

A Rare Cause of Renal Vein Thrombosis: A Progressive Zone I Retroperitoneal Hematoma following Blunt Trauma

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ABSTRACT

Renal vein thrombosis is a rare sequela of blunt trauma with the potential for significant morbidity and mortality. The physiology of the multitrauma victim is extremely dynamic on both the micro and macroscopic levels. Trauma-induced coagulopathy, together with anatomical changes due to injury, plays a significant role in the treatment and prognosis of the trauma victim. Here we show, with sequential computer tomography (CT) scans, the effect of an enlarging retroperitoneal hematoma on the renal venous system. The changes and external pressures, without direct compression, of the retroperitoneal hematoma, created a thrombogenic environment for the left renal vein leading to renal vein thrombosis. The measurement of the retroperitoneal hematoma, and its progression, might be a useful marker for prognosis and the potential need for invasive intervention in order to prevent further injury and morbidity.

Keywords: Blunt trauma, Retroperitoneal hematoma, Renal vein thrombus.

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INTRODUCTION

Renal vein thrombosis (RVT) describes the presence of thrombus in the major renal veins or their tributaries. The mechanism of RVT is similar to that of other venous thrombosis involving three key factors first described by Rudolf Virchow in the 1800's—endothelial damage (e.g., blunt trauma, vasculitis), stasis (e.g., severe hypovolemia, the kink of renal vein, renal vein compression), and hypercoagulability (e.g., nephrotic syndrome, puerperium, disseminated malignancy, intrinsic hypercoagulability, APLS, etc.).¹

Renovascular injury is a rare complication of blunt abdominal trauma with only a few documented cases,²⁻⁴ associated with a 28% mortality.⁵ Patients with RVT may be asymptomatic or present with flank pain, microscopic or gross hematuria, renal function deterioration, and/or proteinuria.⁶ The diagnosis is most commonly made by contrast-enhanced computed tomography angiography (CTA) scans, with a sensitivity and specificity of close to 100%.⁶

Traumatic retroperitoneal hematoma is a rare yet deadly injury, mostly associated with another intra-abdominal, pelvic, or skeletal injury.⁷ With blunt trauma, in the stable (or responsive) patient, surgery and/or invasive procedures are not indicated when there is no other reason for surgery, and the majority of cases are successfully managed with conservative therapy.⁸ The retroperitoneal influence on the peritoneal cavity is known, especially in regards to abdominal compartment syndrome.⁹ Yet, to our knowledge, there are no cases demonstrating how the dynamics of a retroperitoneal hematoma may result in an RVT due to contortion and external forces (not necessarily compression) on the renal vasculature. Here we show this phenomenon in sequential CT scans in a patient after high kinematic blunt trauma.¹⁰⁻¹³

CASE

A 56-year-old, otherwise healthy male was found unrestrained in the driver's seat of his sedan automobile following a high-velocity head-on collision with a concrete wall. The patient's entire torso was flexed upon his legs under the steering wheel console with the airbag deployed. The patient was found in an altered mental state.

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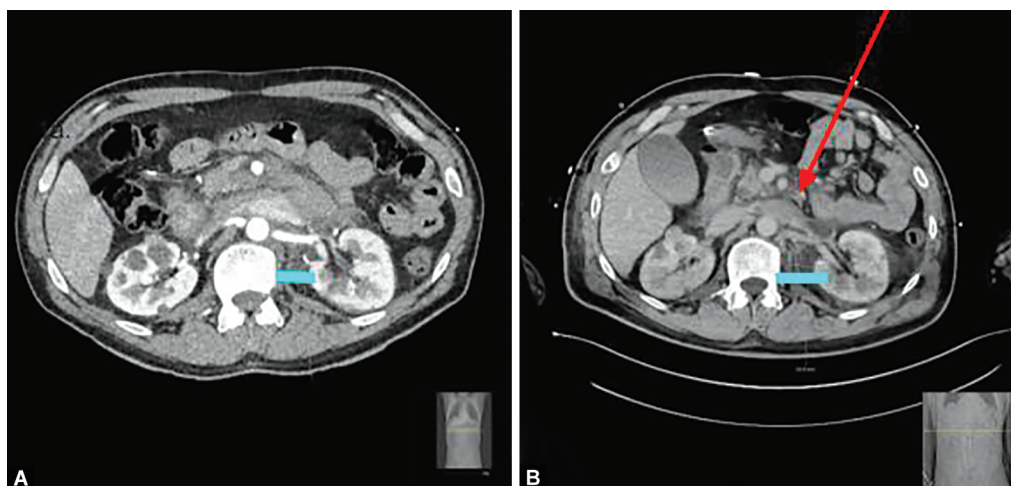
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After first responders removed him from the automobile with C-spine precaution, they performed a needle chest decompression due to severe deformation on the right side and respiratory distress. They then did a scoop-and-run and were in our trauma bay within minutes.

