3ο ΠΑΝΕΛΛΗΝΙΟ ΣΥΝΕΔΡΙΟ ΠΝΕΥΜΟΝΙΚΗΣ ΥΠΕΡΤΑΣΗΣ 7-9/6/2019 ΑΘΗΝΑ

Γιώργος Π. Αναστασιάδης

Καρδιολόγος
Διευθυντής ΕΣΥ
Καρδιολογική Κλινική
ΓΝΑ ΛΑΙΚΟ

Δεν έχω σύγκρουση συμφερόντων

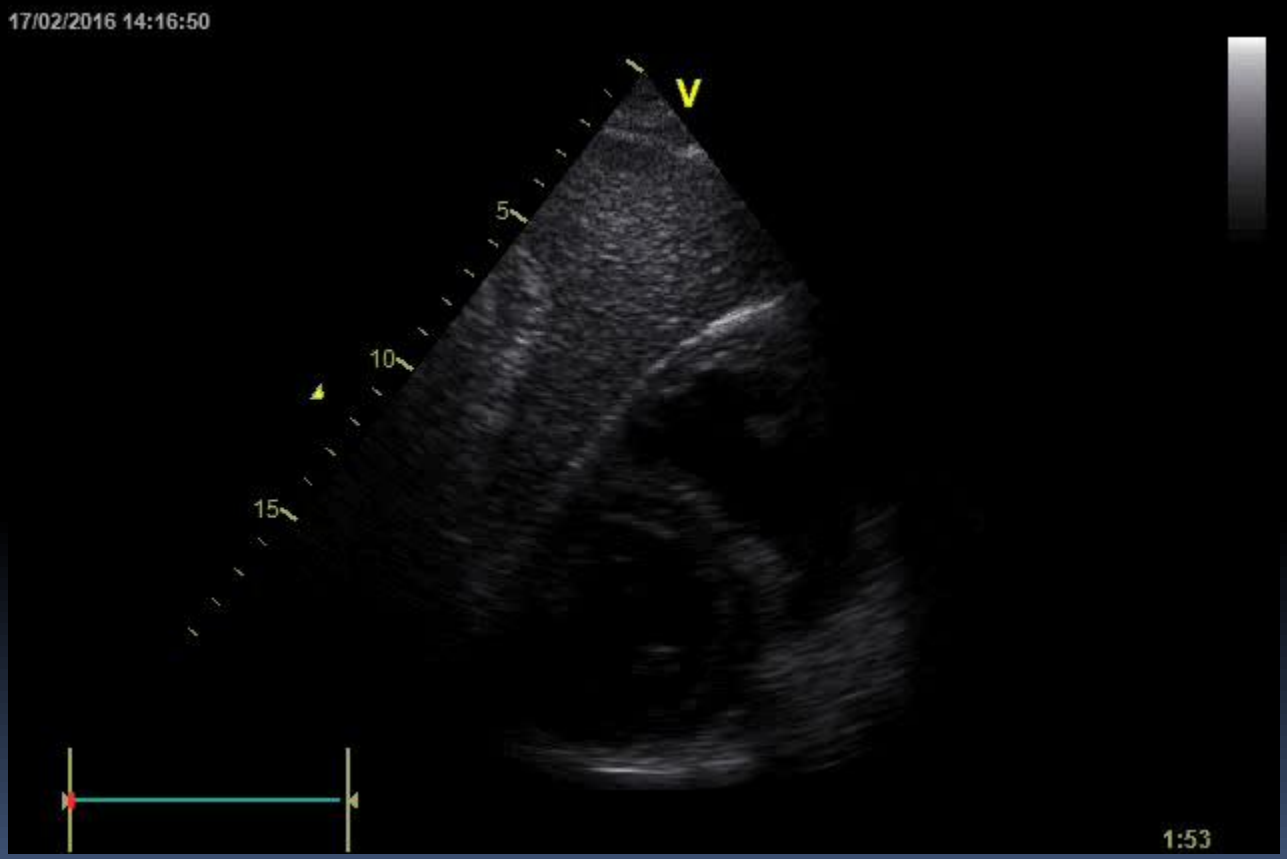
Ενδιαφέροντα περιστατικά με πνευμονική υπέρταση (ΙΙΙ)

Ιστορικό

- Πρόκειται για ασθενή ηλικίας 65 ετών με ενδιάμεση μεσογειακή αναιμία που παρακολουθείται στο κέντρο αιμοσφαιρινοπαθειών του νοσοκομείου από το 2012.
- Ασθενής σε FC *I με ιστορικό σπληνεκτομής το 1992 χωρίς μεταγγίσεις με Hb 8-9gr/dl*
- *Σημειώνεται επίσης ιστορικό χρήσης καπνού και αλκοόλ.*

Ιστορικό

- Έναρξη Exjade το 2012 λόγω αιμοσιδήρωσης ήπατος. (LIC 15,4mg/g-T2* 37,4msec)
- 10/2015 σε προγραμματισμένο καρδιολογικό έλεγχο διαπιστώνεται υπερηχογραφικά υψηλή TRV 3,8m/sec με ήπια διατεταμένες δεξιές κοιλότητες και καλούς δείκτες λειτουργικότητας της δεξιάς κοιλίας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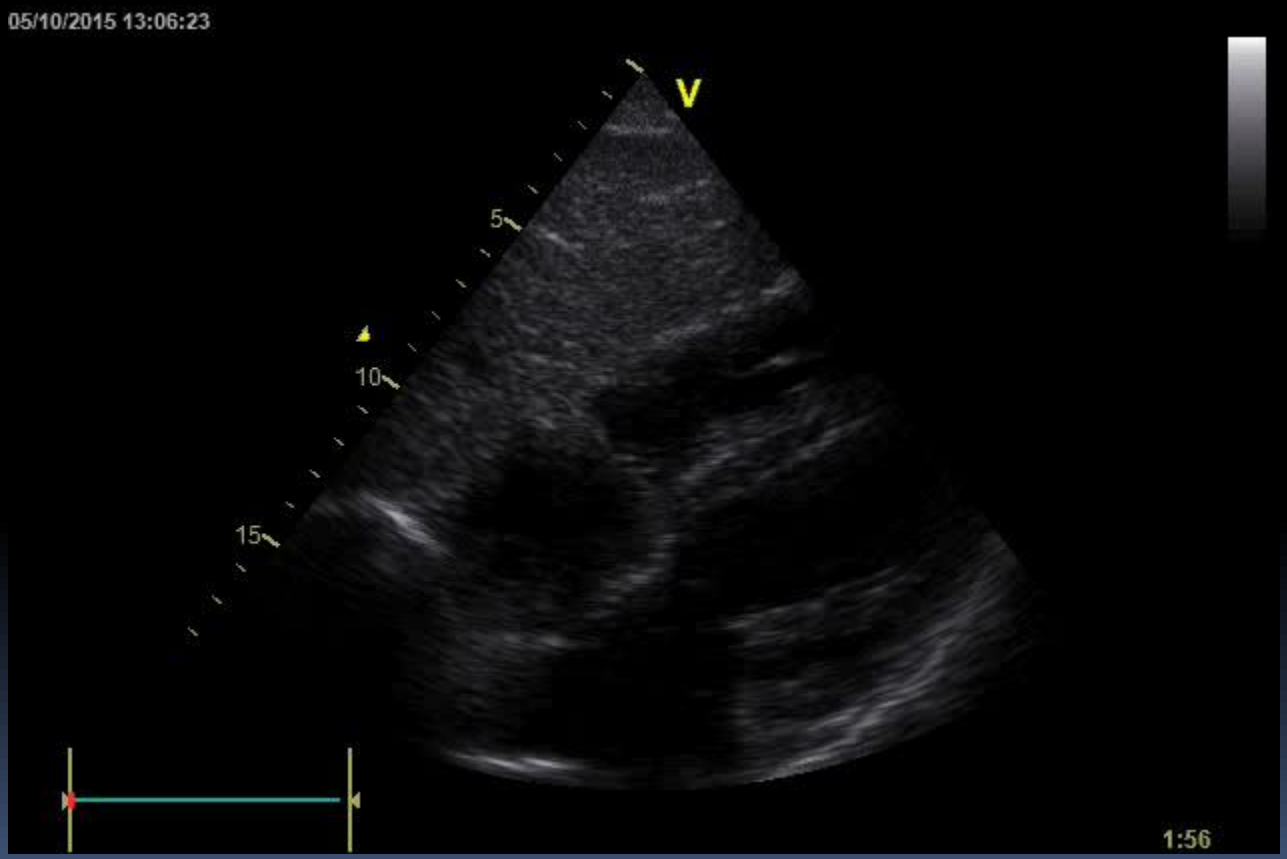
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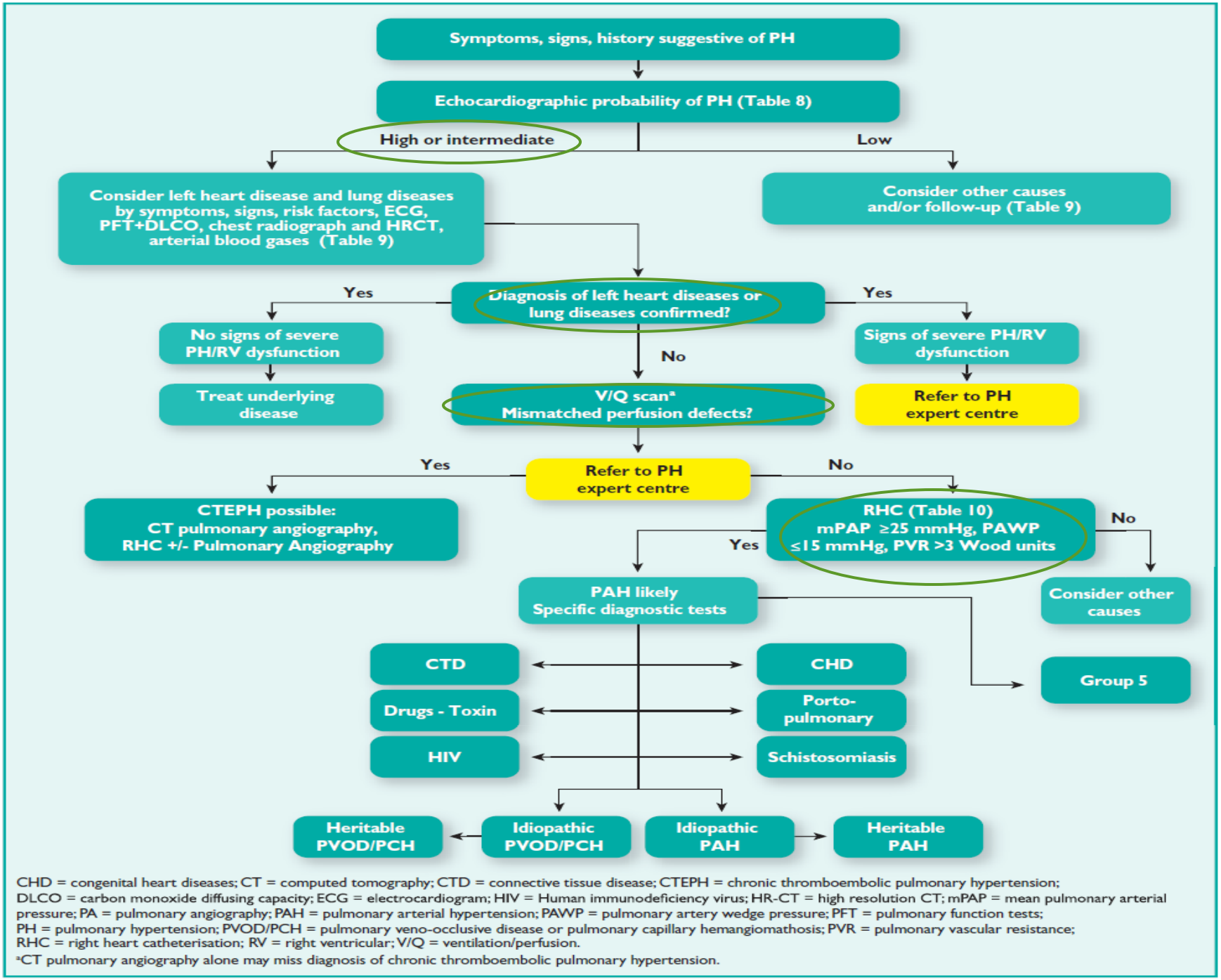
Table 8A Echocardiographic probability of pulmonary hypertension in symptomatic patients with a suspicion of pulmonary hypertension

