جامعة الملك سعود
King Saud University

Pharmacology
435 team

Drugs affecting erectile dysfunction

Objectives:

- **Revise** the haemodynamic changes inducing normal erection
- **Interpret** its different molecular control mechanisms
- **Define** erectile dysfunction [ED] and enumerate its varied risks
- **List** drugs inducing ED and reflect on some underlying mechanisms
- **Correlate** drugs used in treatment of ED to the etiopathogenesis
- **Classify** oral 1st line therapy relevent to; Mechanism / Utility / ADRs
- **Compare** the pharmacological difference of PDE5 inhibitors
- **Study** the transurethral, intracavernous or topical 2nd line therapies; Mechanism / Utility / ADRs
- **Enumerate** lines of treatment of priapism

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Editing file

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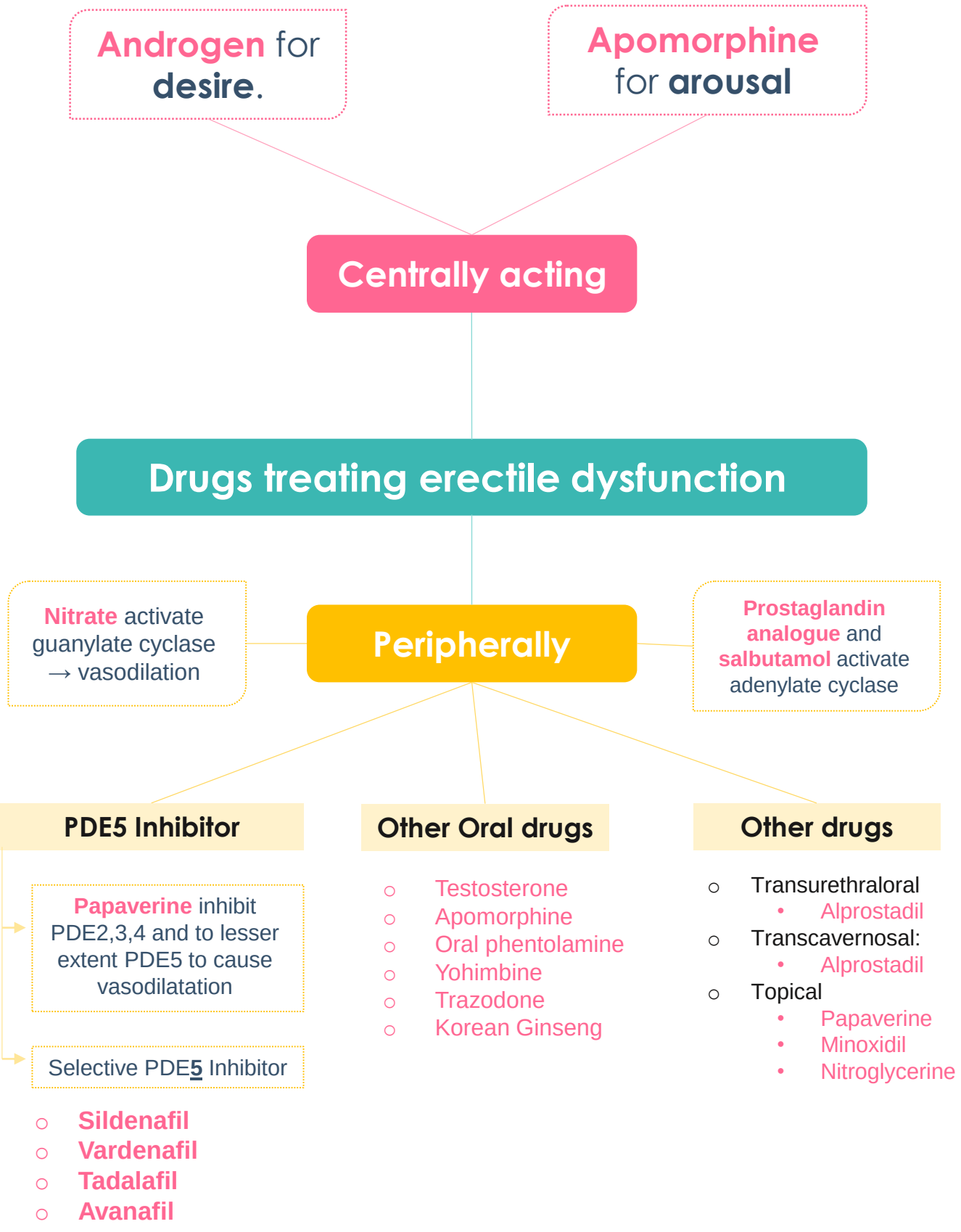
Drug's name | Doctors' notes | Important | Extra

