Non-operative management of simultaneous hepatic and renal grade V injuries after blunt trauma

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Abstract

Non-operative management (NOM) of solid organ injury after trauma is a well accepted technique, however there is less experience in treatment of multiple simultaneous injuries. Experience with a 25-year-old male after a motor vehicle accident that resulted in both hepatic and right kidney injury is related. Both injuries were graded V. The literature for the treatment of NOM of these injuries is reviewed.

Introduction

Solid organ injury after blunt trauma is often managed with nonoperative management (NOM).[1,2] Ideal candidates for this approach are patients who are hemodynamically stable, with minimal transfusion requirements, the lower grade organ injury and solitary organ injury. As experience has accumulated with nonoperative management of solid organ injuries, patients that do not fit into these ideal categories have also been successfully managed. However, it is uncommon to manage a solitary Grade V solid organ injury non-operatively. Successful nonoperative management of simultaneous injuries in two different solid organs is also a rare event.[3] The experience of a case of two high grade solid organ injuries, successfully managed via NOM, is related.

Case Report

A 25-year-old male restrained driver sustained a head on collision with another vehicle at 40 mph. He denied loss of consciousness, and there was airbag deployment. He was transported to a nearby community hospital, and complained of right upper quadrant abdominal tenderness. His admission vitals revealed a tachycardia of 106 beats per minute, and was hypotensive with a blood pressure of 69/44 mmHg. His physical exam was positive for significant abdominal tenderness with no peritoneal signs, and a seatbelt sign. His past medical history was positive for juvenile diabetes managed with insulin, and no previous surgical history. A CT scan of the chest, abdomen and pelvis revealed both a Grade V hepatic injury, and a Grade V right renal injury (Figure 1).

He was resuscitated with two units of packed red blood cells (PRBC's) and two liters of normal saline, and emergently transferred to our regional trauma center. On presentation, he was hemodynamically stable, with an unchanged physical exam. His cervical spine was cleared clinically. A urinalysis showed >182 red blood cells per high power field. His hematocrit was 29.6%, his lactate was normal, and the focused abdominal sonography of trauma (FAST) exam showed both the right kidney and hepatic injury (Figure 2).

Upon review of the outside CT scans, the injuries to the liver and kidney were seen, however there was no active extravasation to necessitate an angioembolization. In addition, there was perfusion demonstrated to a portion of the right kidney, and especially with the history of diabetes in this young patient, the goal was to maximally preserve kidney function. The patient was admitted to the surgical intensive care unit (SICU) for bedrest, serial hematocrits, and invasive blood pressure monitoring.

The patient remained hemodynamically stable. However, over the next week, his hematuria persisted, which required the transfusion of a total of eight units of packed red blood cells. Due to the continuing transfusion requirement, an angiogram was performed. It revealed both a solitary pseudoaneurysm of the left hepatic artery, and multiple pseudoaneurysms of the branches of the right renal artery; these were all embolized with microvascular coils (Figure 3). The patient required no further transfusions, and was subsequently discharged on hospital day #10. Healing of the injuries was monitored as an outpatient with serial ultrasounds, which proceeded to full resolution over a six month period postinjury, and renal function remained in the normal range by laboratory assessment.

Discussion

NOM of hepatic injury is currently the standard of care in the blunt trauma patient with hemodynamic stability.[4] These patients should be placed on bedrest, and monitored for further blood loss via serial hematocrits. For injuries with higher bleeding potential, the patient should be admitted to the SICU, have an arterial line placed, and serial lactates trended to ensure that the patient is not going into hemorrhagic shock.[5] While higher grade injuries (Grade IV and V) have a higher failure rate, in the hemodynamically stable patient, NOM is still a viable option, taking into account other injuries as well as any preinjury comorbid conditions. In one recent series, over 90% of Grade IV and V hepatic injuries that met criteria for NOM were successfully managed with only 6.5% requiring a delayed laparotomy for liver bleeding.[6]

While renal injuries due to a penetrating mechanism are usually operatively explored, when the mechanism is blunt, they are also treated with NOM in the hemodynamically stable patient, analogous to other solid organ injuries. While this is commonly done for Grade I to IV renal injuries, in the case of a Grade V renal injury, the standard treatment has been nephrectomy, although more recently nonoperative management has been attempted on these highest grade renal injuries.[7] While there have been attempts at NOM of high grade renal trauma, in a series of pediatric patients with blunt renal trauma, while 80% of Grade IV injuries were treated conservatively, all the Grade V injuries required operative treatment.[8]

The ideal candidate for NOM has an isolated solitary organ injury, and is managed via an algorithmic approach (Figure 4). Multiple simultaneous injuries can be attempted to be managed nonoperatively, but in a recent large series of NOM of solid organ injuries, the failure rate for multiple solid organ injuries managed with NOM was reported to be high at 85%.[9] Malhotra, *et al*, also found that when managing simultaneous injuries to the liver and spleen, compared to a single organ injury, they had a higher mortality, longer lengths of stay, and increased transfusion requirements.[3] However,

