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INTERNAL MEDICINE DEPARTMENT**

**Medical support of the cardiovascular and
metabolic diseased patient with cardiac
pacemaker at the annual stage of observation**

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INTRODUCTION

- **The proportion of cardiovascular disease (CVD) in the structure of mortality is about 56% of all cases, of which almost 90% of cases take death from coronary heart disease (CHD)**
- **Hypertension is often associated with CHD as a major cause of left ventricular hypertrophy and diffuse myocardiosclerosis - remodeling of the heart muscle, which in turn contributes to different, sometimes fatal, arrhythmias and conduction disorders of the heart.**
- **Obesity - the most common metabolic disease, which is one of the important risk factor of developing CVD.**
- **Implantation of a permanent pacemaker is effective method of treatment resistant to medical therapy life-threatening cardiac arrhythmias and bradysystolic arrhythmia, however, it does not eliminate the problem of support. AH is one of the most important clinical syndromes requiring therapeutic support.**
- **AV-block is the most common indication for the implantation of pacemaker**

OUR PATIENT

- **Male**
- **Age:55 y.o.**
- **Factory Worker**
- **Townsman**
- **Admitted to our polyclinic 10/12/2016**

COMPLAINTS

- **Dyspnea, during physical activity, absent at rest**
- **Fatigue**
- **Chest pain, behind the breastbone during physical activity(400m)**

