

CT Cystography Following a Scrotal Gunshot Wound

Peter R. Eby, M.D.

We present the case of a 22-year-old man who sustained a gunshot wound to the scrotum. The imaging findings and management of the patient are described and discussed in the context of prior research pertaining to traumatic bladder rupture. Non-pressurized antegrade 10-minute delayed CT may result in unnecessary radiation exposure, delayed diagnosis and is not adequate to exclude bladder rupture. Retrograde pressurized CT cystography should be performed to exclude bladder rupture in patients with high-risk imaging results, clinical findings or injury mechanisms.

Introduction

Injury to the urinary bladder is associated with blunt and penetrating trauma to the pelvis. Acute pelvic fractures, hematuria, free pelvic fluid and intravesicular foreign bodies are associated with bladder trauma [1]. Failure to diagnose and operatively repair an intraperitoneal bladder rupture may lead to sepsis and death. Appropriate radiographic evaluation is critical to early treatment and management. Low pressure antegrade CT cystography can frequently result in false negative examinations [2]. Retrograde filling of the bladder with distension to 40 cm of pressure improves diagnostic accuracy [3-7]. The following case illustrates the impor-

tance of high-pressure retrograde CT cystography when bladder rupture is suspected.

Case Report

A 22-year-old man presented to the Emergency Department following a gunshot wound to the scrotum. Physical examination revealed an entrance wound in the left scrotum and an exit wound in the left paraspinal soft tissue at the L5 level. The patient was unable to void but there was no blood at the urethral meatus and a Foley catheter was placed without difficulty.

CT of the abdomen and pelvis was performed during the venous phase of IV contrast administration to further evaluate his injuries. This revealed a left testicular hematoma, puncture fracture of the left pubis, bone fragments within the bladder, intraperitoneal fluid, presacral bowel wall thickening and bone fragments in the left L5 lateral recess (Fig. 1). No metallic foreign bodies were present. These findings confirmed the suspicion of a through-and-through gunshot injury involving the scrotum, pubis, bladder and L5 vertebral body. However, there was no intraperitoneal or extraperitoneal contrast extravasation on this venous phase examination

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Abbreviations: CT, computed tomography

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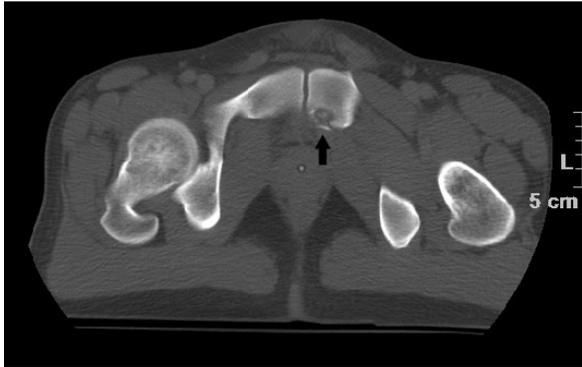


Figure 1A. 22-year-old man with scrotal gunshot wound. Axial venous phase CT image of the pelvis demonstrates round puncture fracture of the left pubis (arrow).

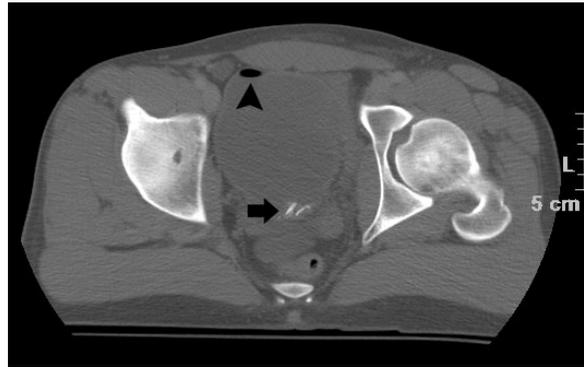


Figure 1B. 22-year-old man with scrotal gunshot wound. Axial venous phase CT image of the pelvis demonstrates dependent bone fragments (arrow) and gas in the bladder (arrowhead).

to confirm bladder rupture.

The patient was taken to the operating room for exploratory laparotomy. Two perforations in the bladder were found (left anterior wall and midline posterior wall) indicating entrance through the left anterior wall by the bullet and pubic bone fragments and exit through the midline posterior wall by the bullet alone. The sigmoid colon was also perforated. All injuries were repaired intra-operatively and the patient recovered.

