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Left Ventricular Assist Device Associated Gastrointestinal Bleeding: Recognition of an Iatrogenic Etiology on Technetium-99m Tagged Red Blood Cell Scintigraphy

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Abstract:

Technetium-99m (99mTc) tagged RBC scintigraphy is the imaging modality of choice in the diagnosis of active gastrointestinal bleeding (GIB). Continuous-flow left ventricular assist devices (CF-LVADs) are the state-of-the-art treatment for advanced heart failure, with GIB as the most common complication. Recognition of the distinctive imaging feature of CF-LVADs on scintigraphic images could aid diagnosis of GIB.

Key words:

Gastrointestinal bleeding

Tc-99m red blood cell scintigraphy

Left ventricular assist device

Introduction: About 5 million patients have heart failure in the U.S. (*1*). In the past decade, the continuous-flow left ventricular assist devices (CF-LVADs) have replaced the pulsatile-flow predecessors and become the mainstay of treatment in patients with end-stage heart failure, as either the bridge to heart transplantation or the destination therapy. However, there is increased incidence of gastrointestinal bleeding (GIB) following placement of CF-LVADs, which could be as high as 23% and with recurrent GIB rate at 9.3% (*2, 3*). Endoscopy has been the first choice in evaluation and treatment of this iatrogenic complication. 99mTc tagged RBC scintigraphy is the most sensitive imaging tool in localization of active GIB. In this report, we present scintigraphy images of active GIB in a CF-LVAD recipient and aim to familiarize the viewers with the unique imaging feature of the CF-LVAD.

Case Report: A 74-year-old man with history of end-stage heart failure received HeartMate II LVAD for destination therapy. Two months after CF-LVAD implantation, patient was hospitalized for recurrent episodes of melena and anemia. 99mTc tagged RBC scintigraphy was performed to confirm and localize the ongoing GIB. On the first-minute flow images, there was an overlooked CF-LVAD artifact overlying the partially visualized cardiac chambers (Figure 1). The artifact was persistent throughout the remaining 60-minute dynamic images,

along with proximal small bowel bleeding (Figure 2). Immediate upper endoscopy confirmed focal mucosal angiodysplasia in the jejunum. Hemostasis was achieved after thermal therapy.

Discussion: Compared to the pulsatile-flow LVADs, the CF-LVADs are smaller in size and have longer durability. Despite the technological advancement, there has been increased incidence of GIB following CF-LVADs placement (*3*). The etiology of GIB appears to be multifactorial with the two leading theories being acquired von Willebrand disease and low pulsatile pressure induced arteriovenous malformation (*3, 4*). It has been found that the upper GIB is more common than lower GIB with the proximal small bowel angiodysplasia as the bleeding source in 29% of patients with CF-LVADs placement (*3*). 99mTc tagged RBC scintigraphy is preferred for active bleeding source localization and provides guidance for endoscopic procedure. On scintigraphy, the subtle CF-LVAD artifact localized at the margin of the images distinct from the prominent pulsatile-flow LVAD artifact described in literature (*5*).

Conclusion: GIB is the most common complication following CF-LVADs placement. Recognition of the distinctive imaging presentation of CF-LVADs on 99mTc RBC

scintigraphy may raise awareness of this iatrogenic etiology, and improve diagnostic confidence of GIB in nuclear medicine practice.

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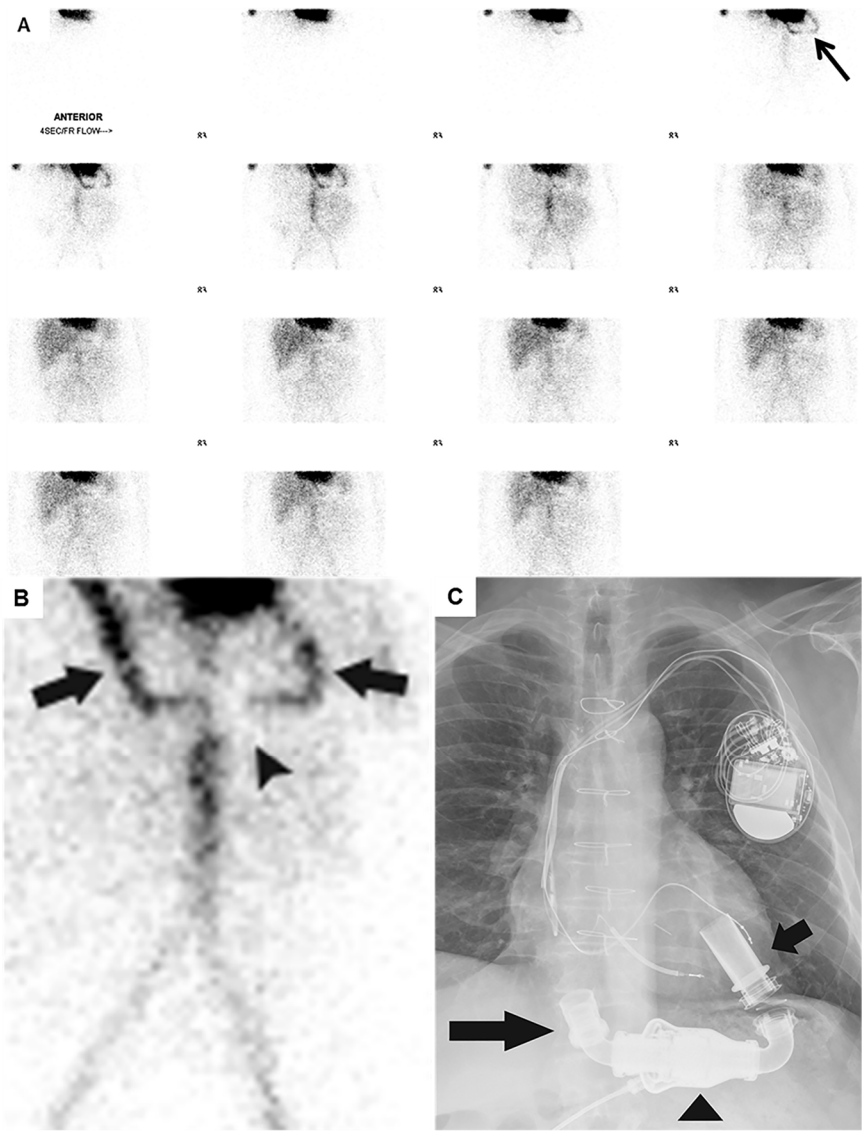

