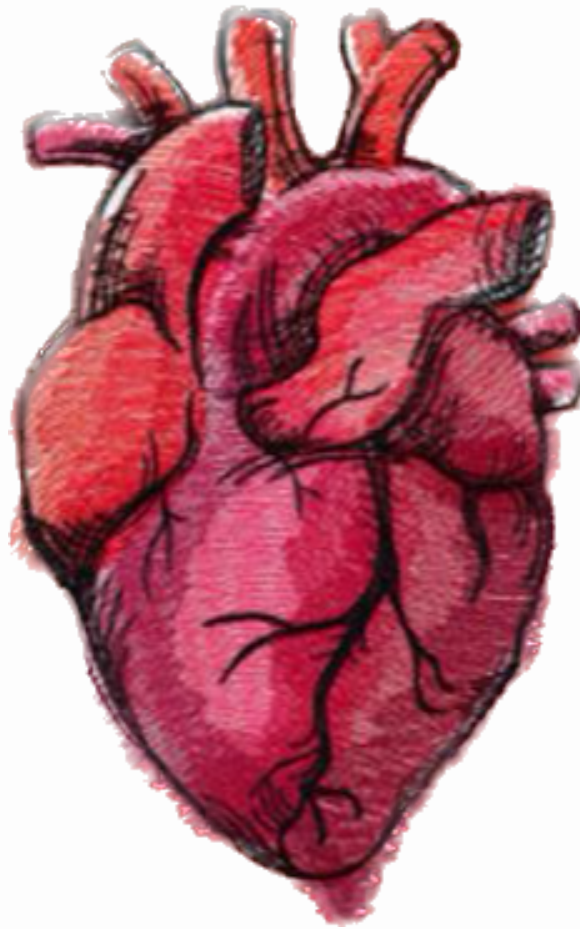




CARDIOVASCULAR SYSTEM



SUBJECT : _____

LEC NO. : 3

DONE BY : Tabark Aldaboubi, Raneem Azzam

وَقُلْ رَبِّ زِدْنِي عِلْمًا

اهلاً يَ لطيف

مش مهم اللي فات، مش
مهم انت ضيحت وقت قدايه،
انت مش متأخر، لسه قدامك
وقت، طول ما لسه بتتنفس
فأنت لسه قدامك وقت



