



Voiding Disorders in Children: The Iceberg of Known Problem

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Agenda

Physiology & Neurophysiology of lower U.T.

Classification of voiding dysfunction

Evaluation of a child with voiding dysfunction

Management

Functions of Lower U.T.

Storage

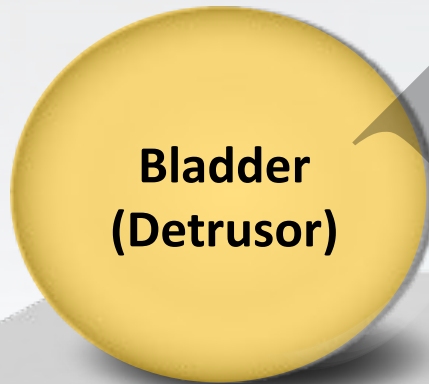
- Adequate volume of urine
- At LOW pressure
- With NO leakage

Emptying

- Voluntary
- Complete
- Efficient
- Low pressure

Functions of Lower U.T.

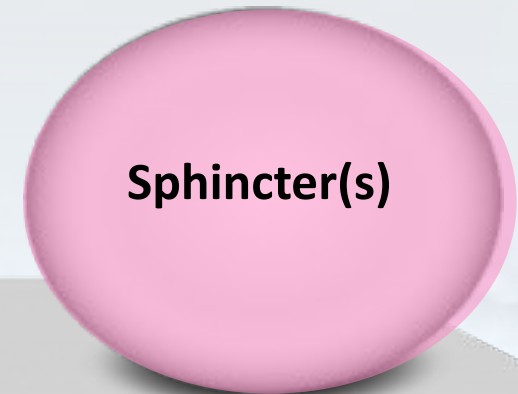
- Stores urine at low pressure
- Compresses urine for voiding



