Il ventricolo destro nell'insufficienza cardiaca

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Conflict of interest

Grant for scientific collaboration (advisory board, clinical studies, speaker):

- Actelion
- Acceleron
- Bayer
- Dompè
- Janssen
- GSK
- Lilly
- MSD
- United therapeutics

Epidemiology of Pulmonary hypertension and RV dysfunction in Heart Failure

- A common condition.

  Prevalence of PH depends on the population studied:

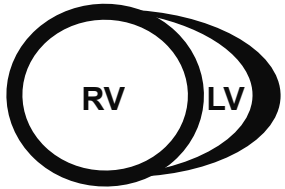
  in referral centers, where advanced pts are evaluated for potential heart transplant listing, up to 50% of pts may have RV dysfunction

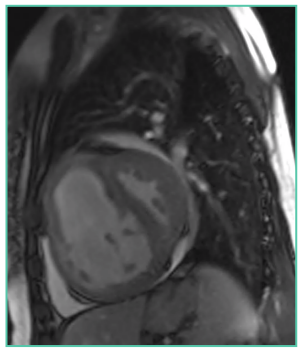
Why the RV becomes dysfunctioning ?

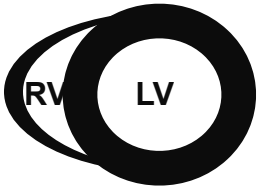
- Geometrical interdependance
- Functional interdependance
- Pathological interdependance

Geometrical interdependence of the ventricles: The interventricular septum

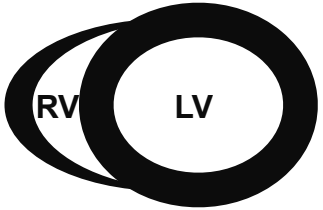
RV Overload: PAH

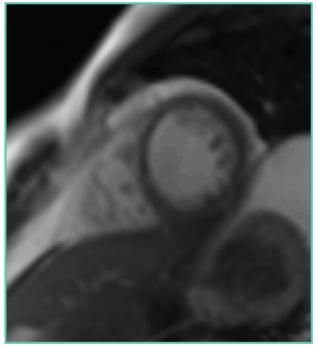




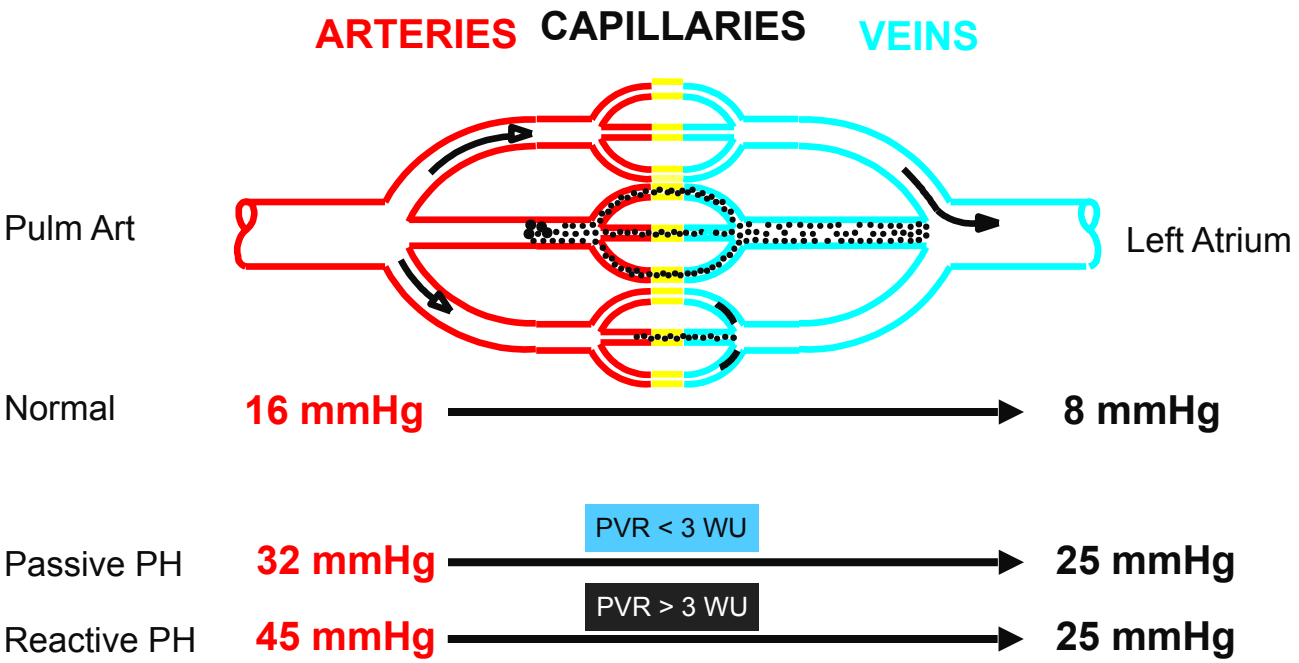


LV Overload: CHF





Functional interdependence of the ventricles: The pulmonary circulation



Pathologic interdependence

The same pathological process could interest both ventricles:

