

# Medi Quest BRS Hospital

A monthly News letter from BRS Hospital

## NEUROGENIC BLADDER PART 2 OF BLADDER DYSFUNCTION

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Neurogenic bladder is a term applied to a malfunctioning urinary bladder due to neurologic dysfunction (Brain, spinal cord and nerve)

### Causes of Neurogenic bladder in childhood

- 1) Neural tube defects (The most common)
2. Meningo myelocele
2. Diastematomyelia
3. Tethered cord syndrome
4. Spinal cord tumour
5. Spinal cord trauma
6. Transverse myelitis
7. Demyelinating Disorders of the spinal cord

### Neurogenic Bladder

Neurogenic bladder manifests as either retention of urine or incontinence or a combination of both. The following types of incontinence are seen in

Neurogenic bladder, explanations follow in the text

- i. Urge Incontinence manifesting as urgency and the urinary leakage even before individual reaches the toilet.
- ii. Over flow incontinence manifesting as involuntary release of urine from an overfull urinary bladder, often in the absence of any urge to urinate.
- iii. Dribbling incontinence, the patient is never dry a continuous leakage of urine is present.
- iv. Note:  
Stress Continence is involuntary release of urine during coughing, straining or laughing is seen in pelvic floor weakness

Post-void dribbling is the phenomenon where urine remaining in the urethra after voiding the bladder slowly leaks out after urination.

### Classification of Neurogenic Bladder :

This is taken from Adult literature in order to facilitate understanding of this complex topic. Many classifications exist the Lapedes classification is given below The following classification of neurogenic bladder (5 types) is based on the location of the neurologic lesion.

**Lapides Classification of Neurogenic Bladder**

Type	Pathogenesis	Possible Etiology	Symptoms
Uninhibited	<b>Injury to cortical regulation of bladder reflex</b>	Stroke, brain tumor, cortical trauma	Normal sensation and motor function, urge incontinence, urinary frequency
Reflex	Damage to spinal cord between sacrum and brainstem	Spinal cord injury, myelomeningocele, transverse myelitis	Poorly coordinated bladder function
Autonomous	Damage to both motor and spinal fibers between bladder spinal cord	Pelvic trauma, low myelomeningocele, surgery	Failure to generate bladder contraction, loss of bladder sensation
Motor	Damage to motor fibers from spinal cord to bladder	Herpes zoster infection, pelvic trauma surgery	Normal sensation, failure of motor function
Sensory	Damage to sensory fibers from bladder to spinal cord	Diabetes mellitus, pernicious anemia, advanced syphilis	No bladder sensation, eventual loss of motor function

**Lapides classification retains some of the older nomenclature, which may ring a bell .**

**1.Uninhibited Bladder**

Lesion in the brain above PMC pontine micturition centre especially if lesion is bilateral . There is reduced awareness of bladder fullness. Cortical inhibitory control of PMC is reduced or lost. Affected individuals show signs of urge incontinence, bladder empties too quickly and frequently. PMC initiates bladder contractions at low volumes , but co ordination between detrusor and sphincters are maintained. ( However voluntary voiding can be initiated and voluntary contraction of Ext ernal sphincter is also possible ) Examples : Stroke, Brain tumour.

**2.Upper Motor Neuron Bladder ( Reflex Bladder in Lapides Classification)**

Typically occurs in Spinal Cord Injury (SCI) , lesions above T10 spinal cord level

Following SCI, a period of spinal shock ensures subsequent to that spinal reflex arc emerges. Micturition is no longer under voluntary control The emerges of spinal reflex arc has the following results

1) Even at small volumes detrusor contraction can

occur – Detrusor hyperreflexia (DH)

2) However there is poor co ordination between Detrusor and External Sphincter with the External Sphincter contracting at same time resulting in Detrusor Sphincter Dysynergia (DSD). This leads to incomplete emptying and residual urine

3. Bladder sensation is not present

4. If Detrusor contractions produce intravesical pressures greater than internal and external sphincter incontinence results. DSD is mainly caused by the loss of inhibitors input from the brain

**3.Lower Motor Neuron Bladder or Autonomous Bladder**

Occurs in Conus Medullaris and Cauda Equina Syndrome . The features are poor or absent contraction of the Detrusor – Detrusor Areflexia with the patient unable to appreciate bladder sensation (extroceptive and proprioceptive sensations are lost) , the net effect is the bladder filling up without emptying ie retention of urine till the viscoelastic properties are overcome , and when intravesical pressures exceed that of the Ext Sphincter , over flow incontinence results. This is a combination of sensory and motor neurogenic bladder. Such a bladder pattern is seen in low meningo

myelocele.

#### 4. Motor Paralytic Bladder or Motor Neurogenic Bladder

This occurs when the motor neurons in the spinal cord or motor efferents to the Detrusor are affected. Examples of the former is Poliomyelitis and the latter is Guillain Barre Syndrome . Absent or weak detrusor contractions , results in retention of urine .Internal sphincter innervations is intact, as sensations are preserved the patient experiences the pain of urinary retention when bladder is distended.

