



HEMODYNAMIC COMPROMISE FROM EXTRINSIC COMPRESSION OF THE HEART DIAGNOSED BY POCUS

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Brief HPI

An 87W w/:

- known CAD including 100% chronic total occlusion of the 1st diagonal
- HTN
- large hiatal hernia

presented with **sudden-onset severe substernal chest pain radiating to the back.**

The pain started at 10PM the previous night, and had been continuously worsening until she called EMS in the AM.

She received nitroglycerin and aspirin, and was hypotensive to SBP 80s in the ambulance.

Physical Exam

Vital Signs:

Afebrile

HR **82-111**

BP 123/82-144/92

RR 16

SpO2 100%

Labs:

troponin 0.04 → 2.12

WBC 14

BNP 83

Physical Exam:

Gen: Elderly woman moaning in pain, A0x3

Neck: no LAD, **+JVD to mandible**

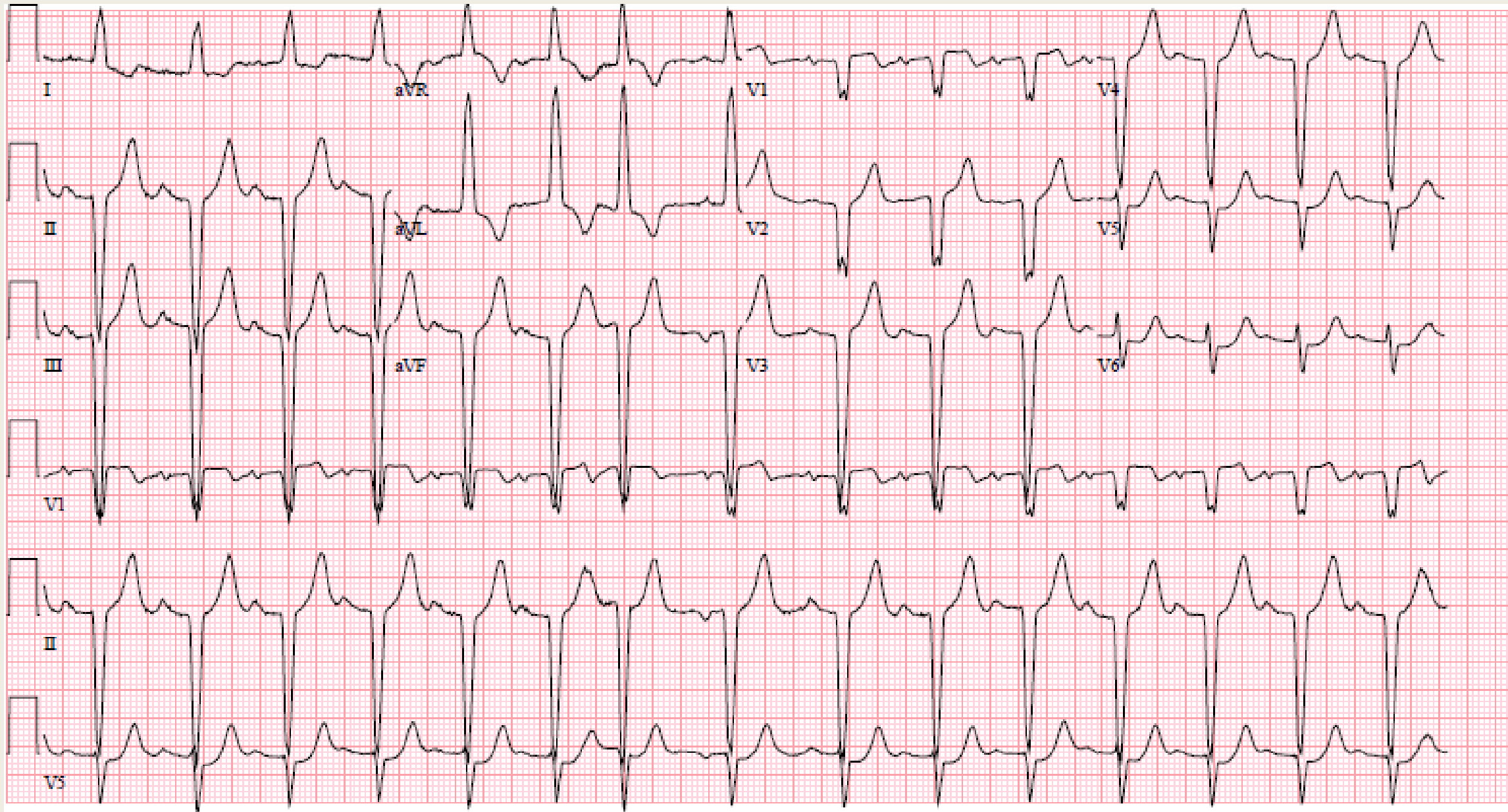
Lungs: CTAB, no c/r/w

Heart: Loud systolic murmur heard throughout precordium, but best in RUSB