- Myocarditis
- Infiltrative diseases
- Ischemia (RV infarction)
- Degenerative diseases (diabetes)

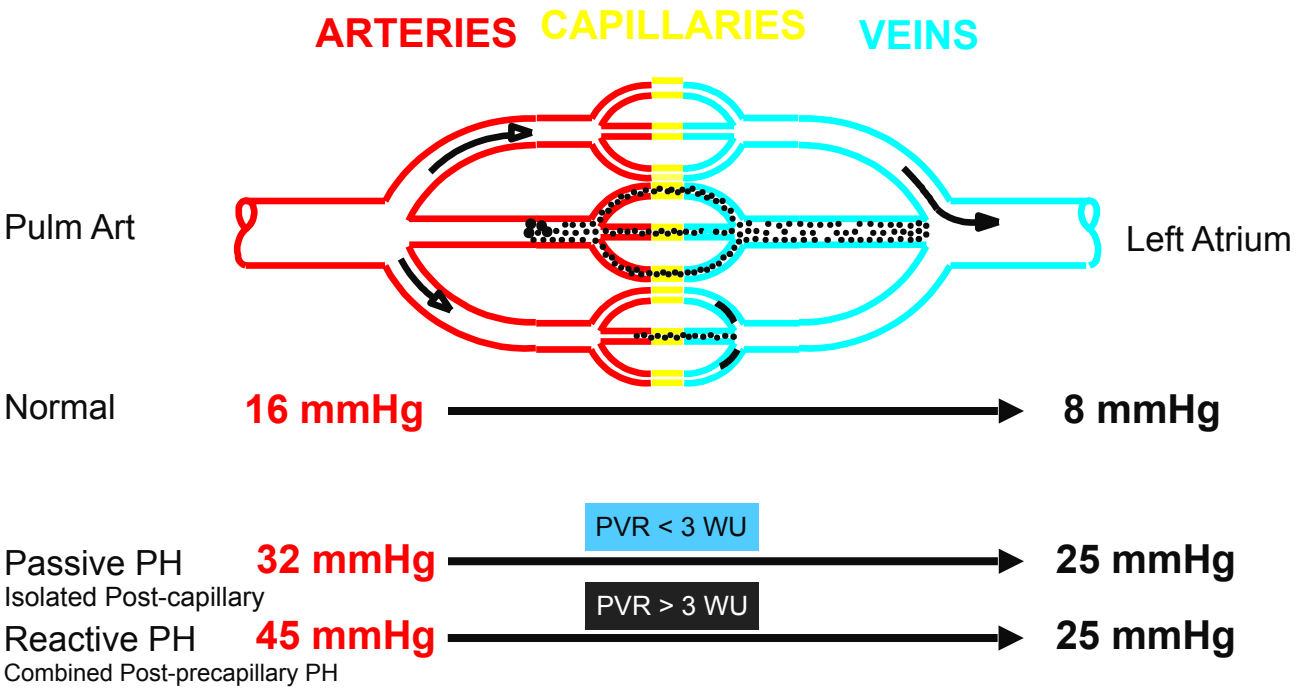
What happens in the clinical arena ?

- The RV could be the first ventricle failing and the cause of AHF:
  - Acute pulmonary embolism
  - Acute RV infarction
  - Rapid progression of “chronic PH”