Upon primary survey, the patient was uncooperative and agitated with a Glasgow coma scale of 8, tachycardic, and weak peripheral pulses. Bilateral open fractures of the lower legs were present without arterial bleeding. The patient was intubated, and FAST was negative for intra-abdominal or pericardial fluid. Chest X-ray showed subcutaneous air on the left side with no clear hemo or pneumothorax; pelvic X-ray showed bilateral pubic rami fractures. He received two units of noncrossed matched blood and was saturating 96% on 60% FiO₂. His hemodynamics responded to resuscitation with an increase in systolic blood pressure to 100 mm Hg. He proceeded to undergo a trauma protocol total body CT scan.

CT scan revealed significant bilateral chest trauma, with multiple rib fractures, a large pneumothorax on the right side, fractured transversales processes, left acetabulum, bilateral pubis rami, and bilateral ischial fractures. There was no head, cervical spine, solid abdominal viscera injury, suspected mesentery/bowel injury, or free air in the peritoneal cavity. A retroperitoneal



Figs 1A and B: Evolution of the retroperitoneal hematoma in parallel with the renal vein thrombus. (A) Showing the initial trauma CT with a measurement of 25 mm between the vertebrae and left kidney with no thrombus present. (B) Showing the CT at 26 hours with an expansion of the distance between the psoas muscle and left kidney to 30.9 mm and a RVT. Red arrow showing the RVT. Blue lines showing the measurements

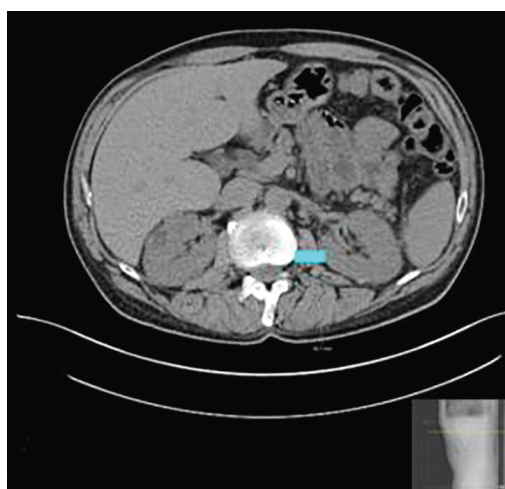


Fig. 2: CT 8 months following the trauma showing complete resolution of the retroperitoneal hematoma and a distance of 18.7 mm between the vertebrae body and kidney. Blue line showing the measurement

hematoma was present. We measured the distance from the vertebral body to the cortex of the kidney at the level of the renal vein. **Figure 1A** shows the initial protocol trauma CT (19 minutes after arrival at the hospital), where the distance between the left kidney and vertebral body is measured at 25 mm. In the initial CT, there was no RVT. Twenty-six hours later, a follow-up CT was conducted in order to re-examine the retroperitoneum because of changes in the patient's hemodynamics. No active bleeding was seen, yet the retroperitoneal hematoma size was increased, using the same measurement location, to 30.9 mm (**Fig. 1B**). This was an expansion of 19.1% between the left kidney and the vertebrae, with an RVT in the left vein. **Figure 2** is a follow-up CT 8 months later, showing a distance of 18.7 mm (a 25.2% and 39.5% reduction in size compared to index CT and second CT), with complete resolution of the retroperitoneal hematoma.

The patient stabilized, was not in need of further blood products, and was placed on full anticoagulation therapy. His renal function remained within normal limits; he was eventually extubated, downgraded from the intensive care ward to the trauma unit, and discharged home after 47 days of being hospitalized.

- There is no conflict of interest from any of the authors
- Informed consent was obtained.
- No animal or humans studies were conducted.

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