Ext: 2+ pulses, no edema

Neuro: A0x3

EKG



Parasternal long



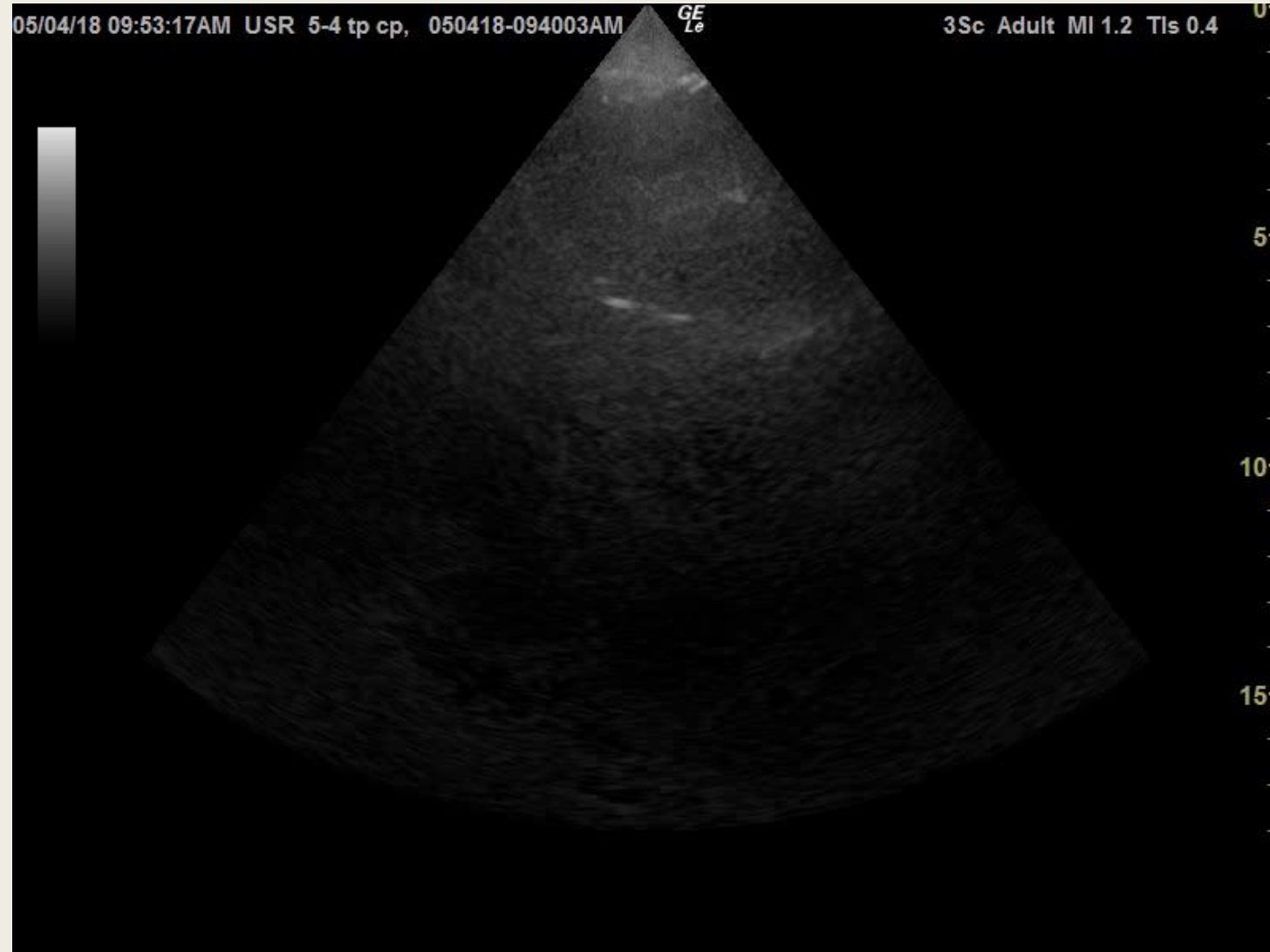
Parasternal long view



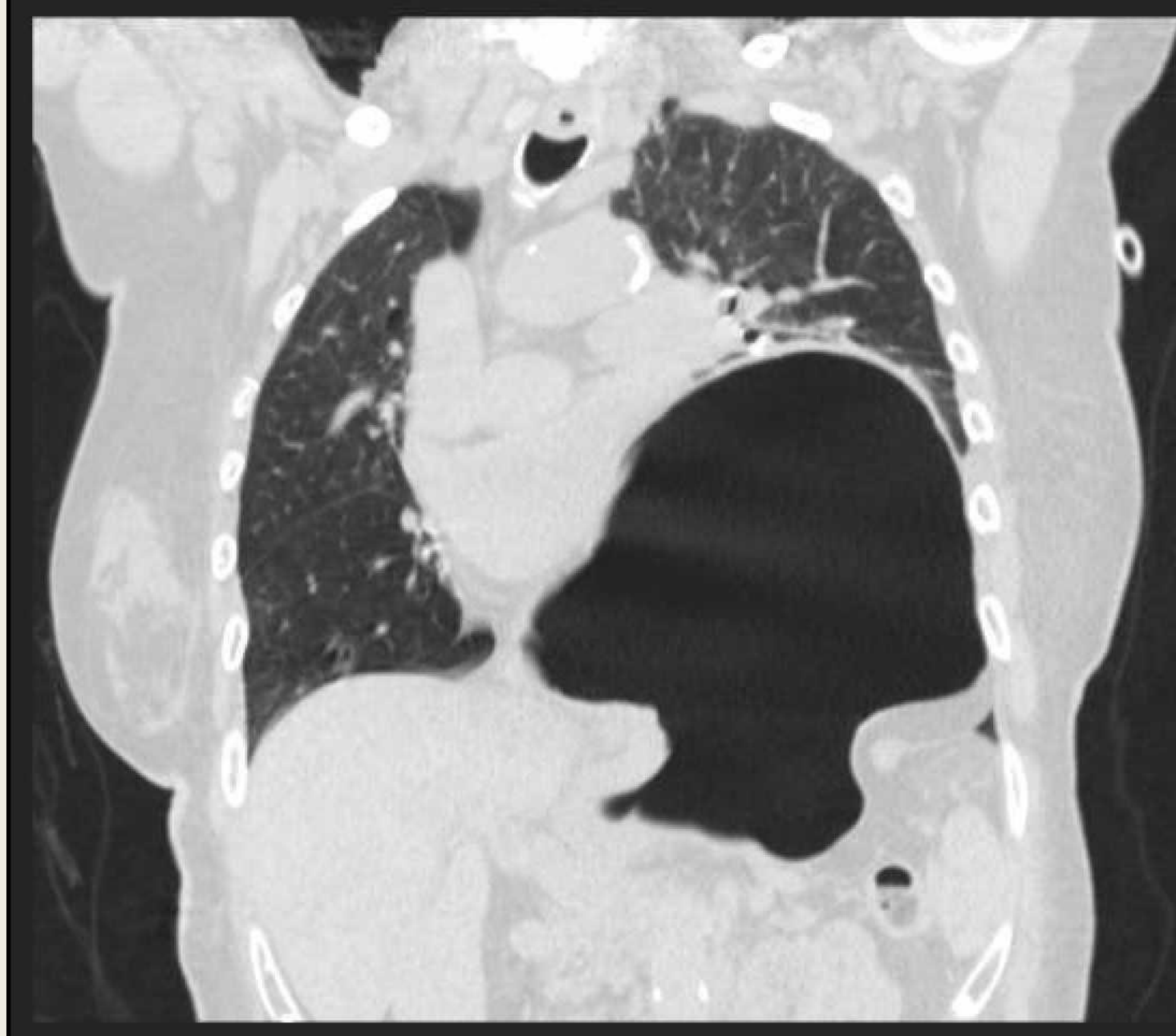
Parasternal short view



Apical four chamber view



CT scan- coronal view



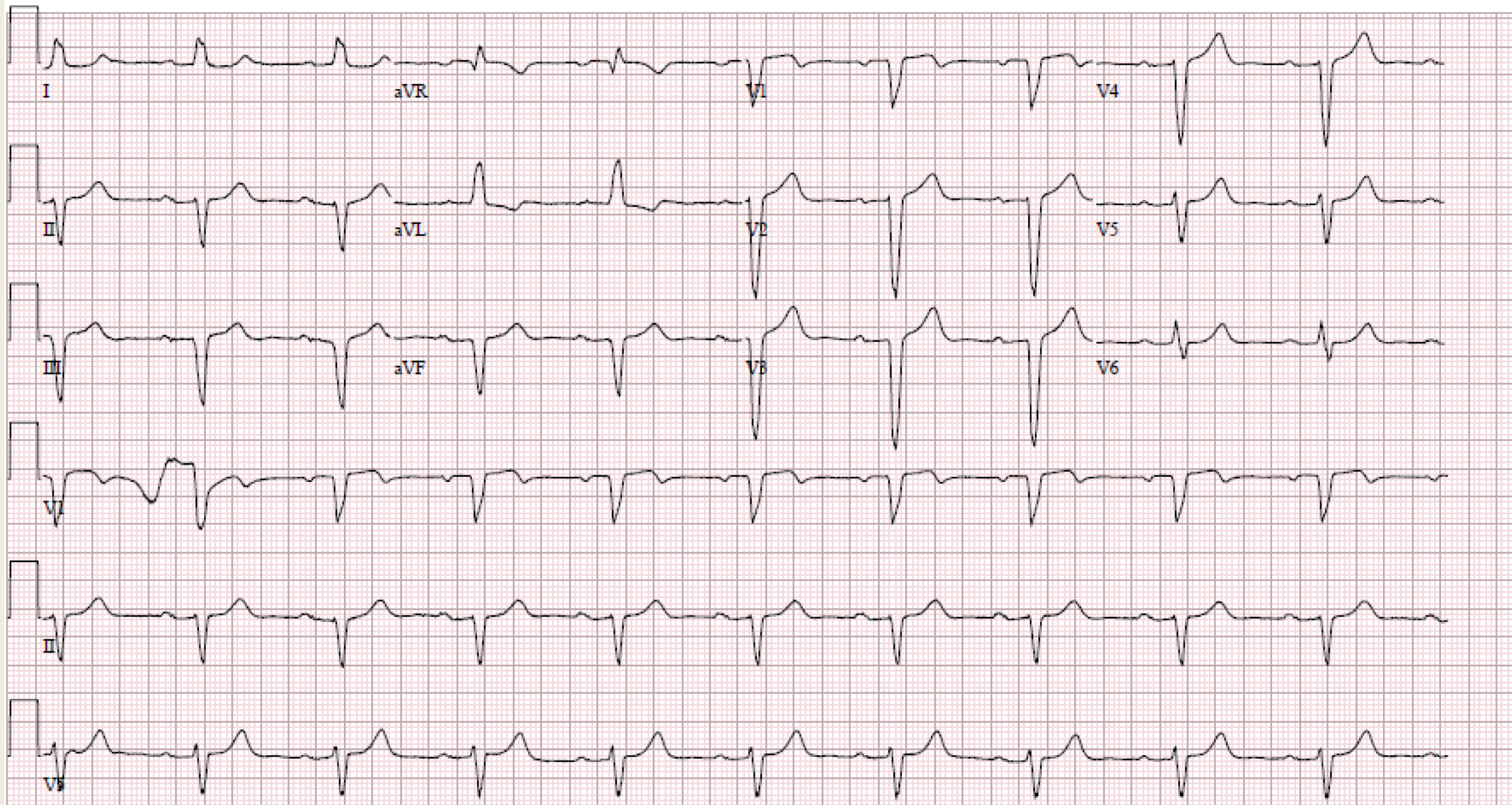
CT scan- transverse view



the story continues...

The patient underwent decompression with a nasogastric tube with resolution of her tachycardia, pain and the ST depressions on EKG.

