Clinically Asymptomatic Inferior Vena Cava Obstruction: Case Report

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We present a case that graphically demonstrates findings of altered venous flow associated with inferior vena cava obstruction. The case illustrates the elaborate modifications to flow which are adopted in an attempt to maintain venous return from the lower extremities. We also present a brief review of altered venous pathways associated with inferior vena cava obstruction.

Occlusion of major channels within the venous system can result in significant alteration in normal venous return pathways. We present a case that illustrates abdominal collateralization and unusual portal anastomosis secondary to occlusion in the inferior vena cava.

CASE REPORT

The patient was an obese 68-yr-old female presenting with a 3-wk history of tenderness and edema of the left lower extremity with associated cellulitis. Physical exam revealed a negative Homan's sign. Doppler studies, performed prior to admission and also after the patient was admitted, showed no evidence of venous thrombosis. However, due to the patient's lower extremity edema, it was difficult to evaluate venous patency above the knees. A contrast venogram was contraindicated due to the patient's iodine allergy. A radionuclide venogram was performed.

MATERIALS AND METHODS

Using a standard protocol (*1*), tourniquets were applied ~2 in above the ankles. Cobalt-57 (^{57}Co) markers were placed on both knees to identify the medial aspect of the knee. The patient was initially positioned so that the calf veins were centered in the camera's field of view and included the ^{57}Co markers at the top of the field.

Four mCi of technetium-99m macroaggregated albumin (^{99m}Tc-MAA) was diluted to a volume of 20 ml with normal saline and divided into two 10-ml syringes with attached 3-way stopcocks. The tracer was then injected into the dorsalis pedis veins bilaterally via 23-g scalp vein infusion needles (butterfly). A bolus injection of 1–2 ml of the ^{99m}Tc-MAA solution into each vein was simultaneously accompanied by a 60-sec image acquisition per view.

The bolus injections and image acquisitions were performed over the calves, knees, thighs, pelvis, including the iliac bifurcation, and lower abdomen, using a large field of view scintillation camera with a low-energy all-purpose collimator and a 20% window peaked to ^{99m}Tc. These images were repeated with the tourniquets removed and repeat bolus injections of 1–2 ml of the ^{99m}Tc-MAA solution to visualize the superficial venous system. Again, 60-sec simultaneous acquisitions were obtained.

RESULTS

In the left lower extremity, greater tracer flow was noted in the superficial venous system than in the deep venous system (Fig. 1). In the region of the iliac veins, extensive collateral circulation was noted on both sides through the superficial abdominal vessels (Fig. 2). The common iliac vein on the right side was barely seen and the inferior vena cava was not seen at all. The abdominal collaterals on the left appeared to be arising as offshoots from the superficial saphenous system. Intense activity was noted in the liver on the abdominal image (Fig. 3).

DISCUSSION

Nonvisualization of the inferior vena cava and common iliac vein may suggest severe or complete venous obstruction related to a thrombus or external mass compression (*2*). The finding that macroaggregated particles injected into a pedial vein were trapped in the liver suggests a shunting of the radionuclide from the peripheral venous system to the abdominal collateral vessels and to the umbilical vein (*3–5*). Since the particle size of ^{99m}Tc-MAA is 10–90 μm, particles larger than sulfur colloid become trapped in the liver.

Visualization of the lungs may be accounted for by collaterals to the systemic circulation (*6*). Documentation of this collateral flow was noted in this patient in the images of the lower abdomen and pelvic region. There appears to be anastomosis from the inferior deep epigastric vein to the liver via

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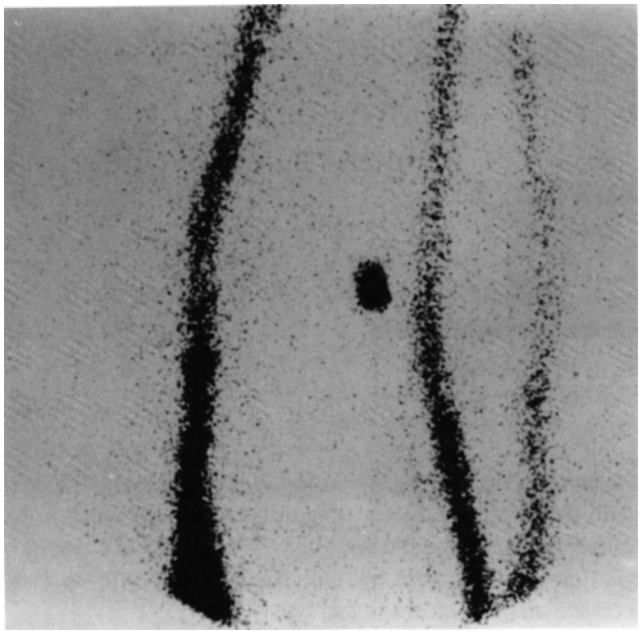

FIG. 1. Anterior view with radioactive markers between knees. There is bilateral flow up deep venous system and in superficial system (medially) on left side.

