Urological Trauma
Disclaimer:

• This is a lot of information to cover and we are unlikely to cover it all today

• These slides are to be utilized for your reference to guide your self study
MCC Objectives

http://mcc.ca/examinations/objectives-overview/

For LMCC Part 1

Objectives applicable to this lecture:

– Urinary Tract Injuries
  • Kidney
  • Bladder and Urethra
Objectives

Trauma:

1. Given a patient with a potential urinary tract injury:
   1. To list and interpret key clinical findings
   2. To list and interpret critical investigations
   3. Construct an initial management plan

Systems:

• Renal
• Bladder
• Urethra
• Ureter
• External Genitalia
Case #1

- 55 year old healthy male in MVA, T-boned, high speed
- Brought in by ambulance
- ABCs done, c-spine cleared
- GCS 8
- **Presents with gross hematuria**
  - DDx and sites of bleeding?
Case # 1 cont’d

• Potential Causes of Hematuria:
  – Urethral Injury
  – Bladder Injury
  – Ureteric Injury
  – Renal Injury
RENAL TRAUMA
Renal Trauma Overview

• Most commonly injured GU organ
• 10% of all serious injuries abdominal have associated renal injury
• Variable etiology depending on the area
  – Rural: 80-95% blunt
  – Urban: as little as 15% blunt
Hematuria and Renal Injury

• NOT related to the degree of injury

Gross Hematuria is Variable:
  – 1/3\text{rd} of patients with renovascular injuries
  – 24% of patients with renal artery occlusion
  – Only 63% of Grade IV injuries (4% have no hematuria whatsoever!)
Whom to workup

- Penetrating trauma: EVERYONE
- Blunt trauma: Image with CT if:
  - gross hematuria
  - microhematuria plus shock
  - microhematuria plus acceleration/deceleration

Mee et al. (1989)
Hardeman et al (1987)
Imaging of trauma patient with hematuria

- CT preferred
  - With contrast
  - With “delayed” films (mandatory)
  - Why not get CT cystogram too?
- Standard intravenous pyelogram (IVP): Forget it
- “One Shot” intraoperative IVP
  - 2 cc/kg intravenous contrast
  - Single film at 10 minutes
Intraoperative One Shot IVP

• Allows safe avoidance of renal exploration in 32% (Morey et al, 1999)

• Highly specific for urinary extravasation

• Confirms existence of the other kidney

Fig. 15.4.8. One-shot IVP revealing a nonfunctioning right kidney
Indications for renal trauma surgery

- **Absolute**
  - Grade V renal injury (debatable in blunt trauma): NEPHRECTOMY or REPAIR
  - Vascular injury in a single kidney: Vascular repair
- **Relative**
  - Persistent bleeding > 2 units/day
  - Devitalized segment AND urinary extrav (80% complication rate?)
  - Renal pelvis injury
  - Ureter injury
  - Incomplete staging and ongoing laparotomy
  - Grade IV vein or artery (thrombosis): nephrectomy

- Most penetrating renal injuries
AAST Organ Injury Severity Scale for the Kidney

Grade I

Grade II

Grade III

Grade IV

Grade V
# AAST Organ Injury Severity Scale for the Kidney

<table>
<thead>
<tr>
<th>Grade*</th>
<th>Type of injury</th>
<th>Description of injury</th>
<th>ICD-9</th>
<th>AIS-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Contusion</td>
<td>Microscopic or gross hematuria, urologic studies normal</td>
<td>866.01</td>
<td>2</td>
</tr>
<tr>
<td>I</td>
<td>Hematoma</td>
<td>Subcapsular, nonexpanding without parenchymal laceration</td>
<td>866.11</td>
<td>2</td>
</tr>
<tr>
<td>II</td>
<td>Hematoma</td>
<td>Nonexpanding perirenal hematoma confirmed to renal retroperitoneum</td>
<td>866.01</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Laceration</td>
<td>$&lt;1.0$ cm parenchymal depth of renal cortex without urinary extravagation</td>
<td>866.02</td>
<td>2</td>
</tr>
<tr>
<td>III</td>
<td>Laceration</td>
<td>$&lt;1.0$ cm parenchymal depth of renal cortex without collecting system rupture or urinary extravagation</td>
<td>866.02</td>
<td>3</td>
</tr>
<tr>
<td>IV</td>
<td>Laceration</td>
<td>Parenchymal laceration extending through renal cortex, medulla, and collecting system</td>
<td>866.12</td>
<td>4</td>
</tr>
<tr>
<td>IV</td>
<td>Vascular</td>
<td>Main renal artery or vein injury with contained hemorrhage</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>V</td>
<td>Laceration</td>
<td>Completely shattered kidney</td>
<td>866.03</td>
<td>5</td>
</tr>
<tr>
<td>V</td>
<td>Vascular</td>
<td>Avulsion of renal hilum which devascularizes kidney</td>
<td>866.13</td>
<td>5</td>
</tr>
</tbody>
</table>

