Quale imaging scelgo per primo nella Sindrome Coronarica Acuta?

Ecocontrastografia con perfusione ci aggiunge dati indispensabili

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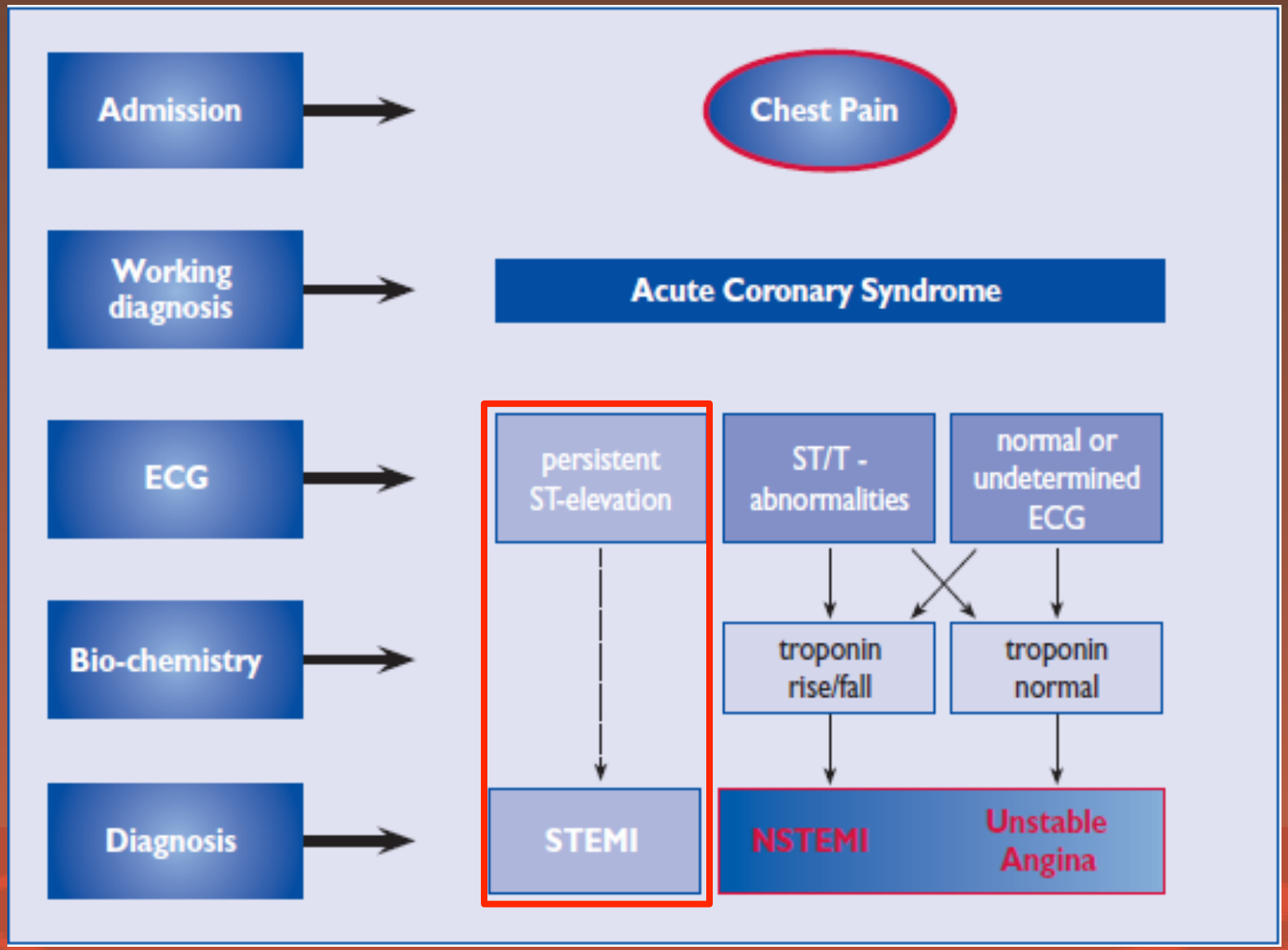
Sindrome coronarica acuta



Sindrome coronarica acuta STEMI

Table 4 Recommendations for initial diagnosis

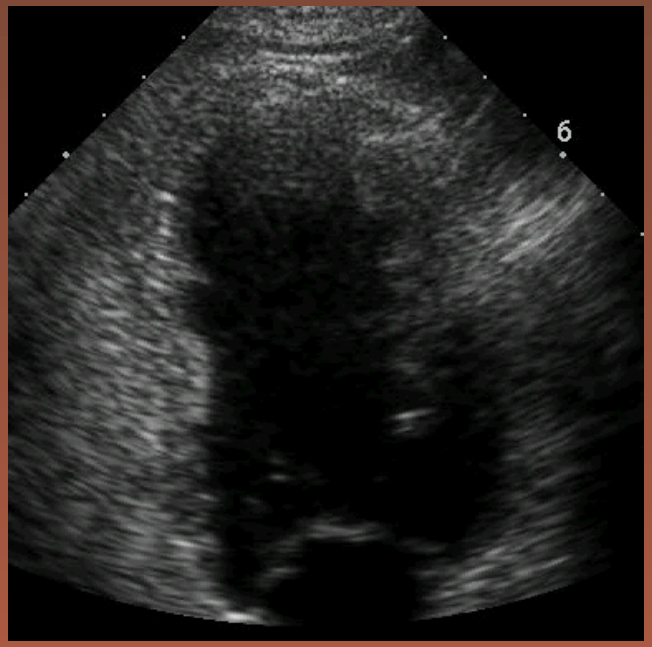
Recommendations	Class[a]	Level[b]	Ref[c]
A 12-lead ECG must be obtained as soon as possible at the point of FMC, with a target delay of ≤10 min.	I	B	17, 19
ECG monitoring must be initiated as soon as possible in all patients with suspected STEMI.			
Blood sampling for serum markers is recommended routinely in the acute phase but one should not wait for the results before initiating reperfusion treatment.			
The use of additional posterior chest wall leads (V_7–V_9 ≥0.05 mV) in patients with high suspicion of infero-basal myocardial infarction (circumflex occlusion) should be considered.	IIa	C	-
Echocardiography may assist in making the diagnosis in uncertain cases but should not delay transfer for angiography.	IIb	C	-

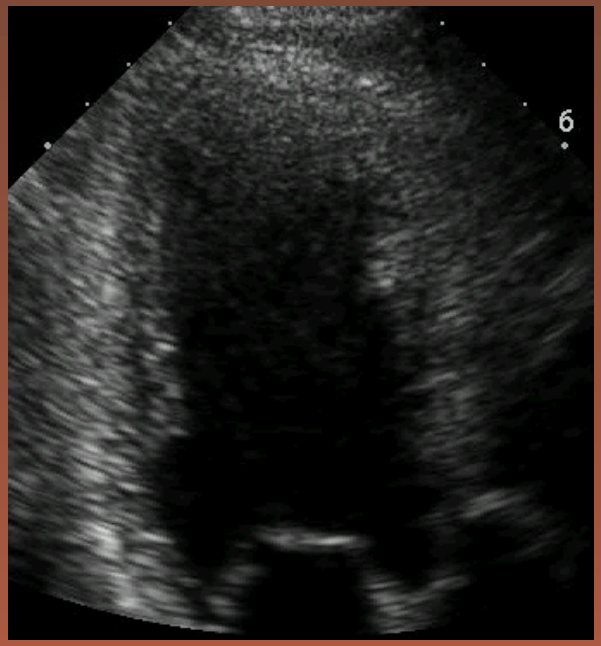
Echocardiography may assist in making the diagnosis in uncertain cases but should not delay transfer for angiography. IIb C -

Sindrome coronarica acuta STEMI
Ecocardiografia

In hospitals or settings in which coronary angiography is not immediately available, provided it does not delay transfer, rapid confirmation of segmental wall-motion abnormalities by two dimensional echocardiography may assist in making a decision for emergency transfer to a PCI centre, since regional wall-motion abnormalities occur within minutes following coronary occlusion, well before necrosis.

Eco in STEMI – fase acuta





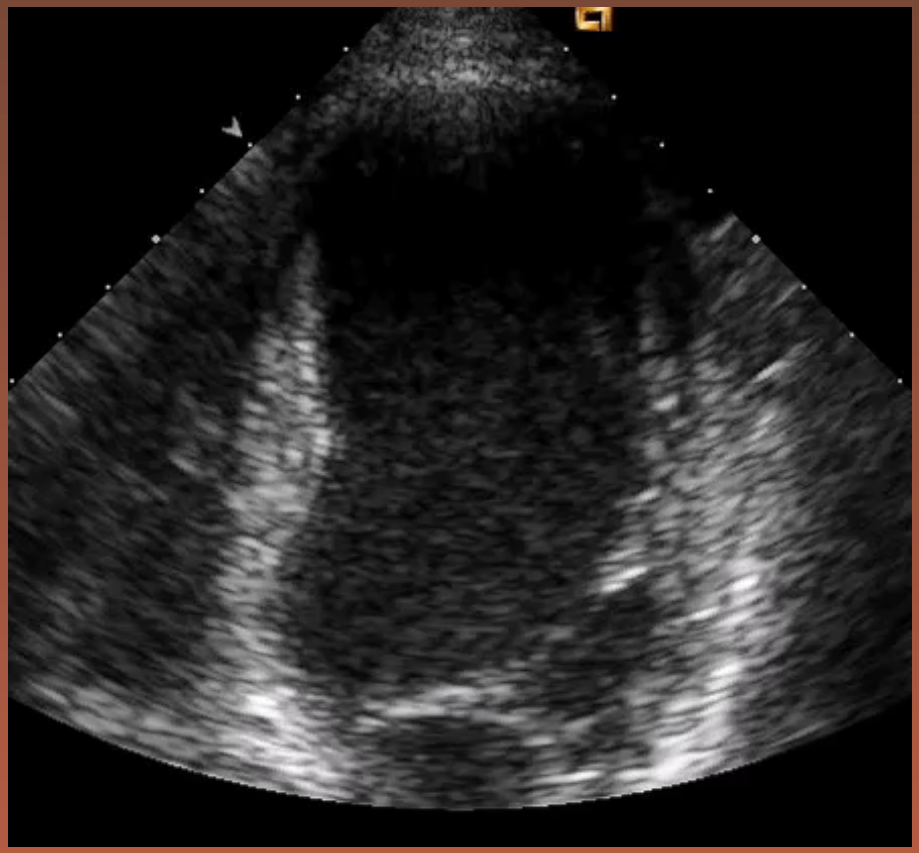
Occlusione di IVA prossimale→ PTCA in 3° ora
Ottimo risultato angiografico

