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PULMONARY EMBOLISM
-CASE REPORT-

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Basic features

- PE is relatively common cardiovascular emergency
- By occluding the pulmonary arterial bed it may lead to acute life-threatening (3% early mortality) but potentially reversible right ventricular failure
- PE is a difficult diagnosis that may be missed because of non-specific clinical presentation.
- Early diagnosis is fundamental, since immediate treatment is highly effective
- Despite the availability of diagnostic tools, mis-diagnosis of PE happens with frequency greater than 10%

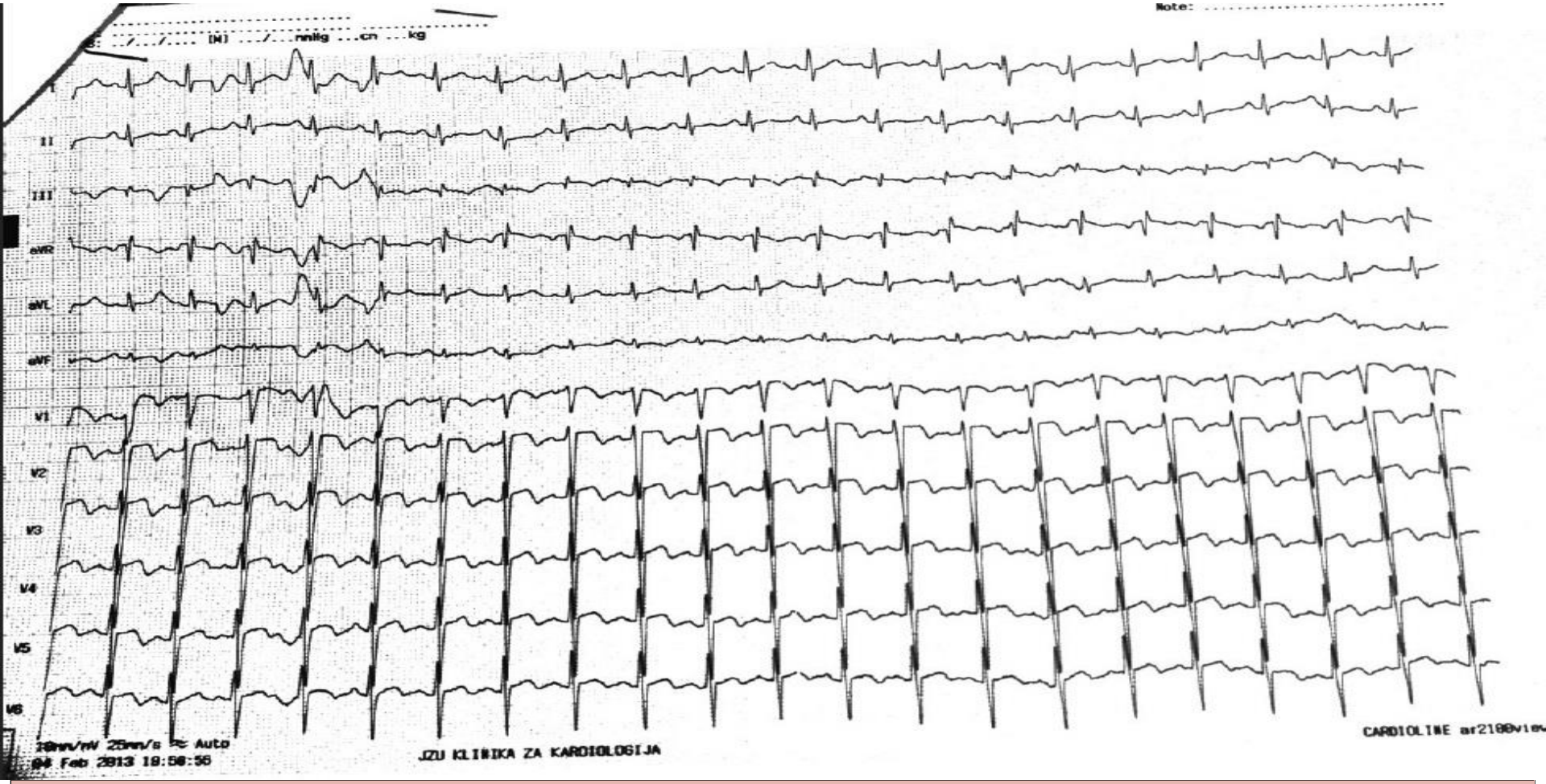
Medical history

✓ Male, aged 42 years, working in service provision, reduced physical activity with increased body weight about 20kg, for the last two years, previously active athlete (one year received protein supplements and creatine, then TT 80 kg)

