

**V. N. KARAZIN KHARKIV NATIONAL UNIVERSITY  
PROPAEDEUTICS OF INTERNAL MEDICINE AND PHYSICAL  
REHABILITATION  
DEPARTMENT**



**A CLINICAL CASE OF SUCCESSFUL BALLON ANGIOPLASTY  
IN THE REMOTE PERIOD IN A MIDDLE-AGED PATIENT AFTER  
LATE STENT RESTENOSIS**

**Speaker: student of IV course, gr.409, Roni Morani**

**Scientific supervisors: D. Y. Pavlova, Assistant Professor T. V. Zolotarova, Assistant Professor**

**Head of department: M. S. Brynza, Candidate of Medicine**



# MYOCARDIAL REVASCULARIZATION AFTER ACUTE MYOCARDIAL INFARCTION

- Myocardial revascularization procedures represent important treatment options for patients with acute and chronic coronary artery disease (CAD).
- Acute myocardial infarction (MI) was identified nearly 50 years ago as a coronary occlusive event resulting from atherosclerotic plaque rupture and thrombosis. This mechanistic understanding was essential to the development of reperfusion therapy for treating ST-segment elevation MI (STEMI).
- The treatment of STEMI has advanced since the introduction of reperfusion therapies.
- Mechanical reperfusion with primary percutaneous coronary intervention is now the standard of care.

# IN-STENT RESTENOSIS

- The introduction of bare metal stents (BMS) was a significant milestone in the evolution of percutaneous coronary intervention. Soon after it was apparent that these stents led to in-stent restenosis (ISR), which requires repeat revascularization.
- Restenosis is defined as a reduction in lumen diameter after percutaneous coronary intervention (PCI), either with or without stent implantation.
- In-stent restenosis currently defined as a >50% stenosis of a previously stented segment, occurs in 30% of all patients receiving BMS.

# **BALLOON ANGIOPLASTY FOR THE TREATMENT OF CORONARY IN-STENT RESTENOSIS**

Balloon angioplasty (BA) was one of the earliest strategies used in patients experiencing ISR. The procedure is technically straightforward and consistently associated with satisfactory acute results and a very low incidence of complications.

Currently available therapeutic modalities, such as drug-coated balloons (DCB) and drug-eluting stents (DES) provide the best clinical and angiographic results in patients with ISR. However, the field is rapidly evolving. Further studies are required to identify clinical and anatomic characteristics that may help to refine selection and tailor available therapeutic strategies to improve clinical outcomes.

# OUR PATIENT PROFILE

- 51 years old (01.06.1968)
- Male
- Retired
- Lives in a village
- Hospitalized on 18.10.18 to the cardiological department of City Clinical Hospital № 8

# COMPLAINTS

## Main

- Disruptions of the heart beats and heart palpitations which are related to physical activity
- Shortness of breath when walking (observed during physical exertion, while ascending the staircase to the fifth floor), disappearing after the rest
- Unstable blood pressure (increasing of BP in the range of 160/90 mmHg – 180/100 mmHg, despite taking hypotensive drugs, – Bicoprolol, Ramipril)

## Additional:

Fatigue

General weakness

# MEDICAL HISTORY 1.2

- Hypertension for 10 years with the maximum blood pressure (BP) over 180/100 mm Hg
- The usual BP is about 140/90 mm Hg (antihypertensive drugs – Bisoprolol 5 mg, Ramipril 5 mg)
- Since 2009, the blood pressure measured noted to be consistently elevated in the range of 160/100 mmHg – 180/100 mmHg on three occasions
- On August 18 2016 was diagnosed with Non-Q-wave myocardial infarction (left ventricular posterior wall myocardial infarction)
- On September 7 2016 was performed coronary angiography and heart catheterization