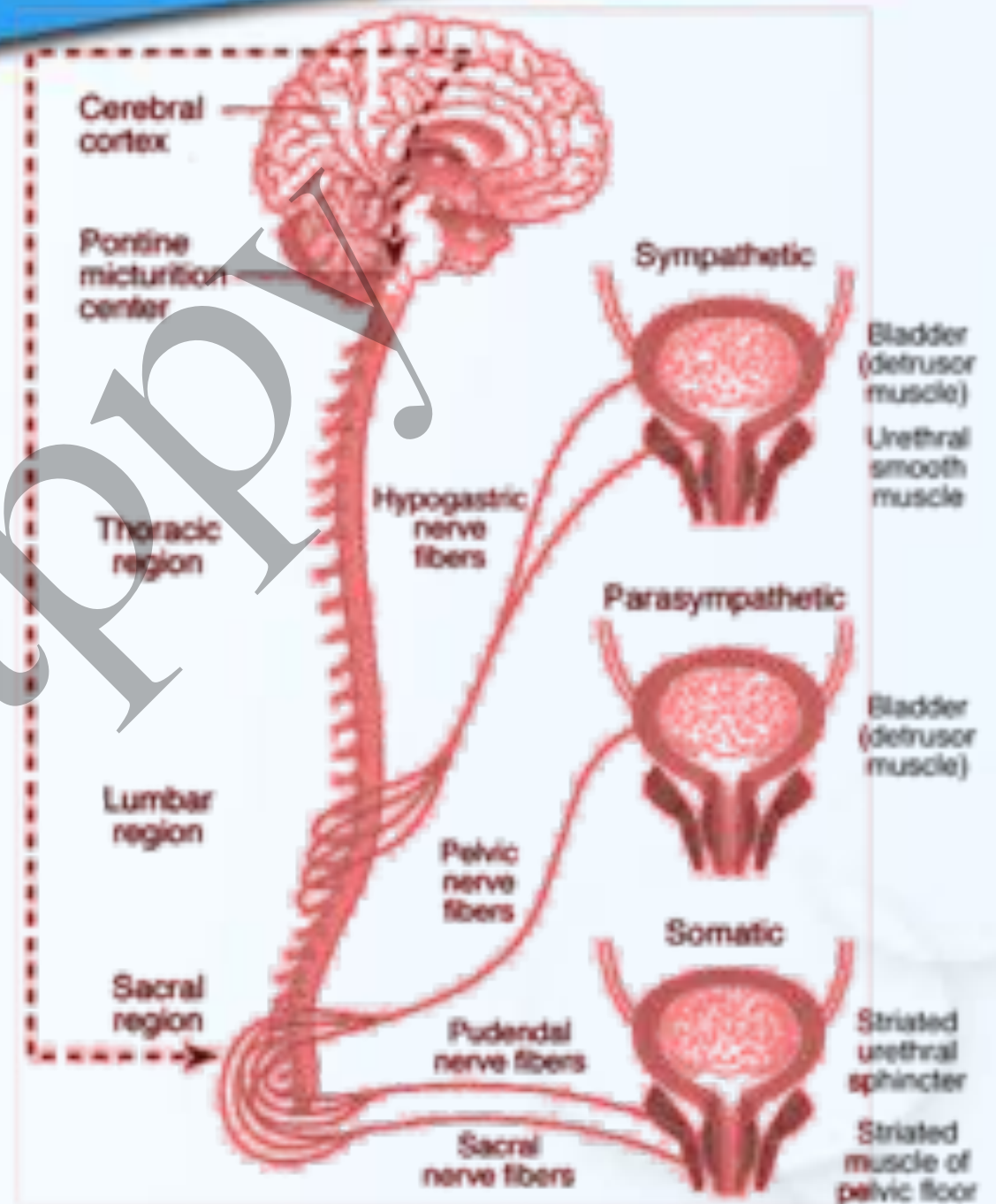
- Conveys urine from bladder to outside



- Controls urine flow
- Maintain continence between voidings



Innervation of bladder, urethra and pelvic floor



Neurophysiology of Lower U.T.

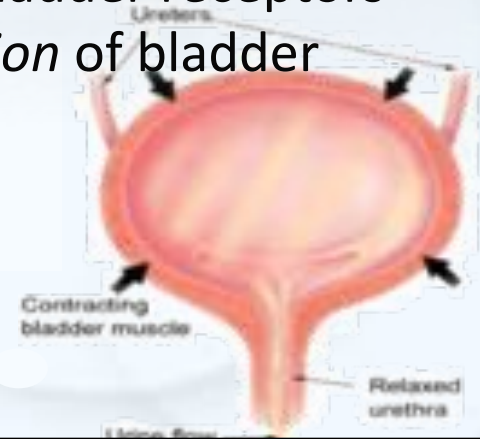
Low Pressure Storage with Continence

- **Outlet Obstruction**
 - Sympathetic α -adrenergic *stimulation* of bladder neck & post. urethra
 - Somatic *stimulation* of external sphincter