✓ Symptoms: two weeks prior to hospitalization general flu-like symptoms that lasted several days followed by light febrile state and episode of fatigue on exertion a week prior to hospitalization, that was repeated the next day and day after at a lower level of effort, and two days before hospital admission present at rest, followed by a feeling of breathlessness

✓ Signs: BP 135/85mmHg, HR 100-110/min, eupnoea, O_2 saturation > 94%, afebrile, remain physical findings without any apparent departure

✓ BMI 30 – obesity



ECG at admission

$S_1Q_3T_3$, sinus tachycardia, nonspecific ST-T wave changes

Clinical probability of PE Wells score and revised Geneva score

Revised Geneva score		**Wells score**	
Variable	**Points**	**Variable**	**Points**
Predisposing factors		**Predisposing factors**	
Age >65 years	+1		
Previous DVT or PE	+3	Previous DVT or PE	+ 1.5
Surgery or fracture within 1 month	+2	Recent surgery or immobilization	+ 1.5
Active malignancy	+2	Cancer	+ 1
Symptoms		**Symptoms**	
Unilateral lower limb pain	+ 3		
Haemoptysis	+ 2	Haemoptysis	+ 1
Clinical signs		Clinical signs	
Heart rate		Heart rate	
75-94 beats/min	+ 3	>100 beats/min	+ 1.5
≥ 95 beats/min	+ 5		
Pain on lower limb deep vein at palpation and unilateral edema	+ 4	Clinical signs of DVT	+ 3
		Clinical judgment Alternative diagnosis less likely than PE	+ 3
Clinical probability	**Total**	Clinical probability (3 levels)	**Total**
Low	***0-3***	***Low***	***0-1***
Intermediate	***4-10***	Intermediate	***2-6***
High	***≥11***	***High***	***≥7***
		Clinical probability (2 levels)	
		PE unlikely	0-4
		PE likely	>4

