ERECTILE DYSFUNCTION/IMPOTENCE (ED)

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BASICS

DESCRIPTION
- Consistent or recurrent inability to attain and/or maintain an erection sufficient for satisfactory sexual activity
- Synonym(s): Impotence

EPIDEMIOLOGY
Incidence
Increases with each decade above 40 (1)[C]:
- 12 cases per 1,000 men-yrs 40–49 yr
- 30 cases per 1,000 men-yrs 50–59 yr
- 46 cases per 1,000 men-yrs 60–69 yr

Prevalence
Increases universally with age and medical comorbidities (DM, cardiovascular disease):
- Up to 40% of men at age 40 have some degree of ED.
- Up to 75% of men >70 have some degree of ED.

RISK FACTORS
- Probability of ED increases with each risk factor (1,2)[C].
- DM:
  - 35–75% of all men w/diabetes have some degree of erectile dysfunction.
- Cardiovascular disease (hyperlipidemia, hypertension, peripheral vascular disease)
- Chronic renal failure, chronic liver disease
- Endocrine (hypogonadism, Cushing disease)
- Prior abdominal/pelvic/penile surgery, radiation, or trauma
- Priapism, Peyronie disease
- Long-distance cycling
- Depression, other CNS pathology
- Medications:
  - Antihypertensives (thiazide diuretics, β-adrenergic blockers, and α_2-adrenergic agonists):
    - ACE inhibitors and α_1-adrenergic blockers cause less ED.
  - Psychotropics (SSRIs, lithium, MAOIs)
  - Antiandrogens, others (ketoconazole, spironolactone, cimetidine, digoxin, marijuana)
- Smoking

GENERAL PREVENTION
- Avoid smoking.
- Split bicycle seat for long distance riding

PATHOPHYSIOLOGY
- Mechanism of erection (1,3)[C]:
  - Relaxation of cavernosal artery smooth muscle (smooth muscle is contracted in flaccid state, limiting penile blood flow):
    - Mediated by release of NO from pelvic nerves, causing
    - Increase in cyclic GMP (cGMP), causing decrease in smooth muscle intracellular calcium, causing smooth muscle relaxation, increased penile blood flow, and tumescence.
    - cGMP is degraded primarily by phosphodiesterase type 5 (PDE5).
  - Restriction of venous outflow from penis
- Organic ED:
  - Vasculogenic (arteriogenic via atherosclerotic changes, traumatic injury to arteries; failure of corporal vasoocclusion)
  - Neurogenic (Alzheimer disease, Parkinson disease, injury to CNS, spinal cord, or peripheral nerves)
  - Anatomic
  - Endocrinologic (hyperprolactinemia decreased testosterone, hyper- or hypothyroidism, adrenal disorders/Cushing syndrome):
    - 5–10% of organic ED
- Psychogenic ED:
  - Only 10% of men
  - More common in men <35
  - May result from lack of interest in partner, performance-related anxiety, negative mood, major life stress

COMMONLY ASSOCIATED CONDITIONS
- Atherosclerosis
- Depression
- Diabetes
- Hypertension
- Multiple sclerosis
- Obesity
- Parkinson disease
- Peyronie disease
- Priapism
- Stroke

DIAGNOSIS

HISTORY
- Medical history
- Surgical history
- Psychosexual history (status of current relationship, level of libido, duration of ED, onset of ED (gradual or sudden), presence of nocturnal/early morning erections, presence of penile curvature, quality of erection):
  - International Index of Erectile Function Questionnaire-5:
    - 5 questions each ranging from 0–5 (total 25 points); higher scores with better function
    - Classifies ED into severe (5–7), moderate (8–11), mild to moderate (12–16), mild (17–21), and no ED (22–25)
- Medication history
- Social history: Alcohol, smoking, recreational drugs, cycling history

PHYSICAL EXAM
- Neurologic: Stroke, CNS disease, visual field defects, peripheral neuropathy, perineal sensation
- Endocrinologic: Loss of secondary sexual characteristics, atrophic testes, gynecomastia
- Abdomen: AAA, cirrhosis
- Cardiovascular: BP, femoral and pedal pulses, evidence of lower extremity ischemia
- Penile: Peyronie disease plaques
- Rectal exam

DIAGNOSTIC TESTS & INTERPRETATION
Lab
- CBC
- Random glucose level, hemoglobin A1C,
- Lipid profile
- Early-morning serum testosterone
- PSA
- Urinalysis
- TSH
- LH
- Prolactin (2)[C]

Diagnostic Procedures/Surgery
- Before any invasive test, a trial of oral pharmacotherapy is warranted (4)[C].
- Specialized testing indicated:
  - In young men <40
  - In men with no risk factors
  - In men with previous perineal/pelvic trauma
  - When it will direct therapy
- CIS with duplex US:
  - CIS: Intracavernous injection of vasodilator and genital/audiovisual sexual stimulation with measurement of erection
  - With US, allows objective evaluation of vascular status of penis
- Nocturnal penile tumescence (RigiScan):
  - Automated, portable measurement of nocturnal erection
  - Presence of full erection proves intact neurovascular axis; diagnoses psychogenic ED
- Tests no longer used: PBI, Penile plethysmography

Pathological Findings
Based on primary disease process

TREATMENT
- Patient and partner should be informed of all relevant treatment options and associated risks/benefits, and treatment choice should be made among physician, patient, and partner. (5)[C]
- Cardiovascular risk assessment (done before proceeding with any therapy):
  - Low risk: Asymptomatic, <3 risk factors; may proceed with treatment
  - Intermediate risk: Asymptomatic, ≥3 risk factors, stable angina, mild heart failure; full cardiovascular assessment to re-classify as low or high risk
  - High risk: Unstable angina, recent MI, uncontrolled HTN, advanced heart failure or valvular disease; defer until cardiac condition stabilized
- Due to the availability of PDE5 inhibitors, often empiric therapy is used.

