Società Italiana di Ecografia Cardiovascolare

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COME MONITORARE GLI EFFETTI DEI FARMACI: FE O VALUTAZIONE PORTATA?

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Dip. Di Cardiologia pediatrica e cardiopatie congenite dell'adulto

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NON SOLO ECOCARDIOGRAFIA….

European Heart Journal (2004) 25, 1788–1796

ELSEVIER

EUROPEAN SOCIETY OF CARDIOLOGY

Clinical research

Comparison of echocardiography and plasma B-type natriuretic peptide for monitoring the response to treatment in acute heart failure

Andrzej Gackowski[a,b,1,2], Richard Isnard[a,*,2], Jean-Louis Golmard[c], Françoise Pousset[a], Alain Carayon[a], Gilles Montalescot[a], Jean-Sébastien Hulot[a], Daniel Thomas[a], Wieslawa Piwowarska[b], Michel Komajda[a]

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Conclusion

We demonstrate that serial evaluation of plasma BNP concentration is an effective method for assessing prognosis and response to therapy in a non-selected acute heart failure population. Lack of initial decrease of BNP plasma levels during first day as well as plasma BNP after the first week of treatment provided incremental prognostic information over clinical presentation and repetitive echocardiographic examination. Our results suggest an interesting and useful application of such a non-invasive biochemical monitoring in this severely ill group of patients. Further studies testing this approach in larger populations are warranted.

ELSEVIER

The European Journal of Heart Failure 7 (2005) 815–819

The European Journal of Heart Failure

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Short communication

Echocardiographic ejection fraction in patients with acute heart failure: correlations with hemodynamic, clinical, and neurohormonal measures and short-term outcome

Nir Uriel[a], Guillermo Torre-Amione[b], Olga Milo[a], Edo Kaluski[a], Loïc Perchenet[c], Alex Blatt[a], Isaac Kobrin[c], Arkadi Turnovski[a], Shoshana Kaplan[a], Maurizio Rainisio[c], Aline Frey[c], Zvi Vered[a], Gad Cotter[d,*]

Abstract

Background: Although echocardiographic ejection fraction (EF) is frequently used for the estimation of left ventricular contractility in patients with acute heart failure, its exact role and correlations with clinical, hemodynamic, and neurohormonal variables of cardiac contractility is not known.

Methods: Patients (343) with acute heart failure, enrolled into two prospective placebo-controlled hemodynamic studies of tezosentan, and in whom EF was available at baseline, were included. Outcome was evaluated in a subset of 94 patients who were enrolled in the placebo arms of the studies.

Results: Higher echocardiographic EF was correlated with older age, increased incidence of hypertension and atrial fibrillation, and female gender. We observed weak correlation between EF and cardiac output or cardiac power and no correlation with wedge pressure, and the change in hemodynamic variables over time. Higher EF was correlated with more baseline leukocytosis and higher plasma levels of endothelin-1 and blood urea nitrogen, while lower EF was related to higher baseline B-type natriuretic peptide (BNP). We observed no overall correlations between EF and outcome.

Conclusions: In patients with acute heart failure, echocardiographic EF is weakly correlated with hemodynamic measures of left ventricular contractility and outcome; hence, it should be interpreted cautiously when evaluating patients admitted due to acute heart failure.

Keywords: Acute heart failure; Ejection fraction; Left ventricular contractility

Recommendations for the diagnostic investigations in ambulatory patients suspected of having heart failure[c]

Recommendations	Class[a]	Level[b]
Investigations to consider in all patients		
Transthoracic echocardiography is recommended to evaluate cardiac structure and function, including diastolic function (Section 4.1.2), and to measure LVEF to make the diagnosis of HF, assist in planning and monitoring of treatment, and to obtain prognostic information.	I	C
A 12-lead ECG is recommended to determine heart rhythm, heart rate, QRS morphology, and QRS duration, and to detect other relevant abnormalities (*Table 5*). This information also assists in planning treatment and is of prognostic importance. A completely normal ECG makes systolic HF unlikely.	I	C
Measurement of blood chemistry (including sodium, potassium, calcium, urea/blood urea nitrogen, creatinine/estimated glomerular filtration rate, liver enzymes and bilirubin, ferritin/TIBC) and thyroid function is recommended to: (i) Evaluate patient suitability for diuretic, renin–angiotensin–aldosterone antagonist, and anticoagulant therapy (and monitor treatment) (ii) Detect reversible/treatable causes of HF (e.g. hypocalcaemia, thyroid dysfunction) and co-morbidities (e.g. iron deficiency) (iii) Obtain prognostic information.	I	C
A complete blood count is recommended to: (i) Detect anaemia, which may be an alternative cause of the patient's symptoms and signs and may cause worsening of HF (ii) Obtain prognostic information.	I	C
Measurement of natriuretic peptide (BNP, NT-proBNP, or MR-proANP) should be considered to: (i) Exclude alternative causes of dyspnoea (if the level is below the exclusion cut-point–*see Figure 1*–HF is very unlikely) (ii) Obtain prognostic information.	IIa	C
A chest radiograph (X-ray) should be considered to detect/exclude certain types of lung disease, e.g. cancer (does not exclude asthma/COPD). It may also identify pulmonary congestion/oedema and is more useful in patients with suspected HF in the acute setting.	IIa	C

FRAZIONE D'EIEZIONE

Percentuale di volume ematico, espulso dal ventricolo durante la sistole completa, rispetto al volume massimo diastolico.

$$\mathbf{FE} = \frac{\text{Volume telediastolico} - \text{Volume telesistolico}}{\text{Volume telediastolico}} \times 100$$

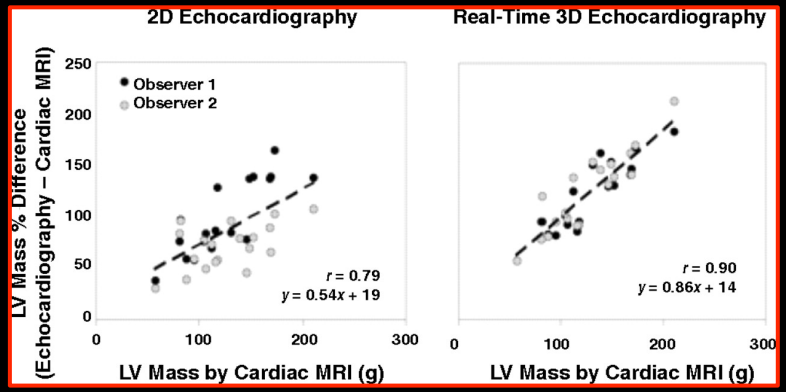
o altrimenti

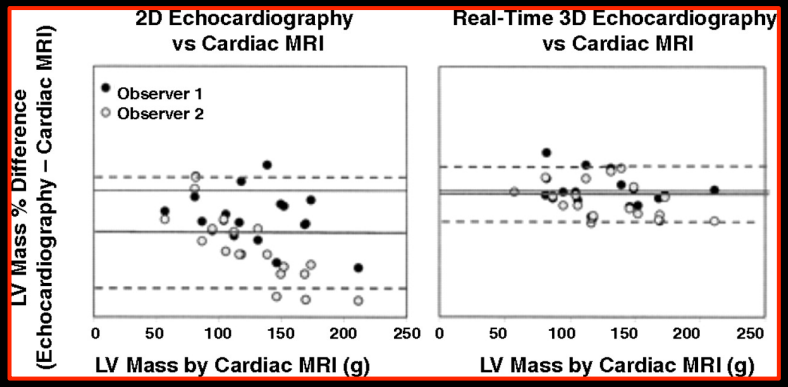
$$\mathbf{FE} = \frac{\text{Gittata Sistolica}}{\text{Volume telediastolico}} \times 100$$

Valori Normali >50/55/60%.

VOLUMETRIE VENTRICOLARI E FE

- Accuratezza
- Ripetibilità
- È proprio necessario sapere il volume esatto?
- Importanza della ripetibilità: se l'errore si ripete in modo sistematico il dato ricavato è ancora clinicamente fruibile.



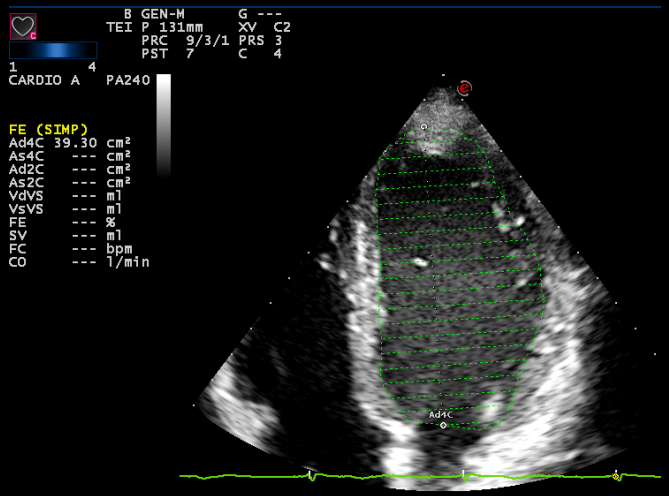


Houck, R. C. et al. Am. J. Roentgenol. 2006;187:1092-1106

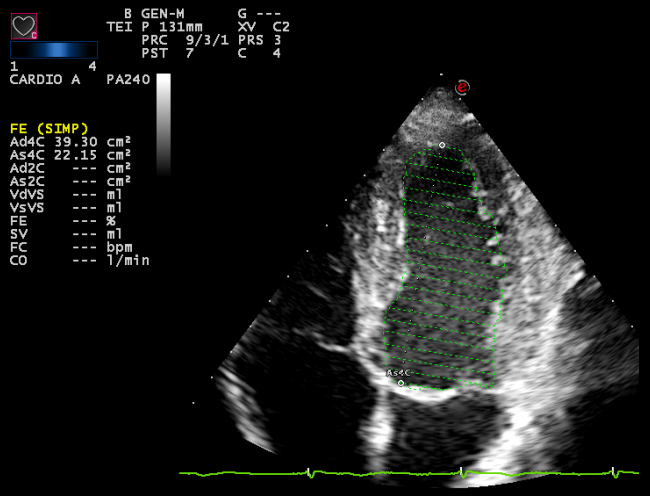
MISURE **B MODE**

VOLUMETRIA DEL VENTRICOLO SINISTRO (SIMPSON BIPLANO)

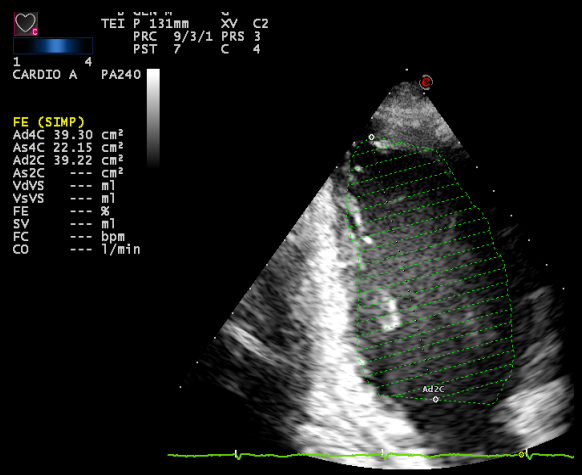
Diastole 4 Ch



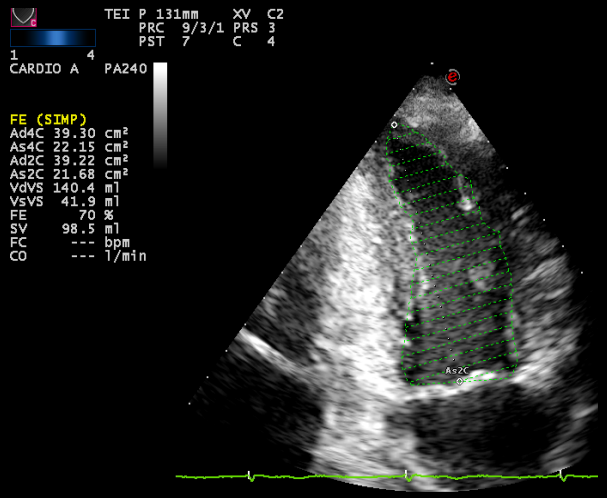
Sistole 4 Ch



Diastole 2 Ch



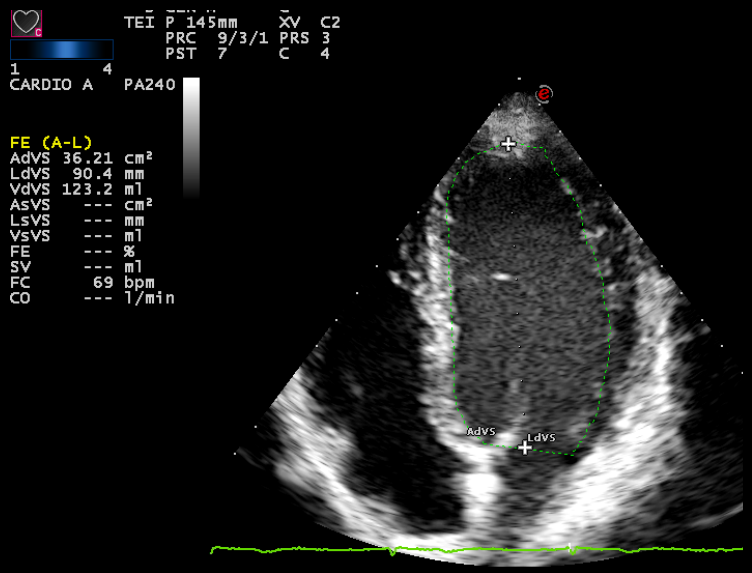
Sistole 2 Ch



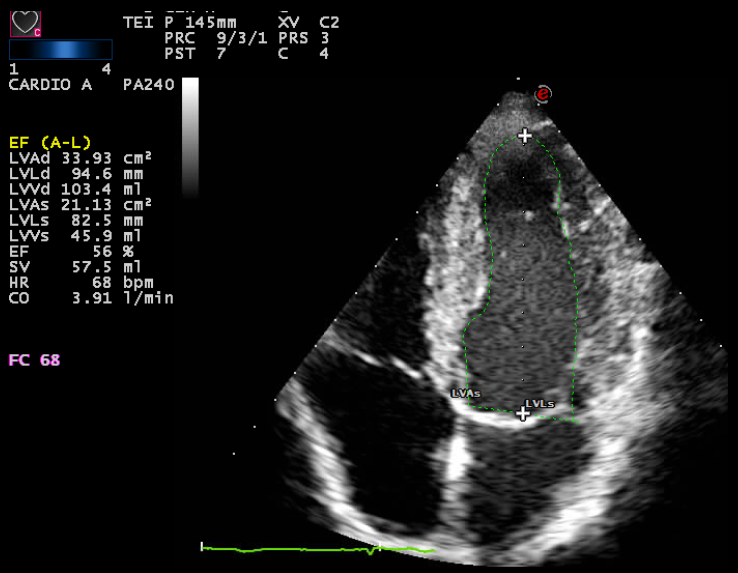
MISURE **B MODE**

VOLUMETRIA DEL VENTRICOLO SINISTRO (AREA/LUNGHEZZA)

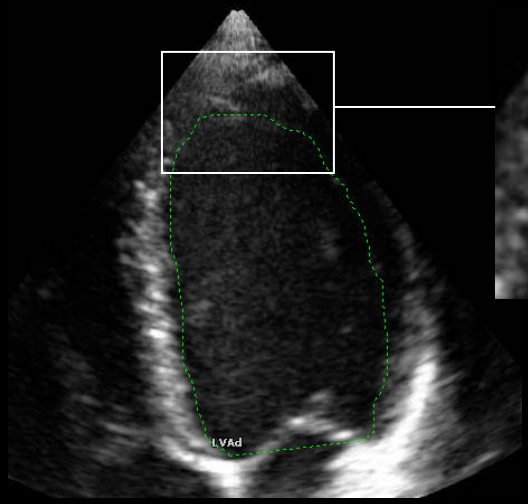
Diastole 4 Ch

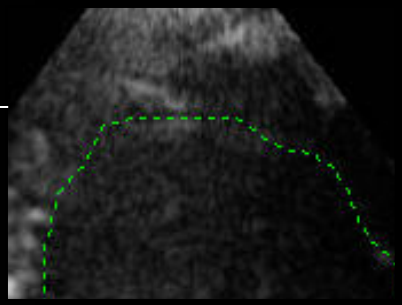


Sistole 4 Ch

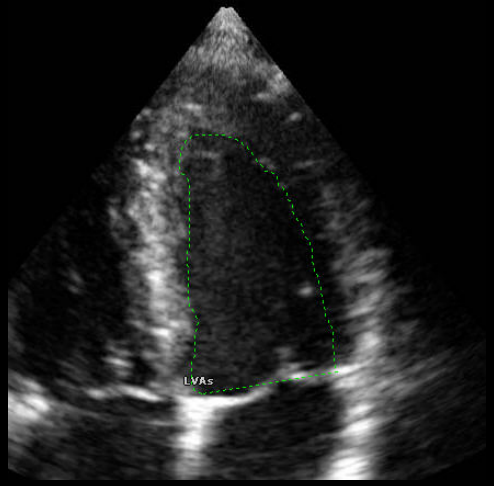


PRIMA VALUTAZIONE VISIVA E MISURAZIONE MANUALE
RISCHIO DI BIAS POSITIVI





1 Pixel = 0.33 mm



EDVol=126 or 132 ml ?