Ecocontrasto nella fase acuta dello STEMI

- Non aggiunge dati a diagnosi
- Valuta l'estensione dell'area non perfusa (ma studi sperimentali hanno dimostrato che sovrastima rispetto all'area non contrattile)
- Non dà in acuto informazioni su prognosi

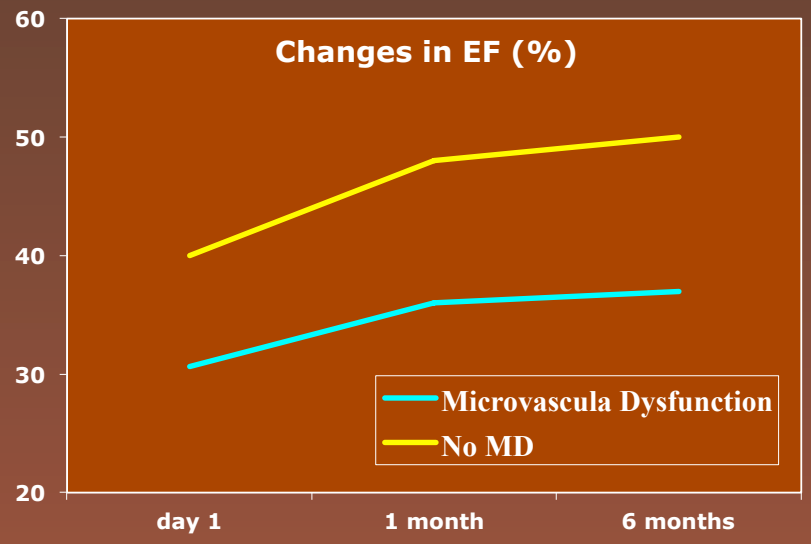
Perfusione post PTCA

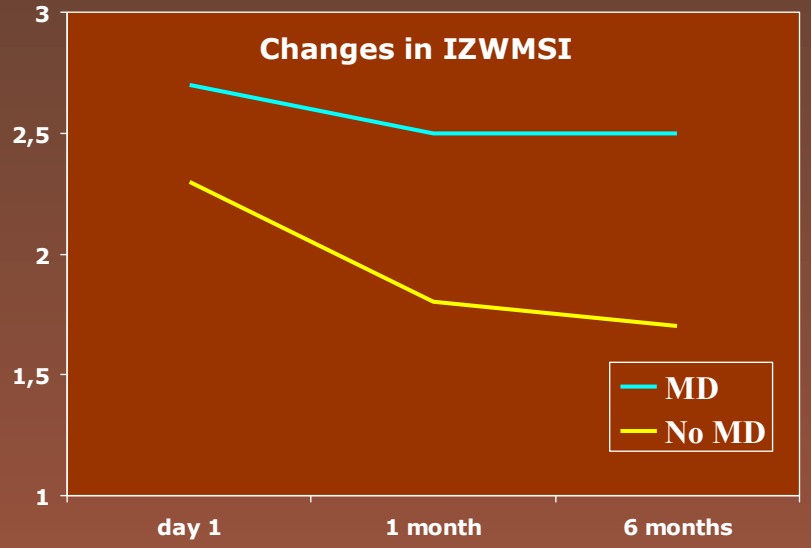
Follow-up a 3 mesi

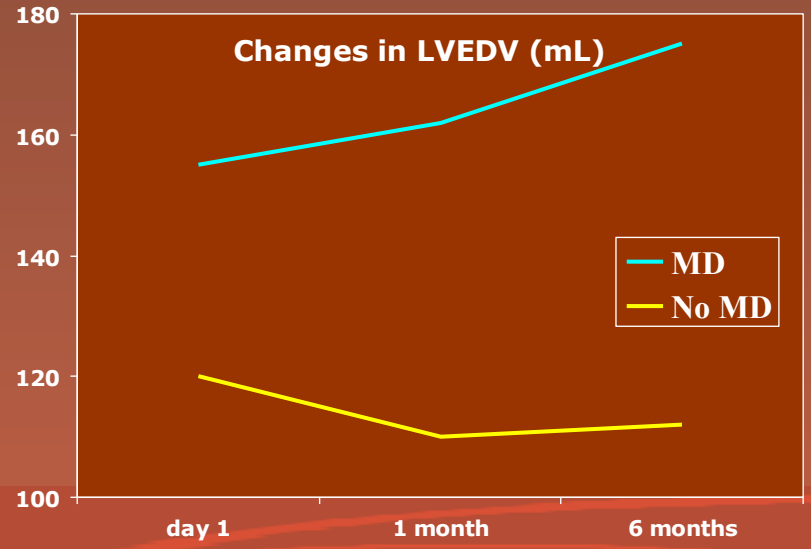


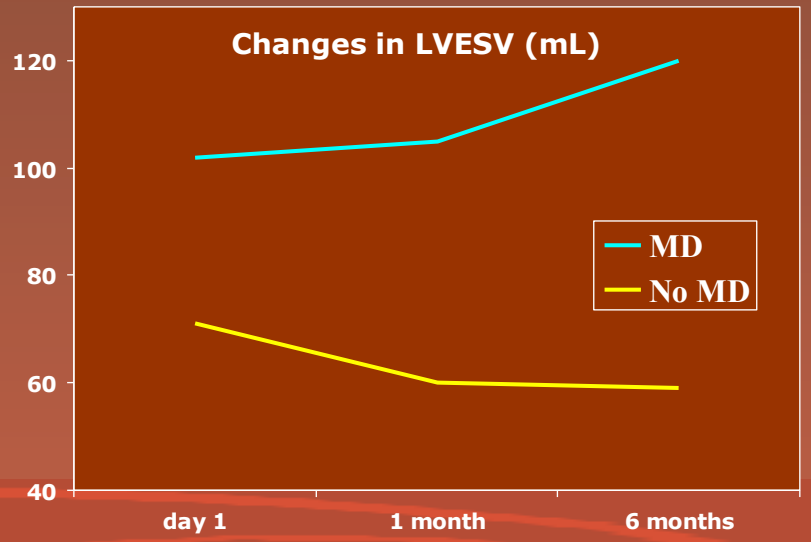
- Non sintomi
- Non eventi

Rimodellamento e disfunzione microcircolatoria



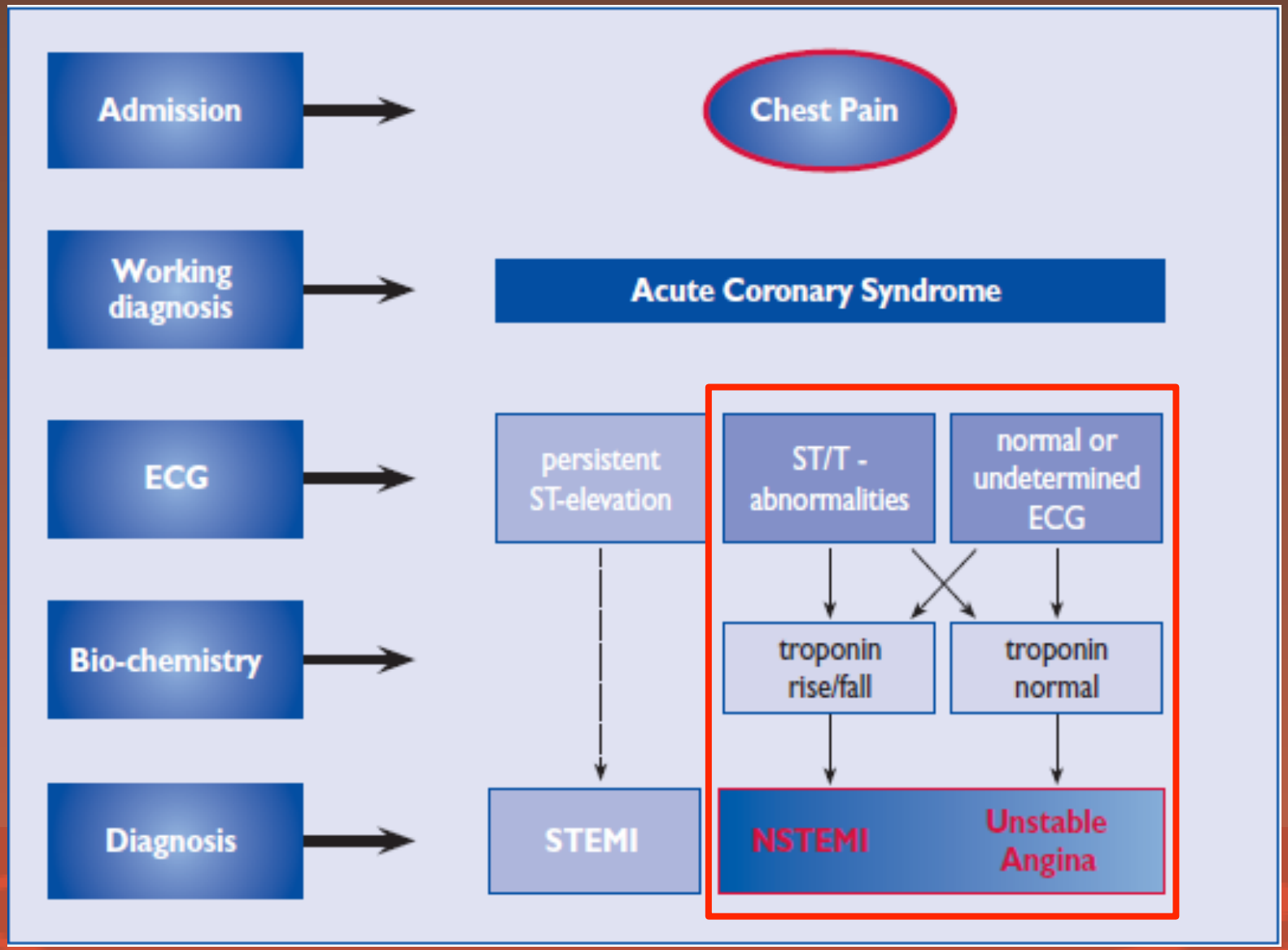






Bolognese L, Circulation 2004

Sindrome Coronarica Acuta



Sindrome Coronarica Acuta

Dolore toracico

In USA: 5,6 milioni di pz /anno in PS

< 10 % con ST elevation

ACC/AHA guidelines STEMI 2004

ECG

3814 pz con DT in PS USA

93% ECG normale o non diagnostico

Forest RS, Ann Emerg Med 2004

Enzimi cardiaci

Troponina ultrasensibile

Controllo a 3 ore di early presenters: PPN ≈ 100%

Falsi positivi di Troponina

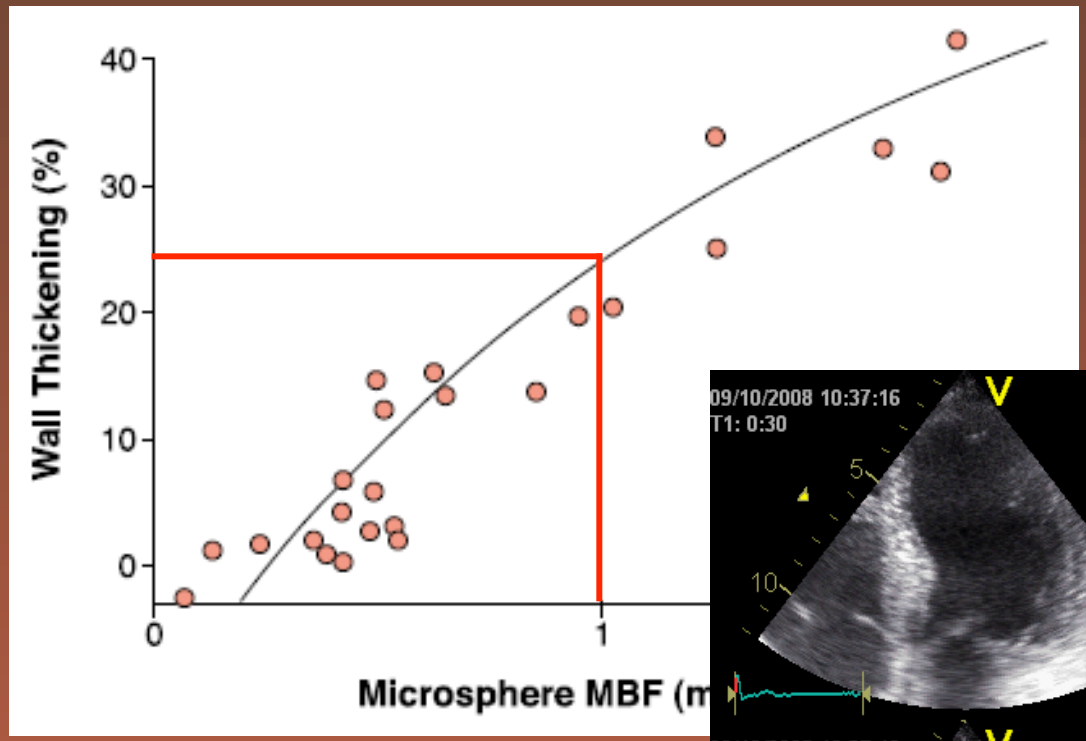
In the clinical setting, a test with high ability to rule out (negative predictive value) and correctly diagnose ACS (positive predictive value) is of paramount interest.

