultrasound in his local hospital (Figures 2B and 2C). He was given anticoagulation and antibiotic therapies. A follow-up chest CT 23 days later showed no significant changes. Therefore, he was transferred to our hospital. Considering there was a very high likelihood that the venous clots would break off, an IVC filter implantation via his left femoral vein was performed with the same procedure as described above (Figures 2D-F). The operation was a success and the patient remained well.

Discussion :

In this report from a frontline Covid-19 epicenter hospital, the morbidity of lower extremity DVT was high at 7.4% (75/1017). Preliminary studies demonstrate that hemostatic abnormalities, hypoxia, severe inflammatory response, critical illness, and underlying traditional risk factors may predispose patients to thrombotic.¹⁻³ No matter whatever causes are, were the high incidence of DVT not recognized in time, particularly when medics are

fighting a pandemic with limited staff and equipment resources, it would inevitably lead to a poor prognosis. We previously demonstrated that DVT is common and is associated with adverse outcomes in hospitalized patients with COVID-19.⁴ The intervention on isolated ward, instead of in an operating theater, is of great cost-effectiveness and convenience. It removes the necessity of transferring contagious and immobile patients between isolation wards and operating theaters. In summary, our cases highlights the safeness, cost-effectiveness and convenience of the life-saving, bedside ultrasound-guided IVC filter implantation in COVID-19 patients.

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Consent: The patient's consent for the case report was obtained after well informed.

Conflict of Interest: None declared.

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Figure legends

Figure 1. (A) Chest CT showing sporadic, small thread-like shadows and ground glass opacity. (B) Ultrasound with color Doppler shows a left iliac vein thrombus. (C) Body surface marking corresponding to the (lowest) renal vein entrance to the inferior vena cava inside the abdomen. (D) The parallel hyperechogenic lines indicates the filter delivery sheath while the arrow points to the tip of the sheath. (E) Injecting contrast agent to reconfirm the tip of the sheath. (F) The filter in situ after being released by the delivery sheath (arrow).

Figure 2. (A) Chest CT findings. (B and C) Thrombosis in the right iliac artery and vein, and deep veins in the lower extremity were diagnosed by bedside ultrasound. (D) The parallel hyperechogenic lines indicates the filter delivery sheath while the arrow points to the tip of the sheath. (E) Injecting contrast agent to reconfirm the tip of the sheath. (F) The filter in situ after being released by the delivery sheath (arrow).

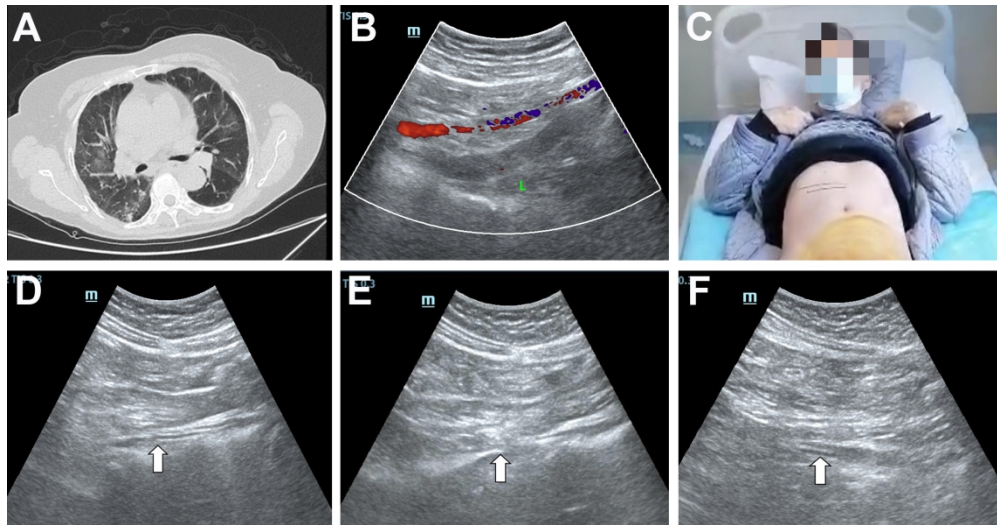


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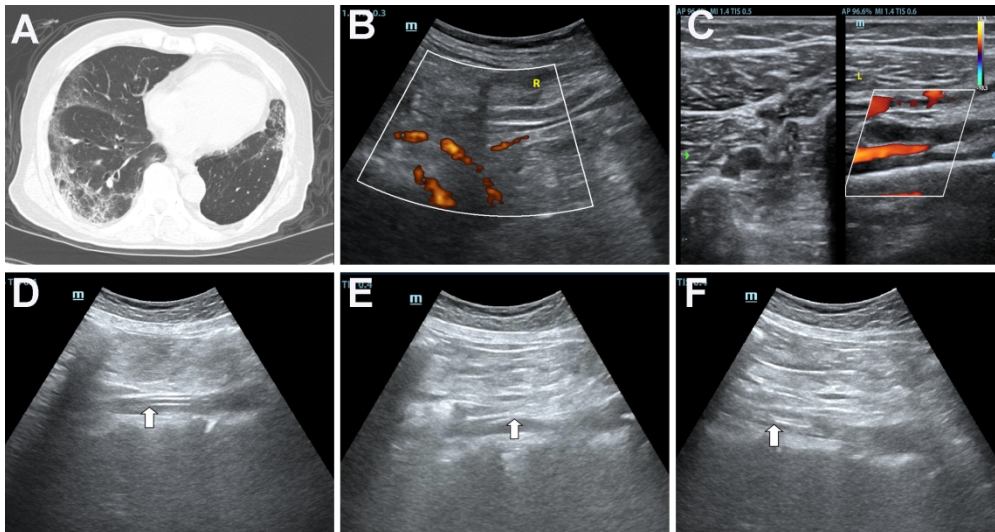


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