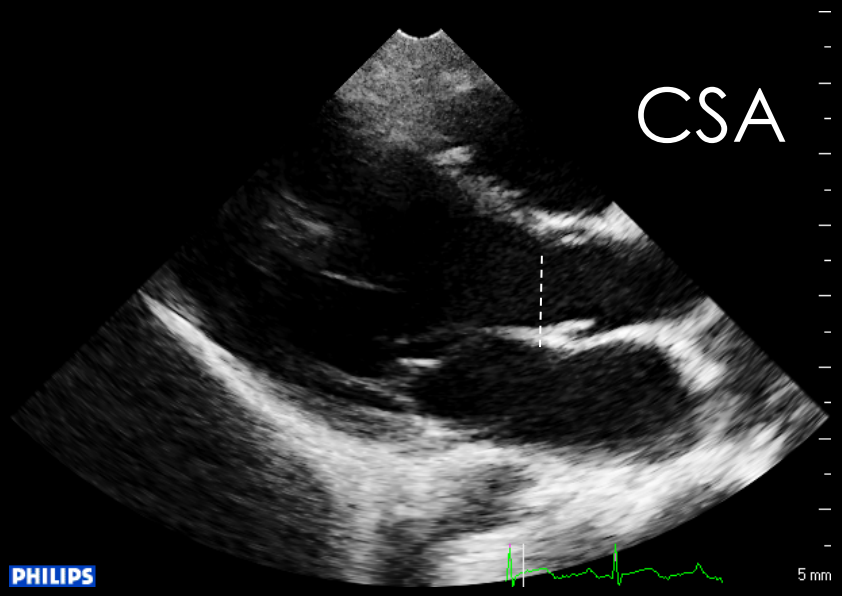
ESVol=61 or 58 ml ?

$$EF = \frac{126 - 61}{126} = 52\%$$

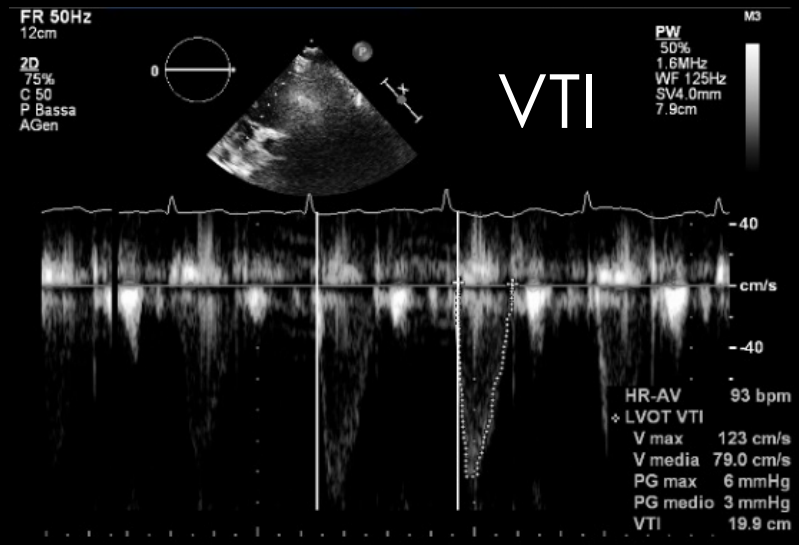
$$EF = \frac{132 - 58}{132} = 56\%$$

Eseguire periodicamente test di variabilità con metodo area lunghezza

GITTATA SISTOLICA



X



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FOCUS ISSUE: STRUCTURAL HEART DISEASE

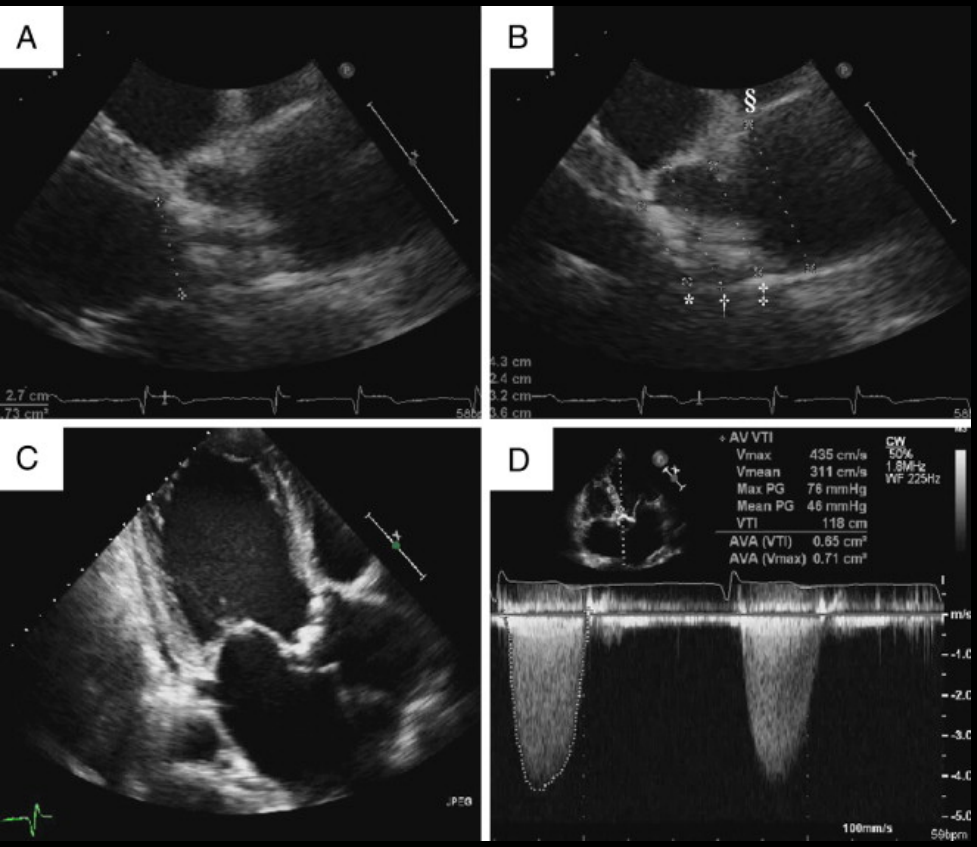
Clinical Research

Multimodality Imaging in Transcatheter Aortic Valve Implantation and Post-Procedural Aortic Regurgitation

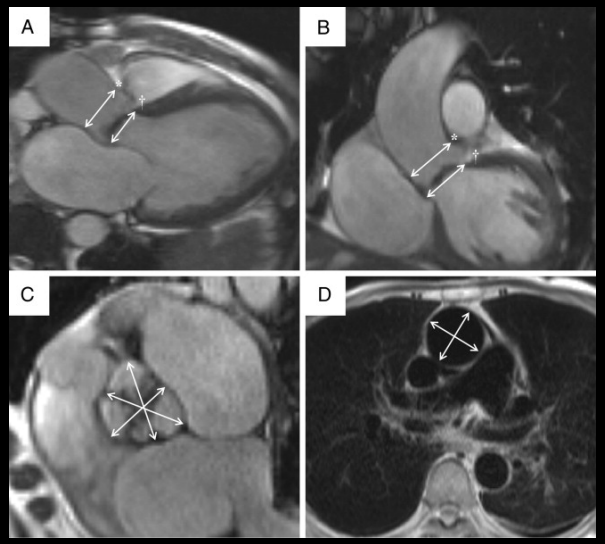
Comparison Among Cardiovascular Magnetic Resonance, Cardiac Computed Tomography, and Echocardiography

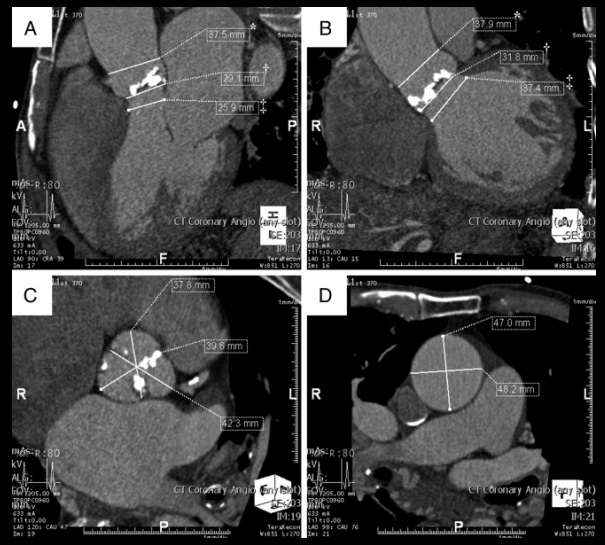
Andrew Jabbour, MBBS, PhD,*† Tevfik F. Ismail, BSc (Hons), MBBS,*† Neil Moat, MBBS, MS*† Ankur Gulati, MBBCh,*† Isabelle Roussin, MBBCh,*† Francisco Alpendurada, MD,*† Bradley Park, MSc,* Francois Okoroafor,* Anita Asgar, MD,* Sarah Barker, MSc,* Simon Davies, MD,* Sanjay K. Prasad, MD,*† Michael Rubens, MBBS,* Raad H. Mohiaddin, MD, PhD*†

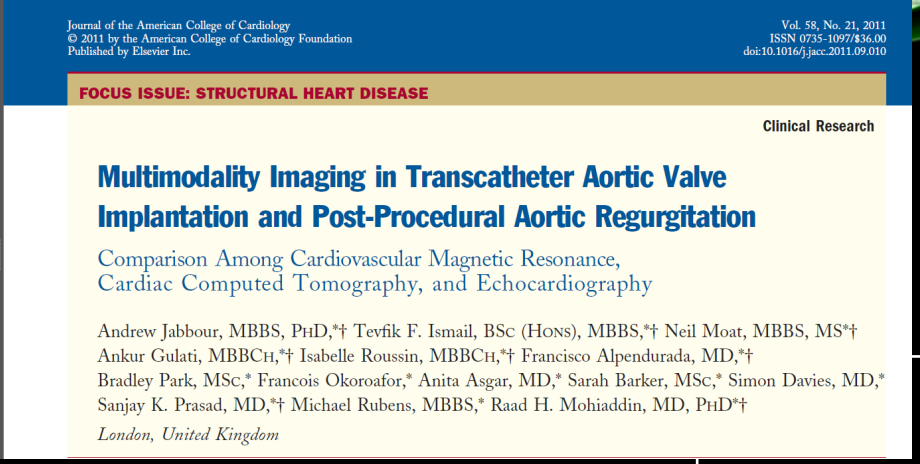
London, United Kingdom



ACCURATEZZA NELLA MISURA DELL'ANNULUS AORTICO







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London, United Kingdom

ACCURATEZZA NELLA MISURA DELL'ANNULUS AORTICO

	CMR	CCT	TTE
Aortic valve annulus			
Intraobserver variability	1.7	3.6	6.8
Interobserver variability	5.1	10.6	8.9
Sinus of Valsalva			
Intraobserver variability	0.6	2.7	3.9
Interobserver variability	2.7	4.7	4.7
Sinotubular Junction			
Intraobserver variability	1.6	6.5	8.0
Interobserver variability	3.1	10.9	9.0
Ascending aorta			
Intraobserver variability	1.4	4.5	10.3
Interobserver variability	2.1	4.8	10.4

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ACCURATEZZA NELLA MISURA DELLA PORTATA

ORIGINAL RESEARCH

Correlation of Stroke Volume Measurement between Sonosite Portable Echocardiogram and Edwards Flotrac Sensor-Vigileo Monitor in an Intensive Care Unit

Abstract

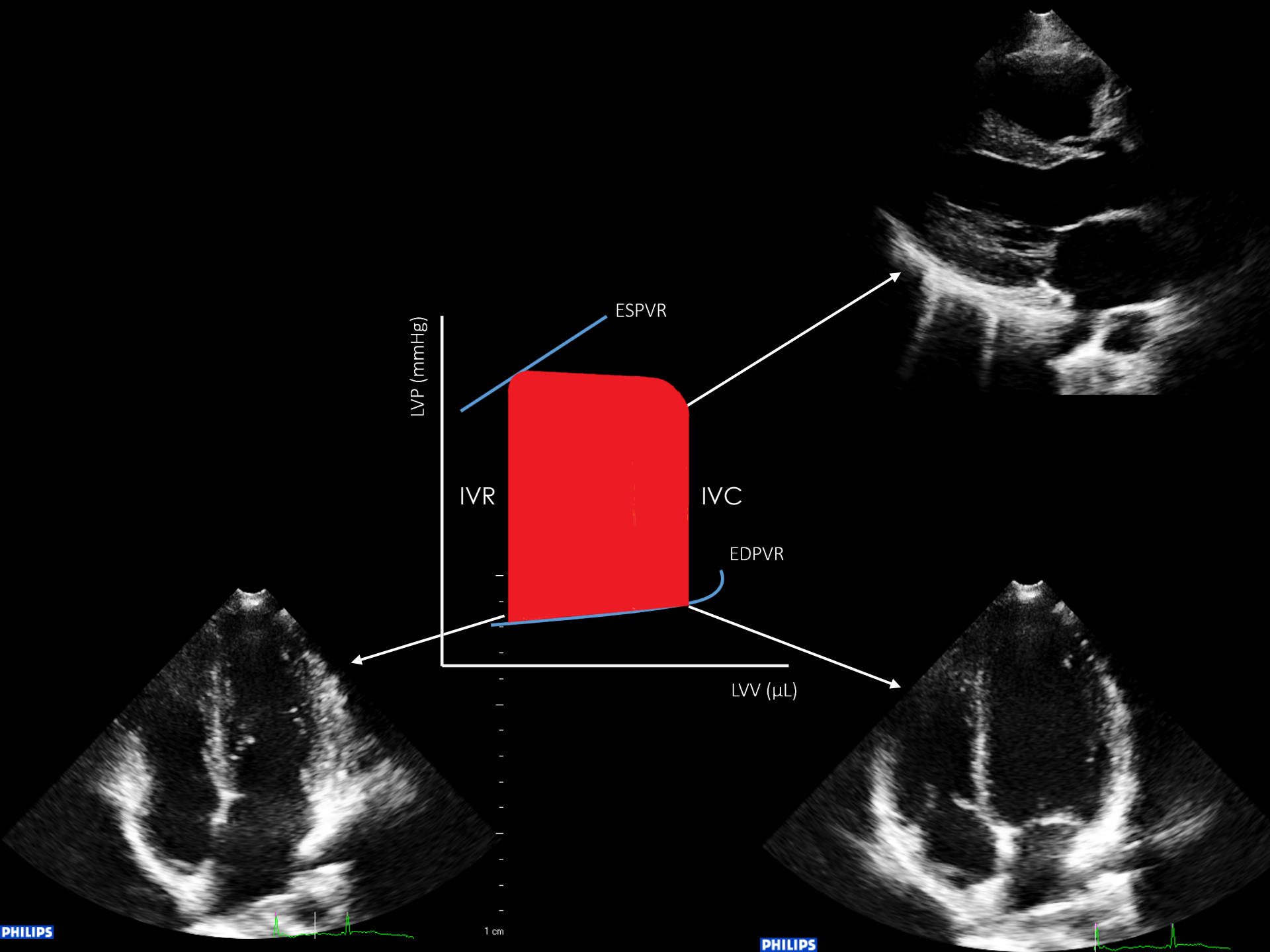
Purpose: Stroke volume (SV) is a parameter that is being recognized as an endpoint in fluid resuscitation algorithms. Its role is now being realized as an important variable in hemodynamic assessment in various clinical scenarios such as septic and cardiogenic shocks. Direct measurement of stroke volume (SV) and its novel corollary, stroke volume variation (SVV) derived by proprietary software, are preferred over mean cardiac output (CO) measurements because they render a more accurate reflection of hemodynamic status independent of heart rate. Flotrac-Vigileo monitor (FTV) (Edwards Lifesciences, Irvine, CA, USA) is a system that uses a complex algorithm analyzing arterial waveform to calculate SV, SVV, and CO. We assessed the feasibility of obtaining SV measurements with a portable echocardiogram and validated its accuracy with the FTV system in mechanically ventilated patients in our intensive care unit (ICU). Furthermore, we emphasized the importance of hemodynamic measurements and familiarity with critical care echocardiography for the intensivists.

