LOWER URINARY TRACT

Bladder has two functions:

**STORAGE**
**EMPTYING**

These require:
- Intact neural system
- Intact detrusor muscle
- Intact outlet
- Compliance

*Neural system* 1. Sensory/motor pelvic nerves - from sacral segments of cord
2. Reflex center in cord to organize sustained bladder contraction with simultaneous opening of outlet (bladder neck + striated)
3. Brain/brain stem to facilitate/inhibit reflex center

*Detrusor muscle*  
Parasympathetic cholinergic control for fundus

*Outlet*  
Sympathetic adrenergic for VN smooth muscle (internal sphincter)
Striated voluntary muscle (external sphincter)
Stable suburethral support

*Compliance*  
Elasticity/muscle relaxation to allow increase in volume without increase in pressure

**STORAGE SYMPTOMS** (“irritative”)  
**EMPTYING SYMPTOMS** (“obstructive”)

<table>
<thead>
<tr>
<th>Storage Symptoms</th>
<th>Emptying Symptoms</th>
</tr>
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<tbody>
<tr>
<td>Frequency</td>
<td>Hesitancy</td>
</tr>
<tr>
<td>Urgency</td>
<td>Decreased stream</td>
</tr>
<tr>
<td>Nocturia</td>
<td>Interruption of stream</td>
</tr>
<tr>
<td>Dysuria</td>
<td>Straining</td>
</tr>
<tr>
<td><strong>Incontinence</strong></td>
<td><strong>Dribbling</strong></td>
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<tr>
<td></td>
<td><strong>Retention</strong></td>
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Disorders of storage and emptying usually related to one or more of the following:

1. Detrusor contracts when it should be relaxed  
   Irritative symptoms, urge incontinence
2. Detrusor relaxes when it should contract  
   Obstructive symptoms, retention
3. Outlet closed when it should be open  
   Obstructive symptoms, retention
4. Outlet open when it should be closed  
   Incontinence, esp stress

**STORAGE PROBLEMS**

**Involuntary Contractions** (Detrusor contracts when it should relax)

1. Neurological  
   Lesion above reflex center (CVA, Parkinson’s, upper spinal cord)
   Multiple sclerosis
2. Inflammation  
   Bacterial infection
   Other inflammation (interstitial cystitis, radiation, cyclophosphamide)
3. Other “local” problems  
   Cancer (esp. ca-in-situ), including invasive from without
   Foreign body
   Cystocele

4. Stress incontinence  
5. Outlet obstruction  
6. Aging  
7. Idiopathic

Impaired compliance and hypersensitivity can lead to same symptoms and can co-exist.

Treatment: 1. **Anticholinergics**
2. Tricyclic antidepressants 
3. Correction of any underlying problem if possible 
4. Sacral Neuromodulation (Interstim) 

**Decreased Outlet Resistance**  
(Outlet open when it should be closed) 

- Stress incontinence  
  a) Pelvic relaxation with hypermobility  
  Rx= bladder neck suspension  
  b) Loss of coaptation, elasticity, & suburethral support  
  (Intrinsic sphincter deficiency)  
  Rx= pubovaginal sling (suburethral support)  
  Topical estrogens  

**EMPTYING PROBLEMS**  

**EMPTYING PROBLEMS**  

**Impaired contractions**  
(Detrusor relaxes when it should contract)  

1. Neurological  
  Cord lesion at or below reflex center  
  Multiple sclerosis  
  Peripheral neuropathy (diabetes, tabes, PA)  
  Nerve injury (extensive pelvic surgery)  

2. Pharmacologic  
  Anticholinergics  
  Drugs with anticholinergic side effects  

3. Prolonged overdistension  
  Obstruction  
  Learned voiding dysfunction  

**Obstruction**  
(Outlet closed when it should be open)  

1. Prostate  
  BPH  
  Prostatitis  
  Carcinoma (late)  

2. Urethral stricture  

3. Pharmacologic  
  Alpha agonists  

4. Fecal impaction  

5. Neurological  
  Detrusor/sphincter dysynergia (MS, quadriplegia)  

**Tools available beyond H&P and routine lab**  

1. Bladder diary  
   I&O, sx associated with voiding, incontinence episodes  

2. Flow rate  

3. Postvoid residual urine  
   Ultrasound or catheter  

4. Cystoscopy  

5. Urodynamics  
   Involuntary contractions  
   Incontinence- stress and urgency  
   Leak point pressure- hypermobility vs ISD  
   Voiding pressure  
   Flow rate  
   Postvoid residual (indirectly)
STORAGE PROBLEMS