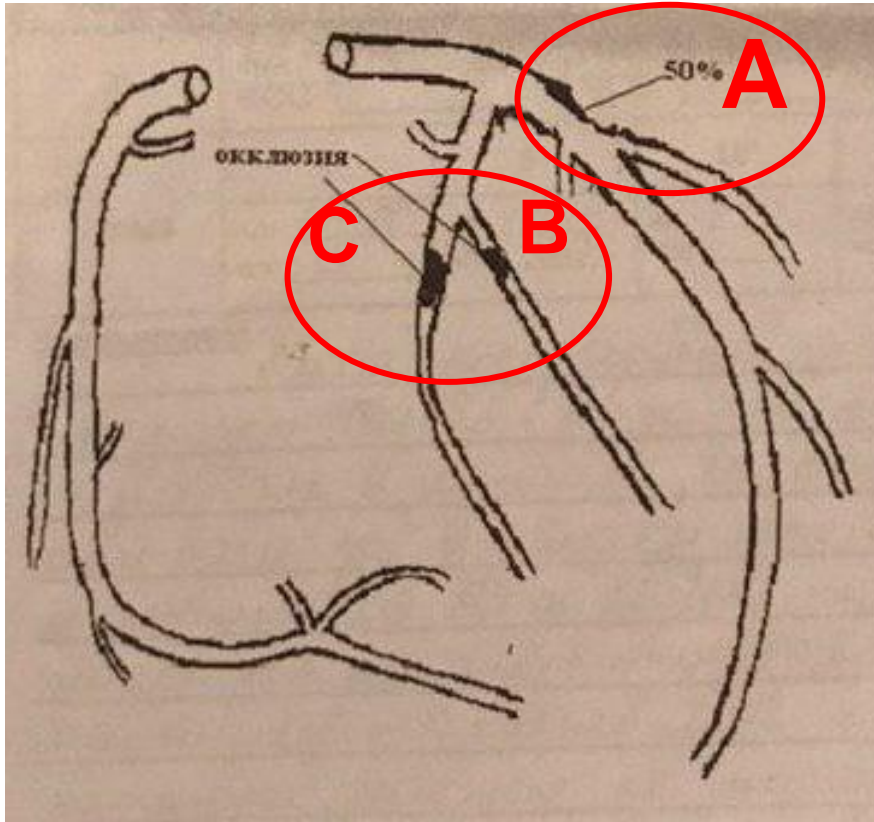
# MEDICAL HISTORY 2.2

- On September 18 2016 was performed coronary angiography with implantation of two non–drug-eluting stents
- On February 2017 symptoms of progressive unstable angina, diagnosed in-stent restenosis, completed balloon angioplasty
- On October 2018 admitted to the cardiological department with complaints: palpitations that were connected with physical exercises; breathlessness while ascending to the fifth floor
- Hospitalized with the diagnoses: Ischemic Heart Disease. Postinfarction (posterior STEMI of LV 18.08.16) cardiosclerosis. Arterial Hypertension, stage III, grade 2, high risk. Chronic heart failure, NYHA class II, stage C, with preserved EF (50%). Patient hospitalized to the cardiological department of CCH №8 for examination and correction of the treatment.



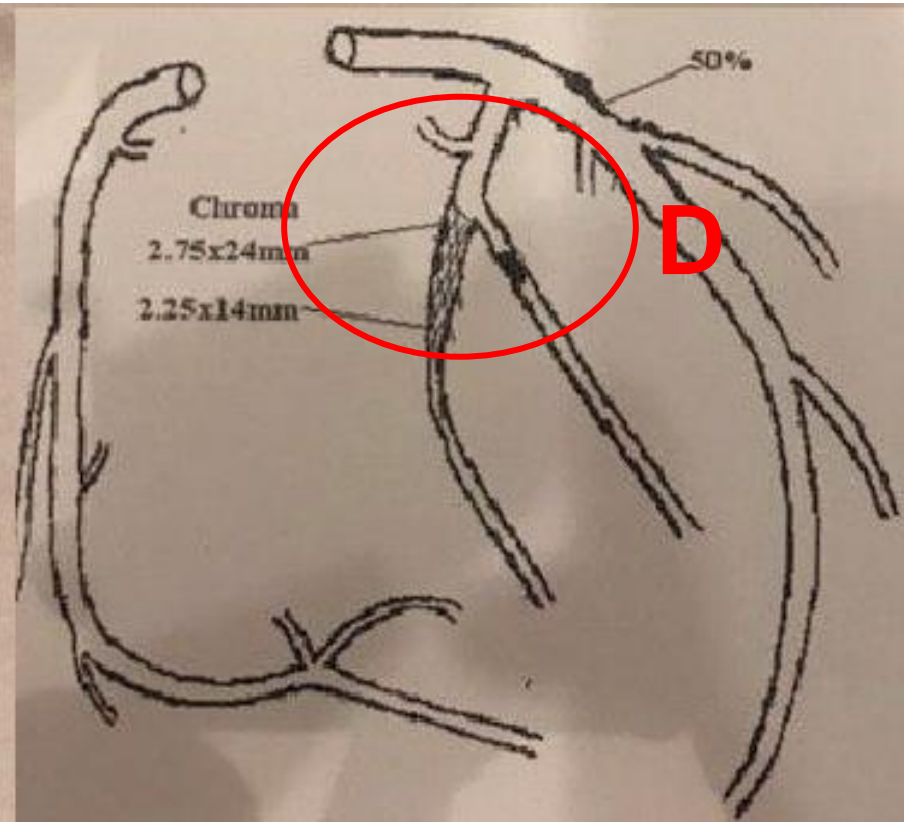
# MEDICAL HISTORY - CORONARY ANGIOGRAPHY

