

PRACTICE GUIDELINES: MANAGEMENT OF PEDIATRIC UROTRAUMA



OBJECTIVE: Provide guidelines for the management of RENAL, URETERAL, BLADDER, AND URETHRAL INJURIES

A. RENAL INJURY: occur in 10-20% blunt traumas with increased susceptibility amongst pediatric population

Renal injury grading scale:

- I- Renal contusion, subcapsular non-expanding hematoma, no parenchymal laceration
- II- < 1 cm parenchymal laceration, no urinary extravasation
- III- >1 cm parenchymal laceration, no urinary extravasation, renal segments viable or devitalized
- IV- Urinary extravasation, renal segments viable or devitalized *OR* injury to main renal vasculature with contained hemorrhage
- V- Shattered kidney (multiple >1cm lacerations with devitalized fragments), injury to main renal vasculature with uncontrolled hemorrhage, renal hilar avulsion

Indication for work-up:

- Presence of gross hematuria
- Microscopic hematuria with urinalysis (UA) > 50 RBCs after blunt trauma *OR* >5 RBCs with penetrating injury; *microscopic hematuria ALONE is not an indication to image*
- Significant deceleration injury
- Flank ecchymosis, rib injury
- Suspicion for renal injury due to mechanism of injury

Imaging workup: *consult to pediatric urology once patient has been triaged and workup has been initiated*

- Stable patients: triphasic abdominal and pelvic CT (CT IVP; noncontrast, contrast, delayed); call urology
- Labile patients: abdominal and pelvic CT with contrast; call urology
- Unstable patients: IV pyelogram (IVP)* intra-operatively to confirm presence of contralateral kidney

*2cc/kg IV contrast followed by single abdominal radiograph

Management

- If blunt or penetrating injury, but no indication for renal imaging (see indications above): serial clinical exam, bedrest until stable serial hematocrits, and serial blood pressure checks
- Low grade injury (I-II) and hemodynamically stable: serial clinical exam, bedrest until stable serial hematocrits, and serial blood pressure checks

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- **Blunt Injury:**
 - < 50 RBC on UA, stable: serial clinical exam, hematocrits, and blood pressure checks
 - > 50 RBC on UA, gross hematuria, deceleration injury, concerning clinical history
 - *STABLE: triphasic CTAP*
 - *Grade I-II:* serial clinical exam, bedrest until stable serial hematocrits, and serial blood pressure checks
 - *Grade III-IV:* 25-50% will require intervention
 - Hematocrit Stable: serial clinical exam, bedrest until stable serial hematocrits, and serial blood pressure checks
 - Symptomatic Urinoma: cystoscopy with ureteral stent placement and/or percutaneous drain placement
 - Hemodynamically unstable: renal angiography, embolization
 - Stable: observe
 - Unstable: abdominal exploration
 - *UNSTABLE: abdominal exploration*
 - Intra-op IVP
- **Penetrating Injury:**
 - < 5 RBC on UA, stable: serial clinical exam, bedrest until stable serial hematocrits, and serial blood pressure checks
 - > 5 RBC on UA, gross hematuria, concerning clinical history:
 - *STABLE: triphasic CTAP*
 - *Grade I-II:* serial clinical exam, bedrest until stable serial hematocrits, and serial blood pressure checks
 - *Grade III-IV:* 25-50% will require intervention
 - Hematocrit Stable: continue serial clinical exam, hematocrits, and blood pressure checks
 - Symptomatic Urinoma: cystoscopy with ureteral stent placement and/or percutaneous drain placement
 - Hemodynamically unstable: renal angiography, embolization
 - Stable: observe
 - Unstable: abdominal exploration
 - *UNSTABLE: abdominal exploration*
 - Intra-op IVP

Follow up:

- No indication for repeat imaging in grade I-II injury; follow up in 1-2 weeks with repeat urinalysis
- Repeat renal ultrasound in 3 months for Grade III injury without devitalized renal fragments
- Repeat CT or MRI abdomen pelvis for grade IV- V injuries, grade III with devitalized tissue at 3 months
- If develops hypertension within 30 days, consider AV fistula, pseudoaneurysm, perinephric scarring
- Consider abstaining from contact activity for 6 weeks post-injury

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B. URETERAL INJURY:

- rare amongst pediatric population- approximately 4% of penetrating injuries
- 40-88% of ureteral injuries detected within 24 hours of inciting injury

Indication for Workup:

- Suspicion for injury in setting of hyperextension or deceleration mechanism
- Any degree of hematuria
- Prolonged ileus, prolonged high output from drains, fever/sepsis, urinary obstruction, elevated creatinine or BUN, flank mass

Workup: *consult pediatric urology if workup is indicated*

- Triphasic CTAP
- Cystoscopy, retrograde pyelogram (better in delayed setting)

Management: *early treatment is preferred*

- Early detection:
 - o Minimal ureteral contusion/close proximity to gunshot wound/renal pelvis laceration: ureteral stent
 - o Severe or large ureteral contusions:
 - STABLE: segmental excision or repair (based on location)
 - UNSTABLE: damage control (ureteral ligation with nephrostomy tube)→possible repair in 48-72 hours
 - o UPJ injury: repair (uretero-pyelostomy)
- Late detection: (> 5 days)
 - o Ureteral injury : Percutaneous drain and/or ureteral stent and/or nephrostomy tube with delayed repair in 6-8 weeks *VERSUS* immediate open repair
 - o UPJ injury: Percutaneous drain and/or ureteral stent and/or nephrostomy tube with delayed repair in 6-8 weeks

Follow up

- Outpatient follow up with urology to monitor for stricture formation

C. BLADDER INJURY:

- less common in children, associated with multi-organ trauma
- typically due to blunt trauma and seen in setting of pelvic fractures

Indication for Workup:

- Absolute indications:
 - o gross hematuria with co-existing pelvic fracture
 - o inability to void
- Relative indications:
 - o Urinary clot retention
 - o Perineal hematoma
 - o History of bladder augmentation
 - o If penetrating injury: in proximity to bladder and/or with free abdominal fluid on CT

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Workup: *please consult pediatric urology prior to initiating workup if bladder injury is suspected*

- CT cystogram or three film cystogram
 - o ****instill at least 50% of estimated bladder capacity***; stop instilling if capacity is reached or at 300cc with bladder contraction

*Bladder capacity: < 2 years: weight x 7kg, > 2 years: (age+2) x 30. Normal adult bladder, 300-500cc

Management: based on location of injury

- Intraperitoneal: communicating with abdominal cavity
 - o Surgical repair + placement of perivesical drain, with urethral or suprapubic catheter
- Extraperitoneal:
 - o urethral catheter placement
 - suprapubic tube if urethral catheter clotting off
 - o if bony spicule protruding into bladder on CTAP, surgical intervention
- Bladder neck laceration:
 - o surgical intervention

Follow up

- repeat cystogram in 7-10 days prior to catheter removal with urology

D. URETHRAL INJURY

- Posterior/proximal urethral injuries more common; associated with pelvic fractures and/or bladder neck injury, may involve sphincter
 - o 2/3 confined to membranous urethra
- Anterior urethral injuries most commonly at bulbar urethra due to straddle injuries
- If severe pelvic fracture and urethral injury, 15% associated with rectal involvement
- 75% female urethral injury with vaginal laceration
- Usually more severe in pediatric population versus adults

Indication for Workup:

- Perineal or genital hematoma
- Blood at meatus or vaginal introitus with or without hematuria
- Inability to void, severe pain associated with voiding
- Blunt trauma with fracture to pubic rami- *especially if pubic symphysis diastasis*

Workup: *please consult pediatric urology prior to initiating workup if suspect urethral injury*

- Digital rectal exam
- If undergoing CTAP for other injuries: early and delayed imaging to survey bladder, bladder neck, rectum

Management:

- Broad spectrum antibiotics and maximal urinary drainage are key
- *Females:*

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- Attempt catheter placement; if difficult, stop immediately and proceed to second bullet
- Cystoscopy, vaginoscopy, rectal evaluation
 - If stable:
 - Minor laceration: repair laceration, urethral catheter placement
 - Significant urethral injury (usually with vaginal and bladder neck involvement) proceed with immediate repair
 - If unstable: suprapubic catheter
- *Males:*
 - Attempt catheter placement; if difficult, stop immediately and proceed to second bullet
 - Retrograde urethrogram and/or cystoscopy
 - Retrograde urethral catheter placement versus suprapubic catheter with delayed repair
 - If bladder neck involvement, proceed with immediate repair

Follow up:

- Follow-up RUG in 3-4 weeks prior to catheter removal
- Surveillance for urethral stricture

References:

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3. Brandes et al (2004). Diagnosis and management of ureteric injury: an evidence based analysis. *BJU International* 94 (3) pp277-289