

VESICoureTERAL REFLUX/UTI

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July 29th, 2011



Disclosures

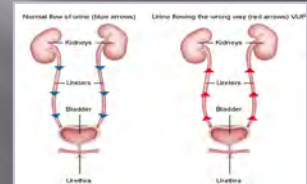
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Learning Objectives:

1. Discuss the types, causes, symptoms and diagnosis of vesicoureteral reflux.
2. Describe the management and treatment of vesicoureteral reflux.
3. Discuss controversies in vesicoureteral reflux.
4. Review the protocol for evaluation of the first urinary tract infection in a child.

Vesicoureteral Reflux (VUR)

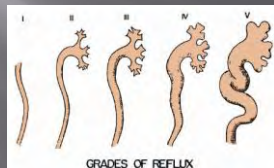
- What is VUR?
 - Retrograde flow of urine from the bladder into the upper tracts



Jacobson SH, et al. Acta Paediatr Suppl 1999

Vesicoureteral Reflux (VUR)

- What is VUR?
 - Retrograde flow of urine from the bladder into the upper tracts
- Grading (1-5)
 - 1-2 = low grade
 - 3 = high (?)
 - 4-5 = high grade



Campbell Walsh Urology, 9th Ed. Fig 117-2.

Why Does VUR Occur?

- Inadequate intramural tunnel
- Inadequate muscular support



Why Does VUR Matter?

- Increasing risk of renal scarring with increasing grade of VUR

Grade Reflux	Normal	Slight Scar	Severe Scar
I - III	100%		
IV	53%	34%	13%
V	15%	38%	46%

Baker et al., 1994

Symptoms of VUR

- Frequently none
- Associated with UTIs
 - Fever
 - Dysuria/frequency/urgency/incontinence
- Associated with hydronephrosis

VUR Diagnosis

- Voiding Cystourethrography (VCUG)
 - Catheter passed into bladder
 - Bladder filled with contrast
 - Images taken of bladder throughout filling and voiding
- Pros: Accurate anatomy, accurate grading of reflux
- Cons: Invasive (catheter), Radiation, Psychological
- Cyclic (multiple fill/void cycles) = More accurate
 - 12-20% greater detection vs. single (Paltiel, et al. 1992)
- Options: Fluoroscopic versus Nuclear

VCUG

- Fluoroscopic
 - Increased radiation
 - Better anatomic detail/grading
 - Often used for initial testing
- Nuclear
 - Decreased radiation
 - Poor anatomic detail/grading
 - Often used in follow up



VUR Management

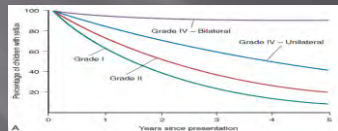
- Simplified options:
 - Observation
 - CAP
 - Surgery
 - Ureteral reimplantation
 - Open vs. laparoscopic
 - Endoscopic surgery
- Classic approach:
 - Continuous antibiotic prophylaxis (CAP)
 - Yearly VCUG
 - Correct if not resolved by age 5/6

Observation

- Pros:
 - Reflux is likely over treated
 - No daily medicine/side effects
- Cons:
 - Significant reflux may be missed or undergraded
 - Risk of pyelonephritis/renal scarring if UTI(s)
 - Parental concern

VUR Resolution

- Less likely to resolve if:
 - Higher grade
 - Bilateral
 - Older age at presentation
 - Abnormal anatomy (Hutch diverticulum, ureterocele)
- Likelihood of resolution (approx., by age 6):
 - Grade 1: 90%
 - Grade 2: 70%
 - Grade 3: 50%
 - Grade 4: 30%
 - Grade 5: 10%



AUA Report on Management of VUR in Children, 1997

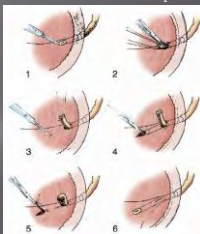
Continuous Antibiotic Prophylaxis

- Pros:
 - Helps prevent pyelonephritis in some children
 - Psychological benefit to parents
 - Non-invasive
- Cons:
 - Daily medicine (with risk of side effects)
 - Questionable effectiveness for some patients
 - Compliance/false sense of security
 - Can still get UTI while on CAP

