

**V.N.KARAZIN KHARKIV NATIONAL UNIVERSITY
INTERNAL MEDICINE DEPARTMENT**

**Performed:
student of VI course
gr. 625 Baseel Jamal Robin Sharif**

**Heart failure in a patient with prosthetic valves
after infectious endocarditis on congenital bicuspid
aortic valve**

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DEFINITION

Chronic heart failure (CHF) is an abnormality of cardiac structure or function leading to failure of the heart to deliver oxygen at a rate commensurate with the requirements of the metabolizing tissues, despite normal filling pressures (or only at the expense of increased filling pressures).

EPIDEMIOLOGY

- Approximately 1–2% of the adult population in developed countries has HF, with the prevalence rising to $\geq 10\%$ among persons 70 years of age or older.
- Heart failure accounts for 34% of cardiovascular-related deaths.
- Heart failure is the most frequent cause of hospitalization in patients.
- Rehospitalization rates during the 6 months following discharge are as much as 50%.
- One of the reasons for the development of heart failure in patients with prosthetic valves is transferred bacterial endocarditis, including on congenital heart defects (such as bicuspid aortic valve).

OUR PATIENT

Patient O.I.A.

- 29 years old
- IT specialist
- city resident
- Date of admission: 19/09/2016

COMPLAINTS

- **Fatigue** - after moderate physical activity - lifting on the second floor, relieved at rest.
- **Dyspnea** - paroxysmal nocturnal dyspnea (PND) occurs during moderate physical activity, stopped at rest.
- **Tachycardia** - palpitation and feeling 90-100 HB/minute, start during housework and eliminated by taking the tablet of validol in 10 minutes, recreation.
- **Dizziness** - due to a sudden change of body position, turning the head to the side, relieved spontaneously.
- **Swelling of the lower limbs** - appearing in the evening.

ANAMNESIS MORBI 1.1

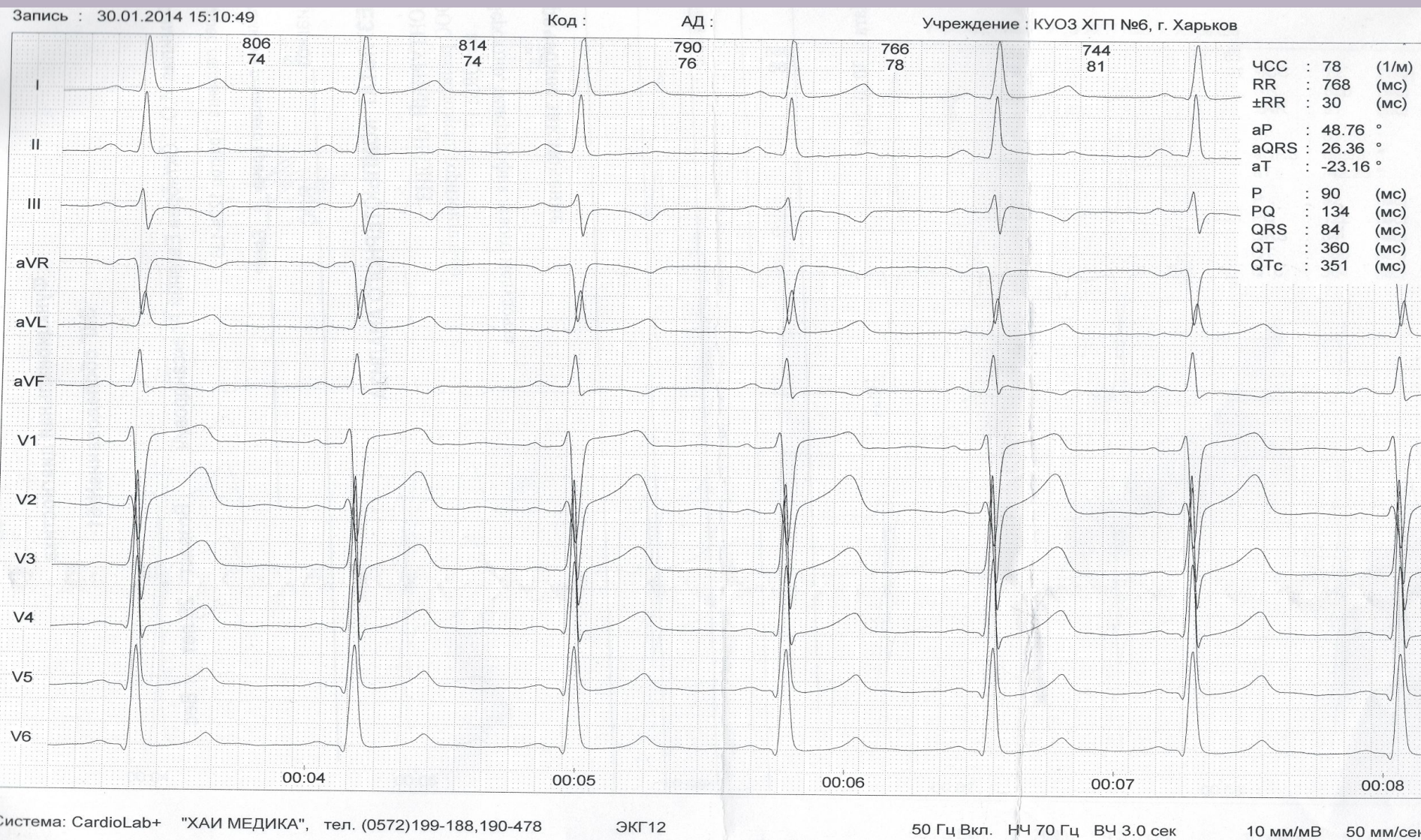
- In December 2012, suffered a sore throat, occurred for the first time. He was admitted to Institution of general and urgent surgery V.T. Zaycev NAMS of Ukraine in February 2013 for diagnosis of CHD: *Infective endocarditis of the aortic valve, acute phase. Septicaemia (Str.pneumoniae). AV insufficiency III degree. MV insufficiency II degree. Congenital bicuspid aortic valve. HF IIB st., II FC.*
- Patient received treatment with a course of antibiotics. Him was offered surgical treatment which he at that moment refused.
- After discharge, the patient's condition began to deteriorate, growing signs of heart failure.