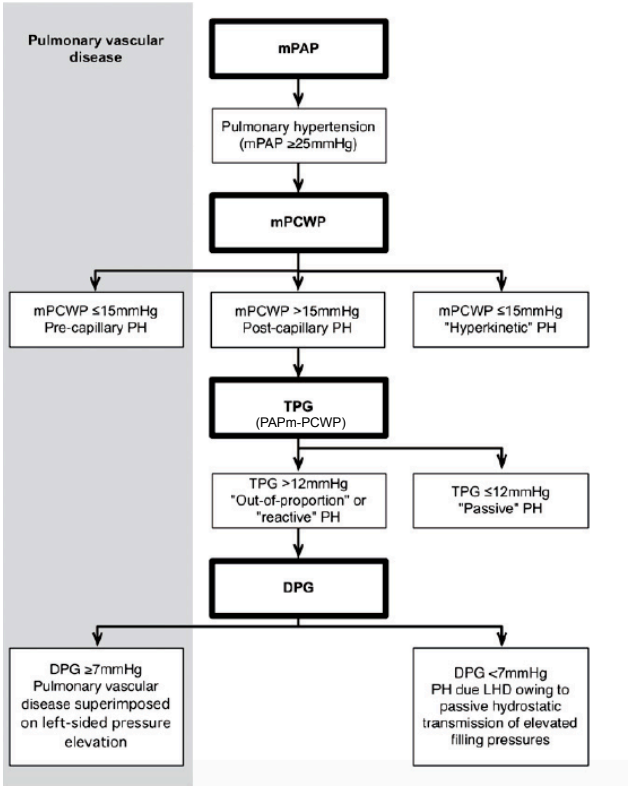
or

- The RV could be “involved” in a primary LV dysfunction as a consequence of increased pulmonary vascular resistance

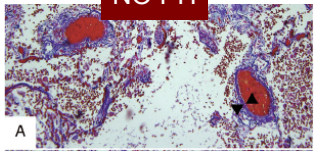
Pulmonary hypertension in left heart disease



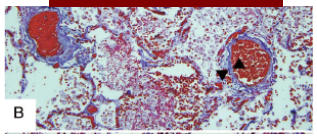
The correlation between hemodynamic and hystology



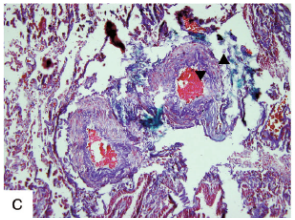
NO PH



Passive PH (IpC)



Reactive PH (CpC)



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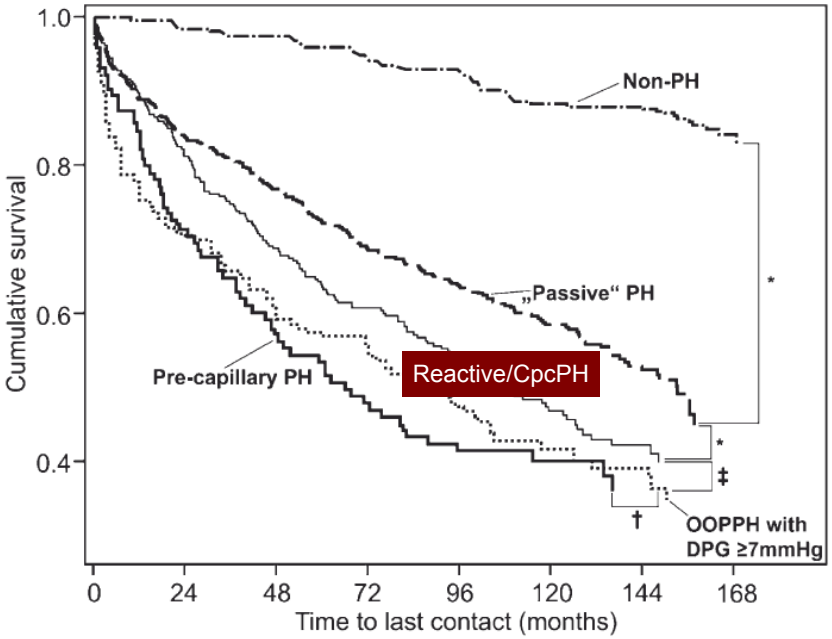
Gerges C. CHEST 2013; 143:758–766