Peak tricuspid regurgitation velocity (m/s)	Presence of other echo 'PH signs'[a]	Echocardiographic probability of pulmonary hypertension
≤2.8 or not measurable	No	Low
≤2.8 or not measurable	Yes	Intermediate
2.9–3.4	No	
2.9–3.4	Yes	High
>3.4	Not required	

Table 9 Diagnostic management suggested according to echocardiographic probability of pulmonary hypertension in patients with symptoms compatible with pulmonary hypertension, with or without risk factors for pulmonary arterial hypertension or chronic thromboembolic pulmonary hypertension

Echocardiographic probability of PH	Without risk factors or associated condition for PAH or CTEPH[d]	Class[a]	Level[b]	With risk factors or associated conditions for PAH or CTEPH[c]	Class[a]	Level[b]	Ref[c]
Low	Alternative diagnosis should be considered	IIa	C	Echo follow-up should be considered	IIa	C	
Intermediate	Alternative diagnosis, echo follow-up, should be considered	IIa	C	Further assessment of PH including RHC should be considered[e]	IIa	B	45, 46
	Further investigation of PH may be considered[e]	IIb					
High	Further investigation of PH (including RHC[e]) is recommended	I	C	Further investigation of PH[e] including RHC is recommended	I	C	



CHD = congenital heart diseases; CT = computed tomography; CTD = connective tissue disease; CTEPH = chronic thromboembolic pulmonary hypertension; DLCO = carbon monoxide diffusing capacity; ECG = electrocardiogram; HIV = Human immunodeficiency virus; HR-CT = high resolution CT; mPAP = mean pulmonary arterial pressure; PA = pulmonary angiography; PAH = pulmonary arterial hypertension; PAWP = pulmonary artery wedge pressure; PFT = pulmonary function tests; PH = pulmonary hypertension; PVOD/PCH = pulmonary veno-occlusive disease or pulmonary capillary hemangiomathosis; PVR = pulmonary vascular resistance; RHC = right heart catheterisation; RV = right ventricular; V/Q = ventilation/perfusion.

[a]CT pulmonary angiography alone may miss diagnosis of chronic thromboembolic pulmonary hypertension.

Δεξιός και αριστερός καθετηριασμός

ΠΙΕΣΕΙΣ

- RA: 7mmHg
- RV: 63/7mmHg
- PA: 61/25/37mmHg
- PCWP:12mmHg
- LV: 115/10mmHg
- Ao: 115/55/75mmHg

ΠΑΡΟΧΗ-ΑΝΤΙΣΤΑΣΕΙΣ

CO:5,84 l/min
CI:3,61 l/min/m²
PVR:4,28 WU
SVR: 10,27 WU

Table 3 Haemodynamic definitions of pulmonary hypertension[a]

Definition	Characteristics[a]	Clinical group(s)[b]
PH	PAPm ≥25 mmHg	All
Pre-capillary PH	PAPm ≥25 mmHg PAWP ≤15 mmHg	1. Pulmonary arterial hypertension 3. PH due to lung diseases 4. Chronic thromboembolic PH 5. PH with unclear and/or multifactorial mechanisms
Post-capillary PH	PAPm ≥25 mmHg PAWP >15 mmHg	2. PH due to left heart disease 5. PH with unclear and/or multifactorial mechanisms
Isolated post-capillary PH (Ipc-PH)	DPG <7 mmHg and/or PVR ≤3 WU[c]	
Combined post-capillary and pre-capillary PH (Cpc-PH)	DPG ≥7 mmHg and/or PVR >3 WU[c]	

Table 4 Comprehensive clinical classification of pulmonary hypertension (updated from Simonneau *et al.*[5])

1. Pulmonary arterial hypertension
1.1 Idiopathic 1.2 Heritable 1.2.1 BMPR2 mutation 1.2.2 Other mutations 1.3 Drugs and toxins induced 1.4 Associated with: 1.4.1 Connective tissue disease 1.4.2 Human immunodeficiency virus (HIV) infection 1.4.3 Portal hypertension 1.4.4 Congenital heart disease (Table 6) 1.4.5 Schistosomiasis
1'. Pulmonary veno-occlusive disease and/or pulmonary capillary haemangiomatosis
1'.1 Idiopathic 1'.2 Heritable 1'.2.1 EIF2AK4 mutation 1'.2.2 Other mutations 1'.3 Drugs, toxins and radiation induced 1'.4 Associated with: 1'.4.1 Connective tissue disease 1'.4.2 HIV infection
1''. Persistent pulmonary hypertension of the newborn
2. Pulmonary hypertension due to left heart disease
2.1 Left ventricular systolic dysfunction 2.2 Left ventricular diastolic dysfunction 2.3 Valvular disease 2.4 Congenital / acquired left heart inflow/outflow tract obstruction and congenital cardiomyopathies 2.5 Congenital /acquired pulmonary veins stenosis
3. Pulmonary hypertension due to lung diseases and/or hypoxia
3.1 Chronic obstructive pulmonary disease 3.2 Interstitial lung disease 3.3 Other pulmonary diseases with mixed restrictive and obstructive pattern 3.4 Sleep-disordered breathing 3.5 Alveolar hypoventilation disorders 3.6 Chronic exposure to high altitude 3.7 Developmental lung diseases (Web Table III)
4. Chronic thromboembolic pulmonary hypertension and other pulmonary artery obstructions
4.1 Chronic thromboembolic pulmonary hypertension 4.2 Other pulmonary artery obstructions 4.2.1 Angiosarcoma 4.2.2 Other intravascular tumors 4.2.3 Arteritis 4.2.4 Congenital pulmonary arteries stenoses 4.2.5 Parasites (hydatidosis)
5. Pulmonary hypertension with unclear and/or multifactorial mechanisms
5.1 Haematological disorders: chronic haemolytic anaemia, myeloproliferative disorders, splenectomy 5.2 Systemic disorders: sarcoidosis, pulmonary histiocytosis, lymphangioleiomyomatosis, neurofibromatosis 5.3 Metabolic disorders: glycogen storage disease, Gaucher disease, thyroid disorders 5.4 Others: pulmonary tumoral thrombotic microangiopathy, fibrosing mediastinitis, chronic renal failure (with/without dialysis), segmental pulmonary hypertension

5. Pulmonary hypertension with unclear and/or multifactorial mechanisms

5.1 Haematological disorders: chronic haemolytic anaemia, myeloproliferative disorders, splenectomy

5.2 Systemic disorders: sarcoidosis, pulmonary histiocytosis, lymphangioleiomyomatosis, neurofibromatosis

5.3 Metabolic disorders: glycogen storage disease, Gaucher disease, thyroid disorders

5.4 Others: pulmonary tumoral thrombothic microangiopathy, fibrosing mediastinitis, chronic renal failure (with/without dialysis), segmental pulmonary hypertension

Table 13 Risk assessment in pulmonary arterial hypertension

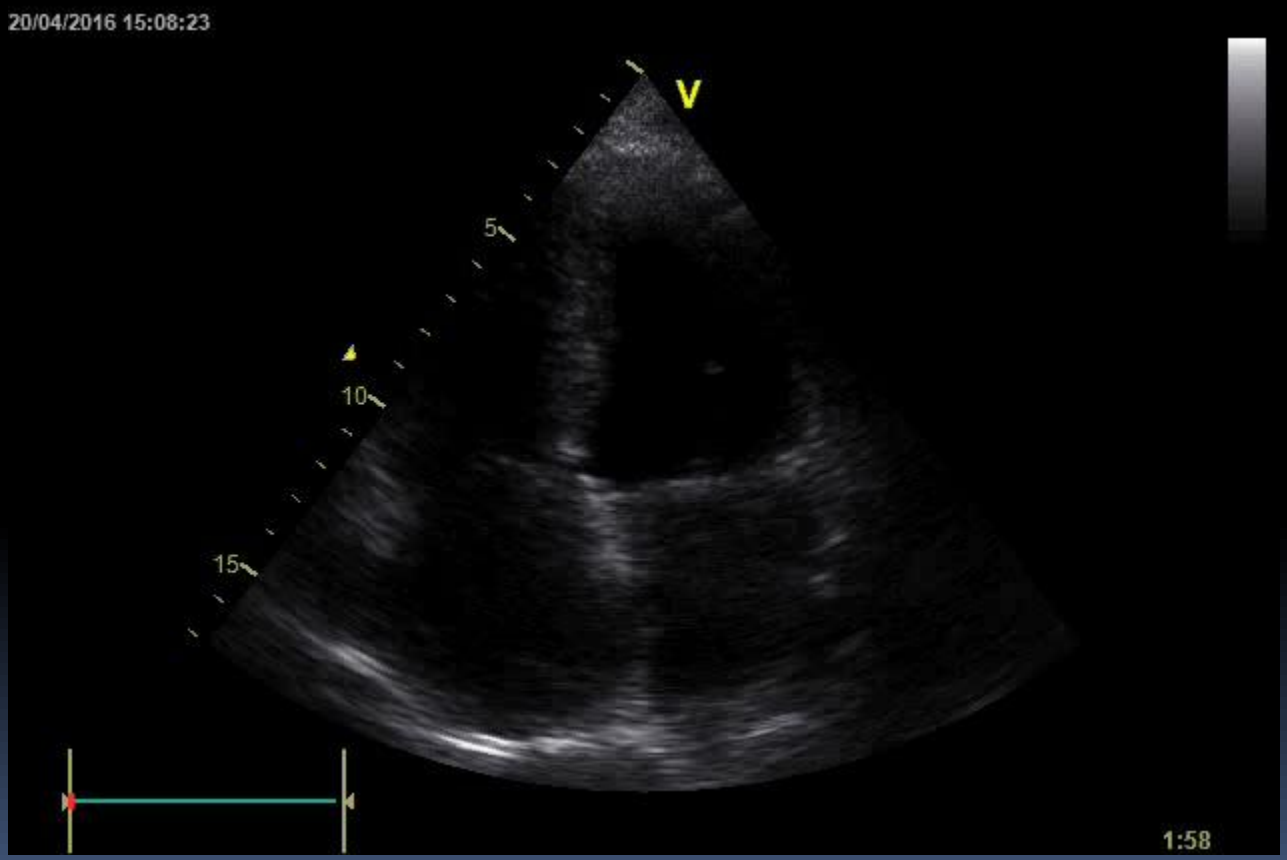
Determinants of prognosis[a] (estimated 1-year mortality)	Low risk <5%	Intermediate risk 5–10%	High risk >10%
Clinical signs of right heart failure	Absent	Absent	Present
Progression of symptoms	No	Slow	Rapid
Syncope	No	Occasional syncope[b]	Repeated syncope[c]
WHO functional class	I, II	III	IV
6MWD	>440 m	165–440 m	<165 m
Cardiopulmonary exercise testing	Peak VO_2 >15 ml/min/kg (>65% pred.) VE/VCO_2 slope <36	Peak VO_2 11–15 ml/min/kg (35–65% pred.) VE/VCO_2 slope 36–44.9	Peak VO_2 <11 ml/min/kg (<35% pred.) VE/VCO_2 slope ≥45
NT-proBNP plasma levels	BNP <50 ng/l NT-proBNP <300 ng/l	BNP 50–300 ng/l NT-proBNP 300–1400 ng/l	BNP >300 ng/l NT-proBNP >1400 ng/l
Imaging (echocardiography, CMR imaging)	RA area <18 cm^2 No pericardial effusion	RA area 18–26 cm^2 No or minimal, pericardial effusion	RA area >26 cm^2 Pericardial effusion
Haemodynamics	RAP <8 mmHg CI ≥2.5 l/min/m^2 SvO_2 >65%	RAP 8–14 mmHg CI 2.0–2.4 l/min/m^2 SvO_2 60–65%	RAP >14 mmHg CI <2.0 l/min/m^2 SvO_2 <60%