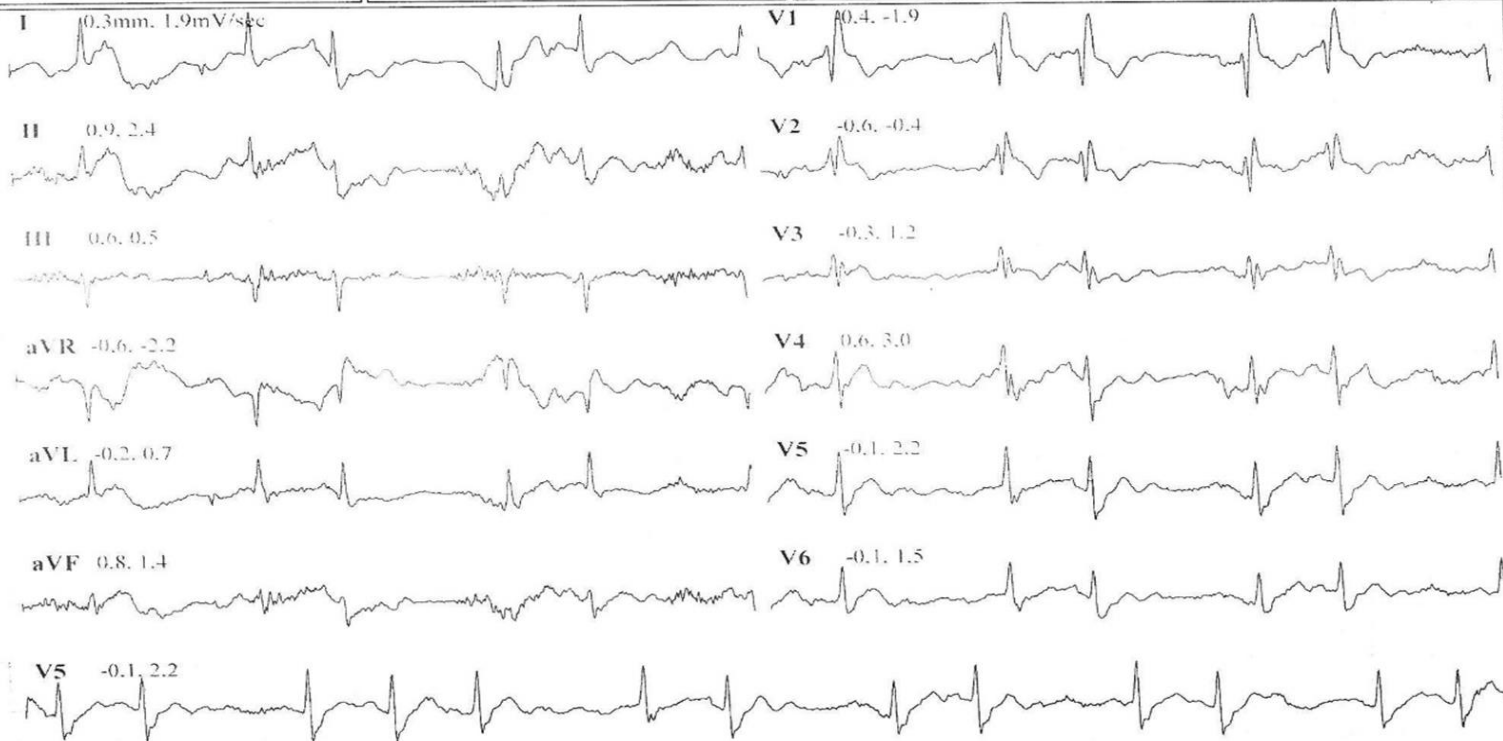
MEDICAL HISTORY 1.1

- 1978 – myocarditis(not confirmed by medical records), then diagnosed full right bundle branch block.
- 2011 – hypertension (max 170/100 mmHg, usual BP 140/90 mmHg(with drugs))
- 2011 – chest pain behind the breastbone during ordinary physical activity absent at rest (refused to do coronary angiography)
- 2011 – during stress test first diagnosed transient atrioventricular block stage 2 Mobitz II
- 2014 – atherosclerosis of coronary arteries
- Since 2014 diagnosis: IHD:STABLE ANGINA.AH II STAGE, 2 DEGREE. FULL RBBB. TRANSIENT AV BLOCK STAGE 2, MOBITZ 2. HF I.
- 2005 - peptic ulcer disease and GERD

MEDICAL HISTORY 1.2

STRESS TEST ECG XIX/2011

Supervising Physician _____	ID [REDACTED] Last Name [REDACTED] First Name [REDACTED] Birth Date [REDACTED] 1961 Age 50 Sex M Weight (kg) 108.00	End of Stage 3 HR: 79 (46% of 170) Physician Notes _____	Elapsed time 06:42 Protocol Bruce Modified Workload 1.7 mph 10.0% VO2 (ml/kg/min) 16.1 METS 4.6
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25 mm/sec 10 mm/mV Filters: 50Hz -on; BL -on; 0.05-35 Hz

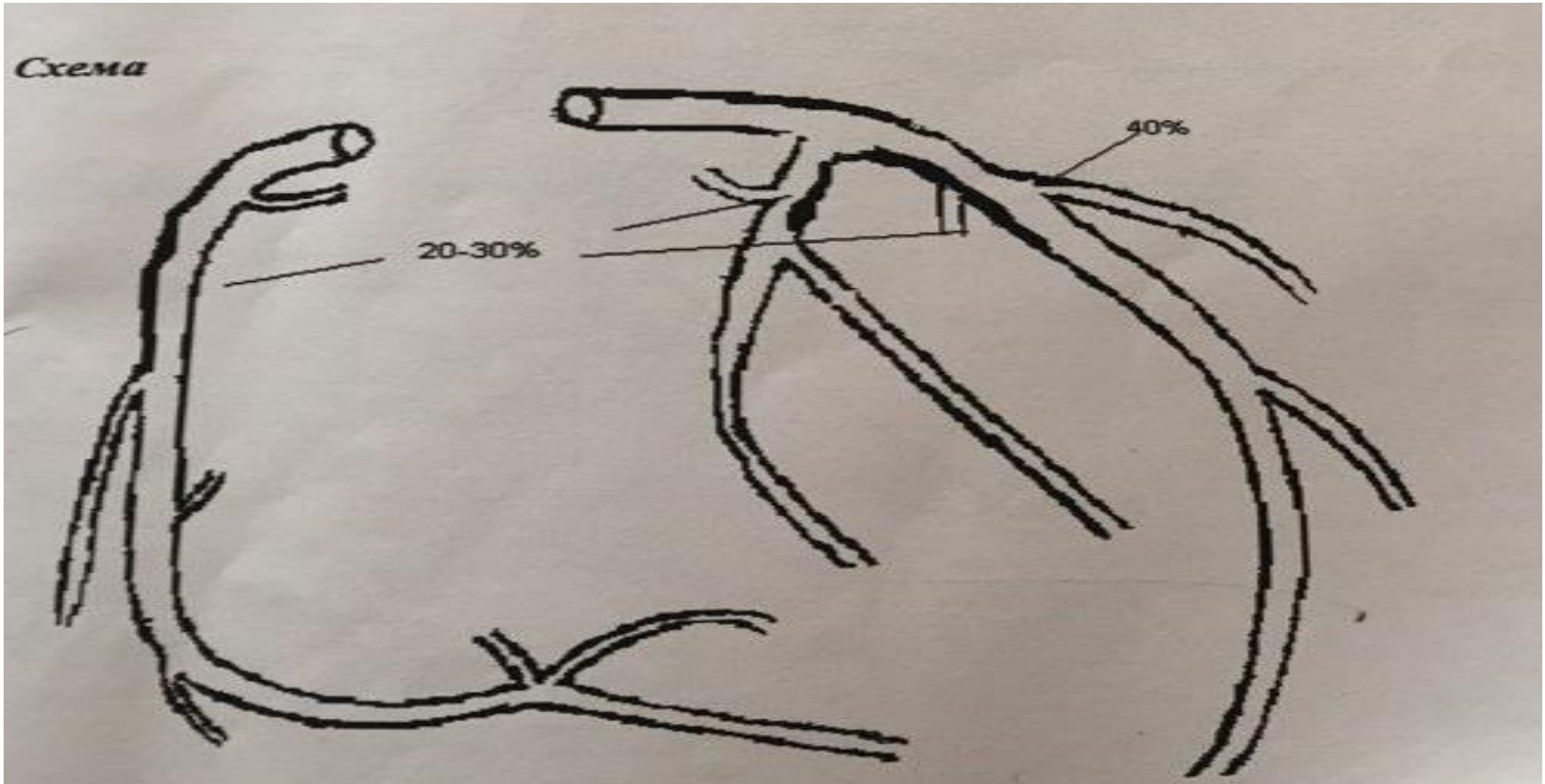
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Stress Ecg Report, Norav Medical rev. 5 351

