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ERECTILE DYSFUNCTION, PEYRONIE'S DISEASE, MALE INFERTILITY, & HYPOGONADISM/HORMONE REPLACEMENT (WITH SUPPLEMENTAL MATERIAL ON PRIAPISM, PREMATURE EJACULATION, & VASECTOMY/STERILIZATION)

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Overview of This Presentation

- Erectile Dysfunction
- Peyronie's Disease
- Male Infertility
- Hypogonadism/Hormone Replacement
- I have provided supplemental syllabus material addressing the following topics, but these will not be discussed due to time constraints:
  - Premature Ejaculation
  - Priapism
  - Vasectomy/Sterilization

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Erectile Dysfunction

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Erectile Dysfunction

"The inability to achieve or maintain an erection sufficient for satisfactory sexual performance."

- Important to distinguish from issues with:
  - Libido
  - Ejaculation
  - Orgasm
  - Genital pain

Impotence. NIH Consensus Statement, 10: 1, 1992

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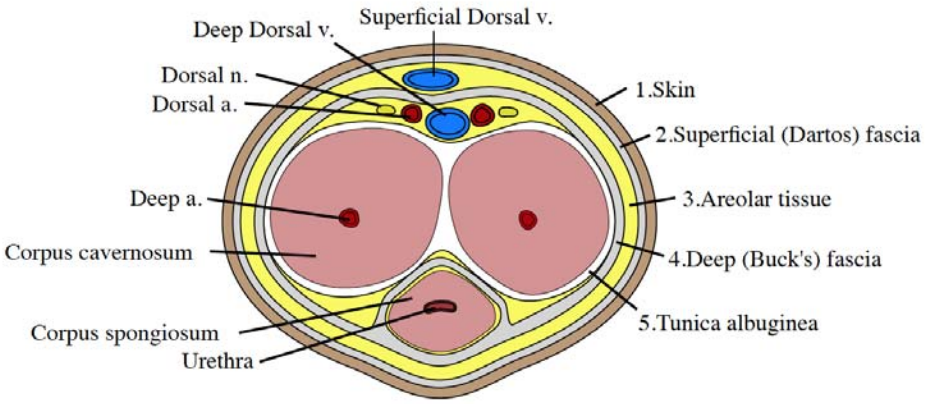
Erectile Function



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Erectile Function
Central Nervous System

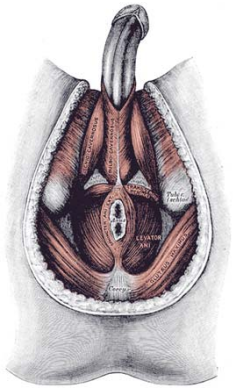
- Hypothalamus:
  - Medial preoptic area, lateral preoptic area, paraventricular nucleus
  - Integration and processing of afferent inputs (visual, olfactory, genital stimulation, imaginative)
- Hippocampus:
  - Integration and processing of afferent inputs (visual, olfactory, genital stimulation, imaginative)
- Forebrain:
  - Medial amygdala
  - Control of sexual motivation

Erectile Function
Central Nervous System

- Sympathetic Spinal Cord Center (T_{11}-L_2):
  - Psychologically activated center
  - Run via hypogastric nerves to corpus cavernosa
- Parasympathetic Spinal Cord Center (S_{2-4}):
  - Main mediator of erection; reflex activated center
  - Efferent fibers run via the nervi erigentes and then the short adrenergic nerves

Penile Functional Anatomy

- Corpus cavernosa:
  - Provide support to corpus spongiosum and glans
- Corpus spongiosum:
  - Pressurizes urethra, facilitating semen expulsion
- Glans penis:
  - Facilitates intromission, sensory input for erection
- Ischiocavernous muscle:
  - Contracts to enhance penile rigidity.
- Bulbocavernous muscle:
  - Contracts bulb, facilitating semen expulsion



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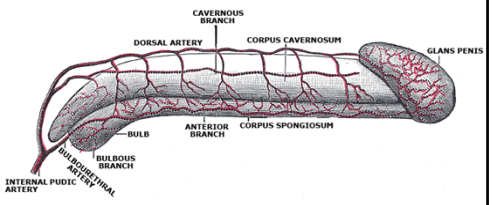
Penile Arterial Blood Supply

- **Internal Iliac Artery**
- **Internal Pudendal Artery**
- **Common Penile Artery**

Dorsal A. **Cavernous A.** **Bulbourethral A.**



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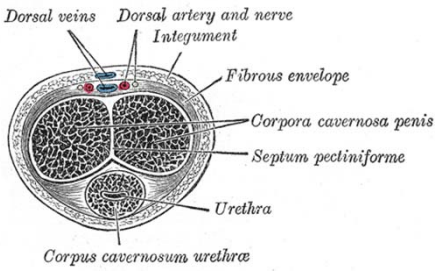
Sexual Stimulation

- Cavernous nerve terminals release neurotransmitters (Nitric oxide)
- Cyclic GMP formation
- Cavernous smooth muscle relaxation
- Artery and arteriole dilation
- Expanding sinusoids compress subtunical veins
- Venous outflow declines
- Increase in intracavernosal pressure (~ 100 mmHG)



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Penile Smooth Muscle Contraction

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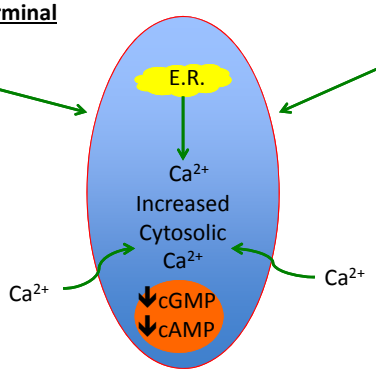
Penile Smooth Muscle Cell Contraction

Sympathetic Nerve Terminal
-Norepinephrine

Endothelium Cells
-Endothelins
-Angiotensin II
-Prostaglandin $F_{2\alpha}$



E.R.: Endoplasmic Reticulum
cGMP: Cyclic Guanosine Monophosphate
cAMP: Cyclic Adenosine Monophosphate

Penile Smooth Muscle Relaxation

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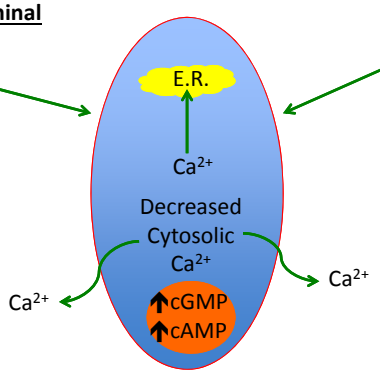
Penile Smooth Muscle Cell Relaxation

Cavernous Nerve Terminal
-Nitric Oxide

Endothelium Cells
-Nitric Oxide



E.R.: Endoplasmic Reticulum
cGMP: Cyclic Guanosine Monophosphate
cAMP: Cyclic Adenosine Monophosphate

The Smooth Muscle Cycle

- Cavernosal smooth muscle relaxation is essential for erection
- NO released by cavernous nerves initiates erection
- NO released from endothelial cells maintains erection
- Low levels of cytosolic Ca^{2+} favor erection
- When cGMP degraded by PDE, cavernous muscle tone returns (contracted)

cGMP: Cyclic Guanosine Monophosphate
PDE: Phosphodiesterase

Erectile Dysfunction: Prevalence

- Massachusetts Male Aging Study (40-70 yo men)
  - Complete ED: 5.1% ➔ 15 %
  - Moderate ED:17% ➔ 34%
  - Mild ED: 17% ➔ 17%

Feldman HA, Goldstein I, Hatzichristou DG et al. Impotence and its medical and psychosocial correlates: results of the Massachusetts male aging study. *J Urol.* 1994;151(1):54-61.

Erectile Dysfunction Risk Factors

- General Health Status
- Diabetes Mellitus
- Cardiovascular Disease
- Other GU Disease
- Psychiatric/Psychological Disorders
- Socioeconomic Conditions
- Smoking
- Medications
- Hormonal Factors

Classification of Male Erectile Dysfunction: Organic

1. Vasculogenic
   A. Arteriogenic
   B. Cavernosal
   C. Mixed
2. Neurogenic
3. Anatomic
4. Endocrinologic

International Society of Impotence Research Classification of Male Erectile Dysfunction, 1999

Classification of Male Erectile Dysfunction: Psychogenic

1. Generalized
   A. Generalized Unresponsiveness
      a. Primary or aging-related lack of arousability
   B. Generalized Inhibition
      a. Chronic disorder of sexual intimacy
2. Situational
   A. Partner-Related
   B. Performance-Related
   C. Psychological Distress or Adjustment Related

International Society of Impotence Research Classification of Male Erectile Dysfunction, 1999

Erectile Dysfunction: Psychogenic

- Proposed Mechanisms:

1. Exaggerated suprasacral inhibition of the spinal erection center by the brain

2. Excessive CNS sympathetic outflow
   (↑ penile smooth muscle tone)

3. Elevated peripheral catecholamine levels
   (↑ penile smooth muscle tone)

Erectile Dysfunction: Neurogenic

- Can occur due to any process affecting the brain, spinal cord, cavernous nerves, pudendal nerves.
  - Parkinson disease
  - Stroke
  - Encephalitis
  - Temporal lobe epilepsy
  - Tumors
  - Dementia
  - Trauma
  - Myelitis
  - Pelvic Fracture

Erectile Dysfunction: Neurogenic

- In men with spinal cord injury, effects depend on *nature*, *location*, and *extent* of injury.
- *Reflexogenic erections* are mediated by pathways in the sacral spinal cord and involve parasympathetic nervous system.
  - 95% of men with complete upper motor neuron (UMN) lesions are able to achieve a reflexogenic erection.
  - 12% of men with complete lower motor neuron (LMN) lesions are able to achieve a reflexogenic erection.
- *Psychogenic erections* are mediated by cortical stimuli and both sympathetic and parasympathetic centers in the spinal cord.
  - 9% of men with complete UMN are able to achieve psychogenic erections.
  - 24% of men with complete LMN lesions are able to achieve psychogenic erections.