Survival according to the type of PH



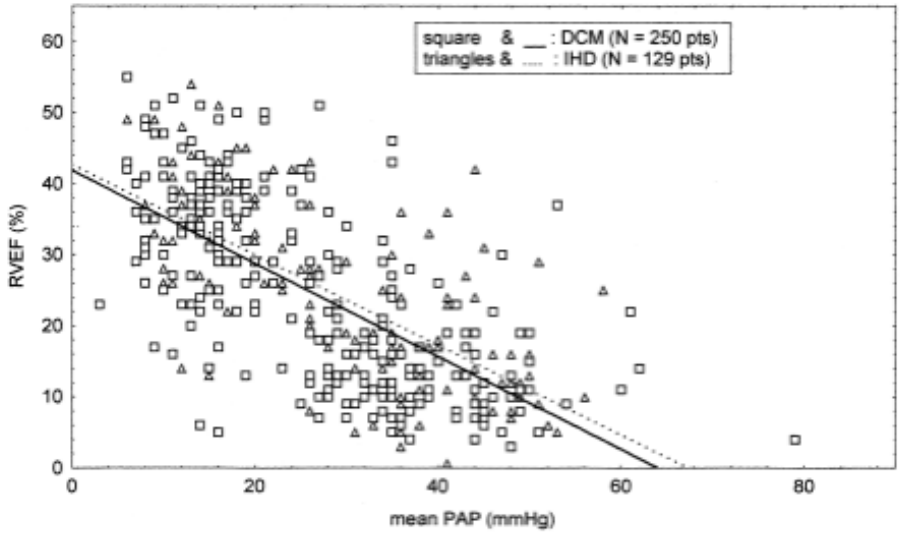
Gerges C. CHEST 2013; 143:758–766

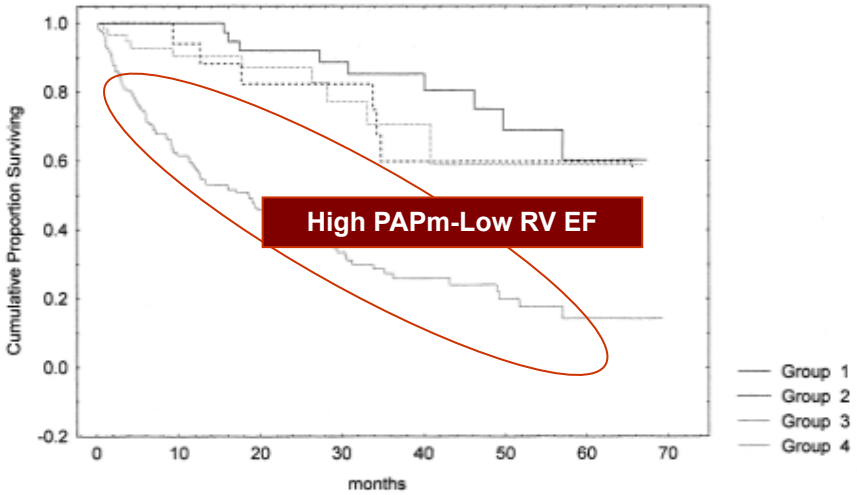
Pulmonary hypertension and RV dysfunction in Heart Failure reduced Ejection Fraction (HFrEF)

Independent and Additive Prognostic Value of Right Ventricular Systolic Function and Pulmonary Artery Pressure in Patients With Chronic Heart Failure

Stefano Ghio, MD, FESC,* Antonello Gavazzi, MD, FESC,* Carlo Campana, MD,* Corinna Inserra, MD,* Catherine Klersy, MD,† Roberta Sebastiani, MD,* Eloisa Arbustini, MD,‡ Franco Recusani, MD,* Luigi Tavazzi, MD, FESC, FACC*

Pavia, Italy





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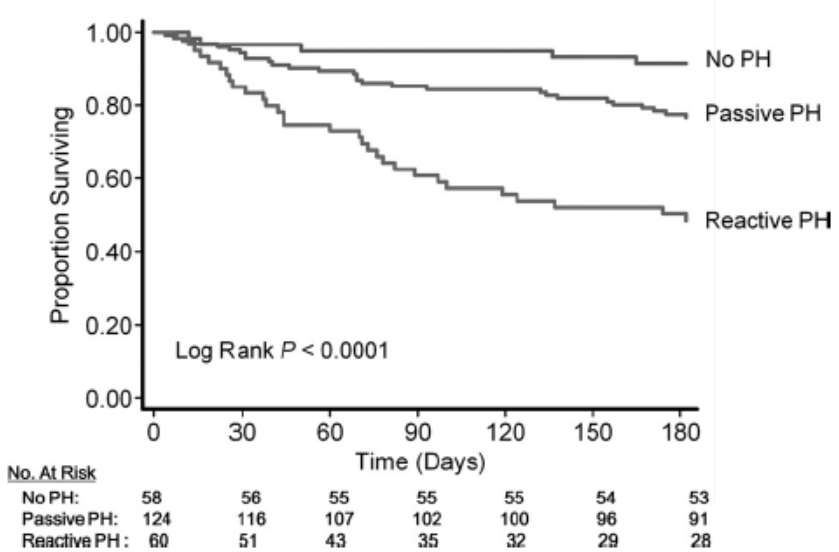
JACC 2001;37:183-8

What about Acute Decompensate Heart failure ?