Conclusion: transient AV block stage 2 Mobiz 2

MEDICAL HISTORY 1.3

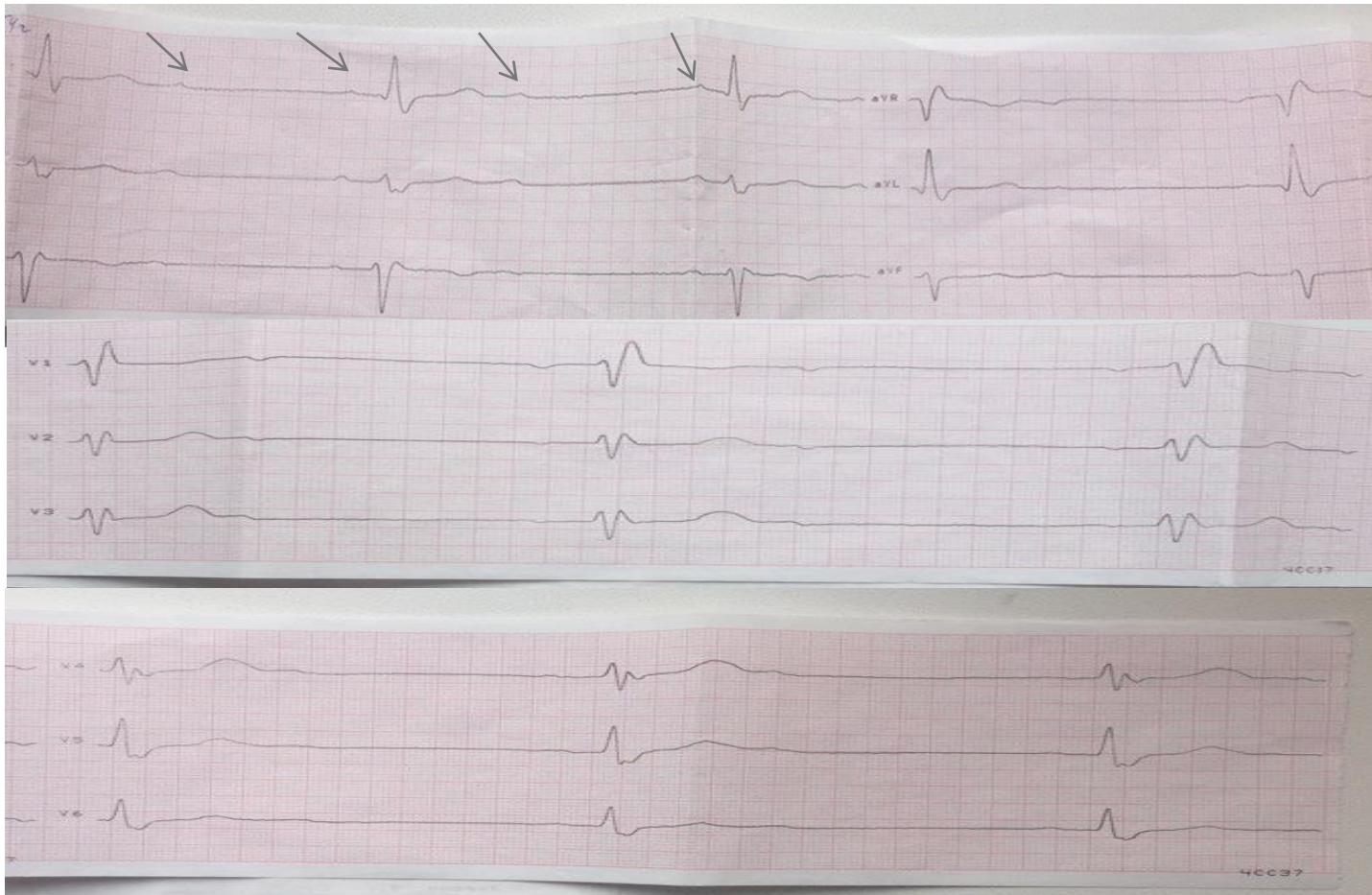
CORONARY ANGIOGRAPHY 17/04/2014



Conclusion: Right descending artery atherosclerosis 20-30%, atherosclerotic plaque mouth diagonal artery 40%, atherosclerotic lesions of the circumflex artery and the right coronary artery 20-30%

MEDICAL HISTORY 2.2

26/10/2015 – during usual physical activity felt dizziness, weakness, tinnitus, nausea, loss of consciousness was not noted, on the ECG recorded complete atrioventricular block.