CVS- Pharmacology 3

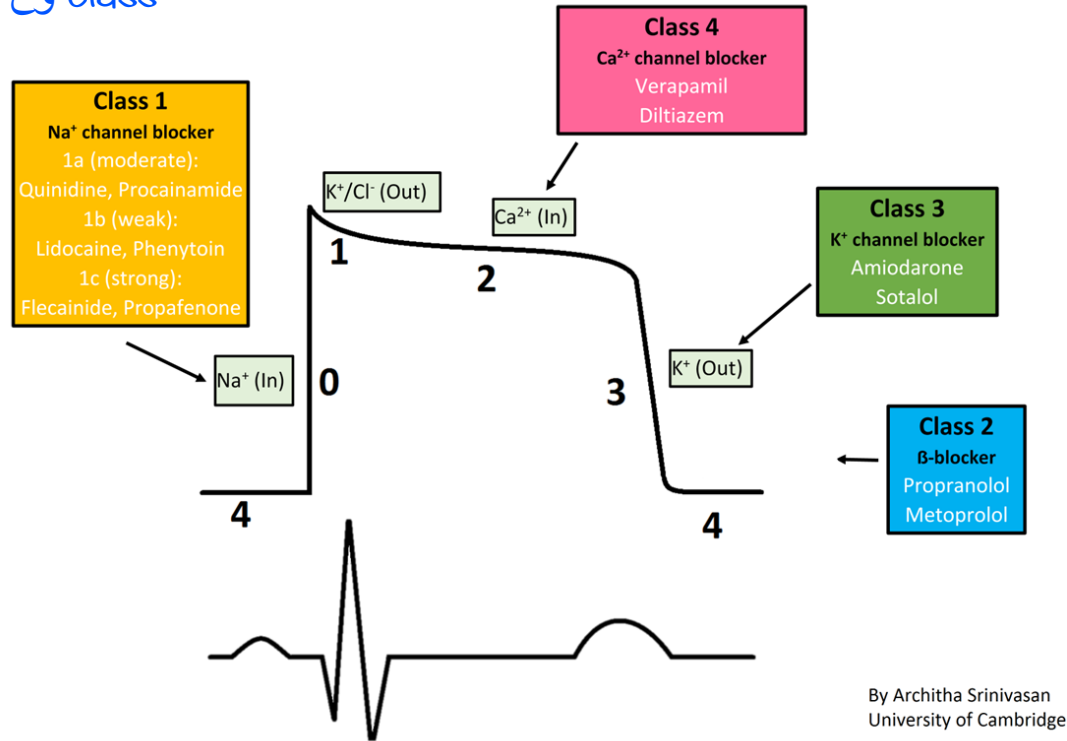
Antiarrhythmics 2

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Antiarrhythmic drugs

رجعت ذكرت الدكتور بالبداية ع كل

class وع شو بشتغل



Class II

Beta blockers? Lol

Propranolol

Atenolol

Metoprolol

↓
cardio selective

Class II Antiarrhythmic Drugs

β -adrenergic antagonists, or β -blockers. use as antiarrhythmic they are cardioselective
← اتفنل اكون سعة الكلمة مع

Mechanism of action:

Diminish phase 4 depolarization and, thus, depress automaticity, prolong AV conduction, and decrease heart rate and contractility.

Therapeutic uses:

1. Treating tachyarrhythmias caused by increased sympathetic activity. because they are β -blocker → block the sympathetic activity

2. Atrial flutter and fibrillation and for AV nodal reentrant tachycardia. β -blocker: تبطئ Tachy more sympathetic activity مع Circulating ↑ like Tumor adrenal gland عند شرحه عند

very important 3. **Prevent life-threatening ventricular arrhythmias following a myocardial infarction.**

↓
one of complication is life threatening arrhythmia to avoid these arrhythmias → بتطيق β -blocker عندهم لمنع بصر Ventricular arrhythmia

Class III Antiarrhythmic Drugs

Pro arrhythmic

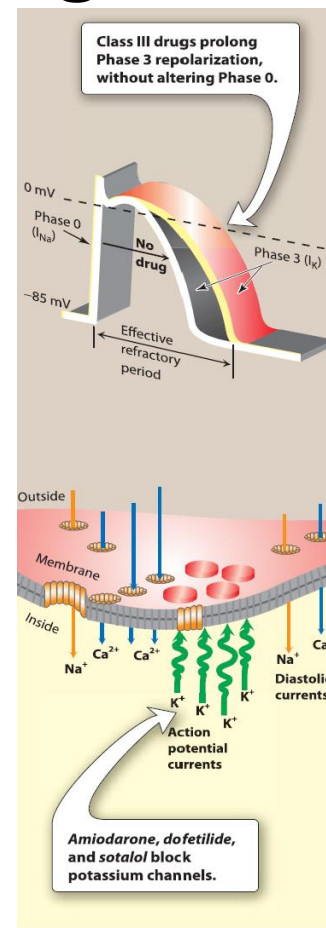
اكتر واحدمستخردم

This is SAD

Sotalol

Amiodarone

Dofetilide



الاول والاخير

عادة يستخدما

بمن المستشفين

- Block K⁺ channels leading to diminish the outward K⁺ current during repolarization of cardiac cells. *تقلل الـ outward K⁺ movement فتبطل الشحنة موجبة فجعل delay انه يرجع يسهل repolarization*
- They prolong the duration of the action potential without altering phase 0 of depolarization or the resting membrane potential.
- They prolong the effective refractory period, increasing refractoriness.
- All class III drugs have the potential to induce arrhythmias.

This is SAD

Sotalol

Amiodarone

Dofetilide

Class III Antiarrhythmic Drugs

هو الكثر واحد يستخدم
لأنه اقل واحد
Pro arrhythmia
arrhythmia (انصت لأكثر من فاعل)

A) Amiodarone

- Mechanism of action:

↳ It's not only class III
It has complex effects, showing class I, II, III, and IV actions, as well as α -blocking activity.

