

Anti-arrhythmic drugs

- **Summary.** (slide 2,3 and 4)
- **MCOs.** (slides 5,6 and 7)
- **SAQs.** (slides 8 and 9)

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The ultimate goal of anti-arrhythmic drugs is to restore normal rhythm and conduction by:

- Maintenance of normal rhythm.
- Prevention of more serious arrhythmias.

Anti arrhythmic drugs produces there effect by:

1. Slow the conduction velocity.
2. Prolongation of effective refractory period.
3. Suppressing ectopic pacemaker activity by inhibiting phase 4 (slow depolarization).

Vaughn Williams classification of anti-arrhythmic drugs:

1. Class I: membrane stabilizing effect by blocking Na channels so
 - On the cardiac muscle will decrease the rise of the depolarization phase.
 - On the pacemaker will decrease the slow depolarization phase (phase 4).

Then class I is subdivided into:

- Class IA: prolongation of the AP duration.
 - ❖ Drugs in this group:
Quinidine, procainamide.
- Class IB: shortening of the AP duration.
 - ❖ Drugs in this group:
Lidocaine, mexiletine.
- Class IC: has no effect on AP duration.
 - ❖ Drugs in this group:
Flecainide.

2. Class II: Beta-adrenoceptor blockers.
 - ❖ Drugs in this group:
Esmolol, Propranolol, Atenolol, Metoprolol.
3. Class III: Drugs that prolong AP duration by prolongation of Phase 3.
 - ❖ Drugs in this group:
Amiodarone, and IBUTILIDE which is pure class III.
4. Class IV: Calcium channel blockers mainly on the SA and AV nodes.
 - ❖ Drugs in this group:
Verapamil, diltiazem.

Drugs	Special features	Uses	ECG changes	ADRs
Quinidine	<ul style="list-style-type: none"> Class IA. Most toxic drug on the heart. Has anti-cholinergic effect. 	<ul style="list-style-type: none"> Atrial flutter and fibrillation. Maintain sinus rhythm after cardioversion. 	<ul style="list-style-type: none"> Prolong PR and QT intervals. Wide QRS complex. 	<ul style="list-style-type: none"> Anti-cholinergic actions. Torsades de pointes arrhythmia even with normal doses. Hypotension.
Procainamide	<ul style="list-style-type: none"> Class IA. Less toxic than QUINIDINE. NO anti-cholinergic effect. 	<ul style="list-style-type: none"> More effective in ventricular arrhythmias than atrial ones. 	<ul style="list-style-type: none"> Prolong PR and QT intervals. Wide QRS complex. 	<ul style="list-style-type: none"> In long term therapy may cause lupus erythematosus-like syndrome. Hypotension. Hallucination and psychosis. Torsades de pointes arrhythmia.
Lidocaine	<ul style="list-style-type: none"> Class IB. Short half life. Note effective orally. 	<ul style="list-style-type: none"> Used in emergency ventricular arrhythmias like in surgery and after acute MI. Not effective in atrial arrhythmias. 	_____	<ul style="list-style-type: none"> Hypotension. Similar to other local anesthetics including convulsion, paresthesia, tremor, dysarthria, and tinnitus.
Mexiletine	<ul style="list-style-type: none"> Class IB. Effective orally. 	<ul style="list-style-type: none"> Ventricular arrhythmias. Digitalis induced arrhythmia. 	_____	<ul style="list-style-type: none"> Nausea, vomiting. Tremor, drowsiness, diplopia. Hypotension and other arrhythmias.
Flecainide	<ul style="list-style-type: none"> Class IC. Should be reserved for resistant arrhythmias. 	<ul style="list-style-type: none"> Supraventricular arrhythmias. WPW syndrome. Effective in ventricular arrhythmias but high risk of proarrhythmias. 	_____	<ul style="list-style-type: none"> Proarrhythmias. Dizziness, tremor and blurred vision. Heart failure due to –ve inotropic effect.
Amiodarone	<ul style="list-style-type: none"> Class III. Additional class IA, II and IC effect. Vasodilating effect. 	<ul style="list-style-type: none"> Mainly used in serious resistant ventricular arrhythmias. Supraventricular arrhythmias (e.g. WPW) Maintenance of sinus rhythm after cardioversion. 	_____	<ul style="list-style-type: none"> exacerbation of ventricular arrhythmias (with high dose). Bradycardia and HF. Pulmonary fibrosis. Check the rest in the main lecture.
Ibutilide	<ul style="list-style-type: none"> Pure class III. Given by rapid IV infusion. 	<ul style="list-style-type: none"> Acute conversion of atrial flutter or fibrillation to normal sinus rhythm. 	<ul style="list-style-type: none"> QR interval prolongation. 	<ul style="list-style-type: none"> Mainly torsades de mointes arrhythmia.

