

## H53 Embolization of Radically Invasive Projectiles (R.I.P.<sup>®</sup>)

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**Learning Overview:** The goal of this presentation is to illustrate an atypical complication that can result from injury from a G2 R.I.P.<sup>®</sup>

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by sharing an atypical presentation of injuries from unusual ammunition, thus bringing awareness to an atypical and rare complication.

A 34-year-old man was brought to the emergency room after receiving a gunshot wound to the right side of the chest. An X-ray of the chest revealed atelectasis and metal foreign bodies. He was persistently hypotensive and was taken to the operating room for exploratory laparotomy. Findings included a liver laceration and diaphragmatic rupture, which were managed with liver packing and diaphragmatic repair. The patient was subsequently noted to have ST-T changes on 12-lead Electrocardiogram (EKG) with elevated cardiac troponins, consistent with myocardial infarction. Echocardiogram revealed normal left and right ventricular function. His cardiac complications were managed medically with aspirin and atorvastatin as he was not a candidate for cardiac catheterization. The hospital course was complicated by bradycardia, hypotension, and hypoxia and despite management, the patient died ten days post-admission. No projectiles were recovered during the hospital stay. The decedent was sent to the Office of the Chief Medical Examiner for an autopsy.

On full-body imaging, one bullet and eight trocars were identified throughout the right side of the thorax and abdomen. Of the eight identified, one trocar was seen in the cardiac silhouette. At autopsy, seven trocars were located in the liver and right lung. The injuries included right lobe of the liver and lower lobe of the right lung lacerations. On dissection of the right coronary artery, one trocar was lodged in the vessel proximally, with surrounding thrombus formation resulting in complete occlusion of the vessel lumen. The proposed path for the trocar is that it likely injured the right lung and gained access to the left side of cardiac circulation through the pulmonary veins, then traveled through the left atrium, left ventricle, aorta, and finally, the right coronary artery ostium. The trocar traveled approximately one centimeter until it was limited by the diameter of the coronary artery. All eight trocars were retrieved. Though there was extensive organ injury caused by the trocars, the proposed terminal event resulted from the single trocar lodged in the right coronary artery, subsequently becoming a nidus for thrombosis of the vessel. Corresponding clinical findings at the final stages of medical care further support the mechanism.

R.I.P.<sup>®</sup> rounds are becoming increasingly popular, and thus presentations of injuries from this ammunition are becoming more common. This type of ammunition proves itself to be challenging to manage clinically and at autopsy. A typical presentation of injuries from such ammunition would result in multiple internal injuries with complications of blood loss; however, presentation of embolization with coronary artery occlusion and resulting myocardial injury is rare.

Bullet and shotgun pellet embolization have been reported. With the introduction and availability of this invasive ammunition, awareness of the eight extremely sharp, small trocar fragments is of utmost importance to forensic pathologists, clinicians, and surgeons. The small size of the trocars allow for not only extensive collateral tissue damage, but also delayed injuries from embolization and further travel throughout the body. Myocardial infarction in patients injured by R.I.P.<sup>®</sup> rounds should prompt full evaluation of the coronary artery system, even if major injuries and bleeding have been treated. Therapy in this setting would include conservative management such as aspirin and beta blockers and more aggressive management in removal of the trocar. Conservative management was unsuccessful in this case.

Delayed deaths following injuries by R.I.P.<sup>®</sup> projectiles should raise suspicion for the possibility of trocar embolization and its consequences. Familiarity with this unique ammunition and its various patterns of injury and complications is essential when presented with one of these challenging cases, not only in the forensic community but also in the surgical and clinical communities.

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### Embolization, Ammunition, R.I.P.<sup>®</sup>