Monga M, Bernie J, Rajasekaran M. Male infertility are erectile dysfunction in spinal cord injury: a review. *ArchPhys Med Rahabil* 1999;80:1331-9.

Erectile Dysfunction: Endocrinologic

- Testosterone:
  - Enhances sexual interest
  - Increases frequency of sexual activity
  - Increases the frequency of nocturnal erection
  - Little to no effect on fantasy- and visually-induced erections
- Many men with low testosterone have no symptoms.
- Threshold level of testosterone to maintain nocturnal erections ~ 200 ng/dL

Mulligan T, Schmitt B. Testosterone for erectile failure. *J Gen Intern Med.* 1993;8(9):517-21.
Granata ARM, Rochira V, Lerchil A, et al. Relationship between sleep-related erections and testosterone levels in men. *J Androl* 1997;18(5):522-7.

Erectile Dysfunction: Endocrinologic

- Hyperprolactinemia:
  - Pituitary adenoma, medications
  - ↑ Prolactin causes GnRH inhibition and ↓Testosterone
  - Low libido
  - ED
  - Galactorrhea
  - Gynecomastia
  - Many men with low testosterone have no symptoms
- Hyperthyroidism
  - More commonly low libido than ED
- Hypothyroidism
  - Low testosterone levels

Mulligan T, Schmitt B. Testosterone for erectile failure. *J Gen Intern Med.* 1993;8(9):517-21.
Granata ARM, Rochira V, Lerchil A, et al. Relationship between sleep-related erections and testosterone levels in men. *J Androl* 1997;18(5):522-7.

Erectile Dysfunction: Arteriogenic

- Occlusion of:
  - Hypogastric➔Internal Pudendal➔Cavernous➔Helicine system
- Decreased perfusion pressure and arterial flow
- Most commonly a component of generalized atherosclerotic disease
- Can be a result of blunt pelvic or perineal trauma

Erectile Dysfunction: Arteriogenic

- Risk Factors:
  - Hypertension
  - Hyperlipidemia
  - Cigarette smoking
  - Diabetes mellitus
  - Blunt perineal or pelvic trauma
  - Long distance (not recreational) cycling

Erectile Dysfunction: Venogenic

- Inadequate venous occlusion during erection
- Can result from:
  - Degenerative/Traumatic tunica albuginea changes
    - Peyronie's disease
    - Age-related
    - Penile fracture
  - Fibroelastic structural changes in penis
  - Insufficient trabecular smooth muscle relaxation
  - Formation of venous shunts
    - Procedures for Priapism

Erectile Dysfunction: Drug-Induced

- Although ED is listed as a possible side effect for most *antihypertension drugs*, recent studies contradict this:

Medication	Effects on Erectile Function	Mechanism
Ca^{2+} Channel Blocker	None	N/A
Angiotensin Converting Enzyme Inhibitor	None	N/A
β_1-Blocker (selective)	None	N/A
β-Blocker (nonselective)	ED	Prejunctional α_2 receptor inhibition
α_1-Blocker	Lowers ED rate	N/A
α_2-Blocker	ED	Central α_2 receptor inhibition
Diuretics	ED	Not known

The management of erectile dysfunction. An Update. Erectile Dysfunction Guideline Update Panel. 2007.

Erectile Dysfunction: Drug-Induced

- Psychotropic Medications are linked to ED:
  - Antidepressants
    - Tricyclic (TCA)
    - Monoamine oxidase inhibitor (MAO)
    - Selective serotonin reuptake inhibitors (SSRI)
  - Antipsychotics
- At this time, anxiolytics and anticonvulsants have *not* been convincingly linked to ED.

Erectile Dysfunction: Antiandrogens

- Antiandrogens act by inhibiting production of the androgen receptor *or* blocking androgen receptor function
- LHRH agonists and LHRH antagonists are linked to loss of libido *and* onset of ED

Erectile Dysfunction: Other Agents

- Opiates:
  - Via hypogonadotropic hypogonadism (decreased LH)
- Antiretroviral agents:
  - 46% prevalence of ED for men taking these medications
- Tobacco:
  - Vasoconstriction and penile venous leakage
  - Dose-response association
- Alcohol:
  - Central sedation
  - Decreased libido

Erectile Dysfunction: Other Factors

- Aging:
  - Most important overall factor
  - Aging changes can impact CNS regulation, hormonal function, neuronal function, penile anatomy/function.
- Diabetes Mellitus (DM):
  - ED is 3 times more common in men with DM
  - ED occurs at an earlier age in men with DM
  - DM can impact CNS function, testosterone production, peripheral nerve, smooth muscle & endothelial function
- Metabolic Syndrome (MS):
  - 27% prevalence of ED
  - ED prevalence rises with increasing # of MS components
- Chronic Renal Failure:
  - 45-55% of men on dialysis have ED
  - Uremia linked to elevated prolactin, low testosterone secretion, atherosclerotic disease progression
  - Increased rate of autonomic neuropathy

ED Evaluation "Standard"

- An *in person* history, physical examination, lab tests:
- History:
  - Sexual, medical, psychosocial histories
  - Determine comorbid conditions/risk factors
  - Partner's sexual history, needs
- Physical Examination:
  - Abdomen, penis, testes, secondary sexual characteristics, lower extremity pulses
- Laboratory Testing:
  - Serum chemistry, Fasting glucose, CBC, Lipid profile, Serum testosterone
  - Prolactin and thyroid tests at clinician's discretion

The management of erectile dysfunction. An Update. Erectile Dysfunction Guideline Update Panel. 2007.

The International Index of Erectile Dysfunction

- Self administered survey (15-items)
- Cross culturally validated
- Linguistically validated in 10 languages
- Five domains:
  - Erectile function
  - Orgasmic function
  - Sexual desire
  - Intercourse satisfaction
  - Overall satisfaction

Rosen RC, Cappelleri JC, Smith MD, et al. Development and evaluation of an abridged, 5-item version of the International Index of Erectile Function (IIEF-5) as a diagnostic tool for erectile dysfunction. *Int J Impot Res*. 1999 Dec;11(6):319-26.

ED Treatment Options

Standard:

- Consider organic comorbidities and psychosexual dysfunctions.
- Appropriately manage or triage their care.
- Therapies:
  - Oral phosphodiesterase type 5 (PDE5) inhibitors.
  - Intraurethral alprostadil.
  - Intracavernous vasoactive drug injection.
  - Vacuum constriction device.
  - Penile prosthesis implantation.
  - Psychosexual counseling.
  - Endocrine therapy for definite endocrinopathies

The management of erectile dysfunction. An Update. Erectile Dysfunction Guideline Update Panel. 2007.

ED Treatment in Setting of CV Disease

- ED and CV Disease Share Common Etiologies:
  - Atherosclerosis
  - Endothelial dysfunction
- Major Risk Factors Associated with CV Disease:
  - Age, HTN, DM, Obesity, Smoking, Dyslipidemia, Sedentary Lifestyle
  - Patients with ≥ 3 risk factors have ↑ risk MI during sex
- Use Princeton Guidelines:
  - Assign patient *to risk level* based on risk factors
  - High Risk, Low Risk, Indeterminate Risk
  - Patients with *indeterminate risk* need additional cardiac workup to facilitate proper categorization

The management of erectile dysfunction. An Update. Erectile Dysfunction Guideline Update Panel. 2007.

ED Treatment in Setting of CV Disease

- Princeton Consensus Panel Guidelines:
  - **High Risk:**
    - Unstable/refractory angina
    - Uncontrolled HTN
    - CHF Class III or IV, MI
    - Cardiovascular accident in prior two weeks
    - High-risk arrhythmias
    - Hypertrophic obstructive or other cardiomyopathies
    - Moderate-to-severe valvular disease
  - **Patient with *High Risk* should *not* be treated for ED until cardiac condition has stabilized.**

The management of erectile dysfunction. An Update. Erectile Dysfunction Guideline Update Panel. 2007.

