Changing Management of Pediatric Urology Problems: Incontinence, Recurrent Urinary Tract Infections and Vescicoureteral Reflux

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No disclosures

Objectives

• Introduce a successful pediatric urology continence program
• Changing treatment of lower urinary tract dysfunction
• Changing treatment of vescicoureteral reflux
• Changing treatment of UTIs
Research

• Pay attention
• Outcome that is most important is often least expected
• Always ask questions
• Try to answer questions
• Focus on big population problems
• Continue to push the envelope

Pediatric Incontinence

• > 13 million pediatric patients
• Physician extenders
• Interest in alternative treatments
• Comprehensive program
• Escalating treatments
• Reaching close to 100% success
Keep in Mind

Historical Treatment of Pediatric Incontinence

- Urodynamics / VCUG/ Ultrasound
- Categorize by bladder findings: non-neurogenic, urge incontinence, hypertonic bladder, bladder instability, and bladder laxity
- Treat with timed voiding, restriction of fluids, antibiotics, anticholinergics, clean intermittent catheterization
The Unstable Bladder of Childhood
Bauer SB, Retik AB, Colodny AH, Hallett M, Khoshbin S, Dyro FM, 1980 U Cl. of N.A.

- Diurnal enuresis, over age 7, 35% had recurrent UTIs
- No vesicoureteral reflux
- 69% had “dysfunctional voiding state”
- 36/110 patients felt not to have voiding dysfunction

Pelvic floor muscle retraining for pediatric voiding dysfunction using interactive computer games.
McKenna P, Herndon C, Connery S, Ferrer F. J. Uro. 1999

- Escalating treatment plan
- No medication use
- High improvement / cure rate
- Introduced the concept of neuroplasticity
- Over emphasized the role of abnormal pelvic floor contraction
- Short treatment regimen well received by children as young as 4 yrs. old
Early Published Articles

Voiding dysfunction associated with incontinence, vesicoureteral reflux and recurrent urinary tract infections
Patrick H. McKenna* and C. D. Anthony Herndonβ

INTERACTIVE COMPUTER GAMES FOR TREATMENT OF PELVIC FLOOR DYSFUNCTION
C. D. ANTHONY HERNDON, MARVALYN D'CAMIRE and PATRICK H. MCKENNA
From the University of Connecticut Health Center, Farmington, Connecticut, and Southern Illinois University, Springfield, Illinois

PELVIC FLOOR MUSCLE RETRAINING FOR PEDIATRIC VOIDING DYSFUNCTION USING INTERACTIVE COMPUTER GAMES
PATRICK H. MCKENNA, C. D. ANTHONY HERNDON, SUSAN CONNERY and FERNANDO A. FERBER
From the Department of Pediatrics: Urology, Connecticut Children's Medical Center, Hartford and University of Connecticut Health Center, Farmington, Connecticut

CHANGING CONCEPTS CONCERNING THE MANAGEMENT OF VESICOURETAL REFUX
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Biofeedback

- Only one part of our successful Program
- Intergraded into our conservative approach
- Trial of elimination education alone
- Applied based on history, and screening studies
- Coordinated with medication
Support for Biofeedback

• Fifty year experience with Kegel exercises
• Proven benefits in multiple patient populations
• Multi center success with treatment
• No clear randomized trials