Διαστρωμάτωση κινδύνου

- FC I
- 6MWT 465m
- NTpBNP 155
- SvO_2 66%
- RA area 20,5cm^2
- RAP 7mmHg
- CI 3,61l/min/m^2

Ιστορικό 2

- Ο ασθενής ετέθη σε πρόγραμμα μεταγγίσεων με 2 ΜΣΕ ανά 20 ημέρες περίπου για διατήρηση Hb>9 gr/dl με ταυτόχρονη εντατικοποίηση της αποσιδήρωσης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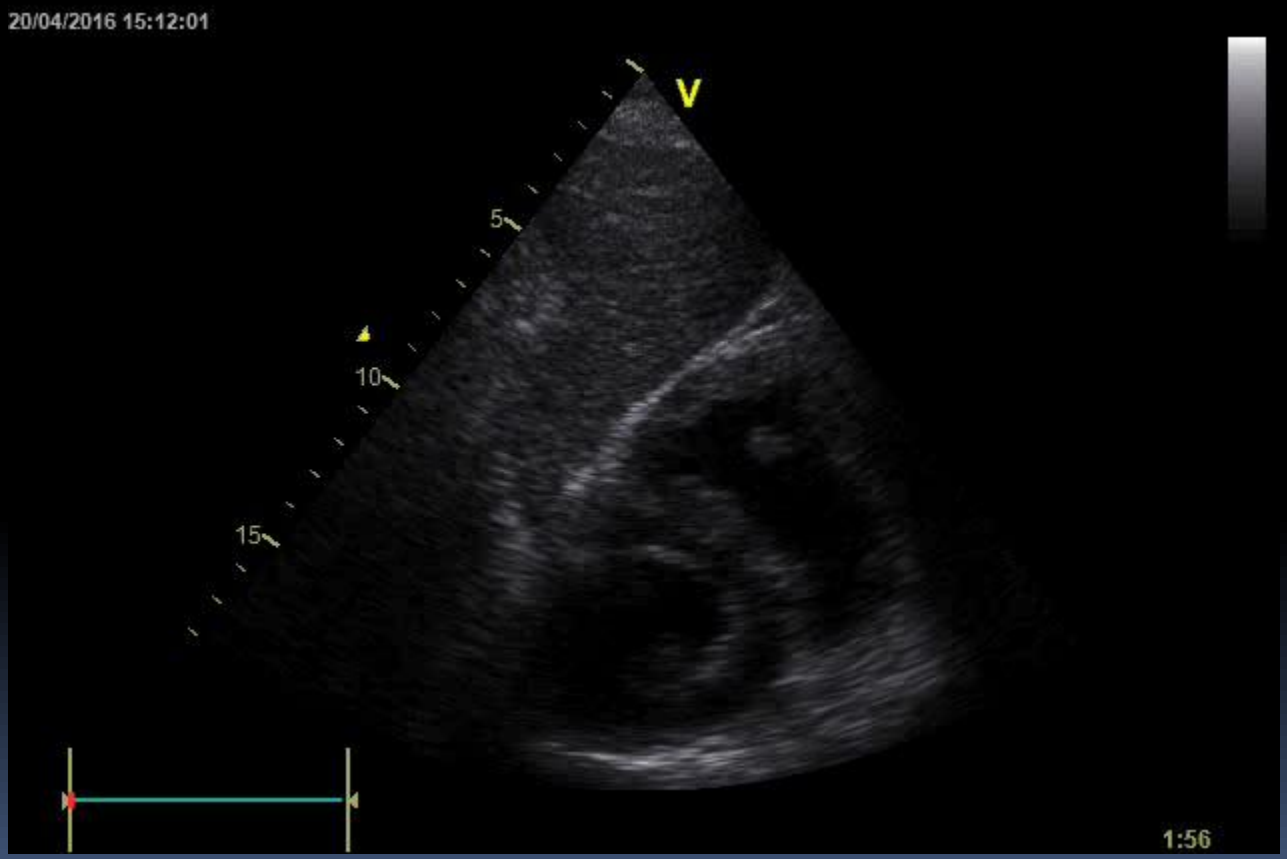
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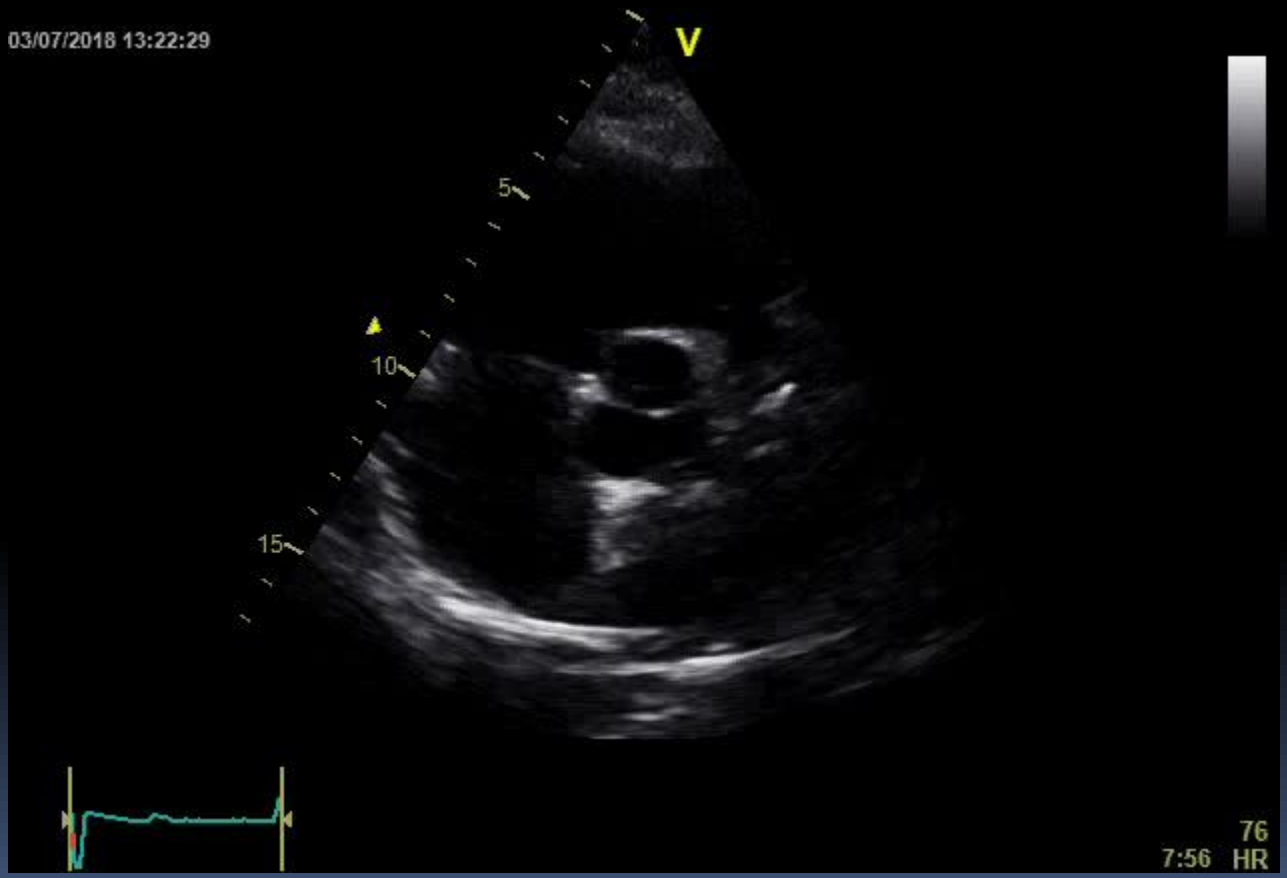
Ιστορικό