- **Bladder Relaxation**
 - β adrenergic *stimulation* of bladder fundus



Voluntary Complete Voiding With Low pressure

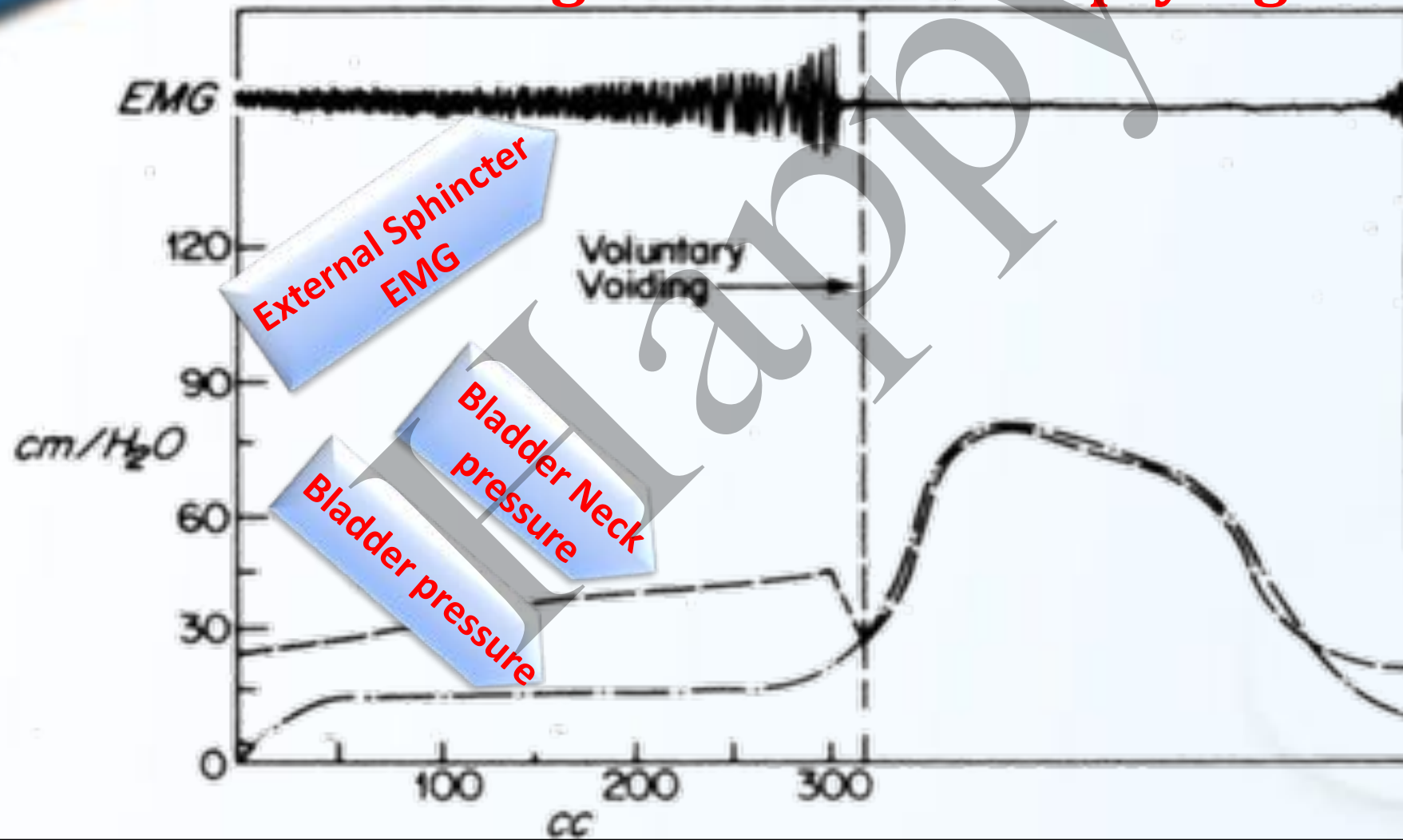
- **Outlet Relaxation**
 - Sympathetic α -adrenergic *inhibition* of bladder neck & post. urethra
 - Somatic *inhibition* of external sphincter
- **Bladder Contraction**
 - Muscarinic (A.Ch.) bladder receptors
 - β adrenergic *inhibition* of bladder fundus