ANAMNESIS MORBI 1.2

- September 15th 2014 he was admitted in Kiev Heart Institute.
- September 22th 2014 - valvular replacement. Aortic (St. Jude #25) and mitral (St. Jude #29) valves. Was transferred from the intensive care with a temporary pacemaker. In the early postoperative period: frequent paroxysms of atrial flutter, frequent episodes of AV-block III degree, one episode of asystole with resuscitation.
- Oktober 13th 2014 - pacemaker implantation (St. Jude Verity DC (DDD)).

ANAMNESIS MORBI 1.3

ECG BEFORE SURGERY 30/01/2014



Conclusion: Left ventricular hypertrophy

ANAMNESIS MORBI 1.4

ECG AFTER SURGERY 06/11/2014

Запись : 06.11.2014 15:14:01

Код :

АД :

Учреждение : КУОЗ ХГП №6, г. Харьков



Система: CardioLab+ "ХАИ МЕДИКА", тел. (0572)199-188,190-478

ЭКГ12

50 Гц Вкл. НЧ 70 Гц ВЧ 3.0 сек

10 мм/мВ 50 мм/сек

Conclusion: AV block I degree. Total left BHBB

ANAMNESIS MORBI 1.5

HEART ULTRASOUND 15/04/14

(BEFORE SURGERY)

Aortic valve: bicuspid; cusps prolapse; hyperechogenic formation up to 5 - 8 mm.; insufficiency +++, pressure gradient of 28 mm Hg. art. The diameter of the aorta 2.9 cm/4.2 cm/4.3 cm; aortic arch - 3.9 cm;

Mitral valve: chords are sealed with visualized hyperechogenic formation, it is not excluded, the “old” calcifications of the growing season; insufficiency ++;
EF=63%

ANAMNESIS MORBI 1.6

TRANSESOPHAGEAL

ECHOCARDIOGRAPHY 17/09/14

(BEFORE SURGERY)

Aortic valve: bicuspid; small hyperechogenic formations on wings AK, insufficiency +++

Mitral valve: signs of infectious endocarditis with the defeat of MV due to chronic trauma aortic insufficiency (small hyperechogenic vegetation, moving 3-4 mm; hyperechogenic, the conglomerate on chords of MV)

ANAMNESIS VITAE

- In the early childhood was diagnosed with **Congenital heart disease. Bicuspid aortic valve.**
- Complaints of fatigue, poor exercise capacity. Surgical treatment was deferred until reaching adulthood.
- Other infections, injuries, tuberculosis, sexually transmitted diseases were denied.
- Hereditary diseases are not identified.
- Allergological history is not burdened.

OBJECTIVE STATUS 1

- General condition-moderate grave, Conciseness - clear, posture - active, body position - sitting on the chair.
- Patient can orientate himself in place, time, his personality.
- Height – 170 sm, weight – 102 kg, BMI – 35,29.
- Skin and mucosae are pink.
- Thyroid: no pathological changes.
- Skeleto–muscular system - deformity of the chest after sternotomy.
- BR – 20 /min.
- Lung percussion: pulmonary below scapula angles from both sides
- Lung auscultation: decreased vesicular breathing, wheezes inferial parts both sides
- Borders of the heart: left border – outside of midclavicular left line on 4 cm.

OBJECTIVE STATUS 2

- Heart auscultation: heart tones rhythmic, melody of mechanical valve on aortic and mitral valves.
- Pulse – rhythmic, 65 bts/min (during receiving blockers).
- BP 110 / 70 mm Hg.
- Abdomen: symmetric, increased in size due to subcutaneous fat.
- Liver: +1 cm.
- Spleen: normal.
- A sign of costovertebral angle tenderness is negative on both sides.
- Edemas: absent.
- Varicose vein disease of lower extremities – absent.
- Feces: everyday, normal color.

PRELIMINARY DIAGNOSIS OF ADMISSION WARD PHYSICIAN

Mechanical prosthesis of aortic and mitral valves bileaflet type (22/09/2014) because of infective endocarditis of bicuspid aortic valve and mitral valve insufficiency. Total AV-block III degree. Pacemaker statement St. Jude Verity DC (DDD)(13/10/2014).

Total heart failure with preserved left ventricular pump function (ejection fraction = 63%), II C functional class by NYHA.

