Canadian Undergraduate Urology Curriculum (CanUUC): Erectile Dysfunction

Last reviewed July 2014
Objectives

1. Define erectile dysfunction
2. List and classify the risk factors for erectile dysfunction (ED)
3. Describe the medical and surgical treatment options available for erectile dysfunction
4. List contra-indications to PDE-5 inhibitors
Erectile Dysfunction (ED): Defined

“The consistent or recurrent inability to obtain and/or maintain an erection sufficient for satisfactory sexual activity”
Prevalence of ED: Massachusetts Male Aging Study

Men aged 40 to 70 years (N = 1290)

- 48% No erectile dysfunction
- 25% Moderate
- 17% Minimal
- 10% Complete
- 52% Erectile dysfunction

Causes of Erectile Dysfunction:

- **Vascular** – arterial (cholesterol, diabetes, hypertension, trauma/surgery), venous
- **Neurogenic** (surgery/trauma, MS, diabetes)
- **Psychologic** (depression, anxiety, substance abuse)
- **Hormonal** (low testosterone, thyroid, prolactin)
- **Anatomical** (Peyronie’s disease, phimosis)
- **Medications** (anti-hypertensives, SSRI)
Pathophysiology of ED

- Arterial
  - arterial
  - arteriolar

- Neurologic
  - sensory
  - motor
  - autonomic
  - neurotransmitters

- Cavernosal
  - tunica albuginea
  - cavernous muscle
  - gap junction
  - endothelium
  - fibroelastic trabeculae
  - emissary vein

- Hormonal
  - testicular
  - pituitary
  - thyroid

- Systemic diseases

- Psychologic

- Drugs
Major Risk Factors for ED:

- Cardiovascular Disease
- Peripheral VD
- Ψ Disease
- Chronic Disease

CV Risk Factors

- Smoking
- Obesity
- Sedentary
- Hypertension
- Diabetes
- Hyperlipidemia

ED: A Canary in a Coal Mine

ED shares many risk factors for heart disease and warrants a cardiac risk assessment.
Evaluation & Diagnosis

**Organic (90%)**
- Older adults
- Gradual onset
- Risk factors
- Pervasive problem

**Psychogenic (10%)**
- Young
- Sudden onset
- Absence of risk factors
- Situational/intermittent problem
- Nocturnal or early morning erections maintained
- Psychological history
Evaluation & Diagnosis

Medical, Sexual, Psychological History

Validated Questionnaire

- Internation Index of Erectile Function (IIEF)
- Sexual Health Inventory for Men (SHIM)

Physical Examination

- HR, BP, weight/BMI
- Penis: size, plaques, foreskin
- Testis: size, masses, consistency
- Peripheral pulses, sensation

Laboratory Investigations

- Hg A1c/fastiging glucose
- Lipid profile
- Testosterone
Specialized Testing (not routinely used):

*Penile Duplex US with injection of vasoactive agent*

- Arterial inflow, venous outflow (leak) rigidity of erections
- Not routinely required
  - Used in difficult cases, poor treatment response, etc.

*Nocturnal Penile Tumescence*

- Presence, frequency, rigidity of erections
- Organic vs. psychological cause

*Angiography (internal pudendal)*

- Focal traumatic stenosis
Treatment Options for ED

- Lifestyle Modification
- Medical
  - Phosphodiesterase Type 5 Inhibitors (PDE5i)
  - Androgens/testosterone
- Vacuum Constriction Device
- Intraurethral Rx: MUSE
- Intracavernosal Injection: Caverject, Trimix
- Penile Prosthesis
- Sex Therapy/Counseling
Lifestyle Modification

- Smoking Cessation
- Exercise
- Diet
- Limit Alcohol intake
- Control hypertension/cholesterol
Medical Therapy of ED

PDE5i

Approved 1998

2003

2003

Contraindicated in men taking nitroglycerine (nitrates) or known hypersensitivity
PDE5 Inhibitors: Pharmacokinetic Comparison

<table>
<thead>
<tr>
<th></th>
<th>Sildenafil 100 mg (fasted)</th>
<th>Vardenafil 20 mg (fasted)</th>
<th>Tadalafil 20 mg (fasted)</th>
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<td>$T_{\text{max}}$ (min)</td>
<td>70</td>
<td>48</td>
<td>120</td>
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<tr>
<td>$T_{1/2}$ (h)</td>
<td>4.0</td>
<td>4.0-5.0</td>
<td>17.5</td>
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</tbody>
</table>