Relationship Between Reactive Pulmonary Hypertension and Mortality in Patients With Acute Decompensated Heart Failure

Doron Aronson, MD; Amnon Eitan, MD; Robert Dragu, MD; Andrew J. Burger, MD

	Final (Posttreatment)		
Baseline	No PH	Passive PH	Reactive PH
No PH (n=2)	1 (50)	1 (50)	0 (0)
Passive PH (n=143)	44 (31)	80 (56)	19 (13)
Reactive PH (n=97)	13 (13)	43 (45)	41 (42)
Total	58	124	60



Circ Heart Fail. 2011;4:644-650.

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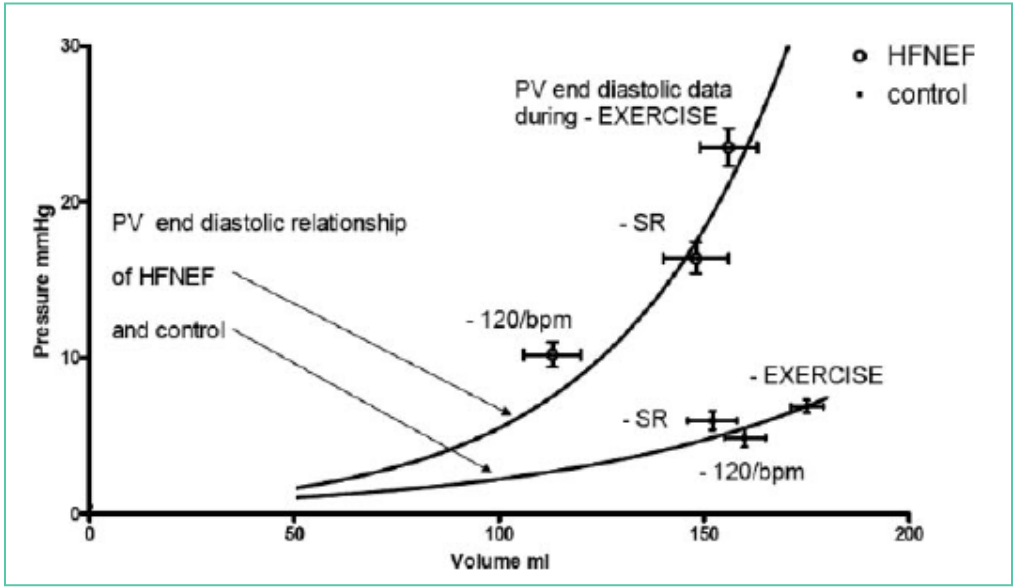
Pulmonary hypertension in Heart Failure with preserved Ejection Fraction (HFpEF)

Diastolic heart failure:
Increased LV stiffness and wedge pressure



Westemann D. Circulation 2008; 117:2051

Pulmonary Hypertension in Heart Failure With Preserved Ejection Fraction

A Community-Based Study

Carolyn S. P. Lam, MBBS,*† Véronique L. Roger, MD, MPH,* Richard J. Rodeheffer, MD,*
Barry A. Borlaug, MD,* Felicity T. Enders, PHD,‡ Margaret M. Redfield, MD*

Rochester, Minnesota; and Singapore, Singapore

	HTN		HFpEF	
	PH Absent	PH Present	PH Absent	PH Present
N (% group)	432 (92)	38 (8)	34 (17)	169 (83)
PASP, mm Hg	28 ± 4	40 ± 5*	30 ± 3	52 ± 13*
Clinical characteristics				
Age, yrs	67 ± 10	72 ± 9*	74 ± 11	79 ± 12*
Male, %	40	32	47	41
Height, m	1.66 ± 0.10	1.62 ± 0.08*	1.66 ± 0.10	1.65 ± 0.14
Weight, kg	79.6 ± 16.9	75.3 ± 14.5	84.8 ± 17.9	81.6 ± 23.0
BSA, m^2	1.91 ± 0.23	1.83 ± 0.20	1.97 ± 0.24	1.92 ± 0.29
Body mass index, kg/m^2	28.8 ± 5.5	28.8 ± 5.2	30.9 ± 6.3	29.6 ± 7.2
Systolic blood pressure, mm Hg	141 ± 21	153 ± 27*	125 ± 20	134 ± 24*
Diastolic blood pressure, mm Hg	75 ± 11	75 ± 11	69 ± 13	67 ± 14
Pulse pressure, mm Hg	66 ± 18	78 ± 20*	56 ± 18	67 ± 20*
Heart rate, beats/min	65 ± 11	65 ± 13	68 ± 15	71 ± 16
Hypertension, %	100	100	91	97
Atrial fibrillation, %	5	13*	22	31
Coronary artery disease, %	16	21	59	53
Diabetes mellitus, %	10	13	27	34
Chronic kidney disease,† %	29	43	50	51
Chronic obstructive lung disease,‡ %	14	21	29	32
Echocardiographic characteristics				
Ejection fraction, %	65 ± 5	65 ± 7	63 ± 5	62 ± 7
Stroke volume/BSA, ml/m^2	46.8 ± 9.3	48.9 ± 10.5	42.7 ± 10.3	43.2 ± 9.8
Cardiac index, $l/min/m^2$	3.0 ± 0.7	3.1 ± 0.8	2.8 ± 0.7	3.0 ± 0.8
LV mass/BSA, g/m^2	99.6 ± 22.4	107.4 ± 31.0	99.7 ± 27.2	103.3 ± 30.1
Relative wall thickness	0.42 ± 0.07	0.42 ± 0.08	0.46 ± 0.11	0.45 ± 0.09
LV end-diastolic volume/BSA, ml/m^2	59.2 ± 12.2	60.7 ± 11.1	54.5 ± 11.4	57.4 ± 15.0
E/e' ratio	9.3 ± 3.3	12.8 ± 4.7*	15.7 ± 9.8	19.6 ± 9.6*
PCWP, mm Hg	18 ± 2	20 ± 3*	21 ± 6	24 ± 6*
Left atrial volume/BSA, ml/m^2	26.2 ± 7.8	32.7 ± 8.5*	32.1 ± 11.4	38.1 ± 14.3*

