UROGENITAL TRAUMA – BLADDER AND URETERAL TRAUMA

Introduction

- Most non-iatrogenic urogenital injuries are caused by motor vehicle collisions and firearms.
- In penetrating abdominal trauma, hematuria is a signal that the kidneys, ureters, and bladder must be evaluated.
- Urethral and genital injuries are suspected only in the setting of wounds to the pelvis, the perineum, or the buttocks.
- When hematuria occurs in association with blunt trauma, the entire urogenital system must be evaluated.

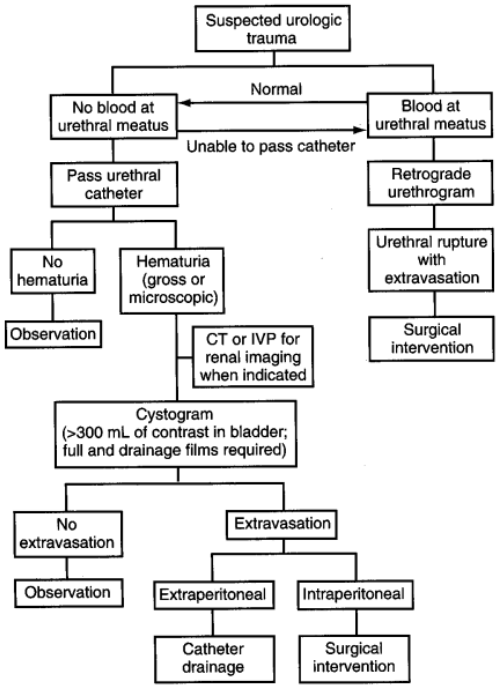
Ureteral Trauma

- Less than 1% of non-iatrogenic urogenital injuries in adults, and of these 80-90% are penetrating (kids can have avulsion at uteropelvic junction UPJ).
- Diagnosis requires high index of suspicion
    - up to 50% missed on initial survey.
    - If untreated: urinoma, sepsis, and nephrectomy may result.
    - Similar complications apply for iatrogenic injury if not recognized intraoperatively/postoperatively.
- One review found the following surgeries had the highest incidence of injury:
    - Hysterectomy was responsible for 54% of injuries
    - Colorectal surgery 14%
    - pelvic surgery 8%
    - abdominal vascular surgery 6%.
    - Another series found urologic procedures responsible for 23% of injuries.
- **Diagnosis of Injury:** fever, leukocystosis, local peritoneal signs
    - If injury is suspected but patient is stable and does not require surgery for other reasons: IVP or CT with delayed images, if studies normal observe, otherwise to OR.
    - If to OR for other reason perform on-table IVP w/film at 10minutes.
    - If no ureteral injury suspected preoperatively in trauma patient and hematoma found near kidney or ureter indigo carmine into collection system can be used to assess for extravasation.
    - Iatrogenic injury:
        - about one third found intraop for open procedures, less in laparoscopic surgery.
        - CT with delayed images recommended in spite of paucity of evidence.
        - Delayed injuries best delineated by retrograde ureterography
- **Grading of Injury** by anatomy and injury
    - Ureter divided in 3 portions radiographically:
        - proximal - UPJ to upper border of sacrum
        - medial - lower border of sacrum
        - distal - to bladder
    - Ureter may have
        - Contusion without devascularization

        - <50% transaction
        - >50% transaction
        - Complete transaction with <2cm devascularization
        - Transection with devascularization
- **Management** – Immediate & Delayed
    - Immediate:
        - Repair Ureter over stent
        - Transureteroureterostomy
        - ureteral reimplantation
        - vesicopsoas hitch
        - Key points: water tight, tension free, removal of devascularized tissue, drainage.
    - Delayed:
        - Nephrostomy w/drainage of abscess/urinoma
        - if possible stent ureter.
        - Definitive if delayed: ureteral re-implant, ileal interposition, autotransplant, nephrectomy.
- **Post Repair**: Drain management, appropriate drain removal, IVP/CT as needed, management of complications.

Bladder Trauma –

- **Introduction**
    - Bladder injury is rare because of the protection offered by the pelvis
    - only 2% of abdominal trauma requiring surgery involves the bladder
    - Usually associated with severe injury to other structures.
    - Mortality 12-22%.
    - Unlike ureteral injury, most non-iatrogenic injuries are blunt.
    - 14-33% of injuries to the bladder are penetrating.
    - 9% of patients with pelvic fractures have bladder injury.
    - Signs and symptoms non-specific though hematuria micro or gross is 95% sensitive.
    - 95% of patients with rupture will have gross hematuria.
    - Management of intra vs. extraperitoneal blunt bladder injury differs. Intraperitoneal requires exploration.