Conclusion:
rhythm regular,
heart rate
35bpm , signs
of left
ventricular
hypertrophy,
full RBBB,
transient AV-
block 3
degree.

INDICATIONS FOR THE IMPLANTATION OF CARDIAC PACEMAKER

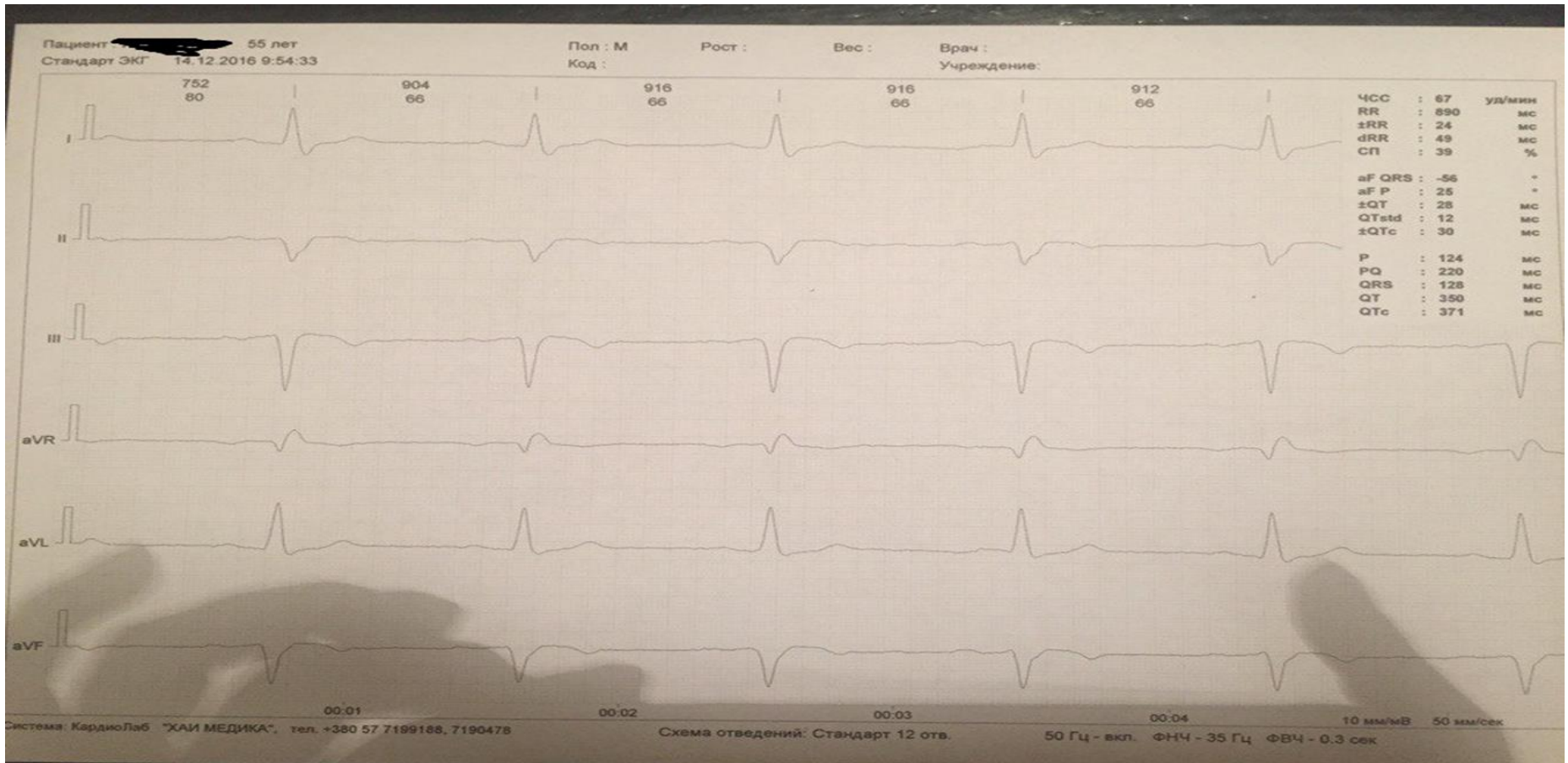
Class I

1. **Third-degree AV block at any anatomic level associated with any one of the following conditions:**
 - a. **Bradycardia with symptoms presumed to be due to AV block. (*Level of evidence: C*)**
 - b. **Arrhythmias and other medical conditions that require drugs that result in symptomatic bradycardia. (*Level of evidence: C*)**
 - c. **Documented periods of asystole ≥ 3.0 seconds or any escape rate < 40 beats per minute (bpm) in awake, symptom-free patients. (*Level of evidence: B, C*)**
 - d. **After catheter ablation of the AV junction. (*Level of evidence: B, C*) There are no trials to assess outcome without pacing, and pacing is virtually always planned in this situation unless the operative procedure is AV junction modification.**
 - e. **Postoperative AV block that is not expected to resolve. (*Level of evidence: C*)**
 - f. **Neuromuscular diseases with AV block such as myotonic muscular dystrophy, Kearns-Sayre syndrome, Erb's dystrophy (limb-girdle), and peroneal muscular atrophy. (*Level of evidence: B*)**