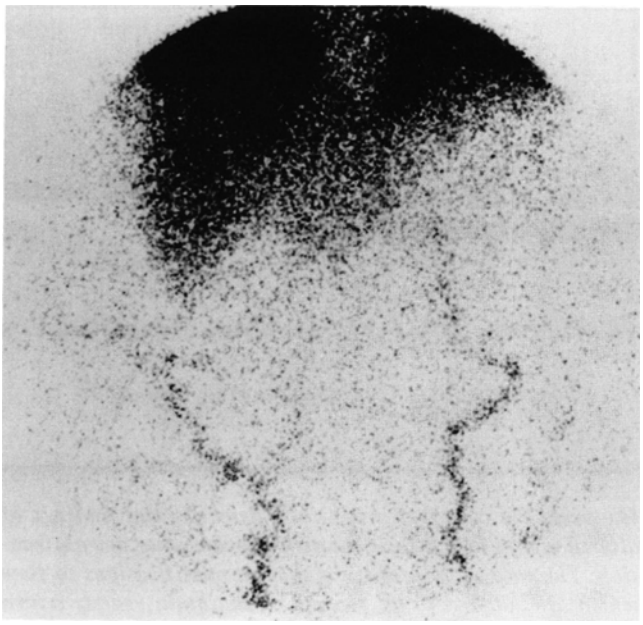

FIG. 3. Anterior view of abdomen with irregular abdominal collateral veins and significant uptake in liver. As expected, there is tracer in lungs.

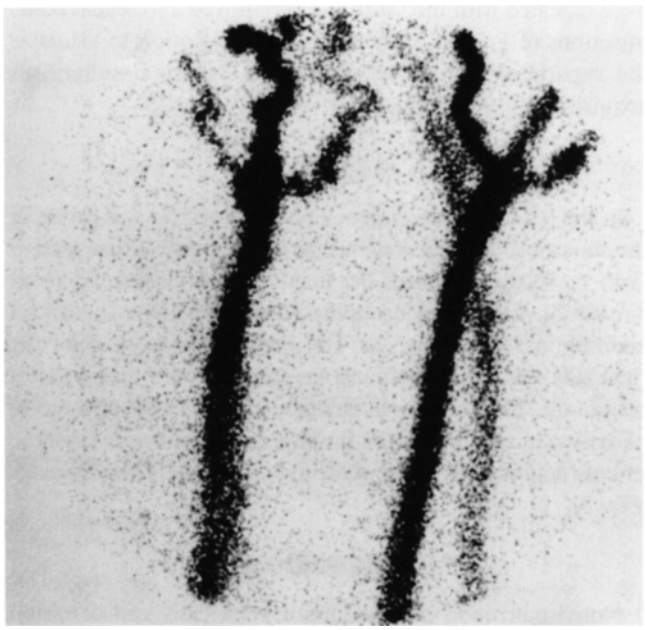

FIG. 2. Anterior view at level of femoral and ileac vein junction. Irregular venous channels seen superiorly are superficial abdominal collateral veins.

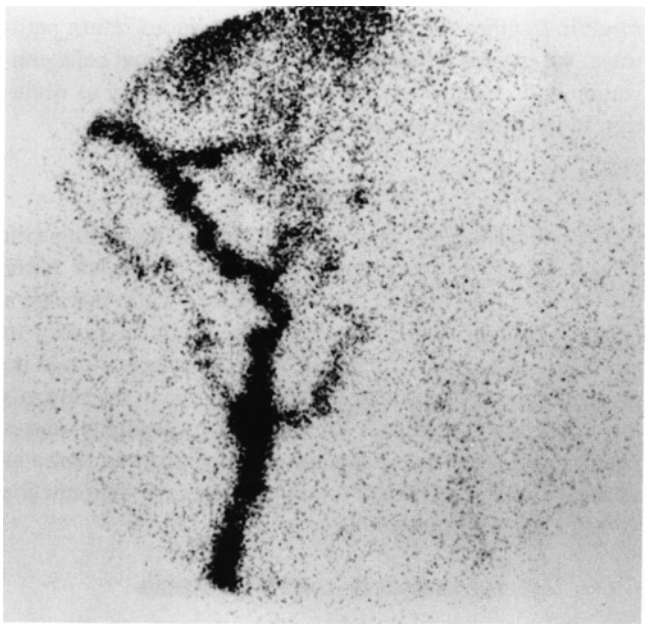

FIG. 4. Anterior view of pelvis-abdomen demonstrates extensive collateral channels; flow toward liver is seen at top of image.

the portal system (Fig. 4). The left side of the image shows greater superficial venous activity than deep venous system activity. This may suggest some partial occlusion in the deep vein system but is more likely related to the more direct collateral connection to the superficial system on that side.

Severe or complete obstruction of the inferior vena cava may cause the following collateral systems to take over its function: anastomosis between the inferior deep epigastric and superior epigastric veins; the thoraco-epigastric vein; the vertebral plexus; or numerous anastomoses with the portal system (*7,8*).

CONCLUSION

This case graphically demonstrates possible findings of altered venous flow associated with inferior vena cava obstruction. It documents the elaborate modifications to flow that

are adopted in an attempt to maintain venous return from the lower extremities.

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