**7.08.16**



- A - Angiography showed the left anterior descending coronary artery stenosis (50%)**
- B - the left circumflex artery occlusion of the distal segment**
- C - occlusion of the obtuse marginal branch**

**27.09.16**



- D - During angiography performed recanalization of occlusion of the distal segment with Ryujin balloon 1.5 cm \* 15 mm with implantation of two Bare – Metal Stents: Chroma 2.25 \* 14 mm and Chroma 2.75 \* 24 mm.**

# **MEDICAL HISTORY - BALLOON ANGIOPLASTY (17.02.17)**

- Patient admitted to the cardiological department with symptoms of progressive unstable angina.
- The Coronary Angiography revealed restenosis of a stented segment to the level of subocclusion, with chronic occlusion of the obtuse marginal branch. The right coronary artery was without significant hemodynamic disturbances.
- During angiography performed angioplasty of the restenosis with NC Sprinter ballon 2.5 \* 15 mm.

# HISTORY OF LIFE

- Was born in a full family, developed according to age
- Denies tuberculosis, diabetes, malaria, viral hepatitis, sexually transmitted diseases and AIDS
- Denies allergic reactions to drugs
- Non-smoker
- Denies alcohol consumption
- Sedentary lifestyle
- Hasn't checked his lipid and glucose profile over 6 months
- Hereditary - no family history of cardiovascular disease

## OBJECTIVE STATE: 1.2

- The general condition is satisfactory, consciousness is clear, emotionally stable, optimistic mood
- Hypersthenic, height 176 cm, weight 80 kg, BMI = 25.8 kg / m<sup>2</sup>, waist-to-hip ratio 0,90
- Skin, visible mucous membranes are pale pink and clean
- Peripheral lymph nodes are not palpable
- The thyroid is not palpable

## OBJECTIVE STATE: 2.2

- Respiratory System: Pulmonary percussion – resonant sound, auscultation - vesicular breathing , no adventitious sounds
- Cardiovascular system: Heart borders extended to the left on 1,5 cm of midclavicular line, HR =76 bpm, regular. Ps= 76 bpm. No pulse deficiency
- Heart sounds are muted, accent of the II tone above the aorta.
- BP dextr = BPsin= 140/80 mm Hg (on the background of antihypertensive therapy)
- Gastrointestinal system: Abdomen–is soft, painless, symmetrical, no discrepancies of the abdominal muscles.
- No visible peristalsis.
- Liver edge is smooth, painless , palpated 2 cm below the costal arch.
- Spleen and pancreas are not palpable
- No pitting oedema

# EXAMINATION

## Examination, completed in the hospital

- General blood test
- General urine test
- Biochemical blood test (Liver and renal function tests)
- Blood lipid spectrum
- Blood glucose level
- Electrocardiography
- Echocardiography
- 24 hours electrocardiography monitoring
- Stress test ( Cycle Ergometer test)

## Recommended additional examination

- Blood glucose level (Hb A1c)
- Random glucose test
- Blood electrolytes (K, Na)
- Cardiologist consultation
- Endocrinologist consultation

Ultrasonography of the abdomen (liver, gallbladder, pancreas, kidneys)

**This tests wasn't completed for financial reasons.**

# COMPLETE BLOOD TEST (19.10.18)

MEASURE	RESULT	RATE
Hemoglobin	154	M 130 - 160 g / l
Erythrocytes	<u>5.04</u>	M 4.0-5.0 T / l
Color index	1.06	0,85 – 1,15
Leukocytes	6.9	4,0 – 9,0 g/L
ESR	11	M 2-12 mm/h
Platelets	260	160-320 g/L
Band Neutrophils	1	1-6 %
Segmented Neutrophils	52	47-72 %
Eosinophils	1	0,5-5,0%
Basophils	0	1-1,0 %
Monocytes	3	3-11 %
Lymphocytes	43	19-37%

**Conclusion: erythrocytosis**

# GENERAL URINE TEST (19.10.18)

MEASURE	RESULT	NORMAL RANGE
SPECIFIC GRAVITY	1.012	1,001-1,040
REACTION	6,8	5,0-7,0
PROTEIN	0.020	to 0.033 g / l
GLUCOSE	0	Absent
LEUCOCYTES	1-2	6-8
EPITHELIUM TRANSITION	Not detected	Not detected
BACTERIA	Not detected	Not detected

