The urinary tract may be damaged by a variety of blunt and penetrating mechanisms. The presence of gross hematuria in the trauma patient mandates evaluation for genitourinary injury. This includes evaluation of the kidneys, bladder, and urethra. The purpose of this guideline is to provide guidance for the evaluation of genitourinary trauma. For the purposes of this guideline the following definitions will be used.

- Gross hematuria is defined as blood in the urine that can be seen as a change in the color of the urine.
- Microscopic hematuria is defined as urine that appears normal in color but has tested positive for blood on microscopic examination.

**EVALUATION FOR RENAL INJURY:**

1. Evaluation for the presence of blunt solid organ injury (including renal injury) is initially dictated by the hemodynamic status of the patient.
   a. In hemodynamically stable patients with gross hematuria, abdominal computed tomography with intravenous contrast and immediate and delayed imaging is the radiologic gold standard for the evaluation of renal parenchymal injury and should be performed in hemodynamically stable patients with gross hematuria.1,2
   b. Hemodynamically unstable patients with gross hematuria should proceed to the operating room for exploratory laparotomy, especially if additional intra-abdominal injuries are suspected. A one shot IVP can be considered intra-operatively to evaluate the functional status of the kidneys1,2. Use of IVP for determination of renal function should only be utilized in hemodynamically stable patients that have been adequately resuscitated.

2. The presence of microscopic hematuria does not mandate performance of CT to evaluate for renal injuries. However, CT imaging to rule out renal injury should be undertaken in patients with major associated injuries, flank ecchymosis, and/or rapid deceleration injuries. If there is no mechanism to suggest intra-abdominal injury then no further diagnostic studies are needed.

**EVALUATION FOR URETERAL INJURIES:**

There are no classic clinical symptoms and signs of ureteral injury. Injury to the ureters should be suspected in all cases of penetrating abdominal injury, and in cases of blunt deceleration trauma in which the kidney and renal pelvis can be torn away from the ureter.

1. Abdominal and pelvic CT imaging with IV contrast with both immediate and delayed imaging is the recommended diagnostic study for evaluation of ureteral trauma.

2. If CT scan cannot be performed, a one shot intravenous pyelogram (IVP) can be performed. If the patient is undergoing laparotomy, direct visualization of the ureters should be performed to evaluate for injury. The technique consists of a bolus intravenous injection of 2 ml/kg radiographic contrast (Omnipaque 350) followed by a single plain film taken after 10 minutes. This study provides important information for decision-making in the critical time of urgent laparotomy, and documents the presence of a functioning contralateral kidney.
EVALUATION FOR BLADDER INJURIES:

Bladder injuries can be divided into extra peritoneal (60%), and intraperitoneal (30%). Simultaneous extra peritoneal and intraperitoneal injuries occur in 10% of all traumatic bladder injuries. About 70–97% of patients with bladder rupture from blunt trauma have associated pelvic fractures. The two most common sign and symptoms are gross hematuria (82%–100%) and abdominal tenderness (62%). Other findings may include the inability to void, bruises over the suprapubic region, and abdominal distension. Extravasation of urine may result in swelling in the perineum, scrotum, thighs, and anterior abdominal wall.

1. The combination of pelvic fracture and gross hematuria constitutes an absolute indication for immediate cystography in blunt trauma patients. All patients with gross hematuria and a pelvic ring fracture should undergo radiologic examination of the bladder. Conventional cystography is the preferred screening method for the evaluation of both intraperitoneal and extra peritoneal bladder injury. CT Cystography with installation of 350 ml of contrast agent into the bladder is also an accepted diagnostic study for the evaluation of bladder injury.

2. The presence of microscopic hematuria is only a relative indication of injury. In patients with microscopic hematuria, imaging should be reserved for those with anterior rami fractures (straddle fracture) or severe pelvic ring disruption.

3. The presence of pelvic fluid in patients with pelvic fractures other than acetabular fractures should prompt cystography to evaluate for bladder injury.

4. Microscopic hematuria with isolated acetabular fracture or minimally displaced pelvic ring fractures is not an indication for cystography.