Diagnostic strategies for suspected non-high-risk PE

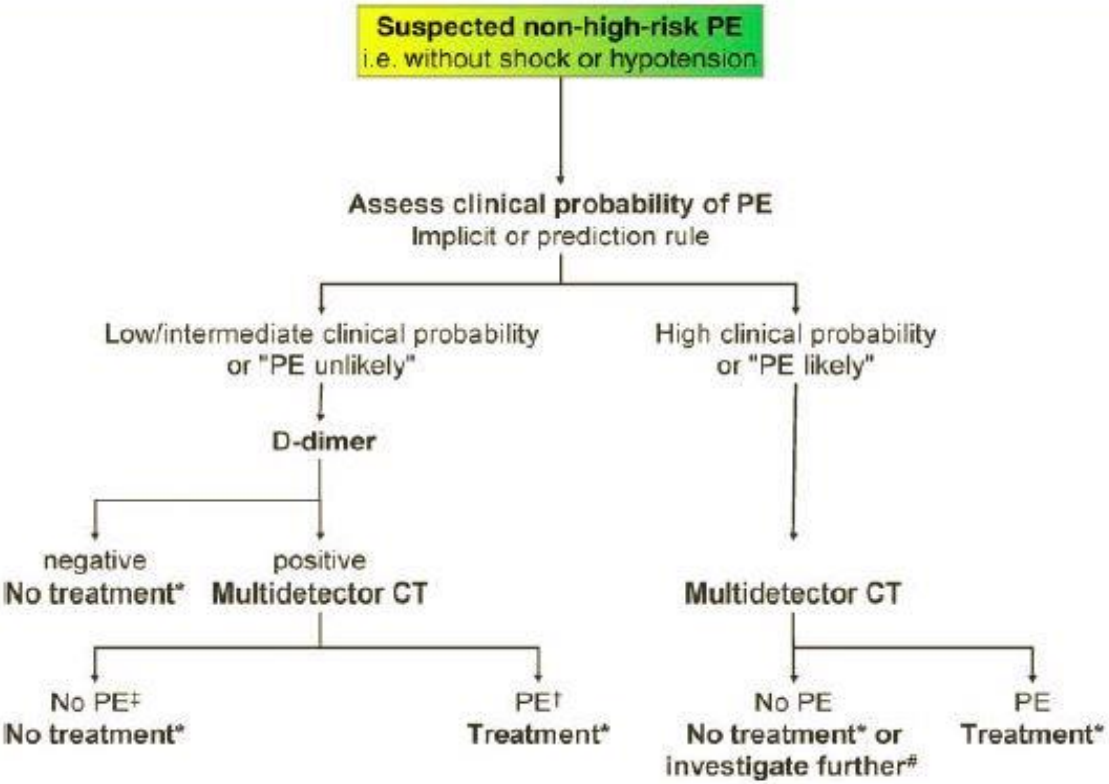
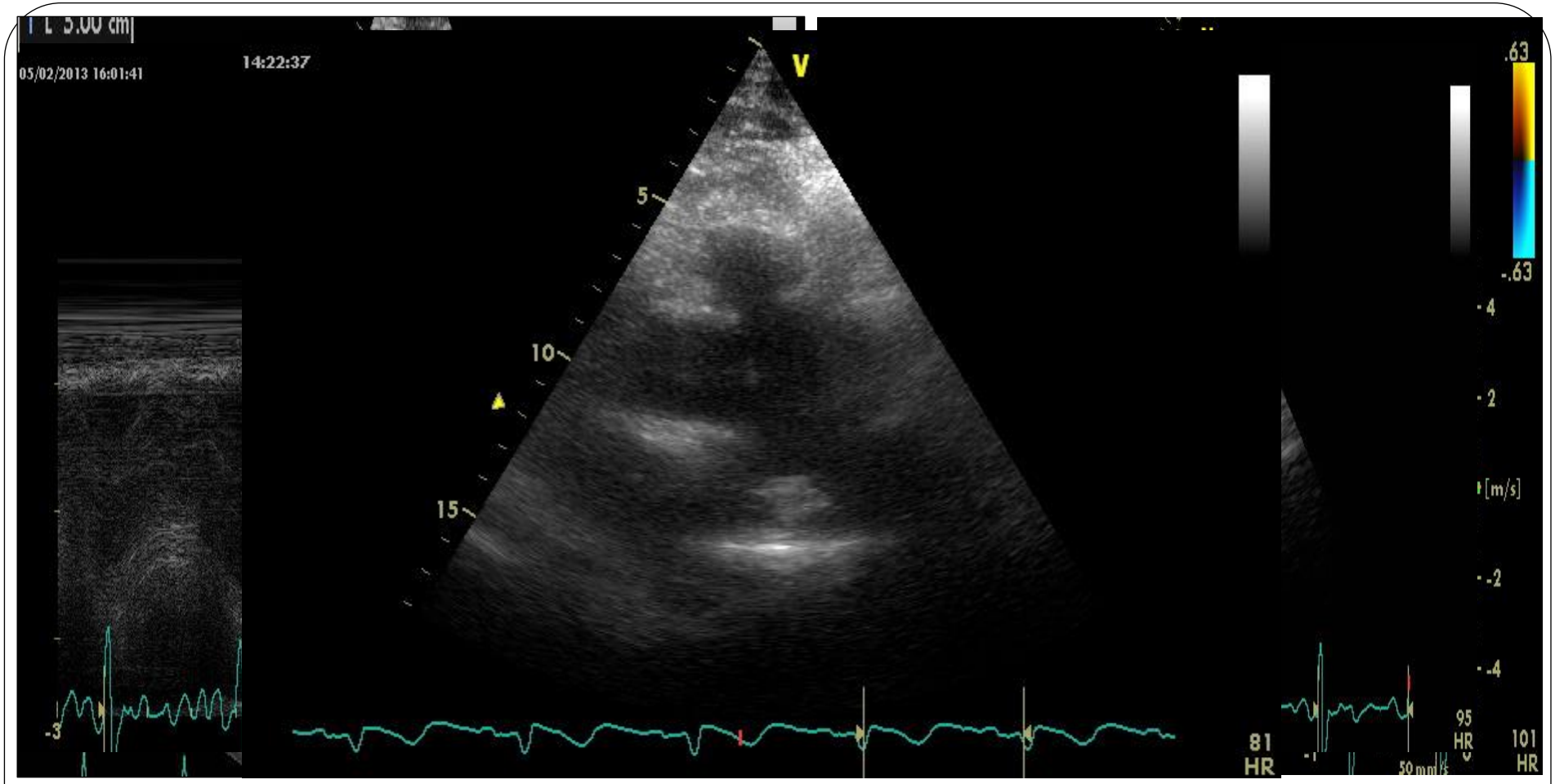