PLAN OF SURVEY IN THE HOSPITAL

- Clinical blood test (CBT) and urine analysis
- Kidneys and liver function tests
- Electrolytes
- Lipid profile
- INR - international normalized ratio
- Electrocardiography(ECG)
- Chest X-ray
- Echocardiography with doppler

CLINICAL BLOOD TEST

19/09/2016

index	results	
hemoglobin	153	120-150 g/l
erythrocytes	5.12	3.9-4.7 *10 ¹²
thrombocytes	213	160-320 g/l
leukocytes	7.13	4.0-9.0 g/l
ESR	2	2- 15 mm/h

Conclusion: Normal test

URINE ANALYSIS 19/09/16

Index	Result	Normal range
Amount	140	
color	Yellow	Light yellow
transparency	Transparent	Transparent
Ontos.plotnost	1.017	1.001-1.040
Reaction (pH)	7	5.0-7.0
Protein(g/l)	Not found	To 0.033 g/l
Glucose (mmol/l)	Not found	-
leukocytes	4	6-8
Transitional epithelium	Not found	
Bacteria	Not found	

Conclusion: Normal test

BIOCHEMISTRY TEST DATA FROM

19/09/16

Tests	Result	Normal range
Creatinine (CKD-EPI GFR)	79.0	53-97 mcmol/l
Urea	4.6	4.2-8.3 mcmol/l
INR	2.28	2-3
AST	22	5-40 U/l
ALT	27	5-40 U/l
Total bilirubin	9.4	3,4—17,1 mcmol/l

Conclusion: Normal test

ELECTROLYTES 19/09/16

Tests	Result	Normal range
Na	141	136-145 mEq/L
K	4.7	3.5-5 mEq/L
Ca	10.2	9-10.5 mg/dL