Methods: Ten patients who were on mechanical ventilation were studied. A femoral arterial line was connected to the FTV system monitoring SV and CO. A portable echocardiogram (M-Turbo; Sonosite, Bothell, WA) was used to measure SV. CO was calculated by multiplying SV by heart rate. No patient had arrhythmia. We used biplane Simpson's method of discs to calculate SV in which subtraction of end-systolic volume from end-diastolic volume yields the SV.

Results: The comparison of simultaneous SV and CO measurements by echocardiography with FTV showed a strong correlation between the 2. (For SV, $y = 0.9545x + 3.3$, $R^2 = 0.98$ and for CO, $y = 0.9104x + 7.7074$, $R^2 = 0.97$).

Conclusions: In our small cohort, the SV and CO measured by a portable echocardiogram (Sonosite M-Turbo) appears to be closely correlated with their respective values measured by FTV. Portable echocardiography is a reliable noninvasive tool for the hemodynamic assessment of the critically ill. Its results need further validation with gold standard measures in a larger cohort of patients. However, our results suggest portable echocardiography could be an attractive tool in assessment of different hemodynamic scenarios in the critically ill.

Keywords: noninvasive hemodynamics, cardiac output, monitoring, stroke volume variation


ESPVR
LVP (mmHg)
IVR
IVC
EDPVR
LVV (µL)
PHILIPS
1 cm
PHILIPS

EFFETTO DELLE VARIAZIONI DEL PRECARICO SULLA GS
(MANTENENDO COSTANTE LA CONTRATTILITÀ)

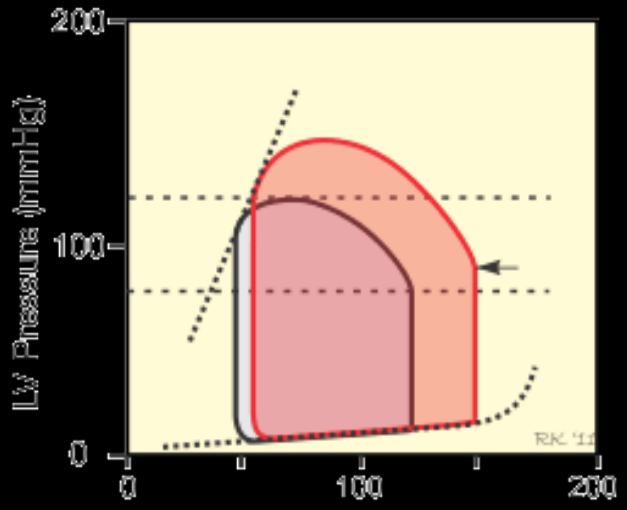
↑ Precarico

↑ **Gittata Sistolica**

↑ EDV

↑ ESV

= FE



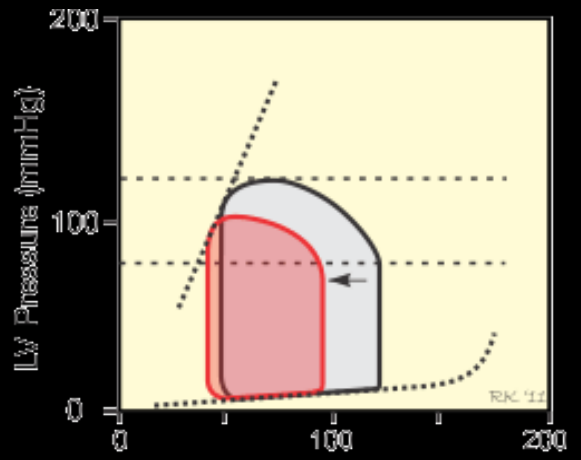
↓ Precarico

↓ **Gittata Sistolica**

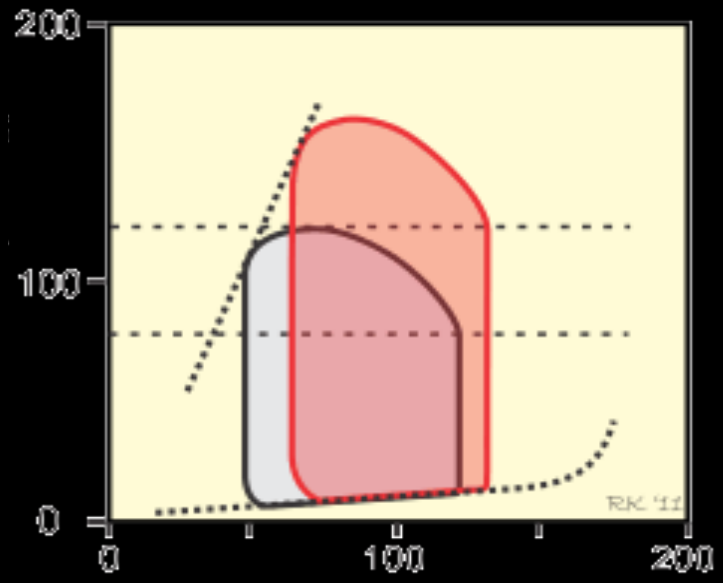
↓ EDV

↓ ESV

= FE



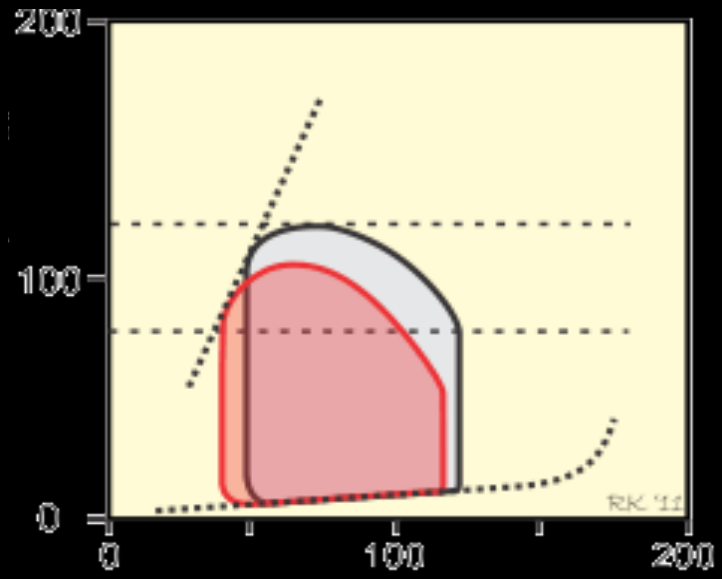
EFFETTO DELLE VARIAZIONI DEL POSTCARICO SULLA GS
(MANTENENDO COSTANTE LA CONTRATTILITÀ



Aumento del postcarico:

↑ EDV ↑ ESV

↓ Gittata Sistolica

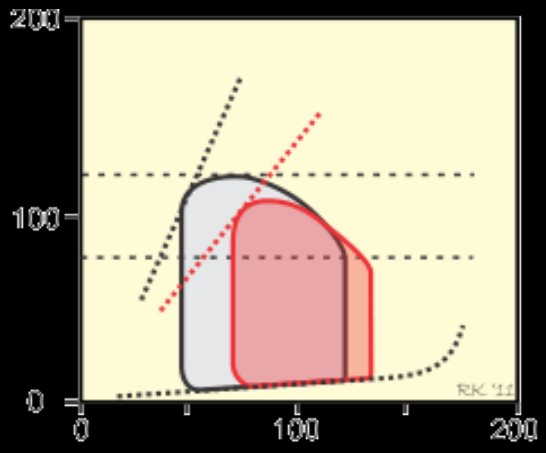


Diminuzione del postcarico:

↓ EDV ↓ ESV

↑ Gittata Sistolica

EFFETTO DELLE VARIAZIONI DELLA CONTRATTILITÀ

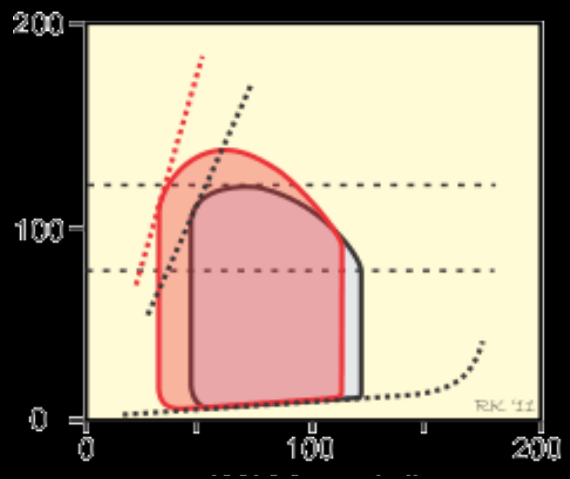


Diminuzione della contrattilità:

↓ Gittata Sistolica

↑ EDV ↑ ESV

EF ↓



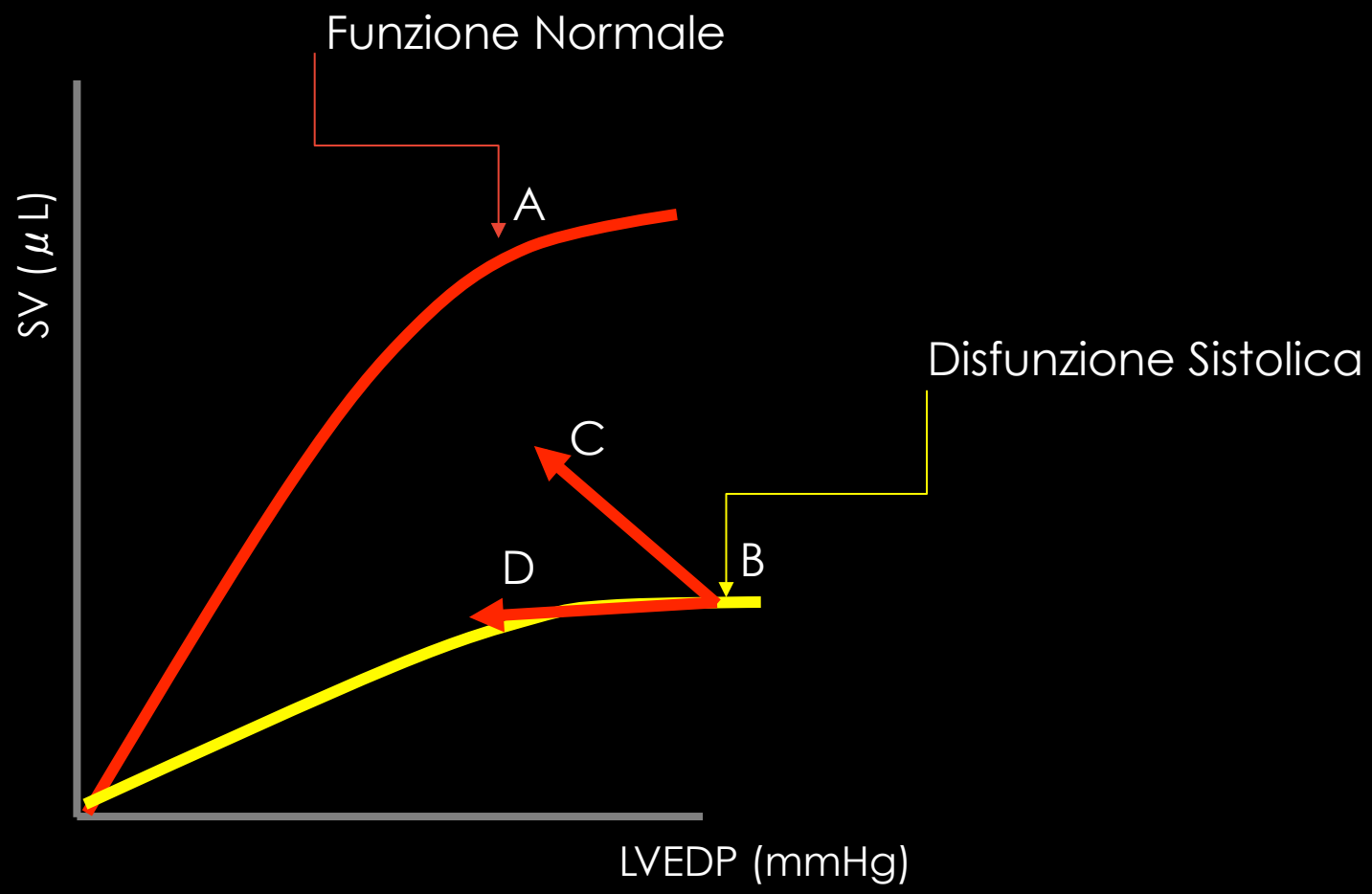
Aumento della contrattilità:

