

EDITOR'S CORNER

Dodging a Bullet

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Welcome to the August 2023 issue of *Vascular Disease Management*.

Over the last several years, there has been an explosion of devices and tools dedicated solely for thrombectomy. Venous thromboembolism (VTE) has garnered much international attention given the grave morbidity and mortality associated with its sequela. Some of this attention should also be credited to the development of novel and highly effective thrombectomy devices that are rapidly moving us past the old dogma of VTE management, which was traditionally 3 to 6 months of anticoagulation. While clinical trials on the interventional management of VTE continue to move the needle toward creation of treatment algorithms and appropriateness of use, one unintended effect of this progress has been the discovery by innovative colleagues that these

VTE-dedicated tools have the potential to impact more than just thrombus. As an example, some of us have may have seen in special clinical scenarios the use of a thrombectomy device for extraction of large valvular vegetations.

In this month's Editor's Corner, we look at [a unique case presented by Drs. William Terrill and Andrew Klobuka](#) of Allegheny General Hospital from my hometown of Pittsburgh, Pennsylvania. By thinking creatively "outside the box," they were able to successfully utilize a tool intended for thrombectomy cases to avoid potentially catastrophic consequences of foreign body vascular embolization. The foreign body in this case was a bullet. Vascular embolization of bullets or its fragments are rare yet well described in the literature. Reported cases from wartime casualties report the incidence of vascular bullet embolization of less than 1%. Those of us who do not work in trauma centers may never encounter this situation, but foreign body retrieval is an important skill all vascular interventionalists should acquire. Whether it's a bullet, thrombus, stent, balloon fragment, wire, or an implanted device gone awry, the benefits of a successful retrieval can obviate the inherent risks of open surgeries in many cases.

Specifically, in Terrill and Klobuka's case, they describe a patient presenting after a gunshot wound to the left lower quadrant of the abdomen without an exit wound. On imaging, the bullet was visualized in the right upper quadrant of the abdomen, and after surgical exploration the bullet was not identified. Interestingly, there was no hematoma noted around the inferior vena cava (IVC) and on further imaging with computed tomography it was discovered that the bullet had dynamic motion in the inferior cava-atrial junction. In most cases, bullets typically pass through the vascular system, but in some rare

instances they can lose kinetic energy and lodge inside the vessel. Fortunately, in this case it appears the IVC must have spontaneously sealed off after projectile entry, which would be a rare occurrence in a higher-pressure arterial vessel. While arterial embolization typically leads to sudden catastrophic ischemic complications, venous embolization of bullet fragments typically is asymptomatic initially but can develop late sequela (sometimes after months to years) from consequences of infection, thrombosis, or arrhythmias.

Avoiding embolic phenomenon to the right heart and pulmonary arteries periprocedurally is another important factor of concern for any procedure in the CAVA involving retrieval of a foreign body or thrombus. In this case, the authors' method of mitigating risk of distal embolization was to utilize the Protrieve sheath from Inari Medical, which is designed to trap emboli during complex DVT and IVC thrombectomy procedures. The Protrieve sheath is 20F, 32-cm long device with a 33.5 mm self-expanding, relatively atraumatic nitinol mesh funnel that allows full wall apposition in the IVC. The atraumatic nature of the nitinol funnel and its expanding size was apparent in this case as it was deployed in the mid right atrium given the migratory nature of the bullet into the right atrium. In addition to caval clot, Protrieve has also been utilized for complex IVC filter retrievals when thrombus is apparent. Ultimately, with the embolic protection funnel deployed, a telescoped device can be inserted for thrombectomy, or in this case with an EnSnare (Merit Medical) to retrieve a foreign body. For thrombectomy cases, when thrombus is noted within the funnel, an aspiration port on the Protrieve sheath can be used to extract any residual clot.

In this beautiful case demonstration, a young man who already had undergone major trauma and an open surgical procedure received a minimally invasive procedure that likely spared him from a probable major cardiac surgery. Protrieve appeared to provide substantial backup during this case to mitigate the risks of adverse events. It is important that we clearly understand the tools of the trade in terms of indications and limitations for use. By taking a thoughtful approach with safety as the cornerstone, it is likely that we will continue to uncover multiple "unintended" applications for the burgeoning number of interventional devices that reach catheterization laboratories worldwide. ■