Neurophysiology of Lower U.T.

Storage

Emptying



Bladder Control

- **Neonate:** bladder emptying via sacral spinal cord reflex
- **~2 years:** conscious sensation of bladder fullness >> spinal reflex gradually modified & inhibited by pontine micturition center
- **2-4 years:** the child develops ability to control voiding
- Balance between “inhibiting voiding” and “initiating voiding” not fully mastered until ~ 4 years

Terminology

Voiding Frequency:

Normal frequency 4-7 /day

- Frequent micturition $\geq 8/\text{day}$
- Infrequent micturition $\leq 3/\text{day}$

Incontinence:

Uncontrollable leakage of urine. It can be continuous or intermittent

Urgency:

Sudden and unexpected experience of an immediate need to void

Terminology

Hesitancy:

Difficulty in the initiation of voiding or that the child must wait a considerable period before voiding starts.

Straining:

The child applies abdominal pressure to initiate and maintain voiding

Intermittency:

Term applied when micturition occurs not in a continuous stream, but rather in several discrete spurts (> 3 years)

Other Symptoms

Feeling of
incomplete voiding



Residual urine > 20 ml

Holding



Post-micturition
dribbling



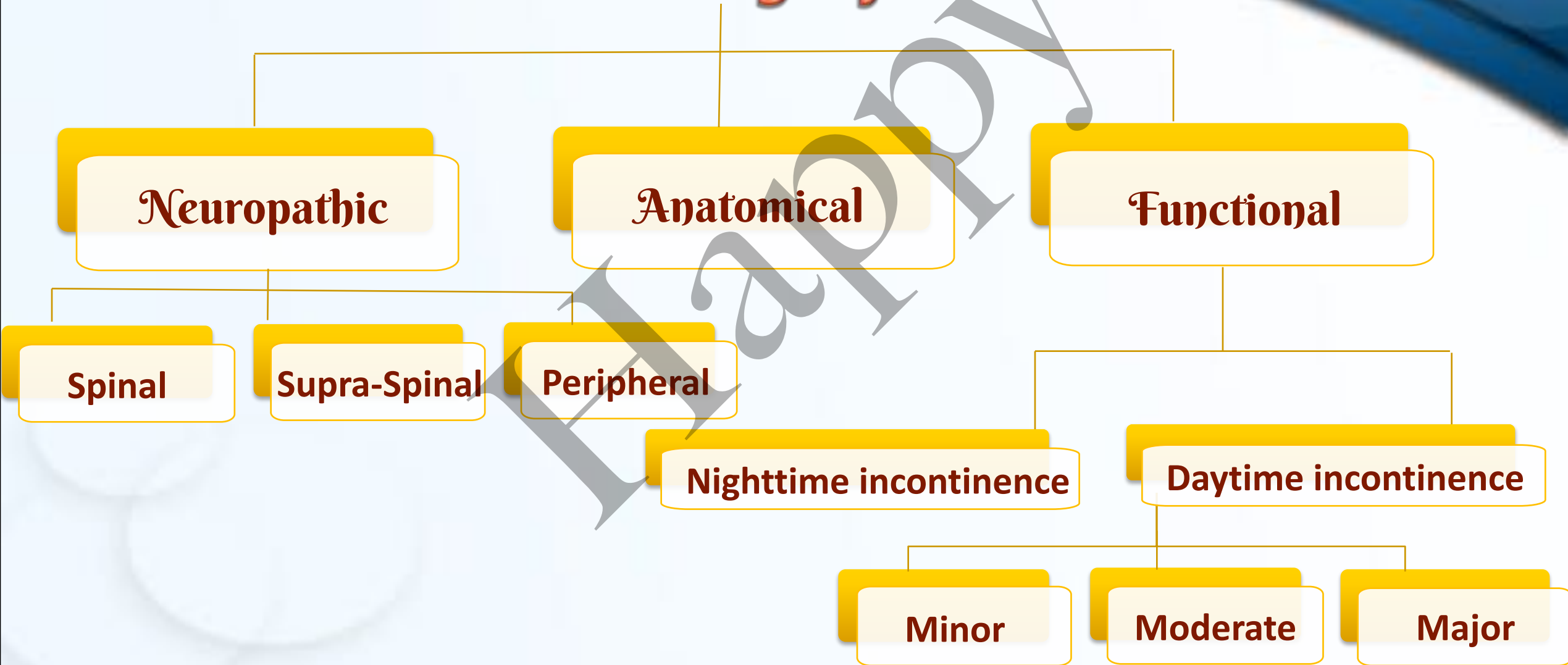
Weak urine stream

Enuresis

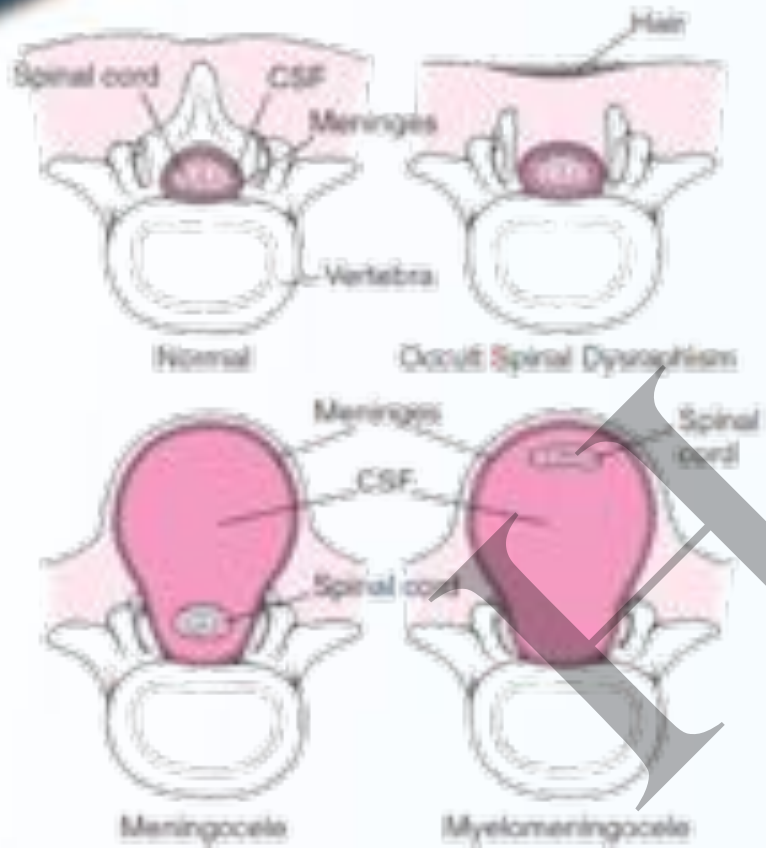
- Normal voiding that occurs in an inappropriate or socially unacceptable place or time.
 - Nocturnal or diurnal
 - Diurnal enuresis vs dysfunctional voiding