Its dominant effect is **prolongation of the action potential duration and the refractory period by blocking K⁺ channels.**

Therapeutic uses: بالتالي يقل ال heart rate

- *Amiodarone* is effective in the treatment of severe refractory supraventricular and ventricular tachyarrhythmias.
- ***Amiodarone* has been a mainstay of therapy for the rhythm management of atrial fibrillation or flutter.**

This is SAD

Sotalol

Amiodarone

Dofetilide

Class III Antiarrhythmic Drugs

- A) Amiodarone

- Adverse effects:

- ^{→ long term use} pulmonary fibrosis, neuropathy, hepatotoxicity, corneal deposits, optic neuritis, blue-gray skin discoloration, and hypo- or hyperthyroidism. → ^{كسل او نشاط}
- Amiodarone is the **least proarrhythmic of the class I and III antiarrhythmic drugs.**

This is SAD

Sotalol

Amlodarone

Dofelotide

Class III Antiarrhythmic Drugs

- **B) Sotalol** *Class III و Class II mainly*
- A class III antiarrhythmic agent with a nonselective β -blocker activity.
- Blocks a **rapid outward K⁺ current (delayed rectifier current)**. Used for maintenance of sinus rhythm in patients with atrial fibrillation, atrial flutter, or refractory paroxysmal supraventricular tachycardia and in the treatment of ventricular arrhythmias.
- For his β -blocking properties, it is commonly used in patients with left ventricular hypertrophy or atherosclerotic heart disease. *المريض الي عندهم*

من فائدة انه اعطيه β -blocker لانه صي بتقل ال remodeling to heart (تتولد fibrasis)

To reduce the risk of proarrhythmic effects, sotalol should be initiated in the hospital to monitor QT interval. *AP بطول ال **

*Ventricular arrhythmia بتقل QT يزداد ال refractory period لبتالي بتزيد ال **

This is SAD

Sotalol

Amiodarone

Dofetilide

Class III Antiarrhythmic Drugs

C) Dofetilide

- Is a pure K⁺ channel blocker.
- Can be used as a first-line antiarrhythmic agent in **patients with persistent atrial fibrillation and heart failure or in those with coronary artery disease.**
- Because of the risk of proarrhythmia, dofetilide **initiation is limited to the inpatient setting.**

Class IV Antiarrhythmic Drugs

I and V in Class IV?

Diltiazem

Verapamil

- Non-dihydropyridine Ca²⁺ channel blockers: **verapamil and diltiazem**

Cardiac و Vascular smooth muscle على الأخص ليس تأثيرها

- Although voltage sensitive Ca²⁺ channels occur in many different tissues, the major effect of **Ca²⁺ channel blockers** is on **vascular smooth muscle and the heart.**

↓
skeletal muscle و smooth muscle

- In the heart, verapamil and diltiazem bind only to open depolarized voltage-sensitive channels, thus decreasing the inward current carried by Ca²⁺.

لما يكون عننا AP more قاعد بهيمير على الـ cell رح يكون في استخدام أكثر لـ Ca²⁺ channel

used dependante

أما لما استخدمنا على الـ normal cell يكون الـ effect تابعه اقل لأنه يكون فيه less open depolarize voltage Ca²⁺ channel

contractility و heart rate ↓

لما مشغل الـ لاويته عليهم بتزوج تعمل block الـ channel بالتالي decreased inward current بأثر على

Ca²⁺ channel blocker (class IV) و بابطية !! heart failure لوفى مريض عنده

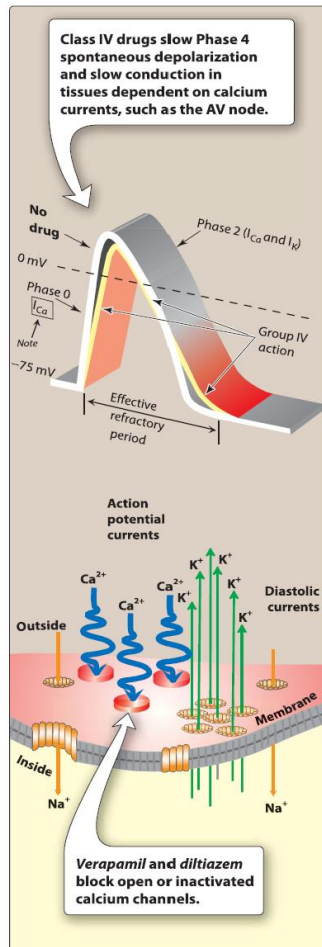
I and V in Class IV?

Diltiazem

Verapamil

Class IV Antiarrhythmic Drugs

بشتغلو mainly على phase two



- These drugs are **use dependent** as they prevent **repolarization** until the drug dissociates from the channel, resulting in a **decreased rate of phase 4 spontaneous depolarization**.

- They also slow conduction in tissues that are dependent on Ca²⁺ currents, such as the AV and SA node.

مشان هيك هما more effective لانهم بشتغلو على العضلات (شوي) وعلى ال pacemakers الي هما ال AV,SA بالتالي بقللو ال conduction وهيك بقل ال HR

Class IV Antiarrhythmic Drugs

I and V in Class IV?