↑ Gittata Sistolica

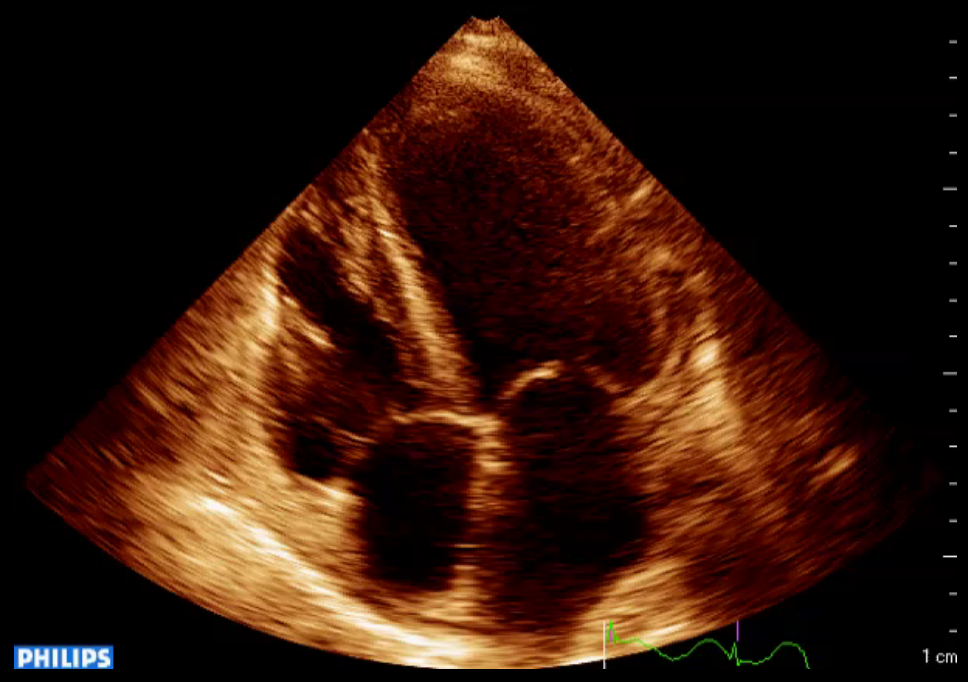
↓ EDV ↓ ESV

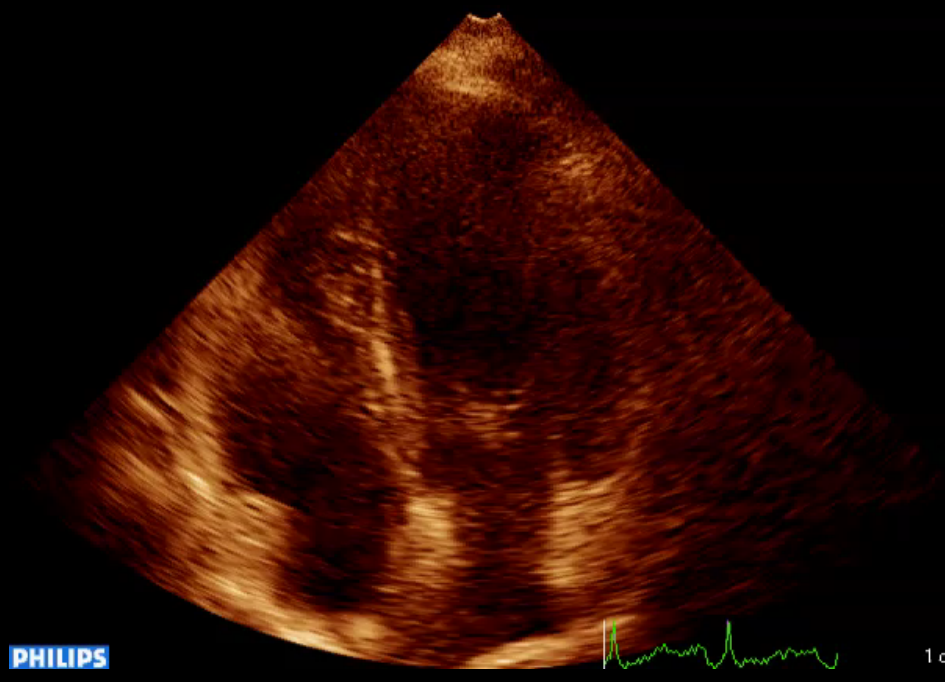
EF ↑

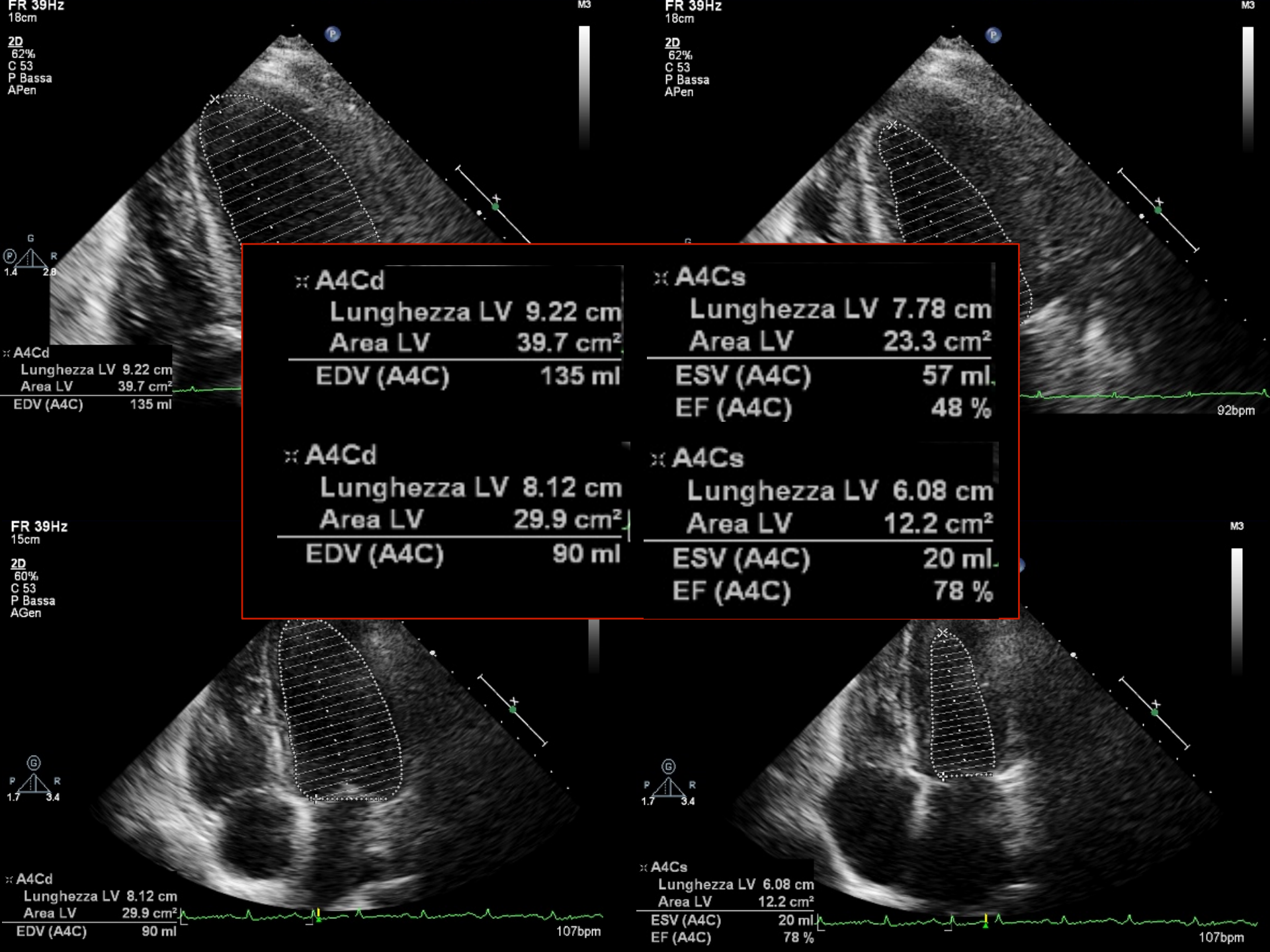
EFFETTO DEI FARMACI



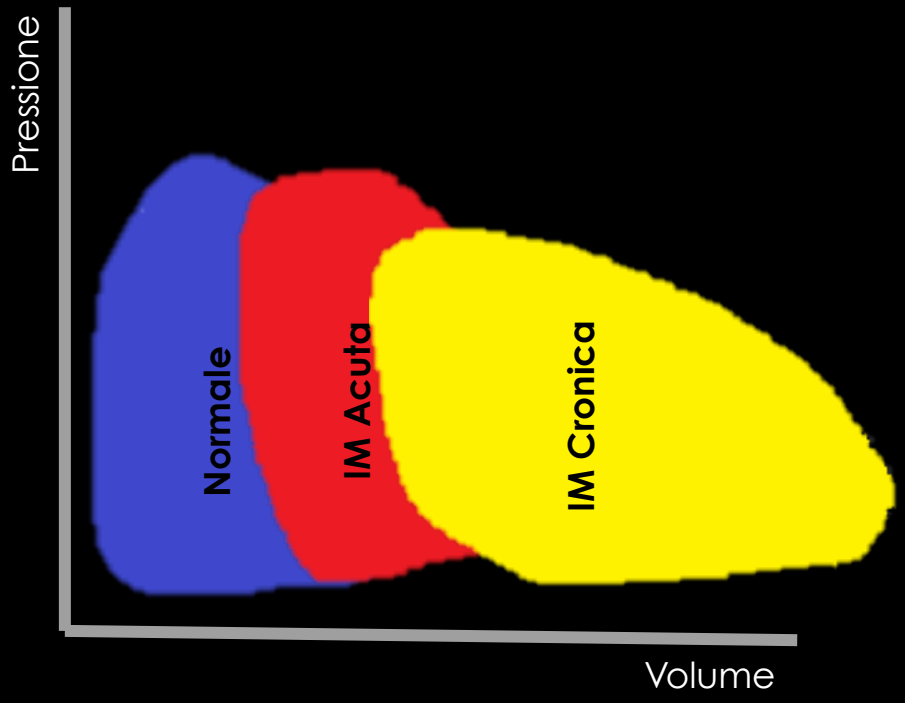
Effetto delle Variazioni del Postcarico

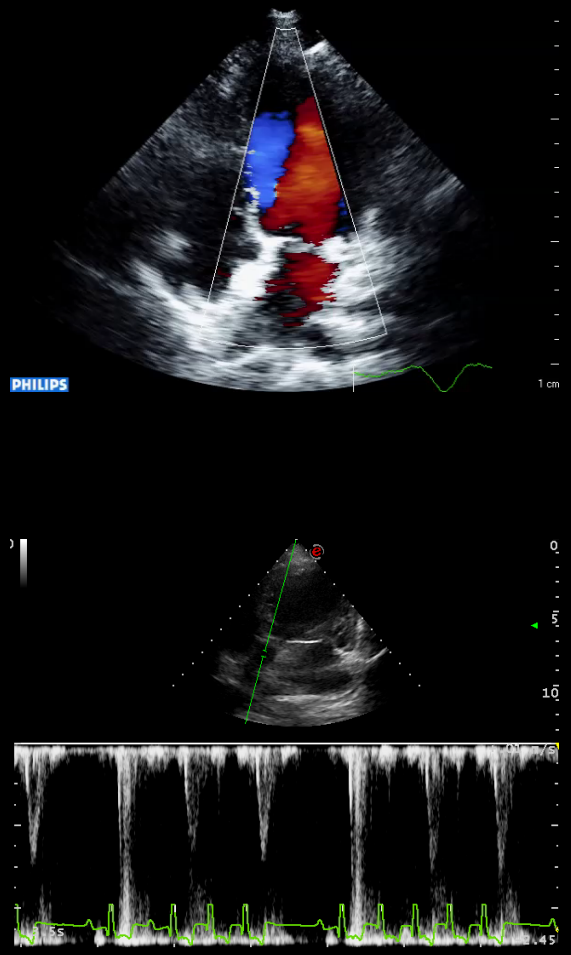




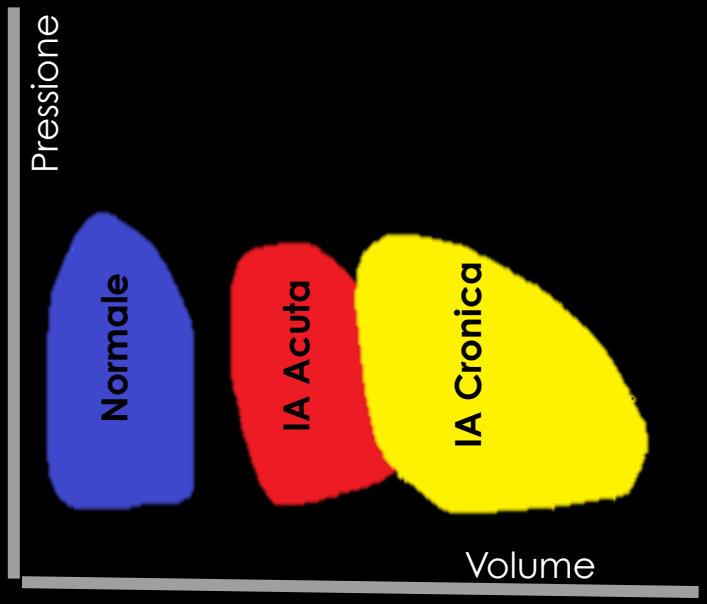

FR 39Hz
18cm
2D
62%
C 53
P Bassa
APen
M3
A4Cd
Lunghezza LV 9.22 cm
Area LV 39.7 cm²
EDV (A4C) 135 ml
A4Cs
Lunghezza LV 7.78 cm
Area LV 23.3 cm²
ESV (A4C) 57 ml
EF (A4C) 48 %
92bpm
A4Cd
Lunghezza LV 8.12 cm
Area LV 29.9 cm²
EDV (A4C) 90 ml
A4Cs
Lunghezza LV 6.08 cm
Area LV 12.2 cm²
ESV (A4C) 20 ml
EF (A4C) 78 %
FR 39Hz
15cm
2D
60%
C 53
P Bassa
AGen
107bpm

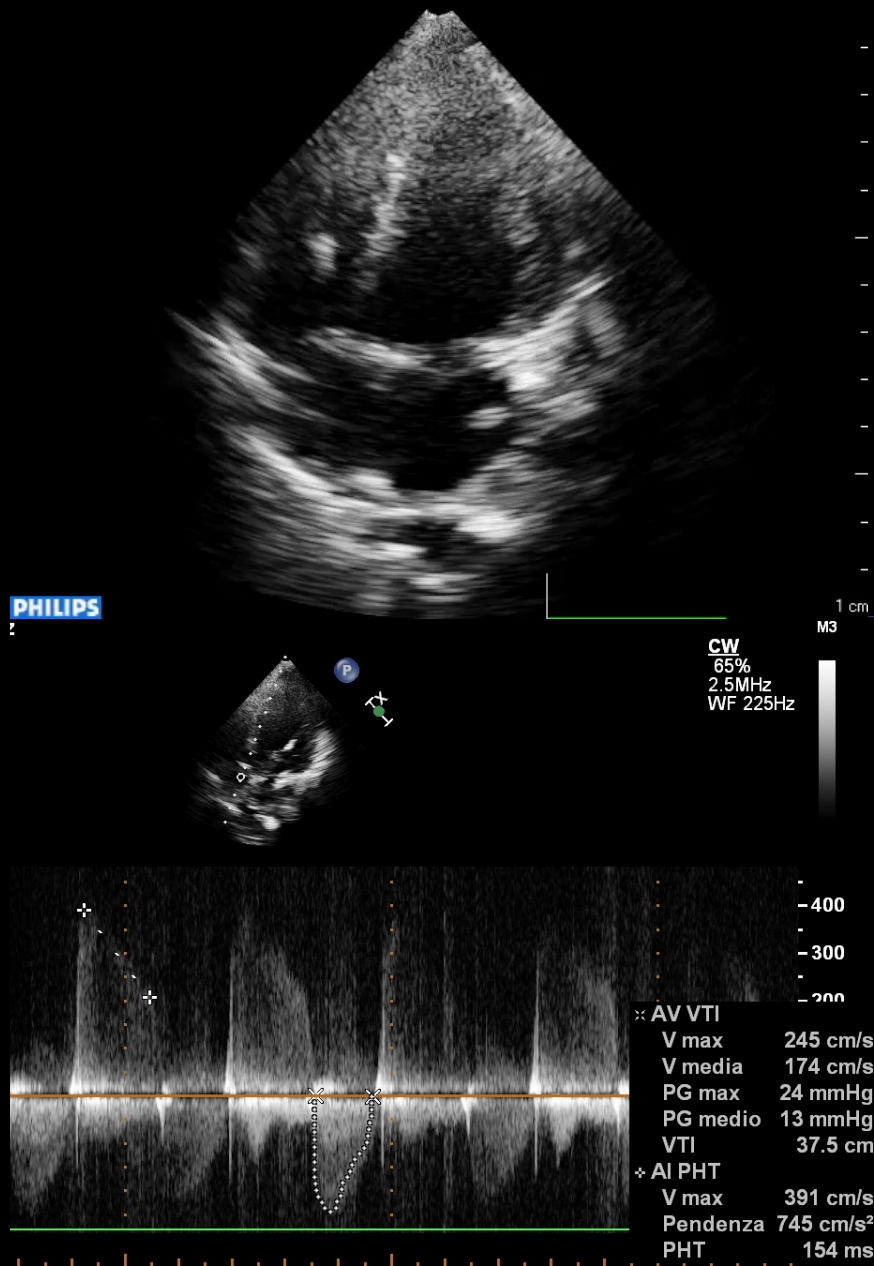
Una FE Normale non Sempre è Garanzia di una Gittata Adeguata