**Conclusion: normal**



# BIOCHEMICAL BLOOD TEST (19.10.18)

MEASURE	RESULT	NORMAL RANGE
AsAt	27,8	<37 u/L
AlAt	<u>60</u>	<41 u/L
Fasting glucose	<u>6,2</u>	4,2-6,1 mmol/l
Creatinine	91,5	80-115 mcmol/L

**Conclusion: elevated transaminases, hyperglycemia.**

GLOMERULAR FILTRATION RATE	<u>RESULT</u>	NORMAL RANGE
GFR (Cockroft - Gault)	<u>85.4</u>	>90 ml/min/1.73m <sup>2</sup>
GFR (CKD-EPI)	<u>83.2</u>	>90 ml/min/1.73m <sup>2</sup>
GFR (MDRD)	<u>81</u>	>90 ml/min/1.73m <sup>2</sup>

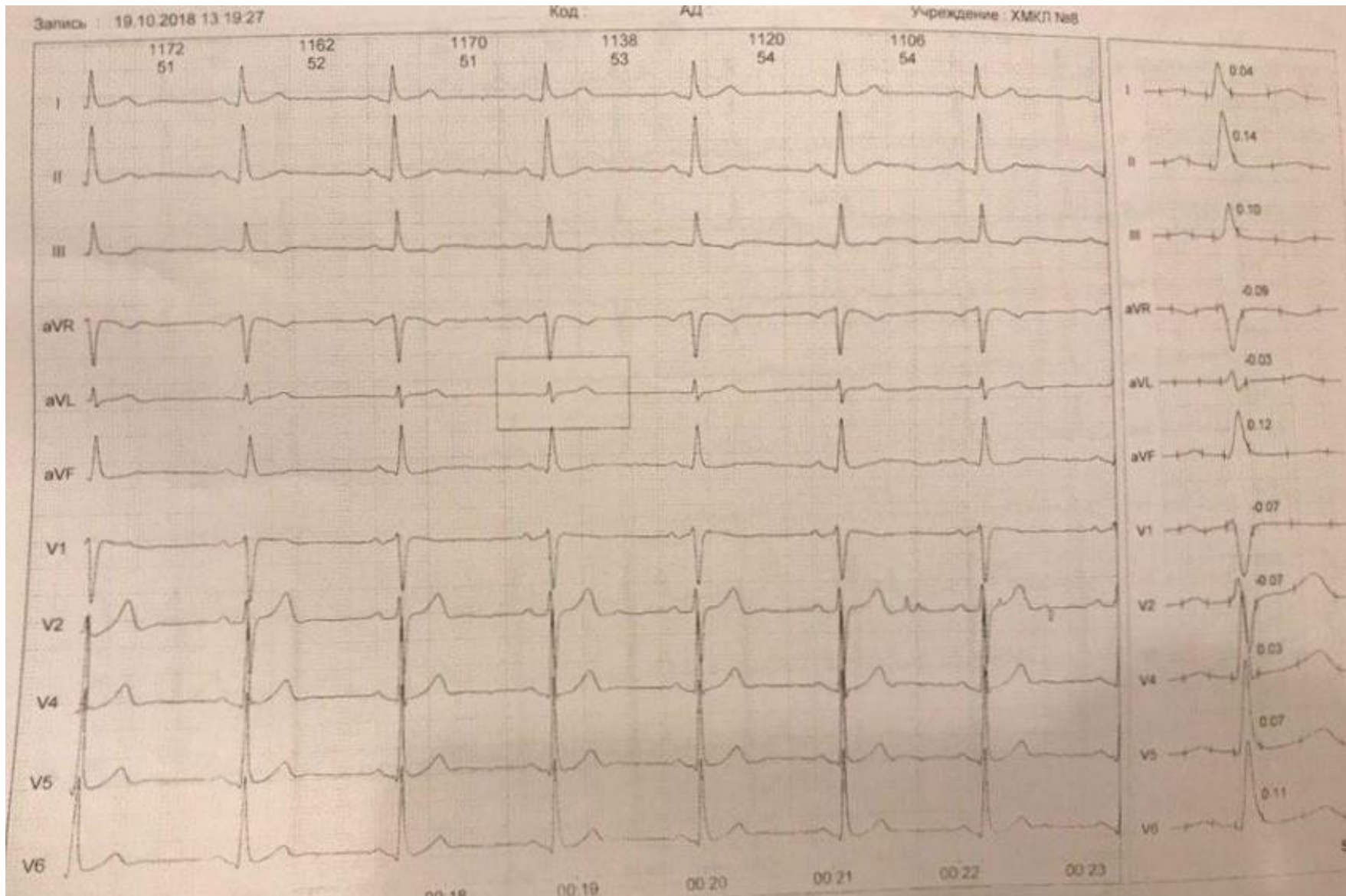
**Conclusion: According to GFR level, mildly reduced kidney function.**