« قل سيروا في الأرض فانظروا كيف بدأ الخلق »
سورة العنكبوت

Mind Map

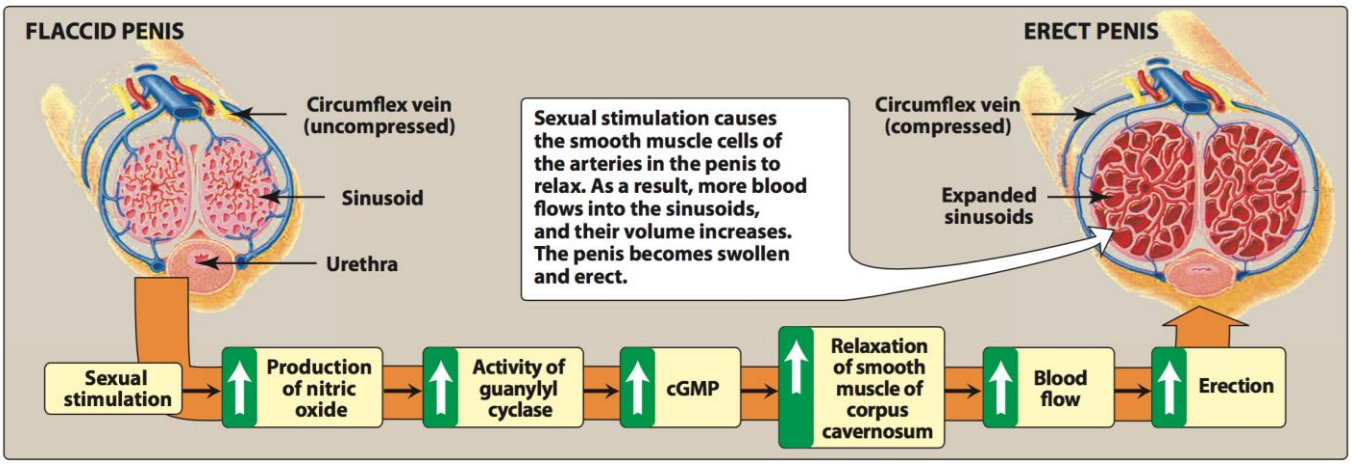

Androgen for desire.
Apomorphine for arousal
Centrally acting
Drugs treating erectile dysfunction
Nitrate activate guanylate cyclase → vasodilation
Peripherally
Prostaglandin analogue and salbutamol activate adenylate cyclase
PDE5 Inhibitor
Other Oral drugs
Other drugs
Papaverine inhibit PDE2,3,4 and to lesser extent PDE5 to cause vasodilatation
Selective PDE5 Inhibitor
Sildenafil
Vardenafil
Tadalafil
Avanafil
Testosterone
Apomorphine
Oral phentolamine
Yohimbine
Trazodone
Korean Ginseng
Transurethraloral
Alprostadil
Transcavernosal:
Alprostadil
Topical
Papaverine
Minoxidil
Nitroglycerine

To Understand Better

Mechanism of an erection

- A normal erection relies on the coordination:
  - Vascular, Neurological, Hormonal, Psychological
- An erection can occur following direct genital stimulation or auditory or visual stimulation, aspects that contribute to the influx of blood to the penis.
- An erection occurs when the amount of blood rushing to the penis is greater than the amount of blood flowing from it
- A massive influx of blood accumulates in the sinusoidal spaces due to relaxation of smooth muscle & dilatation of arteries → corpora cavernosa to swell (tumescence)
- Tumescence (erection) compresses the veins that normally drain the penis → prevents blood outflow & maintains penile rigidity.

Peripheral haemodynamic changes inducing erection



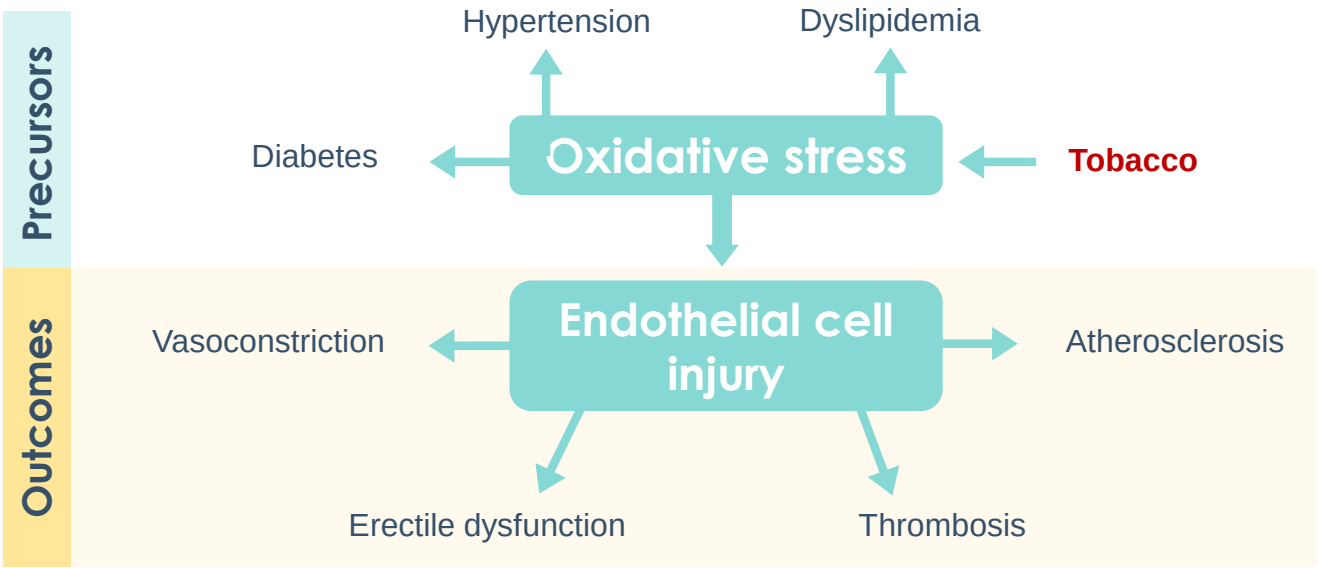
الدكتور حذفه وقال ما راح يجيكم | الدكتورة قالت قراءة (لأننا بناخذ أهمهم في سلايد ٥)