ED Treatment in Setting of CV Disease

- Princeton Consensus Panel Guidelines:
  - **Low Risk:**
    - Asymptomatic CAD
    - < 3 risk factors for CAD (excluding gender)
    - Controlled HTN
    - Mild, stable angina
    - Successful coronary revascularization
    - Uncomplicated past MI
    - Mild valvular disease
    - CHF (Left ventricular dysfunction and/or NYHA Class I)
  - **Patients with *Low Risk* can be considered for *all* first line therapies**

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ED Treatments

Standard

- "Oral phosphodiesterase type 5 inhibitors, unless contraindicated, should be offered as a first-line of therapy for ED."
- Sildenafil, tadalafil, vardenafil, avanafil.
- No valid, comparative outcomes data exists.

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PDE5 Inhibitor Pharmacokinetics and Side Effects*

Name	T_{max}	Onset of Action	Duration of Action	$T_{1/2}$	Unique Side Effects
Avanafil	½ hour	15 minutes	6 hours	3-5 hours	Back Pain
Sildenafil	1 hour	30-60 minutes	12 hours	4 hours	Visuals Side Effects
Tadalafil	2 hours	15-45 minutes	36 hours	17 ½ hours	Back Pain
Vardenafil	1 hour	15-30 minutes	12 hours	4-5 hours	Prolonged QT Interval, Visual Side Effects

*All four have possible headache, facial flushing, nasal congestion, and dyspepsia side effects.

PDE5 Inhibitors and Nitrates

Standard:

"Phosphodiesterase type 5 inhibitors are *contraindicated* in patients who are taking organic nitrates."

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Alprostadil Intra-Urethral Suppositories

Standard:

- The initial trial dose should be administered under healthcare provider supervision due to the risk of syncope.
- Hypotension risk (3%).
- Synthetic vasodilator that is identical to Prostaglandin E1 (PGE1).
- Studies assessing combination therapy (PDE5-inhibitors, Vacuum Erection Device) show greater efficacy over monotherapy, but more studies are needed.

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Intracavernosal Vasoactive Drug Injection Therapy

Standard:

- The *initial trial dose* of intracavernous injection therapy should be administered under *healthcare provider supervision.*
- Physicians prescribing this therapy should:

  1. Inform patients of the potential occurrence of prolonged erections (> 4 hours).
  2. Have a plan for urgent treatment of prolonged erections.
  3. Inform the patient of the plan.

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Vacuum Constriction Device

- Recommendation:
  - "Only vacuum constriction devices containing a vacuum limiter should be used by patients."
  - The feature limits penile damage due to excessively high pressure.
  - Devices are low cost and effective, but low patient acceptability limits use of this therapy.

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Other Therapies

- Recommendations:
  - "Testosterone therapy is *not* indicated for the treatment of erectile dysfunction in the patient with a normal serum testosterone level."
  - "Yohimbine is *not* recommended for the treatment of erectile dysfunction."
  - "Herbal therapies are *not* recommended for the treatment of erectile dysfunction."

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Surgical Therapies: Penile Prosthesis Implantation

- Standard:
  - The patient and his partner (when possible) should be informed of:
    A. The *types* of prosthesis available
       1. Malleable (i.e. "Semi-rigid prosthesis")
       2. Inflatable
    B. This *possible risks* of:
       1. Infection
       2. Erosion
       3. Mechanical failure (6-16% over 5 years)
       4. Need for reoperation
       5. Penile shortening
       6. Pump displacement
       7. Autoinflation

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Modifications to Decrease Risk of Penile Prosthesis Complications

- Antibiotic coating (rifampin & minocycline)
  - To decrease risk of infection
- Hydrophilic coating
  - To decrease risk of infection
- Lockout valve
  - To decrease the risk of autoinflation.

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Penile Prosthesis and MRI Imaging

- MRI *contraindicated* in patients with a *ferromagnetic* implant due to risk of device:
  - Dislodgement
  - Excessive heating
  - Electrical current induction
- Two models are not MRI compatible, and *both are no longer manufactured:*
  - OmniPhase prosthesis
  - Duraphase prosthesis
- **Currently in the US, *no* manufacturer produces penile implants that have MRI contraindications**

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Penile Prosthesis Surgery

- Standard: "Prosthetic surgery should *not* be performed in the presence of systemic, cutaneous, or urinary tract *infection.*"
- Standard: "Antibiotic providing Gram-negative and Gram-positive coverage should be administered *preoperatively*."
- Antibiotics are administered *before* the incision is made and usually continued *24-48 hours* postoperatively.
- Shaving should be done *immediately prior* to surgery. Shaving earlier can result in skin cuts and infection.

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Penile Venous Reconstructive Surgery

- Recommendation: "Surgeries performed with the intent to limit the venous outflow of the penis are *not* recommended."
  - Surgical management of veno-occlusive disease is *not* effective.
  - Difficult to discern:
    - Anatomical area involved with venous leak.
    - Preponderance of venous vs. arterial dysfunction.
  - There is *no* evidence from RCT's that documents a standardized approach to the diagnosis or the efficacy of treatment for veno-occlusive ED.

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Penile Arterial Reconstructive Surgery

- Option: "Arterial reconstructive surgery is a treatment option *only* in healthy individuals with recently acquired ED secondary to a *focal arterial occlusion* and in the absence of any evidence of generalize vascular disease."
  - Technique most commonly involves anastomosis of inferior epigastric artery to dorsal penile artery, less commonly dorsal penile vein.
  - Data showing efficacy of this surgery is *lacking*.

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ARS-Q1

A 50 yo male with new onset erectile dysfunction has failed all four PDE5-inhibitor agents. He has no morning erections, and his libido is decreased. His serum testosterone level is 400 ng/dL. The best treatment option is:

A. Topical testosterone gel therapy.
B. Inflatable penile prosthesis.
C. Alprostadil intracavernosal injection therapy.
D. Penile stem cell therapy.
E. Penile venous ligation.

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Answer: C

A 50 yo male with new onset erectile dysfunction has failed all four PDE5-inhibitor agents. He has no morning erections, and his libido is decreased. His serum testosterone level is 400 ng/dL. The best treatment option is:

A. Topical testosterone gel therapy.
B. Inflatable penile prosthesis.
C. Alprostadil intracavernosal injection therapy.
D. Penile stem cell therapy.
E. Penile venous ligation.

The next best option is intracavernosal injection therapy with a vasoactive agent such as alprostadil. This approach is second line therapy after failure of PDE5-inhibitor therapy.

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Peyronie's Disease

Peyronie's Disease

- "An *acquired* penile abnormality characterized by fibrosis of the tunica albuginea, which may be accompanied by *pain, deformity, ED, and/or distress."*
  - Prevalence ranges from 0.5% - 20.3% (variable patient populations studied).
  - The higher rates reported in more recent studies more likely reflect greater awareness.

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.
https://creativecommons.org/licenses/by/3.0/deed.en; Peter Maier, No changes made. 2014.

Peyronie's Disease: Pathophysiology

- Acquired inflammatory disorder of tunica albuginea.
- Microvascular trauma to the penile shaft associated with buckling of erect or semi-erect penis.
  - Elastase release
  - Replacement of tunical collagen: Type 1 ➔ Type 3
  - Scarring and curvature

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Natural History

- Pain at presentation:
  - 89% have complete resolution of pain
- Curvature at presentation:
  - 12% had improvement in curvature
  - 40% remain stable
  - 48% had worsened curvature
- Plaque volume:
  - 96% increased (greatest among men < 45 yo).

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Natural History

- Emotional distress:
  - Up to 81% of men have emotional distress with PD diagnosis.
  - Up to 48% of men have moderate to severe depression.
  - 54% of men report relationship difficulties as a result of PD
  - Decrease in sexual confidence, sense of masculinity, sexual satisfaction
- Most patients do *not* recall an event or injury linked to onset of PD

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Natural History

- Penis is *usually* still firm enough for intercourse.
- Penile plaques are *usually not* palpable when the penis is *not* erect initially.
- **The recent onset of *penile curvature*, *penile pain without a palpable abnormality*, in non-erect state is diagnostic.**

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Differential Diagnosis

- Congenital penile curvature
- Thrombosed or torn dorsal penile vein
- Penile fracture
- Primary penile cancer
- Metastatic cancer to the penis
- Penile sarcoma
  - penile epithelioid sarcoma
  - leiomyosarcoma

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Active vs. Stable Disease

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Active Disease:

- *Dynamic* and *changing* symptoms
- **"Penile and/or glanular pain or discomfort with or without erection is the defining symptom of the active stage."**
- Patient *may or may not* have penile induration.
- Plaques *may not* be fully developed at this stage.
- Erectile dysfunction *may* be intact or impaired.

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Active vs. Stable Disease

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Stable Disease:

- Symptoms have been quiescent or unchanged for at least three months.
- "Stable disease" means that the deformity is no longer progressive.
- Curvature may be *uniplanar* or *biplanar*.
- Most common plaque location is *dorsal mid-shaft*.
- ED may be present in 33% of affected patients.
- >50% of men with PD state that ED predated PD.

