Outline

- Renal Trauma
- Ureter Trauma
- Bladder Trauma
- Urethral Trauma
- External Genitalia Trauma
Renal Trauma
Anatomy
Anatomy
<table>
<thead>
<tr>
<th>Level</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Contusion</td>
<td>Microscopic or gross hematuria; urologic studies normal</td>
</tr>
<tr>
<td></td>
<td>Hematoma</td>
<td>Subcapsular, nonexpanding without parenchymal laceration</td>
</tr>
<tr>
<td>II</td>
<td>Hematoma</td>
<td>Nonexpanding perirenal hematoma confined to the renal retroperitoneum</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>&lt;1 cm parenchymal depth of renal cortex without urinary extravasation</td>
</tr>
<tr>
<td>III</td>
<td>Laceration</td>
<td>&gt;1 cm parenchymal depth of renal cortex without collecting-system rupture or urinary extravasation</td>
</tr>
<tr>
<td>IV</td>
<td>Laceration</td>
<td>Parenchymal laceration extending through the renal cortex, medulla, and collecting system</td>
</tr>
<tr>
<td></td>
<td>Vascular</td>
<td>Main renal artery or vein injury with contained hemorrhage</td>
</tr>
<tr>
<td>V</td>
<td>Laceration</td>
<td>Completely shattered kidney</td>
</tr>
<tr>
<td></td>
<td>Vascular</td>
<td>Avulsion of renal hilum that devascularizes kidney</td>
</tr>
</tbody>
</table>
Renal Trauma

- 10 % of abdominal trauma
- Blow to the flank, deceleration trauma, fall from a height, or penetrating abdominal, pelvic, and lower chest injury
- Hematuria is the most common sign of renal trauma
Physical Exam

- tenderness in the flank, costovertebral angle or abdomen
- a palpable flank mass
- ecchymosis in the flank, back, or abdomen
- inspection of the trunk for a penetrating injury is critical
Investigations

- urinalysis by dipstick
- microscopic examination for blood or infection

Question:
Does gross or microscopic hematuria equal emergency room imaging?
Not Always!

- Study in 1985 showed the only findings that were predictive of significant renal injury were:
  1) presence of penetrating or blunt trauma with gross hematuria
  2) microhematuria and shock.
Other Indications

- injury to the brain, loss of consciousness, or altered mental status
- deceleration trauma
- fractures of long bones, lower ribs, or transverse spinous processes
Imaging in Renal Trauma

- assesses pt's candidacy for nonoperative management
- demonstrates the presence of two functioning renal units prior to surgical intervention
- Gold Standard is...
Nonoperative Management

- long been accepted that low-grade renal injuries can be managed nonoperatively
- Some limit operative management of renal injuries to hemodynamically unstable patients
- Others operate with ongoing hemorrhage requiring significant transfusion, pulsatile or expanding hematoma on exploration, or avulsion of the pedicle
Nonoperative Management

- percutaneous drainage
- stenting
- angiographic embolization
- bed rest for the first 24 to 72 h, or until significant gross hematuria resolves
Operative Management

Indications

- blunt avulsion or penetrating lesions of the renovascular pedicle
- AAST grade V parenchymal injuries
- ureteropelvic avulsion or complete avulsion of the fornices
- Salvage VS Removal
Operative Management

- Palpate uninjured kidney
- Intraoperative IVP is useful to assess other kidney
- Many different approaches and techniques depending on renal injury
Ureteral Trauma
Ureteral Trauma

- Occur in 4% of patients with penetrating injuries and <1% of those with blunt trauma
- Concomitant visceral injury occurs in the majority of patients with ureteral injuries
- Hematuria is an important sign of ureteral injury but may be absent 15 to 45% of the time
Imaging

- IVP and contrast-enhanced CT scanning are helpful
- Delayed excretory phase should specifically be requested
- Failure of the distal ureter to opacify on a CT scan should raise concern of an injury
- Cystoscopy with retrograde pyelography may also be indicated
Management

