

Case Report

Triple vessel injury with single penetrating trauma to the lower extremity requiring popliteal to posterior tibial artery bypass

Jaspreet Sandhu, Charles La Punzina*, Ravi Kothuru

Department of Surgery, Brookdale University Hospital Medical Center, Brooklyn, NY 11212, United States

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ABSTRACT

This is a case report describing the delayed presentation of injury to all three lower extremity infrapopliteal arteries after a 34 year old male sustained multiple gunshot wounds, including one to his left lower extremity. As part of his initial assessment, ankle brachial index was performed and was found to be abnormal. Further work up for this was delayed due to need for emergent trauma laparotomy. After this procedure, more detailed evaluation with CT angiography of the extremity injury was performed. Though imaging indicated adequate perfusion of the lower extremity, serial neurovascular examination revealed inadequate perfusion. The patient required arterial reconstruction and fasciotomies.

This case demonstrates the need for continued surveillance of extremity perfusion in atypical trauma cases when index of suspicion suggests the degree of injury may be worse than initial work up may indicate.

Introduction

Vascular injuries of the Lower Extremity (LE) are commonly associated with penetrating and blunt trauma. While most studies focus on the diagnosis, management and complications of vascular injury with trauma, there is little attention to the pattern of injuries encountered.

We describe a case where a 34 year old male presents with multiple gunshots to the neck, chest, abdomen, right upper extremity and left lower extremity (LLE) who underwent an emergent exploratory laparotomy. Patient had delayed loss of palpable and Doppler-able pulses in LLE. Formal angiography revealed injury to all 3 vessels necessitating a popliteal to posterior tibial artery bypass and 4-compartment fasciotomy.

This case illustrates an unusual presentation of gunshot wounds where by a single gunshot at the calf injured all 3 vessels of the LE necessitating a bypass. The case also values the importance of repeat vascular exam and how other factors may confound or delay the diagnosis.

Case presentation

This case is that of a 34 year old male brought to the emergency department with multiple gunshot wounds to the neck, chest, abdomen, right upper extremity and left lower extremity (LLE). The patient underwent endotracheal intubation on arrival for airway protection. He was tachycardic but normotensive. As part of his secondary survey, it was noted the patient had palpable Dorsalis Pedis (DP) and Posterior Tibial (PT) pulses on the left, but these were felt to be decreased when compared to right. ABI was performed

* Corresponding author.

E-mail addresses: jsandhu@bhmc.org (J. Sandhu), clapunzi@bhmcny.org (C. La Punzina), rkothuru@bhmcny.org (R. Kothuru).

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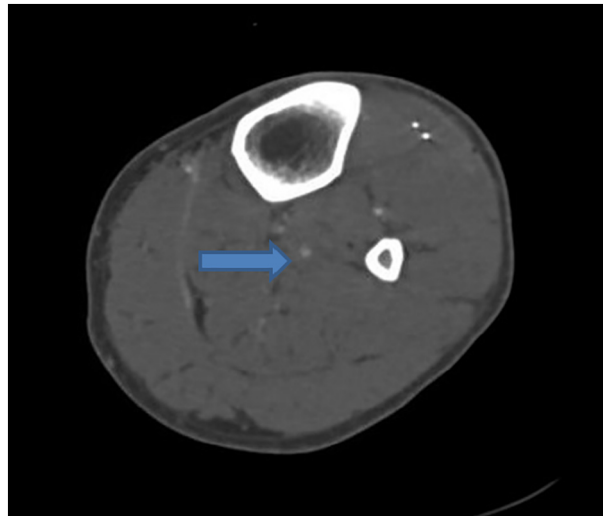


Image 1. Enhancement anterior and posterior vessels.

at bedside comparing the left upper and left lower extremity systolic pressures. It was noted to be 0.7. This was considered to be significant and would require additional investigation. However, as part of the patient's evaluation, a bedside FAST performed was noted to be positive for free intraabdominal fluid in the left and right upper quadrants. This was considered to be a finding requiring immediate evaluation and the patient was taken for emergent exploratory laparotomy during which multiple small bowel enterotomies were found. Resection and primary anastomosis was performed.

During the immediate post-operative period, the patient was tachycardic, hypertensive and hypothermic. At this time, there was no palpable temperature difference between the extremities. Completion of the trauma imaging work up was done and included CT angiography of the LLE which demonstrated normal flow of IV contrast to the level of the distal popliteal artery into the tibioperoneal trunk ([Image 1](#)).