- 2 έτη μετά σημειώνει κλινική και υπερηχογραφική επιδείνωση
- Υποβάλλεται εκ νέου σε σπινθηρογράφημα αιμάτωσης πνευμόνων που είναι αρνητικό.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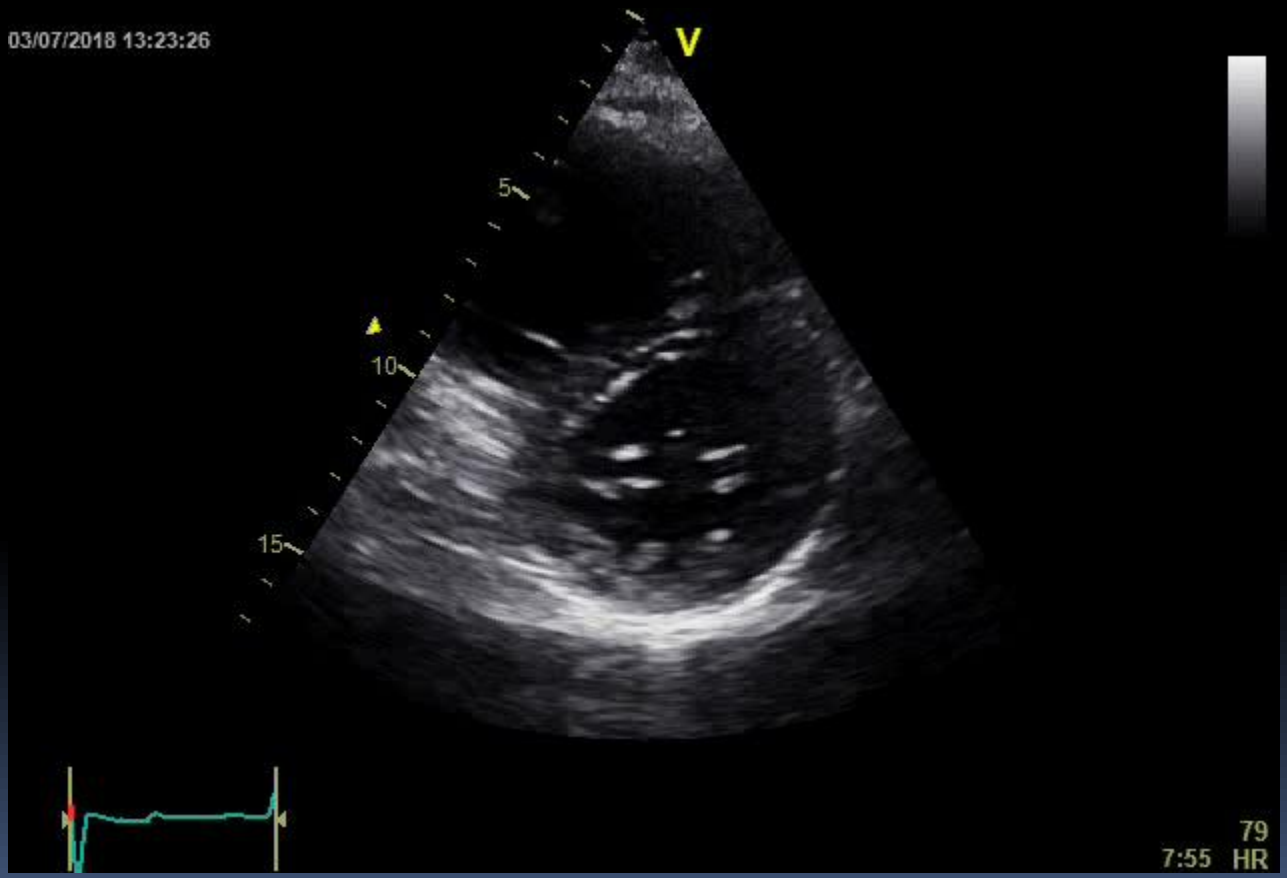
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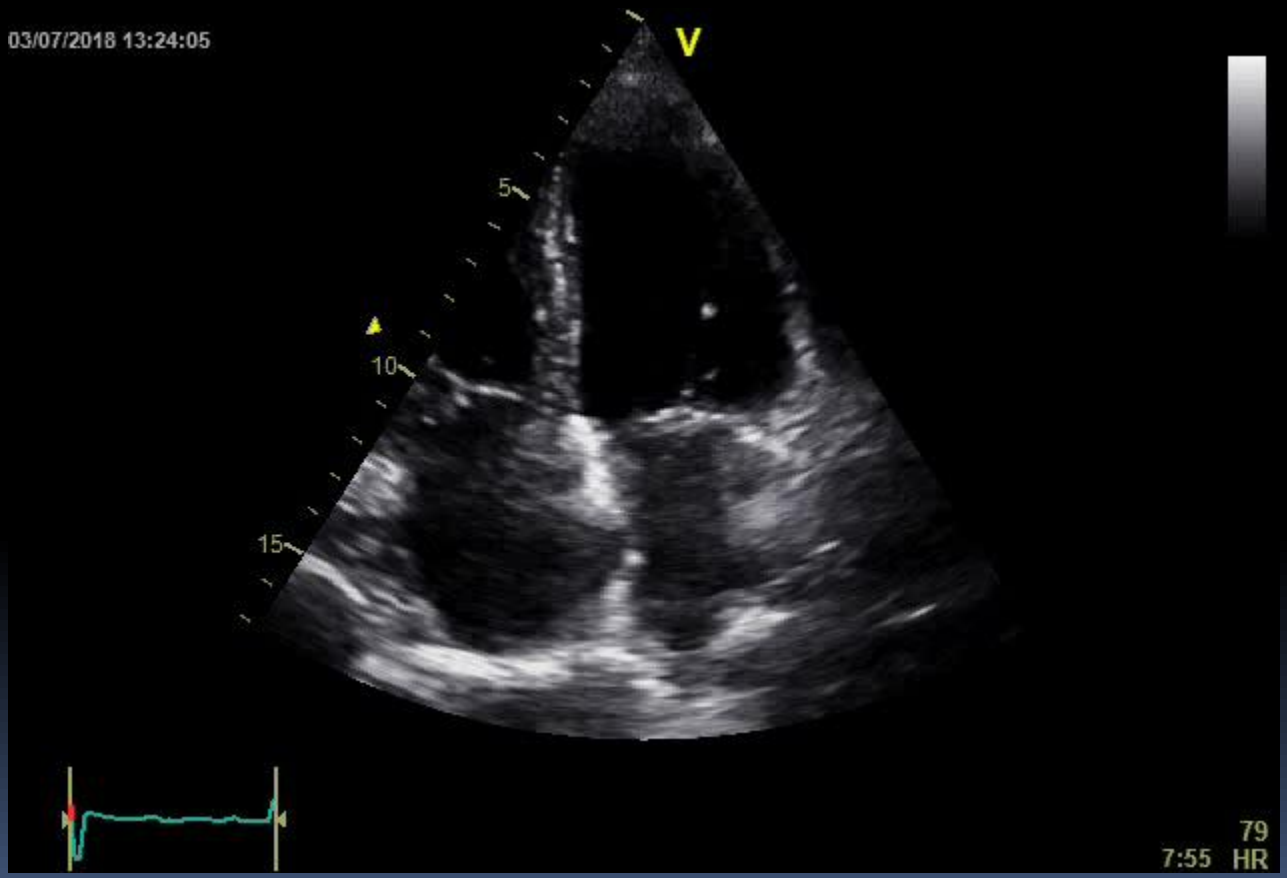
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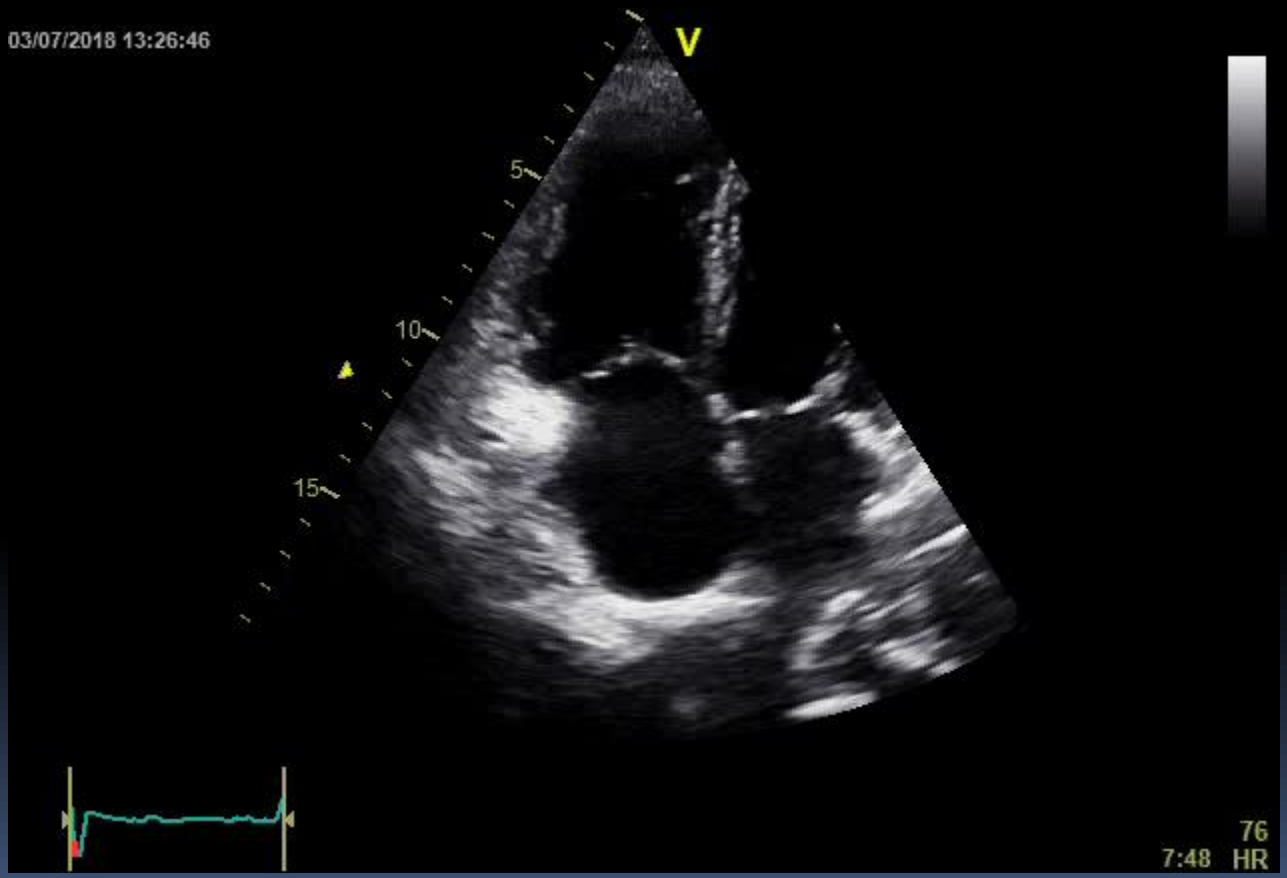
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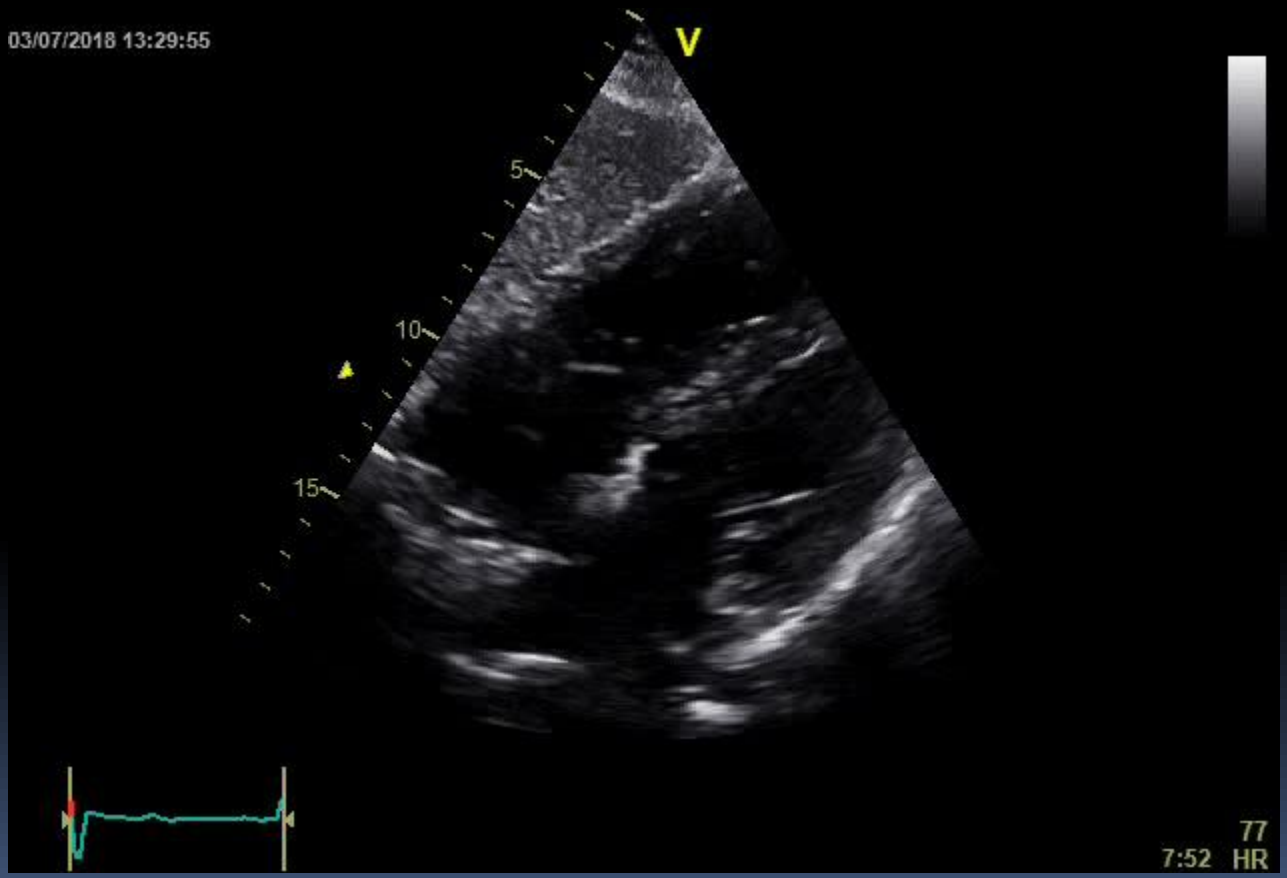
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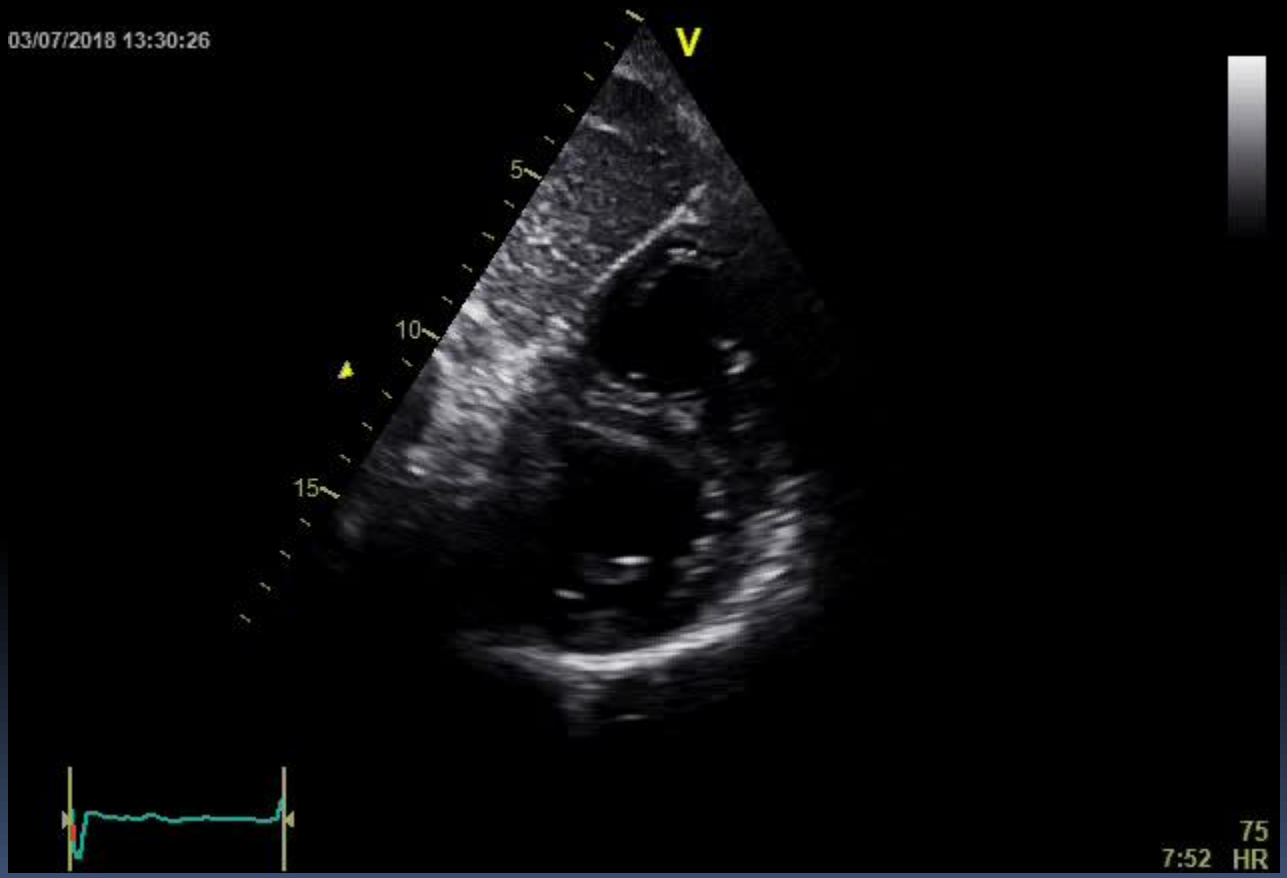
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Δεξιός καθετηριασμός 2