Figure 2 Proposed diagnostic algorithm for patients with suspected non-high-risk PE (i.e. without shock and hypotension). Two alternative classification schemes may be used to assess clinical probability: a three-level scheme (clinical probability low, intermediate or high) or a two-level scheme (PE unlikely or PE likely). When using a moderately sensitive assay, D-dimer measurement should be restricted to patients with a low clinical probability or a 'PE unlikely' classification, while highly sensitive assays may be used in patients with a low or intermediate clinical probability of PE. Plasma D-dimer measurement is of limited use in suspected PE occurring in hospitalized patients. *Anticoagulant treatment for PE. †CT is considered diagnostic of PE if the most proximal thrombus is at least segmental. ‡If single-detector CT is negative, a negative proximal lower limb venous ultrasonography is required in order to safely exclude PE. #If multidetector CT is negative in patients with high clinical probability, further investigation may be considered before withholding PE-specific treatment (see text). PE, pulmonary embolism.

PTE - Diagnosis

- D-dimmer level in our patient – 2200 ng/ml (<500)

- CUS (compression venous ultrasonography) of lower limbs - a negative finding



Typical echocardiographic image of PE involves the presence of three groups of criteria**:**

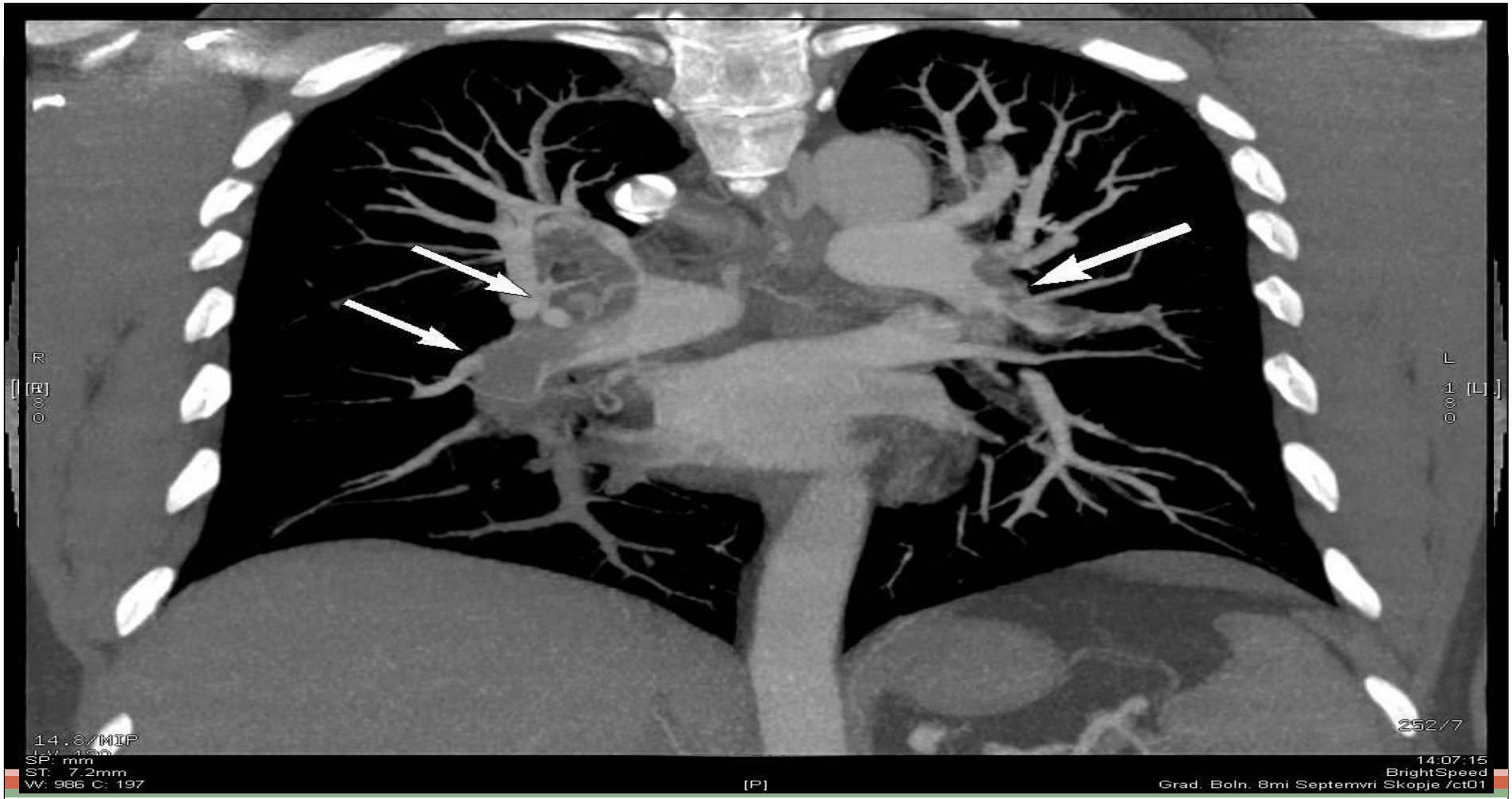
1.Criteria for right ventricular overload (present ≥1) presence of thrombus in RV cavities, ↑ RV diastolic dimension > 30mm in parasternal section or RV / LV terms > 1, systolic flattening of IPC, acceleration time <90 msec, or pressure gradient TV > 30mmHg in the absence of RV hypertrophy