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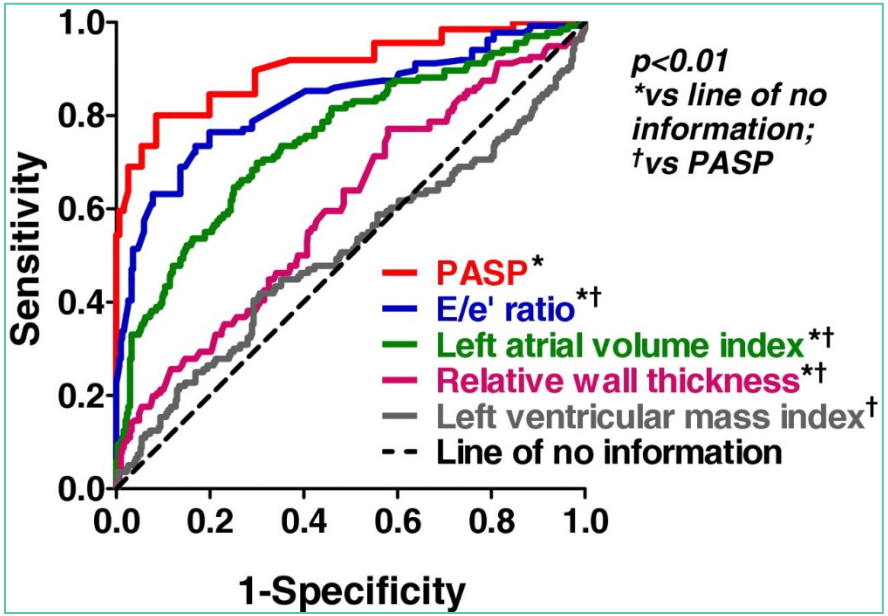
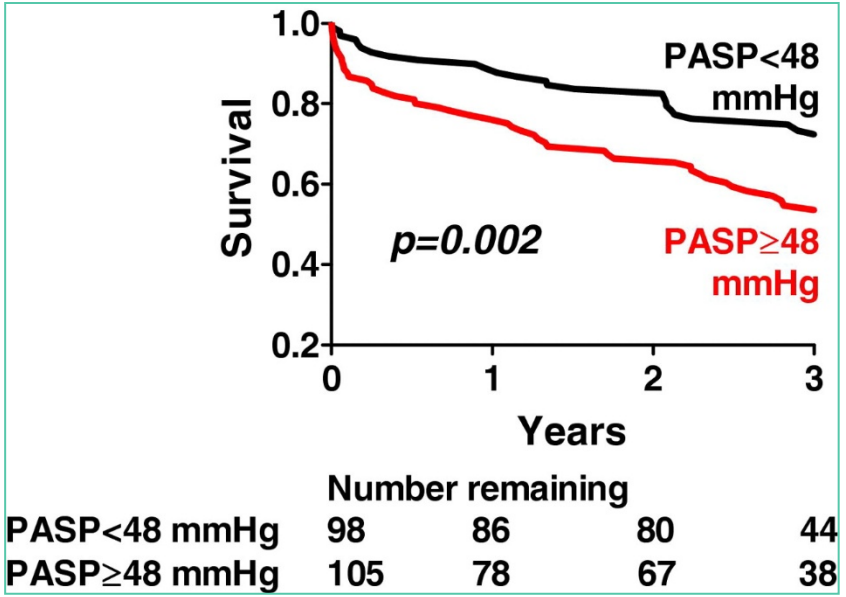
Lam, C. S.P. et al. J Am Coll Cardiol 2009;53:1119-1126