MEDICAL HISTORY 2.3

27/10/15 – ESPRITE DDR (Dual Chamber Ventricular pacemaker), mode of stimulation DDD:

- **HR-60bpm, stimulation threshold-0,75V, impedance-350Om**



Conclusion: sinus rhythm, regular, heart rate 76bpm , full RBBB, signs of left ventricular hypertrophy

PATIENT'S MEDICAL TREATMENT FOR THE LAST YEAR

- *Perindopril 4 mg*
- *Amlodipin 5 mg*
- *Atorvastatin 40 mg*
- *Aspirin 75 mg*

LIFE/SOCIAL HISTORY

- **Married**
- **Smoking History: 15 Pack years (1/2 pack for 30 years)(quit smoking two years ago)**
- **Father died from ventricular rupture.**
- **Mother died from stroke secondary to Long standing hypertension**

OBJECTIVE SUBJECT 1.2.

- The general condition is satisfactory, consciousness is clear, emotionally stable, optimistic mood
- Hypersthenic, Height = 176 cm, Weight = 115 kg, **BMI= 37.1 (Obese)**
- Skin, visible mucous membranes are pale pink and clean
- Peripheral lymph nodes are not palpable
- The thyroid is not palpable
- Signs of eyelid retraction, periorbital edema, proptosis are absent

OBJECTIVE SUBJECT 2.2.

➤ Respiratory System:

- pulmonary percussion –normal
- auscultation - weakened vesicular breathing, no adventitious sounds

➤ Cardiovascular system:

- heart borders extended to the left on 1,5 cm of mid clavicular line, HR =78 bpm, regular.
- no pulse deficiency; **heart sounds are muted**

➤ **Blood Pressure left hand = 145/100 mmHg (on the background of antihypertensive therapy), Blood Pressure of right hand = 140/90 mmHg**

➤ Gastrointestinal system:

- abdomen is soft, painless, symmetrical, no discrepancies of the abdominal muscles, no visible peristalsis
- liver edge is smooth, painless , palpated 0.5 cm below the costal arch
spleen and pancreas are not palpable

PRESCRIBED EXAMINATIONS

- **Complete blood test**
- **General urine test**
- **Biochemical blood test**
- **Liver function test (ALT, AST, AP)**
- **Blood lipid spectrum**
- **ECG**
- **Echocardiogram**

COMPLETE BLOOD COUNT

10/12/2016

INDEX	RESULT	NORMAL
Erythrocyte	4.23	3.9-4.7
Hematocrit	41.1%	36-42%
Hemoglobin	135 g/l	120-140g/l
Thrombocyte	313 g/l	160-320 g/l
Leukocyte	7.7 g/l	4-9.0 g/l
Lymphocyte	22%	19-37%
ESR	3 mm/hr	2-15 mm/hr

Conclusion: normal

URINALYSIS 10/12/2016

INDEX	RESULT	NORMAL
Specific Gravity	1.011	1.000 – 1.030
Glucose	Negative	Negative
Protein	Negative	Negative
Leucocyte	4.7	0-5 WBC/hpf

Conclusion: normal

BIOCHEMICAL BLOOD TEST

10/12/2016

INDEX	RESULT	NORMAL
Bilirubin	15.6 $\mu\text{mol/l}$	2-20 $\mu\text{mol/l}$
Creatinine	113 $\mu\text{mol/l}$	60-123 $\mu\text{mol/l}$
Urea	6 $\mu\text{mol/l}$	2.5-7 $\mu\text{mol/l}$
Blood Sugar	5.8 $\mu\text{mol/l}$	≤ 6.1 $\mu\text{mol/l}$
AST	30	8-38 U/L
ALT	38	8-40 U/L

Conclusion: normal

BLOOD LIPID SPECTRUM

10/12/2016

INDEX	RESULT	NORMAL
Cholesterol	4.65	< 5.2 mmol/l
VLDL	0.6120	< 1.0 mmol/l
LDL	2.9680	< 3.5 mmol/l
HDL	1.07	> 0.9 mmol/l
Triglycerides	1.36	≤ 2.3 mmol/l

Conclusion: normal

ECHOCARDIOGRAPHY 1.1

INDEX	RESULT	NORMAL
Aorta	36.0	20-37mm
Aortic valve	19.0	17-26mm
Mitral valve	32.0	26-35mm
Left atrium	33.0mm	To 38 mm
End Diastolic velocity	100	50-180 cm/s
End Systolic volume	50.0	35-55mm
Left Ventricular	14.1	6-11mm
Ejection Fraction	69%	55-78%
Left Ventricle amplitude	9.9 mm	7-13mm
Intraventricular septum	13.0 mm	6-11mm
Right atrial diameter	34.0mm	≤45mm
Right Ventricular diameter	23.0 mm	9-26mm

Conclusion: Atherosclerosis of aorta and aortic valves mild degree, hypertrophy of the left ventricle. Dyssynergic areas were not identified.