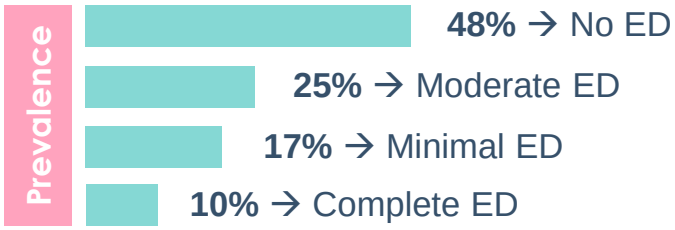
Drug class	Specific drug examples
❖ Beta blockers	Propranolol, metoprolol, atenolol
❖ Ca^{2+} channel blockers	Verapamil, nifedipine
❖ Alpha adrenergic agonists	Clonidine
❖ Cardiac glycosides	Digoxin
❖ Thiazide diuretics	Hydrochlorothiazide
❖ Aldosterone antagonists	Spironolactone
❖ Fibric acid derivatives	Gemfibrozil, clofibrate
1. SSRIs 2. TCAs 3. Other anti-deppressants	1. Fluoxetine, sertraline, paroxetine, citalopram 2. Amitriptyline, desipramine, nortiptyline 3. Lithium.
❖ Benzodiazepines	Lorazepam, alprazolam, diazepam
❖ H_2 receptor antagonists	Rantidine, cimetidine
❖ Butyrophenones & phenothiazines	Haloperidol, prochlorperazine, chlorpromazine
❖ Hydantoin anti-convulsants	Phenytoin
❖ Cytotoxic agents	Cyclophosphamide, methotrexate
❖ Recreational drugs	Alcohol, cocaine, marijuana

To Understand Better | Erectile dysfunction

Erectile dysfunction	Impotent
Persistent or recurrent inability to attain (acquire) & maintain (sustain) an erection (rigidity) sufficient for satisfactory sexual performance	It is reserved for those men who experience erectile failure during attempted intercourse more than 75 % of the time.

Endothelial Dysfunction is the commonest cause of ED





❖ I.M.P.O.T.E.N.C.E

الدكتور حذفها من سلايداته

Inflammatory	Prostatitis, urethritis
Mechanical	Peyronie's disease, chordee
Psychological	Depression, performance anxiety, stress, relationship difficulties
Occlusive vascular	**Art: Hypertension, smoking, hyperlipidemia, DM, peripheral vascular disease.** Ven: venous occlusion due to anatomical or degenerative changes
Trauma	Pelvic fracture, SC inj, penile trauma.
Endocrine	**Hypogonadism**, hyperprolactinemia, hypo & hyperthyroidism.
Neurologic	Parkinsons, MS, spina bifida, pelvic surgery peripheral neuropathy
Chemical	**Anti-HTN, ant-arrhyth, anti-depressants, anxiolytic, anti-androgens, anti-convulsants, alcohol, marijuana, anti-parkinson drugs, LHRH analogues.**
Extra factors	Prostatectomy, old age, CRF, cirrhosis