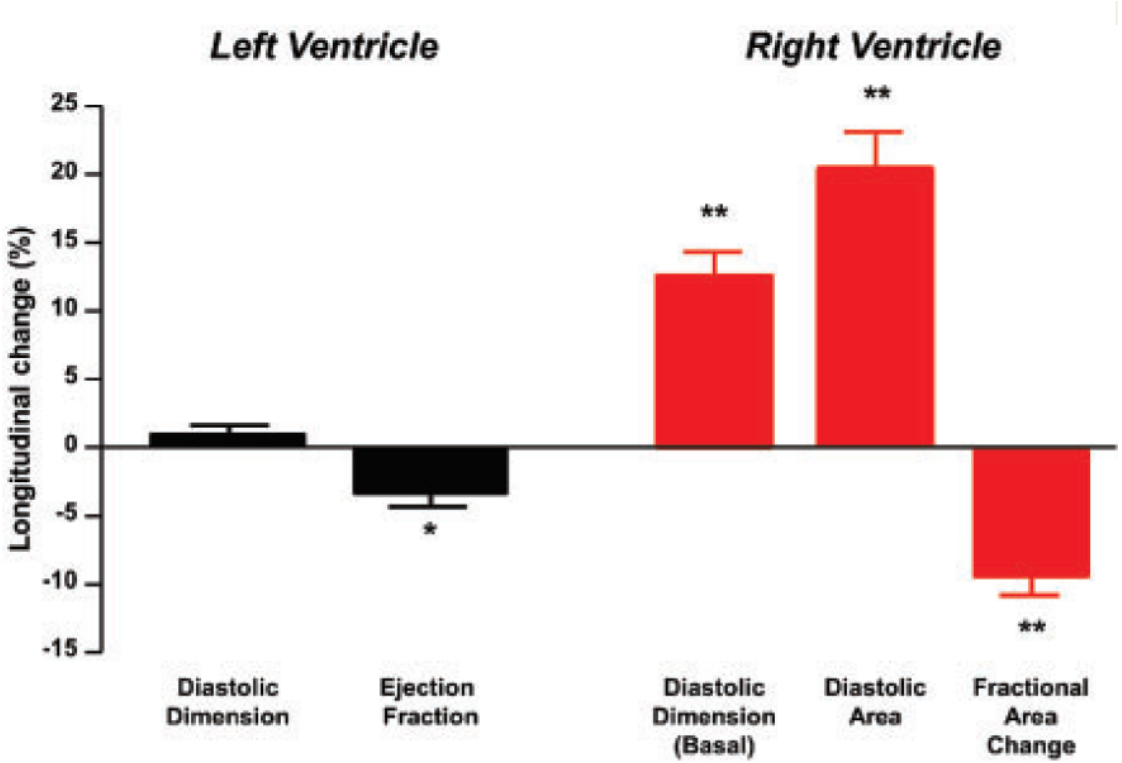
Pulmonary systolic pressure: Impact on diagnosis and survival

