JAMAICA KIDNEY KIDS FOUNDATION in association with

1ST JAMAICAN PAEDIATRIC NEPHROLOGY CONFERENCE

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VOIDING DISORDERS IN CHILDREN

Dr. Colin Abel
Paediatric Urologist
Bustamante Children’s Hospital
Associate Lecturer
University of the West Indies
Jamaica
The Bladder is an abdominal organ which functions to store and empty urine.
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- Bladder wall has 3 layers:
  - Mucosa
  - Detrusor muscle – meshwork of smooth muscle fibres
  - Adventitia
Detrusor muscle relaxes (compliance) to allow urine to fill the bladder.

Micturition involves coordination of detrusor muscle contraction and bladder sphincter relaxation.
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- Micturition control mechanisms depend on
  - Intact neural pathway
  - Awareness of social norms
  - Gradual increase in function bladder capacity
  - Maturation of Detrusor / Sphincter coordination
  - Development of voluntary control over the whole bladder sphincteric – perineal complex.
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- Normal Bladder Capacity (ml)
  - 25 mls/year of life + 25 mls
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- Classification of bladder dysfunction

- Derangement of nervous system.
  - Congenital Malformations – Myelomeningocele.
  - Development Disturbances – Mental Retardation.
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Classification of bladder dysfunction

- Disorders of Detrusor and Sphincteric Muscle function.
  - Congenital Conditions eg. Muscular dystrophy
  - Acquired Conditions eg chronic bladder distension.
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Classification –

- Structural Abnormalities
  - Congenital conditions e.g. Prune belly, PUV
  - Acquired conditions e.g. Traumatic stricture
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- Voiding disorder / dysfunction describes a constellation of problems that interfere with efficient storage and evacuation of urine.
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Symptoms include:

- Day and or night wetting
- Urgency
- Frequency
- Urinary dribbling
- Infrequent voiding
- Weak or intermittent stream
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- Prevalence – Age 4 – 10 years
  - Female to Male 1.5 : 1
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- Two Categories:
  - Filling phase dysfunction
    - Detrusor hypertrophy $\rightarrow$ unstable contractions $\rightarrow$ Incomplete emptying at bladder neck $\rightarrow$ altered Closure of VUJ $\rightarrow$ VUR $\rightarrow$ infections
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Categories continued

- Voiding Phase – Probably a learnt behaviour that results from child’s attempt to suppress impending or actual bladder contractions by inappropriately contracting urethra and pelvic floor muscles rather than relaxing during voiding.
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Result –

Cycle of increased voiding pressure of detrusor sphincter dyssynergia that produces inefficient voiding
  ▶ Staccato voiding
  ▶ Frequency with small volumes
Overall Result

- Dysfunctional Voiding
- UTI
- VUR
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Symptoms - Review

- Children 4 years and older
- Diurnal enuresis
- Urgency
- Frequency
- Elevated post void residuals
- UTI
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- Patient Evaluation
  - History urinary and GIT symptoms important
  - Onset and duration of symptoms
  - Psychological profile
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- Physical Examination
  - Look for developmental or anatomical Problems
  - Neurological examination
  - GU and GIT assessment – full bladder, soiling
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- Investigations
  - Urinalysis and urine culture
    - Treatment of UTI
    - Urinary prophylaxis
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- Investigations
  - KUB
    - Constipation
    - Urolithiasis
    - Spinal abnormalities
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- Investigations
  - Abdomino pelvic ultrasounds
    - Upper or lower tract abnormalities.
    - Post void urine volume – 10% of expected capacity is significant.
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- Voiding Cystourethrogram
  - VUR
  - Bladder trabeculation
  - Post void volume
  - Spinning top urethra
    - indicative of habitual high pressure voiding due to poor pelvic relaxation
SPINNING TOP URETHRA
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- **URODYNAMIC** studies –
  
  Measure the relationship between pressure and volume of the bladder.
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URODYNAMIC studies evaluate
- bladder filling
- detrusor activity
- rectal activity
- internal and external sphincteric activity
- urinary flow
- efficiency of emptying
- urinary leakage.
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- Normal Bladder filling pressure <30 cm H₂O
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- Children with
  - Unstable filling phase
  - Unstable voiding
  - Pressure greater than 30 cm H₂O
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- Treatment - Initially conservative
  - Combined with medical and behavioural management.
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Behavioural Management

- encourages socially acceptable behaviour
- reinforces desired behaviour

with a system of rewards
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- Behavioural Management
  - Diet and Fluids
    - appropriate fluid intake
    - avoid foods that are bladder irritants
      e.g. Caffeine, chocolate, food colourings
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- Behavioural Management

Toilet diaries

assess voiding patterns
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- Timed Voiding
- Double Voiding
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- Pelvic muscle retraining
  - Kegel exercises
    - contraction and relaxation of pelvic muscles.
  - Biofeedback
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Medical Management

- Pharmacologic Agents
  - Detrusor Muscle (smooth muscle) relaxation.
  - Bladder sphincter (striated muscle) relaxation.
Detrusor Muscle Relaxation

- **Antimuscarinic** drugs relax detrusor muscle
- **Anticholinergic** drugs act on nerve terminals to block contractility of detrusor muscle

The effective action of these 2 agents

- promotes muscle relaxation $\rightarrow$ increased bladder capacity

eg: - Oxybutynin
   - Tolterodine
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- Adrenergic antagonists
  - initiate smooth muscle relaxation of the bladder neck
    - reduction of the bladder contractions
    - facilitation of smoother bladder emptying.
  - e.g. - Terazosin
    - - Doxazosin
Tricyclic antidepressants exert a local anaesthetic effect on the bladder.

- Decreased detrusor contractility
- Increased outlet resistance
- Increased bladder capacity

e.g. Imipramine
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- Length of Treatment
  - 3 to 6 months on average.
  - Up to 2 years if indicated.
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- **Enuresis (Nocturnal)**
  - Diagnosis made after age 5 years.
  - Rule out UTI and anatomical abnormalities
  - Fluid restriction
  - Timed voiding at night
  - Alarms
  - Imipramine
  - Desmopressin
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Summary 1

▶ Voiding dysfunction is a common problem

▶ Variety of symptoms

▶ Prone to UTI
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- Summary 2
  - Complete history and physical examination.
  - Rule out anatomical or physiological causes.
  - Successful management with behavioural and pharmacological therapies.