Drugs adversly causing ED

Type	**A- Centrally Acting Drugs** = on CNS — SSRIs are the most imp
MOA	○ Dopamine > NE promote arousal (الإثارة), so whenever 5HT (serotonin) act on $5HT_2$ → ↓ DA release → ↓ arousal
Drug & MOA	1- Most **ADDs (Antidepressant drugs)** leads to ↓ 5HT uptake → ↑ 5HT in synapse and act on $5HT_2$ → ↓ DA release → ↓ arousal • Like non-selectively as **TCAs** and selectively as **SSRIs** (e.g. Fluoxetine) NOTE: SSRIs also work **Peripherally** and antagonize NO actions → ↓ genital sensation → **Delay ejaculation** → it can be used to Treat Premature Ejaculation.
	2- **Anti-psychotic drugs** they are **DA antagonist** + **hyperprolactinemia** that leads to ↓ arousal that leads to Erectile Dysfunction — Normally, D inhibits prolactin secretion from AP, so whenever the D R are blocked → ↑ prolactin
	3- Anti-epileptic drugs (phenytoin) have **GABA effect** that leads to antagonize the excitatory amino acids (aspartate & glutamate), cause ↑ **sedation and ↓ arousal.**
type	**B- Centrally acting anti-hypertensives**
drug	**1- Methyldopa, Reserpine** → ↓ arousal
drug	**2- Clonidine** leads to ↓ arousal centrally / Vasoconstriction peripherally
type	**C- Other anti-hypertensives**
drug	**1- β_2 blockers** leads to -ve vasodilating on β_2 + **potentiate α_1 effect** — When β_2 is blocked, most of NE will act on α_1 R
drug	**2- Thiazide diuretics** leads to ↓ **spinal reflex controlling erection** + ↓ arousal
type	**D- Anti-androgens leads to ↓ desire**
drug	**1- Finasteride:** leads to **α reductase inhibitor** (prevent production of active testosterone → **irreversible erectile dysfunction**.(used to prevent baldness & BPH)
drug	**2- Cyproterone acetate**: it is synthetic steroidal anti-androgen → used to treat acne in F.
drug	**3- Cimetidine** (important) (high doses) **/ Ketoconazole /Spironolactone leads to hyperprolactinemia + gynecomastia**
drug	**4- Estrogen-containing medications**
type	**E- Habituating Agents**
drug	**1- Cigarette smoking** leads to vasoconstriction + **penile venous leakage** **2- Alcohol [small amounts]** leads to ↕ desire + ↓ anxiety + vasodilatation **3- Alcohol [big amounts]** leads to ↕ sedation + ↓ desire **4- Chronic alcoholism** leads to hypogonadism + polyneuropathy

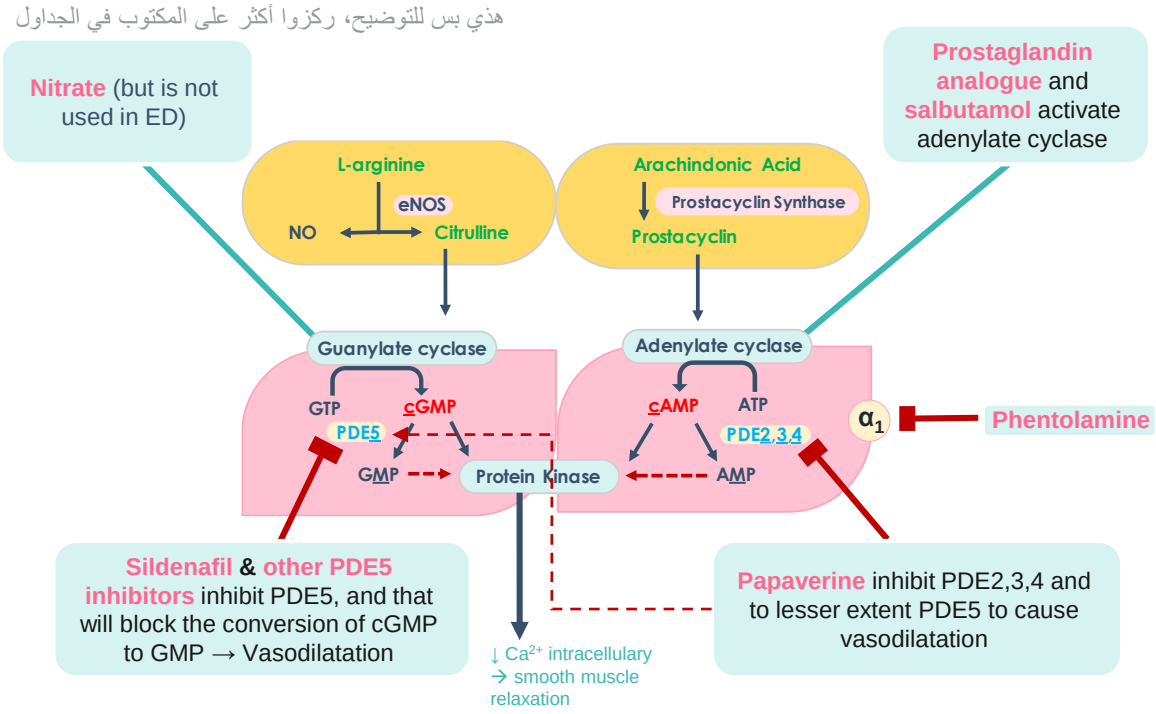
Drugs treating Erectile Dysfunction

Centrally

- **Androgen** for **desire** (libido) الرغبة
- **Apomorphine** (D agonist) for **arousal**. الإثارة

Peripherally

هذي بس للتوضيح، ركزوا أكثر على المكتوب في الجداول



* Note: both Nitrates and Salbutamol are not used nowadays.