- **ΠΙΕΣΕΙΣ**

- RA: 14mmHg
- RV: 84/12mmHg
- PA: 81/28/49mmHg
- PCWP:10mmHg

ΠΑΡΟΧΗ-ΑΝΤΙΣΤΑΣΕΙΣ

CO:2,94lt/min
CI:1,81l/min/m²
PVR:13,26WU

Διαστρωμάτωση κινδύνου

- FC II
- 6MWT 350m
- NTpBNP 520ng/l
- RA 23,5cm²
- CI 1,81l/min/m²
- SvO²: 62%
- RAP: 14mmHg

Table 13 Risk assessment in pulmonary arterial hypertension

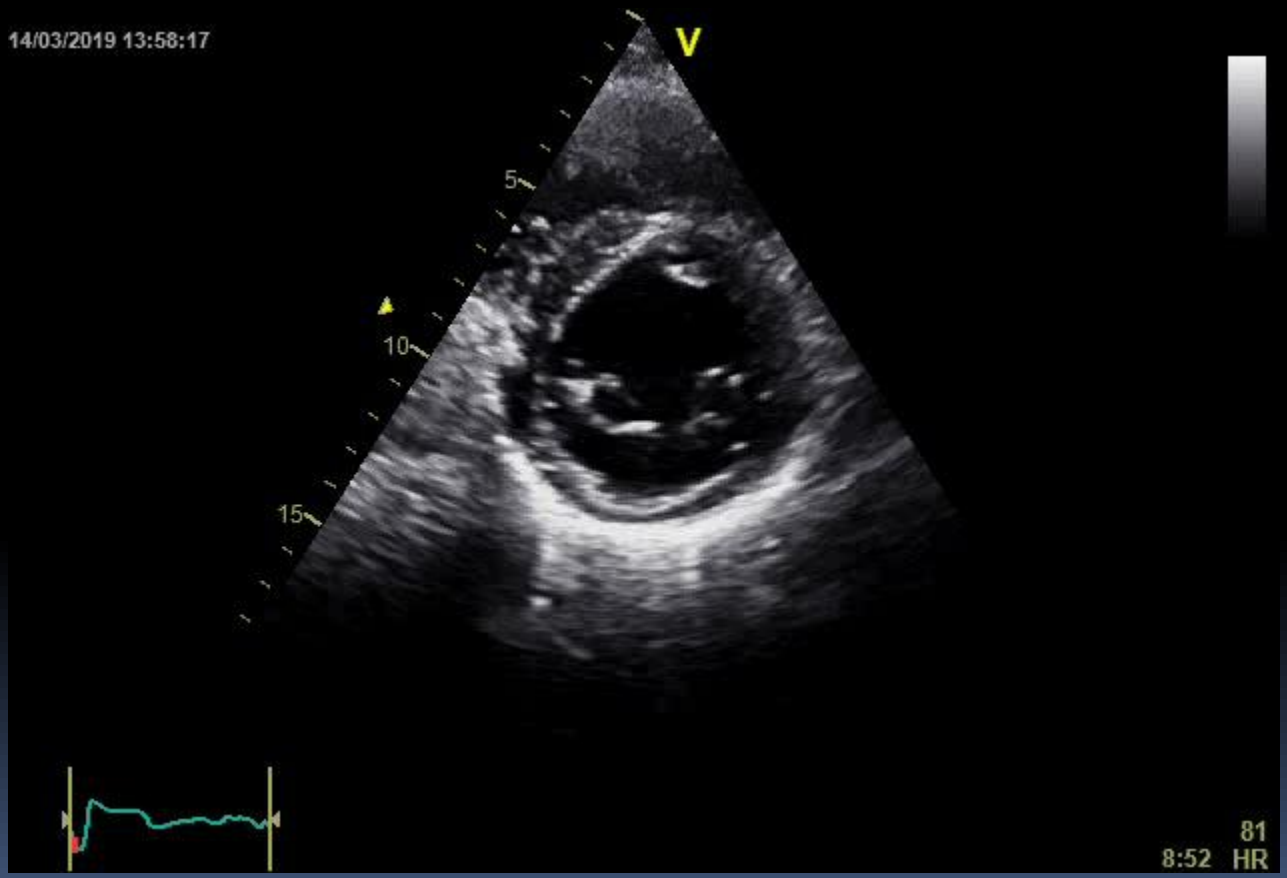
Determinants of prognosis[a] (estimated 1-year mortality)	Low risk <5%	Intermediate risk 5–10%	High risk >10%
Clinical signs of right heart failure	Absent	Absent	Present
Progression of symptoms	No	Slow	Rapid
Syncope	No	Occasional syncope[b]	Repeated syncope[c]
WHO functional class	I, II	III	IV
6MWD	>440 m	165–440 m	<165 m
Cardiopulmonary exercise testing	Peak VO_2 >15 ml/min/kg (>65% pred.) VE/VCO_2 slope <36	Peak VO_2 11–15 ml/min/kg (35–65% pred.) VE/VCO_2 slope 36–44.9	Peak VO_2 <11 ml/min/kg (<35% pred.) VE/VCO_2 slope ≥45
NT-proBNP plasma levels	BNP <50 ng/l NT-proBNP <300 ng/l	BNP 50–300 ng/l NT-proBNP 300–1400 ng/l	BNP >300 ng/l NT-proBNP >1400 ng/l
Imaging (echocardiography, CMR imaging)	RA area <18 cm^2 No pericardial effusion	RA area 18–26 cm^2 No or minimal, pericardial effusion	RA area >26 cm^2 Pericardial effusion
Haemodynamics	RAP <8 mmHg CI ≥2.5 l/min/m^2 SvO_2 >65%	RAP 8–14 mmHg CI 2.0–2.4 l/min/m^2 SvO_2 60–65%	RAP >14 mmHg CI <2.0 l/min/m^2 SvO_2 <60%

Ιστορικό

- Ο ασθενής ετέθη σε αγωγή με ανταγωνιστές των υποδοχέων ενδοθηλίνης και ένα μήνα μετά και σε αναστολείς PDE-5 που όμως διέκοψε σχεδόν αμέσως λόγω ανεπιθύμητων ενεργειών (υπόταση).