Una FE Normale non Sempre è Garanzia di una Gittata Adeguata





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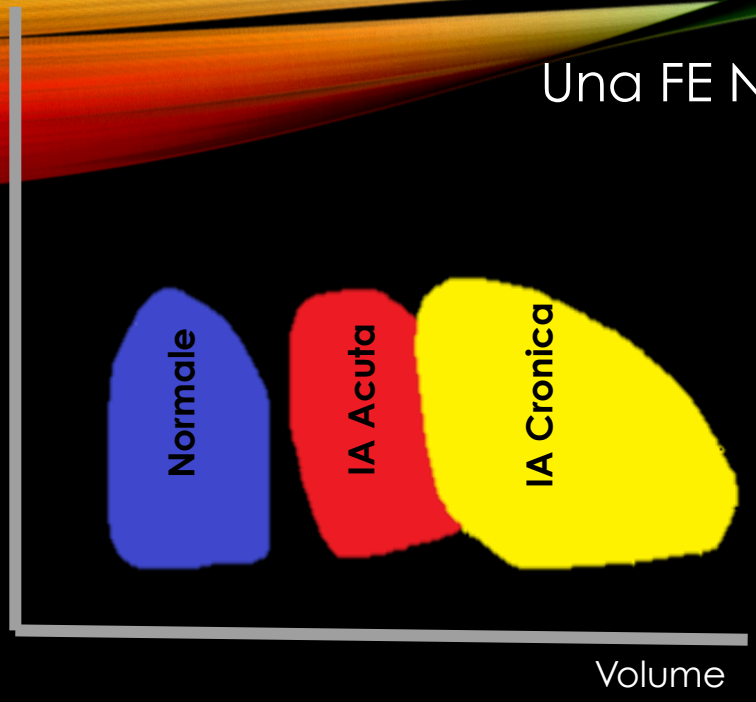

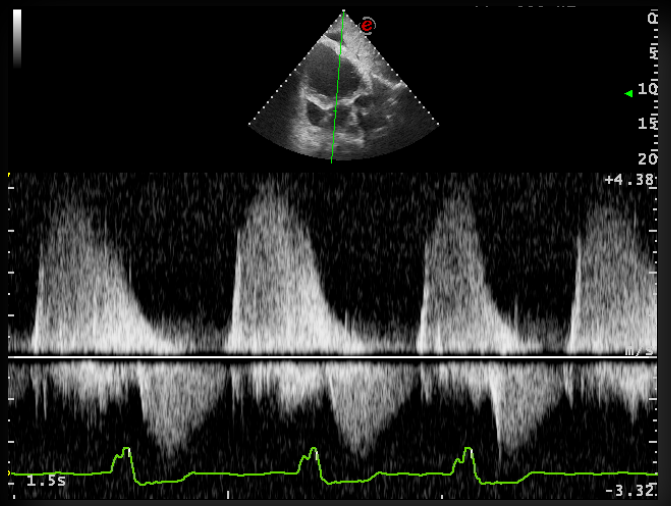

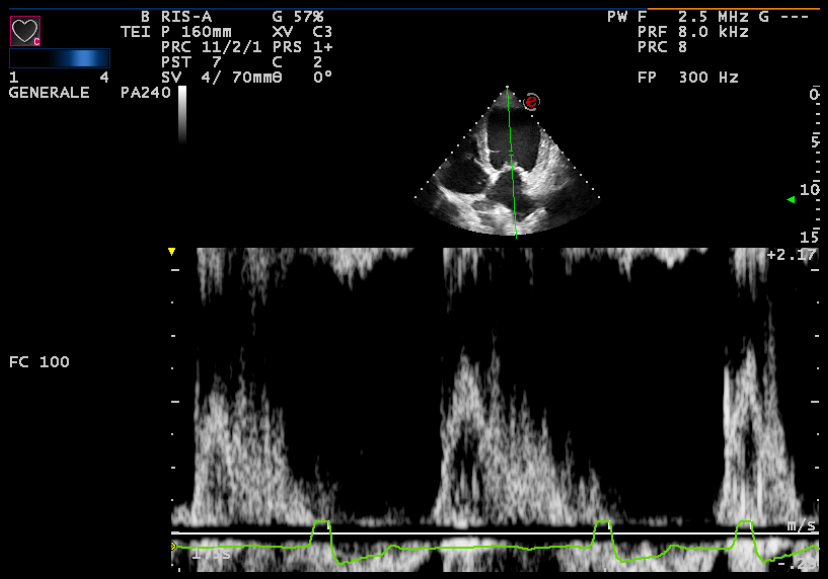

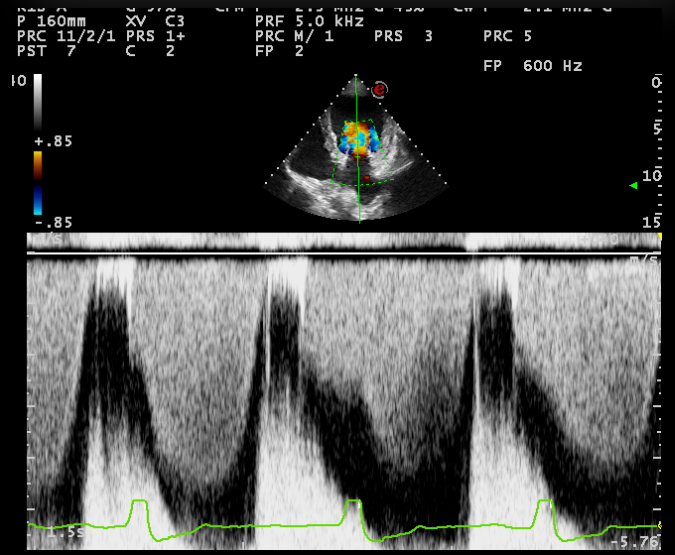

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Effects of Vasodilation in Heart Failure With Preserved or Reduced Ejection Fraction

Implications of Distinct Pathophysiologies on Response to Therapy

Shmuel Schwartzenberg, MD, Margaret M. Redfield, MD, Aaron M. From, MD, Paul Sorajja, MD, Rick A. Nishimura, MD, Barry A. Borlaug, MD

Rochester, Minnesota

Objectives The purpose of this study was to compare hemodynamic responses to vasodilator therapy in patients with heart failure (HF) and preserved ejection fraction (HFpEF) versus HF and reduced ejection fraction (HFrEF).

Background There is no proven therapy for HFpEF. In the absence of data, medicines with established benefit in HFrEF such as vasodilators are frequently prescribed for HFpEF.

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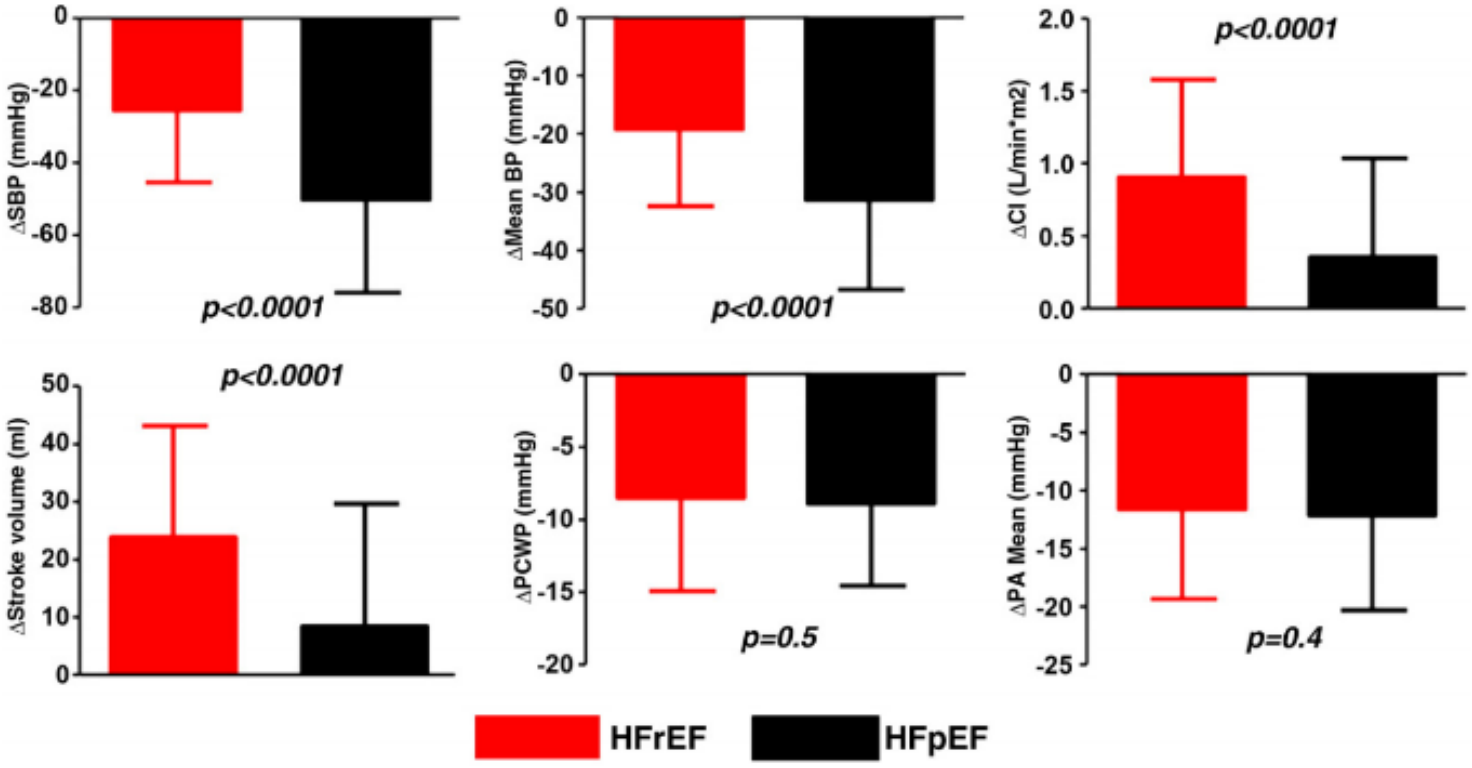
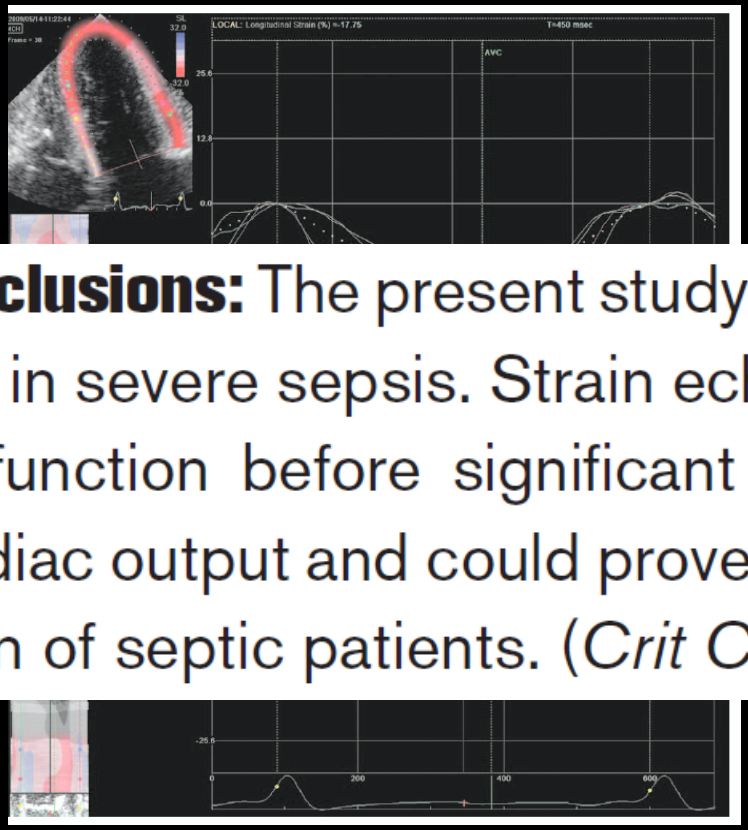


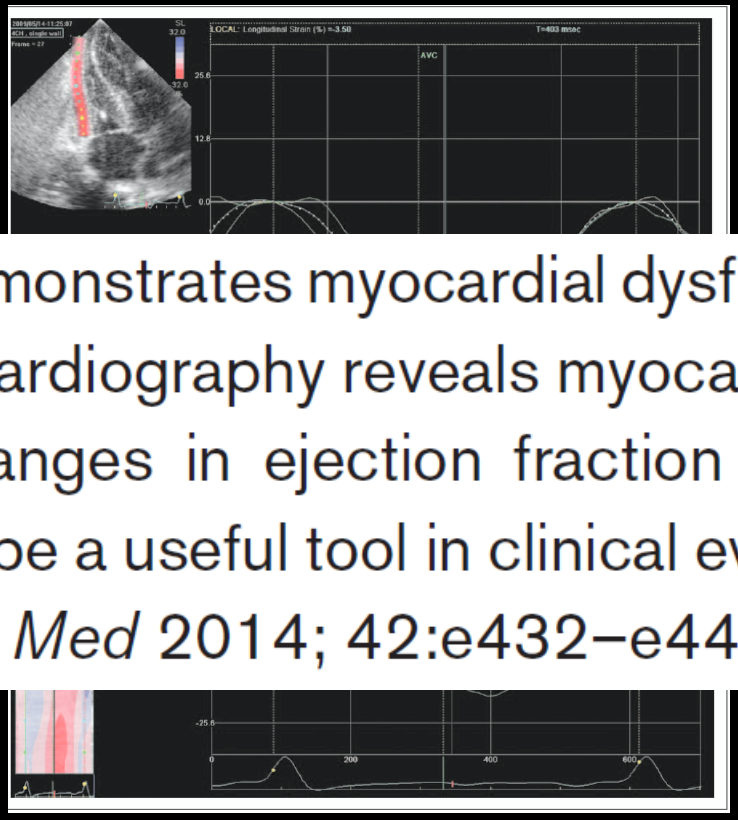
Figure 2 Peripheral and Central Hemodynamic Changes With Nitroprusside

Nitroprusside caused greater blood pressure (BP) reduction in heart failure with preserved ejection fraction (HFpEF) **(black)** compared with heart failure with reduced ejection fraction (HFrEF) **(red)**, whereas augmentation in stroke volume (SV) and cardiac output were greater in HFrEF compared with HFpEF. PCWP = pulmonary capillary wedge pressure; SBP = systolic blood pressure.