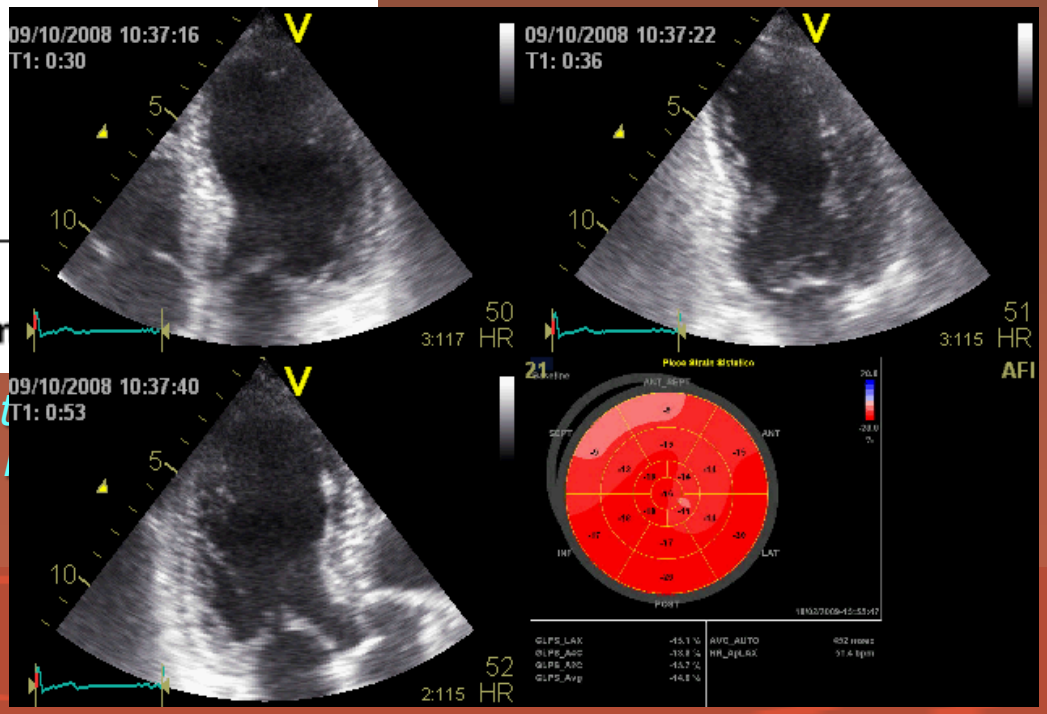
ESC Guidelines 2011

Table 3 **Possible non-acute coronary syndrome causes of troponin elevation (bold: important differential diagnoses)**

• **Chronic or acute renal dysfunction**
• Severe congestive **heart failure** – acute and chronic
• **Hypertensive crisis**
• **Tachy- or bradyarrhythmias**
• **Pulmonary embolism**, severe pulmonary hypertension
• Inflammatory diseases, e.g. **myocarditis**
• Acute neurological disease, including **stroke**, or subarachnoid haemorrhage
• Aortic dissection, aortic valve disease or hypertrophic cardiomyopathy
• Cardiac contusion, ablation, pacing, cardioversion, or endomyocardial biopsy
• Hypothyroidism
• Apical ballooning syndrome (Tako-Tsubo cardiomyopathy)
• Infiltrative diseases, e.g. amyloidosis, haemochromatosis, sarcoidosis, sclerodermia
• Drug toxicity, e.g. adriamycin, 5-fluorouracil, herceptin, snake venoms
• Burns, if affecting >30% of body surface area
• Rhabdomyolysis
• Critically ill patients, especially with respiratory failure, or sepsis