# BLOOD LIPID SPECTRUM (19.10.18)

MEASURE	RESULT	RATE
Total Cholesterol	3,7	≤ 5,2 mmol / l (<4,5)
VLDL	0,97	<1,0 mmol / l
LDL	1,92	<3,5 mmol / l
HDL- cholesterol levels	<u>0,81</u>	>0,9 mmol / l
Triglycerides	<b>2,13</b>	≤2,3 mmol / l
Coefficient of atherogenicity	<u>3,57</u>	to 3,0 mmol/l

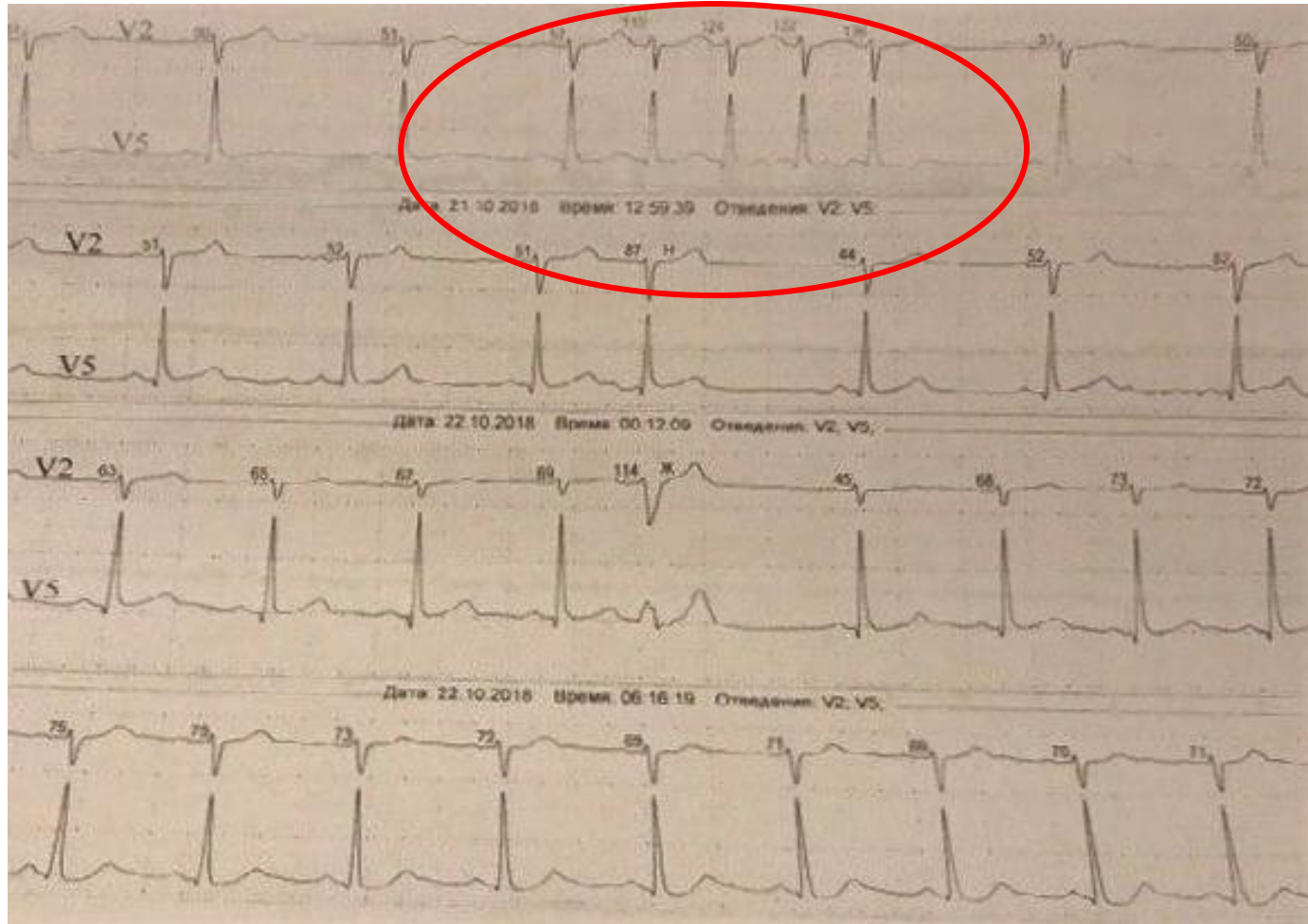
**Conclusion: increased coefficient of atherogenicity due to the level of HDL**