Bladder rupture was suspected due to the presence of intravesicular bone fragments and intraperitoneal fluid. Therefore, the Foley catheter was clamped and a repeat CT was performed after a 10-minute delay. This examination demonstrated a distended bladder with a contrast-fluid level but no extravascular contrast extravasation (Fig. 2). A retrograde CT cystogram was then performed with a combination of 250 cc of normal saline and 50 cc of Omnipaque 300 instilled under 40 cm of pressure. This examination revealed contrast extravasation into the peritoneal cavity which confirmed the suspected intraperitoneal bladder rupture (Fig. 3A). In addition, there was direct evidence of contrast leaking through the perforation in the posterior wall of the bladder (Fig. 3B).

Discussion

Bladder rupture is associated with blunt and penetrating trauma to the pelvis. Suspicion should be increased in the setting of pelvic fractures, hematuria, free pelvic fluid and intravesicular foreign bodies [1]. Injuries

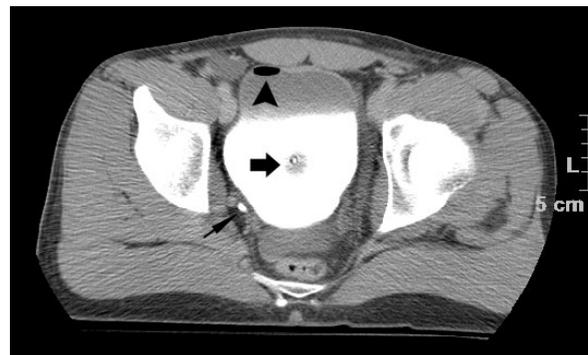


Figure 2. 22-year-old man with scrotal gunshot wound. Axial CT image 10 minutes after contrast administration with the Foley catheter clamped demonstrates a contrast/fluid level, Foley catheter (arrow) and gas (arrowhead) in the bladder but no extravascular contrast. The distal right ureter (skinny arrow) also contains contrast.

may be classified as bladder contusion, intraperitoneal rupture, extraperitoneal rupture or both. Failure to diagnose and operatively repair an intraperitoneal bladder rupture may lead to sepsis and death. Extraperitoneal rupture may be treated non-operatively with Foley catheter placement and bladder decompression unless orthopedic fixation will be performed. Patients should undergo radiographic evaluation as early as possible in the course of treatment to facilitate appropriate management.

Antegrade CT cystography in which the Foley

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Figure 3A. 22-year-old man with scrotal gunshot wound. Axial image of the pelvis during CT cystogram demonstrates contrast surrounding the bowel (arrowheads) which is diagnostic of intraperitoneal bladder rupture. Bone fragments are also present in the L5 left lateral recess (arrow).

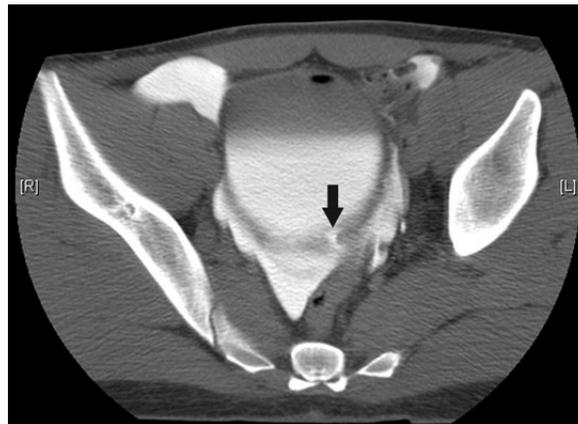


Figure 3B. 22-year-old man with scrotal gunshot wound. Axial image of the pelvis during CT cystogram demonstrates contrast extravasating through a perforation in the posterior wall of the bladder (arrow).

catheter is clamped and axial pelvic images are acquired 15-30 minutes after the administration of contrast can frequently result in false negative examinations [2]. Retrograde filling of the bladder with distension to 40 cm of pressure has demonstrated improved diagnostic accuracy [3-7]. Deck et al. correlated retrograde CT cystography with operative exploration and confirmed 95% sensitivity and 100% specificity for the diagnosis of bladder rupture in the setting of blunt abdominal trauma and hematuria [5, 6]. Chan et al performed a retrospective review of patients with traumatic pelvic fracture and describe sensitivity, specificity, positive predictive value and negative predictive value of the CT cystography as 100%, 99.6%, 85.7% and 100% respectively [7].

This case illustrates the false-negative result and pitfalls that may occur without properly establishing retrograde intravesicular pressure and filling. Despite the presence of intravesicular bone fragments in this case, clamping the Foley catheter and acquiring delayed images was not adequate to exclude potentially fatal intraperitoneal bladder rupture. In addition, the delay in treatment and radiation exposure incurred by the antegrade exam could have been avoided by proceeding directly to retrograde CT cystography. Retrograde cystography with 40 cm of pressure is recommended to adequately evaluate potential bladder injuries in the

setting of trauma and appropriate clinical and radiologic findings.

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