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A 54-year-old man sustained multiple lower limb fractures in a road traffic accident and presented to the emergency department with unconsciousness. He was hemodynamically unstable (blood pressure 80/40) with reduced bilateral air entry and increasing respiratory distress. Heart sounds were muffled,

Dependent contrast venous pooling in cardiogenic shock on computed tomography imaging

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Letters to Editor

Cardiac shock in the hospital setting may be the result of multisystem failure and hypotension. Timely recognition of imaging signs like dependent venous contrast pooling in the abdomen due to hemodynamic disturbances in cardiogenic shock can allow immediate cardiopulmonary resuscitative measures to be instituted and at times can be life-saving. Dependent venous pooling implies cardiac pump dysfunction which involves a failure to propel blood against gravity. Dependent venous contrast pooling on CT can be used as a marker in imminent cardiogenic shock. Altered hemodynamics resulting from cardiac failure causes stasis of blood in the dependent organs of the body, which is manifested on imaging by dependent contrast pooling and layering. There is little opacification of the left heart chambers and the aorta, the contrast settling down in the dependent portions of the right side of the body, predominantly in the venous system. In our case, we described the imaging features in imminent cardiogenic shock, which showed contrast layering in the right hepatic vein, right renal vein, dependent IVC, and dependent lumbar veins on CT scan.

In cardiogenic shock with a drop in systemic arterial and venous pressures, a loss of arteriovenous pressure gradient occurs. When the heart stops functioning, the heavier contrast medium tends to accumulate in the dependent regions of the venous system. Positive pressure during mechanical ventilation also has been postulated to cause retrograde filling of the IVC from the right heart. Typical CT features in shock patients demonstrated contrast collecting in the dependent portion of the superior vena cava and the IVC, forming a blood-contrast level. The retrograde contrast from IVC to the right hepatic vein densely opacified the right lobe liver parenchyma. With normal physiological flow, specific gravity has little effect on the contrast agent dynamics. However, in patients with cardiogenic shock, both arterial and venous blood flow dramatically decreases and becomes stagnant after reaching an equilibrium. Contrast agents are heavier than blood and tend to accumulation the dependent parts of the venous system. Under such circumstances, the distribution of the contrast agent depends largely on its density and specific gravity, as well as the injected volume and duration. Therefore, most of the injected contrast agents in these patients are found in the superior vena cava, the IVC, and the dependent parts of the body causing venous pooling and layering of contrast material CECT.

Altered hemodynamics in cardiogenic shock cause stasis of blood in the dependent regions resulting in dependent venous contrast pooling. Thus, CT contrast dependent venous pooling can be used as a marker in imminent cardiogenic shock. Clinical physicians should recognize these CT findings of imminent cardiovascular decompensation and provide prompt medical management to prevent further patient deterioration.

Declarations of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest
There are no conflicts of interest.

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