Urinary Incontinence

Clinical Cases Applicability: Urinary incontinence, urinary retention

Learning Objectives:

1) Describe the anatomy of the bladder
2) Understand the physiology of normal bladder filling, emptying and continence
3) Understand the autonomic control of the bladder
4) Understand the pathophysiology of urinary incontinence
5) Describe the pharmacology of medications for urge incontinence

Describe the layers of the bladder wall:
1) Mucosa – consists of transitional cell epithelium and lamina propria 2) Submucosa 3) Muscularis – detrusor composed of 3 smooth-muscle “plexiform” layers → allow for rapid expansion 4) Adventitia

What is unique about the transitional cell epithelium? “Umbrella” cell layer – stretches & thins with bladder filling; impermeable to provide urine-plasma barrier; covering the lining is a glycosaminoglycan (GAG) layer → prohibits bacterial adherence and acts as a protective barrier

What are the components of the peripheral nervous system?
Somatic: innervates striated muscle, VOLUNTARY movements
Autonomic: innervates smooth muscle, INVOLUNTARY movements
   - Sympathetic “fight or flight”: acts through epinephrine & norepinephrine on α and β adrenergic receptors
   - Parasympathetic “rest and digest”: acts through acetylcholine (Ach) binding to muscarinic or nicotinic receptors

What is the innervation of the bladder and urethra? Sympathetic: T10-L2, terminates into R & L hypogastric nerves; parasympathetic: S2-S4, pelvic nerves (figure 1)
Bladder dome: parasympathetic muscarinic receptors (contraction, voiding) & sympathetic β receptors (relaxation, storage)
Bladder neck: greater density of sympathetic α receptors (contraction, aids in continence)
Urethral sphincter: composed of striated muscle, somatic innervation through the pudendal N (S2-S4)

What happens in normal storage (figure 2)? ↑ Sympathetic, ↓ parasympathetic
   - Contraction of striated urethral sphincter muscles
   - Sympathetic stimulation w/ NE on (α) contraction of bladder neck; on (β) relaxation of dome
   - Inhibited parasympathetic transmission → decreased detrusor contraction

What happens in normal voiding (figure 2)? ↓ Sympathetic, ↑ parasympathetic
   - Sensation of bladder stretching → efferent impulses from pontine micturition center
   - Voluntary relaxation of striated urethral sphincter
   - Inhibition of sympathetic system → (α) relaxation of bladder neck, (β) decreased relaxation of dome
   - Stimulation of parasympathetic system w/ Ach release → detrusor muscarinic contraction

What are the different types of urinary incontinence? Treatment?
(all types may benefit from weight loss, normalize fluid intake, ↓ bladder irritants (alcohol, carbonation, caffeine), minimize constipation, smoking cessation)
Stress – occurs with increases in intra-abdominal pressure; mechanism: urethral hypermobility from insufficient support tissue vs intrinsic sphincter deficiency; Treatment: Kegel, PT, pessary, urethral bulking agent, midurethral sling
Urge – urge to urinate followed by involuntary leakage, overactive bladder; detrusor overactivity; Treatment: Bladder training, anti-muscarinic agents & β adrenergic agents (relaxes detrusor muscle)
Overflow: continuous leakage or dribbling in the setting of incomplete bladder emptying; Treatment: treat underlying impairment, possible intermittent straight catheterization (i.e. spinal cord injury)

What are side effects of anti-muscarinic agents? Urinary retention, dry mouth, constipation, blurred vision, tachycardia, drowsiness, decreased cognitive function; contraindicated in myasthenia gravis & narrow angle-closure glaucoma
References

- Rickey, LM. Chronic urinary retention in women. In: UpToDate, Post TW (Ed), UpToDate, Waltham, MA. (2017)
- Lukacz ES. Treatment of urinary incontinence in women. In: UpToDate, Post TW (Ed), UpToDate, Waltham, MA. (2018)