

# 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  $\alpha$  and  $\beta$  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  $\beta$  receptors (relaxation, storage)

Bladder neck: greater density of sympathetic  $\alpha$  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 ( $\alpha$ ) contraction of bladder neck; on ( $\beta$ ) 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 → ( $\alpha$ ) relaxation of bladder neck, ( $\beta$ ) 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 &  $\beta$  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

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Figure 1:

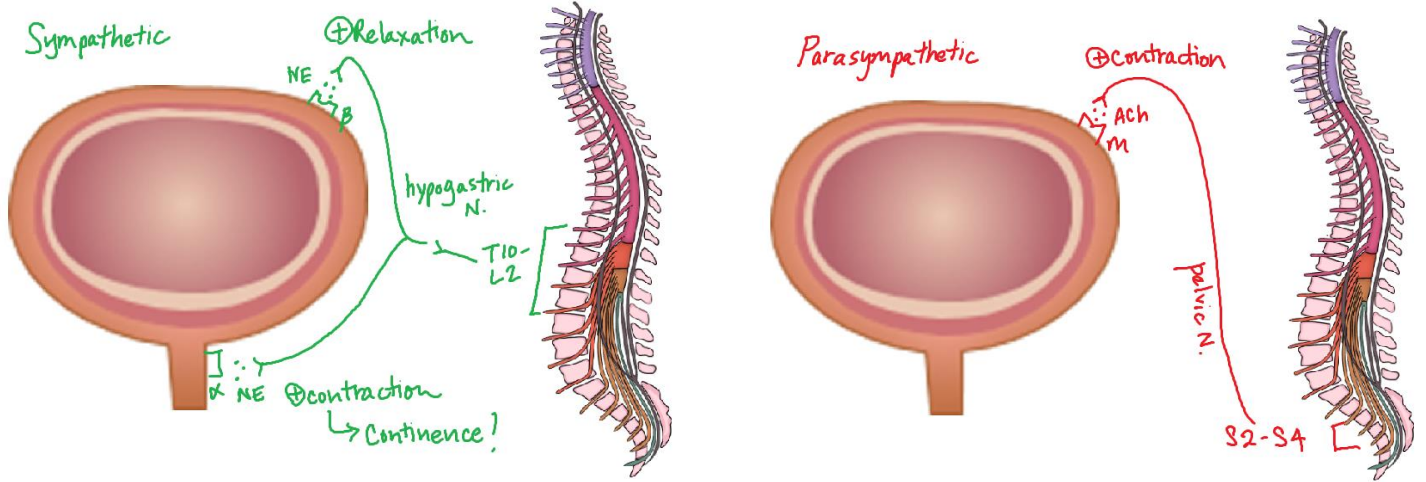
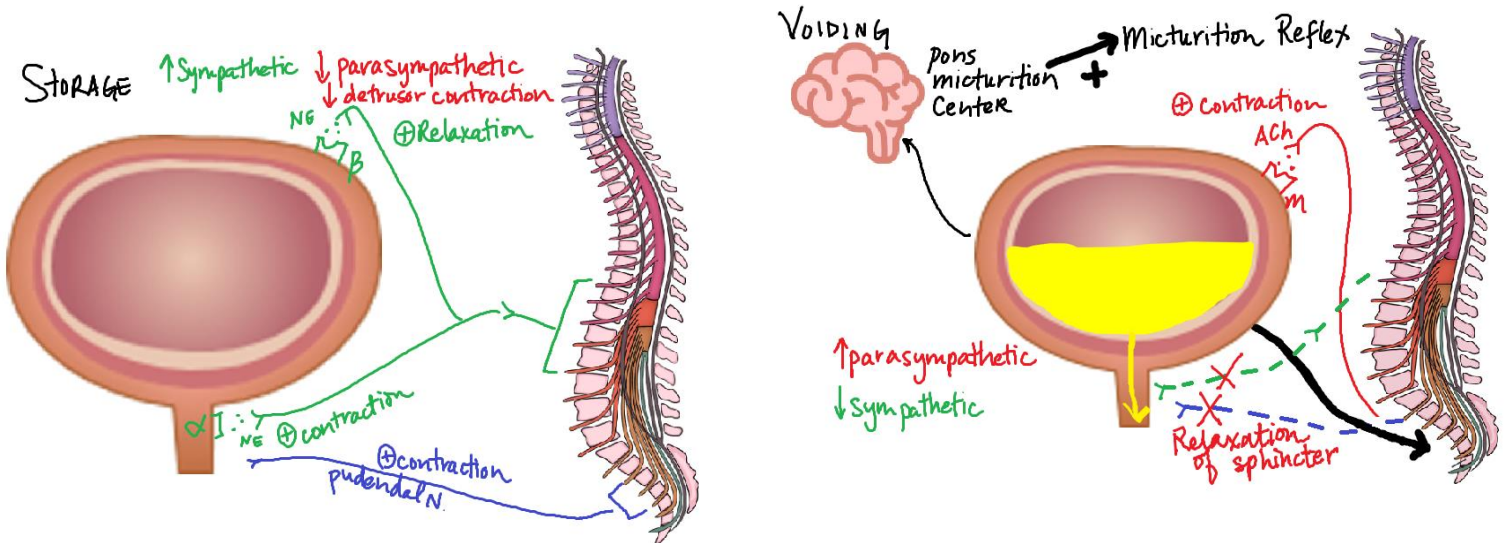


Figure 2:



## References

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