Later in the hospitalization, she underwent surgical repair of her hiatal hernia.



a hiatal hernia can cause hemodynamic compromise

Left Atrial Compression and the Mechanism of Exercise Impairment in Patients With a Large Hiatal Hernia

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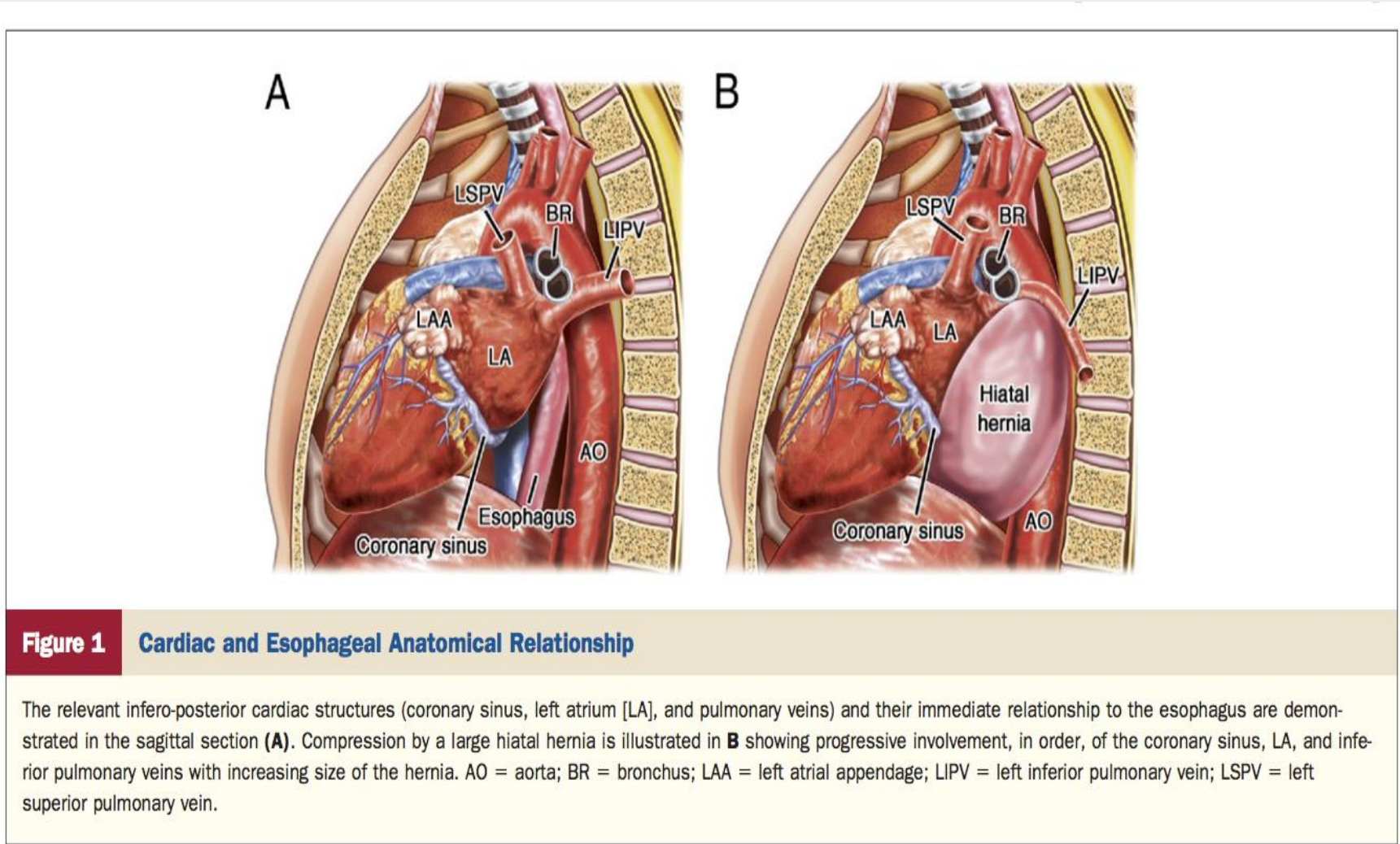
Sydney, New South Wales, Australia

Naoum, Christopher, et al.

"Left atrial compression and the mechanism of exercise impairment in patients with a large hiatal hernia."

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the hiatal hernia is posterior and can compress the left atrium and pulmonary veins