Data are shown as means

1. Klotz et al, ACCP 2002
2. Sildenafil product monograph
Mechanism of Erections: Vascular Circulation

Smooth muscles contracted > vasoconstriction > low blood flow

Smooth muscles relaxed > vasodilation > high flow

Flaccid Penis

Erect Penis

Mechanisms of Smooth Muscle Cell Relaxation with PDE5i
Common Side Effects of PDE5i

- Headache
- Dyspepsia
- Rhinitis
- Flushing of face/skin
- Abnormal vision
- Dizziness


McMurray JG, et al. Poster presented at: 10th World Congress of the International Society for Sexual and Impotence Research; September 22-26, 2002; Montreal, Canada.
Contraindications to PDE5i

➡️ Absolute:
   ⚫ Use of Nitrate medication

➡️ Relative:

The package inserts of all three PDE5 inhibitors warn against the use in patients with severe cardiovascular diseases and left ventricular outflow obstruction (e.g., aortic stenosis, idiopathic subaortic stenosis), those with severely impaired autonomic control of blood pressure, and patients not studied in clinical trials (U.S. prescribing information of Viagra, Cialis, and Levitra, August 2009). These include patients with:

- Myocardial infarction, stroke, or life-threatening arrhythmia within the previous 6 mo
- New York Heart Association class II or greater heart failure or coronary artery disease causing unstable angina
- Resting hypotension (<90/50 mm Hg) or hypertension (>170/100 mm Hg)
- Known hereditary degenerative retinal disorders including retinitis pigmentosa
- Severe hepatic impairment (Child-Pugh C) or end-stage renal disease requiring dialysis
Androgens and Testosterone Replacement

• Indicated in men with ED and low testosterone

• Consider in men not responding to PDE5i
## Testosterone Deficiency Syndrome

### TABLE 1. Symptoms and signs suggestive of androgen deficiency in men

#### A. More specific symptoms and signs
- Incomplete or delayed sexual development, eunuchoidism
- Reduced sexual desire (libido) and activity
- Decreased spontaneous erections
- Breast discomfort, gynecomastia
- Loss of body (axillary and pubic) hair, reduced shaving
- Very small (especially <5 ml) or shrinking testes
- Inability to father children, low or zero sperm count
- Height loss, low trauma fracture, low bone mineral density
- Hot flushes, sweats

#### B. Other less specific symptoms and signs
- Decreased energy, motivation, initiative, and self-confidence
- Feeling sad or blue, depressed mood, dysthymia
- Poor concentration and memory
- Sleep disturbance, increased sleepiness
- Mild anemia (normochromic, normocytic, in the female range)
- Reduced muscle bulk and strength
- Increased body fat, body mass index
- Diminished physical or work performance

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Bhasin S et al. Testosterone Therapy in Adult Men with Androgen Deficiency Syndromes: An Endocrine Society Clinical Practice Guideline
Testosterone Deficiency Syndrome

- **Initial Evaluation for TDS**
  - Morning serum Total T, FSH, LH, Prolactin
  - PSA, CBC, DRE if considering therapy

- **Treatment** *(indicated for symptoms of TDS + Low T)*
  - Topical Gel – 1<sup>st</sup> Line (Androgel, Testim)
  - Other agents – 2<sup>nd</sup> Line (Oral, IM, Patch)

- **Monitoring** *(q3-6 months initially)*
  - Symptom assessment and CBC, PSA, DRE
MUSE Intraurethral Suppository

MUSE for treating erectile dysfunction.
Problems:
• Limited efficacy
• Pain
• Lightheaded
Vacuum Erection Device
Intracavernosal Injection Therapy (ICI)

Caverject (Alprostadil)

Trimix (Prostaglandin -PGE, Phentolamine, Papaverine)
Penile Implants/Prosthesis
Types of Penile Implants

1-piece non-inflatable/rigid/malleable
2-piece inflatable
3-piece inflatable
Non-inflatable (malleable) Penile Implant
Inflatable 2-Piece Penile Implant

Cylinder

Pump & reservoir
Inflatable 3-Piece Penile Implant

- Reservoir
- Cylinder
- Pump
Risks of penile implants

Infection: usually requires complete removal
Perforation: in the OR
Malfunction: 5% in 10 years
Urethral injury:
Erosion: tip of penis, bladder
Auto-inflation:
Psychogenic ED

Sex Therapy
Priapism

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A prolonged, painful, unwanted erection (>4 hours)
**A urologic emergency**
Two types:
- Low flow (ischemic)
- High flow (non-ischemic)
Rule out leukemia, sickle cell anemia
Treatment:
- Corporal irrigation
- Intra-cavernosal injection of α-adrenergic agonists
- Surgical: Corpus cavernosal shunts (To corpus spongiosum or saphenous vein)