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Guidelines Panel Approach

- Peyronie's Disease is a *symptoms complex*
- "There is no agreed upon minimal curvature necessary prior to intervention."
- Median baseline curvature from published studies is 48°.
- Guidelines panel reviewed all therapies:
  - Oral
  - Topical
  - Intralesional
  - Mechanical
  - Combination
  - Surgical therapies

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Guidelines Panel Approach

- **Aim to ensure that patients were *not* offered treatments that *lack efficacy*.**
- Use of these treatments could preclude use of therapies with *proven* effectiveness.
- The threshold for categorizing treatments as *lacking efficacy* was relatively *low*.
- The threshold for categorizing treatment as *efficacious* was relatively *high*.

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Treatment

- Clinicians may offer non-steroidal anti-inflammatory medications to patients suffering from ***active*** Peyronie's disease who are in need of ***pain management***.
- Patients should ***not*** be offered oral therapy with:
  - Vitamin E
  - Tamoxifen
  - Procarbazine
  - Omega-3 fatty acids
  - Combination of Vitamin E with L-Carnitine
- Clinicians should ***not*** offer electromotive therapy with verapamil.

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Intralesional Collagenase Clostridium Histolyticum

- Clinicians may offer Intralesional Collagenase Clostridium Histolyticum in combination with modeling by the clinician and patient for reduction of penile curvature in patients with:
  - Stable Peyronie's Disease
  - Penile curvature is >30° and <90°
  - Intact erectile function (with or without the use of medications)
- Possible adverse events:
  - Penile ecchymosis
  - Penile pain
  - Penile swelling
  - Corporal rupture

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

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Peyronie's Disease: Intralesional Interferon α-2b

- Clinicians may offer Intralesional Interferon α-2b to patients with Peyronie's disease
- One injection every 2 weeks x 12 weeks
- Appropriate for use in patients with:
  - Stable disease
  - Curvature > 30 °
  - No calcified plaque
- Expected average curvature reduction is 13.5°
- **Magnitude of treatment effect beyond placebo is modest**

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

American Urological Association Education & Research, Inc.

Peyronie's Disease: Intralesional Interferon α-2b

- Potential side effects:
  - Sinusitis
  - Flu-like symptoms
  - Minor penile swelling

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

American Urological Association Education & Research, Inc.

Peyronie's Disease: Intralesional Verapamil

- The evidence for use of intralesional verapamil is *"weak"*, and there is "substantial uncertainty regarding its efficacy."
- Clinicians should carefully consider the use of *"other treatments* that are clearly *more effective."*
- Potential side effects:
  - Penile bruising
  - Dizziness
  - Nausea
  - Pain at injection site

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

American Urological Association Education & Research, Inc.

Peyronie's Disease: Extracorporeal Shock Wave Therapy

- Clinicians should *not* use Extracorporeal Shock Wave Therapy (ESWT) for the reduction of *penile curvature* or *plaque size*.
- Clinicians *may* offer ESWT to improve penile pain.
  - Pain improved in 85% of treatment arm vs. 48% of placebo/sham arm
  - Side effects:
    - Petechial bruising/bleeding
    - Urethral bleeding
    - Hematuria
    - *Worsening* pain

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Radiotherapy

- Clinicians should *not* use Radiotherapy to treat Peyronie's Disease.
- Most studies are *poorly designed*, single arm
- Studies suggesting benefit may just be showing natural disease improvement over time.
- Benefits with this treatment are *not* proven and do *not* merit justify patient exposure to radiation.

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Surgery

- Clinicians should assess patients as *candidates for surgical reconstruction* based on the presence of *stable disease*.
  - Typically, PD lesions become stable at 12-18 months after symptom onset.
  - Most studies assessed patients with the presence of symptoms for at least 12 months and stable curvature for 3-6 months.
- Distinguishing features of *stable disease*, per the guidelines panel:
  - "Deformity and plaque(s) that are *unchanging* and *nonprogressive*."

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Surgery

- "Clinicians may offer *tunical plication surgery* to patients whose rigidity is adequate for coitus (with or without pharmacotherapy and/or vacuum device therapy) *to improve penile curvature."*
- For most patients plication surgery results in curvature correction in the setting of relatively low risk of serious adverse events."
- Plication surgery is *not* a treatment for ED.

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Surgery

- "Clinicians may offer *plaque incision or excision and/or grafting* to patients with deformities whose rigidity is adequate for coitus (with or without pharmacotherapy and/or vacuum device therapy) *to improve penile curvature."*
- For most patients *plaque incision or excision and/or grafting* surgery results in curvature correction in the setting of relatively low risk of serious adverse events."
- Plaque incision or excision and/or grafting surgery is *not* a treatment for ED.

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Surgery

- "Clinicians may offer *penile prosthesis surgery* to patients with Peyronie's disease and erectile dysfunction and/or penile deformity sufficient to impair coitus despite pharmacotherapy and/or vacuum device therapy."
- For the majority of patients, *penile prosthesis implantation* results in *curvature correction* and *restoration of satisfactory sexual function* in the context of relatively low adverse event rates.

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Surgery

- "Clinicians *may* perform adjunctive intraoperative procedures, such as *modeling, plication, or incision/grafting* when significant penile deformity persists after insertion of the penile prosthesis.
- "Clinicians should use an *inflatable* penile prosthesis for patients undergoing penile prosthetic surgery for the treatment of Peyronie's disease."
  - Fewer adverse events
  - Higher patient satisfaction
  - Modeling difficult with semi-rigid devices

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Unproven Treatments

- Colchicine
- Pentoxifylline
- Potassium aminobenzoate
- Co-enzyme Q10
- Topical therapies (Magnesium or verapamil)
- Topical or intralesional liposomal recombinant human superoxide dismutase (LrhSOD)
- Electromotive therapies (Electromotive verapamil + dexamethasone)
- Mechanical therapies
  - Penile traction
  - Hyperthermia

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

Peyronie's Disease: Challenges

- Lack of understanding of etiology results in:
  - Clinicians are unable to advise men about risk factors and their avoidance
  - Treatment focuses on alleviation of symptoms rather than prevention
- Symptoms change over time:
  - Hard to discern natural disease process from intervention effect

Nehra A, Alterowitz R, Culkin DJ, et al. Peyronie's disease: AUA guideline. 2015.

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ARS-Q2

A 54 yo male has a one-year history of a right-sided 1 cm penile plaque with 95 degrees of curvature that prevents intercourse. He has had no associated pain and no progression in the curvature for over six months. He has full erections and desires treatment. The next best step is:

A. Radiotherapy.
B. Tamoxifen.
C. Intralesional collagenase clostridium histolyticum with modeling.
D. Electromotive verapamil.
E. Tunical Plication.

American Urological Association Education & Research, Inc.

Answer: E

A 54 yo male has a one-year history of a right-sided 1 cm penile plaque with 95 degrees of curvature that prevents intercourse. He has had no associated pain and no progression in the curvature for over six months. He has full erections and desires treatment. The next best step is:

A. Radiotherapy.
B. Tamoxifen.
C. Intralesional collagenase clostridium histolyticum with modeling.
D. Electromotive verapamil.
E. Tunical Plication.

Intralesional collagenase clostridium histolyticum is not an option given that he has > 90 degrees of curvature. The correct answer is tunical plication. The other options are not recommended in the treatment of Peyronie's disease.

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Male Infertility

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Male Infertility: Evaluation

- "An *initial screening* evaluation of the male partner of an infertile couple should be done if pregnancy has not occurred within *one year* of unprotected intercourse."
- "An *earlier evaluation* may be warranted if a known male *or* female infertility risk factor exists *or* if a man questions his fertility potential."

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

Initial Screening Evaluation:

- Reproductive history and two semen analyses

A *Full* Evaluation by a urologist or other male reproductive health specialist *if* initial screening reveals *abnormal history* or *abnormal semen analysis.*

- A *full* evaluation also in couples with *unexplained infertility* and in couples with *persistent infertility* despite treated female factor.

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

- **History:**
  - Reproductive history
  - Medical and surgical history
  - Review of medications
  - Lifestyle exposures
  - Family reproductive history
  - Survey of past infections (respiratory, STD's)

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

- **<u>Examination</u>:**
  - General examination
  - Focused genital examination
    - Penis (location of urethra, etc.)
    - Palpation of testicles (size, consistency)
    - Presence/consistency of vas deferens
    - Presence of varicocele
    - Secondary sexual characteristics
    - Digital rectal examination
  - Congenital bilateral absence of the vas deferens is diagnosed on *<u>exam</u>*, *<u>scrotal exploration</u>* is *<u>not</u>* necessary.

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

- **<u>Semen Analysis</u>:**
  - World Health Organization has published protocols:
    - Two-three days of abstinence in advance of test.
    - Semen testing performed within *<u>one hour</u>* of ejaculation.
    - Proper evaluation consists of *<u>two</u>* properly timed semen analyses.
    - The diagnosis of azoospermia requires the absence of sperm from at least *<u>two</u>* separate centrifuged semen samples.
    - Centrifuged at maximum speed (3000 x g) for 15 minutes, and pellet examined.