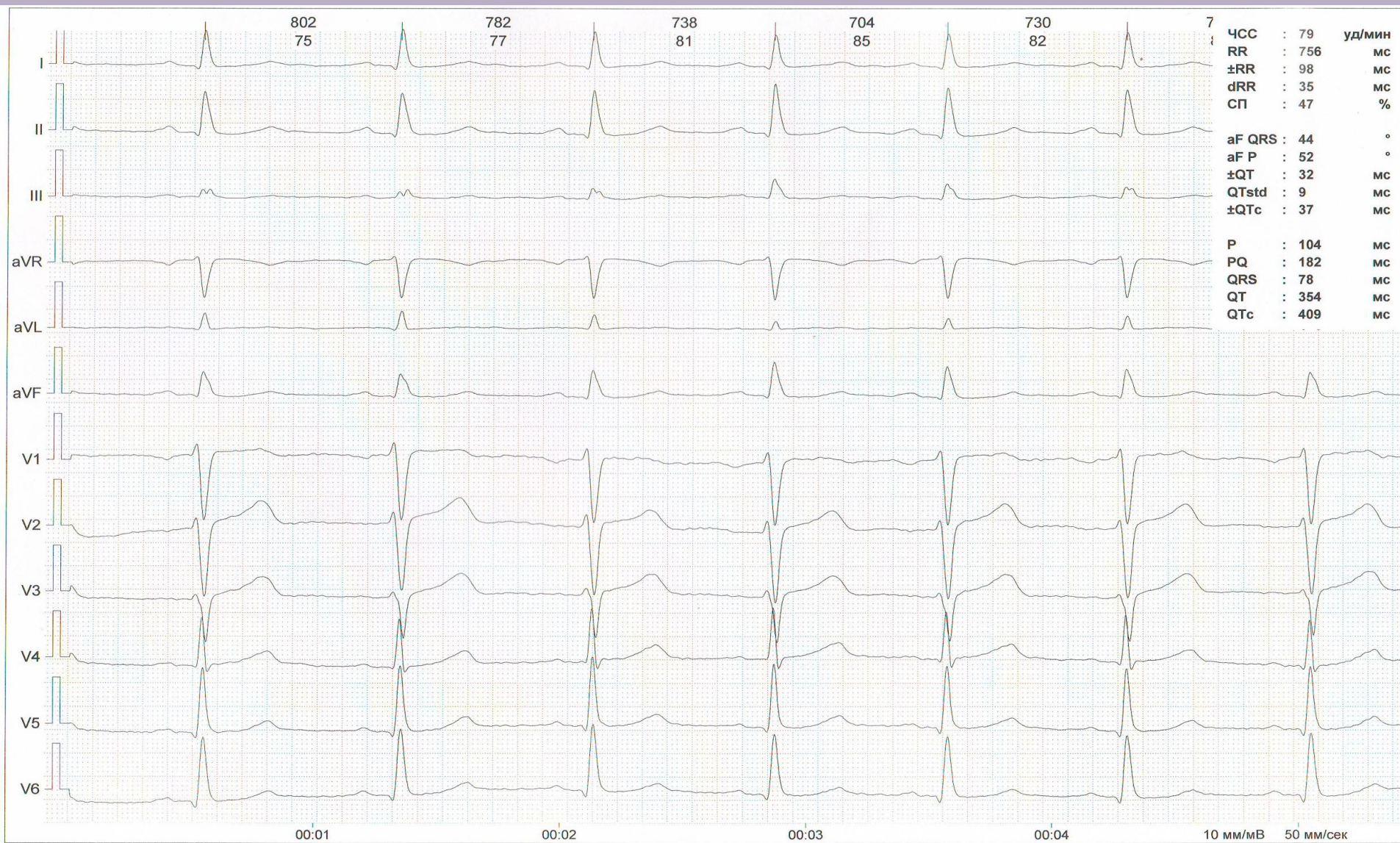
Conclusion: Normal test

LIPID PROFILE 19/09/2016

Total cholesterol	4.21	3,1-5,2 mmol/l
Triglycerides	0,74	0,14-1,82 mmol/l

Conclusion: Normal test

ECG 15/09/16



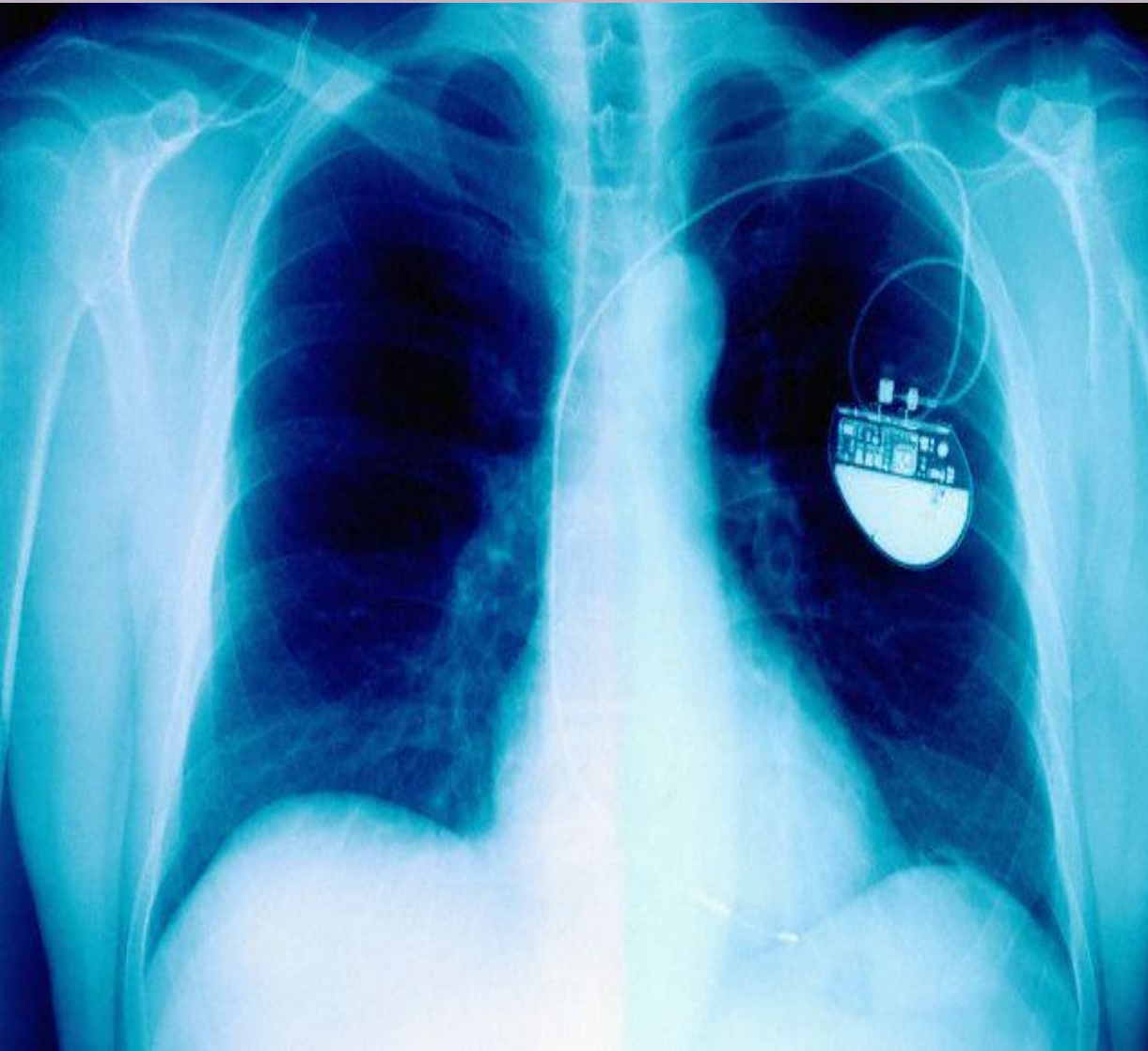
Система: КардиоЛаб "ХАИ МЕДИКА", тел. +380 57 7199188, 7190478

Схема отведений: Стандарт 12 отв.

50 Гц - вкл. ФНЧ - 70 Гц ФВЧ - 3 сек

Conclusion: Left ventricular hypertrophy

CHEST X-RAY 12/09/16



Conclusion: without pathological changes in the lungs.

Pacemaker in left subcostal area, visible electrode to RV.

HEART ULTRASOUND 15/09/16

Aortic valve: prosthesis, gradient-28/19 mm Hg.

Mitral valve: prosthesis, pressure gradient-19/10 mm Hg.

Pericardium and pleural cavities without fluid.

EF-63%.

CONGENITAL PREDISPOSING FACTORS FOR INFECTIVE ENDOCARDITIS

- Uncomplicated congenital aortic valve disease and infective endocarditis can occur together.
- The source of infection in the body often affects anatomically modified organs, which helps in the further development of infective endocarditis with formation of acquired heart defects.
- Some simple lesions, such as secundum atrial septal defect and pulmonary valve disease, carry a low risk of IE, while others, such as bicuspid aortic valve, carry higher risk.

RISK FACTORS FOR INFECTIOUS ENDOCARDITIS

- Presence of a prosthetic valve (highest risk)
- Previous endocarditis (highest risk)
- **Complex cyanotic congenital heart disease (e.g., single ventricle states); Uncomplicated congenital aortic valve disease**
- Surgically constructed systemic pulmonary shunts or conduits
- Acquired valvular dysfunction (e.g., rheumatic heart disease)
- Hypertrophic cardiomyopathy
- Mitral valve prolapse with regurgitation
- IV drug abuse Important Risk Factors

SYNDROMES

- Prosthetic valves
- Pacemaker
- Chronic heart failure

AORTIC VALVE REPLACEMENT INDICATIONS:

- **Patients with valvular heart disease (depends on the stage):**

1. Aortic Stenosis;

2. Aortic Regurgitation;

- **Combined valvular heart disease**
- **Bicuspid aortic valve and aortopathy**
- **Infective endocarditis**

AORTIC VALVE REPLACEMENT

COMPLICATIONS:

- Left ventricular failure;
- Right ventricular failure and tricuspid regurgitation;
- Pulmonary hypertension;
- Sudden death, arrhythmias, and conduction abnormalities;
- Thrombosis, thromboembolism, and complications from anticoagulation;
- Infective endocarditis.

