

Splenic Rupture with Dissection of the Renal Artery in a Young Motorcyclist: A Rare Combination Requires a Combined Approach

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Abstract

Injuries to the spleen in combination with vascular injuries to the kidney are a rare finding and usually expected in polytraumatised patients. The case of a 17-year-old motorcyclist shows that excessive force is not always required but may also occur under circumstances where an extensive injury may not be expected.

Keywords: *Splenic Injury; Blunt Abdominal Trauma; Dissection of the Renal Artery; Endovascular Stent; Motorcycle Accident*

Introduction

A 17-year-old motorcyclist sustained a blunt trauma to the chest and abdomen. It resulted in a combined injury to the spleen and a dissection of the renal artery. Blunt injuries to the renal artery are rare and follow a distinct pathway in their treatment. To date, endovascular stenting is the treatment of choice once the patient is haemodynamically stable.

Case Report

A 17-year-old boy was admitted to the hospital in the early evening hours of a bank holiday weekend. He was a participant in a motorcycle race. It had stopped raining when his bike slipped at approx. 30 mph on the wet tarmac, skidded in a curve and made the young racer fall onto the left side. As he was already in a sloping position, the distance between his body and the surface was described to be only 30 centimeters. He impacted the left lower ribcage as he left the motorbike and skidded a few feet on the tarmac. He was able to get up but complained of left sided chest pain afterwards. His father called the ambulance that transferred the Client to our hospital. The type of the accident necessitated a "trauma call" on arrival.

In casualty, the boy presented in a stable condition. He wore full protective and padded motorcycle gear and complained of left lower chest pain. Vital signs were normal with stable blood pressure, heart rate and saturation.

On inspection, there were no visible marks or bruises. The chest was symmetric and moving bilaterally without crepitus on palpation. Breathing sounds were present. On palpation, the patient indicated tenderness over the left lower ribcage and the flank. The abdomen was soft, the pelvis stable and upper and lower extremities without injuries.

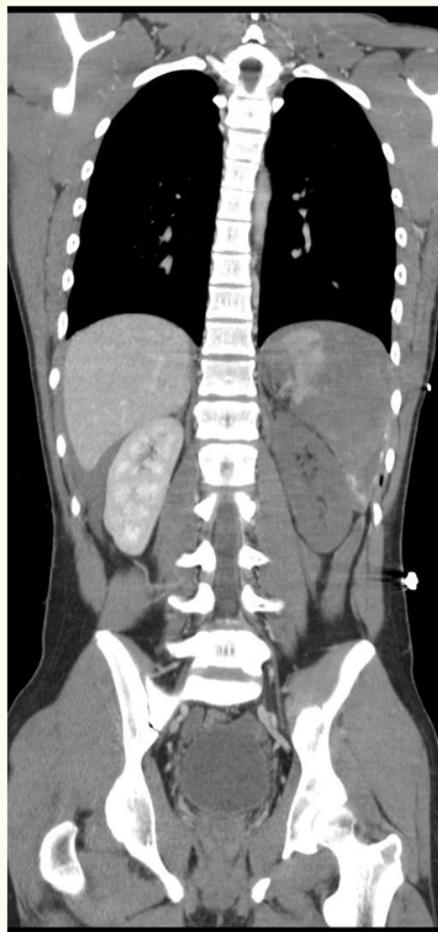


Figure 1: CT abdomen with not contrasted left kidney and laceration to the spleen.



Figure 2: The left renal artery with abrupt stop before the left kidney.

FAST ultrasound queried a laceration to the spleen, but no free fluid in the Koller or Morrison pouches or the abdomen.

With the queried findings, a trauma CT was conducted. It confirmed a deep laceration to the spleen, but more importantly a non-enhanced kidney on the left side. This was due to an intima dissection of the renal artery with a cut-off in the renal artery. The artery appeared intact but only with dye in the proximal aspect. Whilst in the process of coordinating the patient's treatment with the department

for vascular intervention, the patient showed signs of active bleeding from the spleen with a decreasing blood pressure and a drop of his haemoglobin. He underwent an emergency laparotomy. The spleen was found to be shattered making it a grade 4 laceration, which resulted in a splenectomy. After surgery, the Client was transferred to the vascular intervention team. They succeeded in aspirating a thrombus, lysing and bridging the intima lesion with a vascular stent. After intervention, the patient received heparin under PTT monitoring. On day 2, heparin was converted into ASS 100 mg and Clopidogrel 75 mg for 8 weeks.

The boy recovered well and without complications. Renal function and blood pressure remained stable and ultrasound follow-ups were unremarkable.

3 months after surgery, the patient was still asymptomatic with normal renal function and a normotensive blood pressure.

Discussion

Blunt renal artery injuries are quite rare, accounting for 0.05% to 0.08% of blunt abdominal injuries only. In more than 80%, they occur with associated injuries [1,2]. Cass [3] found an average of 3.7 associated injuries per patient, with 85% of patients requiring laparotomy for their intraabdominal injuries. This suggests that these injuries typically occur in polytraumatised patients.