BASIC CLINICAL SYNDROMES

- **Atherosclerosis (sclerotic changes of aorta and aortic valve)**
- **Ischemia (Stable Angina)**
- **Arterial hypertension**
- **Conduct disorder**
- **Heart failure**
- **Obesity**
- **Duodenum Ulcer (2005)**

**THE CLINICAL
DIAGNOSIS
ACCORDING
TO CURRENT
CLASSIFICATIONS**

CLASSIFICATION OF CHD

(ON THE RECOMMENDATIONS OF THE EUROPEAN SOCIETY OF CARDIOLOGY ESC, 2013)

2. Angina

2.1.1. Stable angina (indicating the functional classes (FC)).

2.1.2. Stable angina with angiographically intact vessels (coronary syndrome X).

2.2. Vazospastichna angina (angiospastic, spontaneous, variant, Prinzmetal's).

2.3 Mixed angina

2.4 Unstable angina (up to 28 days)

2.4.1. Angina, which appeared for the first time to 28 days (angina that occurred for the first time, with transient ECG changes - rest).

2.4.2. Progressive angina (angina at rest or the appearance of night attacks in a patient with angina pectoris, angina change, progressive decrease in exercise

tolerance, transient ECG changes - rest).

2.3.3. Early post-infarction angina (from 3 to 28 days).

CLASSIFICATION OF HYPERTENSION ACCORDING TO THE LEVEL OF BLOOD PRESSURE

(RECOMMENDATIONS BY THE UKRAINIAN ASSOCIATION OF CARDIOLOGISTS PREVENTION AND TREATMENT OF HYPERTENSION, 2008)

Category	Systolic		Diastolic
Optimal	<120	and	<80
Normal	120-129	and/or	80-84
High normal	130-139	and/or	85-89
Grade 1 hypertension	140-159	and/or	90-99
Grade 2 hypertension	160-179	and/or	100-109
Grade 3 hypertension	>180	and/or	>110
Isolated systolic hypertension	>140	or	<90

CLASSIFICATION OF HYPERTENSION STAGES

(RECOMMENDATIONS OF THE ASSOCIATION OF CARDIOLOGISTS OF UKRAINE 2008)

Stage	The degree of target organ damage
I	Objective changes in the target organs are absent
II	<p>There is objective evidence of target organ damage without symptoms with their hand or dysfunction: Left ventricular hypertrophy (on ECG, ultrasound, Ro)</p> <p>Generalized narrowing of retinal arteries Microalbuminuria and / or a small increase</p> <p>in serum creatinine (y m. - 115 - 133 mmol / L at x. -107 - 124 mmol / l) Carotid artery disease - a thickening of the intima-media > 0.9 mm or the presence of atherosclerotic plaques.</p>
III	<p>There is objective evidence of target organ damage with symptoms from their side and impaired heart - myocardial infarction, heart failure II A - III stage; brain - stroke, transient ischemic attack, acute hypertensive encephalopathy, vascular dementia; fundus - hemorrhage and retinal exudates with papilledema the optic nerve or without;</p> <p>kidney - concentration of plasma creatinine in males > 133 umol / L, y Women > 124;</p> <p>vessels - dissecting aortic aneurysm; peripheral arterial occlusion</p>

HYPERTENSION RISK FACTORS







CARDIOVASCULAR RISK STRATIFICATION CHART WITH RECOMMENDED FOLLOW-UP FREQUENCY FOR EACH CATEGORY

Other risk factors, asymptomatic organ damage or disease	Blood Pressure (mmHg)			
	High normal SBP 130–139 or DBP 85–89	Grade 1 HT SBP 140–159 or DBP 90–99	Grade 2 HT SBP 160–179 or DBP 100–109	Grade 3 HT SBP ≥180 or DBP ≥110
No other RF		Low risk	Moderate risk	High risk
1–2 RF	Low risk	Moderate risk	Moderate to high risk	High risk
≥3 RF	Low to Moderate risk	Moderate to high risk	High Risk	High risk
OD, CKD stage 3 or diabetes	Moderate to high risk	High risk	High risk	High to very high risk
Symptomatic CVD, CKD stage ≥4 or diabetes with OD/RFs	Very high risk	Very high risk	Very high risk	Very high risk

BP = blood pressure; CKD = chronic kidney disease; CV = cardiovascular; CVD = cardiovascular disease; DBP = diastolic blood pressure; HT = hypertension; OD = organ damage; RF = risk factor; SBP = systolic blood pressure.