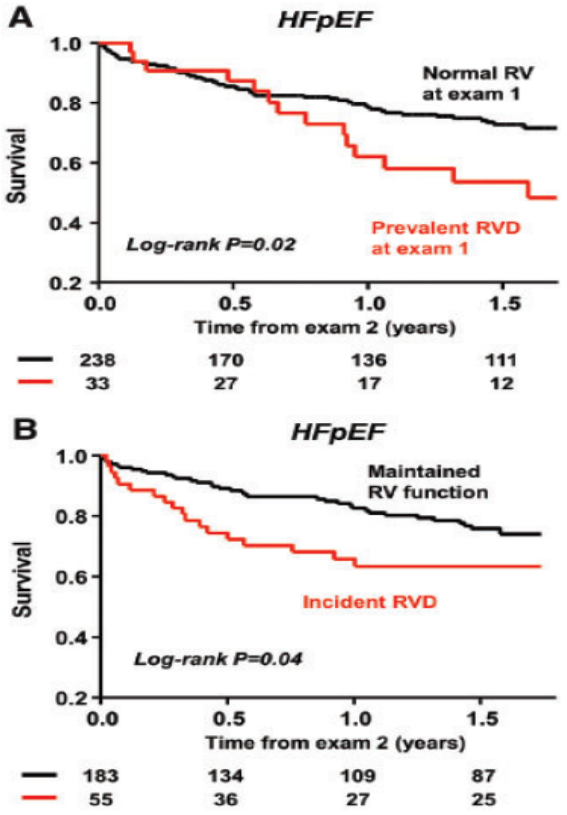




Lam, C. S.P. et al. J Am Coll Cardiol 2009;53:1119-1126

Deterioration in RV Structure and Function Over Time in Patients with HFpEF





Obokata et al. *Eur Heart J* 2019; 40: 689-698

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Key message

Pulmonary Hypertension and RV dysfunction

- are a quite frequent observation in patients with Heart Failure
- RV dysfunction could be determined by several mechanisms, but the most important is the increase in afterload due to the developement of pulmonary hypertension (PH)

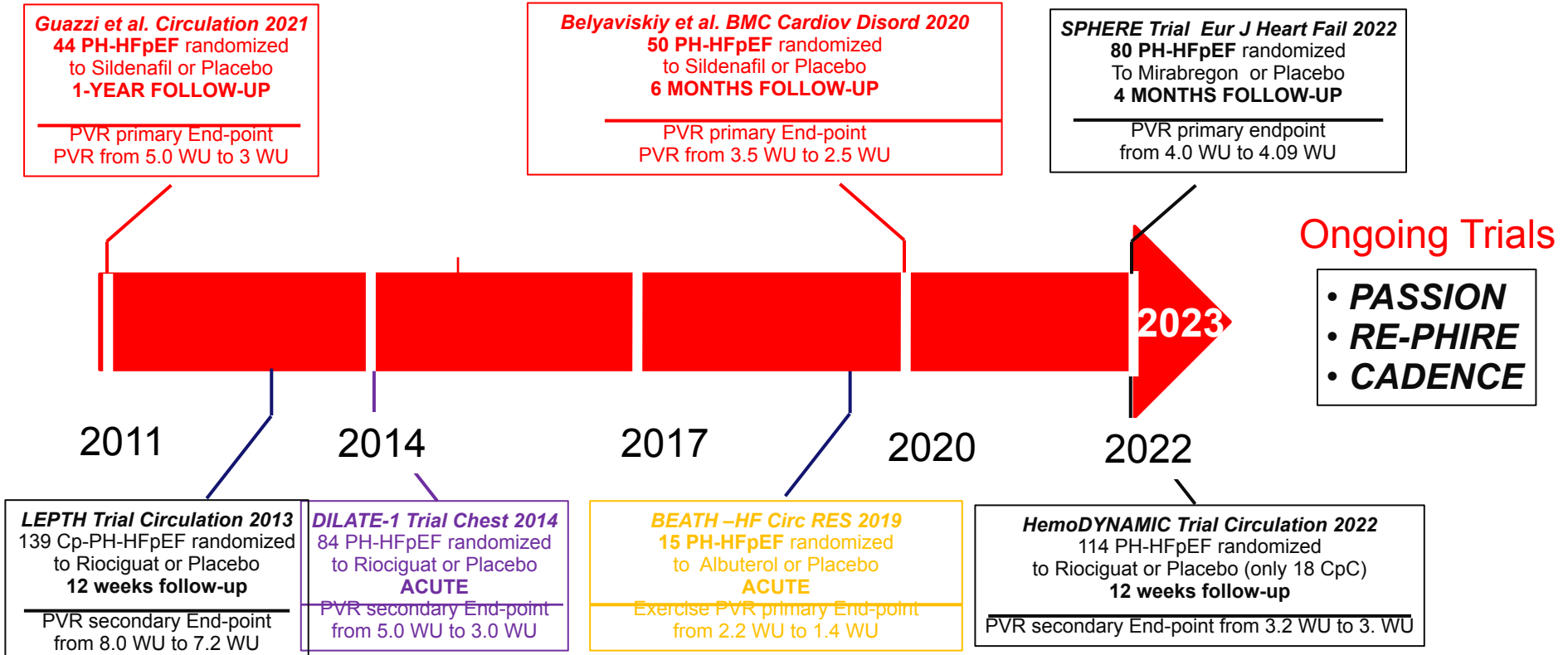
PH in left heart disease

- is a consequence of post-capillary hypertension, and could be aggravated by a precapillary component
- PH and the related RV dysfunction are important prognostic factors in HFrEF and HFpEF

Always look at the right ventricle !

Pharmacological Studies in Cpc-PH HFpEF

Pulmonary Vasodilator Therapy and PVR (primary or secondary EP)



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