<table>
<thead>
<tr>
<th>Study</th>
<th>Treatment</th>
<th>No. patients</th>
<th>Follow-up</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wennegren and Obreng (1)</td>
<td>PRMT only, 12-18 sessions</td>
<td>16</td>
<td>1 yr</td>
<td>9 cured of incontinence, 7 improved</td>
</tr>
<tr>
<td>Hobebe et al (5)</td>
<td>PRMT with biofeedback, 10 sessions (mean)</td>
<td>50</td>
<td>6 mo</td>
<td>82% improved incontinence</td>
</tr>
<tr>
<td>Combs et al (4)</td>
<td>PRMT with biofeedback, 4 sessions (mean)</td>
<td>21</td>
<td>34 mo</td>
<td>81% urodynamic improvement</td>
</tr>
<tr>
<td>De Paspe et al (17)</td>
<td>PRMT with biofeedback</td>
<td>42</td>
<td>6 mo</td>
<td>100% improvement in recurrent UTI</td>
</tr>
<tr>
<td>Feist et al (7)</td>
<td>PRMT with game biofeedback, 12 sessions</td>
<td>15</td>
<td>3-4 mo</td>
<td>100% clinical improvement</td>
</tr>
<tr>
<td>McKenna et al (10)</td>
<td>PRMT with game biofeedback, 6 sessions (mean)</td>
<td>41</td>
<td>7 mo</td>
<td>99% improvement in incontinence</td>
</tr>
<tr>
<td>De Paspe et al (17)</td>
<td>PRMT only PRMT with biofeedback, 10 sessions (mean)</td>
<td>12</td>
<td>10 mo</td>
<td>13 of 20 cured of incontinence, no direct comparison between groups receiving or not receiving biofeedback</td>
</tr>
<tr>
<td>Pernia et al (8)</td>
<td>PRMT with biofeedback, 11 sessions (mean)</td>
<td>43</td>
<td>2 yr</td>
<td>87% cured of incontinence</td>
</tr>
<tr>
<td>Hernandez et al (18)</td>
<td>PRMT with game biofeedback in children with VUR</td>
<td>51</td>
<td>24 mo</td>
<td>99% reduction in need for surgical intervention</td>
</tr>
<tr>
<td>Chiu-Prendergast and Salle (20)</td>
<td>PRMT with biofeedback, 5 sessions (mean)</td>
<td>87</td>
<td>6 mo</td>
<td>61% improvement in urinary symptoms</td>
</tr>
<tr>
<td>Hernandez et al (19)</td>
<td>PRMT with game biofeedback, 5 sessions (mean)</td>
<td>168</td>
<td>24 mo</td>
<td>87% improved incontinence</td>
</tr>
</tbody>
</table>
Pelvic Floor Training

- Powerful effector of bladder function
- Requires patient to contract in isolation to impact bladder function
- Without EMG feedback Kegel exercises are done incorrectly in the majority of patients
- Advanced program should be part of urologic practice

Continence Data Base

- Elimination Education Alone: 25%
- Anatomic Abnormality: 5%
- Urotherapy Recommended But Not Done: 10%
- Urotherapy Alone: 35%
- Behavioral Therapy Plus Urotherapy: 2%
- Urotherapy Plus Medication: 15%
- Medication Alone: 3%
- Surgery: 3%
- Other: 1%

n=4876
Evaluation

- **History / Physical**
  - R/O underlying neuropathology
  - Assess maturity
  - Determine level of constipation

- **Screening**
  - VCUG (historical)
  - Simultaneous uroflow, EMG, and ultrasound post-void residual
Flow

Volume Voided

Pelvic Floor EMG Activity

Abdominal EMG Activity
<table>
<thead>
<tr>
<th>Maximum Flow</th>
<th>19 ml/s</th>
<th>Flow Time</th>
<th>38.4 s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Flow</td>
<td>11 ml/s</td>
<td>Voiding Time</td>
<td>44.4 s</td>
</tr>
<tr>
<td>Voided Volume</td>
<td>358 ml</td>
<td>Time to Max Flow</td>
<td>5.2 s</td>
</tr>
<tr>
<td>Residual Volume</td>
<td>133 ml</td>
<td>Patient</td>
<td>Female</td>
</tr>
</tbody>
</table>

**Treatment**

**Elimination Education**
- Increase fluids
- Timed voiding, voiding tricks
- Aggressive bowel program
- Hygiene

McKenna et al, *J.Uro, Vol. 162, 1999*
Treatment Impact

- Strengthen muscle
- Inhibit uninhibited contractions
- Learn how to relax pelvic floor
- Neuroplasticity
- Reset coordinated function (CNS/local)
- Education/therapy

Biofeedback Treatment Options

- Monitor pelvic muscles and teach during active voiding
- Use catheter to refill bladder to allow repeated practice with voiding while monitoring pelvic floor muscles
- Actively record pelvic floor and Abdominal muscles and teach isolation and relaxation without voiding
Our Treatment Method

- Elimination education
- Pelvic floor /Abdominal muscle retraining
- Biofeedback
  - Standard biofeedback
  - Computer game assisted biofeedback

End Outcome

McKenna et al, J Uro, Vol. 162, 1999
Follow Up Study

- Majority of patients that do not improve have small capacity bladder
- Good response to anticholinergic
- Small percentage with smooth bladder neck dysfunction respond to alpha blocker