Diltiazem

Verapamil

- **Therapeutic use:**

These agents are more effective against atrial than against ventricular arrhythmias

1. Treating reentrant supraventricular tachycardia
2. Reducing the ventricular rate in atrial flutter and fibrillation.

- **Adverse effects:**

$\downarrow HR \rightarrow \downarrow \text{contraction} \rightarrow \text{peripheral edema}$

- bradycardia, hypotension, and peripheral edema.

لانو حكيينا بشتغلو على ال vascular smooth muscle، ف لما احنا نعمل بلوك للكالسيوم رح يخف الكونتراكت ويصير
hypotension ويعمل vd،،،، برضو عشان بقتل ال HR رح يقل ال output ويقل الكونتراكت و برضو يعمل hypotension

Other Antiarrhythmic Drugs

انتبه هون !!

Digoxin **Mainly use in HF patient .**

in Myocardial ^{بعل} → shortening
in AV node ^{بعل} → prolongation → ↓↓ conduction →

- **Inhibits the Na⁺/K⁺-ATPase pump**, shortening the refractory period in atrial and ventricular myocardial cells while prolonging the effective refractory period and diminishing conduction velocity in the AV node.

↓↓ HR
عنت طريق
ال AV
node

- Used to control ventricular response rate in atrial fibrillation and flutter; however, sympathetic stimulation easily overcomes the inhibitory effects of digoxin. →

سبب ال فرماضه تغذمو كثير

- At toxic concentrations, digoxin causes ectopic ventricular beats that may result in VT and fibrillation.

↓
Ventricle tachycardia

ع
* لو اعطيتو overdose
يعير
VT ← proarrhythmic

عصم نغز
انه مش
first
choise

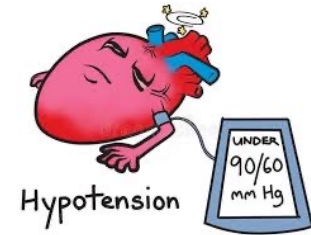
Other Antiarrhythmic Drugs

- Adenosine

- At high doses, the drug decreases conduction velocity, prolongs the refractory period, and decreases automaticity in the AV node. → ↓ HR

IV → • Intravenous *adenosine* is **the drug of choice for converting acute** → في الطوارئ
supraventricular tachycardias. ميزتو انو ال short duration ،،،، ال الو سريعة

- It has low toxicity but causes flushing, chest pain, and hypotension.



Other Antiarrhythmic Drugs

احد اسباب الاريثميا هو الالكترون امبلانس، واحد هم هو المغنيسيوم

- Magnesium sulfate
- Magnesium is necessary for the transport of Na^+ , Ca^{2+} , and K^+ across cell membranes.
- It slows the rate of SA node impulse formation and prolongs conduction time along the myocardial tissue.
- Therapeutic use: *نستخدمه في حالتين*
- To treat **torsades de pointes** and (digoxin-induced arrhythmias.) →

في حال كان مريضه HF

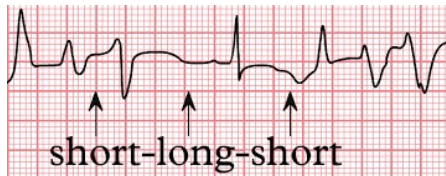
وما شئ على digoxin دمار عند Toxicity ادي ال arrhythmias
بعضه بياه .

Long QT

غشيم

(Genetic abnormalities) or (sometimes certain medicines can cause Long QT interval.)

للتوضيح →



ملخصه
بس

تنبيه من الدكتوراه !! كل شيء
حلتو اليوم وطلوب .

Antiarrhythmic Drugs

CLASSIFICATION OF DRUG	MECHANISM OF ACTION	COMMENT
IA	Na ⁺ channel blocker	* Slows Phase 0 depolarization in ventricular muscle fibers
IB	Na ⁺ channel blocker	+ Shortens Phase 3 repolarization in ventricular muscle fibers
IC	Na ⁺ channel blocker	* Markedly slows Phase 0 depolarization in ventricular muscle fibers
II	β -Adrenoreceptor blocker	Inhibits Phase 4 depolarization in SA and AV nodes
III	K ⁺ channel blocker	Prolongs Phase 3 repolarization in ventricular muscle fibers
IV	Ca ²⁺ channel blocker	Inhibits action potential in SA and AV nodes

Therapeutic indications for some commonly encountered arrhythmias.