TYPES OF PROSTHETIC HEART VALVES

- **Biologic**

Stented

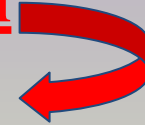
- Porcine xenograft
- Pericardial xenograft

Stentless

- Porcine xenograft
- Pericardial xenograft
- Homograft (allograft)
- Autograft

Percutaneous

- **Mechanical**



- **Bileaflet**
- Single tilting disc
- Caged-ball

ANTICOAGULATION THERAPY FOR PROSTHETIC VALVES 1.1

Class I

1. Anticoagulation with a VKA and international normalized ratio (INR) monitoring is recommended in patients with a mechanical prosthetic valve. (Level of Evidence: A)
2. Anticoagulation with a VKA to achieve an INR of 2.5 is recommended in patients with a mechanical AVR (bileaflet or current-generation single tilting disc) and no risk factors for thromboembolism. (Level of Evidence: B)
3. Anticoagulation with a VKA is indicated to achieve an INR of 3.0 in patients with a mechanical AVR and additional risk factors for thromboembolic events (AF, previous thromboembolism, LV dysfunction, or hypercoagulable conditions) or an older-generation mechanical AVR (such as ball-in-cage). (Level of Evidence: B)

ANTICOAGULATION THERAPY FOR PROSTHETIC VALVES 1.2

4. Anticoagulation with a VKA is indicated to achieve an INR of 3.0 in patients with a mechanical MVR. (Level of Evidence: B)
5. Aspirin 75 mg to 100 mg daily is recommended in addition to anticoagulation with a VKA in patients with a mechanical valve prosthesis. (Level of Evidence: A)

INTERNATIONAL NORMALIZED RATIO (INR) TARGETS 1.1

The international normalized ratio (INR) recommendations below are per guidelines from the American College of Chest Physicians (2008).

Rheumatic mitral valve disease :

INR target (range)

- Atrial fibrillation (AF), prior embolism, and/or left atrial thrombus: 2.5 (2.0-3.0)
- AF plus systemic embolism or left atrial thrombus: 3.0 (2.5-3.5)
- Normal sinus rhythm plus left atrial diameter >55 mm: 2.5 (2.0-3.0)
- Preprocedure percutaneous mitral balloon valvotomy (PMBW) with left atrial thrombus: 3.0 (2.5-3.5)

Duration of therapy: Long-term

INTERNATIONAL NORMALIZED RATIO (INR) TARGETS 1.2

Mitral valve prolapse :

- INR target (range)
 - AF, systemic embolism, or recurrent transient ischemic attacks (TIAs): 2.5 (2.0-3.0)
- Duration of therapy: Long-term**

Mitral annular calcification :

- INR target (range)
 - Recurrent systemic embolism, ischemic stroke, or TIA, without AF: 2.5 (2.0-3.0)
 - AF: 2.5 (2.0-3.0)
- Duration of therapy: long-term**

INTERNATIONAL NORMALIZED RATIO (INR) TARGETS 1.3

Acute deep venous thrombosis (DVT) of the arm :

- INR target (range): 2.5 (2.0-3.0)
- Duration of therapy: ≥ 3 months**

Calcific aortic valve disease :


- INR target (range)
 - Ischemic stroke: 2.5 (2.0-3.0)
- Duration of therapy: Long-term**

INTERNATIONAL NORMALIZED RATIO (INR) TARGETS 1.4

Mechanical heart valve :

- INR target (range)
 - Bileaflet mechanical valve in aortic position, sinus rhythm, no left atrial enlargement: 2.5 (2.0-3.0)
 - Tilting-disk or bileaflet mechanical valve in mitral position: 3.0 (2.5-3.5)
 - Caged-ball or caged-disk: 3.0 (2.5-3.5)
 - Risk factors: 3.0 (2.5-3.5)
 - Systemic embolism despite therapeutic INR: Increase from 2.5 to 3.0 (2.5-3.5) or 3.0 to 3.5 (3.0-4.0)
 - Aortic position with prosthetic valve thrombus: 3.5 (3.0-4.0)
 - Mitral position with prosthetic valve thrombus: 4.0 (3.5-4.5)
- Duration of therapy: Long-term**

RESULTS OF INTERNATIONAL NORMALIZED RATIO (INR) FOR MECHANICAL PROSTHESES



Prosthesis thrombogenicity ^a	Patient-related risk factors ^b	
	No risk factor	Risk factor ≥ 1
Low	2.5	3.0
Medium	3.0	3.5
High	3.5	4.0

^aProsthesis thrombogenicity: Low = Carbomedics, Medtronic Hall, St Jude Medical, ON-X; Medium = other bileaflet valves; High = Lillehei-Kaster, Omniscience, Starr-Edwards, Bjork-Shiley and other tilting-disc valves.

^bPatient-related risk factors: mitral or tricuspid valve replacement; previous thromboembolism; atrial fibrillation; mitral stenosis of any degree; left ventricular ejection fraction <35%.