Ιστορικό

- Περίπου 9 μήνες μετά ο ασθενής είναι σε λειτουργικό στάδιο Ι με βελτιωμένους λειτουργικούς, βιοχημικούς και υπερηχογραφικούς δείκτες.
- Προ μηνός ετέθη σε αγωγή με Riociguat 0,5mg tid χωρίς να αναφερθεί ή να διαπιστωθεί ανεπιθύμητη ενέργεια.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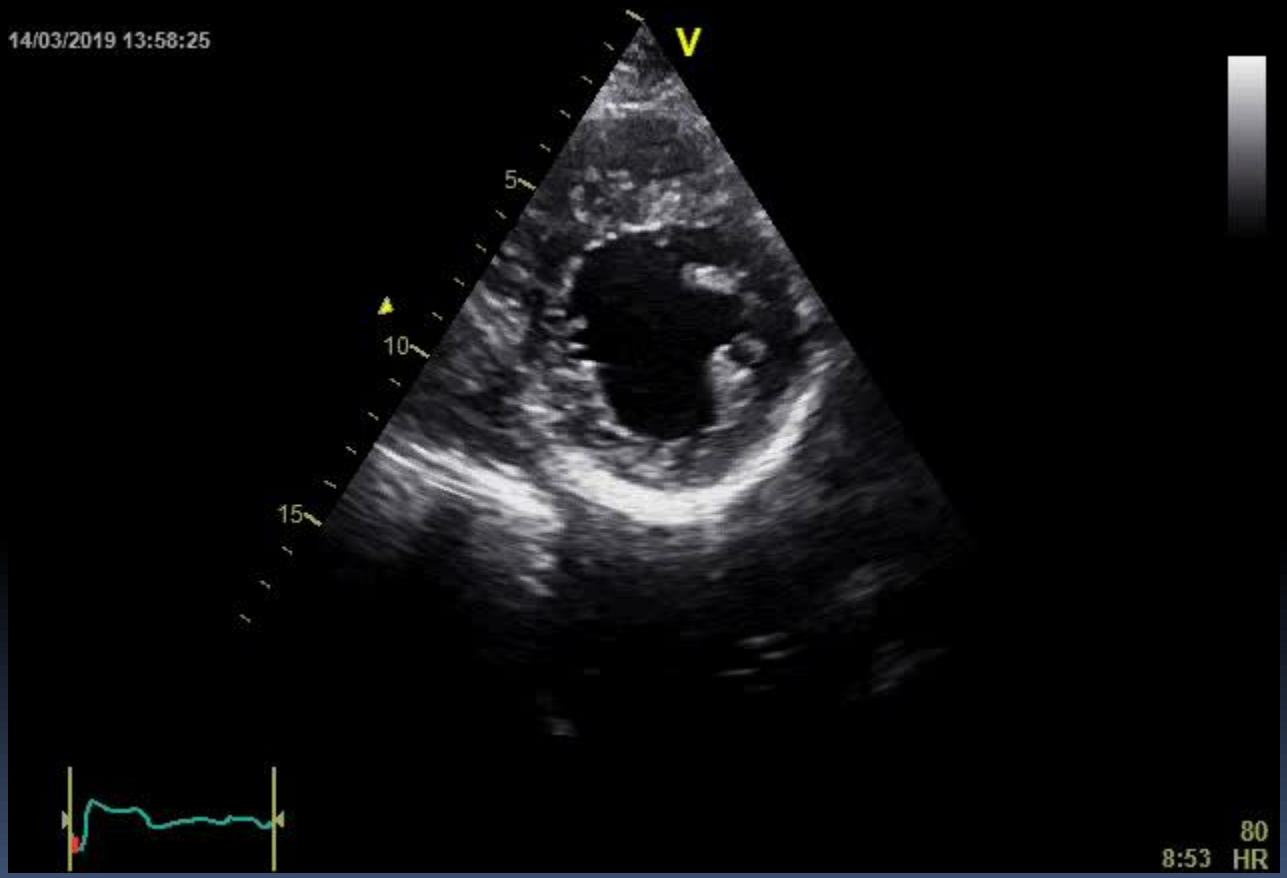
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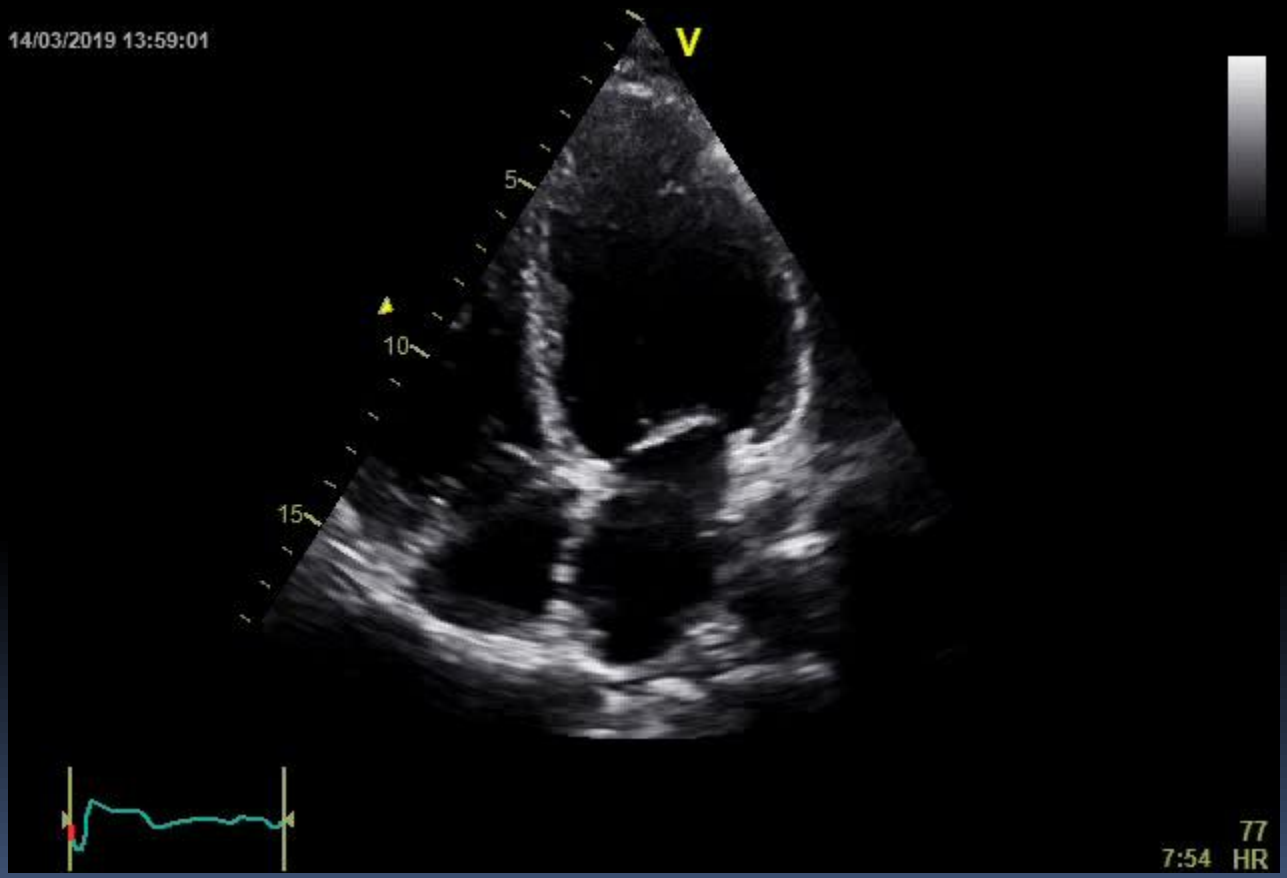
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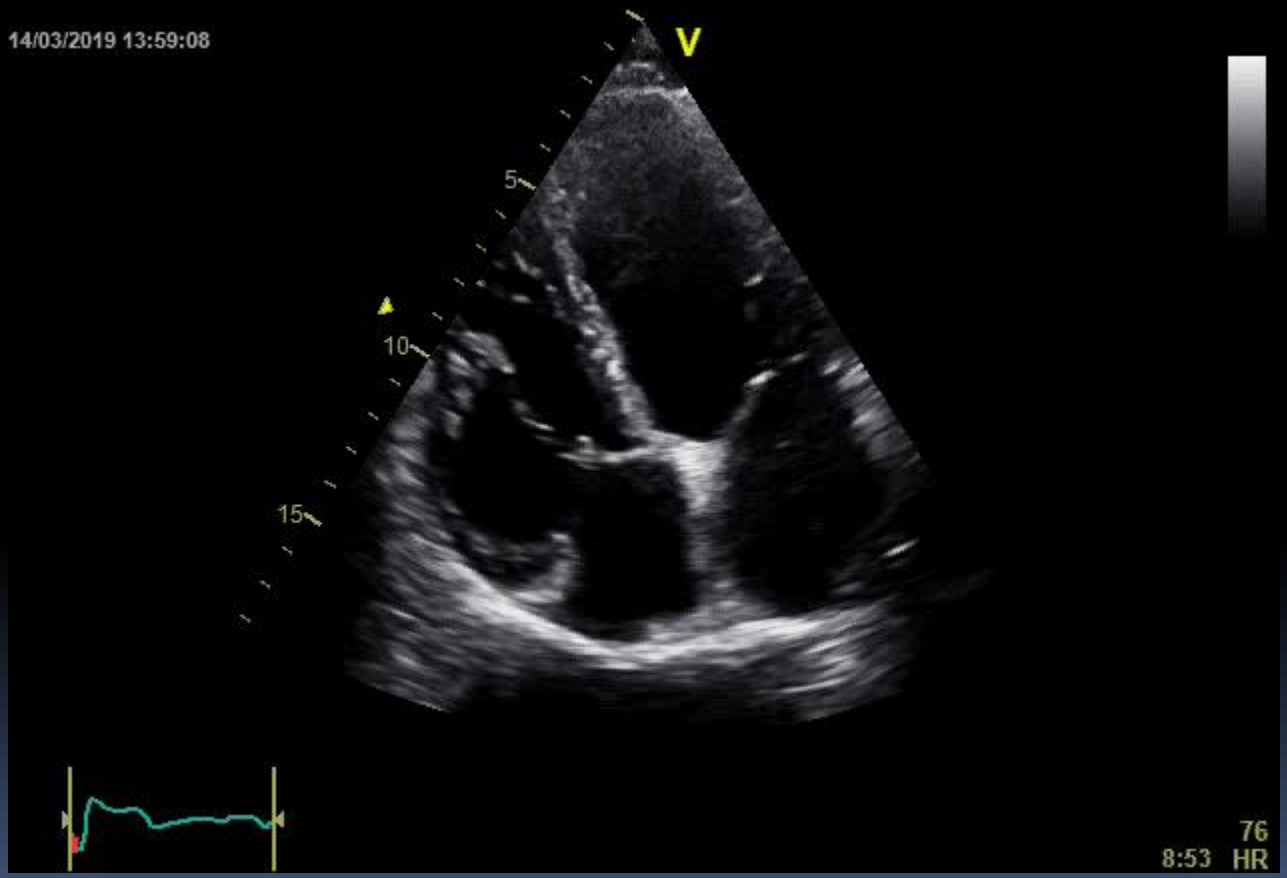
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β Θαλασσαιμία

- Ελαττωματική σύνθεση β αλυσίδων της αιμοσφαιρίνης Α ως κληρονομική διαταραχή γενετικών μεταλλάξεων στο Chr 11 με συνέπεια την υπερπαραγωγή α αλυσίδων στα προερυθροκύτταρα και κατάληξη την καταστροφή τους στο μυελό και στο περιφερικό αίμα
- Η ενδιάμεση β θαλασσαιμία χαρακτηρίζεται από μικρότερη μείωση των β αλυσίδων

Παθοφυσιολογία ΠΥ στις αιμοσφαιρινοπάθειες

- Χρόνια ιστική υποξία
- Υψηλή καρδιακή παροχή
- Αιμόλυση
- Υπερπηκτικότητα
- Σπληνεκτομή
- Αιμοσιδήρωση
- Χρόνια πνευμονική βλάβη