Distal injury was not able to be completely assessed due to scatter effect from bullet fragments. There was adequate enhancement of the DP and PT arteries. Resuscitation continued post operatively with rewarming. Serial vascular checks were performed during this period. 12 h after presentation, poikilothermia was noted in the LLE. This was associated with a loss of palpable and Doppler pulses as well. The patient was returned to the OR emergently for LLE angiography. This demonstrated occlusion of the anterior and posterior tibial arteries with evidence of thrombosis associated with injury ([Image 2](#)). The peroneal artery was also occluded with distal reconstitution from collateral flow. A popliteal to posterior tibial bypass using reverse saphenous vein from the contralateral extremity was performed ([Image 3](#)). After completion of the bypass, a four compartment fasciotomy of the calf was performed. This

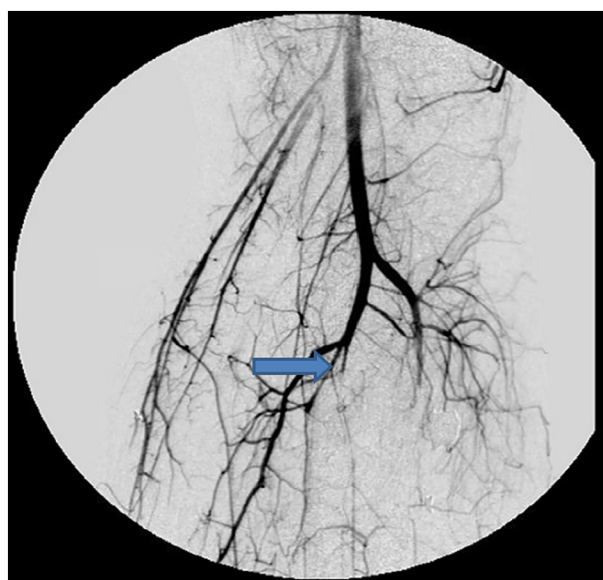


Image 2. Arrow indicates interrupted follow of anterior and posterior tibial vessels.



Image 3. Arrow indicates bypass graft to proximal posterior tibial artery.

was notable for nonviable tissue along the projectile path through the muscles. The remainder of muscle groups were without obvious evidence of malperfusion. Post operatively, the patient's foot was warm with a Doppler PT pulse signal which by post-operative day 2 was palpable. The patient was maintained on IV heparin for 4 day post operatively and then started on Aspirin. Neurovascular exam was intact at discharge. The vascular surgery service did not believe further studies were necessary and the patient's vascular exam remained unchanged for the remainder of his hospitalization. He underwent fasciotomy closure on hospital day 21. He was discharged to short term physical therapy center on hospital day 27.

Discussion

Arterial injury secondary to penetrating trauma is not an uncommon injury in urban trauma centers. However, in the lower leg, one and two vessel injuries are typically encountered [1]. Since such injuries often do not result in distal ischemia, if hemorrhage is not present, intervention is often not required. The more common injury pattern is that of transection [2,9]. This case illustrates a less common presentation where a single gunshot injury to the LLE resulted in injury to all three lower leg arteries causing thrombosis.

On presentation, this patient did have findings which indicated a possibility of vascular injury. Physical exam yielded diminished pulses in the LLE and ABI was 0.7. Due to intraperitoneal injury with developing hemodynamic instability, emergent laparotomy took precedence over the work up of suspected vascular injury. CTA is considered a sensitive test for vascular injury. Its utility over angiography has been demonstrated [3,4]. In this case, CTA was not diagnostic of injury.

This patient experienced complete loss of palpable pulses multiple hours after injury and initial operative procedure [5]. This emphasizes the need for frequent neurovascular checks in such patients, especially when multiple procedures are necessary. Delay in deterioration of vascular exam can take place over a period of time of variable length, ranging from several hours up to three weeks [6–8]. This indicates the need for close follow up and even outpatient screening after discharge.

A variety of procedures are employed in the present day management of vascular injury [9–11]. Open exploration and repairs of different types have been used for decades [5]. Evolution in the treatment of peripheral arterial injury has evolved to include endovascular management with coil embolization of lower extremity pseudoaneurysms as well as traversing intimal flaps with wires followed by subsequent stenting [10,12]. In this case, injury to all three lower leg arteries necessitated bypass [13–15,18]. Question can be raised whether such infrapopliteal injury may require repair of two of three crural vessels [16,17]. The short and intermediate term follow up of this patient has demonstrated adequate perfusion with single vessel revascularization. An additional consideration is the use of fasciotomy [16]. This procedure was employed in this case due to the relatively long time interval between the injury and repair. There is no evidence of increased morbidity or mortality with this technique [19]. Compartment syndrome can be both limb and life threatening particularly in cases of delayed presentation and repair. The usage of this technique may have contributed to successful limb salvage.

Conclusion

We are presenting an uncommon case of injury to the three major arteries of the lower leg due to a penetrating trauma. Its management was compounded by life threatening intraperitoneal injury. Though such arterial injury is expected to result in immediate distal ischemia, this did not occur in our case even after what is accepted investigation. High index of suspicion with close follow up did lead to the proper diagnosis. Single vessel arterial bypass combined with fasciotomy proved sufficient for limb salvage

in this patient.

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