THE NEW YORK HEART ASSOCIATION (NYHA) FUNCTIONAL CLASSIFICATION (FUNCTIONAL CAPACITY) OF CHRONIC HEART FAILURE

NYHA Class	Level of Clinical Impairment
I 	No limitation of physical activity. Ordinary physical activity does not cause undue breathlessness, fatigue, or palpitations.
II 	Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in undue breathlessness, fatigue, or palpitations.
III 	Marked limitation of physical activity. Comfortable at rest, but less than ordinary physical activity results in undue breathlessness, fatigue, or palpitations.
IV 	Unable to carry on any physical activity without discomfort. Symptoms at rest can be present. If any physical activity is undertaken, discomfort is increased.

AMERICAN HEART ASSOCIATION HEART FAILURE STAGES

Class	Objective Assessment
A	No objective evidence of cardiovascular disease. No symptoms and no limitation in ordinary physical activity.
B	Slight limitation of physical activity. Comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea (shortness of breath).
C	Objective evidence of moderately severe cardiovascular disease. Marked limitation in activity due to symptoms, even during less-than-ordinary activity. Comfortable only at rest.
D	Objective evidence of severe cardiovascular disease. Severe limitations. Experiences symptoms even while at rest.

DEFINITION OF HEART FAILURE WITH PRESERVED (HFPEF), MID-RANGE (HFmrEF) AND REDUCED EJECTION FRACTION (HFrEF)



Definition of heart failure

Type of HF	HFrEF	HFmrEF	HFpEF
CRITERIA	1	Symptoms ± Signs ^(a)	Symptoms ± Signs ^(a)
	2	LVEF <40%	LVEF 40–49%
	3	—	1. Elevated levels of natriuretic peptides ^(b) 2. At least one additional criterion: a. relevant structural heart disease (LVH and/or LAE), b. diastolic dysfunction (for details see Section 4.3.2).

BNP = B-type natriuretic peptide; HF = heart failure;
 HFmrEF = heart failure with mid-range ejection fraction (40-49%);
 HFpEF = heart failure with preserved ejection fraction (> 50%);
 HFrEF = heart failure with reduced ejection fraction (< 40%);
 LAE = left atrial enlargement; LVEF = left ventricular ejection fraction;
 LVH = left ventricular hypertrophy;
 NT-proBNP = N-terminal pro-B type natriuretic peptide.

a/ Signs may not be present in the early stages of HF (especially in HFpEF) and in patients treated with diuretics.

b/ BNP > 35 pg/ml and/or NT-proBNP > 125 pg/mL.

CLASSIFICATION OF OVERWEIGHT AND OBESITY BMI CLASSIFICATION

Classification	BMI Category (kg/m ²)	Risk of developing health problems
Underweight	<18.5	Increased
Normal Weight	18.5 - 24.9	Least
Overweight	25.0 - 29.9	Increased
Obese class I	30.0 - 34.9	High
Obese class II	35.0 - 39.9	Very high
Obese class III	>= 40.0	Extremely high

COMPLETE MAIN DIAGNOSIS OF OUR PATIENT

- Ischemic heart disease
- Stable angina, II FC
- Essential arterial hypertension II stage, 2 degree, hypertensive heart (LVH)
- Full RBBB
- Full AV-block
- Condition after the implantation of cardiac pacemaker ESPRIT DR, mode of stimulation DDD
- Heart failure with preserved ejection fraction, II FC, stage B

CO-MORBIDITY OF OUR PATIENT

- Obesity II class
- Peptic ulcer disease and GERD

TREATMENT

LIFESTYLE MODIFICATION

- Intensive weight reduction
- DASH diet
- Control of compliance to medical recommendations

PHARMACOLOGICAL TREATMENT IN STABLE FORMS OF IHD

Indication	Class ^a	Level ^b	Ref. ^c
General considerations			
Optimal medical treatment indicates at least one drug for angina/ischaemia relief plus drugs for event prevention.	I	C	-
It is recommended to educate patients about the disease, risk factors and treatment strategy.	I	C	-
It is indicated to review the patient's response soon after starting therapy.	I	C	-
Angina/ischaemia^d relief			
Short-acting nitrates are recommended.	I	B	3, 329
First-line treatment is indicated with B-blockers and/or calcium channel blockers to control heart rate and symptoms.	I	A	3, 331
For second-line treatment it is recommended to add long-acting nitrates or ivabradine or nicorandil or ranolazine, according to heart rate, blood pressure and tolerance.	IIa	B	177, 307, 3, 199, 284, 286, 308, 319-321, 328
For second-line treatment, trimetazidine may be considered.	IIb	B	313, 315
According to comorbidities/tolerance it is indicated to use second-line therapies as first-line treatment in selected patients.	I	C	-
In asymptomatic patients with large areas of ischaemia (>10%) B-blockers should be considered.	IIa	C	-
In patients with vasospastic angina, calcium channel blockers and nitrates should be considered and beta-blockers avoided.	IIa	B	3, 365
Event prevention			
Low-dose aspirin daily is recommended in all SCAD patients.	I	A	333, 334, 366
Clopidogrel is indicated as an alternative in case of aspirin intolerance.	I	B	335
Statins are recommended in all SCAD patients.	I	A	62
It is recommended to use ACE inhibitors (or ARBs) if presence of other conditions (e.g. heart failure, hypertension or diabetes).	I	A	348, 349, 351, 352