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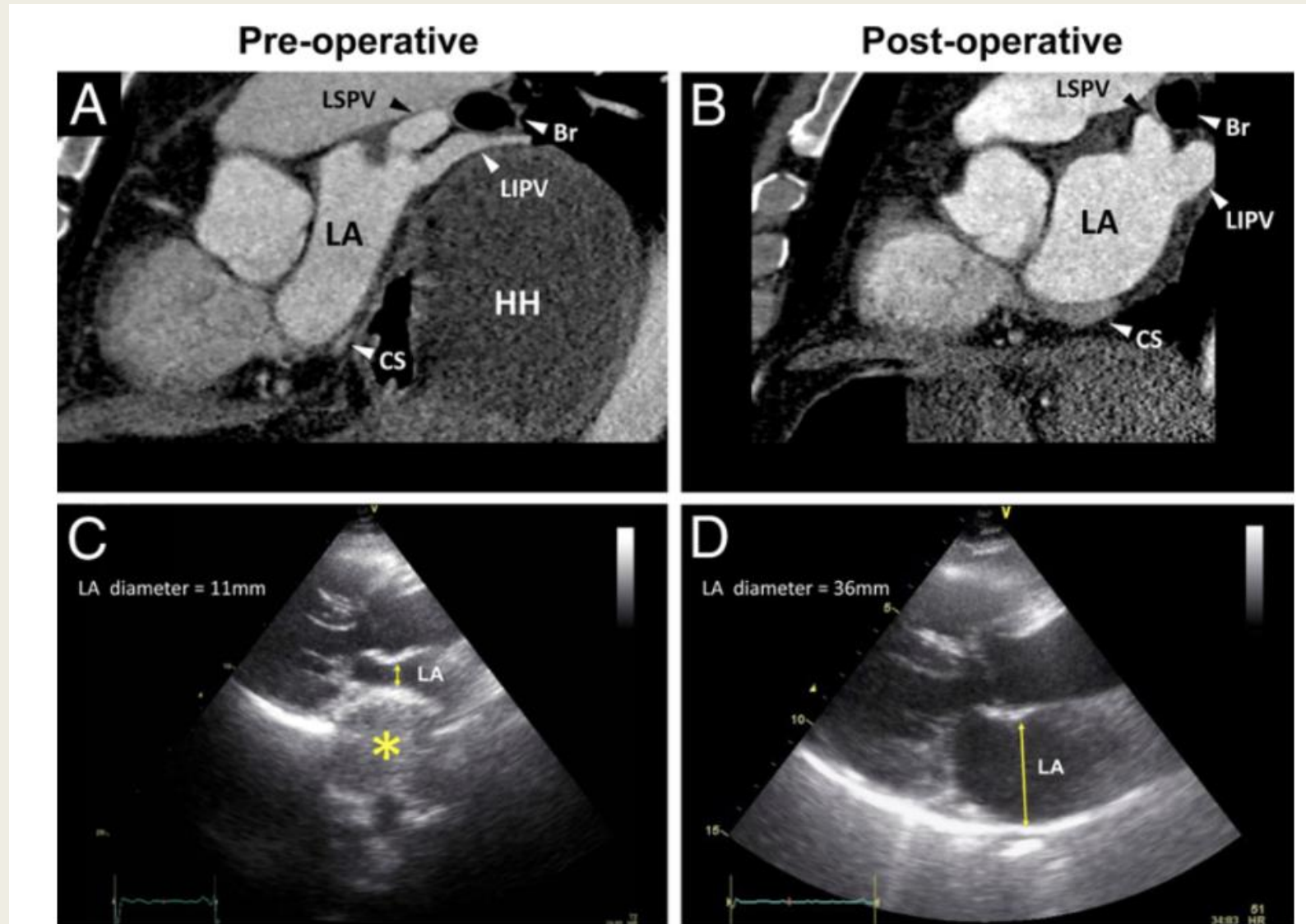
table 1: many patients with large hiatal hernias had exertional dyspnea or chest pain...

Symptoms	
Cardiorespiratory symptoms	
Dyspnea	
Exertional	25 (83)
Postural	17 (57)
Postprandial	20 (67)
Cough	7 (23)
Chest pain or pressure (noncardiac)	24 (80)
Angina pectoris	1 (3)
Palpitations	7 (23)
Syncope	1 (3)
Orthopnea or paroxysmal nocturnal dyspnea	4 (13)
Ankle swelling	4 (13)
Gastrointestinal symptoms	
Heartburn	18 (60)
Regurgitation	17 (57)
Early satiety	24 (80)
Dysphagia	16 (53)

...but did not have significant cardiac and respiratory disease (although 1/3 had elevated RVSP)

New York Heart Association functional class	
I	6 (20)
II	11 (37)
III	11 (37)
IV	2 (7)
Patients with comorbidity	
≥1 respiratory conditions on history†	10 (33)
≥1 cardiac conditions on history‡	7 (23)
Cardiac function on Doppler-echocardiography	
Left ventricular function	
LVEF, %	61 ± 9
No. of patients with LVEF <40%	0 (0)
No. of patients with LVEF between 40% and 55%	9 (30)
No. of patients with inducible myocardial ischemia on stress echocardiography	0 (0)
No. of patients with significant valvular heart disease§	2 (7)
Pulmonary hypertension 	
RVSP, mm Hg	32 ± 8
No. of patients with RVSP >28 mm Hg	10 (33)

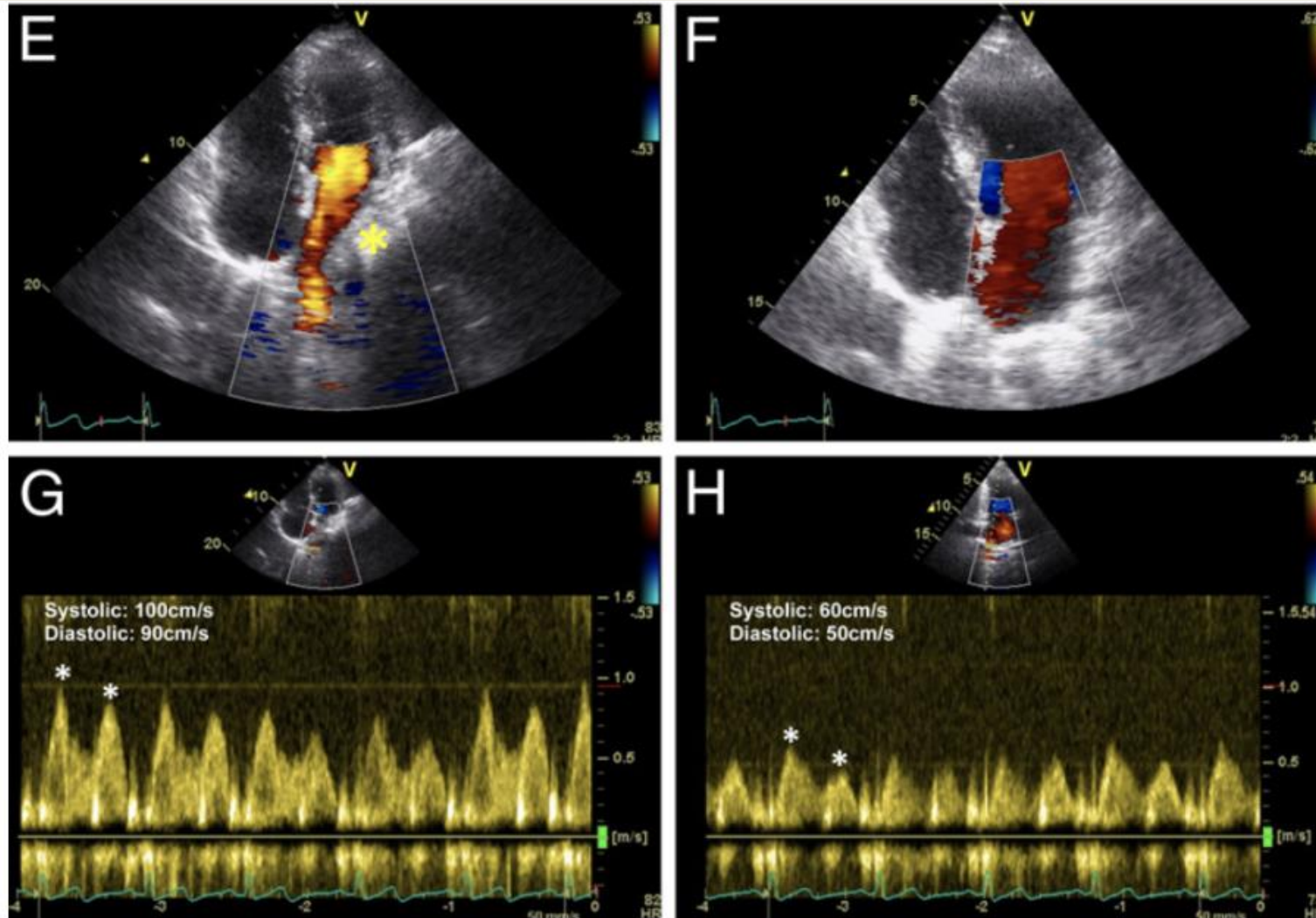
the LA diameter increases post-operatively on CT and ultrasound