Advantages of Strain Echocardiography in Assessment of Myocardial Function in Severe Sepsis: An Experimental Study*

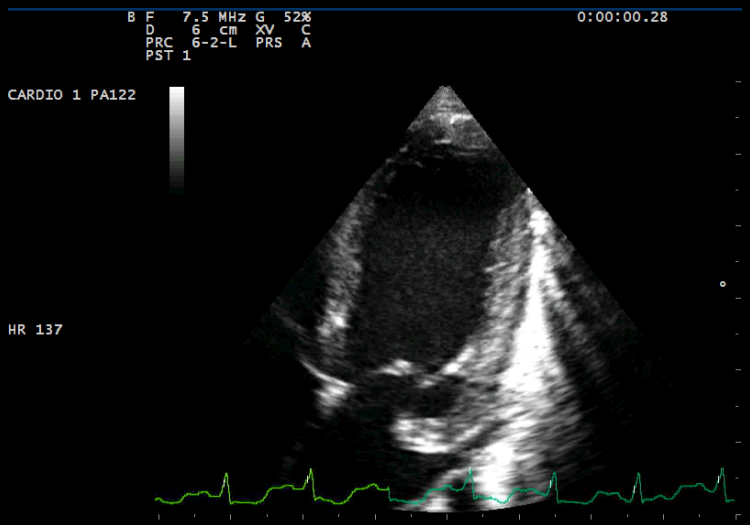
Siv M. Hestenes, MD[1,2]; Per S. Halvorsen, MD, PhD[1,2]; Helge Skulstad, MD, PhD[3]; Espen W. Remme, PhD[1,4]; Andreas Espinoza, MD[1,2]; Stefan Hyler, MD[1]; Jan F. Bugge, MD, PhD[2]; Erik Fosse, MD, PhD[1,5]; Erik W. Nielsen, MD, PhD[6,7,8]; Thor Edvardsen, MD, PhD[1,3,5]

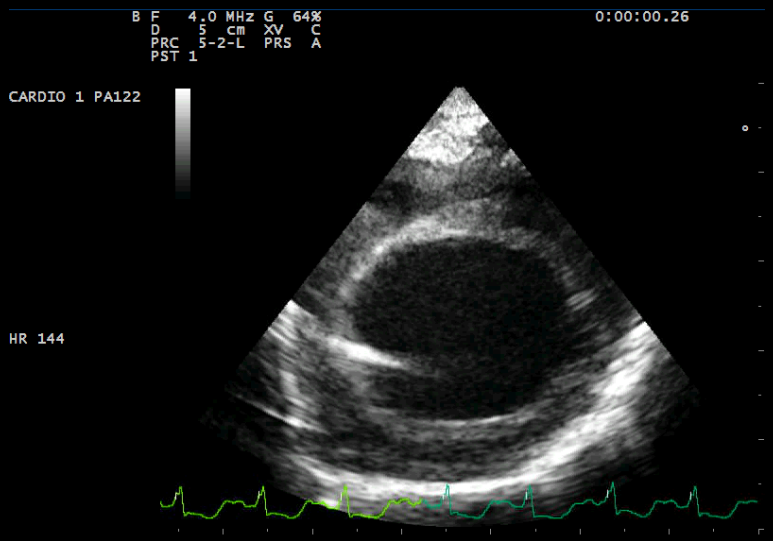


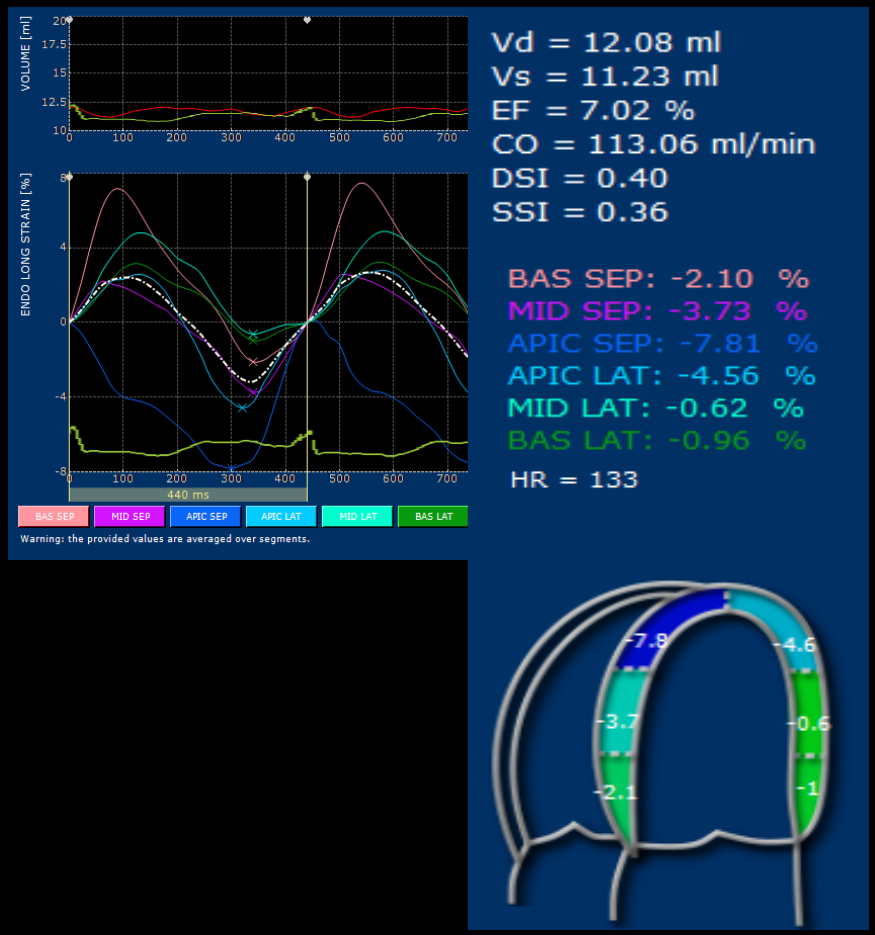


Conclusions: The present study demonstrates myocardial dysfunction in severe sepsis. Strain echocardiography reveals myocardial dysfunction before significant changes in ejection fraction and cardiac output and could prove to be a useful tool in clinical evaluation of septic patients. (*Crit Care Med* 2014; 42:e432–e440)

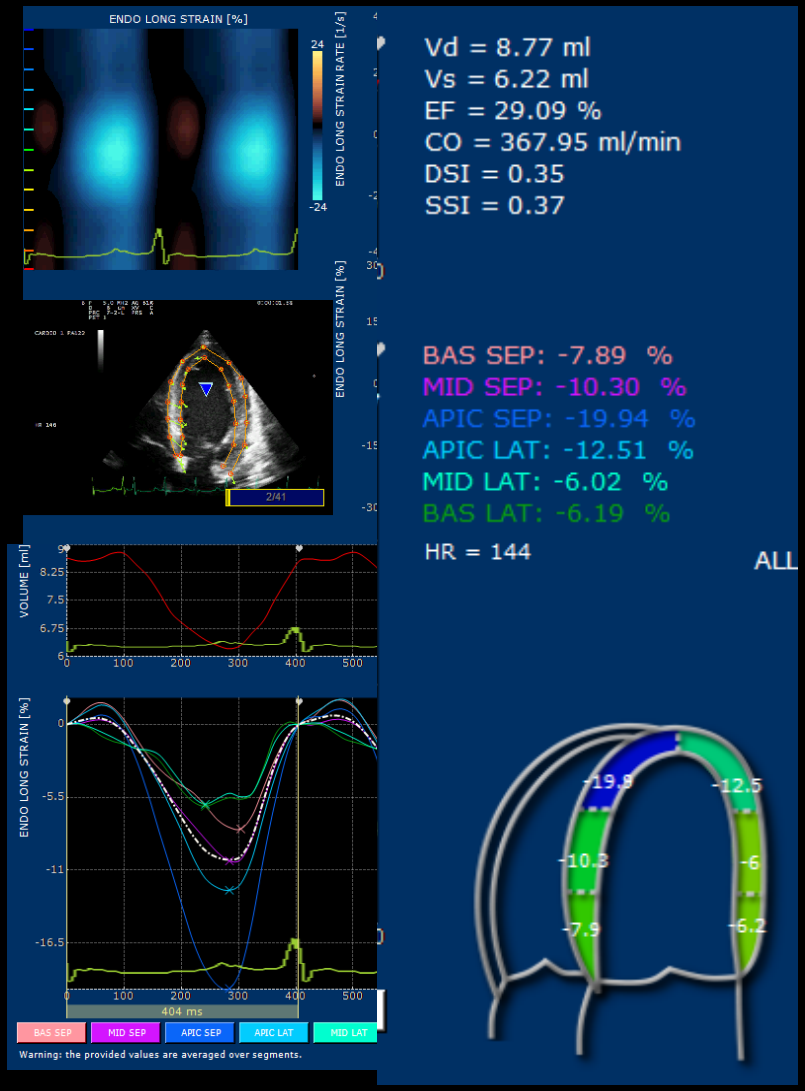
SEVERE AORTIC STENOSIS IN A NEWBORN BEFORE BVP

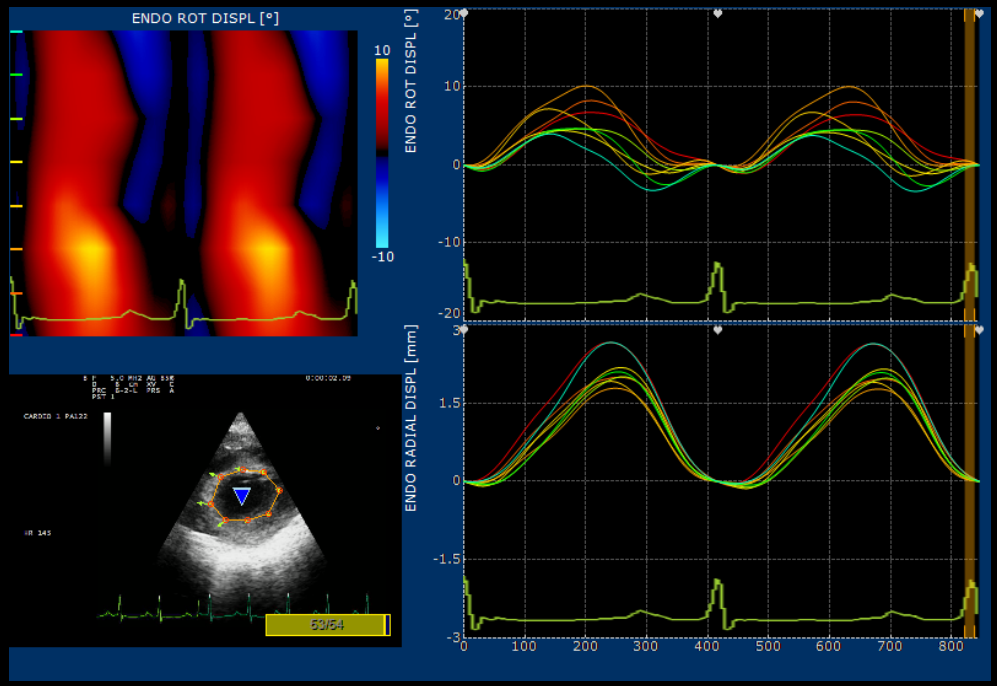






SEVERE AORTIC STENOSIS IN A NEWBORN FU AFTER BVP





SEVERE AORTIC STENOSIS IN A NEWBORN FU AFTER BVP

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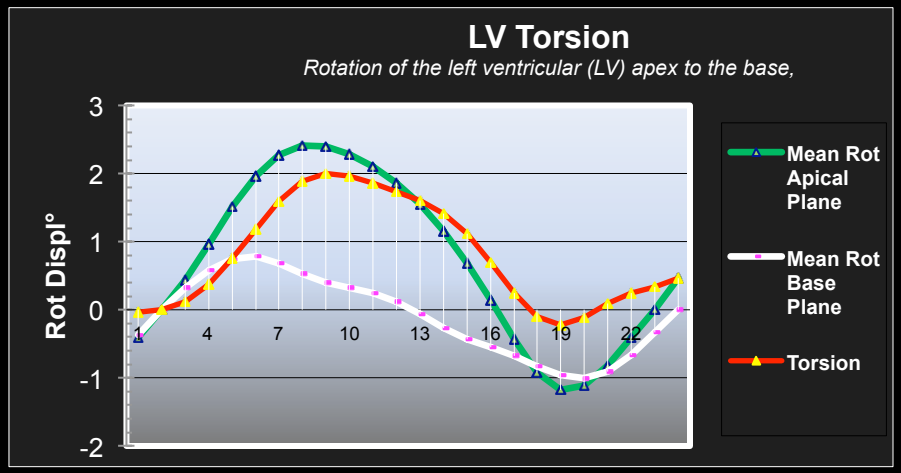