MEDICATION

First Line

PDE5 inhibitors (3,4)[C]:

- Mechanism: Inhibit breakdown of corporal cGMP, thus promote smooth muscle relaxation
- Drugs:
  - Sildenafil (Viagra): Onset 15–60 min duration of action 4 hr
  - Vardenafil (Levitra): Onset 15–60 min, duration of action 2–8 hr
  - Tadalafil (Cialis): Onset 15–120 min, duration of action 24–36 hr
- Contraindications to PDE5 inhibitor:
  - Absolute: Use of nitrates, use of α-adrenergic antagonist (vardenafil and tadalafil only), priapism risk (relative)
  - Sildenafil: Should be postponed for 4 hr after taking α-adrenergic antagonist
  - Vardenafil: Should not be taken with type 1A or type 3 antiarrhythmics or in patients with long QT syndrome
- Side effects:
  - All: Headache, dyspepsia, facial flushing
  - Tadalafil: Backache, myalgia
  - Sildenafil: Blurred/Blue vision
- Efficacy: Well over 50% of patients with organic ED respond; effective even in diabetic and postprostatectomy patients

Second Line

- Intracavernous injection therapy:
  - Mechanism: Self-injection of vasoactive agent into corpora cavernosa; produces rapid erection
  - Drugs: Alprostadil (PGE1, Caverject), papaverine, phentolamine, or Trimix (all 3 drugs)
  - Contraindications: Concomitant monoamine oxidase medications, decreased dexterity
  - Side effects: Fibrosis, priapism, painful erection, hematoma
  - Efficacy: 80–90% effective in wide range of patients (2)[C]
- Intraurethral injection therapy:
  - MUSE (Medicated Urethral System for Erection)
    - Insertion of alprostadil (PGE1)-containing pellet in distal urethra; absorption into corpora cavernosa, erection in 30 min
  - Contraindications: Priapism risk
  - Side effects: Penile pain, dysuria, vaginal pain
  - Efficacy: <50% effective (4)[C]
- Vacuum constriction device:
  - Good 2nd line nonpharmacologic alternative or adjunct to pharmacotherapy
  - Should be pursued prior to IPP
  - Device used to produce negative penile pressure, thus engorging penis
  - Constricting ring at base of penis maintains tumescence
  - Side effects: Penile ischemia (>30 min of use), pain

SURGERY/OTHER PROCEDURES

- IPP:
  - Indications: Failed 1st- and 2nd-line pharmacotherapy or 2nd-line vacuum erection device
  - Definitive treatment of ED, with placement of inflatable cylinders into corpora cavernosa
  - Complications: Infection (1–3%), erosion (<5%), mechanical malfunction (5–10%)
- Penile revascularization:
  - Indications: Reserved for select young patients with clearly documented arterial occlusion

ADDITIONAL TREATMENT

- Psychosexual therapy:
  - Patients with psychogenic ED should be referred for sex therapy
  - Cognitive-behavioral intervention used to identify sexual stressor and refocus maladaptive thought process
- Yohimbine:
  - α_2-adrenergic agonist; centrally acting
  - No evidence that drug augments erections in organic ED
  - May have role in psychogenic ED

ALERT
Herbal and dietary supplements used to treat ED are not FDA-approved; those listed here are for reference only

COMPLEMENTARY AND ALTERNATIVE MEDICINE

Therapies reported to possibly improve ED are ginkgo biloba, red ginseng, yohimbine

ONGOING CARE

FOLLOW-UP RECOMMENDATIONS

Patient Monitoring

Patients should be re-evaluated on frequent basis, with following considerations:

- Response to initial therapy
- Need for dose titration
- Need for patient education (taking PDE5 inhibitor on empty stomach at appropriate time point, proper administration/use of local therapy)
- Progression to 2nd-line therapy or surgery based on response to dose titration, therapeutic effectiveness, patient satisfaction
- Consider using serial, validated questionnaires to evaluate effectiveness

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ADDITIONAL READING

See Also (Topic, Algorithm, Electronic Media Element)
Erectile Dysfunction, Following Pelvic Surgery or Radiation

CODES

ICD9

- 302.72 Psychosexual dysfunction with inhibited sexual excitement
- 607.84 Impotence of organic origin

ABBREVIATIONS

- AAA: Abdominal aortic aneurysm
- ACE: Angiotensin-converting enzyme
- BP: Blood pressure
- CBC: Complete blood count
- CIS: Combined intracavernous injection and stimulation
- CNS: Central nervous system
- ED: Erectile dysfunction
- IPP: Inflatable penile prosthesis
- LH: Leuteinizing hormone
- MAOI: Monoamine oxidase inhibitor
- NO: Nitric oxide
- PBI: Penile brachial index
- PDE5: Phosphodiesterase type 5
- PSA: Prostate-stimulating antigen
- SSRI: Selective serotonin reuptake inhibitor
- TSH: Thyroid-stimulating hormone
- US: Ultrasound