كثير مهم!!

+ يمكن تجيب الدوا و فينالا type ال arrhythmia الو *

++ الا اثنين من غيرهم best of choice

Control arrhythmia $\frac{one}{for}$ 2 Drug $\frac{الثاني}{الثاني}$ منعني
prevent completion of arrhythmia

This common arrhythmia involves multiple ectopic foci of atrial cells, creating a chaotic movement of impulses through the atria. The ventricular response may be rapid (100-150 beats per minute) and irregular. Cardiac output is decreased and exercise intolerance is common.

β -Blockers are used in atrial fibrillation or flutter, because they decrease heart rate and promote conversion to sinus rhythm. Long-term, oral anticoagulant therapy reduces the risk of stroke that is associated with atrial fibrillation or flutter.

TYPE OF ARRHYTHMIA	ANTIARRHYTHMIC DRUGS				
	Class I	Class II	Class III	Class IV	Other
ATRIAL ARRHYTHMIAS					
ATRIAL FLUTTER		Metoprolol		Verapamil	Digoxin
ATRIAL FIBRILLATION	Propafenone	Metoprolol	Amiodarone Dofetilide	Diltiazem	Anticoagulant therapy Digoxin
SUPRAVENTRICULAR TACHYCARDIAS					
AV NODAL REENTRY		Metoprolol		Verapamil	Digoxin
ACUTE SUPRAVENTRICULAR TACHYCARDIA				Diltiazem	Adenosine
VENTRICULAR TACHYCARDIAS					
ACUTE VENTRICULAR TACHYCARDIA	Lidocaine		Amiodarone		
VENTRICULAR FIBRILLATION (not responding to electrical defibrillation)	Lidocaine		Amiodarone		Epinephrine

Conduction is slowed through the AV node with metoprolol, verapamil, or digoxin.

Implantable cardioverter defibrillators are commonly used to terminate ventricular arrhythmias.

This arrhythmia is a common cause of death in patients who have had a myocardial infarction. Cardiac output is impaired, and tachycardia may deteriorate into ventricular fibrillation. Therefore, ventricular tachycardia requires prompt management.

Key: **Drug name** Commonly used drugs
Drug name Alternative drugs

First choice
Not first

مهم ندرت انمو
مهم ندرت بديل

حالت الدكتور بعضي مع كل هياي الادوية
عشش بين مربوط مع digoxin

preventing cardiac arrest

Study Questions



1-A 60-year-old woman had a myocardial infarction. Which agent should be used to prevent life-threatening arrhythmias that can occur post myocardial infarction in this patient?

A. Digoxin

B. Flecainide

C. Metoprolol

D. Procainamide

C

الذئبورة حلت ما بيبي

سؤال

حيدك

غير جبا مشر

2- A 57-year-old man is being treated for an atrial arrhythmia. He complains of dry mouth, blurred vision, and urinary hesitancy. Which antiarrhythmic drug is he mostly like taking?

- A. Metoprolol
- B. Disopyramide
- C. Verapamil
- D. Sotalol

B

3- Which arrhythmia can be treated with lidocaine?

- A. Paroxysmal supraventricular tachycardia
- B. Atrial fibrillation
- C. Atrial flutter
- D. Ventricular tachycardia

4-A clinician would like to initiate a drug for rhythm control of atrial fibrillation. Which of the following coexisting conditions would allow for initiation of flecainide?

A. Hypertension

B. Left ventricular hypertrophy

C. Coronary artery disease

D. Heart failure

5- Which one of the following drugs binds bile acids in the intestine, thus preventing their return to the liver via the enterohepatic circulation?

- A. Niacin.
- B. Fenofibrate.
- C. Cholestyramine.
- D. Fluvastatin.
- E. Lovastatin.

6-Which one of the following drugs is most likely to block K⁺ channels in the heart responsible for cardiac repolarization, and also blocks calcium channels in the AV node?

A. Amiodarone

B. Quinidine

C. Lidocaine

D. Sotalol

E. Verapamil

7- The treatment of hyperlipidemic patients with nicotinic acid (niacin) results in

- A. increases in VLDL
- B. decreases in both plasma cholesterol and TGs
- C. inhibition of HMG-CoA reductase
- D. decreases in HDL
- E. no change in total cholesterol in the plasma



ربنا شايفك وأنت
بتحاول وبتعمل
اللي عليك واكيد
هيراضيعك في
يوم من الايام
باللي أنت
عايزه وبتتمناه
متبطلش محاولة