*Advance one grade for bilateral injuries up to grade III

From Moore et al. [7]; with permission
Case

- 34 year old man flipped over handlebars of mountain bike
- Gross hematuria
- Stable
- Investigations?
Case

- Patient continues to be febrile
- Hgb drifts down to 70 after 3 U PRBCs
- Management?
Management Options For Renal Trauma

• Close observation
  – Bed rest
  – Serial Hemoglobins
  – Antibiotics if urinary extravasation

• Radiographic Embolization

• Urinary Diversion
  – Ureteral Stenting
  – Nephrostomy Drainage

• Surgery
  – Renal Preservation / Reconstruction
  – Nephrectomy
Bladder Trauma
Bladder: BLUNT: Overview

- Rare: <2% of all injuries requiring surgery
- Often with a severe associated injuries
- Often high-energy injuries
- Associated with urethral rupture 10-29% and pelvic fracture 6-10%
Bladder: PENETRATING: Overview

- Civilian incidence 2%
- Associated major abdominal injuries (35%) and shock (22%)
- Mortality high: 12%
Bladder: Diagnosis: Physical Signs

- Suspicion: required in cases of penetrating trauma (no time for studies): based on trajectory
- Physical signs:
  - Abdominal pain
  - Abdominal tenderness
  - Abdominal bruising
  - Urethral catheter does not return urine
  - Delayed?
    - Fever
    - No urine output
    - Peritoneal signs
    - ↑ BUN / Creatinine
Bladder: Diagnosis: Hematuria

- Most (95%) have gross hematuria
- Microhematuria does occur: usually with minimal injury
Bladder: Diagnosis Plain Cystography

- Nearly 100% accurate when done properly:
  - Adequate filling with 350 cc
  - Drainage films
- Use 30% contrast
- Underfilling (250 cc) associated with false negatives
Bladder: Diagnosis CT Cystography

- Preferred, especially if already getting other CTs
- Antegrade filling by “clamping the Foley” is not OK!
- Must dilute contrast (6:1 with saline, or to about 2-4%)
Bladder: Diagnosis CT Cystography

Extraperitoneal

Intraperitoneal
Posterior Urethral Injuries

NORMAL POSITION

FOLLOWING COMPLETE RUPTURE
Posterior Urethra Trauma: Etiology

- 4-14% of pelvic fractures
- Bilateral pubic rami fractures (straddle fracture) and sacroiliac diastasis
- Mostly males, but can happen in females
- Associated bladder rupture in 10-17%
- Rectal injury can lead to urethral-rectal fistula in 8%
Posterior Urethra Trauma: Diagnosis

- Blood at meatus: 50%
- “High riding prostate”: 34%
- Inability to urinate
- Inability to place urethral catheter
- Rarely, perineal hematoma (late finding)
Retrograde Urethrogram

Normal

Urethral Injury
Posterior Urethra Trauma: Management

- Unable to get Foley in: Place an open suprapubic catheter
- Allows inspection/repair of the bladder for associated injury
- No evidence that s/p “infects orthopedic hardware” although ortho docs worry about it
External genital trauma
Testes Trauma

- Rare in general
- But, in significant scrotal blunt trauma, rupture can be as high as 50%
- Bilateral 1.5%
- Assaults and sports injuries predominate
- Local anesthetic block may improve exam
Case #2

• 34 y.o. male in high velocity MVA presents to ER
• GCS 13, ABCs OK
• “cannot void”
• Tib-fib, Pelvic #, multiple rib #s and pulmonary contusions
• Next step?
We get all sorts of calls....
Main points: Kidney Trauma

- Get a CT in everyone with
  - Gross hematuria
  - Microhematuria + deceleration or shock
- Treat most kidneys nonoperatively
- Indications for operation:
  - Grade V renal injury
  - Persistent bleeding
  - Suspected ureter or collecting system injury
  - Incomplete staging and ALREADY having lap
- Isolate the vessels first
Main Points: Bladder Trauma

- Get a CT cystogram if pelvic fracture
- Most extraperitoneal ruptures can be managed conservatively,
  - BUT: Consider treating extraperitoneal bladder ruptures OPEN, especially if undergoing lap and DEFINITELY if undergoing pelvic ORIF
- Microhematuria (no gross hematuria) usually means no significant injury to bladder
Main Points: Ureter/Urethra

• Suspect ureter injuries and you’ll miss them less

• If the Foley isn’t draining, it’s probably not in the right place