2. 60-60 mark: acceleration time during RV ejection 60 msec in the presence of pressure gradient of tricuspid regurgitation by 60mmHg

3. McConnell sign: Normo / hyperkinesia of the apical segment, with hypo / akinesia of the free wall of RV

In our patient**:**

- **RV diastolic dimension > 30mm in parasternal section**
- **RV / LV terms > 1**
- **acceleration time <90 msec**
- **pressure gradient TV > 30mmHg in the absence of RV hypertrophy**
- **McConnell sign +**



- Presence of massive thrombs in both pulmonary arteries, right with complete obstruction of the lumen.
- Truncus pulmonalis with diameter up to 33 mm

CT findings in addition to **MASSIVE BILATERAL PULMONARY THROMBOEMBOLISM**

markers for risk stratification

-three key components-

PE-related early MORTALITY RISK		RISK MARKERS			Potential treatment implications
		KLINICAL (schok or hypotension)	RV dysfunction	Myocardial injury	
HIGH (>15%)		+	(+)[a]	(+)[a]	Trombolysis or or embolectomy embolectomy
NON-HIGH	Inter mediate (3-15%)	-	+	+	Hospital admission
			+	- (troponin)	
			-	+	
	Low (< 1 %)	-	-	-	Early discharge discharge or home treatment treatment

Recommendations: treatment for Non-high-risk PTE

Anticoagulation should be initiated without delay in patients with high or intermediate clinical probability of PE while diagnostic workup is still ongoing	**I**	**C**
Use of LMWH or fondaparinux is the recommended form of initial treatment for most patients with non-high-risk PE	**I**	**A**
In patients at high risk of bleeding and in those with severe renal dysfunction, unfractionated heparin with an aPTT target range of 1.5–2.5 times normal is a recommended form of initial treatment	**I**	**C**
In patients at high risk of bleeding and in those with severe renal dysfunction, unfractionated heparin with an aPTT target range of 1.5–2.5 times normal is a recommended form of initial treatment Initial treatment with unfractionated heparin, LMWH or fondaparinux should be continued for at least 5 days and I A may be replaced by vitamin K antagonists only after achieving target INR levels for at least 2 consecutive days	**I** **I**	**A** **C**
Routine use of thrombolysis in non–high-risk PE patients is not recommended, but it may be considered in selected patients with intermediate-risk PE	**IIb**	**B**
Thrombolytic therapy should be not used in patients with low-risk PTE	**III**	**B**

Anticoagulant treatment and response threw parameters of hemostasis in our patient

		date	date	date	date	date	date
PARAMETER	Normal values	5.02	8.02	11.02	14.02	15.02	18.02
Tr	150-450	186	255	214	264	254	224
Htc	35-45%	44	45	41	46	42	43
PT	13 sec	13*	11*	12*	17	18	14
aPTT	32sec	28*	23*	28*	32	33	28
TT	20 sec	20*	16*	19*	15	20	20
INR	1		from 7.02**	1.13**		1.5	1.2
Anti Xa	<0.30 IU/ml			***	***	1.2***	1.29***
D dimer	<500ng/ml	2200	3700		4500	>4500	<3000

Legend: *UFH 30000/24h continuous i.v. infusion
** UFH + OAK
***LMWH (0.9ml/12h)+ OAK