HAS-BLED RISK SCORE

Clinical characteristics comprising the HAS-BLED bleeding risk score

Letter	Clinical characteristic ^a	Points awarded
H	Hypertension	1
A	Abnormal renal and liver function (1 point each)	1 or 2
S	Stroke	1
B	Bleeding	1
L	Labile INRs	1
E	Elderly (e.g. age >65 years)	1
D	Drugs or alcohol (1 point each)	1 or 2
		Maximum 9 points

PACEMAKER SYNDROME

- Some patients with VVI pacemakers, especially with sinoatrial (SA) rather than atrioventricular (AV) disease, will show retrograde ventriculoatrial (VA) conduction during ventricular pacing which can cause fatigue, dizziness and hypotension.
- Pacemaker syndrome is associated with atrial cannon waves caused by simultaneous atrial and ventricular contractions. Replacement with a dual chamber is required.

COMPLICATIONS OF TEMPORARY PACING

- Immediate complications include:
 - Ventricular tachycardia or fibrillation.
 - Arterial puncture.
 - Pneumothorax.
 - Brachial plexus injury.
- Late complications include:
 - **Ventricular arrhythmias.**
 - Septicaemia (especially staphylococcal infection).
 - Wrong position requiring repositioning.

FUNCTIONAL CLASSES OF HEART FAILURE

NEW YORK HEART ASSOCIATION (NYHA) CLASSES¹

NYHA class I

- No limitation on physical activity
- No overt symptoms

NYHA class II

- Slight limitation on physical activities
- Comfortable at rest, but ordinary physical activity causes symptoms of heart failure



NYHA class III

- Marked limitation on physical activities
- Comfortable at rest, but less than ordinary activity causes symptoms of heart failure

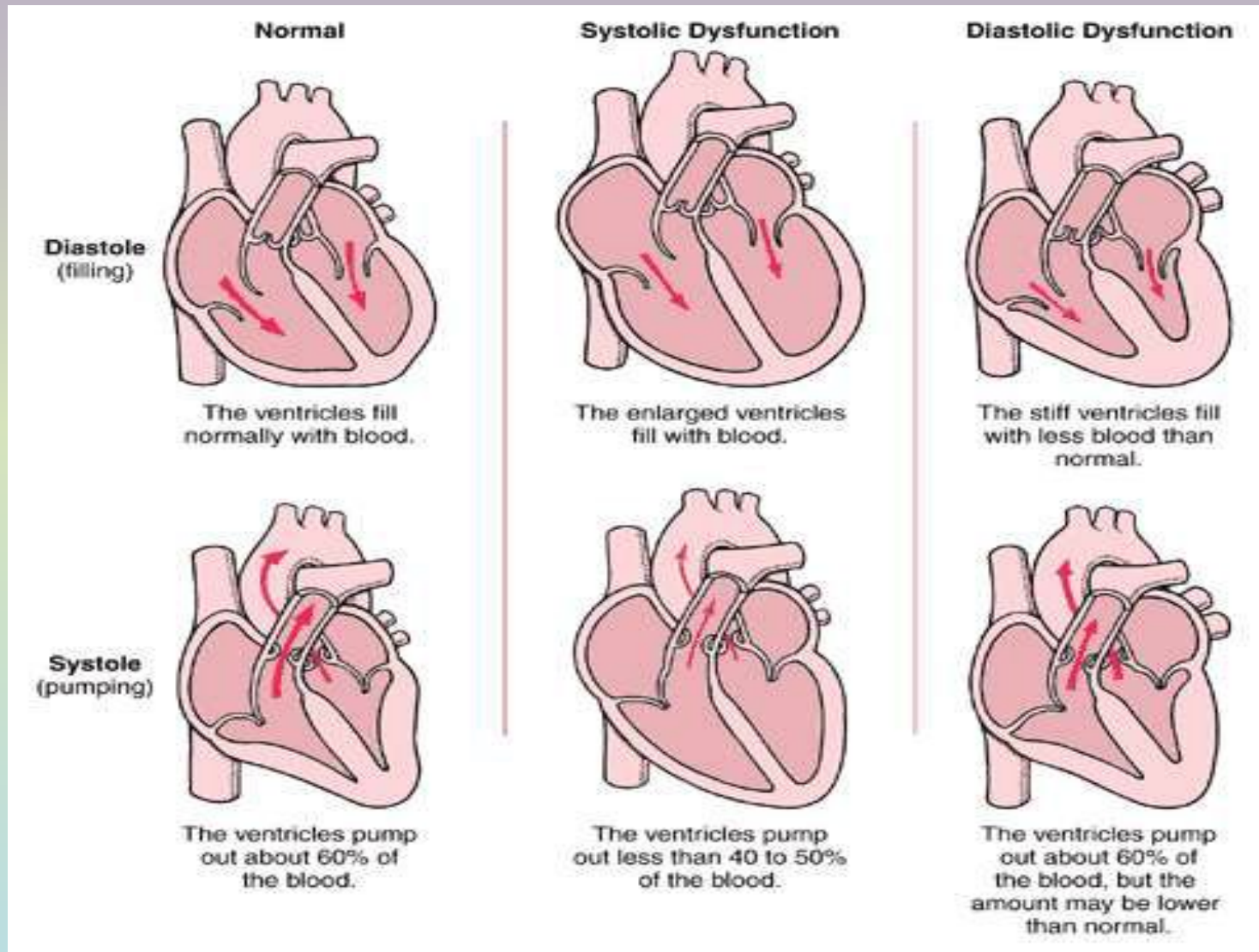
NYHA class IV

- Inability to carry on any activity without symptoms
- Presence of symptoms even at rest