Ureteral Reimplantation

- Pros:
 - Definitive (>95% success)
 - Low risk of recurrence
 - Low risk of complications
 - Reassuring to parents
 - Minimally impacted by dysfunctional elimination
- Cons:
 - More invasive/risks of surgery
 - Pain, cosmesis, obstruction, etc.
 - Most often inpatient stay

Glenn-Anderson Technique



Campbell Walsh Urology, 9th Ed. Fig 117-16

Endoscopic

- Pros:
 - Less invasive
 - Outpatient
 - Decreased surgical risks
- Cons:
 - Success rate lower (particularly with higher grades)
 - Higher risk of recurrence
 - Less effective with dysfunctional elimination



www.delflux.com

VUR management

- Old paradigm:
 - Febrile UTI → Renal/Bladder Ultrasound (RBUS) and Voiding cystourethrogram (VCUG)
 - Continuous antibiotic prophylaxis (CAP)
 - Yearly VCUG until 5-6 years old
 - Correction

New thinking

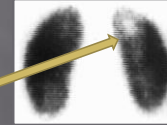
- Decreased frequency of ordering VCUGs
- Decreased use of CAP
 - Particularly in low grade
- Decreased surgical intervention
- Increased emphasis on treating dysfunctional elimination

VUR and UTI

- When to evaluate for VUR in a patient with UTI is an area of debate
- Old approach:
 - Febrile UTI (M/F), any UTI (M) → US + VCUG
- Are we looking for VUR too much/soon?
 - 'Top Down' approach
 - NICE Guidelines

Top Down Approach

- Obtain DMSA renal scan 1st
 - If scarring, then VCUG
 - If normal, no VCUG
- Scan performed within 2 weeks of febrile UTI:
 - Prospective study of 290 patients
 - 51% demonstrated abnormalities
 - 96% of the VUR Grade III or higher positive
 - VCUGs avoided in 50% of patients



Preda I et al. *J. Pediatr.*, Aug 2007.

Top Down

- Advantages:
 - Identifies renal scarring
 - Not seen with VCUG; US poor at identifying
 - Identifies clinically significant VUR
 - Minimizes unnecessary catheterization
- Disadvantages:
 - Increased radiation dose
 - Est. 10x fVCUG, 200x nVCUG (Routh, et al. *AJR* 2010)
 - If positive, VCUG still necessary to assess for VUR
 - IV, +/- need for sedation

NICE Guideline

- National Institute for Health and Clinical Excellence
 - Urinary Tract Infection in Children: diagnosis, treatment, and long-term management
 - Extensive review of literature published in 2007
 - <http://guidance.nice.org.uk/CG054>
- Similar protocols developed/adapted at some institutions throughout United States
- Last AAP guideline 1999, though new guidelines forthcoming

NICE Guideline

- Screen urine if:
 - Fever >38c,
 - Urinary symptoms
- Collection:
 - Clean catch
 - Catheterized/SP aspirate
 - Bagged specimens are not adequate

NICE Guideline: Pediatric UTI

- Micro:
 - Clinical symptoms and either WBC (+)/Bacteria (+) treat as UTI
- Dipstick (> 3yo):
 - Leuk (+), Nitr (+) → culture + txt UTI
 - Leuk (-), Nitr (+) → culture + txt UTI (if fresh)
 - Leuk (+), Nitr (-) → micro/culture, empiric txt if clinical suspicion
 - Leuk (-), Nitr (-) → no txt, culture only if 'indication'

NICE Guideline: Pediatric UTI

- 'Indication for culture'
 - Pyelonephritis
 - High-intermediate risk of serious illness
 - <3 years old
 - Recurrent UTI
 - Infection/illness not responding to txt after 24-48 hours
 - Clinical symptoms/concern