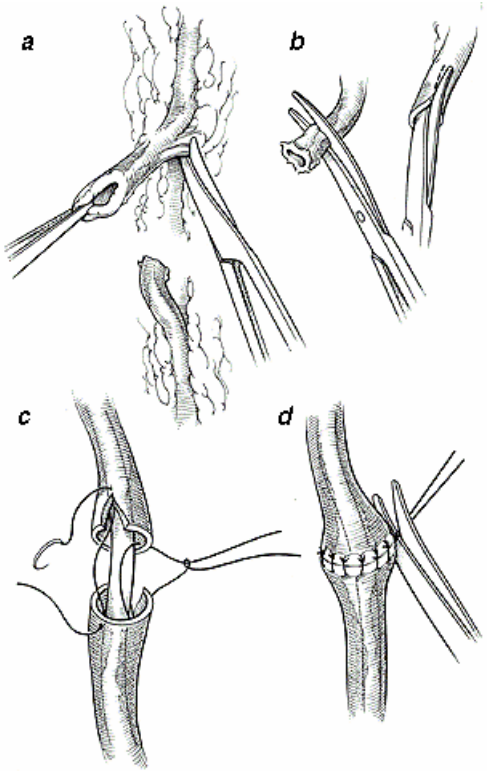
- **Diagnosis**
    - Hematuria
    - Inability to pass catheter, no urine may need urethrogram first.

- If suspected cystography or CT cystography. Recommend at least 350ml of contrast or until patient complains of pain. 250ml associated with false negatives.

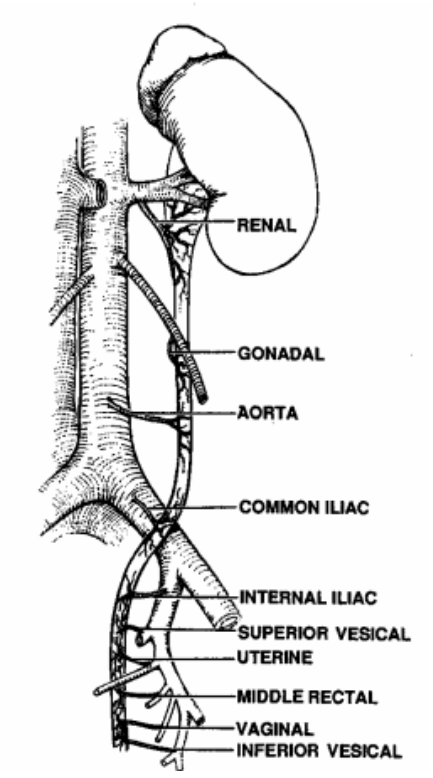
- **Grading and Management of Injury**
  - Blunt vs. Penetrating. All penetrating injuries require exploration. Some contusions are not recognized. Contusions diagnosed by exlusion: no upper urinary tract injury in presence of hematuria and cystography is normal.
  - Blunt: Intraperitoneal vs. Extraperitoneal
    - Extraperitoneal: 67% of ruptures. Catheter drainage is standard management if adequate catheter drainage, no exploration for other reasons, no bony fragments protruding into bladder. Repair seems to be associated with a lower risk of clot retention and infection. Highly recommended if orthopedic surgery is planned.
    - Intraperitoneal: 25% of ruptures. Generally these ruptures involve dome. Theorized that occurs because of rapidly rising intravesical pressure. Open repair plus perivesical drain.

- **Post Repair:**
  - Large bore Foley catheter.
  - Remove drains once output decreases.
  - Suprapubic catheter is not superior to urethral catheter however it can be added in cases of severe hematuria to allow for adequate irrigation.
  - Cystography at 10-14 days.
  - Antibiotics until 3 days after catheter is removed in extraperitoneal injury.
  - Intraperitoneal injury give 3 days only and peri-catheter removal.