the LA diameter increases post-operatively on CT and ultrasound

Pre-operative

Post-operative



moderate-to-severe LA compression was found in 77% patients with CT and 65% with US

Table 2 Quantitative Cardiac Parameters Before and After Hiatal Hernia Repair Stratified by Left Atrial Compression Severity

Echocardiography	All Patients (n = 30)			No LA Compression (n = 2)			Mild LA Compression (n = 8)			Moderate LA Compression (n = 13)			Severe LA Compression (n = 7)		
	Pre-Operation	Post-Operation	p Value	Pre-Operation	Post-Operation	p Value	Pre-Operation	Post-Operation	p Value	Pre-Operation	Post-Operation	p Value	Pre-Operation	Post-Operation	p Value
LA diameter, mm	25 ± 8	36 ± 6	<0.001	31 ± 7	30 ± 8	†	33 ± 7	37 ± 7	0.13	24 ± 6	36 ± 6	<0.001	17 ± 5	36 ± 5	<0.001
LA inflow velocity, cm/s*															
Systolic	88 ± 24	74 ± 16	0.003	77 ± 8	85 ± 6	†	79 ± 15	75 ± 17	0.68	87 ± 25	72 ± 15	0.04	103 ± 29	73 ± 19	0.002
Diastolic	72 ± 23	54 ± 16	0.004	59 ± 18	60 ± 6	†	69 ± 22	57 ± 18	0.24	70 ± 23	55 ± 19	0.09	86 ± 27	47 ± 8	0.04

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NYHA class and exercise capacity improved post-op