# ECG (18.10.18)



**Result: sinus rhythm, normal heart axis, with heart rate 54 bpm. Posterior wall repolarization interruption.**

# 24 HOURS ELECTROCARDIOGRAPHY MONITORING (18.10.18)



**Result:** during 24-hours monitoring registered sinus rhythm, supraventricular premature contractions (total 210); short supraventricular tachycardia episodes; monomorphic ventricular premature contractions (total 10). Daily heart rate - 55 beats/min (bpm), night heart rate - 55 beats/min (bpm).



# Principles of diagnostic testing

**Table 12** Characteristics of tests commonly used to diagnose the presence of coronary artery disease

	Diagnosis of CAD	
	Sensitivity (%)	Specificity (%)
Exercise ECG <sup>a, 91, 94, 95</sup>	45–50	85–90
Exercise stress echocardiography <sup>96</sup>	80–85	80–88
Exercise stress SPECT <sup>96, 99</sup>	73–92	63–87
Dobutamine stress echocardiography <sup>96</sup>	79–83	82–86
Dobutamine stress MRI <sup>b, 100</sup>	79–88	81–91
Vasodilator stress echocardiography <sup>96</sup>	72–79	92–95
Vasodilator stress SPECT <sup>96, 99</sup>	90–91	75–84
Vasodilator stress MRI <sup>b, 98, 100–102</sup>	67–94	61–85
Coronary CTA <sup>c, 103–105</sup>	95–99	64–83
Vasodilator stress PET <sup>97, 99, 106</sup>	81–97	74–91

CAD = coronary artery disease; CTA = computed tomography angiography; ECG = electrocardiogram; MRI = magnetic resonance imaging; PET = positron emission tomography; SPECT = single photon emission computed tomography.

<sup>a</sup> Results without/minimal referral bias.

<sup>b</sup> Results obtained in populations with medium-to-high prevalence of disease without compensation for referral bias.

<sup>c</sup> Results obtained in populations with low-to-medium prevalence of disease.

**Table 14** Performing an exercise electrocardiogram for initial diagnostic assessment of angina or evaluation of symptoms

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>	Ref. <sup>c</sup>
Exercise ECG is recommended as the initial test for establishing a diagnosis of SCAD in patients with symptoms of angina and intermediate PTP of CAD (Table 13, 15–65%), free of anti-ischaemic drugs, unless they cannot exercise or display ECG changes which make the ECG non evaluable.	I	B	115, 116
Stress imaging is recommended as the initial test option if local expertise and availability permit.	I	B	117–120
Exercise ECG should be considered in patients on treatment to evaluate control of symptoms and ischaemia.	IIa	C	-
Exercise ECG in patients with $\geq 0.1$ mV ST-depression on resting ECG or taking digitalis is not recommended for diagnostic purposes.	III	C	-

CAD = coronary artery disease; ECG = electrocardiogram; PTP = pre-test probability; SCAD = stable coronary artery disease.

<sup>a</sup> Class of recommendation.

<sup>b</sup> Level of evidence.

<sup>c</sup> Reference(s) supporting levels of evidence.

# CYCLE ERGOMETER STRESS TESTING FOR IDENTIFICATION OF SIGNIFICANT CORONARY ARTERY DISEASE (19.10.18)



- The bicycle ergometer test was carried out according to the incremental workloads calibrated in watts (W). The protocol started with a power output of 10W/minutes, followed by increases of 25 W/min. every 3 min.
- **The test was negative.** Stopped after reaching the 150 W/min, the appearance of chest pain, heavy chest pressure, difficulty in breathing. The duration of the last step – 1 min. 30 sec.
- **After stopping the test ECG showed ST segment without specific changes, registered infrequent ventricular extrasystoles without signs of coronary insufficiency, blood pressure - 210/100 mmHg, heart rate - 110 beats/min (bpm).**
- Period of restitution was without specific features. Blood pressure recovered in 5 min. to 120/80 mmHg, chest pain relieved in 2 min.

