Urinary Tract Infections and Vesicoureteral Reflux in Children

Urinary Tract Infections

- **UTI:** Growth of significant number of organisms of a *single species* in the urine, in the presence of symptoms.
- > 50,000 CFU/ml from an accurately collected specimen

TWO TYPES OF UTIs

- Distinction between "upper (pyelo) and lower tract (cystitis)" UTI is not always possible - or even necessary.
- **"Clinical severity"** determines management course.
- **ALL FEBRILE UTIs:** considered to involve the upper tract with the greatest potential for renal scarring.

Signs & Symptoms of UTIs

- *Features of UTI in **infants** are **nonspecific**: thus a high degree of suspicion is necessary.*

1) Infant or child with "unexplained fever" beyond 3 days.
   - ❖ Fever generally will not break with conservative measures.
2) Neonates – usually part of septicemia and presents with *fever, vomiting, lethargy, jaundice and seizures*.
3) Infants & young children – may present with *fever, diarrhea, vomiting, abd. pain, and poor weight gain*.
4) Older child – *dysuria, hematuria, urgency, frequency, flank pain, foul smelling urine, or onset of wetting*.

Urine Sample Collection & Diagnostic Testing Methods

- Prevent contamination!!!!!
- Send urine within 1 hour for accurate culture results.
- Can refrigerate for up to 24 hrs if delay.
- Significant UTIs: >100,000 CFU/HPF

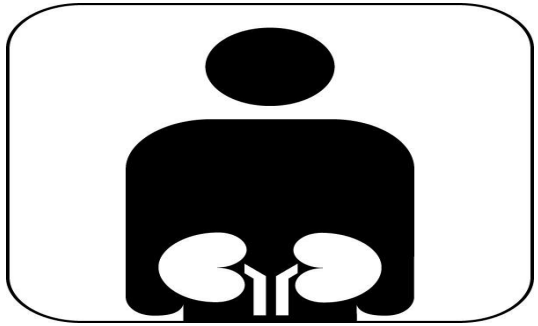
- **"Bagged"** = BAD highly unreliable!
- **Voided "clean catch** (80-90% accurate if perineum well cleaned & caught midstream)
- **Catheterized** Most accurate and reliable
- **Supra pubic aspiration** very rare / very accurate

Who needs X-Ray evaluation?

- ✔ **Any** child with **febrile UTI** or **recurrent UTIs**.
- ✔ ALL females < 5 yo with UTI
- ✔ **"Non-febrile" UTIs** (male at any age, neonate, toilet training children)

STANDARD WORK UP includes

- **VCUG** (voiding cystourethrogram)
  - ✔ Allows for grading (NCG can not grade VUR)
- **RUS** (complete renal ultrasound)
- Optional: **Nuclear Renal Scans**
  - ✔ DTPA (GFR) / Glucoheptonate-DMSA (Cortical Binding)