Net effect is Retention of urine with overflow incontinence. Urodynamics reveal normal sensation, normal capacity without the ability to generate bladder contractions

#### 5. Sensory Neurogenic Bladder

Lack of bladder sensation that has led to overfilling of the bladder. Sensory neurogenic bladder is characterized by poor bladder sensation as a result of injury or insult to the afferent nerves in the reflex arc leading to the spinal cord. Loss of sensation allows for the bladder to distend without triggering a reflex bladder contraction. In addition, because the sensation of bladder contraction is carried along the afferent neural pathway, the patient is unaware that the bladder is distended. Over time, gradual stretching of the detrusor muscle leads to detrusor failure and urinary retention and overflow incontinence.

USG reveals Residual Urine Urodynamic study reveals , poorly sensitive bladder with large capacity and impaired contractility.

(However It is to be noted the type of Neurogenic bladder cannot be diagnosed accurately based on the level of lesion. Video urodynamic recording along with Electromyomography is essential to find out filling capacity , detrusor contractility, atonia, hyperreflexia , sphincter tone and its co ordination during voiding and storage. USG is needed to detect residual urinary volumes.)

What follows is a discussion of certain congenital

pediatric conditions with Neurogenic bladder .

#### A. Neural Tube Defects

The Most common cause of Neurogenic bladder in children. It is a result of failure of neural tube to close spontaneously between 3-4th week of intra uterine life. This results in abnormalities of spinal cord including myelo meningocele and meningocele

Urologic manifestations in myelomeningocele are

Urinary incontinence

DSD

VUR

Hydronephrosis

UTI`s/Pyelonephritis

Renal functional deterioration

#### Urodynamic studies reveal the following abnormalities Meningomyelocele

- 1) Bladder may show detrusor hyper reflexia (uninhibited contraction at low volumes)
- 2) Atonia or lack of bladder contraction
- 3) Normal bladder volume with normal bladder contraction
- 4) Bladder compliance or elasticity can be reduced

#### Urodynamic studies of the sphincter show

- 1) Normal tonicity with elasticity during bladder contraction
- 2) Reduced or absent tonicity
- 3) Increased tonicity that increasing during a bladder contraction (DSD) already covered before

#### The two major effects of Neurogenic bladder in Neural tube defects are

1. Renal damage
2. Incontinence

#### Renal Damage:

DSD is the major contributory for renal damage in the following ways

- 1) DSD causes functional obstruction of bladder outlet and high intravesicular pressure which in tube contributing to VUR, Hydronephrosis and Rec UTI
- Treatment Strategies of Neurogenic Bladder in Neural Tube Defects :

1. Anticholinergic drugs – eg Oxybutynin at the



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following doses:

For infants <12 months of age, 0.1 mg/kg orally three times a day (available as Ditropan syrup, 1 mg/mL).

For children one to five years of age, 0.2 mg/kg per dose three times a day (or 1 mg per year of age per dose).

For children 5 years old, we use oxybutynin tablets 5mg orally three times a day.

### 2) Clean intermittent catheterization (CIC)

The goal of CIC is to reduce the risk of urinary tract infection (UTI) and overdistension of the bladder, which can lead to hydronephrosis, vesicoureteral reflux and chronic renal disease. Start early for two reasons, one better outcome, two the earlier you start more the acceptance from the child.

If these measures are not helpful surgical intervention would be needed which included

- 1) Botulinum toxin injection into detrusor
- 2) Cutaneous vesicostomy for severe reflux
- 3) Sphincter dilatation / Botulinum injection
- 4) Augmentation cystoplasty (enlarging bladder and patch of intestine) This intervention allows normal capacity bladder with low bladder pressure and effective drainage of bladder

### Surgical treatment for Persistent incontinence

1. Reconstruction bladder neck surgery
2. Implantation of artificial sphincter
3. Creative of urinary stoma to aid CIC (Mitrofanoff procedure)

### B. Occult spinal dysraphism may present as

### neurogenic bladder

There are Defect in vertebral body fusion with closed spinal cord malformations which are associated with neurogenic bladders. (Note : Spina bifida occulta Denotes posterior vertebral body fusion defect mostly L5 S1 Not associated with spinal cord malformation). It is pertinent to note that Cutaneous lesions in the lumbosacral region are associated with occult spinal dysraphism these are

Lipoma

Dermal sinus

Subcutaneous mass or lipoma

Hairy patch

Vascular lesions

Skin appendages

If cutaneous lesions are identified further evaluation with MRI is warranted

### Closed spinal cord malformations in Occult spinal dysraphism

Syringomyelia

Diastematomyelia

Tethered cord

### Clinical Manifestations

include Urinary urgency, incontinence

Severe generative back pain

Motor and sensory abnormalities of LL

Examination of spine especially the lumbo sacral region becomes an essential part of clinical examination for the Pediatrician to suspect Occult Spinal Dysraphism.