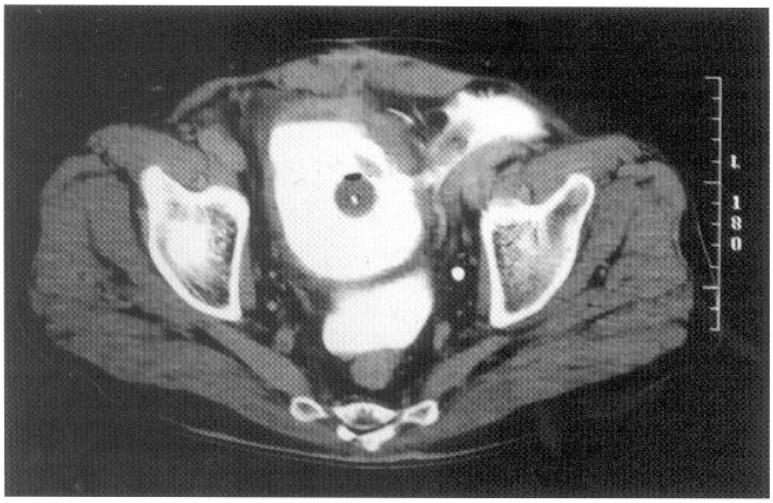
1. Steps in a ureteroureterostomy



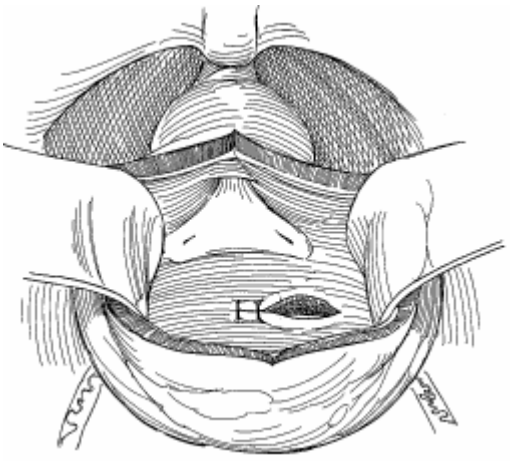
2. Sources of Blood to the Ureter

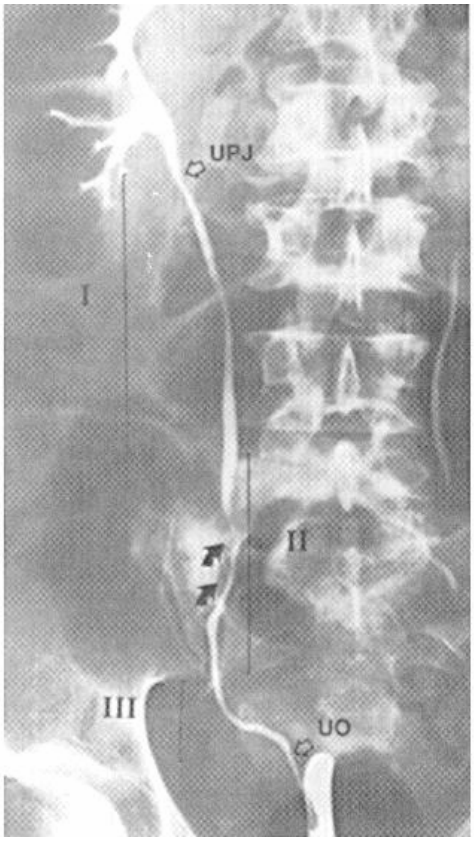


CT Cystography: Extraperitoneal extravasation of urine.



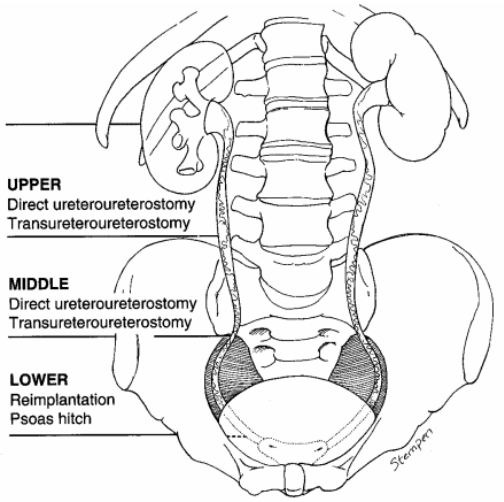
Repair of extraperitoneal bladder injury. Bladder is opened at dome.





The right ureter, illustrated by retrograde injection of contrast material. UO, ureteral orifice in the bladder; UPJ, ureteropelvic junction; I, upper ureter, extending to the upper border of the sacrum; II, middle ureter, extending to the lower border of the sacrum; III, distal or lower ureter, traversing the pelvis to end in the bladder. *Arrows* indicate the course of the common iliac artery and vein

Recommended ureteral repair by level of injury



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