Voiding Dysfunction & Nocturnal Enuresis in Children

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Case

- UTI at age 3 months
- Ultrasound Normal
- Radionuclide Cystogram (1mth later)
  - Bilateral VUR – Left > Right
  - Partial emptying of urinary bladder
- Prophylactic Antibiotics
- DMSA Scan
  - Differential Function – 54% Left, 46% Right
  - Size Discrepancy
Case

- Referral to Continence Nurse – 4 yrs 9Mths
  - Still Wetting at 4yrs 9mths
- Oxybutynin (side effects)
  - 2.5mg BD
  - Increased to 7.5mg mane; 2.5mg nocte
- Wobble Watch
- Constipation – Lactulose/ Osmolax
- Adult urologist referral
- DMSA Scan – 62% Left; Right 38%
- Ditropan patches
Case

• Ongoing Symptoms
  • Day and Night Wetting
  • Progressive Faecal Soiling
  • Febrile episodes

• Physiotherapy ongoing

• Increased Fluids

• Stool Softeners
Case

- Paediatric Urology Opinion

- Clean Intermittent Daily catheterisation

- MRI Lumbosacral Spine
International Children’s Continence Society 2008 Definitions

- **Dysfunctional voiding**
  - Applicable to voiding phase only – children who contract the external sphincter during voiding and produce a staccato flow

- **Incontinence**
  - Wetting at an inappropriate time and place in children > 5 years
    - Continuous incontinence – malformations or sphincter damage
    - Intermittent incontinence
      - Daytime incontinence
      - Nocturnal incontinence (Enuresis)

- **Enuresis**
  - Monosymptomatic (no daytime symptoms)
  - Non-monosymptomatic – day time incontinence, urgency, decreased or increased voiding frequency
Definitions

- **Overactive Bladder**
  - Child who experiences urgency symptoms
  - If incontinent – called urge incontinence

- **Detrusor overactivity**
  - Involuntary detrusor contractions found on urodynamics

- **Underactive Bladder**
  - **Detrusor underactivity** – urodynamic term

- **Voiding postponement**
  - Children who postpone voiding habitually, using holding manoeuvres
“Bad” bladder behaviours
Pathogenesis of Bladder Dysfunction

• Bladder has two roles:
  • Store urine at low pressure (< 40cm H20)
  • Empty out completely at safe pressure (< 80cm H20)

• Neonate - bladder emptying via sacral spinal cord reflex

• ~ 2 yr age develop conscious sensation of bladder fullness → spinal reflex gradually modified and inhibited by pontine micturition centre in brain stem

• Between 2-4 years child develops ability to control voiding - conscious voiding requires relaxation of the external sphincter just prior to detrusor contraction

• Balance between “inhibiting voiding” and “initiating voiding” not fully mastered until ~ 4yrs age
Pathophysiology

- Detrusor Contraction during Bladder Filling
  - Central failure to inhibit bladder contractions
    - Sensation of Urgency
      - Pelvic floor used as "emergency brake"
        - Holding maneuvers
          - Incontinence
            - Overactive Bladder
              - Dissipation of detrusor contraction
  - Incomplete relaxation or overactivity of pelvic floor muscles during micturition
    - Functional bladder outflow obstruction
      - Detrusor-sphincter dyscoordination
        - Staccato voiding
          - Fractionated voiding
            - Underactive Bladder syndrome
Staccato Voiding  ‘Underactive Bladder’

cm${\text{H}_2}$O

P$_{\text{ves}}$

P$_{\text{abd}}$

P$_{\text{detr}}$

mV

EMG

mL/s

Flow rate

P$_{\text{ves}}$

P$_{\text{abd}}$

P$_{\text{detr}}$

mV

EMG

mL/s

Flow rate
Urodynamics

- Not required for majority of children

- Indicated if:
  - Evidence of/at risk of upper tract deterioration
    - hydroureteronephrosis
    - high grade VUR
    - recurrent episodes of pyelonephritis
  - Suspicion or evidence of neurological abnormality
  - Significant daytime enuresis that fails to respond to conventional treatment
  - (Unexplained secondary enuresis - cystoscopy is preferable)
History