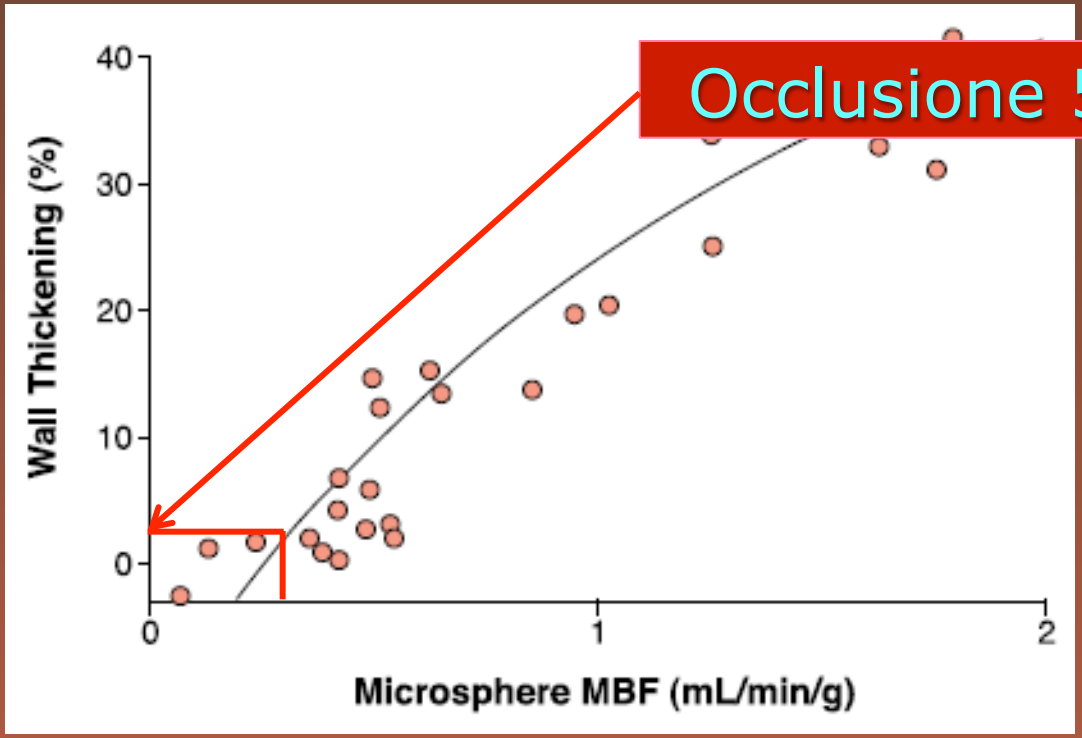
Relazione tra flusso e funzione





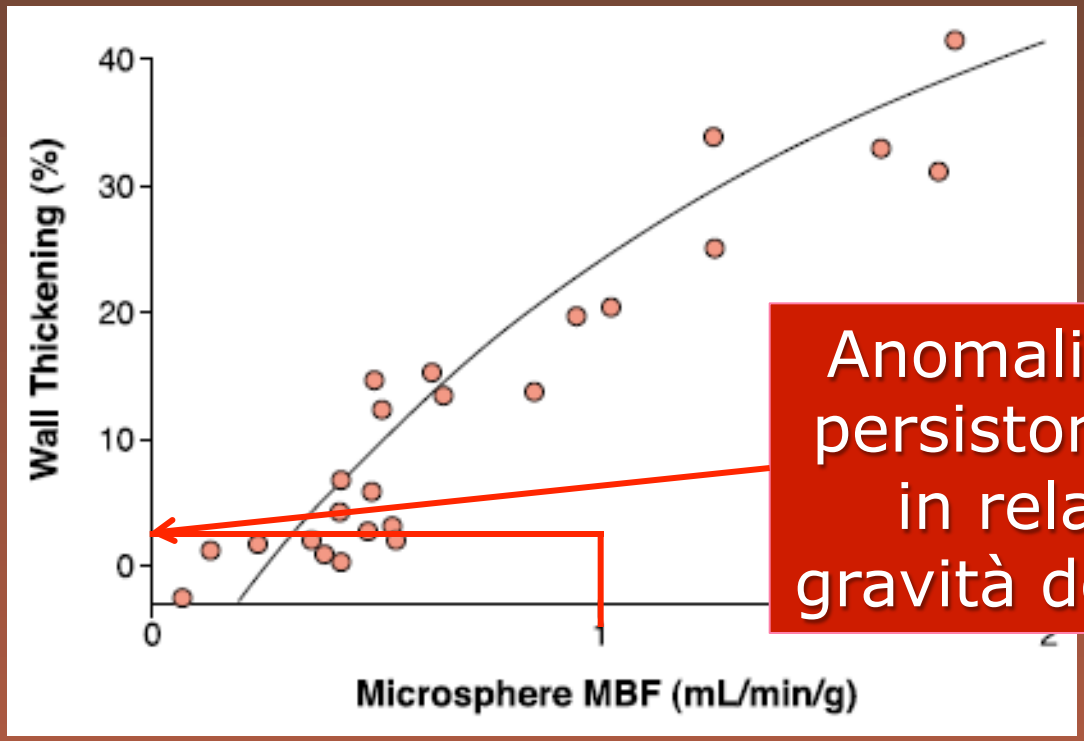
Tennant
Leong

Relazione tra flusso e funzione



Tennant e Wigger 1934
Leong Poi, JACC 2005

Relazione tra flusso e funzione



Anomalie della contrattilità persistono per più di 48 ore in relazione a durata e gravità dell'insulto ischemico

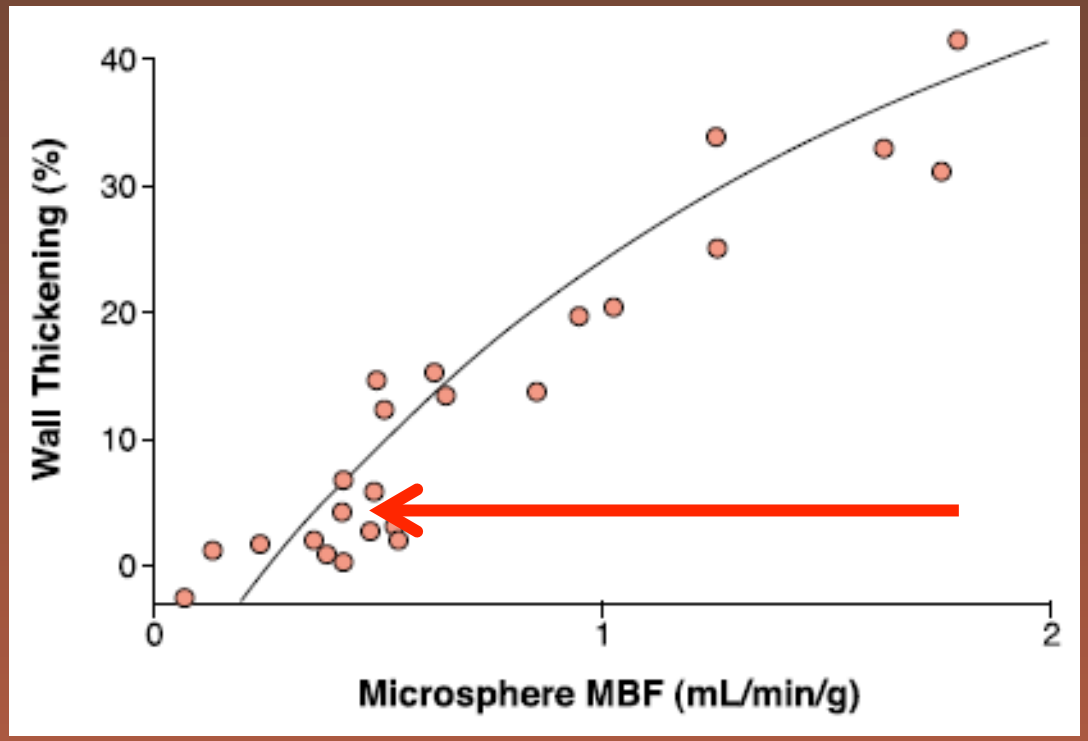
Tennant e Wigger 1934
Leong Poi, JACC 2005

Ispessimento sistolico

Le anormalità di contrazione sono non specifiche per ischemia miocardica e potrebbero essere dovute ad altre cause:

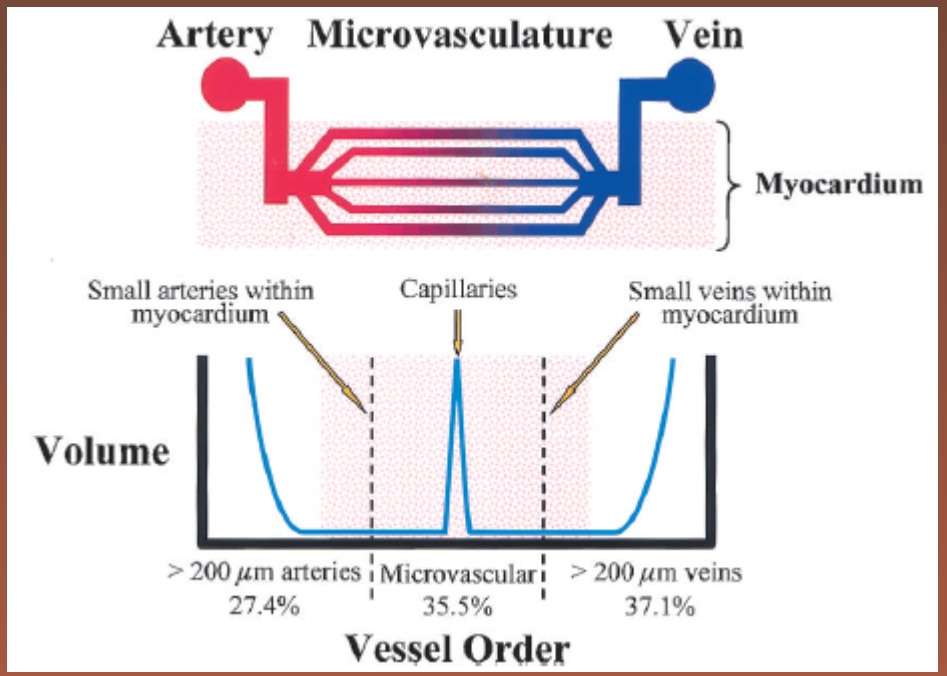
- Miocarditi
- Preeccitazione
- Cardiomiopatie
- Sovraccarichi pressione/volume del ventricolo destro
- Disturbi di conduzione
- Pacemaker

