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Case Report
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Multidisciplinary Management of Complex Vascular and Bowel Injuries in a Hemodynamically Unstable Trauma Patient

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Abstract

A 31-year-old man presented to a Level I trauma center with two penetrating ballistic wounds to the left upper quadrant and right posterior thigh. The patient was taken to the operating room for an exploratory laparotomy, and upon entry to the abdomen, hemoperitoneum was encountered by the surgical team. Examination of the small bowel revealed four enterotomies, which were resected and repaired with stapled side-to-side anastomoses. An expanding hematoma in the right anterior pelvis and thigh was identified, with further exploration yielding significant defects of the femoral artery and femoral vein with active hemorrhage. Vascular surgery was urgently consulted and performed an end-to-end anastomosis of the femoral artery with a reverse great saphenous vein interposition graft and a patch angioplasty of the femoral vein using Bovine pericardium. Angiogram confirmed anterograde flow to the distal lower extremity, after which a four-compartment fasciotomy was performed. A blast injury to the transverse colon was resected and left in discontinuity due to the patient's hemodynamic instability. This case demonstrates the utility of multidisciplinary collaboration in the trauma setting for definitive repair of vascular and bowel injuries. Prompt consultation allowed for simultaneous trauma and vascular surgical procedures to be performed, resulting in rapid, life-saving treatment.

Keywords: Bowel Injuries; Angiogram; Hemorrhage

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Introduction

Penetrating abdominal polytrauma is an emergent condition requiring rapid diagnosis and surgical correction of life-threatening injuries. Identification of ballistics in the primary survey is critical as it impacts clinical decision-making in the resuscitation of the hemodynamically unstable patient [1]. The uncertainty of ballistics number and trajectory requires the use of adjunctive imaging in the trauma bay to determine ballistic trajectory and expeditiously identify injuries and the origin of hemorrhage. Additionally, ballistic trajectory may extend beyond the abdominal viscera into nearby vasculature or bony structures. Prompt identification of injury and consultation to the appropriate specialty service allows for rapid repair of injured structures and definitive treatment by appropriate teams, resulting in interdisciplinary treatment of the abdominal polytrauma patient [2].

Case Presentation

A 31-year-old male presented to the hospital as a Level One Penetrating Trauma with two ballistic wounds to the abdomen and right posterior thigh. He presented tachycardic with a heart rate of 130 beats/minute, blood pressure of 124/80 mmHg (shock index was 1.05), tachypneic with a respiratory rate of 30 breaths/ minute, and his Glasgow Coma Score was 14. On physical exam, there was a ballistic wound to the patient's left upper quadrant of the abdomen with diffuse abdominal tenderness and a ballistic wound to the posterolateral right thigh with swelling and pulselessness to the right lower extremity. On x-ray, there was no ballistic identified intracorporeally, and the Focused Assessment with Sonography in Trauma (FAST) exam was positive for free fluid in the right upper quadrant. Massive Transfusion Protocol (MTP) was activated as was the operating room team for the patient to proceed level one for exploratory laparotomy and groin exploration. Vascular surgery was consulted, given the concern for pulseless extremity and vascular injury.

The patient was taken to the operating room emergently for an exploratory laparotomy and right groin exploration. Upon entry to the abdomen, one liter of hemoperitoneum and succus was encountered. An expanding hematoma in the right anterior pelvis and right thigh was identified,

confirming the concern for vascular injury to the femoral artery and possibly vein. Further right groin exploration yielded significant defects of the right femoral artery and vein with active hemorrhage. The vascular surgery team arrived intraoperatively to assist with repair of the vascular injuries given their extent. The trauma surgery team immediately gained intra-abdominal control of the right iliac artery while the vascular surgery team gained exposure of the femoral vasculature. The femoral artery was repaired with an end-to-end anastomosis using a reverse great saphenous vein interposition graft. Repair of the femoral vein was performed with a patch angioplasty using Bovine pericardium. Angiogram confirmed a patent interposition graft and anterograde flow to the distal extremity, after which a four-compartment fasciotomy was performed due to concomitant vein and artery injuries. Examination of the small bowel yielded four enterotomies, which were resected and repaired with side-to-side stapled anastomoses. At this point in the case the patient was becoming coagulopathic, acidotic, and hypothermic. On further examination, a blast injury to the transverse colon was noted, which was resected, and the bowel was left in discontinuity due to the patient's hemodynamic instability, with plans to return for further evaluation of any other intraperitoneal injuries, address the discontinuous bowel, and close the patient.

Discussion

In this study, we identified a case of penetrating polytrauma with intra-abdominal and extremity vascular injuries requiring prompt, interdisciplinary surgical intervention. Penetrating trauma has a fatality rate of 10% and gunshot wounds are responsible for 90% of the mortality associated with penetrating abdominal trauma [3]. Rapid response and consultation with appropriate services are crucial for victims of gun violence.

Gunshot wounds without retained ballistics require identification of ballistic trajectory in to identify injury patterns in the primary and secondary surveys [4]. This patient presented with peritoneal signs and hard signs of vascular injury described above as diffuse abdominal tenderness and a pulseless extremity, respectively. Ultrasound imaging obtained in the trauma bay identified free fluid in the right upper quadrant, while advanced imaging was deferred in favor of immediate surgical exploration. Intra-abdominal proximal vascular control by trauma surgery supported hemorrhage control and timely repair of the femoral vasculature by vascular surgery. A multidisciplinary approach to this case facilitated expeditious, synchronous treatment of injuries.

Osofsky, et al [5] describes increasing involvement of vascular surgery in trauma cases, resulting in more complex repairs in comparison to those performed by trauma surgery teams. The management of the patient described in this report supports this claim; early consultation of vascular surgery resulted in definitive repair with patch and grafting.

Current literature and teaching emphasize early identification of sources of hemorrhage and hollow viscus injury using imaging and the primary survey; however, reports detailing real-time, interdisciplinary decision-making in the setting of penetrating polytrauma provide perspectives on the application of these teachings in the trauma setting. This case report details such integrative collaboration in the polytrauma patient. Intra-abdominal proximal vascular control by trauma surgery, assisted grafting by vascular surgery, with simultaneous control of intra-abdominal visceral injuries, supporting Osofsky's claim that vascular surgery is becoming increasingly involved with the trauma patient. Additionally, this case corroborates the importance of damage control in the trauma setting. This case demonstrates the value of early interdisciplinary collaboration between vascular and trauma surgery teams in the setting of penetrating abdominal trauma.

Conclusion

This is a case of a 31-year-old male presenting with penetrating abdominal injury with concomitant major vascular injuries resulting in femoral artery grafting, femoral vein patching, and small and large bowel resections. An interdisciplinary approach to this case of penetrating polytrauma allowed for simultaneous trauma and vascular surgical procedures to be performed, translating to rapid, life-saving treatment. Future studies evaluating the effectiveness of interdisciplinary collaboration on patient outcomes in penetrating polytrauma should be pursued to inform best practices on resuscitation and definitive repair of traumatic vascular injuries.

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