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

Endocrine Evaluation Recommendation:

- "An *initial* endocrine evaluation should include at least a serum *testosterone* and *FSH*. It should be performed *if* there is:
  1. An abnormally *low sperm concentration* (especially < 10 million sperm per mL)
  2. *Impaired* sexual function
  3. Other clinical findings suggestive of a specific *endocrinopathy*."

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

Table 2: The Relationship of Testosterone, LH, FSH and Prolactin with Clinical Condition

Clinical Condition	FSH	LH	Testosterone	Prolactin
Normal spermatogenesis	Normal	Normal	Normal	Normal
Hypogonadotropic hypogonadism	Low	Low	Low	Normal
Abnormal spermatogenesis*	High/Normal	Normal	Normal	Normal
Complete testicular failure/ Hypergonadotropic hypogonadism	High	High	Normal/Low	Normal
Prolactin-secreting pituitary tumor	Normal/Low	Normal/Low	Low	High

* Many men with abnormal spermatogenesis have a normal serum FSH, but a marked elevation of serum FSH is clearly indicative of an abnormality in spermatogenesis.

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

- All patients with *acquired* hypogonadotropic hypogonadism should be evaluated for functioning and nonfunctioning pituitary tumors by measurement of *serum prolactin* and *imaging* of the pituitary gland.

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

Post-ejaculatory Urinalysis:

- "A post-ejaculatory urinalysis should be performed in patients with *ejaculate volumes of less than 1 mL*, except patients with *bilateral vasal agenesis* or clinical signs of *hypogonadism.*"

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

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Transrectal Ultrasonography:

- *"Transrectal ultrasonography (TRUS),* with or without *seminal vesicle aspiration and seminal vesiculography,* should be considered as an *initial* minimally invasive diagnostic choice to identify *ejaculatory duct obstruction* in azoospermic men with *low ejaculate volume and bilateral palpable vasa.*"

- "In patients with ejaculatory duct obstruction demonstrated by TRUS, *testis biopsy* may be considered if needed to confirm normal spermatogenesis."

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

American Urological Association Education & Research, Inc.

Tranrectal Ultrasonography:

- *"Vasography* with or without *testicular biopsy* should be considered a *second line choice* to identify the site of reproductive tract obstruction in these patients, and should *not* be done unless reconstructive surgery is undertaken at the same procedure."

- "Patients with *unilateral absence of the vas deferens* and *low volume azoospermia* may have a *variant of CBAVD* and should have *CFTR and 5T testing* and if positive do not need TRUS."

- "Some experts recommend *TRUS* for *oligospermic patients with low ejaculate volumes*, *palpable vasa*, and *normal testicular size* to determine if a *partial ejaculatory duct obstruction* is present."

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

Scrotal Ultrasonography:

- "Scrotal ultrasonography is indicated in those patients in whom *physical examination of the scrotum is difficult* or *inadequate* or in whom a *testicular mass* is suspected."

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

Sperm Morphology:

- "Sperm morphology by rigid (strict) criteria has *not* been shown to be consistently predictive of fecundity and should *not* be used in isolation to make prognostic or therapeutic decisions."

DNA Integrity:

- "Currently there is *insufficient* evidence in the literature to support the routine use of DNA integrity testing in the evaluation and management of the male partner of an infertile couple."
- "Presently, there are *no* proven therapies to correct an abnormal DNA integrity test result."

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

Reactive Oxygen Species:

- "Reactive oxygen species testing has *not* been shown to be predictive of pregnancy independent of routine semen parameters *nor* are there any proven therapies to correct an abnormal test result."
- There is *insufficient data* to support the routine use of reactive oxygen species testing in the management of the male partner of an infertile couple.

Leukocytes:

- Elevated white blood cell levels associated with deficient sperm motility and function.
- Need to differentiate *white blood cells from immature sperm* via special staining—they appear similar on wet mount microscopy.
- Men with true pyospermia (> 1 million leukocytes per mL) should be evaluated for genital tract inflammation and infection.

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

Antisperm Antibody testing:

- Appropriate to run test *if*:
  - Isolated asthenospermia with normal sperm concentration
  - Sperm agglutination
  - Abnormal postcoital test

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

American Urological Association Education & Research, Inc.

Genetic Screening:

- Cystic Fibrosis (CFTR) Gene Mutations:
  - CFTR gene mutation is the *most common cause* of Congenital Bilateral Absence of the Vas Deferens (CBAVD)
  - 70% of men with CBAVD and *no* clinical evidence of cystic fibrosis have an identifiable CFTR gene mutation
  - Men with congenital absence of the vas deferens should be offered genetic counseling and testing for CFTR mutations *before* proceeding with treatments that utilize the sperm of a man with congenital absence of the vas deferens
  - Imaging for renal abnormalities should be offered to men with unilateral vasal agenesis or congenital bilateral absence of the vasa deferens and no evidence of CFTR abnormalities

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

American Urological Association Education & Research, Inc.

Genetic Screening:

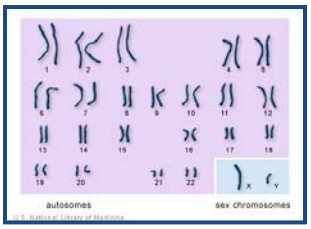
- Cystic Fibrosis (CFTR) Gene Mutations (Continued):
  - Testing should include at minimum a panel of common point mutations and a 5T allele
  - There is *no* consensus on the minimum number of mutations that should be tested
  - *Gene sequencing* may be considered in couples where the wife is a carrier and the husband with congenital bilateral absence of the vas deferens *tests negative* on a routine panel of CFTR mutations.

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

Karotype:

- Karyotype and genetic counseling should be offered to *all* patients with nonobstructive azoospermia and severe oligospermia (< 5 million sperm per mL):



Y-chromosome Microdeletions:

- Approximately 13% of men with nonobstructive azoospermia or severe oligospermia have a *Y-chromosome microdeletion.*
- AZF a,b, and c regions
- Mutations detected via PCR analysis of *sequence tagged sites.*
- While the prognosis for sperm retrieval is poor in patients having large deletions involving AZF region a or b, the results of Y chromosome analysis cannot absolutely predict the presence of sperm

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

Male Infertility: Evaluation

Azoospermia:

- In order to distinguish between obstuctive and nonobstructive causes of azoospermia, diagnostic testicular biopsy is indicated for patients with:
  - *Normal testicular size*
  - *At least one palpable vas deferens*
  - *Normal serum FSH level*
- Vasography should *not* be performed a the time of diagnostic biopsy unless reconstructive surgery is planned at the same time.

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

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Varicoceles

- Varicocele treatment *should be offered* to the male parner of a couple attempting to conceive when *all* of the following are present:
  1. A varicocele is *palpable*.
  2. The couple has *documented infertility*.
  3. The female has *normal fertility* or potentially *correctable* infertility.
  4. The male partner has one or more *abnormal* semen parameters or sperm function tests.

Sharlip ID, Jarow J, Belker AM et al. Report on varicocele and infertility. An AUA Best Practice Policy and ASRM Practice Committee Report. 2001.

American Urological Association Education & Research, Inc.

Varicoceles

- Adult men who have a *palpable varicocele* and abnormal semen analyses but are *not* currently attempting to conceive *should* be offered varicocele repair.
- Young men who have a *varicocele* and *normal semen analyses* should be *followed* with semen analysis every one to two years.

Sharlip ID, Jarow J, Belker AM et al. Report on varicocele and infertility. An AUA Best Practice Policy and ASRM Practice Committee Report. 2001.

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Varicoceles

- *Varicocele repair* may be considered as the primary treatment option when a man with a varicocele has *suboptimal* semen quality and a *normal* female partner.

- *IVF with or without ICSI* may be considered the primary treatment option when there is an independent need for such techniques to treat a *female factor*, regardless of the presence of varicocele and suboptimal semen quality.

Sharlip ID, Jarow J, Belker AM et al. Report on varicocele and infertility. An AUA Best Practice Policy and ASRM Practice Committee Report. 2001.

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ARS-Q3

A 25 yo male has been attempting to conceive with his 26 yo wife for 12 months. His semen analysis reveals normal ejaculate volume azoospermia. The next step in his workup is:

A. Semen centrifugation.
B. Post ejaculate urinalysis.
C. Semen fructose.
D. Semen culture.
E. Antisperm antibody test.

Jarow J, Sigman M, Kolettis PN, et al. The Optimal Evaluation of the Infertile Male: AUA Best Practice Statement. 2010.

American Urological Association Education & Research, Inc.

ANSWER: A

A 25 yo male has been attempting to conceive with his 26 yo wife for 12 months. His semen analysis reveals normal ejaculate volume azoospermia. The next step in his workup is:

- **A. Semen centrifugation.**
- B. Post ejaculate urinalysis.
- C. Semen fructose.
- D. Semen culture.
- E. Antisperm antibody test.

A. The next step is centrifugation of the semen with microscopic inspection of the pellet for sperm. Approximately 15% of men will have sperm in the pellet.

