

Theme of the lesson: **HEART RHYTHM DISORDERS: DISORDERS OF AUTOMATISM, CONDUCTIVITY, MASTERING OF RHYTHM**

Aim: To study basic rules and mechanisms of development of arrhythmias, to form ability to conduct the pathophysiological analysis of situations, related to development of arrhythmias.

Main questions:

1. Arrhythmias: description of concept, kinds.
2. Reasons and mechanisms of development of arrhythmias.
3. Changes of indexes of hemodynamic system and coronary blood stream at the different forms of arrhythmias.
4. Principles of normalization of cardiac activity at arrhythmias.

Literature:

1. General and clinical pathophysiology/Gozhenko A.I. - Odessa National Medical University. - 2002. - p. 143-158
2. Pathophysiology/Gozhenko A.I., Gurkalova I.P. - Odessa National Medical University. - 2005. - p. 244 - 259

CONTROL QUESTIONS

№	Pointings to the tasks fulfillment	Answers of the students with additions at the lessons
1.	Arrhythmia of heart is... Types of arrhythmias: a, b, c, d	
2.	What arrhythmias of heart are related to disturbances of function of heart automatism? a, b	

3.	To the group of nomotopic arrhythmias attribute:	
4.	Give examples of heterotopic arrhythmias: a, b, c, d, e, f	
5.	Enumerate the mechanisms of sinus tachycardia and bradycardia - a, b, c	
6.	What is extrasystole? Types of extrasystoles: a, b, c, d	
7.	Paroxysmal tachycardia – is...	
8.	What arrhythmias do appear as a result of disorders of	

	function of myocardium conductivity? - a, b	
9.	What is characteristic to the Morgania - Edem - Stoks syndrome?	
10.	What arrhythmias do appear as a result of simultaneous disorders of functions of excitability and conductivity? - a, b, c, d	

TASK 1. Fill in a table, marking a sign «+» reasons, causing the different types of nomotopic arrhythmias.

Reasons	Sinus		
	Tachycardia	Bradycardia	Arrhythmia
1.Activating of influencing of the sympathoadrenal system on the heart at stresses, physical work, neuroses, because of sharp arterial hypotension, cardiac insufficiency, hyperthermia, fever and others.			
2.Reduction of the sympathoadrenal influencing on a heart at the injury of cerebral structures, pathways, nervous ganglions and completions of the sympathetic nervous system, because of reduction of adrenoreactivity of heart, at failure of higher			

nervous activity.			
3.Activating of influencing on the heart of the parasympathetic nervous system at annoying of the nuclei of vagus nerve (increase of intracranial pressure at meningitises, encephalitises, tumours, concussion of the brain) or its completions, and also at the increase of intraventricular pressure and tone of myocardium.			
4. Reduction of influencing on the heart of the parasympathetic nervous system at the injury of central nervous formations, pathways, parasympathetic ganglions or as a result of reduction of cholinereactive properties of myocardium.			
5.Variation of parasympathetic influences on a heart and variation of maintenance of gases(O ₂ , CO ₂), metabolites, medicinal preparations (foxglove, opiates, choline- and sympatholitics, choline- and sympathomimetics) in blood.			
6.Direct action of factors of different nature on the cells of sinoatrial node (trauma, hemorrhage, heart attack).			
7.Disorders of correlation of sympathoadrenal and parasympathetic effects on myocardium.			

TASK 2. Comparative description of nomotopic arrhythmias.

Indexes	Sinus		
	Tachycardia	Bradycardia	Arrhythmia
1.Frequency of cardiac reductions			
2.Leading electro-physiological mechanism			
3.Etiologic factors			

TASK 3. Compare the different types of heterotopic arrhythmias with their description.

Heterotopic arrhythmias		Description
1.Idioventricular rhythm		A. Heart rate is 70-80 shots in a minute
2.«Dropping out» reductions		B. Transference of peusmaker from a sinoatrial node to the subjacent departments of heart and back.
3.Atrioventricular rhythm		C. Appearence of separate reductions of heart under influencing of impulses from the centers of 2nd and 3rd order.
4.Migration of rhythm master		D. Heart rate is 10-30 shots in a minute
5.Atrial slow rhythm		E.Simultaneous unmatched work of two masters of rhythm - nomotopic and heterotopic
6.Dissociation with interference		F. Heart rate is 40-60 shots in a minute

TASK 4. Compare the different types of blockades of heart with their description.