Classification of Voiding Dysfunction



Neuropathic VD

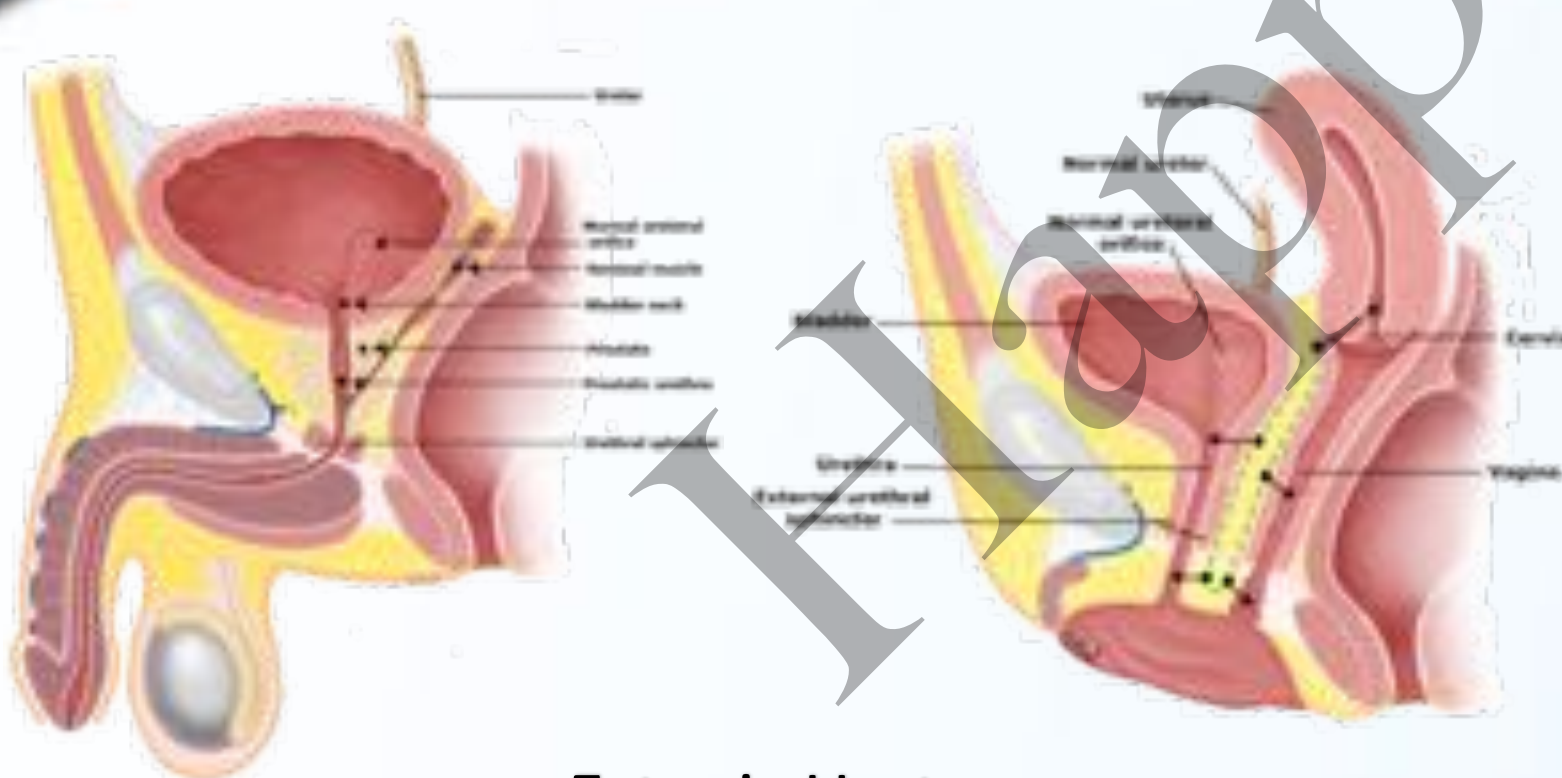


Neurospinal Dysraphism



Sacral Agenesis

Anatomical VD



Ectopic Ureter



PUV

Functional VD

Minor Disorders



No impact on upper UT

1. Extraordinary daytime urinary frequency syndrome
2. Giggle incontinence
3. Stress incontinence
4. Post-void dribbling

Moderate Disorders



Some impact on upper UT

1. Bladder/Bowel dysfunction
2. Underactive bladder
3. Overactive bladder

Major Disorders



Overt impact on upper UT

1. Transient UD dysfunction of infancy
2. Hinman Syndrome
3. Ochoa Syndrome
4. Myogenic detrusor failure

1. Extraordinary Daytime Urinary Frequency Syndrome

- > Boys between 3-8 years
- Sudden onset of daytime-only frequency and urgency every 10–20 min
- Bedwetting is rare
- Etiology is unknown
- Apart from urinalysis / urine culture, NO further investigations
- Lasts from days to months (up to 9 mo)
- TTT: reassurance

2. Giggle Incontinence

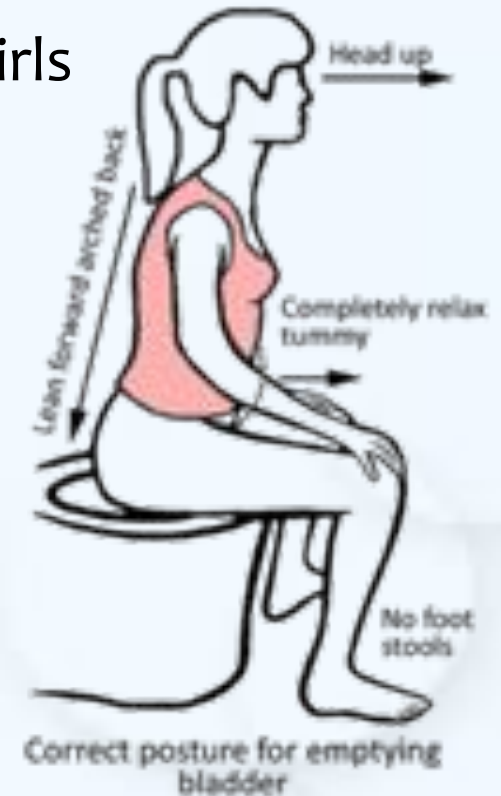
- Massive unexpected detrusor contraction associated with **complete** bladder emptying
- Episodes occur with giggling and laughter
- Starts around puberty
- NO UTI
- **TTT:** Anticholinergics - Sympathomimetics – Biofeedback – Botulinum toxin injection in detrusor

3. Stress Incontinence

- **NOT IN CHILDREN**
- Starts in teenage girls
- Increase incidence with high-impact sports
- Involuntary loss of urine during coughing, sneezing, or physical exertion such as sport activities

4. Post-void Dribbling

- Wetting typically occurs after micturition.
- Due to trapping of urine in the vagina, more in obese girls
- Presents with labiovulvar erythema/burning/itching
- **TTT:** Postural correction