Selective PDE5 Inhibitor

Drug

Sildenafil, Vardenafil, Tadalafil, Avanafil
(Orally)

Mech. of action

- **Inhibit PDE5** which **prevent breakdown of cGMP**, and that leads to **pertain vasodilatation and erection** (increase blood flow to corpus cavernosum).
- They **do not** affect the libido, so sexual stimulation is essential to a successful (At recommended doses, PDE-5 inhibitors have no effect in the absence of sexual stimulation).

❖ **Pharmacodynamic actions relevant to PDE5 inhibition:** ما يهمنا إلا أول نقطة

- **VSMCs of erectile tissue of penis** (vascular smooth muscle cells (VSMCs).
- Other VSMCs (lung, brain, heart,…)
- Other non-VSMCs (prostate, bladder, seminal vesicle, GIT…).
- Platelets.
- Other tissues (testis, skeletal muscles, liver, kidney, pancreas…).

Indications

- **Erectile dysfunction**; **1st line therapy**. All types have similar efficacy.
- Pulmonary hypertension (bc it acts on PDE-5 in the lungs → vasodilation)
- BPH (Benign prostatic hypertrophy) and premature ejaculation.

Selective PDE5 Inhibitor (cont.)

ADRs

Common ADRs:	Sildenafil	Vardenafil	Tadalafil
Headache %	14	10	15
Flushing %	12	11	3
Nasal	Congestion	Rhinitis	Congestion
Dyspepsia %	7	3	15
Abnormal vision %	>4	<2	-
Myalgia & Back pain %	-	-	5
Sperm functions	-	-	Decreased?
QT prolongation	-	Prolonged	-

❖ **Major less common ADRs:** أهم شيء المظلل بالأصفر هي اللي تفرق لي بين دواء ودواء، أما البقية فسببها توسع الأوعية الدموية وكلهم يشتركون بهالشيء

- **IHD** (Ischemic heart disease) and **AMI** (Acute myocardial infarction) (with large dose or on nitrates)
- Hypotension in patients on a-blockers more than with other antihypertensives.
- Bleeding; epistaxis…etc.
- Priapism; if erection lasts longer than 4 hours (emergency situation).

❖ **Major rare ADRs:**

- **Ischemic Optic Neuropathy**; can cause **sudden loss of vision**
- Hearing loss

❖ PDE isozymes

الدكتور حذف الجدول واللي تحته كله، أما الدكتورة فقرأت المظلل بالأصفر فقط

Isozyme	Location ماراح أسألكم على كل آيزوإنزايم وين يأثر عليه، المهم هو تعرفون السايد إفكتس	ADRs (of their blocking)
PDE-1	Heart, lung, brain, smooth muscle.	IHD, AMI.
PDE-2	Adrenal gland, heart, lung, liver, platelets	
PDE-3	heart, lung, liver, platelets, adipose tissue, inflammatory cells.	
PDE-4	Sertoli cells, kidney, brain, liver, lung, inflammatory cells.	-
PDE-5	Lung, platelets, vascular smooth muscles, heart.	Headache, Flush, nasal congestion.
PDE-6	Photoreceptors	Altered vision.
PDE-7	Skeletal muscles, heart, kidney, brain, pancreas, T lymphocytes.	-
PDE-8	Testes, eye, liver, skeletal muscles, heart, kidney, ovary, brain, T lymphocytes.	-
PDE-9	Kidney, liver, lung, brain, possibly heart.	-
PDE-10	Testes, brain.	-
PDE-11	Skeletal muscles, prostate, kidney, liver, pituitary and salivary glands, testes.	Back pain.

❖ **Selectivity of PDE5 inhibitors on PDE5 is not absolute and vary with each drug, and they can:**

- Partially act on PDE targeting **cGMP** (1, 6, 9, 11).
- In higher doses act on PDE targeting **cAMP** (2, 3 ,4, 10, 8, 7).

❖ **Selectivity of PDE5 inhibitors in blocking PDE5 and PDE6:**

- Sildenafil: **10-fold** selective. - Vardenafil: **16-fold** selective. - Tadalafil: > **200-fold** selective.

→ They give variability in ADRs

Selective PDE5 Inhibitor (cont.)

P.K

Absorption:

- Fatty food interferes with Sildenafil & Vardenafil absorption, so taken on empty stomach (at least **2** hours after food).
- Tadalafil and Avanafil are not affected by food.