Blockades of heart		Description
1.Incomplete atrioventricular blockade of the I degree		A.Auricles and ventricles contract independently of each other - auricles with frequency 70 shots, ventricles - 15-40 shots in a minute.
2.Incomplete atrioventricular blockade of the II degree (periods of Venkebach-Samoylov)		B.Prolapse of every 3-5th reduction of ventricles

3.Incomplete atrioventrikulyarnaya blockade of the II degree (blockade of type of Mobitts)		C.Heart rate is normal, but reduction of one of ventricles is late, ORS is extended and deformed
4.Complete atrioventricular blockade		D.Gradual worsening of conductivity up to falling out of one of the reductions
5.Blockade of one of stems of atrioventricular bueam		E.Prolongation of interval of P-Q more than on 0,2 seconds

TASK 5. Fill in a table «Description of different types of ekstrastolia»

Kinds of extra-systoles Indexes	Sinus	Atrial	Atrioventricular	Ventricular
Localization of ektopicheskogo hearth				
Indent of R				
Complex QRS				
Interval of T-R				

TASK 6. To solve clinicopathophysiological problems

A patient, 50 years-old, complains about periodic interruptions in area of heart. On EKG the interval of PQ progressively grows in each subsequent cardiac cycle from 0,21 sec to 0,27 sec and every fifth complex QRS is absent (falls out), whereupon there is a compensatory pause, and the interval of PQ again begins progressively grow from 0,21 sec in the subsequent four cardiac loops with the further fall of complex QRS.

1. What type of arrhythmia is diagnosed?

2. What is the mechanism of fall of complex QRS in every fifth cardiac loop?

3. How does the period of EKG with falling of complex QRS named?

TASK 7. During the examination in a military registration and enlistment office for 16-years-old youth the acceleration of rhythm of heart during inhalation and its deceleration during exhalation is exposed. On registered EKG the interval of RR 0,65 sec is marked during inhalation, and during exhalation - 0,75 sec.

1. What type of arrhythmia is diagnosed for a patient?

2. Substantiate its physiological or pathological character.

3. What mechanism of development of this arrhythmia?

TASK 8.

Patient of 70 years old, is suffering from the IHD, atherosclerotic cardiosclerosis, bradycardia to 45 heartbeats per minute. Has fainted consciousness, when was walking through the passage of the department and failed. After the fall had a try to stand up and failed again from the loss of consciousness. On the ECG: rate of the ventricle complexes is 40 per minute, R-R=1 minute 30 seconds, interval PQ is impossible to define.

Questions:

1. What disturbance of the rhythm is observed at the patient? _____

2. What is the development mechanism of loss of consciousness? _____

TASK 9.

Patient B., of 42 years old was sent to the department of an intensive therapy with complaints on shot episodes of the loss of consciousness to 20 times a 24 hours. From the anamnesis: similar attacks were noticed during 2 years. At first they showed after the flu in a severe form. Was under medical supervision in a polyclinic domiciliary, where was made a diagnosis of a vegetovascular dystonia. Courses of treatment with vitamins and tonic remedies gave no effect. Patient turned for the consultation to the therapeutic clinic, during the examination fainted consciousness. On the ECG: ventricle tachycardia. At the 24 hour

monitoring on the ECG were noticed 15 episodes of ventricle tachycardia with frequency to 180 beats per minute and a duration of an attack from 5 to 30 seconds.

Questions:

1. Define type of arrhythmia and ground your supposition. _____

2. What the pathogenesis of developed arrhythmia? _____

3. Which disturbances of hemodynamics are attended with originated arrhythmia? _____

TASK 10. *To solve the tests for selfcontrol.*

1. Data of the ECG of the patient with the hypertonic disease: rhythm is sinusoidal, right, heart rate is 92 per minute, length of the interval OQ is 0,19 seconds, complex QRS is not changed. Disturbance of which has the patient?

- A. Refractory
- B. Conductance
- C. Excitability
- D. Automatism
- E. Contractility

2. The patient's changes on the ECG were evident firstly with lengthening of the interval PQ, after with prolapse of solitary complexes QRS and finally atrium was contracted with rate 70 per minute and ventricles 35 per minute. For which pathology are the described changes typical?