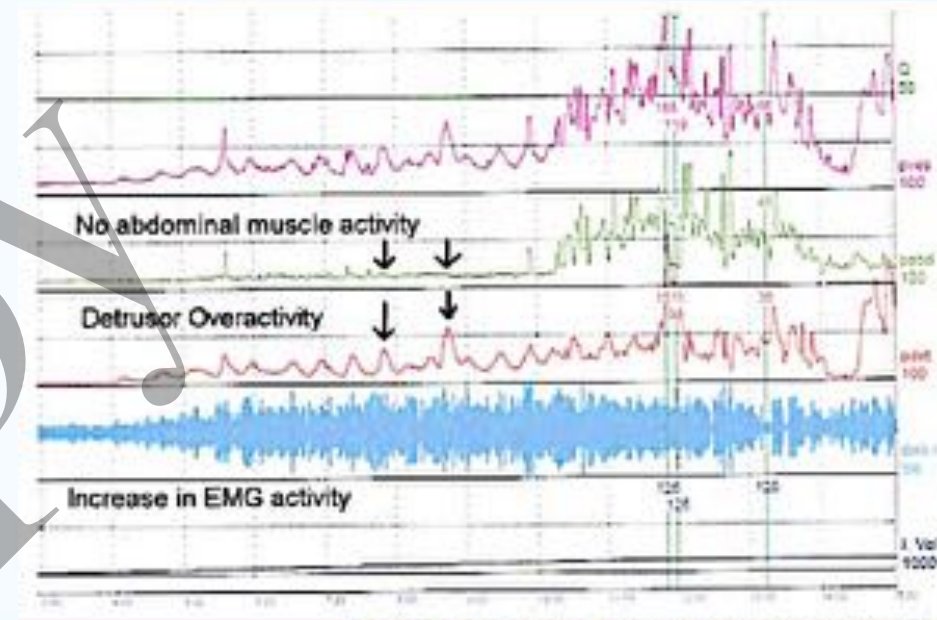


1. Bladder/Bowel Dysfunction (BBD)

- Anorectal and lower urinary tract function are interrelated
- Constipation is often associated with bladder dysfunction
- Several theories to explain
- Bladder dysfunction may be associated with encopresis
- **TTT**: of constipation – timed voiding

2. Overactive Bladder

- 2nd most common VD after nocturnal enuresis.
- Abnormal bladder contraction during filling phase
- May be due to delay in acquisition of cortical inhibition over uninhibited detrusor contractions
- Symptoms include urgency, urge incontinence, enuresis and ... Recurrent UTI
- Holding maneuvers such as leg crossing and squatting are common



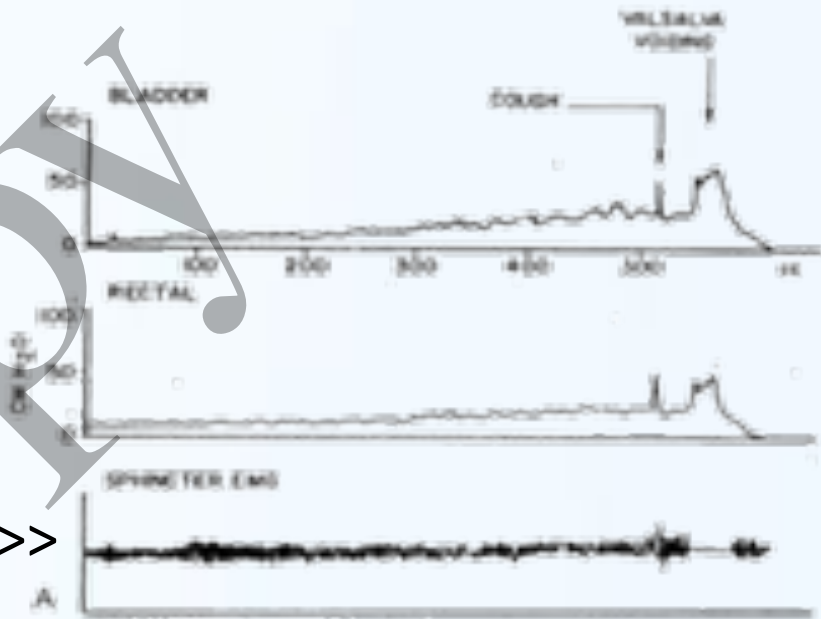
3. Underactive Bladder (Lazy Bladder Syndrome)

- Habitual voiding postponement.
- Holding maneuvers >>> low voiding frequency >>>