Figure 1. First-minute flow images (4 seconds per frame). There was an “U” shaped flow artifact overlying the partially visualized cardiac chambers (arrow in A), which was more conspicuous on the magnified 16-second image (arrows and arrowhead in B). Findings corresponded with in-flow and out-flow conduits (arrows) and pump (arrowhead) of an implanted continuous-flow left ventricle assist device demonstrated by chest radiography (C).

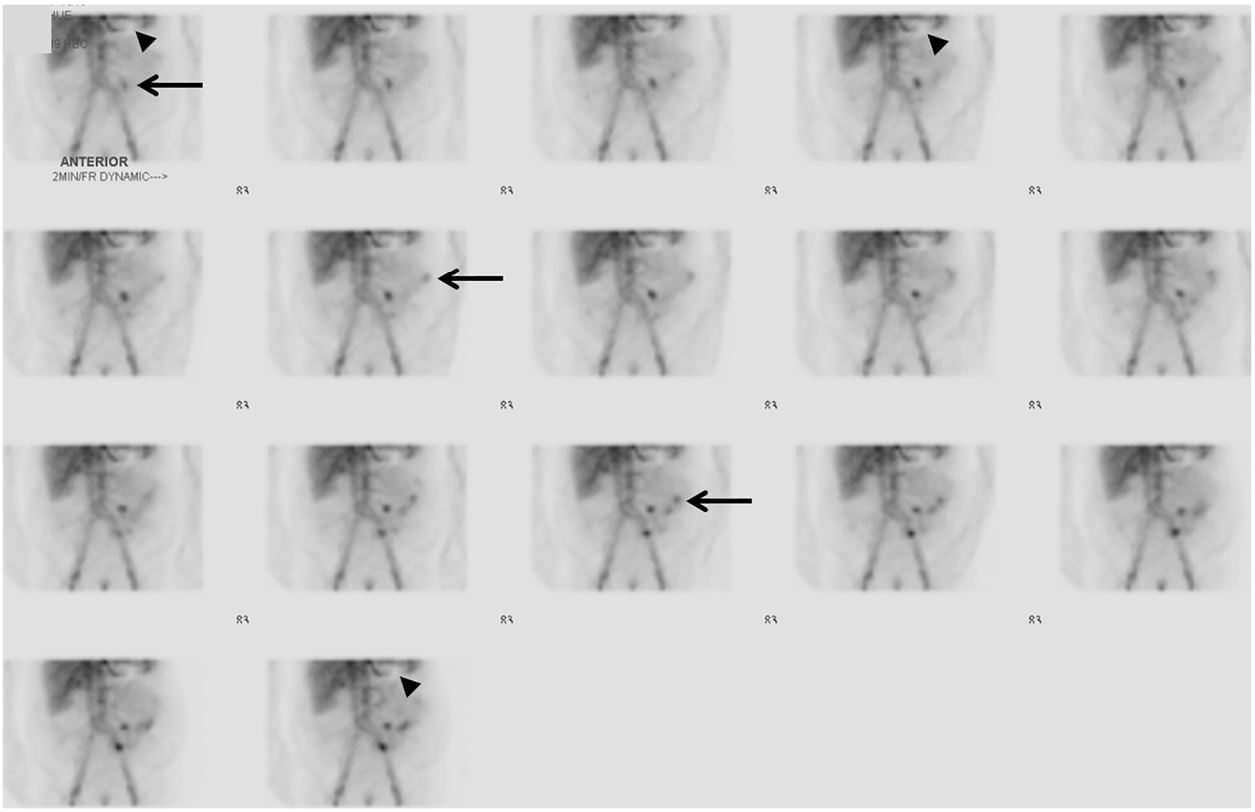

Figure 2. First-hour dynamic images (2 minutes per frame). There was immediate visualization of intraluminal tracer accumulation in the proximal small bowel loops (arrows), consistent with active bleeding. There is persistent visualization of continuous-flow left ventricle assist device in this series (arrowheads).