STAGES OF HEART FAILURE

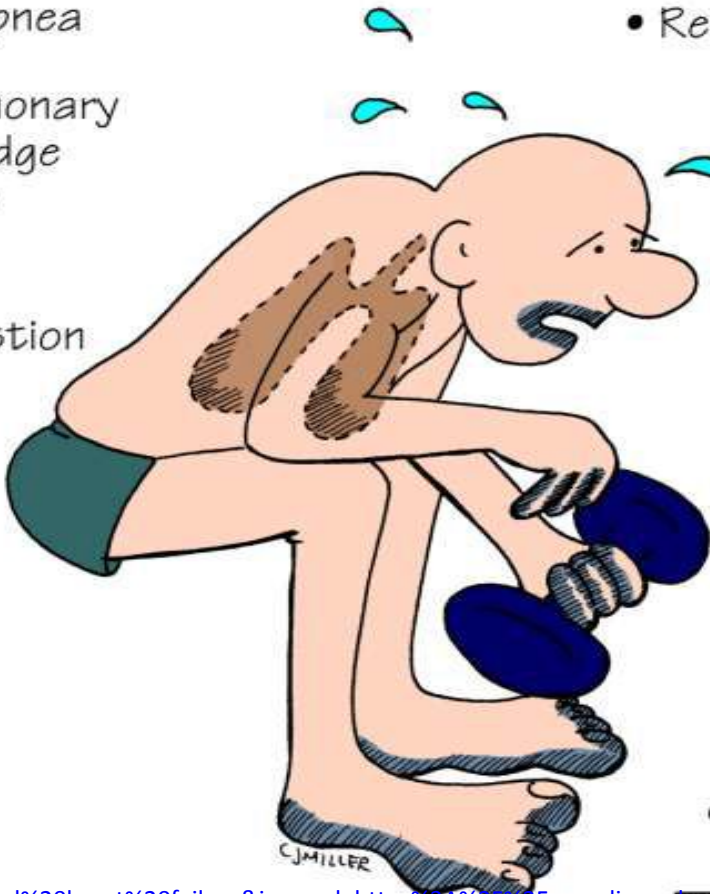
	Stage	Patient Description
A	High risk for developing heart failure (HF)	<ul style="list-style-type: none"> • Hypertension • CAD • Diabetes mellitus • Family history of cardiomyopathy
B	Asymptomatic HF	<ul style="list-style-type: none"> • Previous MI • LV systolic dysfunction • Asymptomatic valvular disease
C	Symptomatic HF	<ul style="list-style-type: none"> • Known structural heart disease • Shortness of breath and fatigue • Reduced exercise tolerance
D	Refractory end-stage HF	<ul style="list-style-type: none"> • Marked symptoms at rest despite maximal medical therapy (eg, those who are recurrently hospitalized or cannot be safely discharged from the hospital without specialized interventions)

TYPES OF HEART FAILURE



SYMPTOMS ACCORDING TO THE SIDE OF THE HEART FAILURE 1.1

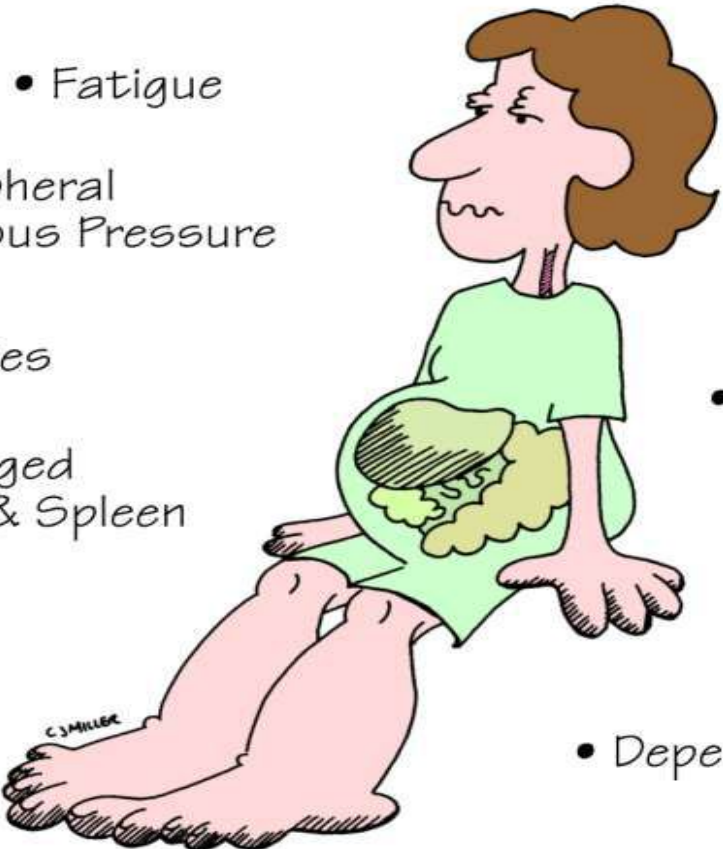
LEFT SIDED FAILURE

- 
- Paroxysmal Nocturnal Dyspnea
 - Elevated Pulmonary Capillary Wedge Pressure
 - Pulmonary Congestion
 - Cough
 - Crackles
 - Wheezes
 - Blood-Tinged Sputum
 - Tachypnea
 - Restlessness
 - Confusion
 - Orthopnea
 - Tachycardia
 - Exertional Dyspnea
 - Fatigue
 - Cyanosis

SYMPTOMS ACCORDING TO THE SIDE OF THE HEART FAILURE 1.2

RIGHT SIDED ♥ FAILURE

(Cor Pulmonale)

- 
- Fatigue
 - ↑ Peripheral Venous Pressure
 - Ascites
 - Enlarged Liver & Spleen
 - May be secondary to chronic pulmonary problems
 - Distended Jugular Veins
 - Anorexia & Complaints of GI Distress
 - Swelling in Hands & Fingers
 - Dependent Edema

TREATMENT OF HEART FAILURE

Nowadays the quality and length of life are the most important in treatment of the patients.