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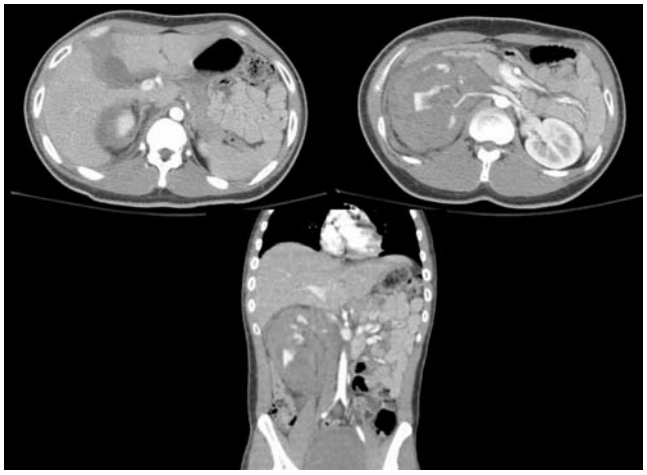

Figure 1. CT scan revealing both a Grade V right renal injury, and a Grade V hepatic injury.

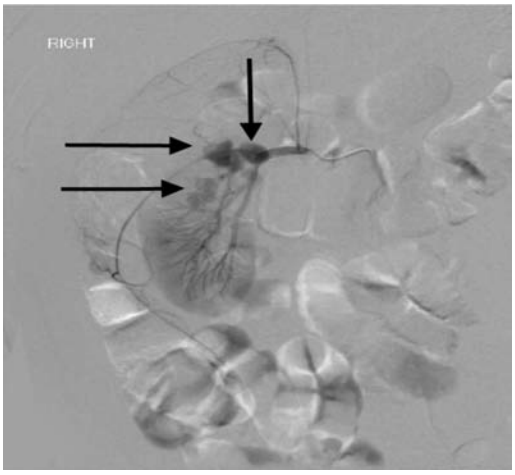

Figure 3. Angiogram showing multiple pseudoaneurysms (black arrows) in the second order branches of the right renal artery.

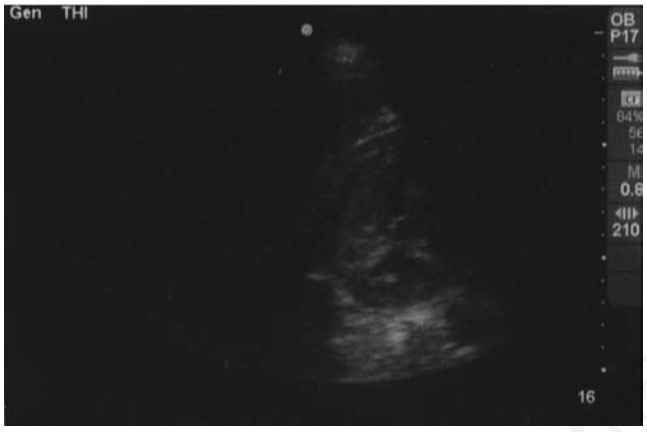

Figure 2. Hepatorenal view on the focused abdominal sonography of trauma exam. Note the blood present both inferior to the liver, and deep to Gerota's fascia of the kidney.

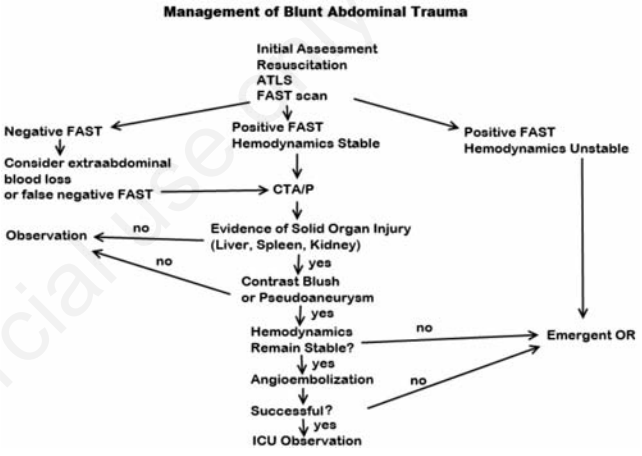

Figure 4. Algorithm for the management of the patient with blunt abdominal trauma.

Yanar *et al.* studied the nonoperative management of multiple solid organ injuries in a prospective observational study, and found a 75% success rate in a series of 46 patients. In their analysis, the independent risk factors for failure of nonoperative management included a 20% or greater drop in hematocrit in the first hour of admission, an elevated lactate on presentation, or a higher solid viscus score.[10] In our patient, the challenge was that he had two simultaneous high grade solid organ injuries, both to the liver and also the right kidney. While this pattern of injury has been uncommonly encountered before, it has not been previously described in a patient where both organs were Grade V. Angiographic techniques were preferable for hemostasis due to the potential mortality with an operative approach.

Conclusions

As experience has accumulated with the NOM of solid organ injury, indications have expanded to less favorable patient types. While higher grade solid organ injury was traditionally treated with surgery, this case illustrates that with critical care monitoring, transfusion support, and well timed angiography, even simultaneous Grade 5 solid organ injuries can be successfully managed with NOM. While proper patient selection is paramount, strong consideration should be made for NOM of even high grade solid organ injury in a hemodynamically stable patient, and multiple injuries should not be considered an absolute contraindication.

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