NICE Guideline: Pediatric UTI

- Pyelonephritis/febrile UTI:
 - <3 mo: immediate referral to specialist
 - >3 mo: consider referral
 - Txt 7-10 days appropriate antibiotics
- Cystitis/afebrile UTI:
 - 3 days appropriate antibiotics

NICE Guideline: Pediatric UTI

- **Do:**
 - Once daily dosing if using aminoglycoside
 - Consider IM if parenteral treatment is required and IV not possible
 - Treat with a different antibiotic if on CAP
 - Know/find out local resistance patterns
- **Don't:**
 - Treat asymptomatic bacteriuria
 - Use CAP after first-time UTI
- **Preventing recurrence**
 - Address dysfunctional elimination syndromes and constipation
 - Encourage children to drink an adequate amount
 - Importance of not delaying voiding

NICE Guideline: Pediatric UTI

- 'Atypical' UTI
 - Seriously ill
 - Poor urine flow
 - Abdominal/bladder mass
 - Elevated creatinine
 - Sepsis
 - Failure to respond within 48 hours
 - Non-*E coli*
- 'Recurrent' UTI
 - 2 or more episodes of pyelonephritis
 - 1 pyelo + 1 acute cystitis
 - 3 or more cystitis

NICE Guideline: Pediatric UTI Imaging

	<6 months	6mo-3years	>3 years
Responds well	Ultrasound	No imaging	No imaging
'Atypical' UTI	Ultrasound VCUG DMSA (4-6mo)	Ultrasound DMSA (4-6mo)	Ultrasound
Recurrent UTI	Ultrasound VCUG DMSA (4-6mo)	Ultrasound (6wk) DMSA (4-6mo)	Ultrasound (6wk) DMSA (4-6mo)

NICE Guideline: Pediatric UTI

- More selective with imaging
- What will effect be on renal scarring in future?

VUR/UTI

- Once we've diagnosed VUR, now what?....

AUA Guidelines for Management of VUR and UTIs

Summary of the AUA Guideline on Management of Primary Vesicoureteral Reflux in Children

Craig A. Peters, Steven J. Skoog, Billy S. Arant, Jr., Hillary L. Copp, Jack S. Elder, R. Guy Hudson, Antoine E. Khoury, Armando J. Lorenzo, Hans G. Pohl, Ellen Shapiro, Warren T. Snodgrass and Mireya Diaz

From the American Urological Association Education and Research, Inc.

Peters CA, et al. *J Urol*, 184: 1134, 2010.

AUA VUR Guidelines

- Categories:
 - **Standard** = most rigid treatment policy
 - 3 in entire guideline
 - **Bold** in upcoming slides
 - Recommendation = less rigidity
 - Sufficient evidence to advocate approach
 - Evidence may not be of highest quality
 - Option = most flexibility
 - Evidence of equal strength supporting more than one approach

AUA VUR Guidelines

- Evaluation of child with VUR:
 - **Height/Weight**
 - **Blood pressure**
 - Urinalysis
 - Cr (option if unilateral; standard if bilateral)
 - Imaging: US recommended
 - DMSA (option)
 - Voiding patterns:
 - **Assess for symptoms of Bowel/Bladder Dysfxn (BBD)**
 - **Education of family**

AUA VUR Guidelines

- < 1 year old + VUR diagnosed
 - History of febrile UTI: recommend CAP
 - Identified via screening (no prior febrile UTI):
 - Gr 3-5: recommend CAP
 - Gr 1-2: CAP option
 - Uncircumcised: discuss circumcision

AUA VUR Guidelines

- > 1 year old with UTI + VUR
 - If BBD: treat dysfunction
 - Recommend CAP if BBD
 - Risk febrile UTI on CAP with BBD is 44% vs. 13% without
 - If no BBD: CAP (option) versus observation (option)
 - Assuming no recurrent febrile UTIs or known scarring
 - Surgery (option)

AUA VUR Guidelines

- Follow-up
 - Annual Ht, Wt, BP, UA
 - US q12mo
 - VCUG q 12-24mo: fluoro or nuclear
 - Longer if lower rate resolution (BBD, Gr 3-5, older)
 - Optional if observation
 - DMSA:
 - Recommend if abnl US, breakthru UTI, Gr 3-5, elev Cr
 - Option after febrile UTI