Drug	Special features	Uses	ADRs
ESMOLOL	<ul style="list-style-type: none"> Beta-blockers. Decrease automaticity of the SA node and ectopic pace maker. Prolong refractory period. ESMOLOL has a very short duration of action. 	<ul style="list-style-type: none"> Atrial arrhythmias associated with emotions (e.g. exercise, thyrotoxicosis) Digitalis induced arrhythmias. WPW. ESMOLOL used for rapid control of ventricular rate in patient with atrial flutter or fibrillation. Others used in patient with MI to reduce incidence of sudden death due to ventricular arrhythmias. 	Check beta blockers lecture.
Propranolol			
Atenolol			
Metropolol			
Verapamil	<ul style="list-style-type: none"> Class IV. Calcium channels blockers. Work on SA and AV nodes causing: <ul style="list-style-type: none"> <input type="checkbox"/> Slow conduction. <input type="checkbox"/> Prolongation of refractory period. 	<ul style="list-style-type: none"> Atrial arrhythmias. Re-entry supraventricular arrhythmias (e.g. WPW) NOT effective in ventricular arrhythmias. 	<hr/>
Diltiazem			
Adenosine	<p>Inhibiting of cAMP causing :</p> <ul style="list-style-type: none"> Hyperpolarization. Negative dromotropic effect. Negative chronotropic effect. <p>Half life less than 10 seconeds.</p>	<ul style="list-style-type: none"> drug of choice for acute management of paroxysmal supraventricular tachycardia. Preferred over verapamil because it's safer and does not depress contractility. 	<ul style="list-style-type: none"> Flushing n 20% of patients. Shortness of breath and chest burning in 10% of patients. Brief AV block. (contra indicated in heart block)
Dronedarone	<ul style="list-style-type: none"> New anti-arrhythmic drug. Non-iodinated congener of amiodarone. Anti-arrhythmic properties related to all classes. should not be used in patients with severe (class IV) heart failure. Risk of death may be increased in these patients. should not be used in patients with permanent atrial fibrillation. Risk of death and stroke, may be increased in these patients. 	<ul style="list-style-type: none"> Used for maintenance of sinus rhythm following cardioversion in patients with atrial fibrillation 	<hr/>
Atropine	<ul style="list-style-type: none"> Brady arrhythmia drug. 	<ul style="list-style-type: none"> Usen in sinus bradycardia after MI and in heart block. In emergency of heart block and may combined with isoprenaline. 	<hr/>

MCQs

1. Which of the following classes has no effect on phase 4 of the AP of the pacemaker?
A) Ia B) II C) III D) IV
2. A patient took class I anti-arrhythmic drugs which resulted in shortening of the AP duration. Which class did the patient take?
A) Ia B) Ib C) Ic D) III
3. Which of the following drugs have short duration of action, confusion and convulsion as ADRs?
A) Lidocaine. B) Mexiletine. C) Flecainide. D) Quinidine.
4. A 78-year-old female has been newly diagnosed with atrial fibrillation. She is not currently having any symptoms of palpitation or fatigue. Which of the following is appropriate to initiate for rate control as an outpatient?
A) Dronedarone.. B) Esmolol.. C) Flecainide. D) Metoprolol.
5. All the following are adverse effect of amiodarone except:
A) Cinchonism. B) Hypothyroidism. C) Hyperthyroidism. D) Pulmonary fibrosis.
6. Which of the following can be treated with Lidocaine?
A) Paroxysmal supraventricular tachycardia. B) Atrial fibrillation. C) atrial flutter. D) Ventricular tachycardia.

Explanation for Q4 → Only B and D are options to control rate. The other options are used for rhythm control in patients with atrial fibrillation. Since esmolol is IV only, the only option to start as an outpatient is metoprolol.

