**ANTIARRHYTMIC DRUGS**

**A. Actuality.** Cardiac arrhythmias are some of the most common symptoms of cardiovascular diseases,of some acute intoxications, etc., which in turn can cause severe cardiovascular and systemic hemodynamics disturbances, often a major lethality factor. Pharmacotherapy of these disorders plays an important role in reducing lethality among patients with cardiac arrhythmias. For these reasons, the knowledge of the pharmacokinetic and pharmacodynamics aspects of antiarrhythmic medication, as well as the development of new drugs, is a major issue for medical practice.

**B. The purpose of the training:**the student must learn basic knowledge in the field of antiarrhythmic medication, urgent health care issues (fight against rhythm disturbances).

**C. Learning objectives:**

1) The student should **know:** the name of the main antiarrhythmic drugs, principles of classification, pharmacokinetic aspects, mechanism of action and pharmacological effects, indications and contraindications, adverse reactions, optimal dosing schedules and principles of antiarrhythmic selection and dosage depending on the situation, substitution of one drug with another analogue according to pharmacological properties.

2) The student should **be able to:** prescribe antiarrhythmic drugs in all forms of medicine, to indicate drugs in different rhythm disorders, and apply the knowledge acquired in solving the problem situations.

**D. Initial level of knowledge required for interdisciplinary integration:**

**Anatomy.** Heart. The conductive system of the heart.

**Histology.** Heart. Structure of the conductive system of the heart and cytochemical characteristic. Age changes in the heart. Regeneration. Cytochemical and functional features of the myocardium.

**Biophysics.** Bioelectrogenezis. Bio potential recording. Transmitting information through biological communication channels.

**Biochemistry.** Structural organization of biological membranes.

**Physiology.** Physiological properties of the myocardium (automatism, excitability, conductibility, contractility). Role of sinusal and atrioventricular node, Hiss and Purkinje fibers. Electrocardiography chart and electrocardiographic interpretation of cardiac abnormalities.

**Toxicology.** Toxines and drugs that cause cardiac arrhythmias.

**Pathophysiology.** Deregulations of the automatism, excitability, conductivity and contractility of the heart. Causes of arrhythmias in children.

**Semiology.** Supraventricular and ventricular tahyaritmias. Bradyarrhythmias and atrioventricular block.

**E. Self-training questions:**

1. Definition and classification of antiarrhythmic.

2. Drugs with action on cardiomyocytes (conductive and contraction myocardial system). Sodium channel blockers (Class IA). Pharmacokinetics and pharmacodynamia (mechanism of action, influence on conductivity, contractility, excitability, automatism and frequency of cardiac contractions). Indications. Side effects.

3. Sodium channel blockers (Class IB). Pharmacokinetics and pharmacodynamics effects. Indications. Contraindications. Adverse reactions.

4. Pharmacokinetics of drugs (Class IC). The mechanism and the peculiarities of action. Indications. Adverse reactions.

5. Remedies with action on the heart's innervation. β-adrenoblockers (class II). Classification. Mechanism of action. Influence on the functional properties of the heart. Indications. Contraindications. Adverse reactions.

6.Calcium channel antagonists (Class IV). Mechanism of action. The pharmacological effects are. Indications. Contraindications. Adverse reactions.

7. Medicines that predominantly increase the effective refractory period (Class III). Mechanism of action. Indications. Contraindications. Adverse reactions.

8. Summary of drug properties used in Brady arrhythmias and conductivity disorders.

9. Other preparations with antiarrhythmic properties (cardiac glycosides, potassium preparations, adenosine, MgSO4 etc.)

10. The particularities of the action of antiarrhythmic drugs in children.

 **F. Independent work** (is done in written form while preparing for the lesson)

**1.)Brief characteristics of compulsory drugs:**

 **Down:** Drugname. 1. Quinidine. 2. Procainamide. 3. Lidocaine. 4.Mexiletine. 5. Flecainide. 6. Metoprolol. 7. Bretylium tosylate 8. Amiodarone. 9. Verapamil. 10. Potassium chloride. 11. Propranolol. 12. Sotalol.

 **Across:**1. Medicinal form. 2. Way of administration. 3. Doses (therapeutic, maximal for one intake and for 24 hours). 4. Spectrum of action 5. Mechanism of action. 6. Indications and contraindications. 7. Side effects.

**2.)Questions on medical prescriptions.**

**To prescribe** the following drugs in all the possible medicinal forms:

1. Quinidine. 2. Procainamide. 3. Lidocaine. 4. Mexiletine. 5. Flecainide. 6. Metoprolol. 7. Bretylium tosylate8. Amiodarone. 9. Verapamil. 10. Potassium chloride. 11. Propranolol. 12. Sotalol.

**Drugs used in (for):** supraventricular paroxysmal extrasistols and tachycardia, ventricular atrial and ventricular extrasystems (neurogenic), atrioventricular block, atrial flutter and atrial fibrillation, ventricular fibrillation, ventricular paroxysmal tachycardia, arrhythmias caused by cardiac glycosides overdose, sinusal bradycardia, ventricular extrasystoles and ventricular tachycardia after acute myocardial infarction.

**3.) Tests** (Guidelines for Laboratory Work in Pharmacology).

**4.) Clinical case** (Guidelines for Laboratory Work in Pharmacology).

**5.) Virtual situations** (Guidelines for Laboratory Work in Pharmacology).

**6.) Virtual didactic movie.**

**7.) Tables**

Table N1

**Comparative feature of antiarrhythmic preparations**

|  |  |
| --- | --- |
| Parameters | Group of antiarrhythmic drugs |
| IA | IB | IC | III | IV |
| Blocking | Na channels |  |  |  |  |  |
| K channels |  |  |  |  |  |
| Ca channels |  |  |  |  |  |
| Influence on the Purkinje fiber potential | Phase 0 |  |  |  |  |  |
| Phase 1 |  |  |  |  |  |
| Phase 2 |  |  |  |  |  |
| Phase 3 |  |  |  |  |  |
| Phase 4 |  |  |  |  |  |
| The duration of the action potential |  |  |  |  |  |
| Influence on heartparameters | Automatism |  |  |  |  |  |
| Excitability |  |  |  |  |  |
| Conductivity |  |  |  |  |  |
| Contractility |  |  |  |  |  |
| The duration of the refraction period |  |  |  |  |  |
| Efficacy in arrhythmias | Supraventricular |  |  |  |  |  |
| Ventricular |  |  |  |  |  |

Note. Use the following signs to complete the table:

 "↑" - increase, "↓" - decrease, "-" - no effect, "+" - presence.

Table N2

**Side effects of antiarrhythmic drugs**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Side effects | Quinidine | Lidocaine | Propafenone | Propranolol | Amioda-rone | Vera-pamil |
| Decrease myocardial contractility (inotrope-negative action) |  |  |  |  |  |  |
| Deregulation of AV conductivity |  |  |  |  |  |  |
| Hypotension |  |  |  |  |  |  |
| Headache |  |  |  |  |  |  |
| Bronchospasm |  |  |  |  |  |  |
| Haematotoxicity |  |  |  |  |  |  |
| Hypo-/ hyperthyroidism |  |  |  |  |  |  |
| Microcrystalline deposition on the retina |  |  |  |  |  |  |
| Alveolitis |  |  |  |  |  |  |
| Aritmogenic (proarrhythmic) action |  |  |  |  |  |  |

**8.) Solve the case:**

A ventricular fibrillation occurred in a patient with myocardial infarction. To save his life it is necessary to restore the heart rate.

What antiarrhythmic drugs will you indicate for this purpose?