Ecocontrastografia. Presupposti teorici



Tennant e Wigger 1934
Leong Poi, JACC 2005

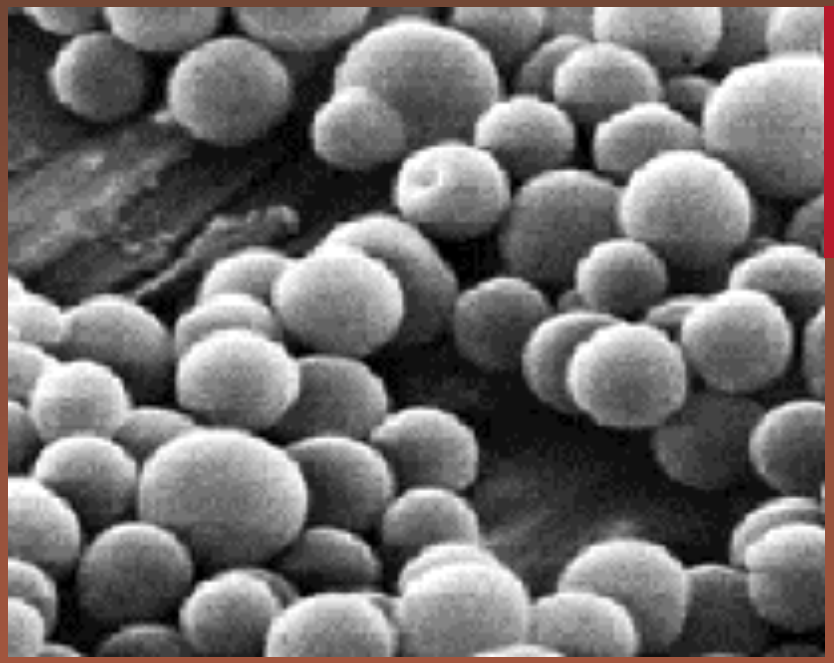
Quantizzazione della perfusione miocardica
Presupposti teorici



Wei K, Prog Cardiovasc Dis 2001

Il sangue nel cuore è per il 90 % ritenuto nel microcircolo

Presupposti teorici



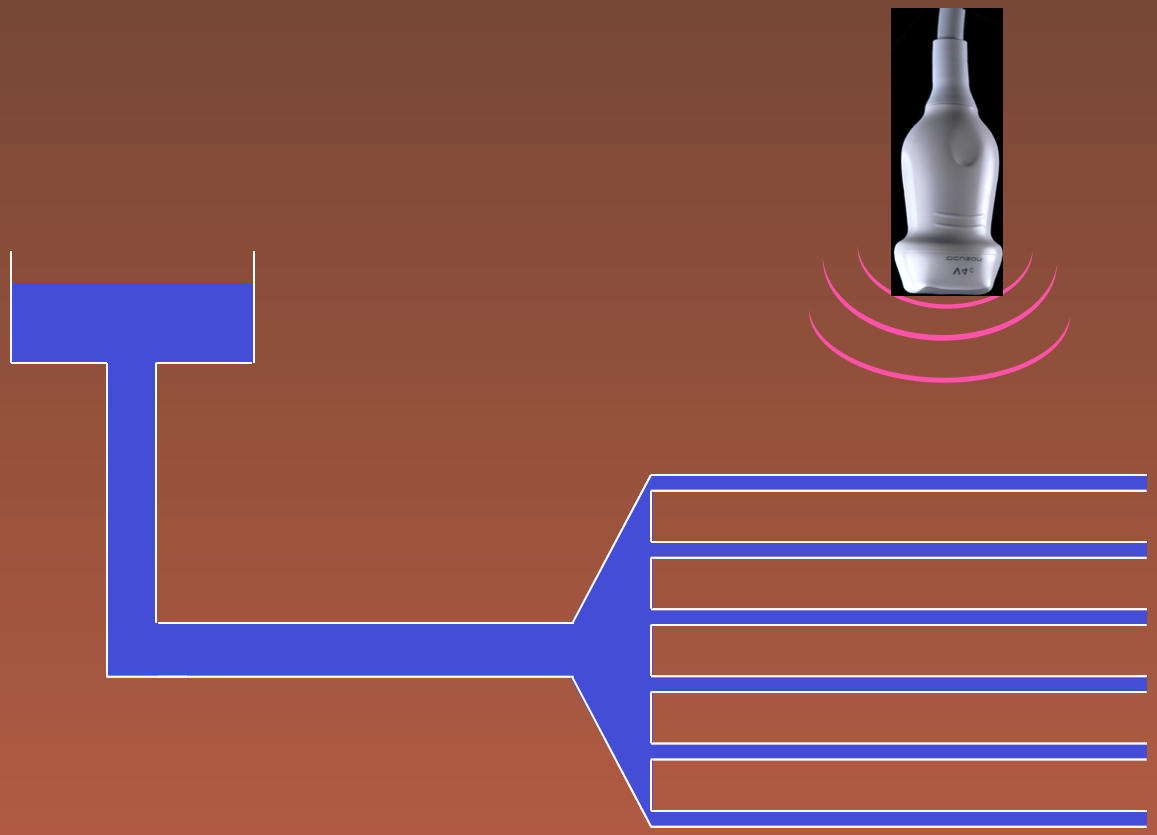
- diametro medio 2.5 μm (90% < 8 μm)
- 2 x 10^8 microbolle/mL (range 1-5 x $10^{8)}$
- pH e viscosità = sol. Fisiologica

Reologia confrontabile con i Globuli Rossi

Totalmente ritenuti nel letto vascolare

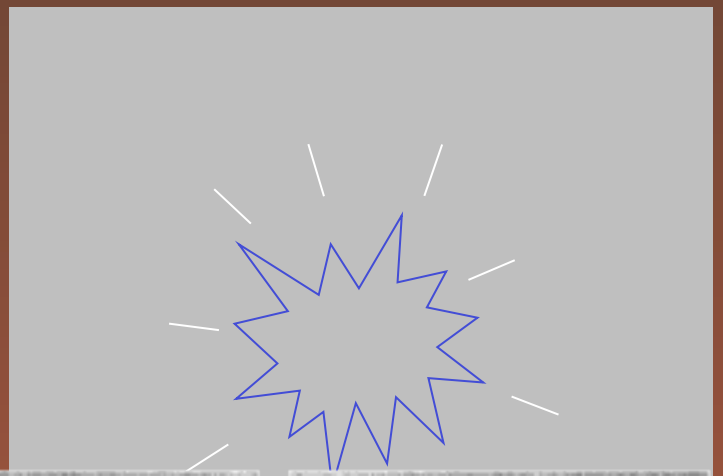
Le microbolle sono traccianti di flusso coronarico