Answers
1:C
2:B
3:A
4:D
5:A
6:D

Cont... MCQs

7. A clinician would like to initiate a drug for rhythm control of atrial fibrillation. Which of the following coexisting conditions would allow him for the initiation of flecainide?
A) Hypertension. B) Left ventricular hypertrophy. C) Coronary artery disease. D) Heart failure.
8. Which of the following is the dominant effect of amiodarone?
A) Prolongation of AP. B) Increase duration of refractory period by blocking K⁺ channels. C) Vasodilating effect. D) Additional class Ia, II and IV.
9. What is the ultimate of anti-arrhythmic therapy
A) Maintenance of normal rhythm. B) Prevention of more serious arrhythmias. C) A & B D) Decrease the conduction velocity of the AV node.
10. Patient had a severe heart failure and the risk of his death is too high. Which of the following drugs is prohibited in his case?
A) Atropine. B) Lidocaine. C) Dronedronone. D) Quinidine.
11. Which of the following drugs is very effective in ventricular arrhythmias but also could cause Proarrhythmia?
A) flecainide. B) Esmolol. C) Atropine. D) Metoprolol.
12. Which of the following drugs could cause torsades de pointes arrhythmia even within the normal therapeutic range?
A) Atropine. B) Lidocaine. C) Dronedronone. D) Quinidine.

Explanation for Q7 → Since flecainide can increase the risk of sudden cardiac death in those with a history of structural heart disease, only A will allow for flecainide initiation. Structural heart disease includes left ventricular hypertrophy, heart failure, and atherosclerotic heart disease.

Answers
7:A
8:A
9:C
10:C
11:A
12:D

Cont.... MCQs

13. Which of the following drugs that may induce a very serious arrhythmia that is stronger and more dangerous than the treated one?
A) Mexiletine. B) Esmolol.. C) Flecainide. D) Metoprolol.
14. A patient was in the OR doing a knee joint replacement, suddenly he developed some sort of ventricular arrhythmia. What is the drug of choice in this case?
A) Lidocaine. B) Esmolol. C) Verapamil. D) Procainamide.
15. Which one of the following anti-arrhythmia drugs is NOT effective in atrial arrhythmias ?
A) Verapamil. B) Lidocaine. C) Ibutilide. D) Quinidine.
16. A 67-year-old male who develop bradyarrhythmia after myocardial infarction, which anti-arrhythmia drug can be used in this case ?
A) Atropine. B) Lidocaine. C) Dronedarone. D) Quinidine.
17. A medical student in his last year, had an important presentation on front of a huge crowded audience and he was very nervous about it.
13. Which of the following classes you think that will help him to calm down and slow his heart rate?
A) CLASS II. B) CLASS Ib. C) CLASS III. D) CLASS Ia.
18. A group of student had a research about patients with myocardial infarction, they divided the patient into 4 groups and gave them a group of different drugs, ESMOLOL, PROPRANOLOL, ATENOLOL, and METOPROLOL. They noticed one of the groups had no changes in the mortality rate, which one of te drugs you think that resulted in no changes in the mortality rate.
A) Propranolol. B) Esmolol. C) Atenolol. D) Metoprolol.

Answers
13:C
14:A
15:B
16:A
17:A
18:B

SAQ

a patient arrived to ER that seemed to have irregular heart beat, after investigations it turned that he had previous record of ventricular arrhythmia.

Q1: Name the drug that should be used in his case?

Lidocaine

Q2: What is the half life of that drug ?

2 Hours

Q3: What is a possible route of administration for the drug ?

Given I.V. bolus or slow infusion

Q4: What should be the prescribed drug for the patient after he leave the hospital ?

Mexiletine

Q5: What is the class of those drugs ?

CLASS IB

Q6: Name one adverse effect that may results from both drugs.

Paresthesia / Tremor / Dysarthria (slurred speech) / Convulsions

SAQ

A 42-year-old male presents to ER complaining of palpitation. On physical examination, he's cool to touch, diaphoretic, and mildly hypotensive with a blood pressure of 90/50 mmHg, his ECG demonstrates an irregular supraventricular tachycardia at a rate of 144 beats/min, likely consist with atrial fibrillation. This is his third presentation to the hospital with supraventricular tachycardia in the two months. After you stabilize the patient and control his heart rate, you call for a cardiology consult to assess whether the patient might be a candidate for treatment with an anti-arrhythmic medication. When the cardiologist arrives, he suggests placing the patient on an agent that acts by blocking sodium channels in the cardiac myocyte, but he states that this medication should only be used in patients with structurally normal heart.

Q1: Which group of drugs did the cardiologist suggest?

Class IC drugs including flecainide.

Q2: What is effect of this class on the duration of action potential?

It has no effect on the duration of action potential.

Q3: What is the clinical uses of this class?

Treatment of supraventricular arrhythmias.

Q4: What is the major side effects in this class?

- Proarrhythmias.
- CNS side effects including tremor dizziness and blurred vision.
- Heart failure due to -ve inotropic effect.



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