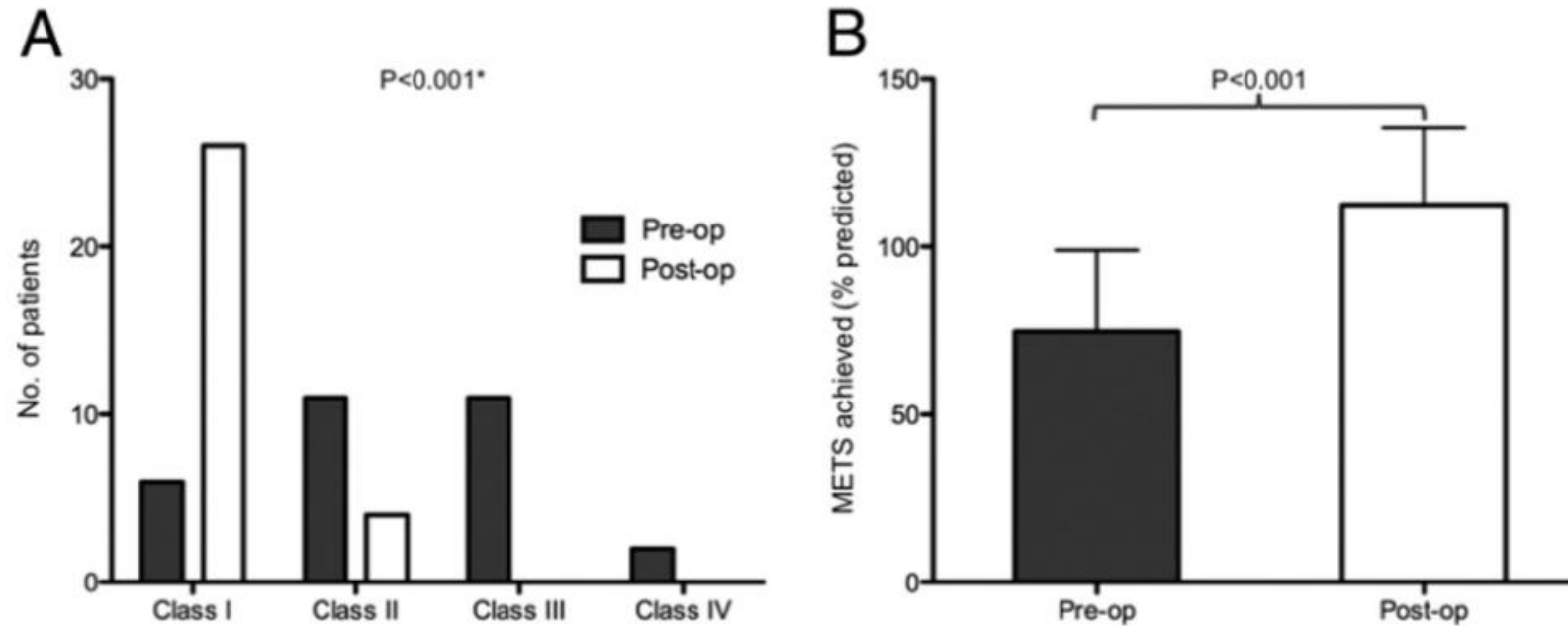


Figure 4 Change in Functional Class and Exercise Capacity After HH Repair

Change in New York Heart Association functional class (**A**) and mean exercise capacity (**B**) after hiatal hernia repair. Exercise capacity defined as metabolic equivalents (METS) achieved expressed as a percentage of age-predicted values. *p value for chi-square test for trend.

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the only independent predictor of improved exercise capacity after HH repair was the change in LA diameter on echo

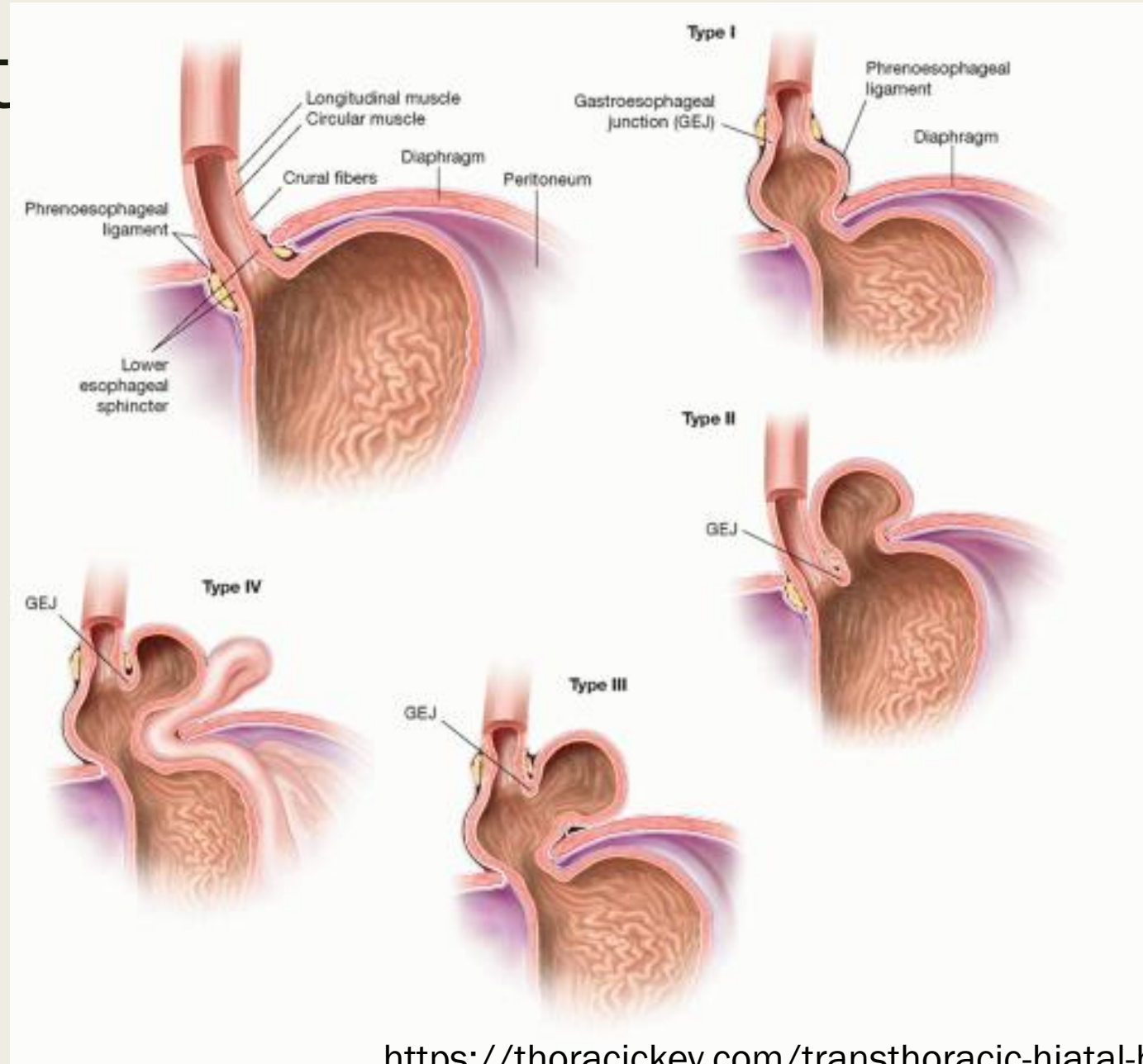
Table 4 Relationship Between Exercise Capacity Improvement Following Hiatal Hernia Repair and Changes in Cardiorespiratory Parameters

Cardiorespiratory Parameter	Mean Change Post-Operation	Univariate Analysis*		Multivariate Analysis†	
		R ²	p Value	Regression Coefficient	p Value
Echocardiographic					
LA diameter, mm	11 ± 9	0.34	<0.001	10.3 (3.4)	0.006
LA inflow velocities, cm/s					
Systolic	-14 ± 24	0.12	0.06	—	—
Diastolic	-17 ± 26	0.03	0.45	—	—
RVSP, mm Hg	2 ± 13	0.01	0.71	—	—
LV ejection fraction	-1 ± 11	0.0004	0.92	—	—
Cardiac CT					
LA volume, ml	9 ± 15	0.02	0.47	—	—
IPV diameter, mm					
Right	1 ± 2	0.18	0.02	18.9 (11.0)	0.10
Left	2 ± 2	0.08	0.15	—	—
LV volumes, ml					
End-diastolic	7 ± 23	0.0005	0.91	—	—
End-systolic	3 ± 13	0.01	0.64	—	—