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ARS-Q4

A 26 year old infertile male has two semen analysis tests revealing low ejaculate volume azoospermia, and both semen centrifuged pellets revealed no sperm. On exam, he is missing the distal 2/3 of his epididymis and his vas deferens bilaterally. The genetics testing that should be ordered is:

A. Karyotype
B. Y Chromosome microdeletion
C. Polycystic Kidney Disease (PKD) 1 and PKD2 gene mutation
D. Cystic Fibrosis gene mutation
E. KALIG-1 gene mutation

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ANSWER: D

A 26 year old infertile male has two semen analysis tests revealing low ejaculate volume azoospermia, and both semen centrifuged pellets revealed no sperm. On exam, he is missing the distal 2/3 of his epididymis and his vas deferens bilaterally. The genetics testing that should be ordered is:

A. Karyotype
B. Y Chromosome microdeletion
C. Polycystic Kidney Disease (PKD) 1 and PKD2 gene mutation
D. Cystic Fibrosis gene mutation
E. KALIG-1 gene mutation

This patient has the clinical findings suggestive of congenital bilateral absence of the vas deferens, so cystic fibrosis gene mutation testing is recommended.

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ARS-Q5

A 45 yo male is married to a 39 yo female, and they have been trying to conceive for 6 months but without success. On exam, he has a large, palpable left varicocele and left testicular atrophy. His semen analysis reveals a total motile sperm count of 100,00 sperm in the ejaculate. His wife's hysterosalpingogram reveals bilateral Fallopian tube obstruction, and she has irregular cycles. The next best step for this couple is:

A. Microsurgical varicocele ligation.
B. Radiographic varicocele embolization.
C. Continue efforts by natural means.
D. *In vitro* fertilization.
E. Intrauterine insemination.

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Answer: D

A 45 yo male is married to a 39 yo female, and they have been trying to conceive for 6 months but without success. On exam, he has a large, palpable left varicocele and left testicular atrophy. His semen analysis reveals a total motile sperm count of 100,00 sperm in the ejaculate. His wife's hysterosalpingogram reveals bilateral Fallopian tube obstruction, and she has irregular cycles. The next best step for this couple is:

A. Microsurgical varicocele ligation.
B. Radiographic varicocele embolization.
C. Continue efforts by natural means.
D. *In vitro* fertilization IVF).
E. Intrauterine insemination.

His wife has female factor infertility with bilateral Fallopain tube blockage, so steps to optimize his fertility and the pursuit of Intrauterine insemination are not recommended. IVF is the correct choice.

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Hypogonadism/ Hormone Replacement

Hypogonadism & Testosterone Replacement Therapy

American Urological Association Education & Research, Inc.

AUA Position Statement on Testosterone Therapy

- *"The AUA concludes that there is conflicting evidence about the impact of testosterone therapy on cardiovascular risks. Definitive studies have not been performed. The FDA drug safety communication cautions that benefits and risks of testosterone products for low testosterone due to aging are not clearly established."*

AUA Position Statement on Testosterone Therapy. August 2015.

Hypogonadism & Testosterone Replacement Therapy

American Urological Association Education & Research, Inc.

AUA Position Statement on Testosterone Therapy

- *"Testosterone therapy is appropriate treatment for patients with clinically significant hypogonadism, including those with idiopathic clinical hypogonadism, that may or may not be age-related, after full discussion of potential adverse effects."*

- *Treatment requires follow-up and medical monitoring.*

AUA Position Statement on Testosterone Therapy. August 2015.

Hypogonadism & Testosterone Replacement Therapy

American Urological Association Education & Research, Inc.

AUA Position Statement on Testosterone Therapy

- *"The management of hypogonadism should start with careful evaluation by a physician experienced in diagnosing and managing patients with hypogonadism."*
  - *Symptoms can be multi-factorial and nonspecific*
  - *Can be due to conditions other than hypogonadism*
  - *History, physical examination, lab testing performed*

AUA Position Statement on Testosterone Therapy. August 2015.

Hypogonadism & Testosterone Replacement Therapy

American Urological Association Education & Research, Inc.

AUA Position Statement on Testosterone Therapy

- *"The AUA is concerned about the risks associated with the misuse of testosterone for nonmedical indications, such as body building and performance enhancement."*

- *Discuss potential side effects:*
  - *Acne*
  - *Breast swelling/tenderness*
  - *Increased red blood cell count*
  - *Swelling of feet/ankles*
  - *Reduced testicular size*
  - *Infertility*

AUA Position Statement on Testosterone Therapy. August 2015.

American Urological Association Education & Research, Inc.

Hypogonadism & Testosterone Replacement Therapy

AUA Position Statement on Testosterone Therapy

- *Optimal Follow-up of men on testosterone replacement therapy has yet to be defined, but should include:*
  - *Serum testosterone*
  - *Serum PSA for age-appropriate men*
  - *Hematocrit*

Montague DK, Jarow J, Broderick GA, et al. Premature ejaculation: Guideline on the pharmacologic management of premature ejaculation. 1999.

American Urological Association Education & Research, Inc.

ARS-Q6

A potential side effect of testosterone replacement therapy is:

- A. Osteoporosis.
- B. Rhabdomyolysis.
- C. Polycythemia.
- D. Hyperzoospermia.
- E. Somnolence.

American Urological Association Education & Research, Inc.

Answer: C

Of the following conditions a potential side effect of testosterone replacement therapy is:

- A. Osteoporosis.
- B. Rhabdomyolysis.
- **C. Polycythemia.**
- D. Hyperzoospermia.
- E. Somnolence.

C. Polycythemia is a potential side effect of testosterone therapy. For this reason, periodic hematocrit/CBC levels are recommended for patients taking testosterone replacement therapy. Osteoporosis and somnolence are symptoms of hypogonadism. Rhabdomyolysis and hyperspermia are not side effects of testosterone replacement therapy.

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Summary Comments

- Erectile Dysfunction
- Peyronie's Disease
- Male Infertility
- Hypogonadism/Hormone Replacement
- Supplemental Material Provided Regarding:
  - Premature Ejaculation
  - Priapism
  - Vasectomy/Sterilization

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Priapism

Supplemental Material

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Priapism

- Priapism is a ***persistent*** penile erection that continues hours beyond, or is unrelated to, sexual stimulation.
- ***Priapism is a medical emergency.***
- ***Subtypes: Ischemic and Nonischemic.***
- Goal is to *achieve detumescence* and *preserve erectile function.*
- Some treatments unfortunately have ED as a potential complication.
- Treatment options are applied in a step-wise fashion.

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

American Urological Association Education & Research, Inc.

Priapism

- **<u>Ischemic (veno-occlusive, low flow):</u>**
  - Nonsexual, persistent erection
  - Little or no cavernous blood flow
  - Abnormal cavernous blood gases (hypoxic, hypercarbic, acidotic)
  - Corpora cavernosa are rigid and tender to palpation.
  - Patients usually report pain

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

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Priapism

- **<u>Ischemic (veno-occlusive, low flow):</u>**
  - Resolution characterized by return to flaccid, nonpainful state
  - Persistent edema, ecchymosis, and partial erections can occur
  - Resolution can be documented by *<u>cavernous blood gases</u>* or *<u>color duplex US showing blood flow</u>*

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

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Priapism

- **Nonischemic (arterial, high flow):**
  - Nonsexual, persistent erection caused by unregulated cavernous arterial inflow
  - Cavernous blood gases are *not* hypoxic or acidotic
  - Erection typically *not* painful
  - Penis usually not fully rigid
  - *Antecedent trauma* is most common etiology
  - Does *not* require emergent treatment

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

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Priapism

- **Stuttering (intermittent):**
  - A recurrent form of ischemic priapism in which unwanted painful erections occur repeatedly with intervening periods of detumescence.

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Priapism

Recommendation:

- "In order to determine appropriate management, the physician must first determine whether the priapism is ***ischemic*** or ***nonischemic.***"

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Priapism

- History:
  - Duration of erection
  - Degree of pain
  - Previous history of priapism and treatment
  - Use of drugs precipitating priapism
  - Pelvic, genital, or perineal trauma
  - Sickle cell disease or other hematologic abnormality

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

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Priapism

- Examination:
  - Corpora cavernosa affected, while corpus spongiosum and glans are not.
  - In ischemic priapism, the corpora are commonly completely rigid
  - In nonischemic priapism, the corpora are commonly tumescent but not completely rigid.

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

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Priapism

- Lab Testing:
  - CBC with WBC differential
  - Reticulocyte count
    - Often elevated in priapism
  - Hemoglobin electrophoresis
    - To assess for hemoglobinopathies
  - Psychoactive medication screening
  - Urine toxicology
    - To assess for levels of both legal and illegal drugs
  - Blood gas testing

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

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Priapism

- **Lab Testing:**
  - Blood gas testing patterns
    - **Ischemic Priapism:**
      - PO_2 < 30 mmHG
      - PCO_2 > 60 mmHG
      - pH < 7.25
    - **Nonischemic Priapism:**
      - PO_2 > 90 mmHG
      - PCO_2 < 40 mmHG
      - pH 7.4
    - **Normal Flaccid Penis (Mixed Venous Blood):**
      - PO_2 40 mmHG
      - PCO_2 50 mmHG
      - pH 7.35

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

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Priapism: Treatment

Recommendation:

- "In patients with an underlying disorder, such as sickle cell disease or hematologic malignancy, systemic treatment of the underlying disorder should *not* be undertaken as the *only* treatment for ischemic priapism.
- "The *ischemic priapism requires intracavernous treatment*, and this should be administered *concurrently*."