Metabolism:

All by hepatic **CYT3A4** (Tadalafil more than the rest) thus:

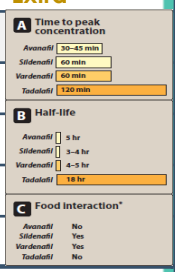
- **Increase ADRs with enzyme inhibitors**: Erythromycin & Clarithromycin, Ketoconazole, Cimetidine, Tacrolimus, Fluvoxamine, Amiodarone…etc.
- **Decrease efficacy with enzyme inducers**: Rifampicin, Carbamazepine, Phenytoin.

Note:

- **Avanafil** has the advantage of been given **30 min** before intercourse.
- **Tadalafil** must be given every 72 hours if used with enzyme inhibitors. مو مهم

Given once a day	Sildenafil	Vardenafil	Tadalafil
Dosage (mg)	50-100	10-20	10-20
Time of admin. (hrs.)	1	1	1-12
Onset of action (min)	30-60	30-60	< 30-45
Duration of action (hrs.)	4	4-5	**36** (the longest)

Extra



C.I

- Hypersensitivity to drug.
- Patients with history of AMI, stroke or fatal arrhythmias <6 months.
- **Nitrates** → **total contraindication**. What should we do? PDEIs in small dose + spacing at least 24hrs (48 hrs with Tadalafil) for **fear of developing IHD/AMI** due to **severe hypotension.** Both PDE5Is & nitrates produce vasoDilation effect → when taken both without decreasing the dose = sever hypotension

Precautions

- With alpha blockers (except tamsulosin-bc it is selective on prostate alpha1 R) → orthostatic hypotension
- With hepato/renal insufficiency. (bc they are metabolized by the liver & excreted by the kidney)
- With bleeding tendencies (leukemias, hemophilia, Vitamin K deficiency, antiphospholipid syndrome,…etc)
- With Quinidine, procainamide, amiodarone (class I & III antiarryth.) (**Vardenafil**).
- Dose adjustment when using drugs that have interaction on hepatic liver microsomal enzymes (inhibitors or inducers).
- Retinitis pigmentosa. (Rare)

Other oral drugs

Testosterone	○ Given to those with **hypogonadism or hyperprolactenemia** ○ Given for promotion of desire. (centrally)	
Apomorphine	**Features**	○ A **dopamine agonist** on D2 receptors. ○ Activates arousal centrally; Erectogenic + Little promotion of desire. ○ Given **sublingual**. Acts quickly. ○ Not FDA approved. Weaker than PDE5. ○ **Safe with nitrate**.
	Indications	○ Given in mild to moderate cases, psychogenic (bc it ↑ arousal & desire), and if PDE5 is contraindicated.
	ADRs	○ **Nausea, headache, and dizziness**,
Oral phentolamine	○ alpha1 blocker / debatable efficacy. (can be combined with other drugs)	
Yohimbine	○ Central and peripheral alpha2 antagonist → **Aphroditic + Erectogenic** Aphrodite → آلهة الجمال والحب في الإغريق ○ but have low efficacy and many **cardiovascular side effects**. ○ Efficacy of yohimbine for the treatment of impotence has never been clearly demonstrated.	
Trazodone	○ **Antidepressant**, a 5HT reuptake inhibitor → **priapism**	
Korean Ginseng	○ Questionable / may be a NO donner.	

Other drugs

Alprostadil أهم شيء فيهم هو

	Trans-urethraloral	Intra-cavernosal Inj.	Topical
Drug	**Alprostadil**	1. **Alprostadil:** ○ ProstaglandinE1→ **↑cAMP** ○ Needs training → Erection → after 5-15 min ○ lasts according to dose injected → May develop fear of self injury / Discontinuation 2. **Papaverine**; ○ ProstaglandinE1 → **↑ cAMP** 3. **Phentolamine**; ○ alpha1 blocker. **These 3 drugs are combined with each other in severe cases.**	○ 20% **Papaverine:** ↑ cAMP + cGMP. ○ 2% **Minoxidil:** NO donner + K^+ channel opener. ○ 2% **Nitroglycerine.** + a drug absorption enhancers.
MOA	○ **Prostaglandin E1 analogue** → ↑ cAMP.		
P.K	○ Synthetic & more stable ○ Applied by a special applicator into penile urethra & acts on corpora cavernousa → Erection. ○ Low to Intermediate Efficacy. ○ Minimal systemic effects. ○ Rarity of drug interactions.		• Low efficacy. • No FDA approval • **Female Partner** can develop: • **Hypotension, headache because of vaginal absorption**.
ADRs	○ Variable penile pain ○ Urethral bleeding / Urethral tract infection ○ Vasovagal reflex / Hypotension ○ **Priapism** or Fibrosis → rare	With **Alprostadil**: • Pain or bleeding at injection site • Cavernosal fibrosis • Priapism	

Treatment of Priapism

❖ What is Priapism?

Priapism is a condition in which a penis remains erect for hours in the absence of stimulation or after stimulation has ended.