SUMMARY OF RECOMMENDATIONS AND TREATMENT STRATEGIES IN PATIENTS WITH AH

Recommendations	Class ^a	Level ^b	Ref. ^c
Diuretics (thiazides, chlorthalidone and indapamide), beta-blockers, calcium antagonists, ACE inhibitors, and angiotensin receptor blockers are all suitable and recommended for the initiation and maintenance of antihypertensive treatment, either as monotherapy or in some combinations with each other.	I	A	284, 332
Some agents should be considered as the preferential choice in specific conditions because used in trials in those conditions or because of greater effectiveness in specific types of OD.	IIa	C	-
Initiation of antihypertensive therapy with a two-drug combination may be considered in patients with markedly high baseline BP or at high CV risk.	IIb	C	-

The combination of two antagonists of the RAS is not recommended and should be discouraged.

Other drug combinations should be considered and probably are beneficial in proportion to the extent of BP reduction. However, combinations that have been successfully used in trials may be preferable.

Combinations of two antihypertensive drugs at fixed doses in a single tablet may be recommended and favoured, because reducing the number of daily pills improves adherence, which is low in patients with hypertension.

III	A	331, 433, 463
IIa	C	-
IIb	B	465

ACE = angiotensin-converting enzyme; BP = blood pressure; CV = cardiovascular; OD = organ damage; RAS = renin-angiotensin system.

^aClass of recommendation.

^bLevel of evidence.

^cReference(s) supporting recommendation(s).

SUMMARY OF RECOMMENDATIONS ON THERAPEUTIC STRATEGIES IN HYPERTENSIVE PATIENTS WITH HEART DISEASE

Recommendations	Class ^a	Level ^b	Ref. ^c
In hypertensive patients with CHD, a SBP goal <140 mmHg should be considered.	Ila	B	141, 265
In hypertensive patients with a recent myocardial infarction beta-blockers are recommended. In case of other CHD all antihypertensive agents can be used, but beta-blockers and calcium antagonists are to be preferred, for symptomatic reasons (angina).	I	A	284
Diuretics, beta-blockers, ACE inhibitors, angiotensin receptor blockers, and/or mineralocorticoid receptor antagonists are recommended in patients with heart failure or severe LV dysfunction to reduce mortality and hospitalization.	I	A	411
In patients with heart failure and preserved EF, there is no evidence that antihypertensive therapy per se or any particular drug, is beneficial. However, in these patients, as well as in patients with hypertension and systolic dysfunction, lowering SBP to around 140 mmHg should be considered. Treatment guided by relief of symptoms (congestion with diuretics, high heart rate	Ila	C	-

with diuretics, high heart rate with beta-blockers, etc.) should also be considered.

ACE inhibitors and angiotensin receptor blockers (and beta-blockers and mineralocorticoid receptor antagonists if heart failure coexists) should be considered as antihypertensive agents in patients at risk of new or recurrent atrial fibrillation.

It is recommended that all patients with LVH receive antihypertensive agents.

In patients with LVH, initiation of treatment with one of the agents that have shown a greater ability to regress LVH should be considered, i.e. ACE inhibitors, angiotensin receptor blockers and calcium antagonists.

	Ila	C	-
	I	B	458
	Ila	B	580

^a = angiotensin-converting enzyme; CHD = coronary heart disease; EF

RECOMMENDATIONS FOR TREATMENT OF PATIENTS WITH HEART FAILURE WITH PRESERVED EJECTION FRACTION

Recommendations	Class ^a	Level ^b	Ref ^c
it is recommended to screen patients with HFpEF or HFmrEF for both cardiovascular and non-cardiovascular comorbidities, which, if present, should be treated provided safe and effective interventions exist to improve symptoms, well-being and/or prognosis.	I	C	
Diuretics are recommended in congested patients with HFpEF or HFmrEF in order to alleviate symptoms and signs.	I	B	178, 179

OUR RECOMMENDED TREATMENT

- *B-blocker:* bisoprolol 5 mg in the morning
- *ACE-inhibitor:* enalapril 5 mg in the evening
- *Statin:* rosuvastatin 20 mg in the evening

PROGNOSIS

- ▶ **Prognosis for life - non-compliance to doctor's appointments – non-satisfactory**
- ▶ **The prognosis for recovery – an unfavorable**

CONCLUSIONS

- **Cardiac pacing in the presence of possible solutions to the problem of arrhythmias and HF it does not cancel, but modifies the medical support of patients**
- **Reliability and quality of modern devices that are based on science and technology, gives confidence to physicians and patients that the number of people who live fully life with pacemaker (ECS) will continue to grow up.**