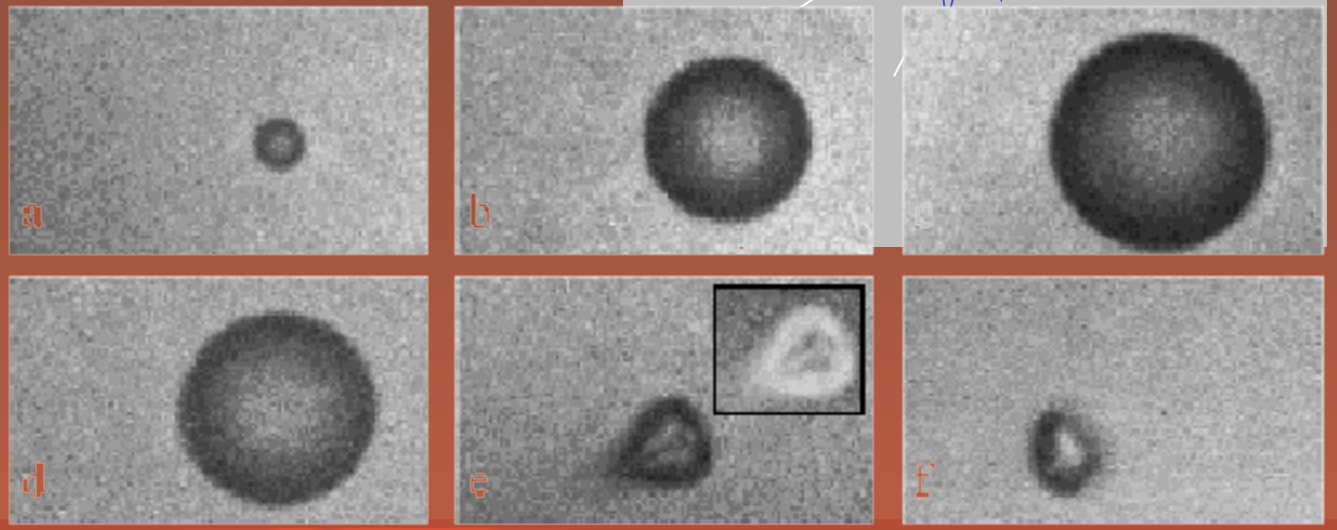
Presupposti teorici



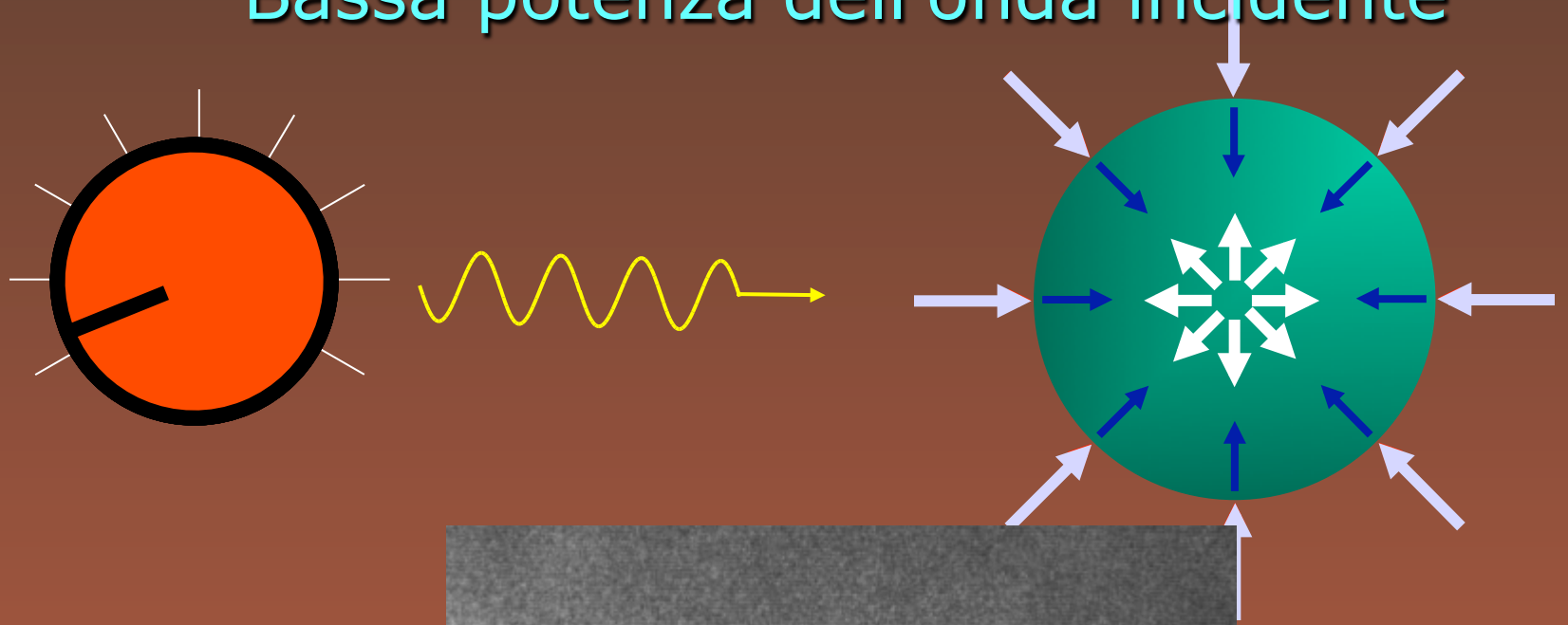
Alta potenza dell'onda incidente

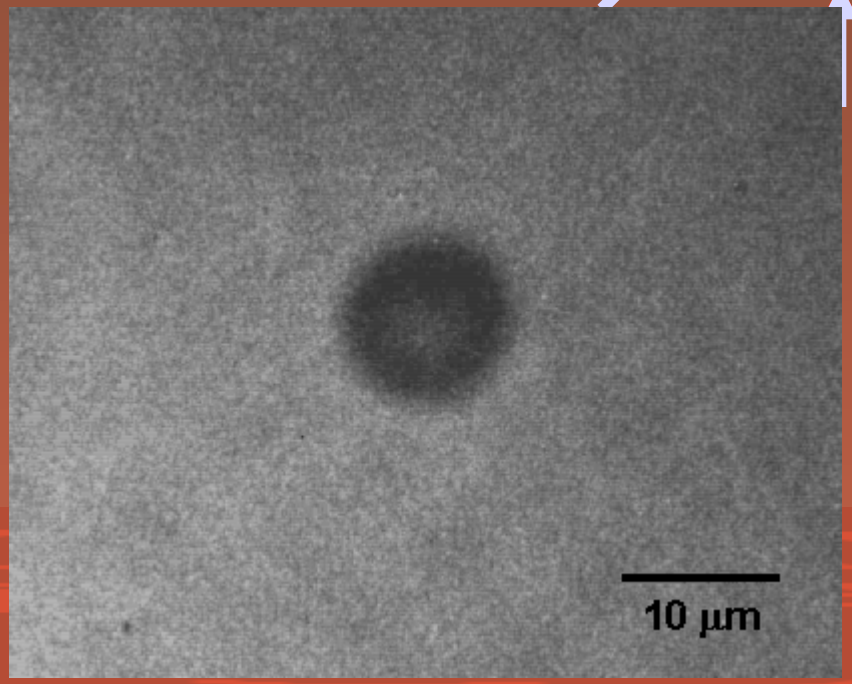
M.I.