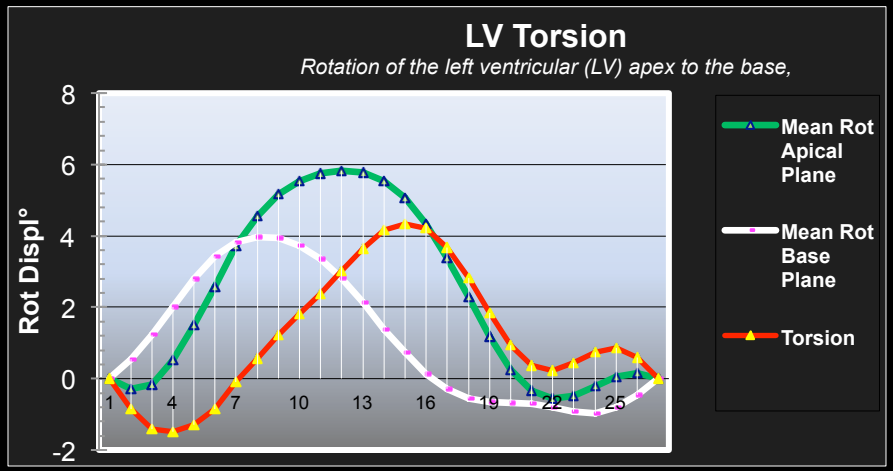

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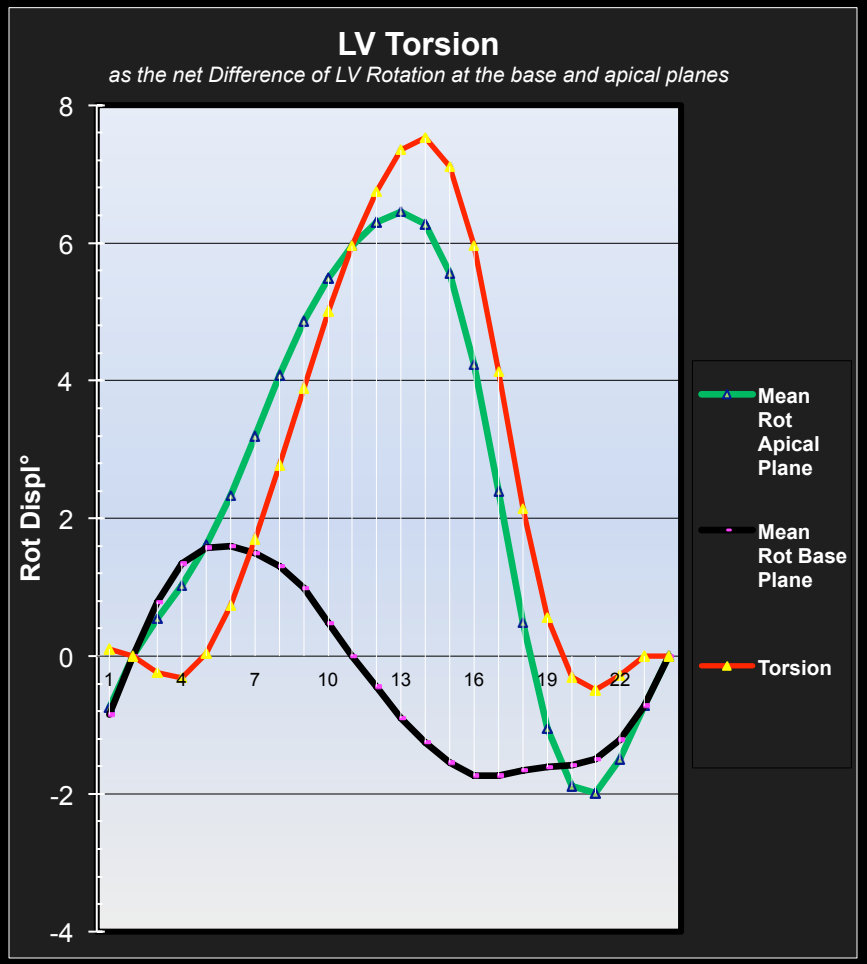
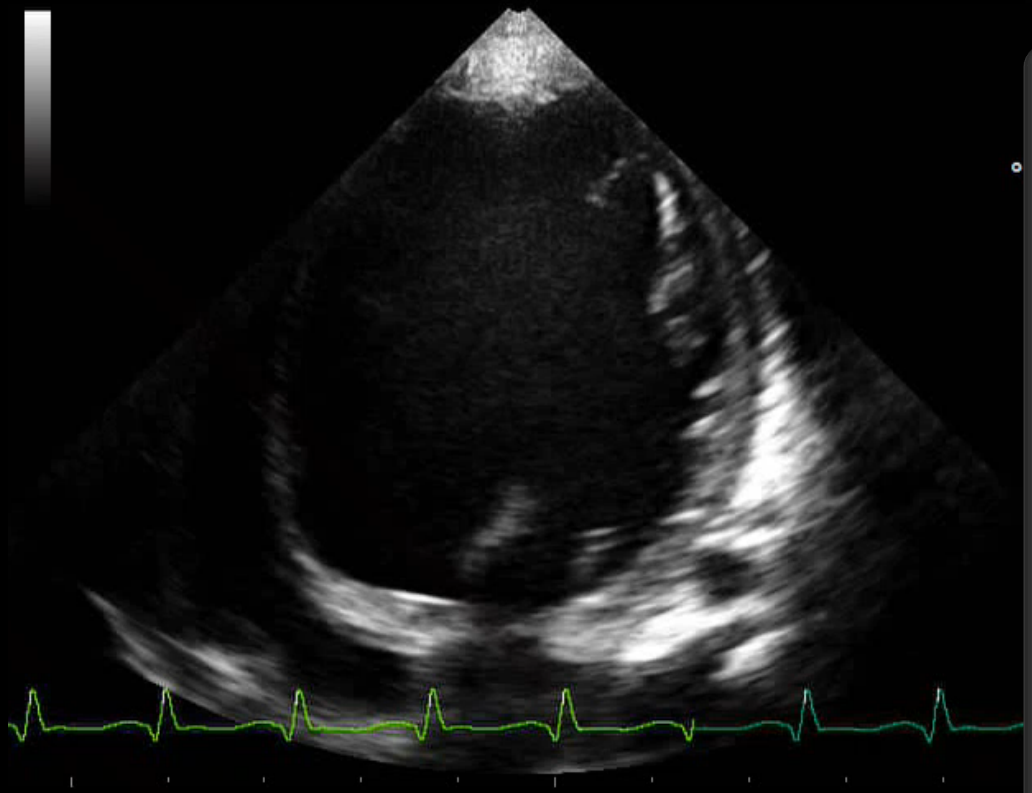
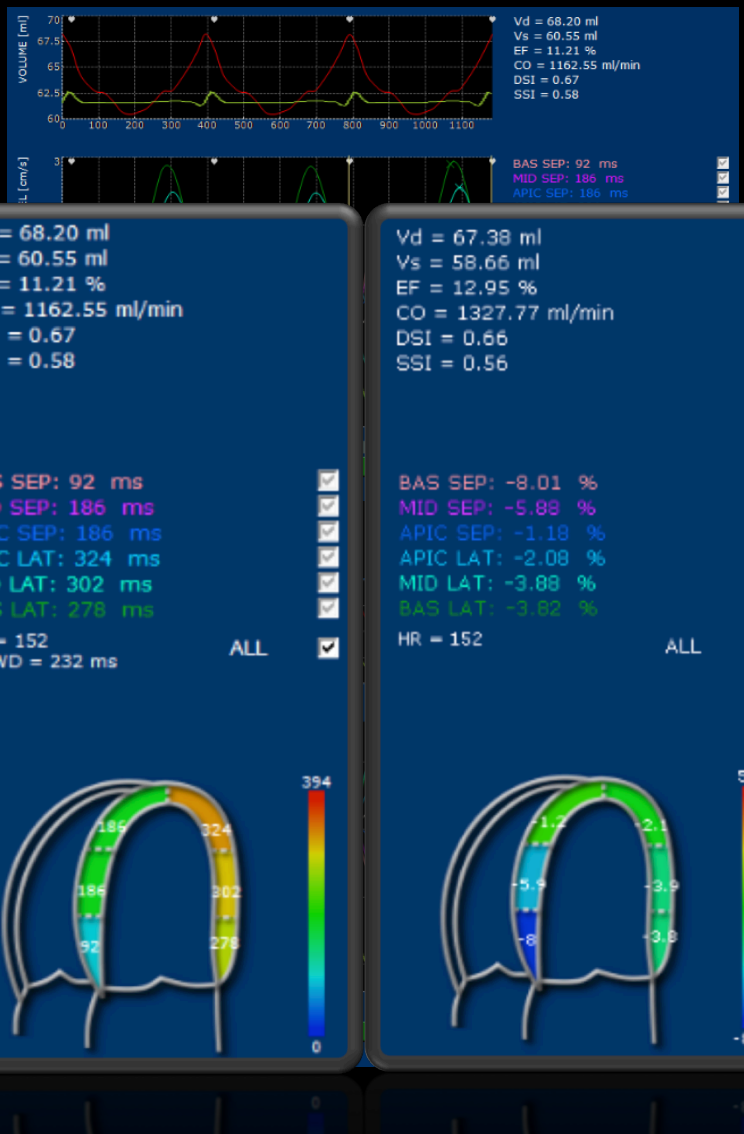


ALCAPA

Anomalous Left Coronary Artery Arising From Pulmonary Artery AT THE ADMISSION





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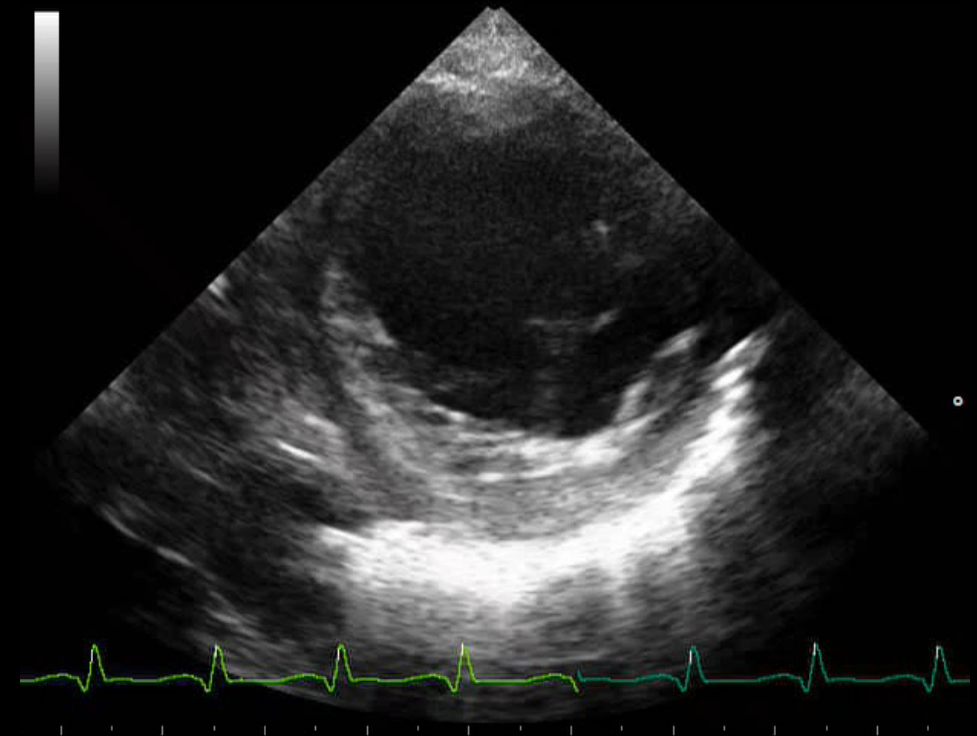
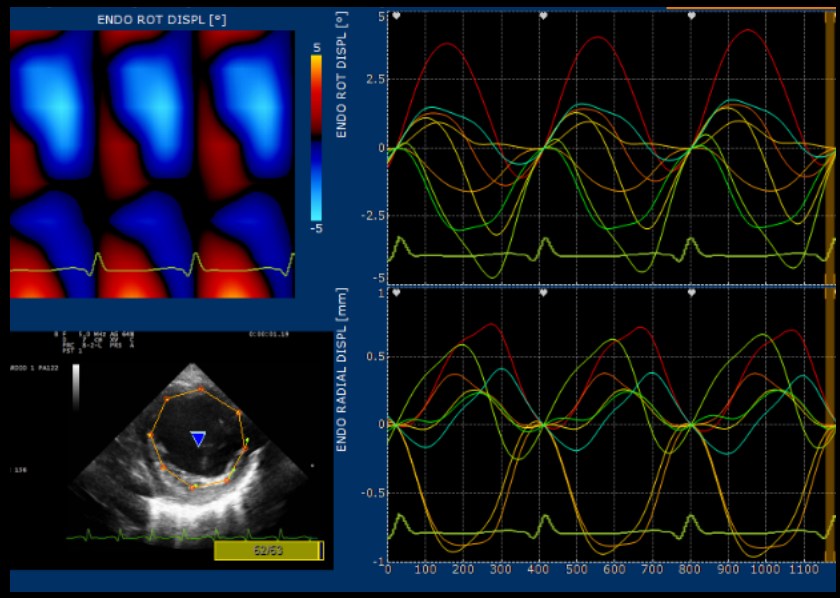
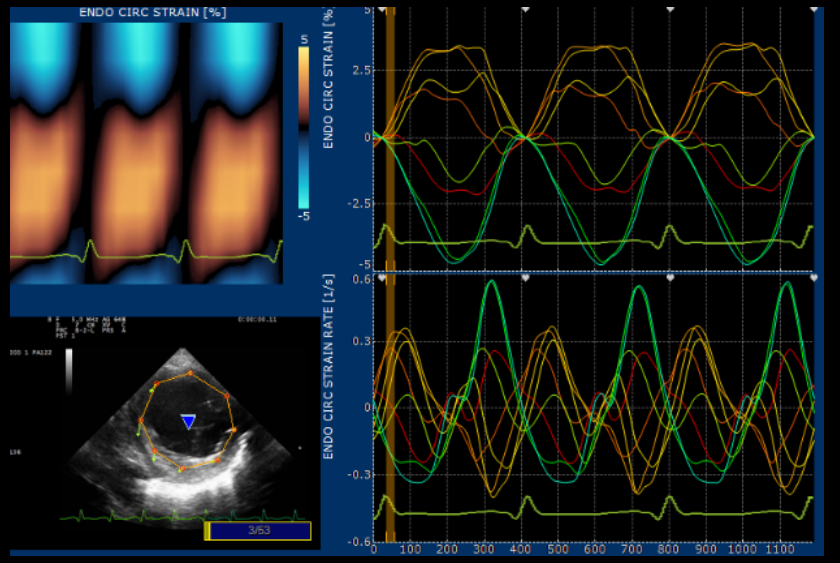
AT THE ADMISSION



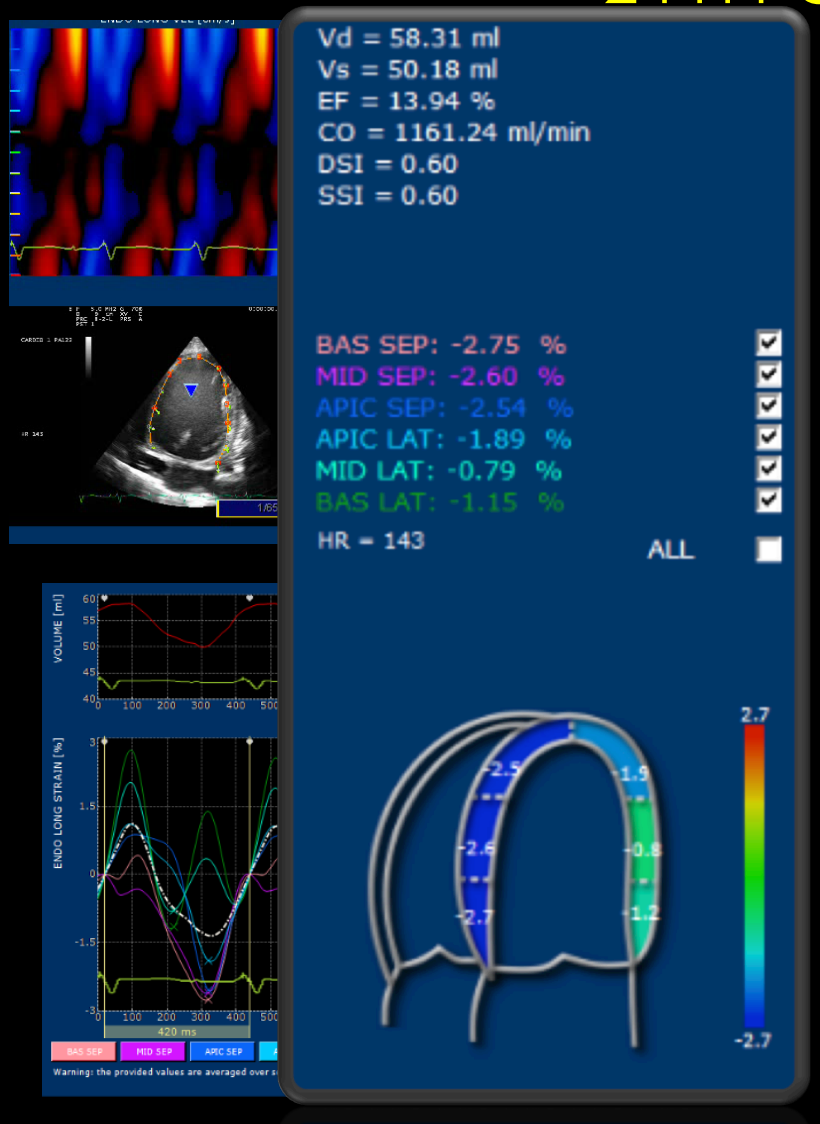




ALCAPA

Anomalous Left Coronary Artery Arising From Pulmonary Artery

24 H POST



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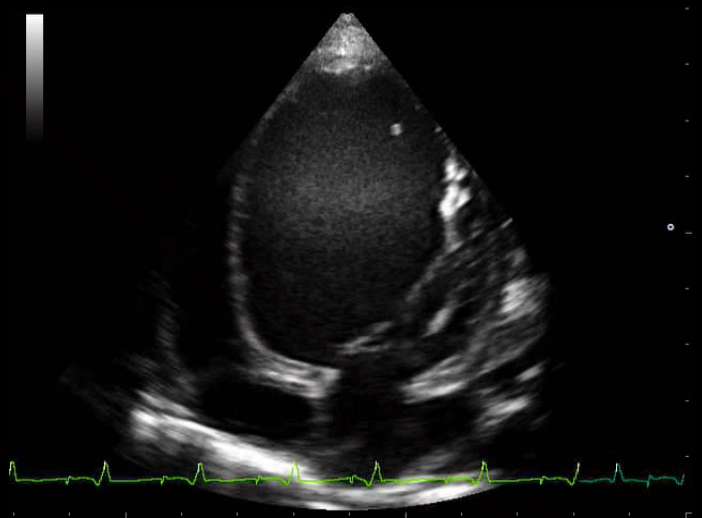
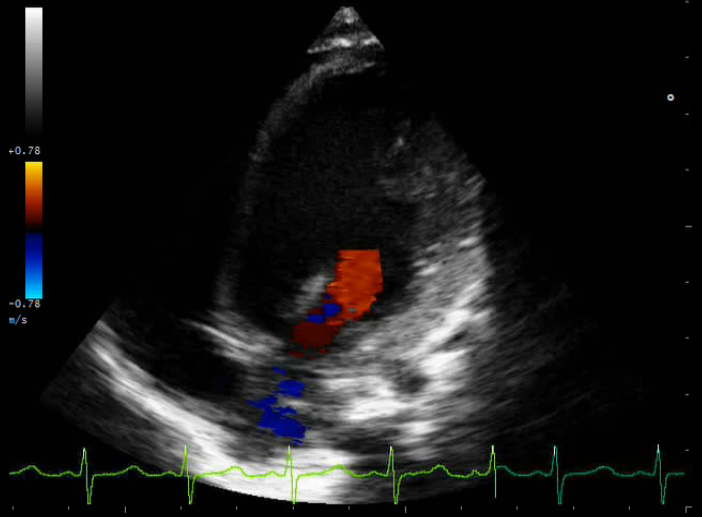
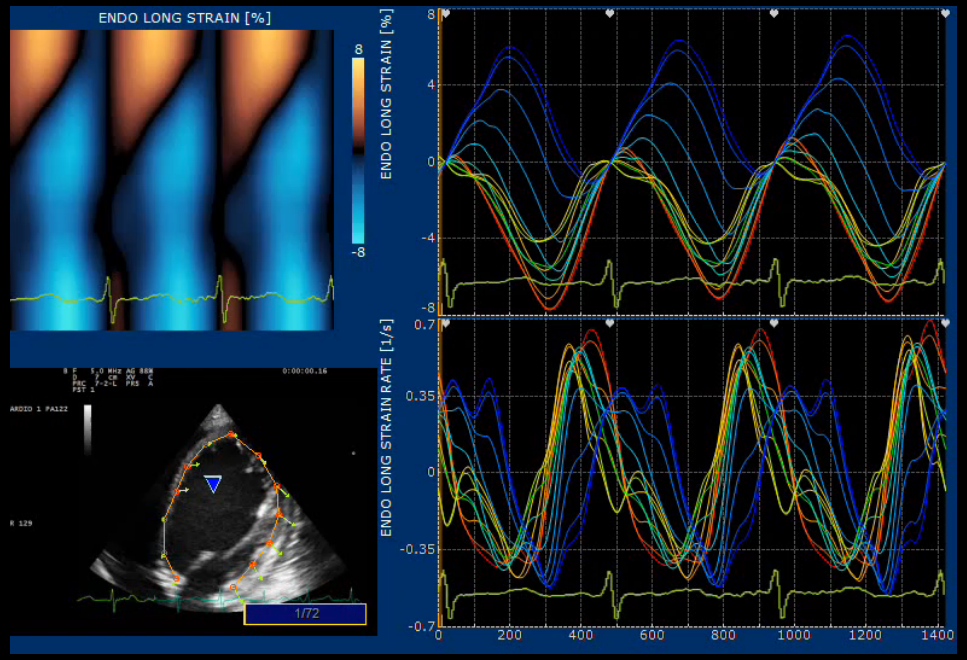
10 D POST