HEPARIN RESISTANCE

- Situations where patients require unusually high doses of heparin to achieve therapeutic aPTT level
- In the clinical setting - PTE patients who require >35000 IU/24 hours to achieve therapeutic aPTT levels are defined in this category

Possible mechanisms:

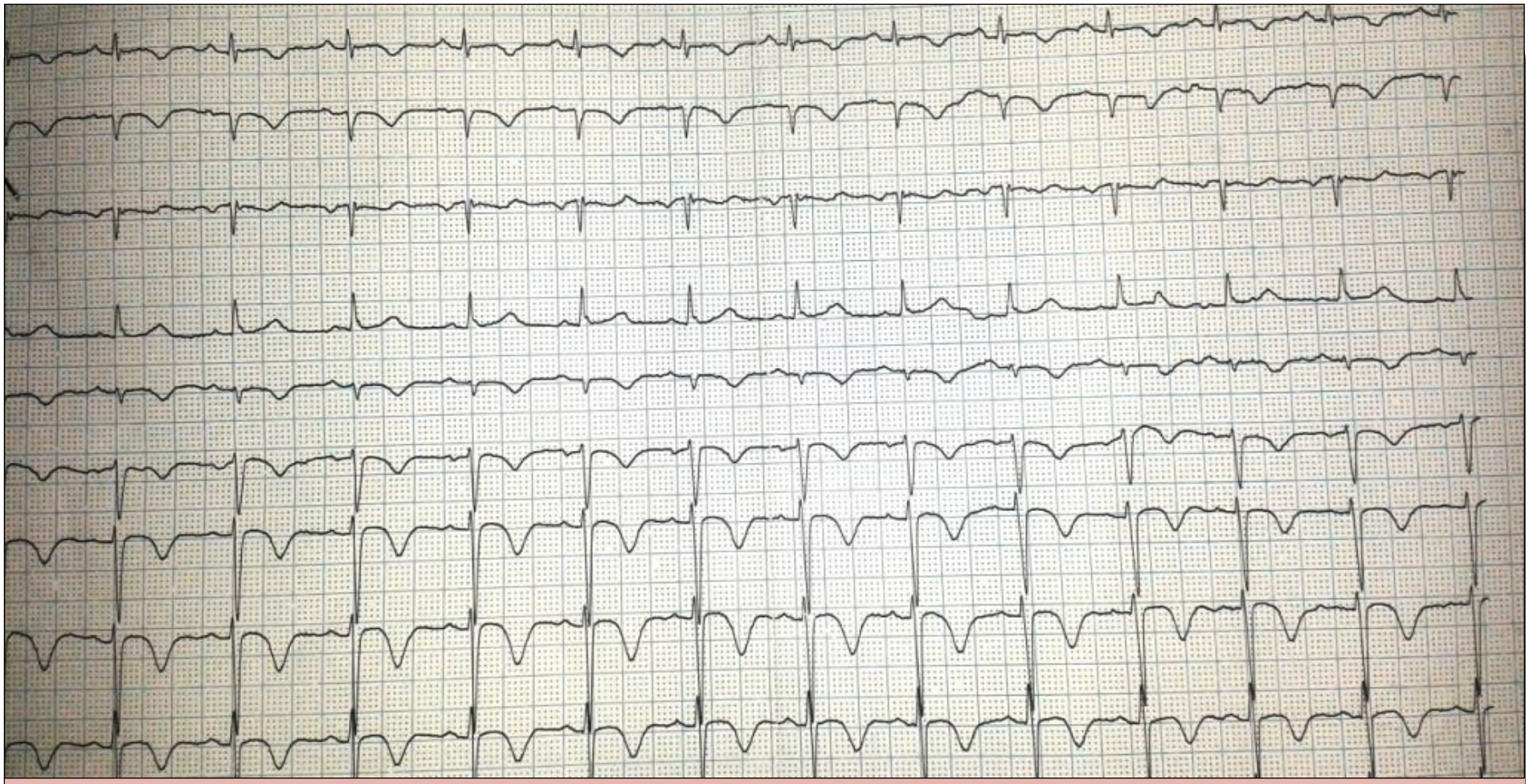
- ✓ AT deficiency
- ✓ ↑ clearance of heparin
- ✓ ↑ levels of heparin binding proteins (PF4, fib, fVIII and histidine rich glycoprotein)
- ✓ high values of the factor VIII or fibrinogen
- ✓ inability of inactivation of factor Xa bound to platelets
- ✓ inability to deactivate thrombin bound to fibrin
- ✓ reduction of AT quantities under the influence of heparin
- ✓ some medications (NTG, aprotinin)