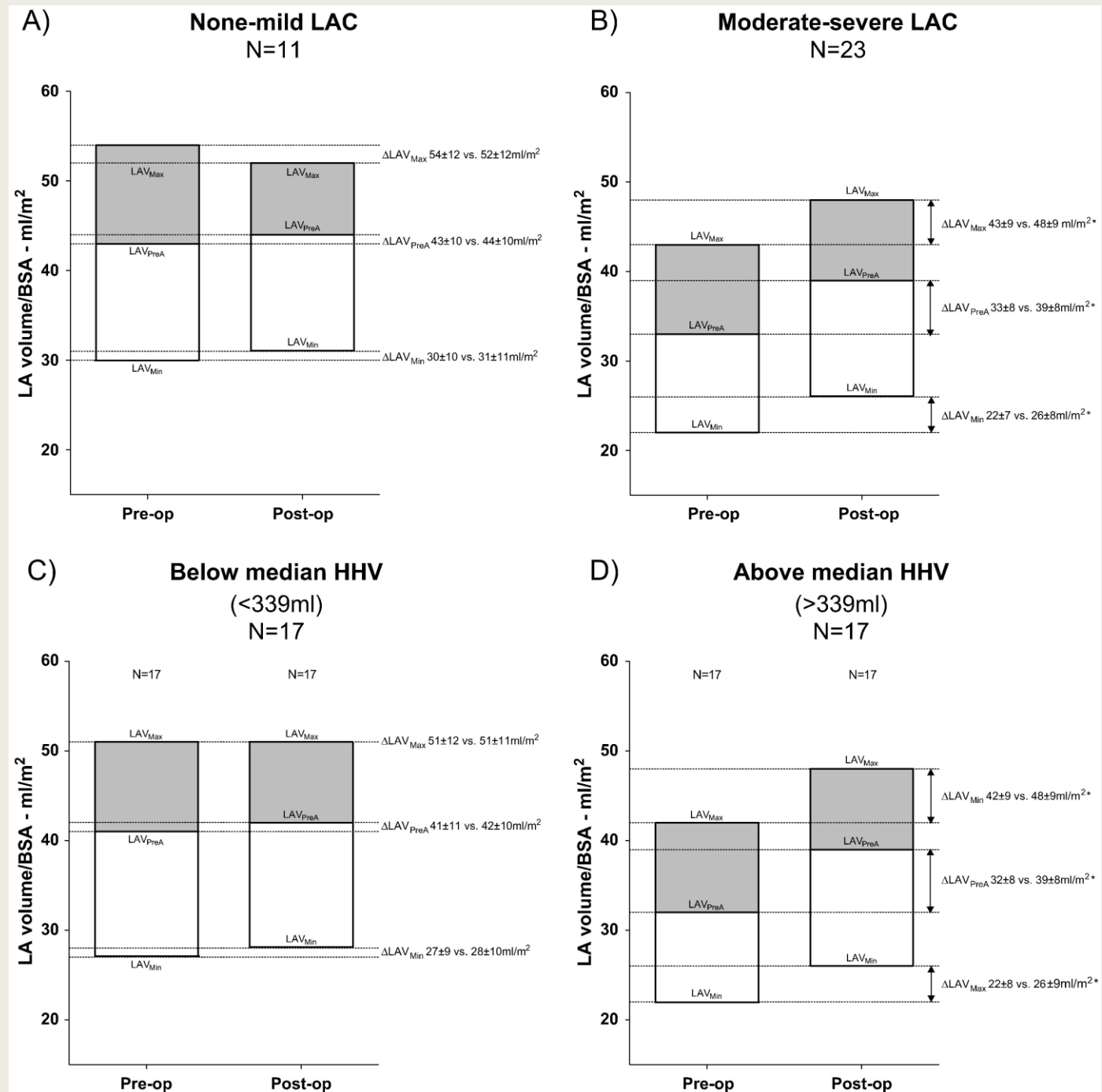
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- Naoum, Christopher, et al. "Left atrial compression and the mechanism of exercise impairment in patients with a large hiatal hernia." *Journal of the American College of Cardiology* 58.15 (2011): 1624-1634.
- "Hiatal hernia squeezing the heart to flutter." *The American journal of emergency medicine* 32.4 (2014): 392-e1.
- Paroxysmal postprandial atrial fibrillation suppressed by laparoscopic repair of a giant paraesophageal hernia compressing the left atrium."
- Naoum, Christopher, et al. "Modulation of phasic left atrial function and left ventricular filling in patients with extrinsic left atrial compression by hiatal hernia." *International journal of cardiology* 176.3 (2014): 1176-1178.

there are 4 t



decreased LA filling leads to exercise induced dyspnea



Naoum, Christopher, et al. "Modulation of phasic left atrial function and left ventricular filling in patients with extrinsic left atrial compression by hiatal hernia." *International journal of cardiology* 176.3 (2014): 1176-1178.

Table 1**Baseline Characteristics and
Cardiac and Respiratory Function (N = 30)**

Demographic and clinical characteristics

Age, yrs	70 ± 10
Female	23 (77)
Heart rate, beats/min	79 (70–85)
Systolic blood pressure, mm Hg	130 (130–135)
Body mass index, kg/m ²	30.9 (26.6–34.5)

Hiatal hernia size and classification

Volume on computed tomography, ml	400 (248–596)
Percentage of intrathoracic stomach (intraoperative)	
30%–50%	2 (7)
50%–75%	21 (70)
75%–100%	7 (23)
Classification*	
Type I	0 (0)
Type II	0 (0)
Type III	29 (97)
Type IV	1 (3)