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Case Report

Bullet retrieval from the right hepatic vein using a controlled endovascular and transhepatic approach

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ABSTRACT

Venous bullet embolism is a rare complication of trauma. We describe a patient who sustained a gunshot wound. Computed tomography revealed antegrade embolization of the bullet to the right hepatic vein (RHV). The risk of not retrieving the bullet embolus and subsequent embolization to the pulmonary circulation includes pulmonary artery thrombosis, bleeding, or abscess formation. The bullet was retrieved through right internal jugular vein access; assisted by percutaneous transhepatic repositioning and endovascular balloon-immobilization of the bullet. The balloon served to "isolate" the bullet within the RHV to avoid the risk of endovascular migration to the pulmonary circulation. Transhepatic access allowed repositioning of the bullet within the RHV leading to successful snare retrieval. This technique demonstrates advantages of percutaneous and endovascular accesses, that repositioned and immobilized the bullet in the RHV to accomplish controlled endovascular retrieval.

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Introduction

Although venous bullet emboli are rare [1,2] devastating complications often occur. A bullet can gain access to the venous circulation through penetrating wounds and embolize to any vascular bed. They may be asymptomatic or cause life-threatening complications, especially with migration [3,4].

The following case report describes bullet removal from the RHV in a postoperative patient who sustained a gunshot

wound to the right torso. Previous reports of bullet retrieval in the hepatic veins have been described [5–8] using a snare via a single venous access without endovascular balloon stabilization. Utilization of an endovascular balloon to stabilize a bullet during retrieval has been described in the retrieval of IVC [9] and the iliac vein [10] bullet emboli. In contrast to previous reports, the following employed techniques show the advantages of percutaneous transhepatic access and endovascular balloon immobilization to allow for controlled endovascular bullet retrieval from the RHV.

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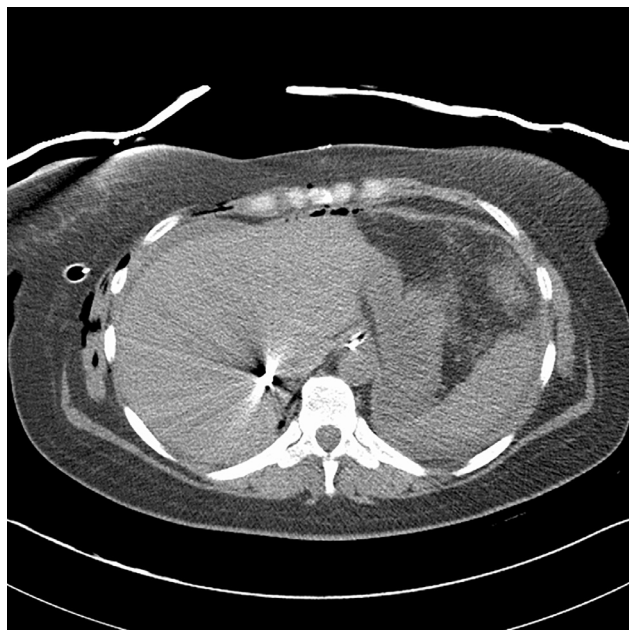


Fig. 1 – Noncontrast CT of the abdomen at the level of the hepatic veins showing bullet embolus in close proximity to the IVC.

Case

A 36-year-old female sustained a single gunshot wound to the right chest and abdomen. Emergent laparotomy repaired a through-and-through inferior vena cava (IVC) injury and bowel injuries. The bullet was not recovered. In addition, she required repair of a colon injury, small bowel resection and anastomosis, and placement of a right chest tube.

A postoperative computed tomography (CT) (Fig. 1) revealed the missing bullet had embolized to an unstable location within the RHV close to the IVC confluence.

Next, the patient underwent bullet retrieval in the interventional radiology suite under general anesthesia. A 65 cm, 20-F sheath (Cook Medical, Bloomington, IN) was selected for bullet retrieval and placed via the right internal jugular vein (IJV) with the tip positioned in the intrahepatic IVC. The size of the sheath was determined from CT measurements. A second sheath, 35 cm, 8-F Brite Tip (Cordis Corporation, Bridgewater, NJ), was inserted via the left IJV. Special care was taken in the positioning of guidewires and sheaths to avoid placement into the lower IVC where there had been a recent surgical repair. Through the left IJV sheath, a 65 cm, 5-F Soft-Vu MPA catheter (AngioDynamics, Inc. Queensbury, NY) was positioned into the RHV, caudal to the bullet, and a venogram (Fig. 2) demonstrated the relationship of the bullet to the RHV and no change in position compared to the CT.

An 18 mm × 4 cm Atlas balloon catheter (BARD Peripheral Vascular, Inc., Tempe, AZ) was placed through the left IJV sheath and inflated immediately cephalad to the bullet in the superior aspect of the RHV (Fig. 3). Slight movement of the bullet observed during balloon manipulation reaffirmed the precarious position of the bullet in the RHV. The balloon was



Fig. 2 – Selective right hepatic venogram showing bullet embolus within the right hepatic vein.

maintained in this position to secure the bullet in the RHV and prevent migration to the heart and lungs during retrieval attempts. Balloon inflation was titrated to allow sufficient RHV blood flow and avoid thrombosis.

Through the right IJV sheath, attempts to snare the bullet using different retrieval devices including a basket as well as a 20 mm Amplatz GooseNeck Snare (ev3 Endovascular, Inc., Plymouth, MN) were unsuccessful due to the unfavorable position of the bullet—too close to the balloon and lack of space in the RHV.

To facilitate the right IJV approach snare capture of the bullet, percutaneous, ultrasound- and fluoroscopic guided, transhepatic access to the RHV was obtained. A guidewire via the right IJV was placed within the peripheral posterior subsegmental branch of the RHV and used as a fluoroscopic target to guide the transhepatic access to the bullet. Through this transhepatic access, multiple attempts using different retrieval devices including a basket were unsuccessful. A 20 mm Amplatz GooseNeck Snare was then used to move the bullet away from the balloon and into a side branch of the RHV favorable for retrieval (Fig. 4). Through the right IJV 20-F sheath, a 12–20 mm Atrieve Vascular Snare (Angiotech Pharmaceuticals, Inc., Vancouver, BC) successfully captured the bullet (Fig. 5). Although a basket is a much better choice, however the Atrieve Vascular Snare was the only device that successfully captured the bullet.

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