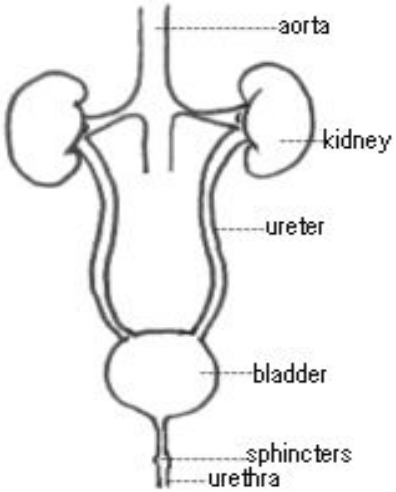
Vesicoureteral Reflux

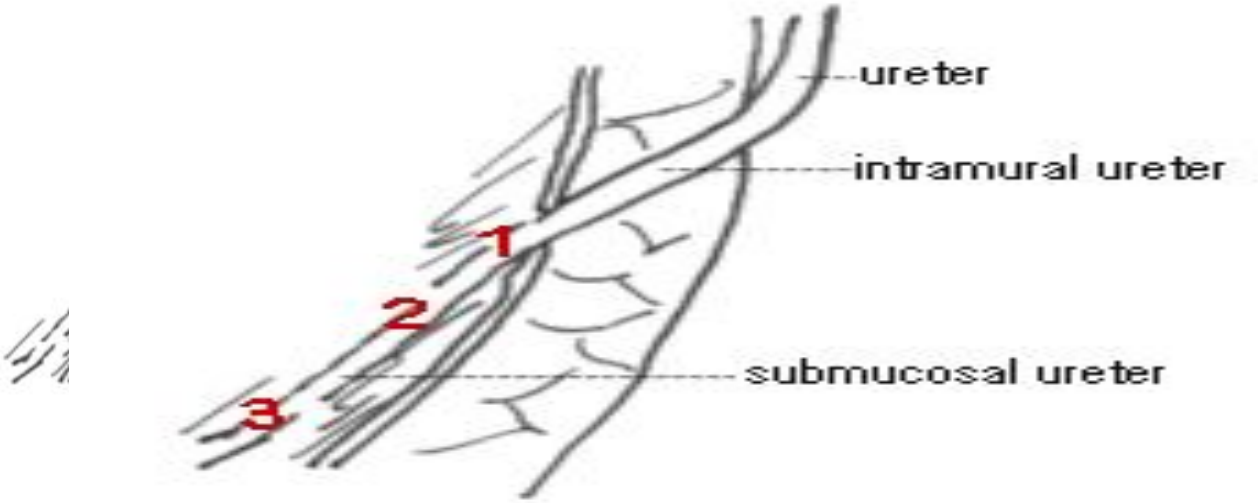
- **“Backwash”** or **retrograde flow** of urine from the bladder into the ureters, and usually up to the kidneys.
- VUR is a risk factor for upper tract infection=Pyelonephritis.
- VUR found in 50% of children with UTI.
- Affects 1% of all children.
- Boys typically dx with higher grades than girls.
- Female to Male ratio is **6:1**
- 10 times more common in whites vs blacks
- Hereditary components / Family history !
  - ✔ parent: 50% / sibling 33-45%

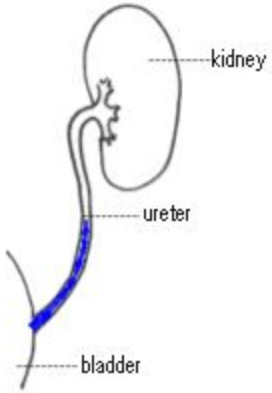
Etiology / Pathophysiology

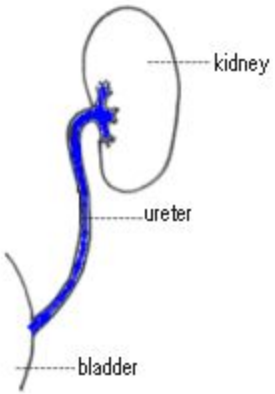
- **<u>Primary: (Congenital)</u>** defect of UVJ (ureterovesical junction) – Most common –deficient tunnel / laterally displaced orifices
- **<u>Secondary (Acquired)</u>** increased intravesical pressure secondary to neurogenic problems or DES, bladder instability, bladder outlet obstruction (PUVs)
- **UTIs** (problem #1) **do not cause reflux!!**
- **Reflux** (problem #2) **does not cause UTIs!!**

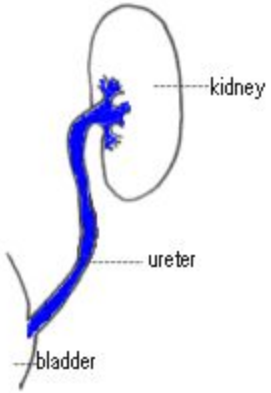
Anatomy and Grading System

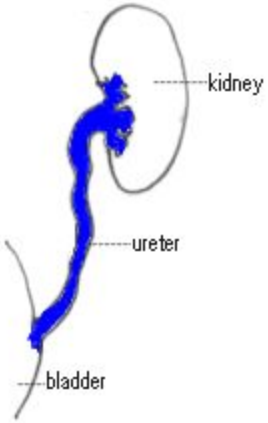


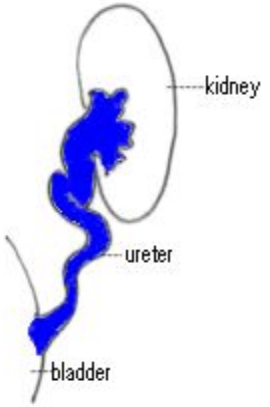












Management Trends / Rx

- A person can NEVER be cured of UTIs
- A person CAN BE cured of reflux.
- Must address **UTI risk factors** FIRST !