AUA VUR Guidelines

- Breakthrough UTI: change therapy
 - 20% on CAP
 - On CAP: Consider surgery (reccomendation)
 - Single breakthrough UTI on CAP + no scarring: consider change abx (option)
 - Without CAP: Start CAP if febrile (rec), consider CAP if afebrile
 - Consider surgery (98% success open, 83% Endo x1)
- Resolution (normal or surgical)
 - Ht, Wt, BP, UA thru adolescence (rec if abnl kidneys, option if nl)
 - Feb UTI after resolution, eval for BBD or recurrent VUR
 - Discuss: Htn, loss renal fxn, recurrent UTI, familial VUR

AUA VUR Guidelines

- Siblings
 - Recs: sibling with VUR
 - Abnl US or UTI hx: VCUG
 - Observation option: offer screening of toilet-trained
 - US option for screening

Summary of Guidelines

- Lots of questions still remain
- Individualized treatment
- Discussion with family regarding choices

My Approach to UTIs/VUR

- All febrile UTIs/many afebrile UTIs: RBUS
 - If abnormality, discuss VCUG vs. DMSA vs. observation
 - Treat voiding dysfunction (timed urination, txt constipation)
- Mult febrile UTIs or severe infection: RBUS + VCUG
- Older/issues related to catheterization: RBUS + DMSA
- CAP:
 - High grade
 - Low grade +
 - Young
 - Voiding dysfxn
 - Scarring
 - Questionable social situation

Who do I operate on?

- Breakthrough UTIs
- Failed attempt at stopping CAP in older child
- Scarred kidneys
- Concerns about compliance

Which type of surgery?

- Pros/cons different approaches
- Individualized
 - Factors:
 - Scarring
 - Compliance/social situation
 - Prior surgery
 - Presence of voiding dysfxn
 - Willingness to undergo repeat VCUG
 - Age/size

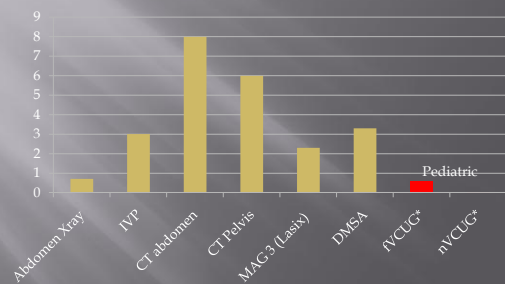
VUR/UTI in 2011 (and beyond?)

- Diagnosis and treatment of VUR is no longer formulaic
- Individualized screening, imaging, and management plans
- Greater involvement of parents in decision making process

Other Related Topics of Interest

- Continuing search for new methods to diagnose VUR without catheterization
 - US, MRI...
- Risk of radiation-induced malignancy due to medical imaging
- Compliance with antibiotic prophylaxis
 - Pharmacy claims data: 40% compliance (Copp et al. *J Urol* 2010)
- Discontinuation of CAP with VUR
- RIVUR (Randomized Intervention for VesicoUreteral Reflux)
- Effects of persistent VUR later in life
 - Pregnancy

Effective Radiation Dose (mSv)



Mettler, et al. *Radiology* 2008
Ward, et al. *Radiology* 2008

Pazik, et al. *Med Phys* 2007

Mythology

- Narrow urethras in girls cause UTIs
 - Urethral dilation rare occurrence in modern practice
- Bubble baths cause bacterial cystitis
 - May cause meatal/introital irritation
- Improper wiping causes UTIs
 - 95% of non-toilet trained children never develop UTI
- Isolated bedwetting increases risk of UTI
- All renal scarring is acquired
 - Some is renal dysplasia from abnormal development

VUR/UTI

Questions?

- Contact info:
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 - 330-729-1945 (Akron Children's Mahoning Valley)
- Thanks to William A. Kennedy II, MD for assistance with this presentation