

Bullet Embolism after Gunshot Injury: A Case Report

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ABSTRACT

We describe a case of gunshot injury presenting with cardiac tamponade in which a dummy bullet advanced through the aorta and caused embolization in the right renal interlobar artery after passing above the sternoclavicular joint and penetrating into the aorta. Emergency surgery with cardiopulmonary bypass was performed to repair the cardiac tamponade and aortic injury. Postoperatively, a direct abdominal x ray revealed a bullet image, confirmed by an ultrasonography examination that demonstrated the presence of a metal object in the right renal pelvis. The bullet was considered to have reached the kidney via an arterial route and to cause embolization in the distal bed. The procedure was successful, and the patient was discharged on postoperative day 8. In gunshot injuries, if all entrance points are not paired with exit points, the possibility of an organ or extremity embolism caused by the presence of a bullet or shrapnel fragments in circulation should be borne in mind, although such occurrences are rare.

INTRODUCTION

The frequency of gunshot injuries causing death or injury among civilians is increasing. A rare type of injury is the organ or extremity embolism due to bullet or shrapnel fragments [Habdank 2003, Reil 2005]. We report a case of right renal interlobar artery embolism after arterial movement of a dummy bullet.

CASE PATIENT

A 28-year old woman presented to our emergency unit with cardiac tamponade. She had an entrance wound of 4 to 5 mm that was 1 cm superior to the right sternocleidomastoid joint,

but no exit point was observed. The patient was conscious, with weakness of pulse and venous distention, and arterial blood pressure was too low to be measured. Chest x-ray showed mediastinal widening.

The patient was taken to emergency surgery and given fast volume replacement. Invasive monitoring showed a pulse rate of 130 bpm, blood pressure of 90/50 mm Hg, and a central venous pressure of 21 mm Hg.

Sternotomy was considered the best surgical approach because of cardiac tamponade, the location of the entrance point, and the possible tracing of the bullet. Cardiopulmonary bypass equipment was prepared, and the right femoral artery was cannulated owing to the possibility of multiple injuries in the heart and major vessels. After sternotomy, blood was observed in the pericardial sac and evacuated. Adjacent to superior vena cava, a 3- to 4-mm opening with bleeding was observed on the ascending aorta, along with eroded areas on the superior vena cava. The bleeding control was achieved with digital compression, and venous cannulation was performed. When aortic tension was relieved by cardiopulmonary bypass, the opening in the ascending aorta was repaired with 4/0 prolene pledgeted sutures. After aortic repair was done, the track of the bullet was followed carefully and the injury or wounds in tissues and organs were explored, as were



Figure 1. Selective right renal artery angiography demonstrating the dummy bullet in the interlobar artery.

Received March 31, 2008. received in revised form April 5, 2008; accepted April 12, 2008.

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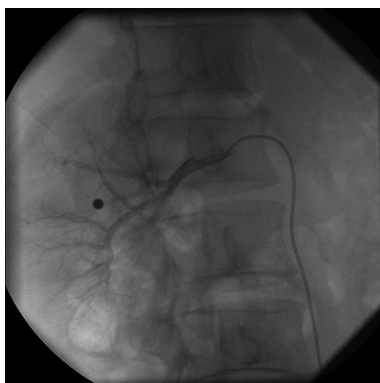


Figure 2. Digital subtraction angiography image of the dummy bullet in the right renal artery.

the heart, diaphragm, and other intrapericardial structures. No other injuries were detected. After the termination of cardiopulmonary bypass, decannulation was performed and surgical layers were closed anatomically.

Postoperatively a 5- to 6-mm bullet image was detected in the direct abdominal x-ray obtained in the intensive care unit, and the presence of a 5- to 6-mm metal object in the right renal pelvis was confirmed with ultrasonography examination. Whole body x-ray screening showed no other bullet image, and the bullet was considered to have reached the kidney via an arterial route, leading to embolization in the distal bed of the renal artery.

A series of laboratory tests showed no abnormalities in renal functions. The bullet did not cause any perfusion or functional abnormalities, so it was left in place because of the higher risk of the invasive procedure for the removal of the bullet. The patient was discharged on postoperative day 8 with resolution of her injuries.

DISCUSSION

The rare occurrence of bullet embolization is usually observed following gunshot injuries. Bullet embolization was first reported by Davis in 1834 [Barret 1960]. The most extensive data on gunshot injuries comes from the medical records of the Vietnam War, which showed that bullet or shrapnel embolism comprised 0.3% of the 7500 cases of vascular injuries [Rich 1978].

The incidence of embolization does not differ significantly between civilians and noncivilians [Mattox 1979]. Gunshot injuries due to model guns or dummy guns modified to use bullets are frequently encountered in Turkey. The bullets of these types of guns have a lower acceleration, and bullets with low or lowered acceleration, after entering into heart spaces or great vessels, can be passively transported by the blood flow after losing their kinetic energy and thus cause organ or extremity embolization [Jones 1999].

Gunshot injuries in the heart or aorta usually result in a quick death [Grewal 1997, Berkan 2002]. In our case,

the bullet entered into the ascending aorta, lost its energy, and was propelled to the distal part of the right renal artery with the aid of gravity and blood flow. Because of the bullet's lack of ballistic effect and small size, the size of the aortic injury was equal to that of the bullet. Therefore, cardiac tamponade developed relatively gradually. The bullet did not cause total arterial embolization in the renal artery and probably resulted in the embolization of an interlobar branch.

Antegrade, retrograde, or paradoxical embolizations in various organs or extremities have been reported in the literature. However, only one case of right renal vein embolization has been reported, and we are not aware of any prior reports of renal arterial embolization. In our case patient, the bullet did not cause any perfusion or functional abnormalities, and thus it was left in place because of the higher risk of the invasive procedure for the removal of the bullet.

After hemodynamic stabilization of patients with gunshot injuries, the entrance points and their numbers, traces, and exit points should be carefully examined. If no corresponding exit points are seen, then radiological, ultrasonographic, echocardiographic, and, if needed, angiographic methods should be used [Corbett 2003].

It should always be borne in mind that bullets and similar fragments that remain in the circulatory system may cause extremity or organ loss or even death due to embolization. The therapeutic approach should include medical therapy, invasive techniques, and surgical methods, and if needed, the bullet should be removed quickly to prevent catastrophic consequences. Bullets causing no functional abnormalities, such as the one in our case that was associated with distal arterial bed embolization, may be left in place to avoid the risks associated with invasive procedures.

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