- **Symptoms and signs**
  - Voiding pattern - stream/volume/frequency (diary)
  - Dysuria/frequency/urgency
  - Holding manoeuvres
  - Perineal hygiene - vulvovaginitis/balanitis
  - UTI’s
  - Constipation

- **Birth and Infancy history**

- **Age and pattern of toilet training**
  - longest dry periods

- **Family history of urological problems**

- **Social history** - consider Child Sexual Abuse
Evaluation - Physical Exam

• Structural lesions
  • Abdominal examination
  • Genital examination
    • labial adhesions/meatal stenosis
    • Ectopic ureter
    • bifid clitoris (epispadias)

• Occult neurological disorders
  • Back for signs of occult spina bifida
  • Lower limb reflexes
  • Gait
  • Anal wink and tone
**Investigations**

- **Urinalysis - dipstick, M/C/S, (urine osmolality)**

- **Ultrasound pre and post void residual**
  - Bladder Capacity $30 + (30 \times \text{age})$ ml
  - Post void residual > 20mls

- **Paediatric Nephrology/ Paediatric urology Opinion**
  - MCU if abnormal US

- **Spinal X-ray and MRI Spine**

- **Urodynamics**
  - Bladder volume
  - Urine flow rate
  - Intravesical pressure at rest and during filling and voiding
    - Resting bladder pressures > 40cm water inevitably lead to renal failure
• Neurological /neuro-orthopaedic abnormality

• Secondary enuresis or deterioration in primary enuresis

• Significant associated bowel abnormality

• Urodynamic study suggesting neurogenic bladder

• Failure to respond to conventional treatment
Overactive Bladder Syndrome
Persistent infantile bladder, bladder immaturity

- Commonest voiding dysfunction
- Peak incidence between 5-7 yrs
- Delayed disappearance of uninhibited contractions
- Symptoms of urgency, urge incontinence and nocturnal enuresis
- Characteristic holding postures
- Recurrent lower UTI occur

- Assess:
  - spine for deformities,
  - abdomen for constipation,
  - lower extremities for neurological signs.

- Urodynamics show detrusor hyper-reflexia, lower bladder capacity,
- Treat with oxybutinin
Underactive Bladder Syndrome

- Children with decreased voiding frequency and who need to use intra-abdominal pressure to void
- Large capacity, hypotonic bladder
- Infrequent voider
- Constipation common
- Treat with bladder retraining
- Incontinence between voiding due to overflow
- Decreased sensation of bladder fullness
Bladder Pathology

- Severe VUR
- Prune Belly Syndrome
- Posterior Urethral valves (urethral obstruction)

Neuropathic bladder
- Spina bifida
- Sacral agenesis
- Spinal cord trauma/tumour
- Transverse myelitis
- Autonomic neuropathy

Non-neurogenic neurogenic bladder (Hinman syndrome)
- Bladder behaves as if neurologically abnormal, no defect identified
- Evolves over time from incomplete or infrequent voiding
- Abnormal bowel habit
- Bladder contractions not coordinated with sphincter relaxation
Treatment

- High fluid intake – produce high urine output
- Bladder Training
  - Regular voiding/ Timed Voiding
  - Complete bladder emptying/ Pelvic floor training
- Prevent/ Treat constipation
- Perineal hygiene
- Medications
  - Antibiotic prophylaxis
  - Oxybutinin hydrochloride (overactive bladder)
    - Side effects
      - Flushing, Vagueness, Blurred vision
      - Dry Mouth, Constipation
      - Loss of bladder sensation
Nocturnal Enuresis

- 20% in 5 year olds
- 10% in 10 year olds
- 3% in 15 year olds
- Majority spontaneously resolve
- Boys > Girls
- Hereditary 77% vs 43%
- Nocturnal polyuria / Nocturia
Assessment

• Arousal Problems
• Nocturnal polyuria
• Bladder overactivity
• Bowel History

• Investigations
  • Urine daytime flow chart – frequency/volumes

• Bowel Chart
  • Bristol Stool Chart
Management

• Do Nothing
• Bladder Training
• Minirin melts – 200mcg - 400mcg
• Minirin Nasal Spray – 20mcg – 40mcg
• Enuresis Alarm
• Tricyclic Antidepressants (Imipramine/Amitriptyline)
  • Benefit vs Risk
• Oxybutynin
Thank-You

Questions