# ECHOCARDIOGRAPHY:1.2 (23.10.18)

Name	Result	Normal
1) Aorta	37 mm.	20-37 mm
2) Aortic Valve	Opening 18 mm	17-26 mm
3) Left Atrium	<b>Antero-posterior size: 50 mm</b>	To 38 mm
4) Mitral Valve	No regurgitation	
5) Posterior wall of the LV	11 mm. Contraction – normokinetic.	6-11 mm
6) LV end-diastolic diameter	<b>58 mm</b>	46-57 mm
7) LV end-systolic diameter	43 mm	31 - 43 mm

# ECHOCARDIOGRAPHY:2.2

Name	Result	Normal
8) Interventricular septum	11 mm	6-11 mm
9) Right Ventricle	D.: 24 mm	D.: (9-26 mm). Thickness of the wall 3-6 mm
10) Right Atrium	38 mm	<44 mm
11) Tricuspid Valve	No regurgitation	
<u>10)Ejection Fraction</u>	50%	55-78%

**Conclusion:** sclerotic changes of aortic walls, aortic valve. Dilation of the left ventricle and atrium. Left ventricular hypertrophy.



# BASIC CLINICAL SYNDROMES

- Atherosclerosis (sclerotic changes of aortic valve, mild atherosclerotic aortic stenosis)\*
- Arterial hypertension \*
- Arrhythmias (permanent (constant) AF)
- Heart failure
- Dyslipidemia\*
- Hypertensive heart (LVH, atrial enlargement, increased diastolic stiffness)\*
- Hepatomegaly, liver steatosis
- Erythrocytosis, hemoconcentration
- Hyperglycemia / glycosuria syndrome\*
- Obesity: BMI = 25.8 kg / m<sup>2</sup>, waist-to-hip ratio 0,90\*
- \* - features of metabolic syndrome

# **The clinical diagnosis according to current classifications**

# CLASSIFICATION OF OVERWEIGHT AND OBESITY AND WAIST-TO-HIP RATIO

Weight categories	BMI (kg/m <sup>2</sup> )
Underweight	<18.5
Healthy weight	18.5-24.9
<b>Overweight</b>	<b>25-29.9</b>
Obese	30-34.9
Severely Obese	35-39.9
Morbidly Obese	>40

CATEGORIES	WAIST-TO-HIP RATIO
Health risk	Men
Low	0.80 or lower
Moderate	0.81-0.85
<b>High</b>	<b>&gt;0.86</b>

# DEFINITIONS AND CLASSIFICATION OF OFFICE BLOOD PRESSURE LEVELS (MMHG)

Stage	The degree of target organ damage
I	Objective changes in the target organs are absent
II	There is objective evidence of target organ damage without symptoms with their hand or dysfunction: Left ventricular hypertrophy (on ECG, ultrasound, Ro) Generalized narrowing of retinal arteries Microalbuminuria and / or a small increase 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
III	<b>There is objective evidence of target organ damage with symptoms from their side and impaired heart - myocardial infarction,</b> 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; kidney - concentration of plasma creatinine in males > 133 umol / L, y Women > 124; vessels - dissecting aortic aneurysm; peripheral arterial occlusion

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
<b>Grade 2 hypertension</b>	<b>160-179</b>	<b>and/or</b>	<b>100-109</b>
Grade 3 hypertension	≥180	and/or	≥110
Isolated systolic hypertension	≥140	and	<90

## THE NEW YORK HEART ASSOCIATION (NYHA) FUNCTIONAL CLASSIFICATION (FUNCTIONAL CAPACITY) OF CHF

Functional capacity	Objective Assessment
<b>Class I</b> - No symptoms and no limitation in ordinary physical activity, e.g. shortness of breath when walking, climbing stairs etc.	<b>Class A.</b> No objective evidence of cardiovascular disease.
<b>Class II</b> - <b>Mild symptoms (mild shortness of breath and/or angina) and slight limitation during ordinary activity.</b>	<b>Class B.</b> Objective evidence of minimal cardiovascular disease.
<b>Class III</b> - Marked limitation in activity due to symptoms, even during less-than-ordinary activity, e.g. walking short distances (20—100 m). Comfortable only at rest.	<b>Class C.</b> <b>Objective evidence of moderately severe cardiovascular disease.</b>
<b>Class IV</b> - Severe limitations. Experiences symptoms even while at rest. Mostly bedbound patients.	<b>Class D.</b> Objective evidence of severe cardiovascular disease.

## AMERICAN HEART ASSOCIATION HEART FAILURE STAGES

# COMPLETE DIAGNOSIS OF OUR PATIENT:

## HEALTH FACILITY DIAGNOSIS

### Main:

ISCHAEMIC HEART DISEASE. ANGINA PECTORIS CLASS III.

POSTINFARCTION (POSTERIAL STEMI OF LV 18.08.16) CARDIOSCLEROSIS.