Our patient primarily appeared to have sustained a blunt trauma to the chest. The force of the impact appeared to have been minor, as the reported fall is typical and very common in motorcycle racing. However, the injury pattern without associated rib fractures or additional injuries was surprising. We have established FAST ultrasound in the management of any trauma. It revealed a laceration of the spleen, which then resulted in a CT scan that showed the full extent of the injuries with an involvement of the renal artery.

The classification of injuries of the spleen follows the classification of American Association for the Surgery of Trauma (AAST) [4].

- Grade I
 - Subcapsular hematoma <10% of surface area
 - Parenchymal laceration <1 cm depth
 - Capsular tear
- Grade II
 - Subcapsular hematoma 10-50% of surface area
 - Intraparenchymal hematoma <5 cm
 - Parenchymal laceration 1-3 cm in depth
- Grade III
 - Subcapsular hematoma >50% of surface area
 - Ruptured subcapsular or intraparenchymal hematoma ≥5 cm
 - Parenchymal laceration >3 cm in depth
- Grade IV
 - Any injury in the presence of a splenic vascular injury* or active bleeding confined within splenic capsule
 - Parenchymal laceration involving segmental or hilar vessels producing >25% devascularisation
- Grade V
 - Shattered spleen
 - Any injury in the presence of splenic vascular injury with active bleeding extending beyond the spleen into the peritoneum

On CT, the splenic injury was classified as grade 4. During laparotomy, the spleen was shattered and actively bleeding. As such, it had progressed into a grade 5 injury. A reconstruction could not be considered and resulted in a splenectomy.

Injuries to the renal artery do not have to result from massive force. The mechanism of the motorcyclist's injury corresponds well with the given anatomy and the high likelihood of the left renal artery being exposed to stretch injuries or to direct impact that compresses the renal vessel against the vertebral column [5,6]. These forces can lead to intimal tearing, dissection, thrombosis, pseudoaneurysm, and complete or incomplete transection of the renal artery. The tear usually occurs 2 - 4 cm from the origin of the main renal artery as the kidneys are fixed in place only by the vascular pedicle and ureter [7-9]. All this applied to our patient.

Blunt renal artery injuries can then follow two routes: bleeding or stenosis/occlusion. For bleeding cases, emergency laparotomy or transcatheter renal artery embolisation is required for hemostasis [10]. Conservative therapy is the option for a renal artery injury with stenosis/occlusion in a state of shock when the treatment of other injuries is prioritised. In a hemodynamically stable patient with renal artery injury and stenosis/occlusion, treatment can be conservative surgical [11-13]. The main complications with conservative therapy consist of acute renal failure or renovascular hypertension. The risk varies between 19% and 43% [14]. The success rate of surgical revascularization is only 25% to 50% [13,14].

Therefore, renal artery injuries have been preferably treated with renal artery stenting since the mid-1990s in order to avoid renal failure and renovascular hypertension [15]. Surgical revascularisation often resulted in poor outcomes and was reserved for bilateral renal occlusion [16]. The indications for stenting are defined and prefer hemodynamically stable patients with a blunt renal artery injury with stenosis and without active bleeding from the renal parenchyma. Whenever the patient is hemodynamically unstable, the diagnosis and treatment of the primary cause is the main concern.

The procedure should be conducted as early as possible. Although the degree of stenosis appears not to influence the outcome greatly, irreversible changes can occur after one hour already if arterial occlusion is complete [17,18]. Collateral blood flow may not be sufficient and occlusion be complicated if thrombi in the distal renal artery progress, which is likely to occur within the first 3 hours [19]. It is therefore believed that the optimal time frame for intervention is between 3 and 4 hours [20]. Later, revascularisation can prevent renal hypertension but results in lesser renal function [21-23].

Among the laboratory findings, an increased serum creatinine, leukocytosis and serum lactate dehydrogenase (LDH) can indicate renal parenchymal cell death [24,25].

In our case, endovascular stenting could be conducted within 3 hours after admission, which falls within the ideal interval for intervention. The patient received a combined thrombosis prophylaxis with ASS 100 mg and Clopidogrel 75 mg for the duration of 8 weeks. Some three months after admission, the patient remains asymptomatic with a normal creatinine, renal function and a normotensive blood pressure.

The long-term prognosis of endovascular stenting by Okada [26] was found to be excellent. All the patients survived and no complications due to the intervention itself could be observed. Renal function could be preserved without irreversible renovascular hypertension. It is suggested to be a safe intervention and helps avoiding long-term haemodialysis and renovascular hypertension.

Complications consist of bleeding and stent thrombosis, renal atrophy and malignant hypertension. Bleeding may be controlled by endovascular intervention, e.g. arterial embolisation. Usually, stenting is done under the care of stand-by surgeons in cases of urgent nephrectomy. The risk of stent thrombosis is low as the material is large in diameter and short in length [27] and can effectively be treated with endovascular treatment [28]. More importantly, considerations should be given for a thrombosis prophylaxis with either antiplatelet agents or heparin [29].

Conclusion

Study reviews suggest that blunt injuries to the abdomen can result in a dissection of the renal artery as a rare but associated injury. The treatment of choice is stenting of the renal artery injury. It can preserve renal function and prevent renovascular hypertension if conducted in an appropriate timeframe. The procedure has a minor complication rate with a good long-term prognosis.

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