

Update on Urology Focus: Prostate Gland and Bladder

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Overview

- Bladder Function/Dysfunction
- Continence
- Prostate Function/Dysfunction
- Prostate Cancer Screening/Treatments
- Questions



Bladder Function

- The bladder is a hollow muscle;
- Relaxes to fill, and contracts to empty;
- Pressure monitor and not a gas gauge;
- Does its work automatically;
- It is told NOT to do its work by the brain;
- It "lays in wait" for the brain either to be become lulled to sleep (white noise) or go into deep phase sleep.



Bladder/Brain: Functional Anatomy

- The brain's job is to dampen or suppress spontaneous activity, i.e. heart, lung, intestinal;
- The brain is "programmed" to pay attention to changes in intensity of input, i.e. noise, pressure;
- Constant input will be perceived as "non-threatening" and will be put on the back burner, i.e. the waterfall and the branch cracking.



Bladder: Functional Anatomy

- Parasympathetic Nerves -- S2 thru S4 (Cholinergic) controls the bladder musculature;
- Alpha-adrenergic – travelling with pelvic arteries controls the bladder neck (physiologic sphincter);
- Striated musculature – pelvic nerves controls the pelvic floor (anatomic sphincter).

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Bladder Functional Physiology

- The bladder must relax to fill and contract to empty;
- The physiologic sphincter must contract to maintain continence and relax to assure emptying;
- Similarly, the anatomic sphincter must maintain high tone for continence and relax to empty.

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Bladder Functional Physiology

- For optimal emptying, the bladder contracts, timed and coordinated with relaxation of the sphincters;
- For optimal continence, the bladder relaxes timed and coordinated with sustained sphincter contraction;
- Synergy: $1 + 1 > 2$.

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Bladder Functional Physiology

- Brain and Upper Motor Neurons DAMPEN;
- Lower Motor Neurons STIMULATE;
- Reflex arc has a motor and a sensory limb;
- Remember: S2 – S4, **BUT** the conus medularis is at L1 – L2 and as such, deficits may not correlate totally with bony structure injury.

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Bladder Dysfunction: Examples

- Brain and Central Nervous System
 - Stroke
 - Parkinson's Disease
 - Multiple Sclerosis
 - Trauma
 - Myelomeningocele
 - C.N.S. "Senility"



Bladder Dysfunction: Examples

- Lower Motor Neuron
 - Diabetes Mellitus
 - Trauma



Bladder Dysfunction: Examples

- End Organ
 - Inflammatory conditions, i.e. infection;
 - Extrinsic compression, i.e. pregnancy;
 - Response to outflow obstruction, i.e. the "Arnold Schwarzeneger Conditon;"
 - Patient induced: infrequent voiding, dysfunctional voiding; ingestion, i.e. H2O and EtOH;
 - Iatrogenic - clinician caused.



Bladder Dysfunction: Examples

- Iatrogenic Bladder Dysfunction
 - Outflow: alpha-adrenergics, i.e. cold preparations;
 - Bladder Relaxants: anti-cholinergics, i.e. anti-depressants, anti-psychotics.



Bladder Dysfunction: Summary

- Brain;
- Upper Motor Neuron vs. Lower Motor Neuron;
- Principle of a reflex arc;
- Voiding synergy:

TONE	CHOLINERGIC	ALPHA-ADRENERGIC	STRIATED SPHINCTER
FILLING	LOW	HIGH	HIGH
EMPTYING	HIGH	LOW	LOW

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Urinary Continence

- Mandates the bladder:
 - Is served by an intact neurologic system;
 - Serves as adequate reservoir;
 - Adequately empties;
 - Has adequate physiologic sphincter support;
 - Has adequate anatomic sphincter support.

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Urinary Continence

- Principles of anti-incontinence (anatomic)
 - Bladder function is optimal (filling and emptying);
 - Pouiselle's Law: resistance to flow directly related to length and inversely related to the fourth power of the radius;
 - The bladder and urethra maintain a reasonable angle to allow coaptation to assist with dryness, aka the sigmoid colon.

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Urinary Continence

- Incontinence is resultant when:
 - The bladder cannot serve as a low-pressure reservoir – either at low or high volumes;
 - The urethra becomes an accordion;
 - The urethra becomes a non-compliant tube.

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Urinary Incontinence Treatments

Hypotonic, Large Capacity States: Timed-double voiding, ICC;

Hypertonic, Small Capacity States: Addressing outflow obstruction: i.e. BPH; or high pressure voiding, i.e. post menopausal urethral conditions, with anti-cholinergics (Detrol, Vesicare, Enablex);

Normo-tonic States with Loss of Anatomic Support

Stress incontinence treatments, i.e. Slings; or, Urethral Bulking Agents;

Dysfunctional Voiding States: Musculo-Pelvic Floor Re-training, i.e. "Biofeedback" is like putting your key in the keyhole when you have to really go!



The Prostate Gland:

- Function:
 - Provides approximately half by volume of the ejaculate for nutrient support and "bolus";
 - Provides, by its millieu, protection to the bladder from infection;
 - ?