SYSTEMIC ATHEROSCLEROSIS (ATHEROSCLEROSIS OF THE AORTA)

ARTERIAL HYPERTENSION STAGE III, 3 GRADE

HYPERTENSIVE HEART (LVH)

## OUR CLINICAL DIAGNOSIS

### Main:

ISCHAEMIC HEART DISEASE. POSTINFARCTION (POSTERIAL STEMI OF LV 18.08.16) CARDIOSCLEROSIS.

7.08.16 CORONARY ANGIOGRAPHY, 27.09.16 CORONARY ARTERY STENTING WITH TWO BARE-METAL STENTS, 17.02.17 BALLOON ANGIOPLASTY AFTER STENT RESTENOSIS.

SYSTEMIC ATHEROSCLEROSIS (ATHEROSCLEROSIS OF THE AORTA)

ESSENTIAL ARTERIAL HYPERTENSION STAGE III, 2 GRADE. HYPERTENSIVE HEART (LVH)

CHRONIC HEART FAILURE WITH PRESERVED LEFT VENTRICLE EJECTION FRACTION ( EF-50%), II CLASS, STAGE C NYHA.

VERY HIGH ADDED TOTAL CV RISK

Co-morbidity: Pre- diabetes?

# **TREATMENT**

- **Lifestyle modification**
- **Medical intervention**

# THERAPEUTIC LIFESTYLE CHANGES

PARAMETER	TREATMENT GOAL
Weight loss (for overweight and obese patients)	Reduce by 5% to 10%
Physical activity	<ul style="list-style-type: none"><li>• At least 150 minutes of moderate-intensity physical activity (for example, 30 minutes, 5 days a week), or</li><li>• At least 75 minutes of vigorous-intensity physical activity (for example, 25 minutes, 3 days a week); or</li><li>• A combination of moderate- and vigorous-intensity aerobic activity, and</li><li>• At least 2 days of moderate- to high-intensity muscle-strengthening activities (such as resistance weight training) for additional health benefits</li></ul>
Diet	<ul style="list-style-type: none"><li>• Vegetables, fruits, and whole grains</li><li>• Legumes and nuts</li><li>• Low-fat dairy products</li><li>• Low-fat poultry (without the skin)</li><li>• Fish and seafood</li><li>• Nontropical vegetable oils</li></ul>

# TREATMENT STRATEGY 1.2.

## Our goals:

- **BP target – 130-139/85-89 mm Hg**
- **n LDL-C target of 1.8 mmol/L (70 mg/dL)**
- **Glycated Hemoglobin (HbA1c) to ,7.0% (53 mmol/mol)**

According to the ESC Clinical Practice Guidelines 2013, Management of Stable Coronary Artery Disease



# HEALTH FACILITY TREATMENT

## Drug therapy

- Bisoprolol 5 mg in the morning
- Enalapril 5 mg in the morning
- Aspirin 100 mg in the evening
- Clopidogrel 75 mg in the evening
- Atorvastatin 40 mg in the evening

## IV therapy

- Meldonium 500mg / 5.0 ml, N10

# RECOMMENDED TREATMENT

## Drug therapy

- Angiotensin-converting enzyme (ACE) inhibitor-Ramipril 5 mg in the morning
- Diuretic – Eplerenone 25 mg, in the morning
- B- blocker-Bisoprolol 5 mg in the morning (target HR – 60 b/m)
- Antiplatelet therapy - Aspirin 100 mg in the evening
- Antiplatelet agent - Clopidogrel 75 mg in the evening
- Statin- Rosuvastatin 20 mg in the evening

**CONTROL OF COMPLIANCE  
TO MEDICAL  
RECOMMENDATIONS (diet,  
weight, physical activity,  
drug treatment) !**

# **RECOMMENDATIONS FOR FURTHER EXAMINATION**

- Exercise ECG
- 24h-ECG monitoring
- Daily glycemic profile, Glucose tolerance test, HbA1C, consultation of Endocrinologist
- Echocardiography for evaluation of diastolic function of LV
- Lipid profile (LDL), ALT (liver)

# PROGNOSIS

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

# Conclusions

- In our clinical case, according to the result of cardiac stress test, when veloergometer cycle test showed no signs of myocardial ischemia, balloon angioplasty has proven to be an effective method of In-stent restenosis treatment.
- Considering that Diabetes mellitus has a role in foster the In-stent restenosis process, further diagnostic recommended: HbA1c, fasting plasma glucose and postprandial glucose level control, glucose tolerance test.
- To clarify the segmental heart contractility, we recommend additionally a Stress-echo test and Speckle tracking echocardiography.
- Repeat Coronarography in case of cardiac ischemia signs.

**THANK YOU FOR  
ATTENTION!**