Prolonged detrusor overdistension >>> hypoactive bladder >>>

Large post-void residuals with overflow incontinence --- risk of UTI

- **TTT**: timed voiding regimen – alpha blockers - CIC

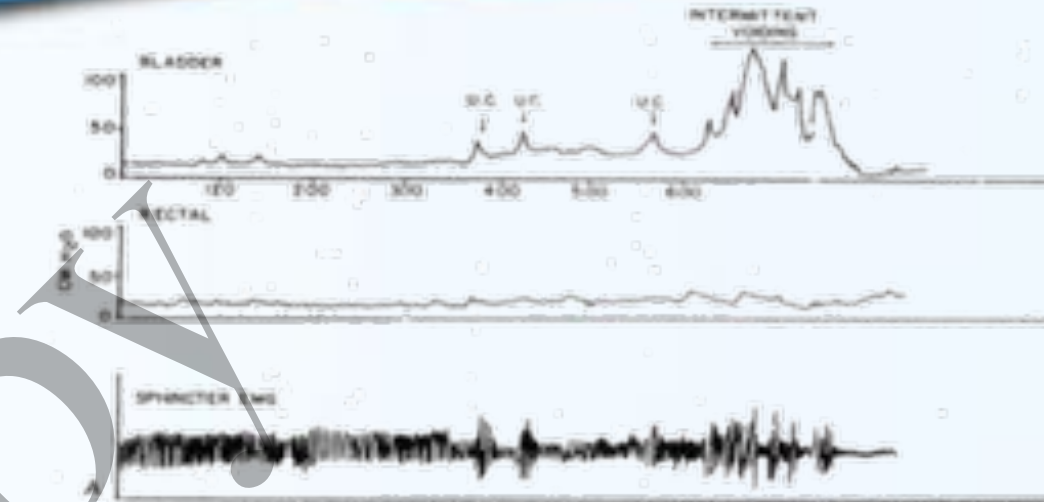


1. Transient urodynamic dysfunction of infancy

- High-grade reflux with thick-walled bladders noted prenatally.
- Absence of infravesical obstruction.
- Spontaneous resolution noted to reach 27% even with grade V reflux.
- May be associated with delay in maturation of the external urinary sphincter
- **TTT:** vesicostomy



2. Hinman Syndrome



- Sphincter contraction during voiding >>>
high voiding pressure → bladder decompensation → UTI → renal damage

Symptoms

Incontinence – enuresis
– UTI – constipation -
encopresis

Findings

UTI – hydronephrosis -
VUR →
renal insufficiency
UD → diagnostic

TTT

- Anti-cholinergics,
alpha-blockers, Botox
- Re-education,
biofeedback
- Surgical (failure)

3. Ochoa Syndrome (uro-facial syndrome)



- All features of Hinman \$ but genetically determined (AR - HPSE2 gene)
- Inversion in the muscles of facial expression that becomes more evident when smiling (grimace that gives the appearance of sobbing or crying)
- Diagnosis early in life (because of facial expression)

4. Myogenic Detrusor Failure

- End-stage bladder decompensation
- End-stage of neuropathic bladder - PUV
- Post-void residue, recurrent UTI → hydronephrosis → renal damage
- **TTT:** alpha blockers

Evaluation



1

When to suspect voiding dysfunction

2

Initial evaluation: History, Examination, Simple Lab

3

Further Investigations

When to suspect voiding dysfunction

- Daytime urinary incontinence in school-age or previously toilet-trained children.
- Persistent urinary symptoms such as urgency, dribbling, or dysuria
- Bladder dysfunction has been associated with conditions such as VUR, recurrent UTI, and chronic constipation or encopresis.

Initial Evaluation

1. History

Voiding schedule: frequency of voids, incontinent episodes, voided volume

Symptoms of bladder dysfunction: urgency, hesitancy, holding maneuvers, etc...

Bowel habits: frequency, stool consistency, encopresis, stool withholding

Neurodevelopmental & psychogenic disorders

Family History, perinatal H. and toilet training history

Initial Evaluation

1. History

Voiding and fluid intake diary

Name: _____ Date of birth: _____

Date: _____

Voiding diary

Time	Urine volume (mL)	Straining/ interrupted stream	Wetting: Damp/wet?	Urge	Comments/observations

Fluid intake diary

Time	Fluid intake (mL)

Voiding Diary

(3 days)

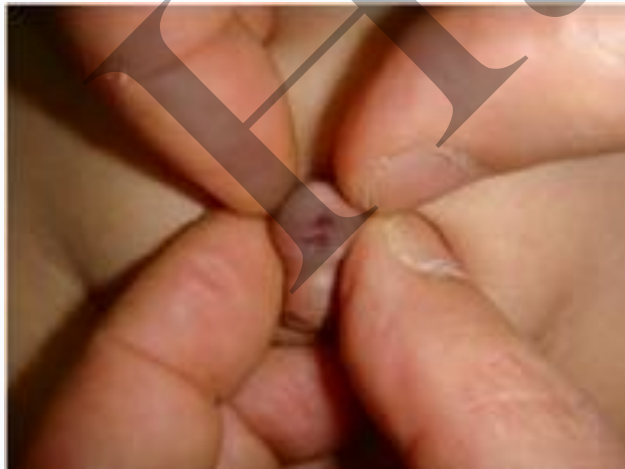
Initial Evaluation

2. Examination

Lower back



External genitalia



Initial Evaluation

2. Examination

- Neurological examination
- Abdominal & rectal examination
- Observation of urine stream (if possible)

Initial Evaluation

3. Simple investigations

- Urinalysis
- Urine culture & sensitivity



Further Evaluation

- Failure to improve following initial trial of conservative management (e.g. timed voiding & treatment of constipation)
- Suspicion of a neurologic / anatomic etiology
- Constant continuous incontinence, since these children are more likely to have an organic cause such as an ectopic ureter
- Recurrent UTI /unexplained VUR
- Impaired kidney functions in a child with voiding disorder