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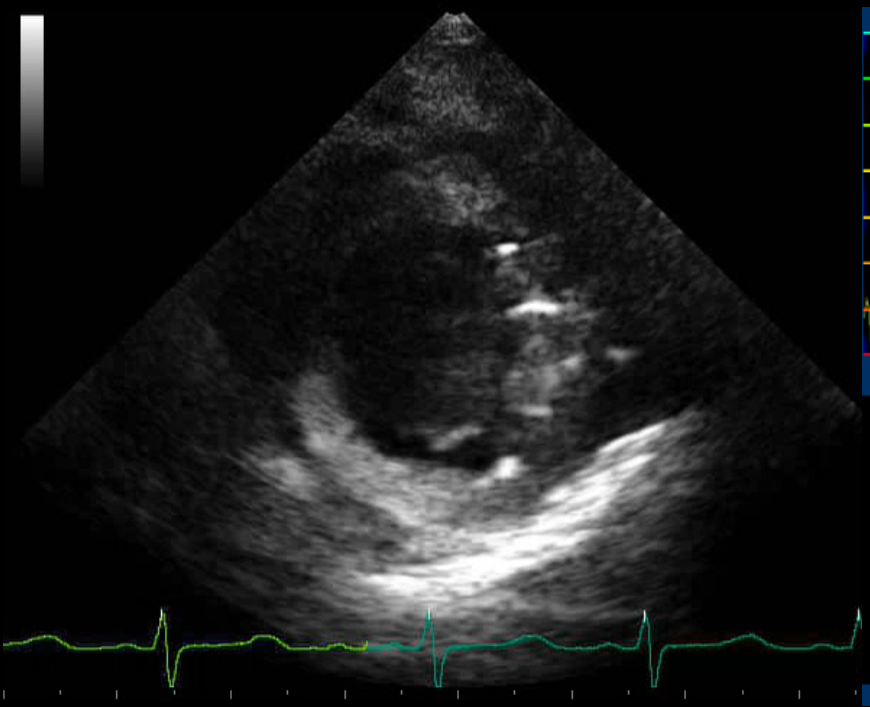

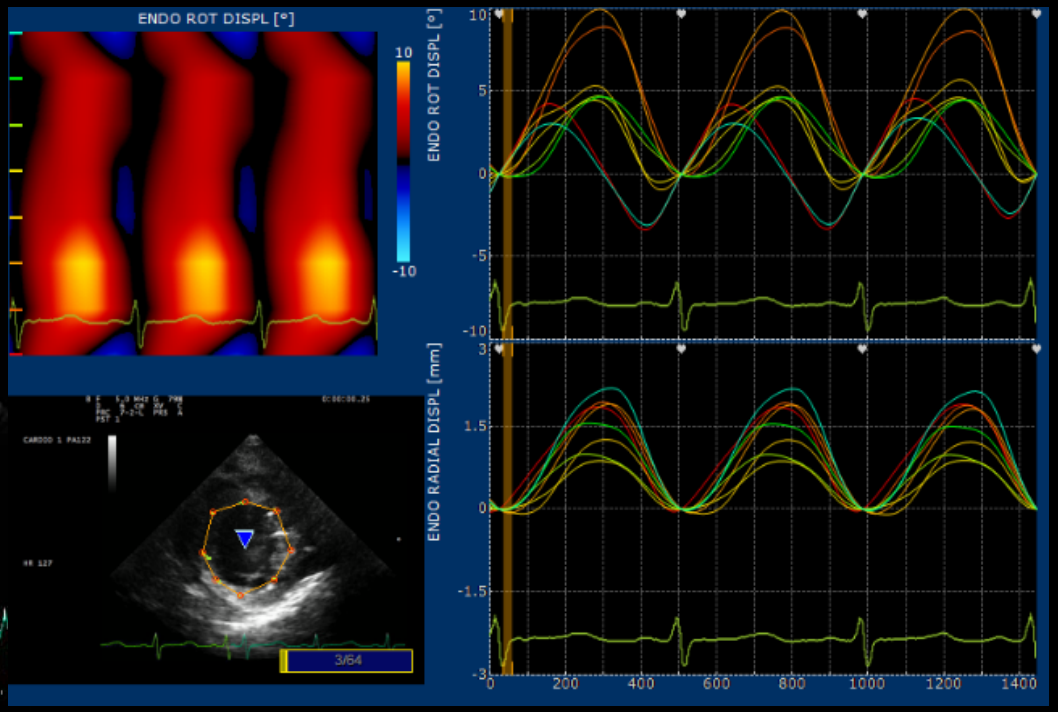

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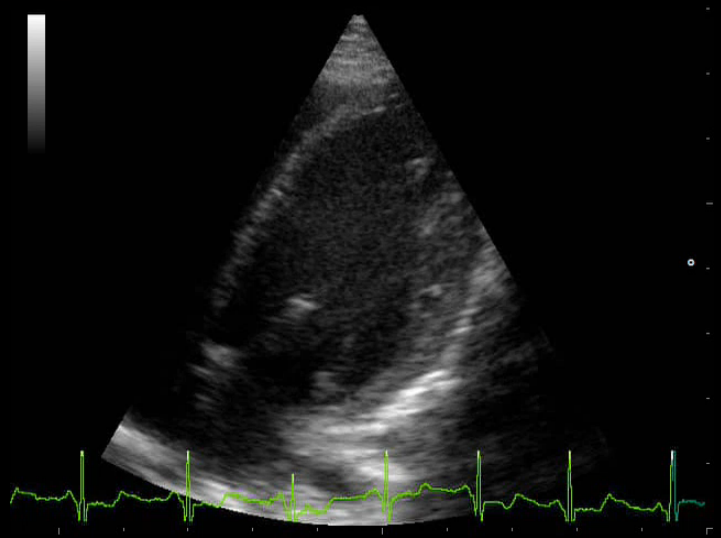
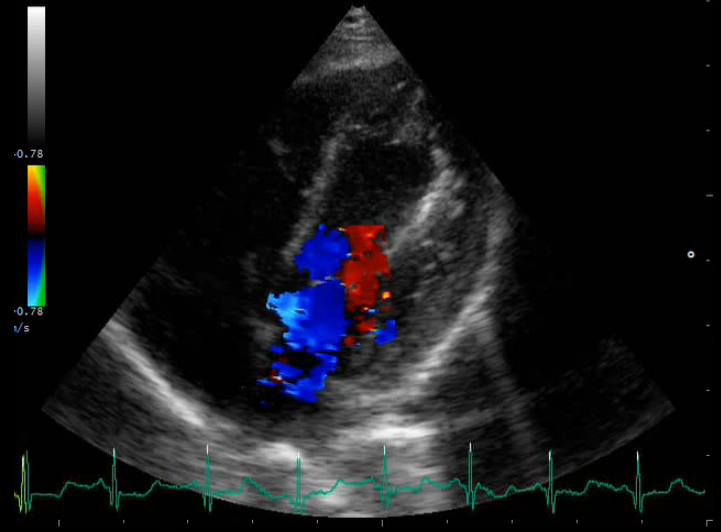
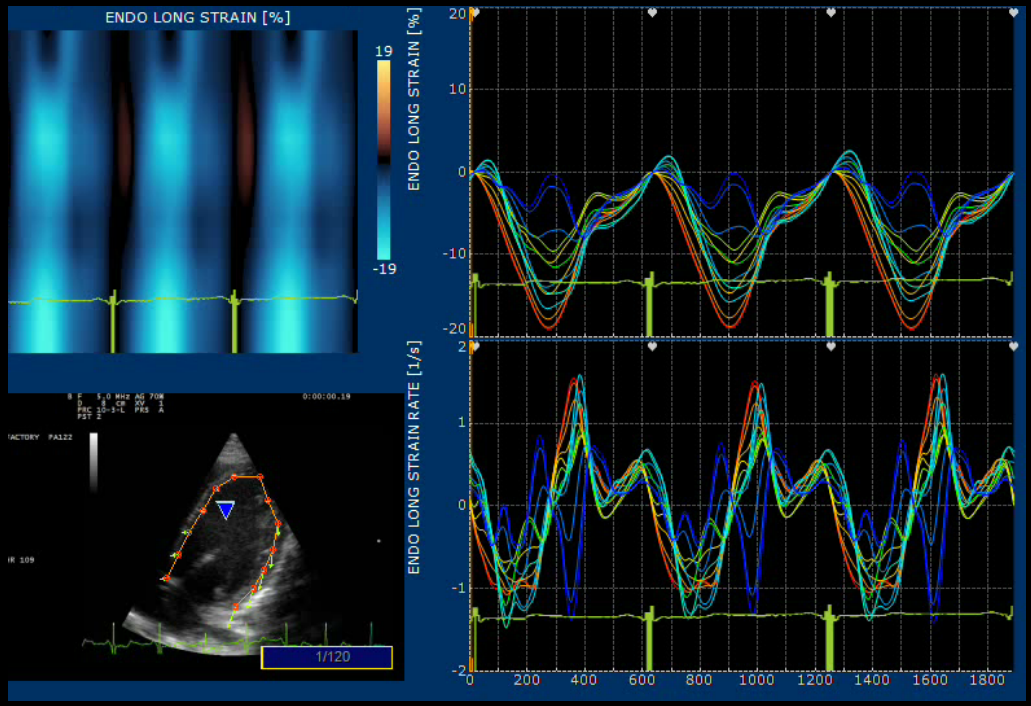
6 M POST







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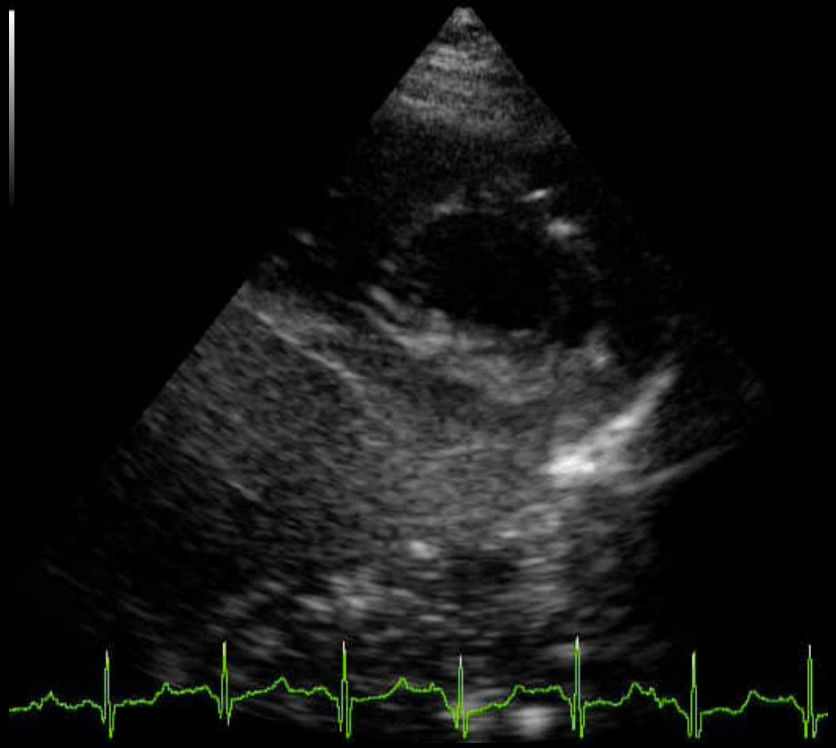

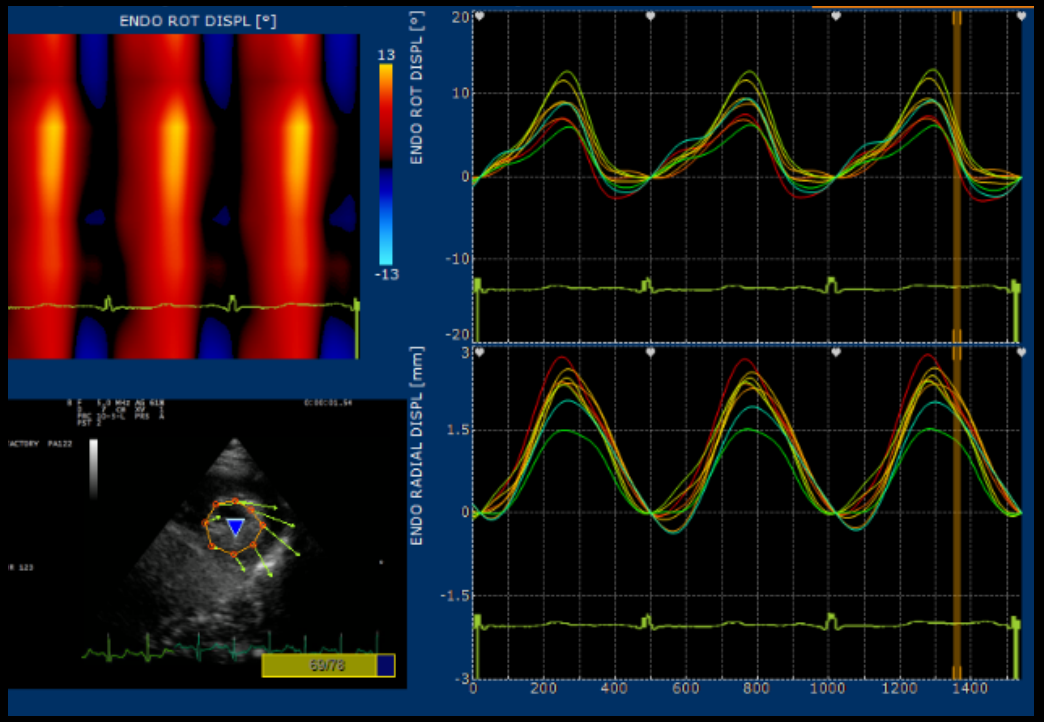

Conclusioni

- La letteratura le linee guida e la pratica confermano l'importanza dell'ecocardiografia.
- Sia FE che CO forniscono informazioni che vanno contestualizzate nel quadro fisiopatologico in esame.
- Altri parametri ecocardiografici di quantificazione diretta della funzione sistolica si rivelano più sensibile e meno influenzabili dalle condizioni di carico.