EVALUATION FOR URETHRAL TRAUMA IN THE MALE

Blood at the meatus is present in 37–93% of patients with posterior urethral injury and at least 75% of patients with anterior urethral trauma. The presence of blood at the meatus should preclude any attempts at urethral instrumentation, until the entire urethra is adequately imaged.

1. Retrograde urethrogram (RUG) is considered to be the gold standard diagnostic test for the evaluation of urethral injury. Evaluation for urethral injuries is recommended for the following patients:
   a. Presence of blood at the urethral meatus
   b. “High-riding” prostate on rectal examination
   c. Gross hematuria
   d. Penetrating trauma to the penis or perineum
   e. Displaced fracture of the anterior pelvic ring (>10 mm displacement)
   f. Inability to void in the setting of pelvic trauma
   g. Unable to pass urethral catheter

2. In the event that a Foley catheter has been inserted prior to urethral evaluation (in a patient with concern for urethral trauma) a pericatheter retrograde urethrogram should be performed in a non-emergent fashion to identify a potential missed urethral injury. This is done by injecting contrast via a 3 French catheter or angiocatheter held in the fossa navicularis to distend the urethra and prevent contrast leak from the meatus.
RETROGRADE URETHROGRAM INSTRUCTIONS:

Where to Perform:
- RUG is optimally performed in a fluoroscopy room
- In urgent situations, RUG may be performed in the trauma room using digital radiography (DR) equipment
  - A member of the ER and/or trauma team will place the urethral catheter and inject the contrast
  - One or more members of the Emergency Radiology team will be present to assist with timing the radiographic exposures and real-time interpretation of the images

Procedure: West modification of Sandler procedure
1. The external meatus is prepared in a standard sterile fashion.
2. Use an 8-F pediatric Foley catheter.
3. The catheter, with both the irrigating syringe and inflating (saline solution) syringe attached, should be flushed before use.
4. Apply a very thin coat of water soluble lubricant to the tip and balloon of the catheter. Very thin means a barely visible coating – less than 0.1 ml.
5. Insert the catheter approximately 2.0 – 2.5 cm into the penis so that the balloon portion of the catheter is seated in the fossa navicularis of the penile urethra. The balloon should be aligned with the corona of the glans penis.
6. The patient should be reassured about the discomfort that is experienced during balloon inflation.
7. The balloon is inflated with 0.5 - 1.0 mL of saline solution while the port is held with the free hand to partially inflate the balloon. Watch the patient grimace to judge when to stop inflating. A properly inflated catheter should remain in place when gentle traction is applied to gently stretch the penis.
8. If possible, the patient is rolled in a supine 45° oblique position. The penis should be gently pulled laterally over the proximal thigh using moderate traction on the catheter.
9. 5 ml of Omnipaque-300 is injected and the first radiograph is made. This first radiograph low volume radiograph may depict massive urethral disruption.
10. If no contrast extravasation is seen on the initial radiograph, an additional 15–25 mL of Omnipaque-300 is injected so that the anterior urethra is filled. Commonly, spasm of the external urethral sphincter will be encountered, which prevents filling of the deep bulbous, membranous, and prostatic urethras. Slow, gentle pressure is usually needed to overcome this resistance. The pressure on the injection syringe often noticeably diminishes as the external sphincter relaxes and the expression on the patient’s face changes. When these events occur, the physician performing the injection says “shoot” for the second radiograph.
11. Timing of the second radiograph is important. The technologist should start the x-ray tube rotor when the higher volume injection commences and push the exposure button when the injecting physician says “shoot.”
12. If the second radiograph shows neither contrast extravasation nor filling of the posterior urethra, a third radiograph may be made during the injection of an additional 25 ml of Omnipaque-300 while the patient is told to “bear down” and try to forcibly urinate against the contrast stream. This maneuver sometimes relaxes the recalcitrant external sphincter. Maximum 50 ml Omnipaque-300.
13. If the posterior urethra is still not filled after 50 ml injection, consider getting a voiding radiograph after the urinary bladder has been filled with contrast from the CT. For this radiograph, the technologist starts the rotor when the patient begins to urinate into a urinal. The technologist then asks the patient to squeeze his penis to interrupt the urine stream and shoots radiograph as the urine stream stops.
REFERENCES:

- http://emedicine.medscape.com/article/1893948-overview#a1
Procedure:
References: