URETERAL INJURIES

LATE MANAGEMENT
Initial Evaluation

- Fewer than 1% of all GU injuries

- Causes: - penetrating trauma (GSW - most common, followed by SW)
  - deceleration – avulsion of ureter at UPJ, more common in children

- Hematuria: gross or microscopic – only 30-70%

  Presti JC, Carroll PR, McAninch JW: J Trauma 29:370, 1989
Diagnosis

- CT with delayed cuts
- IV urography
- Laparotomy: hematoma near kidney or ureter
  1. on-table IVP – if not diagnostic:
  2. direct inspection: injury, contusion, peristalsis
  3. indigo-carmine injection into collecting system
Patient presents with mechanism of injury suggestive of ureteral injury

Maintain high index of suspicion; physical signs are rare, and presentation may be delayed.
Perform urinalysis.
Assess hemodynamic stability.

Patient is stable
Perform IVP or CT.

Patient is unstable
Perform laparotomy.
Perform on-table I.V. pyelography (IVP) with one film at 10 min.
Look for periureteral hematoma.

Findings are normal
Observe patient.

Findings are abnormal
Perform laparotomy.

Explore ureter, exposing entire ureter and renal pelvis.
Determine location and type of injury.
Repair injuries surgically over indwelling stent.

Remove retroperitoneal drains when output is low.
Remove Foley and suprapubic catheters after 7–10 days.
Remove double J stent after 4–6 wk.
Perform follow-up IVP after 8 wk.

If recognition of injury is delayed or if abscess or urinoma occurs postoperatively, consider percutaneous nephrostomy and abscess drainage.
Stent ureter if possible.
Management

- All injuries to the ureter should be repaired surgically, unless a delay in diagnosis results in an abscess or a urinoma.

- For either abscess or urinoma, drainage by percutaneous nephrostomy and ureteral stenting may allow the inflamed ureter to heal, whereas an operative approach may result in nephrectomy.
Operative Management

- debridement of devitalized tissue (GSW more than SW)
- mobilization of the ureter should be limited to avoid compromising the blood supply
- tension-free anastomosis, watertight mucosal approximation (interrupted 5-0 or 6-0 Vicryl preferred)
- ureteral stenting (double J stent or a nephrostomy tube)
- coverage of the repair with vascularized tissue
- drainage
- partial transections may be closed primarily
Special considerations

**Transureteroureterostomy** - for large defects in the abdominal ureter
- the injured ureter is passed behind the mesocolon to the contralateral side, anastomosed to a 1 - 2 cm opening in the medial normal ureter over a 5 Fr stent

**Ureterocystostomy** - injury below the pelvic brim
- the distal stump is ligated, and after the anterior bladder wall is opened, the proximal end of the ureter is brought through a new hiatus on the back wall of the bladder. Large defects can be bridged by performing a vesico-psoas hitch. Significant bladder or vascular damage may require transureteroureterostomy. A ureteral stent should be used in all ureteral reimplantations. The bladder is closed in two layers with a continuous 2-0 Vicryl suture, and a drain is placed in the Retzius space.
Postoperative Care

- Retroperitoneal drains – D/C once the output is minimal
- CT or IVP before D/C from the hospital to r/o extravasation
- Bladder catheterization - 7 days after ureteral reimplantation (in combined bladder and ureteral reconstructions, contrast cystography is indicated before catheter removal)
- Cystoscopic removal of the double J stent under local anesthesia 4 to 6 weeks after operation
- Intravenous urography 3 months after removal of the stent to r/o asymptomatic obstruction
Complications

- **Fistula** - result of distal obstruction or necrosis of the ureter (managed by antegrade or retrograde drainage of the collecting system using percutaneous or endoscopic techniques and drainage of periureteral collection). If recognition of an injury or complication is delayed, reconstruction should not be undertaken for at least 3 months, to allow resolution of the inflammatory phase of wound healing.

- **Hydronephrosis** - result of stricture, retroperitoneal fibrosis, or a urinoma, repeat imaging is appropriate 1 year after injury.
Delayed Recognition

- recognized intraoperatively in approximately 34%
- delayed diagnosis is most often (66% to 76%) made by CT pyelography, excretory urography, or retrograde ureterography
- signs and symptoms: report of 35 patients
  - anuria: 5 (most with bilateral injury)
  - urogenital fistula: 4
  - persistent pain/fever: 3
  - urinary leakage from the wound: 3
  - hydronephrosis: 1
  - hematuria: 1
  - (Ghali et al - J Trauma 1999;46:150–158)

- triad of fever, leukocytosis, and generalized peritoneal signs
Treatment

- immediate attempt at placement of a double-J ureteral stent
  - possible in only 20% to 50%
  - failure to place a stent is due to complete obstruction of the ureter or to a gap too long to bridge


  (Ghali et al, 1999- J Trauma 1999;46:150–158)

- success rate as high as 73% without the need for open surgery

Treatment

- open repair as soon as possible, but the delay in diagnosis increases the complication rate from 10% to 40%  
  \((Campbell \ et \ al\ -Urology\ 1992;40:216–220)\).

- If stent placement is achieved, open repair is required only in those patients with persistent leakage or ureteral stricture  
  \((Dowling \ et \ al\ J\ Urol\ 1986;135:912–915)\)

- 100% success rate in treating late ureteral complications with a ureteral stent for 3 months  
  \((Cormio \ et \ al\ -Br\ J\ Urol\ 1993;72:165–168)\)

- The optimal duration of stenting recommended at least 6 weeks  
  \((Selzman\ AA,\ Spirnak\ JP\ -\ J\ Urol\ 1996;155:878–881)\)
Treatment

- Nephrostomy tube and antegrade stenting in patients that fail placement of a retrograde ureteral stent (wait 7 to 14 days to reattempt antegrade stenting if this fails)
- Ureteral balloon catheters, which stop urine from traveling down the ureter, may be required if simple stenting does not eliminate associated leakage or urinoma
- If the ureter ultimately cannot be stented - open repair after waiting several months for complete wound healing

(Campbell's Urology, 8th ed., 2002)
Review

- 63 patients with war related ureteral injuries, none presented in the acute phase
  - Ureteral injury missed at ex lap in 47 (75%)
  - Total of 59 (94%) had associated injuries
  - Nephrostomy performed in 51 (81%)
  - Various reconstructions in 39 (including autotransplantation in 2)

Results

- leakage ceased in 46 who underwent nephrostomy – 20 (44%)
  had a patent ureter after 3 to 8 weeks and no further reconstruction was needed
Review

- Pts followed 13 to 24 months, after which they had a normal excretory urogram or mild residual dilatation of the collecting system (sterile urine)
- 2 nephrectomies due to chronic sepsis (3.2%)
- Deaths: 1 due to sepsis related to the ureteral injury due to associated injuries (although leakage ceased) 3
- Success of both autotransplanted kidneys

Conclusion

Best results – initial nephrostomy followed by reconstruction when needed

Review

- 20 pts with ureteral injuries over 5 year period
- GSW 15, SW 4, blunt 1
- Hematuria related to ureteral injury alone 53%
- 10 pre- and intraop studies performed - only 2 demonstrated ureteral injury
- 17 pts had their injuries diagnosed primarily – 12 suturing and stenting, 1 just suturing, ureterocystostomy in 4
- Delayed dx in 3 – all in upper portion

Conclusion – direct visualization is the most accurate diagnostic modality in ureteral trauma