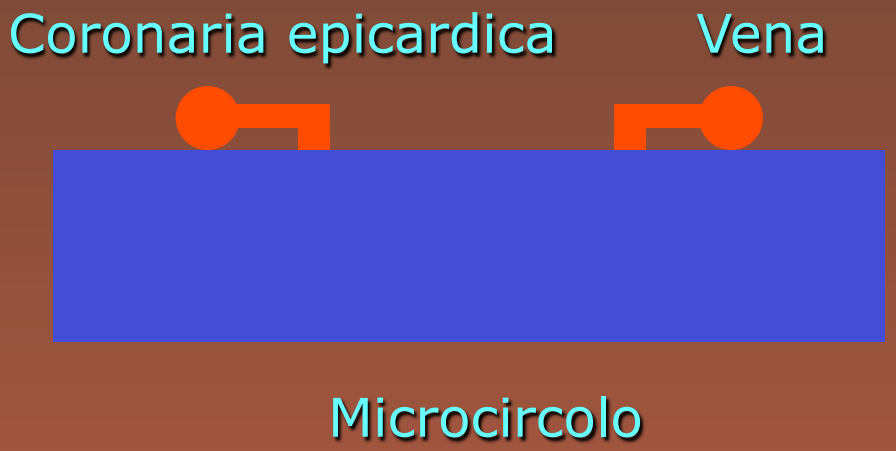


Bassa potenza dell'onda incidente





Quantizzazione della perfusione miocardica
Presupposti teorici



Il segnale videodensitometrico rappresenta il flusso intramiocardico

Quantizzazione della perfusione miocardica
Presupposti teorici

1
normale

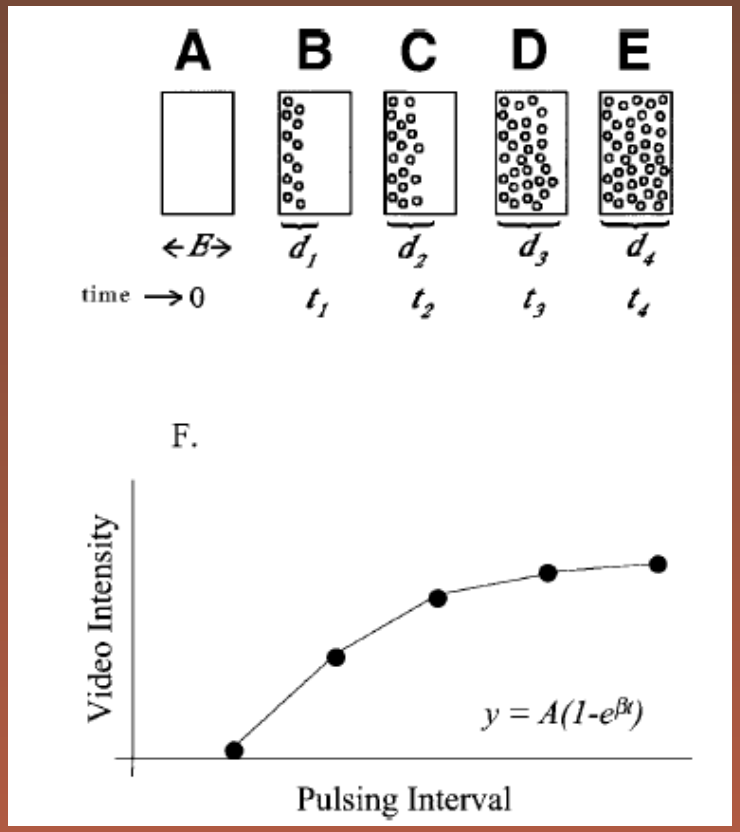
0,5
non omogeneo

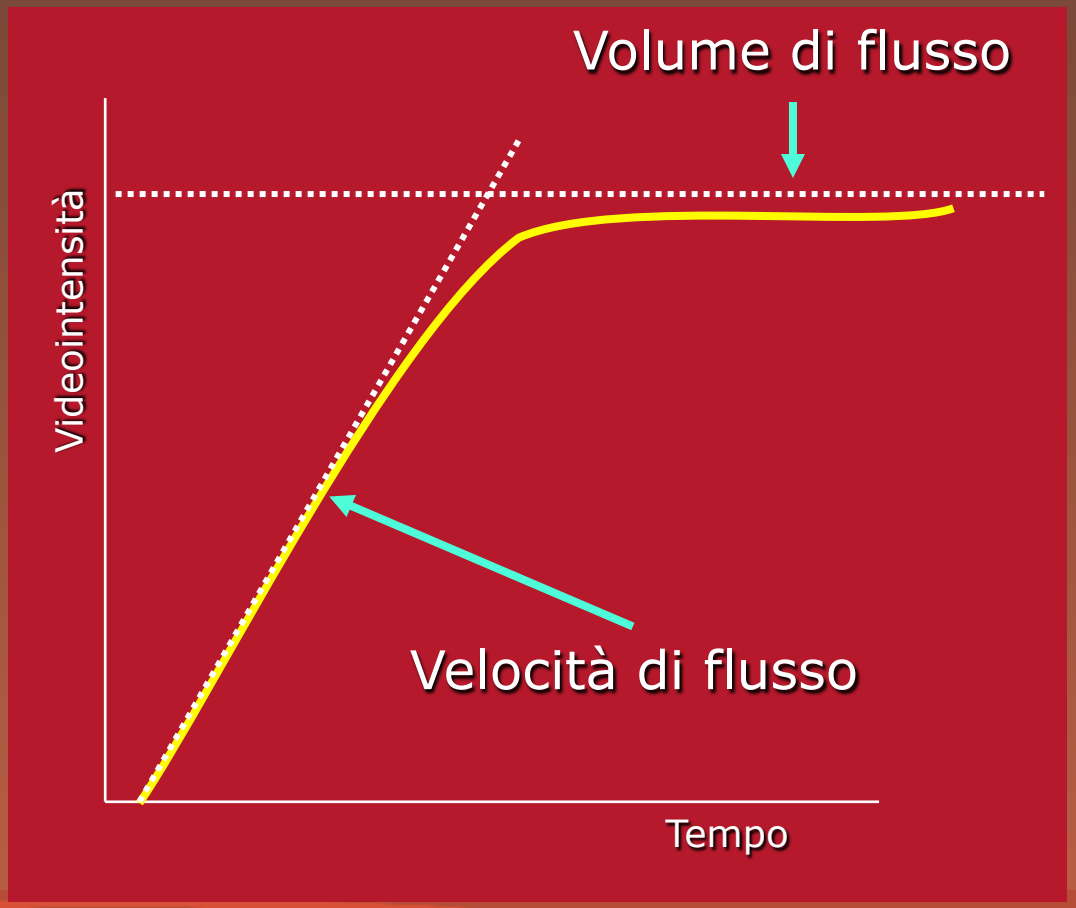
0
non opacizzato

Perfuso

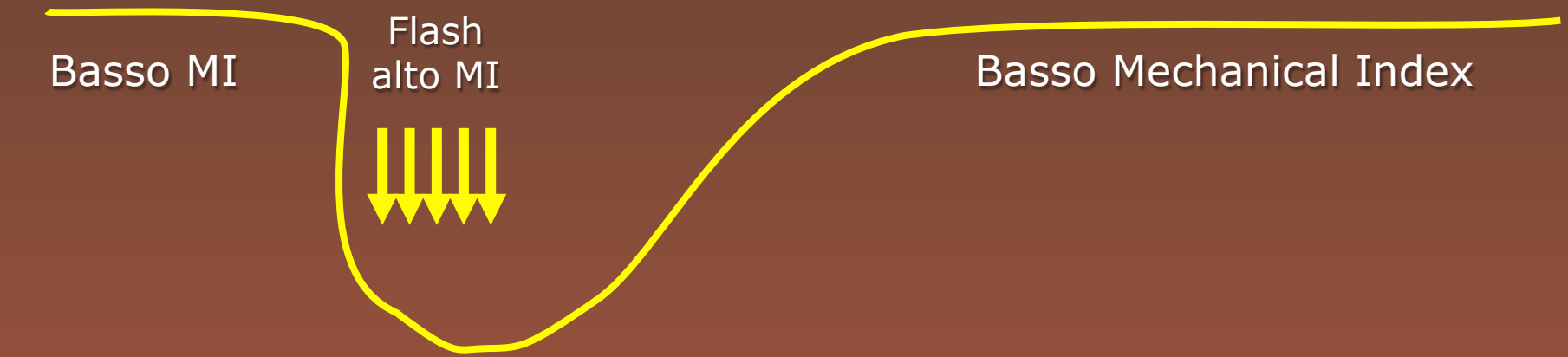
Non perfuso

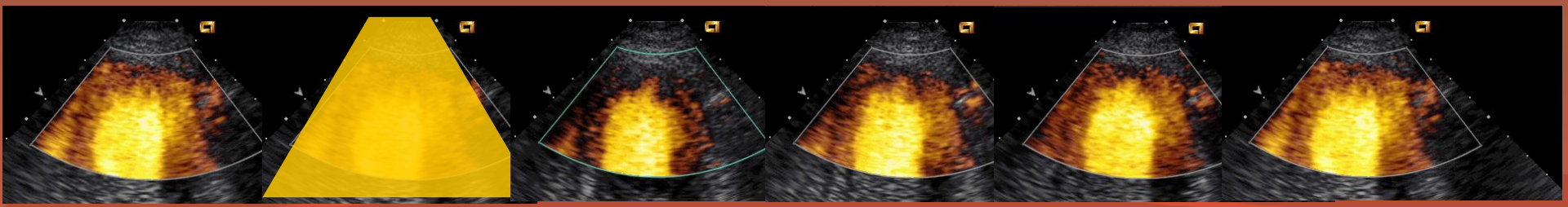
Quantificazione del flusso coronarico
Presupposti teorici





Perfusione miocardica - Tecnica Distruttiva
Modalità di utilizzo degli ultrasuoni





Steady state

Frame rottura

Refilling

MCE nella diagnosi di SCA

114 pz PS per DT con ECG senza ST elevation o onde Q

SCA confermata in 87 pazienti

Comparison of diagnostic accuracy between electrocardiography, troponin I, and conventional and contrast echocardiographies

	Acute Myocardial Infarction	Unstable Angina
Myocardial perfusion defects		
Sensitivity	43/46 (93%)	24/41 (59%)
Specificity	43/68 (63%)	26/27 (96%)
RWMAs		
Sensitivity	30/46 (65%)	13/41 (32%)
Specificity	51/68 (75%)	23/27 (85%)
ST change		
Sensitivity	15/46 (33%)	9/41 (22%)
Specificity	56/68 (82%)	24/27 (89%)
Troponin increase		
Sensitivity	25/46 (54%)	5/41 (12%)
Specificity	62/68 (91%)	26/27 (96%)

Kang DH, AJC 2005

Caso clinico

Anamnesi

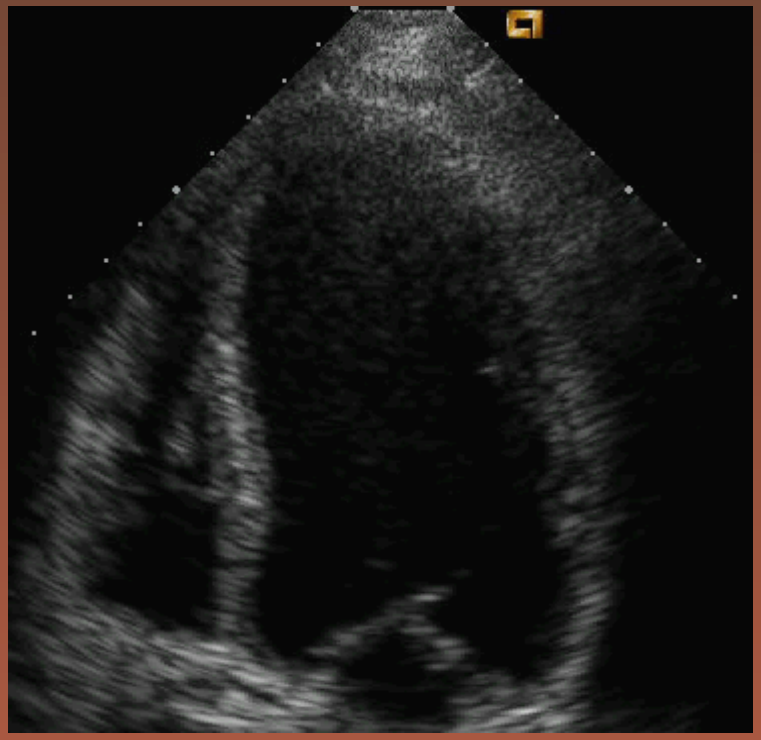
- Maschio, 51 anni
- FRC: Ipertertensione arteriosa
- Anamnesi patologica remota negativa