- A. Intrasytostole
- B. Intraatrial blockade
- C. Intraventricular blockade
- D. Atrioventricular blockade
- E. Bradycardia

3. At the patient 45 years old were detected such changes on the ECG: interval PQ is lengthened and there is prolapse of each third or second complex QRST. What concrete disturbance of the heart is observed?
A. Complete atrioventricular blockade
B. Incomplete atrioventricular blockade of the III degree
C. Synoauricular blockade
D. Intraventricular blockade
E. Incomplete atrioventricular blockade of the I degree

4. The teenager 15 years old is complaining on the loss of an air, general fatigue, palpitation. Heart rate is 130 per minute. Blood pressure is 100/60 millimeters of mercury. Data of the ECG: complex QRS is of normal shape and length, quantity of the waves P and ventricular complexes is similar, wave T is fused with wave P. Which arrhythmia of the heart is observed at the teenager?
A. Sinus extrasystole
B. Sinus tachycardia

- C. Atrial fibrillation
- D. Atrial thrill
- E. Atrial paroxysmal tachycardia

5. After severe infectious process at the patient developed myocarditis which was concomitant with periodical loss of consciousness after development of Morgagni- Adams-Stokes disease. Which disturbance was appeared at the patient?

- A. Blockade of the right crus of His bundle
- B. Blockade of the left crus of His bundle
- C. Transition of incomplete atrioventricular blockade into complete one
- D. Paroxysmal tachycardia
- E. Premature excitation of the ventricles

6. The increasing of intracranial pressure at the patient with cerebral hematoma has caused unlimited activity of vagus nerve and change of the heart rate. Which type of heart

arrhythmia is appeared under such conditions?

- A. Sinusal tachycardia
- B. Sinusal bradycardia
- C. Ventricular extrasystole
- D. Paroxysmal tachycardia
- E. Atrioventricular blockade

7. At the patient with cardiovascular insufficiency has appeared arrhythmia as ventricular extrasystoles. Disturbance of which function of myocardium is observed in this case?

- A. Excitability and conductance
- B. Automatism
- C. Conductance
- D. Contractility
- E. Excitability

8. At the patient was detected extrasystole. Data of the ECG: absence of wave P, in the complex QRS is complete compensatory pause. What kind of extrasystole is it?

- A. Atrioventricular
- B. Atrial
- C. Ventricular
- D. Sinusal
- E. from His' bundle

9. Data of the ECG of the patient with angina pectoris: heart rate is 230 per minute, wave P is deformed, ventricular complex is without changes. Which disturbances of cardiac rhythm are

- A. Ciliary arrhythmia
- B. Atrial paroxysmal tachycardia
- C. Atrial trembling
- D. ventricular fibrillation
- E. ventricular extrasystoly

10. In the experiment under adrenalectomy animals was observed glucose retention in organism, which has caused hyperglycemia. Which disturbance of heart rate is much more probably at such animal?

- A. Ventricular extrasystole
- B. Sinusal tachycardia
- C. Atrial extrasystole
- D. Sinusal bradycardia
- E. Respiratory arrhythmia

11. Data of the ECG of the patient with disturbance of heart: heart rate is 50 per minute, rhythm is sinusal, wrong, interval PQ is lengthened, periodical prolapse of ventricular

complex (period of Samoylov-Vekenhah). Which disturbance of heart rate is present?

- A. Incomplete atrioventricular blockade of the II degree
- B. Complete atrioventricular blockade
- C. Blockade of right crus of His' bundle
- D. Incomplete atrioventricular blockade of the I degree
- E. Syndrome of sinus ganglion weakness

12. At woman 32 years old after myocarditis on the ECG was detected disturbance of heart rate (rhythm is not sinusal). Function of which cardiomyocyte is disturbed?

- A. Contractile
- B. Pacemaker cells
- C. Transitive conductive
- D. Conductive myocytes of His' bundle
- E. Conductive myocytes of crus of His' bundle

13. At the patient with cardiovascular insufficiency has appeared

arrhythmia. Data of the ECG: heart rate of atriums is 70 per minute, ventricles one is 35 per minute. Disturbance of which function of myocardium is observed at the patient?

- A. Excitability and conductance
- B. Excitability
- C. Automatism
- D. Conductance
- E. Contractility

14. At the teenager after the infectious disease is observed fluctuance of heart rate which depends on phase of respiration. Which is the cause of respiratory arrhythmia at the patient?

- A. Disturbance of heart excitability
- B. Fluctuance of vagus nerve tone
- C. Disturbance of contractive function of the heart
- D. Bainbridge reflex
- E. Disturbance of heart conductance

15. During the examination at the teenager of 16 years old was observed speeding of heart rate during inspiration, slowing

one during expiration. On the ECG was noticed shortening of interval R-R during inspiration and lengthening during expiration. Which type of arrhythmia is at the patient?

- A. Sinus tachycardia
- B. Sinus bradycardia
- C. Sinus arrhythmia
- D. Heart blockade
- E. Ciliary arrhythmia

For notes