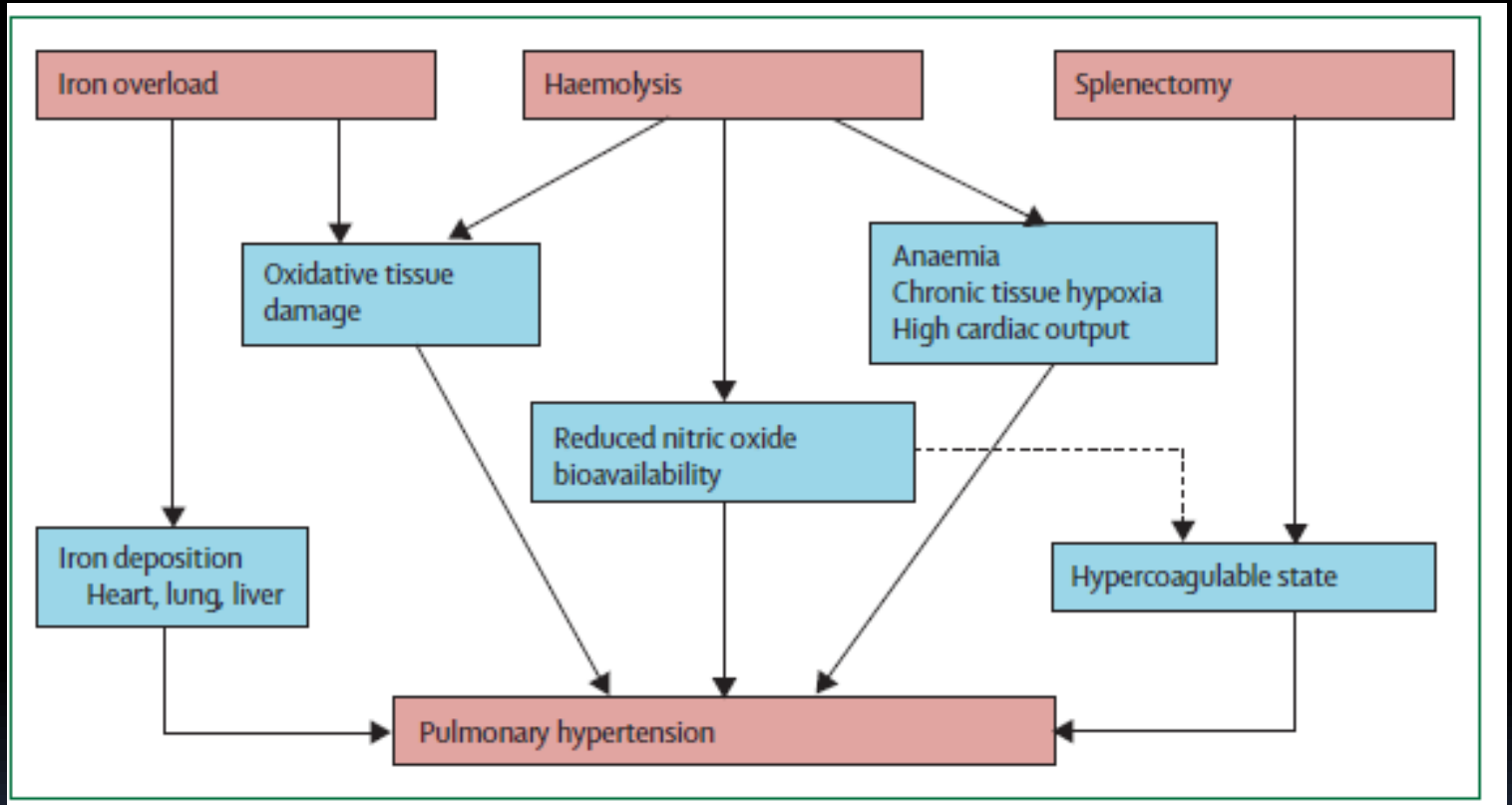

Figure 2: **Pathophysiology of pulmonary hypertension in β thalassaemia**

Pulmonary Hypertension Associated With Hemoglobinopathies

Prevalent But Overlooked

Dimitrios Farmakis, MD, PhD; Athanasios Aessopos, MD, PhD

Hemoglobinopathies constitute a heterogeneous group of hereditary hemoglobin disorders characterized by either reduced (thalassemias) or defective (sickle cell disease) globin chain synthesis that results in chronic hemolytic anemia. They represent the most common monogenetic disorders in humans, and although traditionally confined to specific geographic areas and populations (the Mediterranean Basin and the Middle and Far East in the case of β-thalassemia; Sub-Saharan Africa and African-Americans in the case of sickle cell disease), they have currently expanded to a global distribution because of the immigration of those populations to the Western world.[1] Although their clinical severity is variable, the hemoglobinopathies are generally demanding conditions, particularly in the homozygous state, characterized by reduced survival, multiorgan complications, frequent hospitalizations, and need for lifelong management, thus posing a significant medical and socioeconomic burden.

Cardiovascular complications are among the leading causes of mortality and morbidity in hemoglobinopathies.[1] In the wide spectrum of cardiovascular manifestations of these patients, pulmonary hypertension (PH) holds a prominent place. It has been postulated that hemoglobinopathies, along with HIV infection and schistosomiasis, may be the most common causes of PH worldwide given the high prevalence of PH in those populations.[2]

Epidemiology

β-Thalassemia

PH is a frequent finding in patients with hemoglobinopathies, but the reported prevalence varies in the different conditions and according to the method used for screening (Table 1). In thalassemia intermedia, a form of β-thalassemia that accounts for 20% to 25% of cases, PH has been recognized as the most striking cardiovascular finding and the main cause of heart failure. In a preliminary report, all 7 patients with thalassemia intermedia with heart failure had preserved systolic left ventricular (LV) function and severe PH as shown by right-sided heart catheterization.[8] This initial report was followed by a systematic study of 110 patients with thalassemia intermedia with a mean age of 33 years[9]; PH was observed echocardiographically in approximately 60% of cases, and all 6 patients with heart failure had preserved systolic LV function and underwent right-sided heart catheterization that confirmed the presence of PH.[9] A later study comparing cardiovascular involvement between thalassemia intermedia and the most prevalent form of the disease, namely, thalassemia major, in a cohort of 205 patients confirmed the above findings.[7] In thalassemia major, in contrast, the main cardiac manifestation is LV dysfunction.[6,7] Striking rates of PH of 75% and 79% were reported in 2 previous studies in small populations of patients with thalassemia major,[3,4] but those patients were generally poorly treated and had an increased prevalence of systolic LV dysfunction. Recent trials in optimally treated populations with thalassemia major showed that PH was rather rare and mild, with pulmonary artery pressure elevation, mostly borderline, encountered in approximately 10% of cases in different cohorts.[5–7]

Sickle Cell Disease

In homozygous sickle cell anemia, PH is a frequent finding and has been considered a major determinant of prognosis.[18] In a cohort of 195 patients with a mean age of 36 years, 32% of patients had PH by echocardiography, and PH was the strongest predictor of mortality within 18 months.[10] Similarly, in a subsequent trial in 235 patients with a mean age of 35 years, PH was present in 40% of cases, and together with diastolic LV dysfunction, it was the strongest predictor of mortality.[12] In sickle-thalassemia, a compound heterozygous state with 1 thalassemia and 1 sickle allele, PH has been observed with a rather lower frequency and a definitely lesser severity.[15–17] It should be stressed that with the exception of thalassemia intermedia, in which PH was confirmed by right-sided heart catheterization in 2 of the previously cited trials,[8,9] the vast majority of studies in thalassemia and sickle cell disease used echocardiography as a screening tool, and therefore, the reported prevalence may be overestimated by at least some of those trials.

Pathophysiology

The hemoglobinopathies are not the only hemolytic states associated with PH. In fact, this association is much broader, and it has been observed that other chronic hemolytic

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(*Circulation*. 2011;123:1227-1232.)

Circulation is available at http://circ.ahajournals.org

DOI: 10.1161/CIRCULATIONAHA.110.988089

Review

Pulmonary hypertension in β thalassaemia

Anastasia Anthi, Stylianos E Orfanos, Apostolos Armaganidis

Lancet Respir Med 2013; 1: 488–96

Published Online June 12, 2013 http://dx.doi.org/10.1016/S2213-2600(13)70078-X

2nd Department of Critical Care, University of Athens Medical School, Attikon University Hospital, Haidari, Athens, Greece (A Anthi MD, S E Orfanos MD, Prof A Armaganidis MD); and Pulmonary Hypertension

Pulmonary hypertension is one of the leading causes of morbidity and mortality in patients with haemolytic disorders and is a frequent finding in echocardiographic screening of patients with β thalassaemia. Substantial progress has been made in understanding of the multifactorial pathophysiology of pulmonary hypertension in β thalassaemia. Haemolysis, reduced nitric oxide bioavailability, iron overload, and hypercoagulopathy are among the main pathogenetic mechanisms. Various disease-directed therapeutic methods, such as transfusion, chelation, and splenectomy, have important roles in the development of pulmonary hypertension in β thalassaemia. Studies investigating the prevalence of pulmonary hypertension in β thalassaemia are mostly based on echocardiographic findings, and are thus limited by the scarcity of information derived from right heart catheterisation. Invasive pulmonary haemodynamic data are needed to clarify the true prevalence of pulmonary hypertension in β thalassaemia, to better understand the underlying pathophysiology and risk factors, and to define the optimum therapy for this devastating complication.

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Pulmonary hypertension associated with thalassemia syndromes

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Chronic hemolytic anemia has increasingly been identified as an important risk factor for the development of pulmonary hypertension (PH). Within the thalassemia syndromes, there are multiple mechanisms, both distinct and overlapping, by which PH develops and that differ among β-thalassemia major or intermedia patients. PH in β-thalassemia major correlates with the severity of hemolysis, yet in patients whose disease is well treated with chronic transfusion therapy, the development of PH can be related to cardiac dysfunction and the subsequent toxic effects of iron overload rather than hemolysis. β-Thalassemia intermedia, on the other hand, has a higher incidence of PH owing to the low level of hemolysis that exists over years without the requirement for frequent transfusions, while splenectomy is shown to play an important role in both types. Standard therapies such as chronic transfusion have been shown to mitigate PH, and appropriate chelation therapy can avoid the toxic effects of iron overload, yet is not indicated in many patients. Limited evidence exists for the use of pulmonary vasodilators or other therapies, such as L-carnitine, to treat PH associated with thalassemia. Here, we review the most recent findings regarding the pathogenic mechanisms, epidemiology, presentation, diagnosis, and treatment of PH in thalassemia syndromes.

Table 2. The prevalence of pulmonary hypertension (PH) in β-thalassemia

Study	β-Thalassemia type	Assessment	*n*	Age (years)	Splenectomy (%)	PH prevalence (%)
Aessopos *et al.*[51]	Intermedia	Echo	110	32.5	61 (56)	59
Aessopos *et al.*[44]	Intermedia	Echo	74	28.2	42 (57)	23
Taher *et al.*[95]	Intermedia	Echo	584	25.4	325 (56)	11
Derchi *et al.*[59]	Intermedia	RHC	332	42.8	194 (58)	4.8
Grisaru *et al.*[96]	Major	Echo	35	19.8	29 (83)	75
Du *et al.*[97]	Major	Echo	33	12.1	21 (64)	79
Derchi *et al.*[98]	Major	Echo	130	25	N/A	10
Aessopos *et al.*[12]	Major	Echo	202	27.3	39 (19)	Absent
Wu *et al.*[99]	Major	Echo	39	12.9	15 (38)	31
Aessopos *et al.*[44]	Major	Echo	131	27.9	27 (21)	Absent
Hagar *et al.*[57]	Major	Echo	36	26	20 (56)	57
Vlahos *et al.*[100]	Major	Echo	27	38	17 (63)	19
Derchi *et al.*[59]	Major	RHC	977	34.3	439 (45)	1.1
Phrommintikul *et al.*[28]	β-Thal, E/β-Thal, HbH	Echo	68	29.3	32 (47)	43
Morris *et al.*[53]	β-thal, E/β-thal, HbH	Echo	148	25.9	100 (68)	33

Prevalence and Risk Factors for Pulmonary Arterial Hypertension in a Large Group of β-Thalassemia Patients Using Right Heart Catheterization

A Webthal Study

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on behalf of the Webthal Pulmonary Arterial Hypertension Group*

Background—Pulmonary arterial hypertension (PAH) remains a concern in patients with β-thalassemia major (TM) and intermedia (TI); however, studies evaluating its prevalence and risk factors using systematic confirmation on right heart catheterization are lacking.

Methods and Results—This was a multicenter cross-sectional study of 1309 Italian β-thalassemia patients (mean age 36.4±9.3 years; 46% men; 74.6% TM, 25.4% TI). Patients with a tricuspid-valve regurgitant jet velocity ≥3.2 m/s (3.6%) on transthoracic echocardiography further underwent right heart catheterization to confirm the diagnosis of PAH (mean pulmonary arterial pressure ≥25 mm Hg and pulmonary capillary wedge pressure ≤15mm Hg). The confirmed PAH prevalence on right heart catheterization was 2.1% (95% confidence interval [CI], 1.4–3.0) and was higher in TI (4.8%; 95% CI, 3.0–7.7) than TM (1.1%; 95% CI, 0.6–2.0). The positive predictive value for the tricuspid-valve regurgitant jet velocity ≥3.2 m/s threshold for the diagnosis of pulmonary hypertension was 93.9%. Considerable functional limitation and decrease in the 6-minute walk distance were noted in patients with confirmed PAH. On multivariate logistic regression analysis, independent risk factors for confirmed PAH were age (odds ratio, 1.102 per 1-year increase; 95% CI, 1.06–1.15) and splenectomy (odds ratio, 9.31; 95% CI, 2.57–33.7).