1) Poor voiding habits
2) Constipation
3) Hygiene
4) Poor bladder immunity
5) Gender
6) Structural anomalies

TREATMENT of VUR

- Daily prophylactic antibiotic until reflux self-resolves or is surgically repaired.
- Surgery (laparoscopic, open ,DEFLUX)
- Aggressive tx of dysfunctional elimination.
- ABSOLUTE indication to repair =

✔ ***Catheterized culture documented breakthrough UTI.***

✔ Several other relative indications to repair

Complications of VUR Infection

- Renal Scarring
  - ✔ **Greatest risk of scarring:** Birth to 5 years of age.
- Impaired renal growth and function
- Hypertension (occurs in 10% cases with scarring)
- End stage renal disease
- Pregnancy complications (pre-eclampsia)

Referral Criteria and Follow Up

Referral

- Abnormal “antenatal ultrasounds” = hydronephrosis
- Recurrent UTI
- Febrile UTIs
- VUR lasting 5 years or longer.

Follow-up

- VCUGs/NCGs/RUS are done yearly.
- NRS as indicated if concerns of scarring and function loss.
- DES patients need close f/u as indicated.

Prophylactic Medications

- Bactrim/Septra/TMP-SMX
- Macrodantin, Furadantin, Nitrofurantoin (1-2 mg/kg/per day) Capsules are the best.
- Keflex
- Amoxicillin: (for infants less than 2 months or allergy to Bactrim)
- Generally dose prophylactics at 1/3 – 1/ 4 the therapeutic treatment dose.

Bactrim

5 kg = ¼ tsp

10 kg = ½ tsp

15 kg = ¾ tsp

20 kg = 1 tsp

Evolution in VUR management

Changes

- Minimally invasive surgery
- Observation off RX
- Aggressive management DES
- Prenatal detection

Improvements

- Early detection
- Decreased surgical morbidity
- Pain management
- Early hospital discharge
- Reduced post-op X-Ray evaluations.

- **The END!**

References

- Behrman, R.E., Kliegman, R.M., & Jenson, H.B. (2000). Nelson Textbook of Pediatrics (16th ed.). Philadelphia, London, New York, St. Louis, Sydney, Toronto: W.B. Saunders Company.
- Burns, C.E., Brady, M.A., Dunn, A.M., & Starr,N.B., (2000). Pediatric Primary Care: A hand book for nurse practitioners (2nd ed.). Philadelphia, London, New York, St. Louis, Sydney, Toronto: W. B. Saunders Company.
- Graham, V.M., Uphold, C.R., (1999). Clinical Guidelines in Child Health (2nd ed.). Gainsville, FL.: Barmarre Books Inc.
- Pearson, L.J., (2000). Nurse Practioner's Drug Handbook (3rd ed.). Springhouse, PA.: Springhouse Corporation
- Polin, R.A., Ditmar, M.F., (1997). Pediatric Secrets: Questions you will be asked (2nd ed.). Philadelphia, PA: Hanley & Belfus, Inc.
- Resnick, M.I., Novick, A.C. (2003). Urology Secrets (3rd ed.). Philadelphia, PA: Hanley & Belfus, Inc.
- Rous, S.N. (1996). Urology: A core textbook (2nd ed.). Cambridge, MS: Blackwell Science, Inc.
- Tanagho, E.A., McAnich, J.W. (2004) Smith's General Urology (16th ed.) New York: McGraw –Hill.
- Walsh, P. C., Retik, A.B., Vaughan, E. D., & Wein, A.J. (2000) Campbell's Urology (8th ed.). Philadelphia, PA : W. B. Saunders Company.
- www.q-med.com
- www.deflux.com