Treatments include lifestyle and pharmacological modalities, and occasionally various forms of device therapy and rarely cardiac transplantation.

Treatment focuses on improving the symptoms and preventing the progression of the disease. Reversible causes of the heart failure also need to be addressed (e.g. [infection](#), [alcohol](#) ingestion, anemia, [thyrotoxicosis](#), [arrhythmia](#), hypertension).

PHARMACOLOGICAL TREATMENT OF HEART FAILURE

Recommendations	Class ^a	Level ^b	Ref ^c
An ACE inhibitor is recommended, in addition to a beta-blocker, for all patients with an EF $\leq 40\%$ to reduce the risk of HF hospitalization and the risk of premature death.	I	A	87–91
A beta-blocker is recommended, in addition to an ACE inhibitor (or ARB if ACE inhibitor not tolerated), for all patients with an EF $\leq 40\%$ to reduce the risk of HF hospitalization and the risk of premature death.	I	A	92–98
An MRA is recommended for all patients with persisting symptoms (NYHA class II–IV) and an EF $\leq 35\%$, despite treatment with an ACE inhibitor (or an ARB if an ACE inhibitor is not tolerated) and a beta-blocker, to reduce the risk of HF hospitalization and the risk of premature death.	I	A	99, 100

TREATMENT OF HEART FAILURE

	Starting dose (mg)	Target dose (mg)
ACE inhibitor		
Captopril ^a	6.25 t.i.d.	50 t.i.d.
Enalapril	2.5 b.i.d.	10–20 b.i.d.
Lisinopril ^b	2.5–5.0 o.d.	20–35 o.d.
Ramipril	2.5 o.d.	5 b.i.d.
Trandolapril ^a	0.5 o.d.	4 o.d.
Beta-blocker		
Bisoprolol	1.25 o.d.	10 o.d.
Carvedilol	3.125 b.i.d.	25–50 b.i.d.
Metoprolol succinate (CR/XL)	12.5/25 o.d.	200 o.d.
Nebivolol ^f	1.25 o.d.	10 o.d.
ARB		
Candesartan	4 or 8 o.d.	32 o.d.
Valsartan	40 b.i.d.	160 b.i.d.
Losartan ^{b,c}	50 o.d.	150 o.d.
MRA		
Eplerenone	25 o.d.	50 o.d.
Spironolactone	25 o.d.	25–50 o.d.

TREATMENT OF HEART FAILURE:DIURETICS

Diuretics	Initial dose (mg)	Usual daily dose (mg)		
Loop diuretics ^a				
Furosemide	20–40	40–240		
Bumetanide	0.5–1.0	1–5		
Torsemide	5–10	10–20		
Thiazides ^b				
Bendroflumethiazide	2.5	2.5–10		
Hydrochlorothiazide	25	12.5–100		
Metolazone	2.5	2.5–10		
Indapamide ^c	2.5	2.5–5		
Potassium-sparing diuretics ^d				
	+ACEi/ ARB	–ACEi/ ARB	+ACEi/ ARB	–ACEi/ ARB
Spirolactone/ eplerenone	12.5–25	50	50	100–200
Amiloride	2.5	5	5–10	10–20
Triamterene	25	50	100	200

COMPLETE DIAGNOSIS OF OUR PATIENT IS:

Main: Mechanical prosthesis of aortic and mitral valves bileaflet type (22/09/2014) due to infective endocarditis of congenital bicuspid aortic valve (congenital heart disease) and mitral valve with predominance of insufficiency.

Complications: Total AV-block III degree. Pacemaker statement St. Jude Verity DC (DDD)(13/10/2014).

Total heart failure with preserved left ventricular pump function (ejection fraction = 63%), C stage, II functional class by NYHA.

TREATMENT BY LIFESTYLE MODIFICATIONS

Dietary sodium and fluid restrictions should be implemented in all patients with congestive heart failure. Limiting patients to 2 g/day of dietary sodium and 2 L/day of fluid will lessen congestion and decrease the need for diuretics.

- 2-g Sodium diet
- Monitoring weight daily
- 2-L Fluid restriction
- Monitoring blood pressure
- Medications
- Smoking cessation
- Light aerobic exercise
- Knowing whom to call
- Achieving ideal weight
- Follow-up visits

LIST OF MEDICATIONS PRESCRIBED FOR PATIENT IN HOSPITAL :

- *Warfarin 7,5 mg 1 time/day*
- *Bisoprolol 5 mg 1 time/day*
- *Coraxane 7,5 1 time/day*
- *Spironolactone 25 mg 1 time/day*
- *Torasemide 10 mg 1 time/day*
- *Preductal MR 35 mg 2 times/day*
- *Atorvastatin 20 mg 1 time/day*
- *Hepabene 1 tabl. 3 times/day*

OUR RECOMMENDATIONS FOR TREATMENT OF THE PATIENT

- *Warfarin 5 mg 1 time/day*
- *Bisoprolol 10 mg 1 time/day*
- *Ramipril 2,5 mg 1 time/day*
- *Spironolactone 25 mg 1 time/day*
- *Torsemide 10 mg 1 time/ per 5 days*

CONCLUSION

Infective endocarditis developed on the background of congenital heart disease (bicuspid aortic valve), which led to changes of heart chambers and caused heart failure.

For compensation of heart failure we did surgical heart valve replacement. In the postoperative period such complication as complete AV block was developed, for treatment of which pacemaker was implanted.

Thanks to a timely and comprehensive treatment, the patient is fully compensated.

**THANK YOU FOR YOUR
ATTENTION**