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Priapism: Treatment

Recommendation:

- "Management of ischemic priapism should progress in a *step-wise fashion* to achieve resolution as promptly as possible."

- "Initial intervention may utilize *therapeutic aspiration (with or without irrigation)* or intracavernous injection of sympathomimetics."

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Priapism: Treatment

Recommendation:

- "If ischemic priapism persists following aspiration/irrigation, *intracavernous injection of sympathomimetic drugs* should be performed. Repeated sympathomimetic injections should be performed prior to initiating surgical intervention."

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

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Priapism: Treatment

Recommendation:

- "For intracavernous injection of a sympathomimetic agent, *phenylephrine* should be used to minimize the risk of cardiovascular side effects that are more common for other sympathomimetic medications."
- Phenylephrine: alpha$_1$ selective adrenergic agonist with *no* indirect neurotransmitter releasing action.
- Resolution occurs for 65% of men with phenylephrine therapy.

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

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Priapism: Treatment

Recommendation:

- "For intracavernous injections in adult patients, phenylephrine should be diluted with normal saline to a concentration of 100-500 mcg/mL, and 1 mL injections made every 3-5 minutes for approximately *one hour* before deciding that the treatment will not be successful."
- "Use lower concentrations in children and patients with severe cardiovascular disease."

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Priapism: Treatment

Recommendation:

- "During and following intracavernous injection of sympathomimetic drugs, physician should monitor for:
  - Headache
  - Acute Hypertension
  - Reflex Bradycardia
  - Tachycardia
  - Palpitations
  - Cardiac arrhythmia
- In patients with high Cardiovascular risk, Blood Pressure and EKG monitoring are recommended.

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Priapism: Treatment

Recommendation:

- "The use of surgical shunts for the treatment of ischemic priapism should be considered *only* after a trial of intracavernous injection of sympathomimetics has failed."
- A surgical shunt should *not* be considered as first-line therapy.
- Phenylephrine is less effective in priapism of > 48-hours duration.

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Priapism: Treatment

Recommendation:

- "A *cavernoglanular (corporoglanular) shunt* should be the first choice of the shunting procedures because it is the *easiest* to perform and has the *fewest* complications."
  - Large biopsy needle inserted percutaneously into glans **(Winter)**
  - Scalpel inserted percutaneously into glans **(EbbehØj)**
  - Excision of piece of tunica albuginea at the tip of the corpus cavernosum **(Al-Ghorab)**

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Priapism: Treatment

- Of the three cavernoglanular (corporoglanular) shunts, the **Al-Ghorab procedure** is the most effective.
- It can still be performed if the other two fail.
- In most cases, the shunts close with time.
- Proximal shunting may be warranted if distal shunting fails:
  - **Quackels procedure:** cavernospongiosal shunt(i.e. corporospongiosal shunt)
  - **Grayhack procedure:** cavernosaphenous shunt (i.e corporosaphenous shunt)
- ED rates ~ 25% for distal shunts and 50% for proximal shunts.

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Ischemic Priapism: Treatment

- Oral systemic therapy is *not* indicated for the treatment of ischemic priapism.
  - Oral sympathomimetic agents (i.e. pseudoephedrine)
  - Oral terbutaline
- Important to note that terbutaline *may* be effective in the treatment of prolonged erections in the setting of self-injection therapy for impotence.

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Nonischemic Priapism

- Nonischemic priapism is *uncommon.*
- Can arise due to *perineal trauma* with laceration of cavernosal artery.
- However, many patients have *no* apparent underlying cause.
- If untreated, 62% of cases will resolve *spontaneously*, and 33% will have associated ED.

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Stuttering Priapism

Recommendation:

- "The *goal* of the management of a patient with *recurrent (stuttering) priapism* is *prevention* of future episodes, while management of each episode should follow the specific treatment *recommendations for ischemic priapism."*

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Nonischemic Priapism: Treatment

Recommendation:

- "In the management of nonischemic priapism, corporal aspiration has *only* a diagnostic role. Aspiration with or without injection of sympathomimetic agents is *not* recommended as treatment."

- "The initial management of nonischemic priapism should be *observation*. Immediate invasive interventions (embolization or surgery) can be performed at the request of the patient, but should be precede by a thorough discussion of:
  - Chances for spontaneous resolution
  - Risks of treatment-related ED
  - Lack of significant consequences expected from delaying interventions."

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Nonischemic Priapism: Treatment

Recommendation:

- Conservative measures are acceptable:
  - Ice
  - Site specific compression
- Time from trauma to patient presentation has *no* effect on subsequent outcome
- Many patients will remain potent after spontaneous resolution

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Nonischemic Priapism: Treatment

Recommendation:

- "*Selective arterial embolization* is recommended for the management of nonischemic priapism in patients who request treatment."
- "*Autologous clots* and *absorbable gels*, which are ***nonpermanent***, are preferred to coils and chemicals, which are permanent."

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Nonischemic Priapism: Treatment

Recommendation:

- "*Surgical management* of nonischemic priapism is the option of *last resort* in patients who request treatment and should be performed with intraoperative color duplex ultrasonography"
  - Can help lateralize lesion
  - Can reveal:
    - Cavernous artery dilation
    - Increased cavernosal inflow
    - Sinusoidal "blush"
    - Turbulent flow of pseudoanerysm

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Stuttering Priapism

- Can occur in children *or* adults
- Children (often hematologic abnormalities)
- Adults (often idiopathic)

Recommendation:

- "A trial of gonadotropin-releasing hormone (GnRH) agonists or antiandrogens may be used in the management of patients with recurrent (stuttering) priapism."
- "Hormonal agents should *not* be used in patients who have not achieved full sexual maturation and adult stature."
  - Can interfere with sexual maturation and closure of epiphyseal plates.

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

Stuttering Priapism

- "Intracavernosal self-injection of phenylephrine should be considered in patients who either fail or reject systemic treatment of stuttering priapism."
  - This approach is ***not*** preferred over systemic therapies because it results in ***priapism treatment*** rather than ***priapism prevention."***

Montague DK, Jarow J, Broderick G et al. Priapism: Guideline on the management of priapism. 2003.

ARS-Q7

A 60 yo male presents to the emergency department with a painful erection lasting 8 hours. His cavernous blood gas pattern is consistent with ischemic priapism. Despite aspiration and irrigation with phenylephrine solution for over an hour, his erection persists. The next step in his management is:

A. Distal shunt.
B. Embolization.
C. Surgical ligation.
D. Penile prosthesis.
E. PDE5-inhibitor.

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Answer : A

A 60 yo male presents to the emergency department with a painful erection lasting 8 hours. His cavernous blood gas pattern is consistent with ischemic priapism. Despite aspiration and irrigation with phenylephrine solution for over an hour, his erection persists. The next step in his management is:

A. Distal shunt.
B. Embolization.
C. Surgical ligation.
D. Penile prosthesis.
E. PDE5-inhibitor.

The next step in the management of this patient is a distal shunt, such as a Winter, (EbbehØj), or Al-Ghorab procedure. Embolization, surgical ligation, and penile prosthesis insertion are not treatment options for ischemic priapism. There is no role for PDE-5 inhibitor therapy at this time for this patient.

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Premature Ejaculation

Supplemental Material

Premature Ejaculation

Recommendation:

- "The diagnosis of premature ejaculation (PE) is based on sexual history *alone*."
- "In patients with concomitant PE and ED, the ED should be treated first."
- "The risks and benefits of all treatment options should be discussed with the patient prior to any intervention. *Patient and partner satisfaction* is the primary target outcome for treatment of PE."

Montague DK, Jarow J, Broderick GA, et al. Premature ejaculation: Guideline on the pharmacologic management of premature ejaculation. 1999.

Premature Ejaculation

- *None* of the medical therapies currently employed in the management of PE have been approved by the US Food and Drug Administration for this indication.
- Dose regimens frequently deviate from those employed in FDA-approved indications.

Montague DK, Jarow J, Broderick GA, et al. Premature ejaculation: Guideline on the pharmacologic management of premature ejaculation. 1999.

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Premature Ejaculation

Recommendation:

- "Premature ejaculation can be treated effectively with several *serotonin reuptake inhibitors (SRI's)* or with *topical anesthetics*. The optimal choice should be based on both physician judgment and patient preference."

Montague DK, Jarow J, Broderick GA, et al. Premature ejaculation: Guideline on the pharmacologic management of premature ejaculation. 1999.