Conclusions—The prevalence of PAH in β-thalassemia patients as confirmed on right heart catheterization was 2.1%, with an ≈5-fold higher prevalence in TI than TM. Advanced age and splenectomy are risk factors for PAH in this patient population.

Clinical Trial Registration—URL: http://www.ClinicalTrials.gov. Unique identifier: NCT01496963.

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ΕΠΙΠΟΛΑΣΜΟΣ ΠΝΕΥΜΟΝΙΚΗΣ ΥΠΕΡΤΑΣΗΣ ΣΕ ΑΣΘΕΝΕΙΣ ΜΕ ΑΙΜΟΣΦΑΙΡΙΝΟΠΑΘΕΙΕΣ: ΣΥΣΧΕΤΙΣΗ ΜΕΤΑΞΥ ΥΠΕΡΗΧΟΚΑΡΔΙΟΓΡΑΦΙΚΩΝ ΚΑΙ ΑΙΜΟΔΥΝΑΜΙΚΩΝ ΜΕΤΡΗΣΕΩΝ

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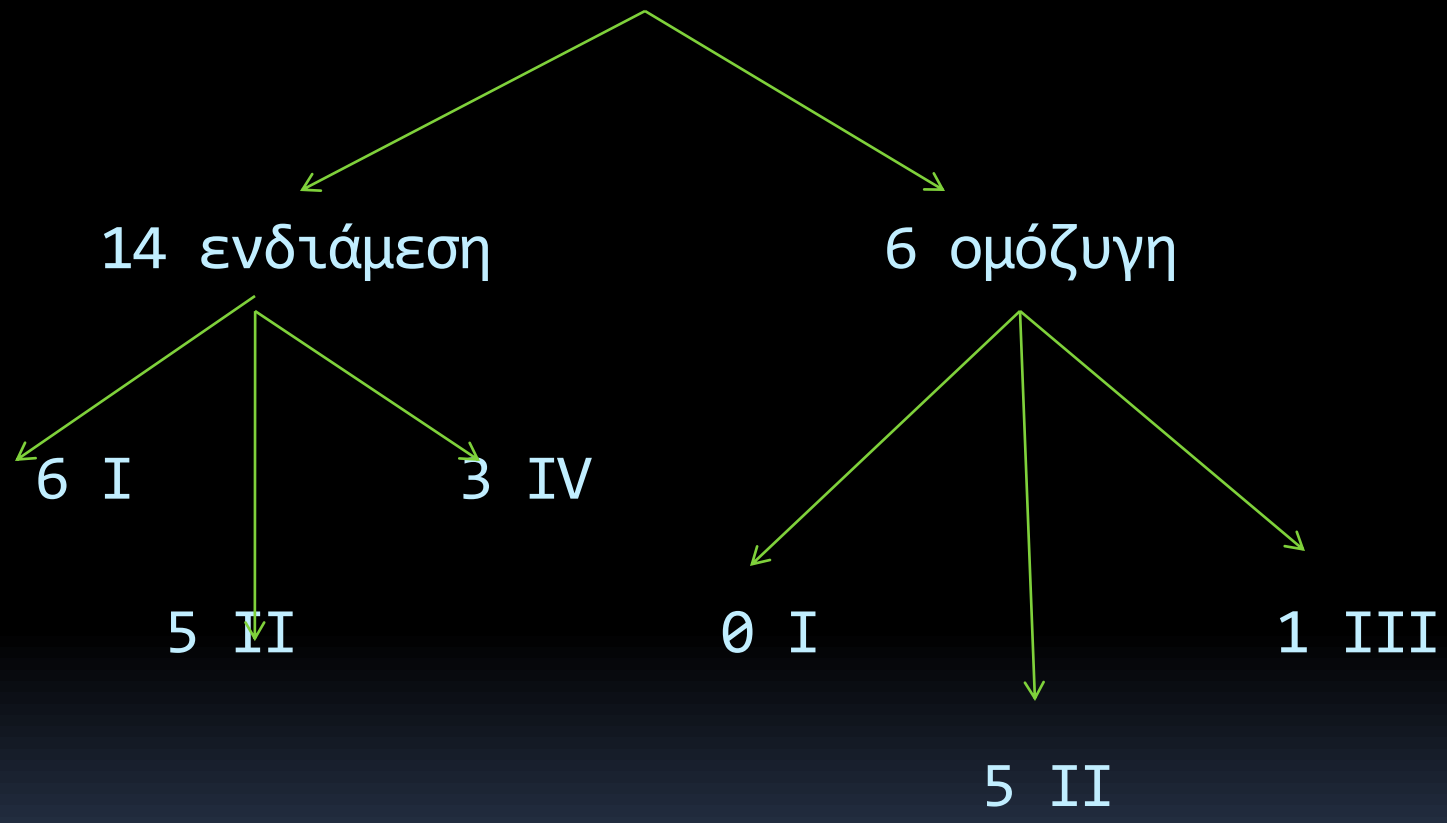
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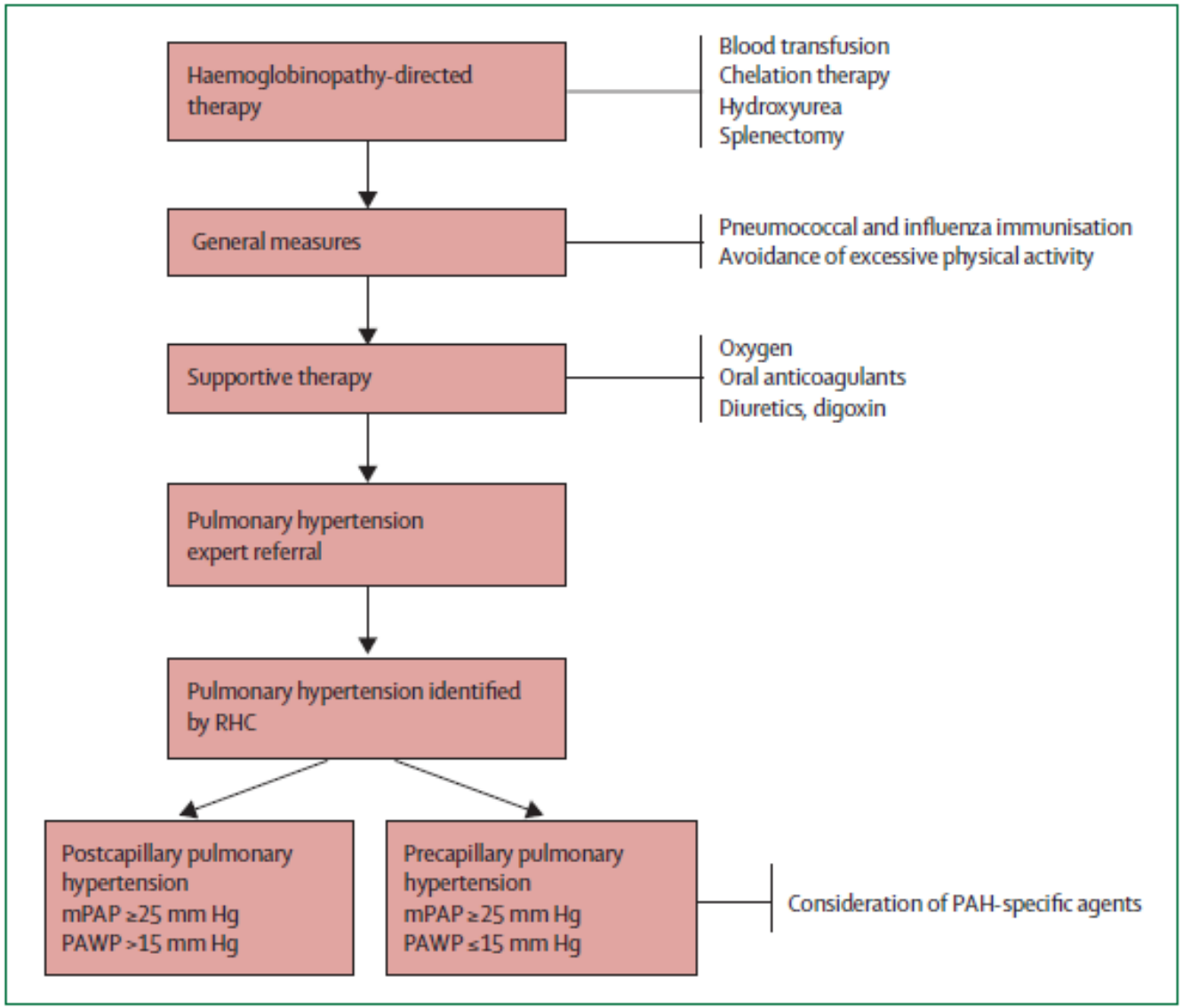

***Figure 3*: Treatment approach for patients with β thalassaemia and pulmonary hypertension**

mPAP–mean pulmonary arterial pressure. PAH–pulmonary arterial hypertension. PAWP–pulmonary arterial wedge pressure. RHC–right heart catheterisation.

Table 2. Studies of Phosphodiesterase-5 Inhibitors and Endothelin Receptor Antagonists in Patients With Hemoglobinopathies

Study	Drug	Hemoglobinopathy	N	Duration	Efficacy
Derchi et al[40]	Sildenafil	Thalassemia intermedia, thalassemia major, sickle thalassemia	7	12–48 mo	↓ TRV
					↓ NYHA
					↑ 6MWT
Machado et al[41]	Sildenafil	Sickle cell anemia	12	6 mo	↓ TRV
					↓ mPAP
					↑ 6MWT
Little et al[42]	Sildenafil vs L-arginine*	Sickle cell anemia	14		↓ TRV
					↑ 6MWT
Minniti et al[43]	Bosentan or ambrisentan	Sickle cell anemia	8	≥6 mo	↓ TRV
					↓ mPAP
					↑ 6MWT
Barst et al[44]	Bosentan vs placebo	Sickle cell anemia	26	4 mo	↓ PVR (NS)
					↑ CO (NS)

TRV indicates tricuspid regurgitant jet velocity; NYHA, New York Heart Association class; 6MWT, 6-minute walk test; mPAP, mean pulmonary artery pressure; PVR, pulmonary vascular resistance; CO, cardiac output; and NS, nonsignificant.

*In addition to hydroxyurea.

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Treatment with bosentan in a patient with thalassemia intermedia and pulmonary arterial hypertension

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ΣΥΜΠΕΡΑΣΜΑΤΑ

- Η χρόνια αιμολυτική αναιμία αναγνωρίζεται ως σημαντικός παράγοντας κινδύνου ανάπτυξης ΠΥ
- Σε σχέση με τα θαλασσαιμικά σύνδρομα στην ανάπτυξη ΠΥ εμπλέκονται πολλοί μηχανισμοί συχνά επικαλυπτόμενοι.
- Η ενδιάμεση β θαλασσαιμία αποτελεί την οντότητα με τον υψηλότερο επιπολασμό ΠΥ.

Οι καθιερωμένες θεραπείες είναι φυσικά οι μεταγγίσεις και η αποσιδήρωση.

Σε μεμονωμένες περιπτώσεις αυστηρά επιλεγμένων ασθενών με προτριχοειδική πνευμονική υπέρταση έχει φανεί ότι η ειδική αγωγή έχει οδηγήσει τόσο σε κλινική όσο και απεικονιστική και εργαστηριακή βελτίωση

Ευχαριστώ
για
την προσοχή σας