- if ureteral trauma is recognized early, operative repair is performed (<3 days)
- delayed recognition is managed with endoscopic or interventional radiologic techniques followed by delayed operative reconstruction
- approach to ureteral repair depends largely on the level of the injury, the amount of tissue loss, and the condition of the local tissues
Bladder Trauma
Bladder Trauma

- Sudden compression of the full bladder, shear forces, or a pelvic fracture may result in a blunt rupture
- Cardinal sign is gross hematuria (95% of cases)
- >80% of patients with bladder rupture have an associated pelvic fracture
- Associated with disruption of the posterior urethra in 10-20% of cases
Imaging

- Stress cystography is the standard study for diagnosis of injury to the bladder.
- It is important that the bladder be adequately filled to avoid false-negative studies.
- A filling film is obtained that should be a vertically oriented abdominal image designed to show the entire abdomen.
Imaging

- Hematuria without contrast extravasation on a properly performed stress cystogram is consistent with a contusion or minimal mucosal injury
- Postdrainage washout films recommended to avoid false-negative cystograms
- Clamping catheter following intravenous contrast is not adequate
Bladder Trauma
Cystography

Extraperitoneal

Intraperitoneal
Nonoperative Management

- 18 to 20 F catheter
- left indwelling for 10 to 14 days followed by a cystogram
- After this, >85% of bladder injuries will show absence of extravasation
- If extravasation persists, another 7 to 10 days of catheter drainage followed by repeat cystography
Operative Management

Indications

- concomitant injury to the vagina or rectum
- injury to the bladder neck in the female
- avulsion of the bladder neck in any patient
- the need for pelvic exploration for other surgical indications
Urethral Trauma
Anatomy
Urethral Trauma

- Trauma to the anterior urethra may result from straddle injuries with sudden compression at the level of the mid- to deep-bulbous urethra against the inferior pubic arch.

- Urethral distraction injuries, or posterior urethral disruption, may accompany pelvic fracture in 4 to >10% of patients.
Urethral Trauma

- Blood appearing at the urethral meatus
- inability to void
- presence of a perineal hematoma
- inability to clearly palpate the prostate on rectal examination
When urethral injury is suspected, a retrograde urethrogram should be performed. It is important to determine from the urethrogram if an injury is partial or complete. No attempt at insertion of a catheter until negative retrograde urethrogram is obtained.
Urethral Trauma

- Following placement of either a urethral catheter or a suprapubic catheter a stress cystogram should still be performed if hematuria is present.

- 10 to 15% of patients with urethral disruptions from a pelvic fracture will have a concomitant injury to the bladder.
Nonoperative Management
Anterior Injuries

- minimal extravasation and flow of contrast past the injury into bladder
- a single attempt at gentle passage of a catheter (by a urologist)
- injuries limited to the mucosa and corpus spongiosum without extravasation are treated by catheterization
Operative Management

- Complete anterior and posterior urethra
- Diversion with a suprapubic cystostomy
- Followed by a period of observation of 3 to 6 months while the pelvic hematoma resolves and the anatomy stabilizes
- Definitive reconstructive surgery
- Success rate of this approach is over 90%
Operative Management

- Newer techniques include endoscopic guidance, open surgical approaches, and the use of interlocking magnetic sounds.
- Possibility that the injury will heal free of intractable stricture.
External Genital Trauma
External Genitalia Trauma

- Penile fracture occurs from forceful bending of the erect penis, often during intercourse.
- Amputation injuries of the penis or testicle can occur due to assaults, self-mutilation, or industrial trauma.
- After major blunt trauma to the scrotum, the risk of testicular rupture is approximately 50%.
- Ultrasound may be valuable.
Conclusion

- Damage control principles
- delaying surgical interventions for injuries not immediately life-threatening
- With the exception of major bleeding from the kidney or renal pedicle, virtually any urologic injury can be managed in this fashion