Parenteral Anticoagulants. *Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines*

Heparin resistance- causes and possible solutions

- REASONS FOR LACK OF RESPONSE TO UFH :
  - ✓ Low dose of the UFH (fixed dose regimen)
  - ✓ Validity of the test (aPTT)
    - ✓ technical limitations of aPTT
    - ✓ variable response of aPTT to heparin
    - SOLUTIONS
      - In patients who require high doses of heparin to achieve therapeutic aPTT value, measuring anti Xa activity is more appropriate test
      - Replacing of UFH with LMWH is one of the sollutions

Parenteral Anticoagulants. *Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines*

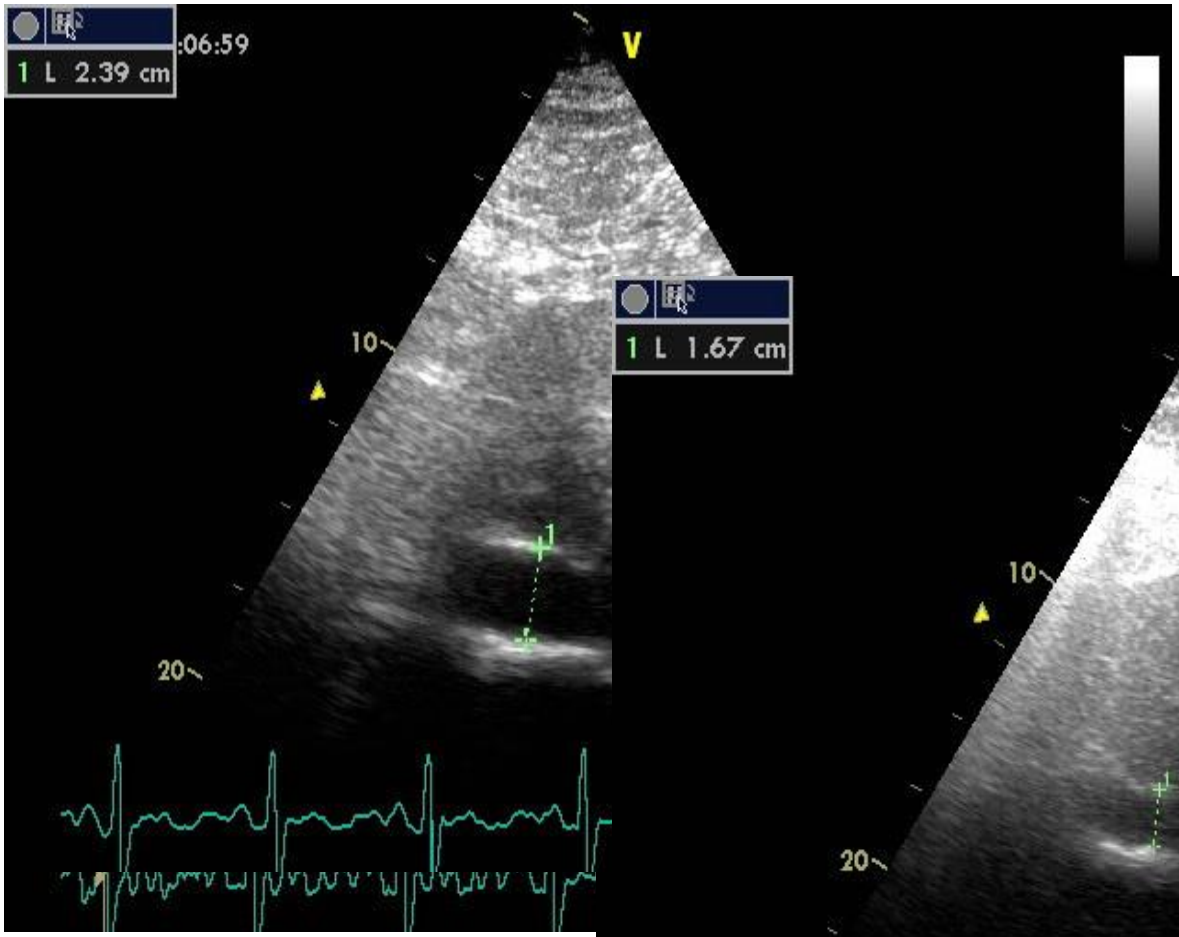


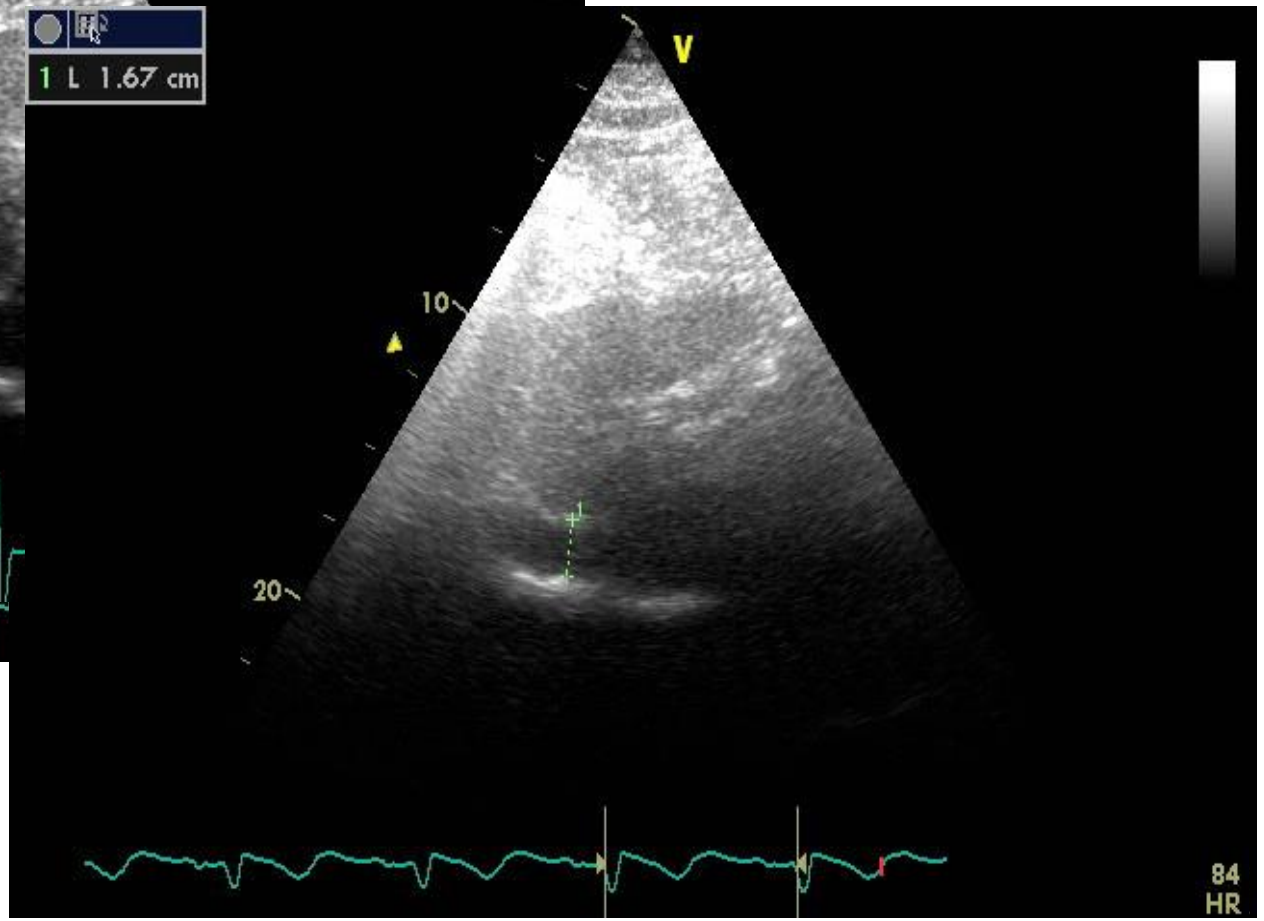
ECG during hospital stay – after therapy

signs of RV overload- inversion of T waves in leads V1-V4,

QR form in V1 lead

RV function in time of diagnosis and after 14 days





❑CLINICAL COURSE OF OUR PATIENT

-clinically stable
-haemodynamically stable
-improvement of right ventricular function with some residual pulmonary arterial hypertension

❑DISSCUSION POINTS

- ❑the phenomenon of heparin resistance has unclear clinical significance
- ❑Would fibrinolitic therapy be indicated in this patient?

Maybe but: time frame and intermediate risk PE

Thank you for attention