Treatment of Priapism (Medical emergency)

- Aspirate blood to **decrease** intracavernous pressure.
- Intracavernous injection of **Phenylephrine** (alpha1 agonist) = vasoconstriction → detumescence

- Detumescence is the process of subsiding from a state of sexual arousal.

Summary-1

Drugs adversly causing ED

A- Centrally Acting Drugs	○ **DA>NE promote arousal, so whenever 5HT act on 5HT2 → ↓ DA release→ ↓ arousal**
	1- Most ADDs (Antidepressant drugs) leads to 5HT↓ uptake → ↑ 5HT in synapse and act on 5HT2 → ↓ DA release → ↓ arousal • **Like non-selectively as TCAs and selectively as SSRIs** NOTE: SSRIs also work Peripherally and antagonize NO actions → decrease genital sensation → Delay ejaculation → it can be used to Treat Premature Ejaculation.
	2- Anti-psychotic drugs they are DA antagonist + hyperprolactinemia that leads to ↓ arousal that leads to Erectile Dysfunction
	3- Anti-epileptic drugs (phenytoin) have GABA effect that leads to antagonize Exc. amino acid, causes ↑ sedation and ↓ arousal
B- Centrally acting anti-hypertensives	**1- Methyldopa, Reserpine → ↓ arousal**
	2- Clonidine leads to ↓ arousal centrally / Vasoconstriction peripherally
C- Other anti-hypertensives	**1- β_2 blockers leads to -ve vasodilating on β2 + potentiate α1 effect**
	2- Thiazide diuretics leads to ↓ spinal reflex controlling erection + ↓ arousal
D- Anti-androgens leads to ↓ desire	**1- Finasteride: leads to α reductase inhibitor (prevent production of active testosterone → irreversible erectile dysfunction**
	2- Cyproterone acetate: it is synthetic steroidal antiandrogen
	3- Cimetidine (high doses) **/ Ketoconazole /Spironolactone leads to hyperprolactinemia + gynecomastia**
	4- Estrogen-containing medications
E- Habituating Agents	**1- Cigarette smoking leads to vasoconstriction + penile venous leakage** **2- Alcohol [small amounts] leads to ↑ desire + ↓ anxiety + vasodilatation** **3- Alcohol [big amounts] leads to ↑ sedation + ↓ desire** **4- Chronic alcoholism leads to hypogonadism + polyneuropathy**

Drugs treating Erectile Dysfunction

Centrally	• **Androgen** for **desire**. • **Apomorphine** for **arousal**.
Peripherally	**Prostaglandin analogue** (+AC), **Sildenafil** & other PDE-5 inhibitors(-PDE5), **Papaverine** (-PDE2,3,4) & **Phentolamine** (-α_1)

Selective PDE5 Inhibitor

(Orally) - Sildenafil, Vardenafil, Tadalafil, Avanafil

MOA

- **Inhibit PDE5** which prevent breakdown of **cGMP**, and that leads to **pertain vasodilatation and erection** (increase blood flow to corpus cavernosum).
- They do not affect the libido, so sexual stimulation is essential to a successful (At recommended doses, PHE-5 inhibitors have no effect in the absence of sexual stimulation).
- ❖ **Pharmacodynamic actions relevant to PDE5 inhibition:**
  - VSMCs of erectile tissue of penis (vascular smooth muscle cells (VSMCs).
  - Other VSMCs (lung, brain…), heart.
  - Other non-VSMCs (prostate, bladder, seminal vesicle, GIT…).
  - Platelets.
  - Other tissues (testis, skeletal muscles, liver, kidney, pancreas…).

Uses

- Erectile dysfunction; 1st line therapy. All types have similar efficacy.
- Pulmonary hypertension.
- BPH (Benign prostatic hypertrophy) and premature ejaculation.

Summary-2

Selective PDE5 Inhibitor (cont.)

ADRs

- ❖ **Common ADRs:**
  - Abnormal vision → more with Sildenafil.
  - Myalgia & back pain → Tadalafil
  - Sperm functions → decreased with Tadalafil
  - QT prolongation → prolonged with vardenafil
- ❖ **Major less common ADRs:**
  - IHD and AMI (with large dose or on nitrates), Hypotension in patients on a-blockers more than with other antihypertensives, Bleeding; epistaxis, Priapism; if erection lasts longer than 4 hours (emergency situation).
- ❖ **Major rare ADRs:** Ischemic Optic Neuropathy; can cause sudden loss of vision & Hearing loss.

P.K

Absorption:

- Fatty food interferes with Sildenafil & Vardenafil absorption, so taken on empty stomach (at least 2 hours after food). While Tadalafil and Avanafil are not affected by food.