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Premature Ejaculation

Table 1. Medical therapy options for the treatment of premature ejaculation*

Oral Therapies	Trade Names†	Recommended Dose ‡§
Nonselective serotonin reuptake inhibitor		
Clomipramine	Anafranil®	25 to 50 mg/day or 25 mg 4 to 24 h pre-intercourse
Selective serotonin reuptake inhibitors		
Fluoxetine	Prozac®, Sarafem®	5 to 20 mg/day
Paroxetine	Paxil®	10, 20, 40 mg/day or 20 mg 3 to 4 h pre-intercourse
Sertraline	Zoloft®	25 to 200 mg/day or 50 mg 4 to 8 h pre-intercourse
Topical Therapies		
Lidocaine/prilocaine cream	EMLA® Cream	Lidocaine 2.5%/prilocaine 2.5% 20 to 30 minutes pre-intercourse

*This list does not reflect order of choice or efficacy.
†Trade names listed may not be all-inclusive.
‡Peak plasma concentrations occur 2 to 8 hours (h) postdose and half-lives range from 1 to 3 days.
§Titrate doses from low to high based on response.

Montague DK, Jarow J, Broderick GA, et al. Premature ejaculation: Guideline on the pharmacologic management of premature ejaculation. 1999.

Premature Ejaculation

- Antidepressant Agents:
  - Start at lowest possible dose of antidepressants
  - Titrate dosage up from that point
  - Medications generally more effective when dosed daily versus prn
- Topical Anesthetic Agents:
  - Can be used with or without a condom
  - Apply to penis with or without a condom for 20-30 minutes before intercourse
  - Prolonged application (30-45 minutes) associated with numbness and difficulty achieving an erection
  - Female partner might notice numbness of vaginal wall

Montague DK, Jarow J, Broderick GA, et al. Premature ejaculation: Guideline on the pharmacologic management of premature ejaculation. 1999.

Premature Ejaculation

- Adrenergic Blockade agents (alfuzosin, terazosin, phenoxybenzamine, propanolol) have been studied but there is *insufficient evidence* to recommend their use.
- Intracorporal injection of vasoactive agents and PDE5-inhibitors have been shown to increase latency time, but overall *not* well studied.
  - Pharmacological assistance in maintaining an erection prevents the patient's need to "rush" to orgasm.

Montague DK, Jarow J, Broderick GA, et al. Premature ejaculation: Guideline on the pharmacologic management of premature ejaculation. 1999.

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Vasectomy

Supplemental Material

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Vasectomy

Guideline:

- "The minimum and necessary concepts that should be discussed in a preoperative vasectomy consultation include:
  - Vasectomy is intended to be a ***permanent*** form of contraception.
  - Vasectomy does ***not*** produce immediate sterility
  - Following vasectomy, another form of contraception is required until vas occlusion is confirmed by post vasectomy semen analysis (PVSA).

Sharlip ID, Belker AM, Honig S, et al. Vasectomy: A guideline. 2012.

Vasectomy

Guideline:

- "The minimum and necessary concepts that should be discussed in a preoperative vasectomy consultation include (cont'd):
  - Even after vas occlusion is confirmed, vasectomy is *not* 100% reliable in preventing pregnancy.
  - The *risk of pregnancy* after vasectomy is approximately *1 in 2000* for men who have post-vasectomy azoospermia or PVSA showing rare nonmotile sperm.
  - Repeat vasectomy is necessary in ≤ 1% of vasectomies, provided that a technique for vas occlusion known to have a low failure rate has been used.

Sharlip ID, Belker AM, Honig S, et al. Vasectomy: A guideline. 2012.

Vasectomy

Guideline:

- "The minimum and necessary concepts that should be discussed in a preoperative vasectomy consultation include (cont'd):
  - Patients should refrain from ejaculation for approximately *one week* after vasectomy.
  - Options for fertility after vasectomy include *vasectomy reversal* and *sperm retrieval with in vitro fertilization*.
  - The rates of *surgical complications* such as symptomatic hematoma and infection are 1-2%.
  - *Chronic scrotal pain* associated with negative impact on quality of life occurs in about 1-2% of men after vasectomy.
  - Other permanent and non-permanent contraception alternative options are available.

Sharlip ID, Belker AM, Honig S, et al. Vasectomy: A guideline. 2012.

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Vasectomy

Guideline:

- Clinicians do *not* need to routinely discuss the following conditions in pre-vasectomy counseling of patients because vasectomy is *not* a risk factor for these conditions:
  - Prostate cancer
  - Coronary heart disease
  - Stroke
  - Hypertension
  - Dementia
  - Testicular cancer

Sharlip ID, Belker AM, Honig S, et al. Vasectomy: A guideline. 2012.

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Vasectomy

Guideline:

- "Prophylactic antibiotics are *not* indicated for routine vasectomy unless the patient presents with a high risk of infection."

Sharlip ID, Belker AM, Honig S, et al. Vasectomy: A guideline. 2012.

Vasectomy

Guideline:

- "The minimum age requirement for vasectomy is the *legal age of consent* in the prevailing legal jurisdiction where the vasectomy procedure is performed."
- In the United States, there is *no* requirement for spousal or partner involvement in preoperative consultation. This involvement is desirable, though.

Sharlip ID, Belker AM, Honig S, et al. Vasectomy: A guideline. 2012.

Vasectomy

Guideline:

- Long-term postoperative complications:
  - Epididymitis (infectious vs. congestive)
  - Sperm granuloma (<5%)
  - Aggregate of studies show *no* evidence of sexual dysfunction complications
  - Dissatisfaction and regret (1-2%)
  - Antisperm antibodies (4%) but infertility due to them is infrequent & *not* a deterrent to vasectomy reversal

Sharlip ID, Belker AM, Honig S, et al. Vasectomy: A guideline. 2012.

Vasectomy: Vas Isolation Techniques

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Table 3: Definitions for Vas Isolation Techniques
Conventional Vasectomy (CV): One midline or bilateral scrotal incisions are made with a scalpel. Incisions are usually 1.5-3.0 cm long. No special instruments are used. The vas usually is grasped with a towel clip or an Allis forceps. The area of dissection around the vas usually is larger than occurs with MIV techniques.
No-Scalpel Vasectomy (NSV): A minimally invasive method that uses specific instruments and sequential specific steps. Alteration of any of the specific steps does not allow the surgical technique to be called NSV. The NSV incision is usually less than 10 mm, and no skin sutures are needed. Two special instruments (vas ring clamp and vas dissector) are essential to NSV. The area of dissection around the vas is kept to a minimum.
Minimally Invasive Vasectomy (MIV): Methods with minor variations of the NSV technique are defined as MIV methods. Skin openings of ≤10 mm are typical and special instruments such as the vas ring clamp and vas dissector that are used for the NSV technique or similar special instruments are commonly used. The area of dissection around the vas is kept to a minimum.

Sharlip ID, Belker AM, Honig S, et al. Vasectomy: A guideline. 2012.

Vasectomy: Vas Occlusion Techniques

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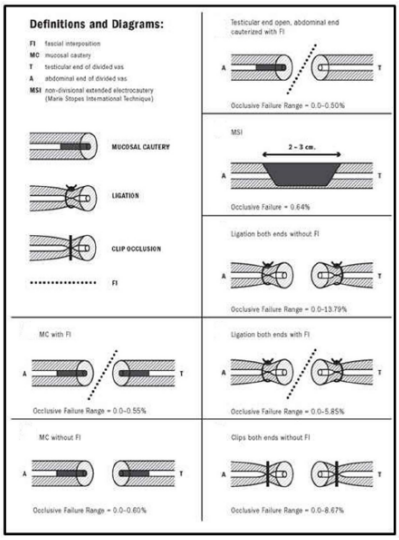
- Recommendation:
- "The ends of the vas deferens should be occluded by one of three divisional methods:
  - Mucosal cautery with fascial interposition and without ligatures or clips applied on the vas.
  - Mucosal cautery without fascial interposition and without ligatures or clips applied on the vas.
  - Open ended vasectomy leaving the testicular end of the vas unoccluded, using mucosal cautery on the abdominal end and fascial interposition
  - Nondivisional method of extended electrocautery.



Sharlip ID, Belker AM, Honig S, et al. Vasectomy: A guideline. 2012.

Vasectomy

Guideline:

- Routine histologic examination of the excised vas segments is *not* required.

- "Patients can stop using other methods of contraception when the examination of one well-mixed, uncentrifuged fresh post-vasectomy semen specimen shows azoospermia or only rare non-motile sperm (< 100,000 sperm per mL)."

Sharlip ID, Belker AM, Honig S, et al. Vasectomy: A guideline. 2012.

Vasectomy: Vas Isolation Techniques

Guideline:

- "Vasectomy should be considered a *failure* if *any motile sperm are seen on PVSA at six months after vasectomy*, in which case repeat vasectomy should be considered."
- "If *> 100,000 non-motile sperm/mL* persist beyond *six months* after vasectomy, then trends of PVSA and *clinical judgment* should be used to determine if repeat vasectomy needed."

Sharlip ID, Belker AM, Honig S, et al. Vasectomy: A guideline. 2012.

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Summary Comments

- Erectile Dysfunction
- Peyronie's Disease
- Male Infertility
- Hypogonadism/Hormone Replacement
- Supplemental Material Provided Regarding:
  - Premature Ejaculation
  - Priapism
  - Vasectomy/Sterilization