I. Imaging

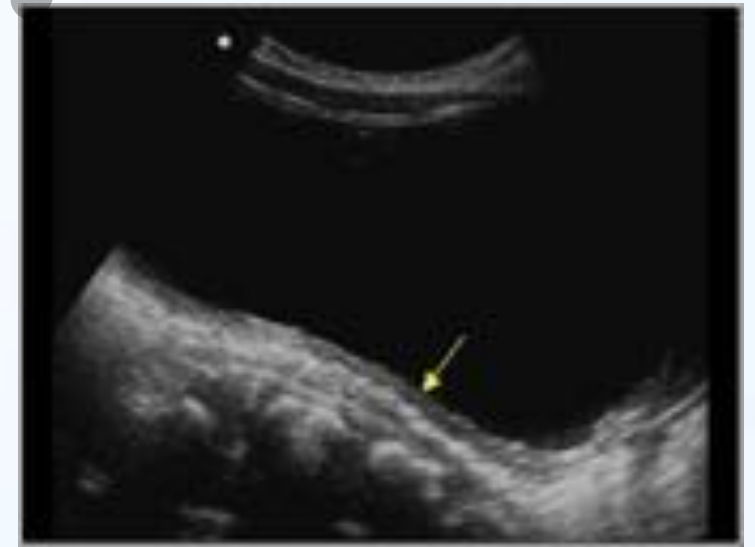
1. Ultrasonography



Hydronephrosis



Post-void residual



Bladder wall thickness

I. Imaging

2. VCUG



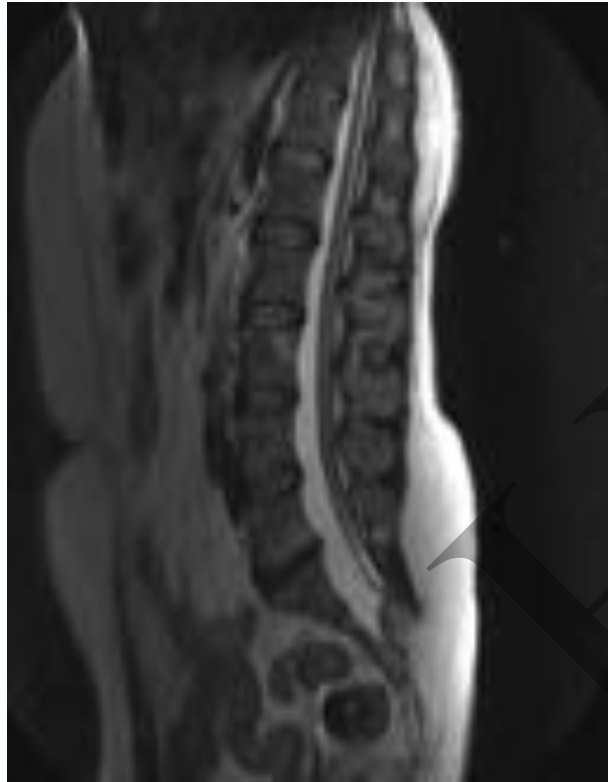
VUR



PUV

I. Imaging

3. MRI



Tethered cord



Diastematomyelia

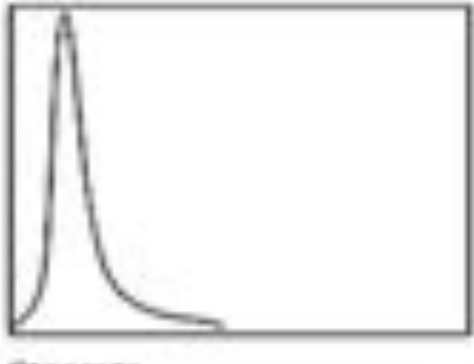
II. Urodynamics

Uroflowmetry

Normal (parabolic)



Tower



Overactive bladder

Plateau



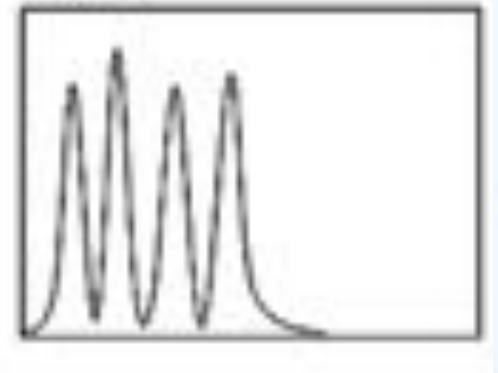
Bladder obstruction

Interrupted (fractionated)



Underactive bladder

Staccate



Dysfunctional voiding

Management

Pharmacological

- Anticholinergics
- DDAVP for enuresis
- Antibiotics prophylaxis for VUR
- Laxatives

Non-pharmacological

- TTT of constipation
- Timed voiding
- Biofeedback
- Pelvic floor exercises



**Take
home message*

- ✓ Some causes of VD may be hazardous with an overt impact on upper UT
- ✓ VD should be suspected if there is daytime urinary incontinence or persistent urinary symptoms
- ✓ Detailed voiding diary is the most important step in evaluation of any case with VD



*Thank
You!*

Happy!