Metabolism:

All by hepatic CYT3A4 (Tadalafil more than the rest) thus:

- Increase ADRs with enzyme inhibitors: Erythromycin & Clarithromycin, Ketoconazole, Cimetidine, Tacrolimus, Fluvoxamine, Amiodarone…etc.
- Decrease efficacy with enzyme inducers: Rifampicin, Carbamazepine, Phenytoin.

Note:

- **Avanafil** has the advantage of been given 30 min before intercourse.
- **Tadalafil** must be given every 72 hours if used with enzyme inhibitors.

C.I

- Hypersensitivity to drug.
- Patients with history of AMI, stroke or fatal arrhythmias <6 months.
- **Nitrates → total contraindication**. What should we do? PDEIs in small dose + spacing at least 24hours (48 hours with Tadalafil) for fear of developing IHD/AMI due to severe hypotension (see detailed mechanism in antianginal drugs).

Precautions

- With alpha blockers (except tamsulosin) → orthostatic hypotension
- With hepato/renal insufficiency.
- With Quinidine, procainamide, amiodarone (class I & III antiarhtmics) (**Vardenafil**).
- Dose adjustment when using drugs that have interaction on hepatic liver microsomal enzymes (inhibitors or inducers).
- Retinitis pigmentosa.

Other oral drugs

Testosterone	○ Given to those with hypogonadism or hyperprolactenemia ○ Given for promotion of desire.
Apomorphine	○ A dopamine agonist on D2 receptors. ○ Activates arousal centrally; Erectogenic + Little promotion of desire. ○ Given sublingual. Acts quickly. ○ Not FDA approved. Weaker than PDE5. ○ Safe with nitrate. ○ **Uses:** Given in mild to moderate cases, psychogenic, and if PDE5 is contraindicated. ○ **ADRs: Nausea, headache, and dizziness**,
Oral phentolamine	○ alpha1 blocker / debatable efficacy.

Other drugs

ROA	Trans-urethraloral	Intra-cavernosal Inj.	Topical
MOA	**Alprostadil:** ❖ Prostaglandin E1 analogue → ↑cAMP. ❖ **P.K:** ○ Low to Intermediate Efficacy. ○ Minimal systemic effects. ○ Rarity of drug interactions.	1. **Alprostadil:** ProstaglandinE1→ ↑cAMP. *Needs training 2. **Papaverine**; ProstaglandinE1 → ↑ cAMP 3. **Phentolamine**; alpha1 blocker. They are combined with each other in severe cases.	○ 20% **Papaverine:** ↑cAMP + cGMP. ○ 2% **Minoxidil:** NO donner + K channel opener. ○ 2% **Nitroglycerine.** + a drug absorption enhancers. **Female Partner** can develop: hypotension, headache because of vaginal absorption.
ADRs	Urethral bleeding / Urethral tract infection. Vasovagal reflex / Hypotension. Priapism or Fibrosis → rare	With **Alprrostadil**: • Pain or bleeding at injection site. Cavernosal fibrosis. Priapism	

Treatment of Priapism

- Aspirate blood to decrease intracavernous pressure.
- Intracavernous injection of Phenylephrine (alpha1 agonist) → detumescence

MCQs

1- Centrally acting antihypertensive causes ED?
A. Reserpine
B. Finasteride

2- What is the MOA of Finasteride?
A. a reductase inhibitor
B. ↑ 5HT in synapse and act on 5HT2 ↓ DA release → ↓ arousal

3- Sildenafil has been prescribed for years to treat erectile dysfunction. Recently, this drug is also being used for what condition?
A. vasospastic angina.
B. supraventricular tachycardia.
C. Cyanide poisoning.
D. Raynaud disease.
E. Pulmonary hypertension.

4- Which of the following is incorrect about selective PDE-5 Inhibitors?
A. They block the conversion of cGMP into GMP.
B. They inhibit PDE-5.
C. All types have similar efficacy.
D. They affect libido.

5- Sildenafil is contraindicated in patients taking the following class of drugs:
A. α-adrenergic blockers
B. β-adrenergic blockers
C. Organic nitrates
D. Angiotensin converting enzyme inhibitors

6- The following is a selective α2 adrenoceptor antagonist:
A. Prazosin
B. Phentolamine
C. Yohimbine
D. Clonidine

7- A 66-year-old man complained of decreased libido and difficulty maintaining an erection. He is con- cerned about the use of drugs to restore sexual function, particularly about the need to time thera- py with anticipated sexual activity. Which one of the following statements is true:
A. Sildenafil is indicated for this patient because of its long duration of action.
B. Vardenafil in a film-coated tablet is indicated for this patient because its absorption is not affected by food.
C. Vardenafil in an orally disintegrating tablet is indicated for this patient because of its long duration of action.
D. Tadalafil is indicated for this patient because of its long duration of action.

Answers: 1-A 2-A 3-E 4-D 5-C 6-C 7-D

Thank you for checking our team!

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Sources:

1. 435's slides.
2. Pharmacology (Lippincotts Illustrated Reviews Series), chapter 29, 5th edition.