The Prostate Gland:

- Function:
 - Provides approximately half by volume of the ejaculate for nutrient support and "bolus";
 - Provides, by its millieu, protection to the bladder from infection;
 - **Helps Urologists to pay for their kids' college educations!**



The Prostate Gland:

- The prostate is like an orange: central adenoma and peripheral compressed surgical capsule;
- It's growth configuration may be simply circumferential; or it may be nodular (i.e. re-growth post-TURP; or it may be like a baffle-valve (i.e. median lobe);
- All result in: "The Arnold Schwarzeneger Phenomena" of high-pressure voiding.



The Prostate Gland: Voiding Dysfunction

- While the prostate is the problem, it's the bladder rendering symptoms:
 - High pressure at rest yields frequency;
 - White noise renders urgency;
 - Deep sleep renders nocturia;
 - Obstruction renders incomplete emptying compounding the above.

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The Prostate Gland: Voiding Dysfunction

- However, the bladder neck musculature, if constricting, can render similar symptoms

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The Prostate Gland/Voiding Dysfunction Rx Treatments

- “R” drugs: **Shrinkers**
 - i.e. Proscar and Avodart;
 - Best used for larger prostates.
- “X” drugs: **Relax**
 - i.e. doxazosin, Flomax, Uroxatral; rule-breaker: terazosin.
 - Best used for smaller prostates.
- Combination Therapy
 - Best used for prostates in transition.

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The Prostate Gland/Voiding Dysfunction Surgical Treatments

- Minimally Invasive Therapies: Small
 - TUMT, TUNA;
- Surgical (endoscopic): Moderate
 - Laser Vaporization, Button Vaporization, TURP;
- Surgical (open): Large (or other pathology, i.e. bladder stone or diverticulum)
 - Supra- or Retro-Pubic Prostatectomy.

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The Prostate Gland: Cancer Screening

- Cancer Screening
 - Rectal alone: 70% accurate;
 - PSA alone*: 70% accurate;
 - Together, if normal: 92-95% accurate.

- * PSA should not be done within 48 hrs. of ejaculating, within 7 – 10 days of ANY rectal probing; or within 3 mos. of a bout of prostatitis or urethral catheterization.

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The Prostate Gland: Cancer Screening and the PSA

- Timing (previous slide);
- Age-adjusted PSA;
- Change in PSA over change in time: <0.8 ng./ml. per year;
- If between age-adjusted and 10 ng./ml., recommend a Free/Total Ratio PSA;
- > 10 ng./ml. warrants biopsy.

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The Prostate Gland: Cancer Screening

- Cancer Screening
 - Rectal alone: 70% accurate;
 - PSA alone*: 70% accurate;
 - Together if normal: 92-95% accurate;
- Biopsy if either is abnormal: 95% accurate;
- 2nd Set of Biopsies, i.e. PSA continues to rise, 98+% accurate.

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The Prostate Gland: Cancer Screening and P.I.N.

- P.I.N. (prostatic intra-epithelial neoplasia);
- Normal -> Atypia -> P.I.N. -> Cancer
 - I -> II -> III 1 -> 5
- P.I.N. increases likelihood of an occult carcinoma and warrants more stringent screening;

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Prostate Cancer

- What if we do nothing: With a setting of no clinical problems and initial suspicion is elevated PSA.
 - Cell doubling time of roughly 4 mos.;
 - On average, 5 – 8 years from diagnosis until clinical issues, i.e. pathologic fracture, retention, hematuria, etc.;
 - Rescued, i.e. by anti-androgen treatments, on average 5 – 8 years before decline.;
 - 5 years until death.

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Prostate Cancer

- That is a FAR CRY difference than doing nothing and giving the patient a sense that they will incur no untoward outcome.
- Morbidity of a non-treatment option must be fully discussed and should be tailored to age-dependency.

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Prostate Cancer: Rx Treatments

- Rely on hormonal receptiveness*
- LH-RH agonist Therapies: i.e. Lupron, Eligard; alone or in combination;
- Androgen Receptor Blockade: i.e. Flutamide; alone or in combination;
- Experimental Protocols of Chemotherapy
- *Increasing understanding of significant morbidity assoc. with low testosterone.

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Prostate Cancer: Treatments

- External Beam Radiation;
- Brachytherapy (Seed);
- Surgical Extirpation
 - Open (Retropubic or Perineal)
 - Laparoscopic
 - Robotic-assisted Laparoscopic;
- *Treatment is always balanced between the “no treatment” option weighed against life-expectancy for age.

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Robotic-Assisted Laparoscopic Radical Prostatectomy

- Provides: 3-D Laparoscopy and Improved optics;
- Shorter hospital stays and less overall morbidity;
- Improved continence and potency* (In my opinion) for a larger patient population.
- Is a TOOL and not a TREATMENT.



One final thought:

- The difference between a good clinician and an excellent clinician is ?



One final thought:

- The difference between a good clinician and an excellent clinician is:
 - An attentiveness to detail;
 - And, compulsivity to follow things through to completion.
- Thank you for your attention to my details and listening until the completion of my talk!