*Herndon, Decambre, Mckenna J Jro 2001

Role of Medications

- Anticholinergic
  - Low bladder capacity
  - Low post void residual
- Alpha Blockers
  - Delay flow
  - Flat flow pattern and low pelvic floor EMG activity
**PROTOCOL BASED PROGRAM**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1. Complete history | • Urinary (UTIs, VUR, frequency)  
• Social & developmental  
• Fluid intake  
• Constipation & encopresis |
| 2. Physical exam | • Back  
• Neurologic  
• Abdominal  
• Genitourinary |
| 3. Extensive elimination education | • Increased fluid intake  
• Timed voiding  
• Regular bowel habits  
• Hygiene |
| 4. Non-invasive evaluation to rule out anatomical problems | • Uroflowmetry (uroflow)  
• Pelvic, abdominal EMG  
• Post void residual (PVR)  
• Ultrasound |

**URINARY TRACT INFECTIONS**

By 3 months after the 1st clinic visit, rates of UTIs were **significantly decreased** in the **Protocol Based** approach compared to the **Standard** program.
**VUR Surgery**

By 12 months after the 1st clinic visit, 24% of patients with VUR in the Standard program had surgery, while 0% in the Protocol Based program had surgery.

**PREScribing OF MEDICATION**

By 12 months after the 1st clinic visit, 67% of the patients in the Standard program were prescribed medication, while 34% in the Protocol Based program were prescribed medication.
Treatment of Vesicoureteral Reflux

• Review current concepts
• Recommend escalating approach to treatment
• Review results of this approach
• Deflux treatment
• Robotic treatment vs. Open

Short Tunnel Theory?

• Males have reflux at birth / Females develop reflux
• Infants with reflux have high rate of urodynamic abnormalities
• Constipation common in reflux patients that have breakthrough infections
• Voiding dysfunction implicated in high volume of patients with reflux that require surgery
• When surgery fails patient often has voiding dysfunction
• Surgical correction does not impact on development of UTI
New Approach

- Treatment program directed at decreasing the rate of breakthrough infections in patients with reflux.

Vesicoureteral Reflux Study

- Flat flow with hyperactive pelvic floor and large post void residual
- 90% decrease in breakthrough infections
- 95% decrease in surgical correction
- High spontaneous resolution of low grade reflux

Herndon, DeCambre, McKenna, J Uro, 166, 2001
Escalating Treatment Approach

- VCUG confirms reflux and suspected voiding dysfunction
- Prophylactic antibiotics
- 4 point medical program
- Flow, surface EMG, PVR
- Computer assisted muscle retraining
- Keep established indications for surgical intervention

Surgical Treatment

- Extravesical ureteral re-implant
- Deflux treatment
  Cystoscopy with intra-ureteral orifice injection Outpatient 75-90 % cure
- Robotic re-implant
Deflux

- Pseudocapsule hyaluronic acid and dextranomer microspheres
- Biodegradable and non-immunogenic
- Implant is stable, long term, remains in position, and does not disappear over time (fibroblast in growth and collagen deposition results in

Injection Technique

- Site 3 was the initial approach in the US
- Initial site should be 1-2-3
- Inject greater amount for higher grades
Current Practice

- Patient education about options
  - Observation
  - Antibiotic prophylaxis
  - Deflux injection
  - Open reimplantation
  - Minimally invasive surgery
- Use of DMSA scan to identify high risk patients

Same Day Extravesical Open Re-implant

- Mini incision
- Modification of technique
- All ages
- Anatomic abnormalities
- Dismembered possible
- Catheter removal in recovery room
Summary

• Initial treatment with prophylactic antibiotics treat lower urinary tract dysfunction
• Surgical intervention less frequent
• Extravesical approach
• Deflux

Surgical Skills Lab

• Volume of open reimplants so low that we have developed models to teach residents how to perform all types of reimplants in the lab
Management of UTIs

• Bacterial factors
• Bladder adhesion factors
• Genetic factors
• LUTD
• Constipation
• Hygiene factors
• Natural bacterial barriers / foreign body

Traditional Treatment

• Prophylactic antibiotics
• Treat infections when they occur
• Repeat screening studies if infections continue
• Consider nuclear medicine VCUG
Mechanisms

- Bacterial factors
- Host factors
- Constipation
- Flow abnormalities
- Bladder changes

Recurrent Urinary Tract Infections

- Correct constipation
- Increased fluids
- Address voiding dysfunction
- Incomplete emptying
- Turbulent flow
- Anatomic bladder abnormalities
New Recommendations

• Elimination education
• Non-invasive screening for voiding dysfunction
• If present consider muscle retraining
• No use of prophylactic antibiotics
Review Objectives

• Introduce a successful pediatric urology continence program
• Changing treatment of lower urinary tract dysfunction
• Changing treatment of vesicoureteral reflux
• Changing treatment of UTIs