Management of the Bladder – a Urologist's Perspective

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Topics to Cover

- Brief review of normal imaging and bladder function
- The underactive bladder
- The overactive or noncompliant bladder – evaluation and management
- Complications of management
- Future horizons

Patient with Spina Bifida at ages One and Three years

Disclosure Information
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Disclosure of Relevant Financial Relationships
I have no financial relationships to disclose.
I will not discuss off-label use and/or investigational use in my presentation

Patient with Spina Bifida at ages One and Three years
Same Patient at 16 Years with a High Pressure Bladder with Deterioration

Post Augmentation

Normal function

- Storage reservoir
  - Low pressure
  - Continence
- Efficient emptying
  - At low pressures
  - Volitional
  - Coordinated with a relaxed external sphincter

Normal Bladder Imaging

- Smooth walled bladder
- No reflux
- Normal urethra on voiding shot
- Complete emptying
Upper Tract Normal Imaging
- IVP shows preserved parenchyma, delicate calyces, nondilated renal pelvis emptying into ureters
- Renal ultrasound shows normal parenchyma and nondilated system

The two extremes – where the urologist gets involved
- Underactive Bladder
  - Loss of bladder contractility
  - May be acquired over time
  - Older patients
- Detrusor overactivity
  - Urodynamic term
  - Pressure increases of greater than 15 cm water
  - Any age but more common in younger patients

Underactive Bladder
- Bladder loses ability to effectively contract
- Symptoms variable
  - May be minimal at first
  - Infrequent voiding
  - Incontinence
  - UTIs
- Increasing capacity leads to stretch injuries
  - acute or chronic
- Urodynamics
  - Large capacity
  - Low or no detrusor contraction
  - Pressures stay low despite high volume filling
  - Poor emptying
  - Diminished uroflow

Underactive Bladder Management
- Upper tracts typically preserved
- Need to empty the bladder effectively
  - Scheduled voiding
  - Intermittent catheterization
  - Continent channel
  - Incontinent drainage
Hostile Bladder

Increased bladder pressures from bladder overactivity. Noncompliant bladder (doesn’t stretch) high outlet resistance (usually not present in CP patients).

Irreversible Collagen Deposition

Does not stretch, does not contract. The collagen bladder may or may not partially respond to anticholinergic meds or Botox.

Options for Overactivity or Poor Compliance

- Goals - physiologic
  - Safe pressures
  - Effective emptying
  - Control the infections
- Goals - social
  - Continence
  - Adequate capacity for adequate time between emptying
  - Convenient emptying
- Timed voiding
- Anticholinergic medication
- Botox
- Surgical enlargement of the bladder

Botulinum Neurotoxin (BoNT)

- Exists in 7 subtypes
- BoNT, type A or Botox is by far the most commonly used agent
- First reported use in the bladder in 2000
- Limited studies in pediatrics
Technique

- Number of required injection sites debated
- Can be performed under local in adults
- Few reported complications, local or systemic
- Onset of action within 1-4 weeks
- Duration is 3-9 months

Botox Injection – Outcomes with NGB

- >60% become dry
- About ½ will no longer require anticholinergics
- Duration variable, on average re-inject about every 8 months
- Must coordinate doses with Rehab injections to not exceed 360 u in 3 months
- Can inject external sphincter for cases of DSD
- Expect voiding pressures to drop, residual urine to decrease

Surgical Management of high pressure bladders

- Bladder augmentation
- Urinary diversion
- Incontinent vesicostomy
- Sphincterotomy
Urinary Diversion

- More frequently performed in the elderly or totally disabled
- Ease of care
- Long term issues with stones and renal deterioration

Catheterizable channels – you have to be able to empty the bladder

- Abdominal access
- Urethra unreliable
- Closed bladder neck

Appendicovesicostomy

- Appendix is attached to bladder – no they cannot get appendicitis

Increasing Outlet Resistance

- Occlusive procedures
- Must assure
  - Adequate storage capacity
  - Reliable catheterizing access
Long Term Complications of Augmentation

- Mechanical
  - Perforation
  - Capacity/configuration problems
  - Continent catheterizable channel problems
  - Stones
- Metabolic
  - Chronic acidosis
  - B-12 deficiency
- Pregnancy

Bladder Perforation after Augmentation

- Incidence
  - <10%, on average 4 yrs after augment
- Risk Factors
  - uncertain
- Etiology
  - ?? Ischemia at suture line
- Diagnosis
  - Cystogram, CT or conventional
- Management
  - Life threatening complication
  - Surgical vs cath drainage

Need for Secondary Revision

- Inadequate capacity
- Continued contractions of reservoir
- Unacceptable “hour glass” configuration
- Indiana group with 10% revision rate at an average of 7.5 years after initial surgery
**Bladder Stones**

- Occur secondary to mucus nidus
- Aggressive irrigation is key chronic management
  - Okay to use 100’s of ml until mucus is out
- Do not treat asymptomatic bacteruria
- Watch for urea splitting bacteria, high urine pH
- Can use gentamicin irrigations safely (formula in handout)

**Gentamicin Formula**

- 120mg/250ml normal saline in 30ml syringes
- Intravesical concentration is 480 micrograms/ml, twice the concentration achievable by IV administration
- No toxicity, no detectable serum levels beyond 0.4 micrograms/ml with or without prior bladder augmentation
- Average treatment duration was 90 days, up to 3 years
- Store in the freezer, thaw before administration
- Apply daily for prophylaxis, BID for treatment

**Complications of Continent Catheterizable Channels**

- Complications range from 10-30%
- Rates have been improved with the “L catheter”
- Complications include:
  - Stomal or internal stenosis
  - False passage
  - Incontinence
- Most occur within 1-2 years
- Most can be resolved

**Vitamin B12**

- Absorption of B12 is in distal ileum after combining with IF in stomach
- Stores are adequate up to 5 years
- Complications include:
  - Megaloblastic anemia (pernicious anemia)
  - Sensory or motor deficits that can be irreversible
  - Neuropsychiatric issues
- Previously treated with IM injection
  - Can now be supplemented orally
Pregnancy and Bladder Augmentation

- Patients can safely deliver by either vaginal delivery or C-section
- Small series and surveys have documented safe delivery by either approach in patients with augments
- Awareness of the mesentery and catheterizable channel is critical for C-section

When to Call the Urologist

- Non-neurogenic issues
  - Gross blood in the urine
  - Febrile UTIs
  - New onset of UTIs
  - Infections with Proteus or other bacteria associated with high urinary pH
  - Gravel in the urine

- Neurogenic issues
  - New or increasing incontinence
  - Difficulty emptying the bladder
  - Evidence of anatomical deterioration

Deterioration of the Bladder is Rarely Silent
Most Patients with CP do not have Hostile Bladders
Evaluate with Changing Symptoms

Future Horizons

First randomized controlled trial to show spinal cord regeneration in dogs
Lessons

• A benign appearance of the anatomy today is no guarantee of the future
• The goal of a safe system takes precedence over social management
• Most patients with CP have safe systems
• But if unexplained changes of symptoms, infections, or bleeding are occurring, investigate
Lessons

• Proteus infections, or other organisms that are “urea splitters” are harbingers of problems
• Reassess patients when changes occur
• This patient was evaluated very rapidly but still had significant upper tract stone disease
• Keeping her clear in the future will be problematic