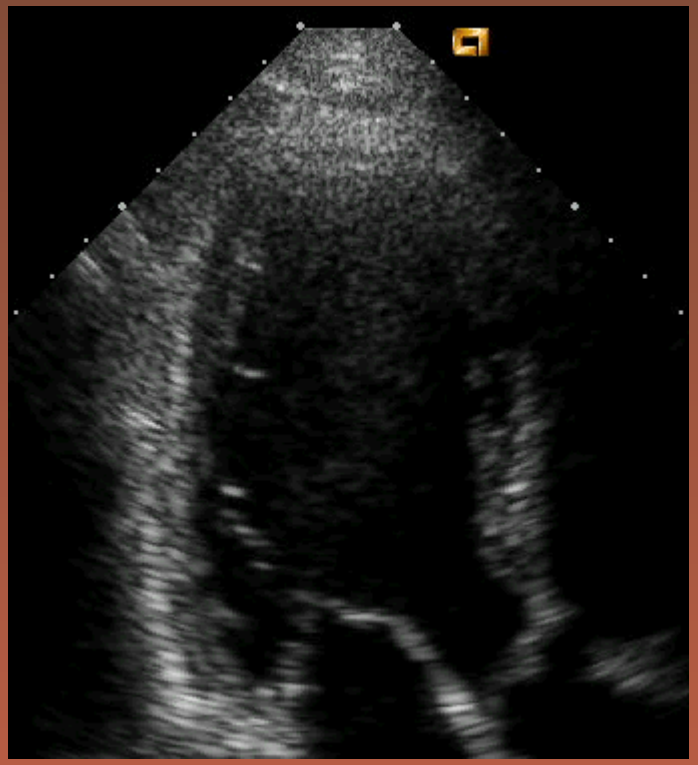
Caso clinico

Anamnesi patologica prossima

- Arresto cardiaco
- ECG: fibrillazione ventricolare
- DC shock: ritmo sinusale

Ecocardiogramma

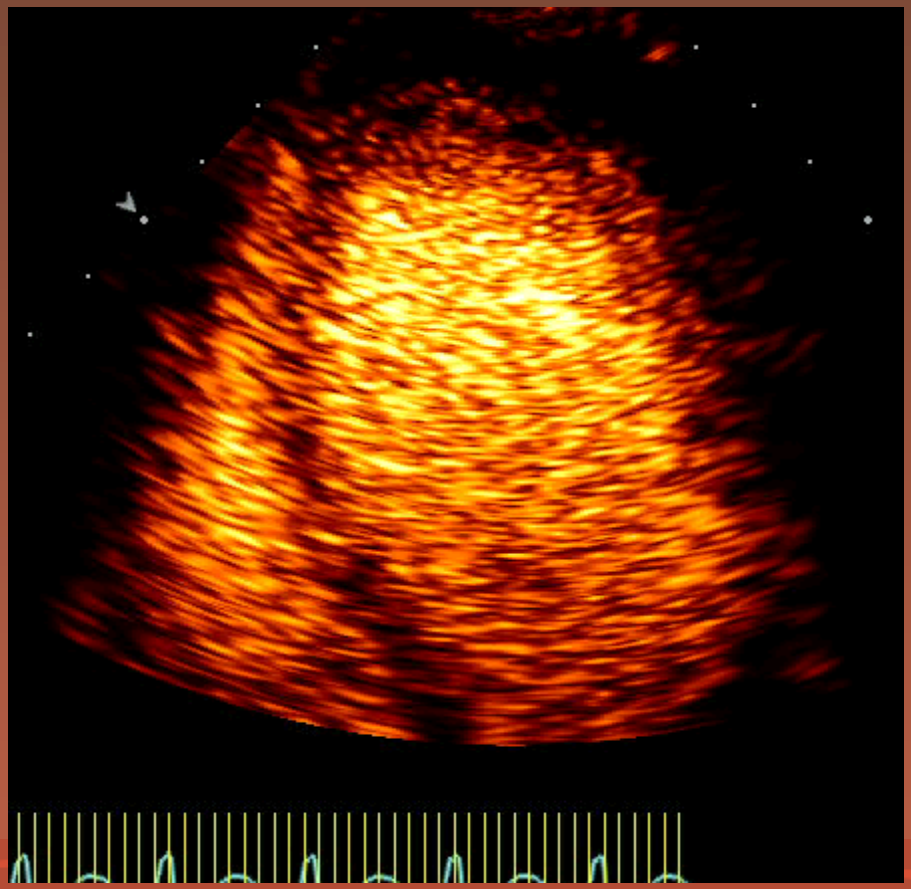




Ipotesi diagnostiche

1. FV primaria
2. FV in cardiomiopatia dilatativa
3. STEMI
4. Sindrome coronarica acuta NSTEMI

Perfusione miocardica



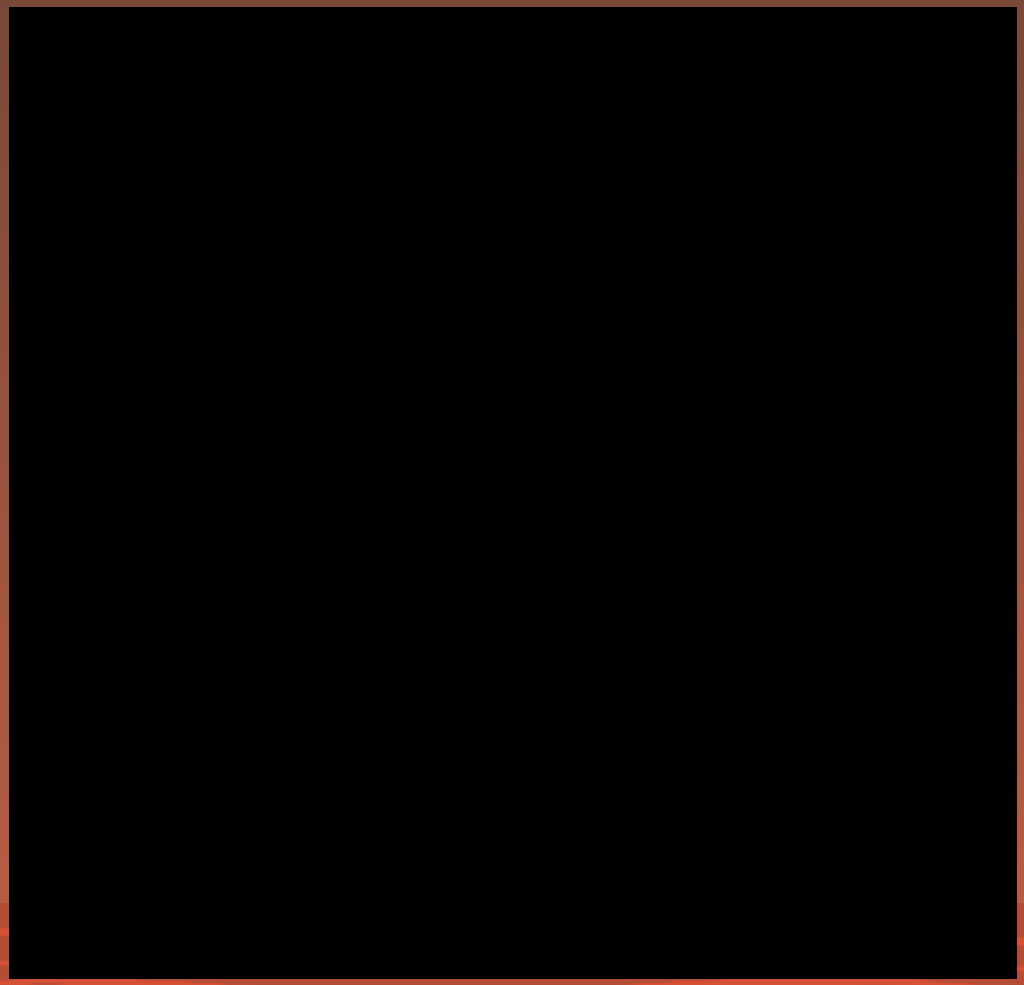
Caso clinico

Anamnesi patologica prossima

- Arresto cardiaco
- ECG: fibrillazione ventricolare
- DC shock: ritmo sinusale
- Minima dispersione enzimatica
- Nessuna evoluzione ECG

Coronarografia

Coronarografia



MCE nella diagnosi di SCA

Pz > 30 anni in PS per DT > 30 minuti + ECG non diagnostico

TIMI risk score
TIMI modificato

Rischio basso
Rischio intermedio
Rischio alto

Ecocardio:
- Wall motion (WM)
- Perfusione (MCE)

- WM + MCE normali
- WM normale+ difetto MCE
- WM anormale + MCE normale
- WM anormale + difetto MCE

Follow-up (early, intermediate, late events)
- End point primario = morte o AMI
- End point secondario: rivascolarizzazione o UA/ricovero

Tong, JACC 2005

MCE nella diagnosi di SCA

M-TIMI + WM

M-TIMI

M-TIMI + WM + MCE

TIMI

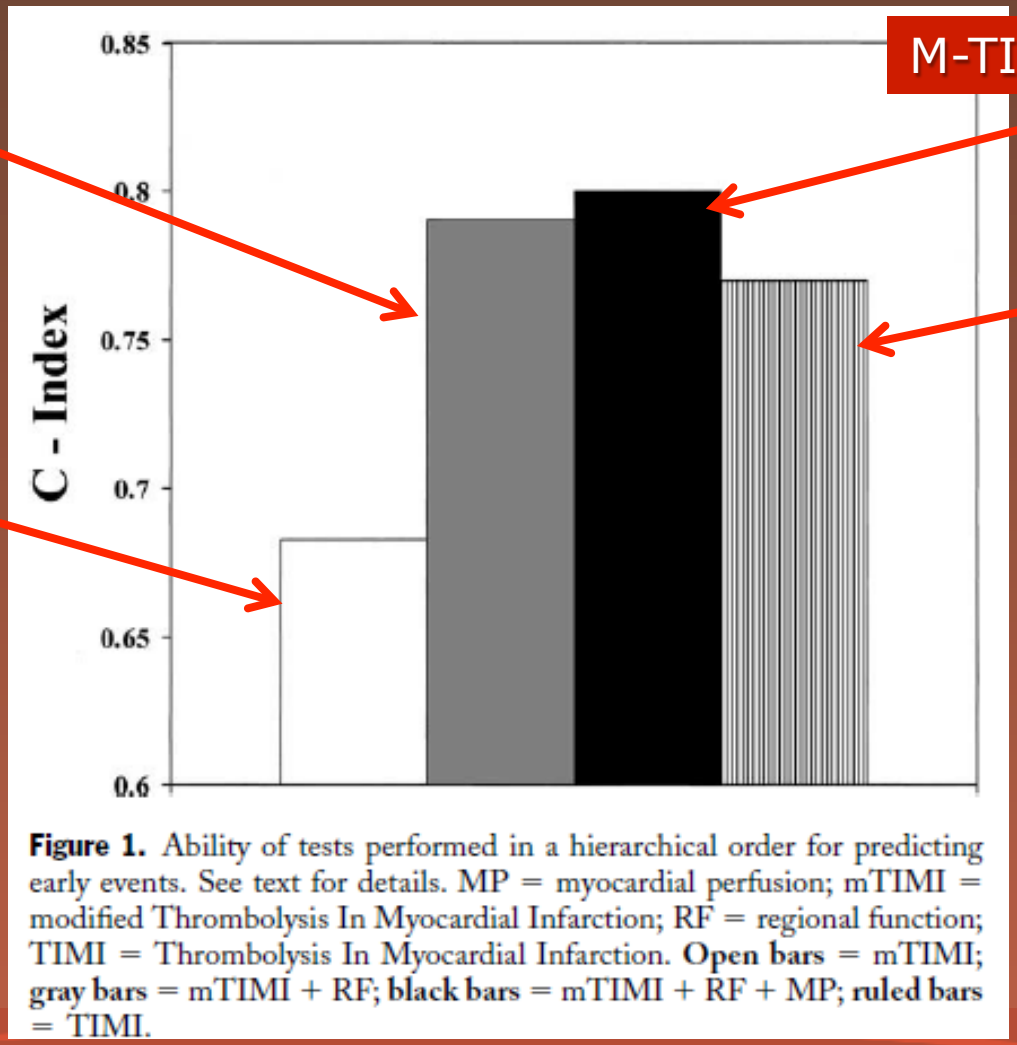
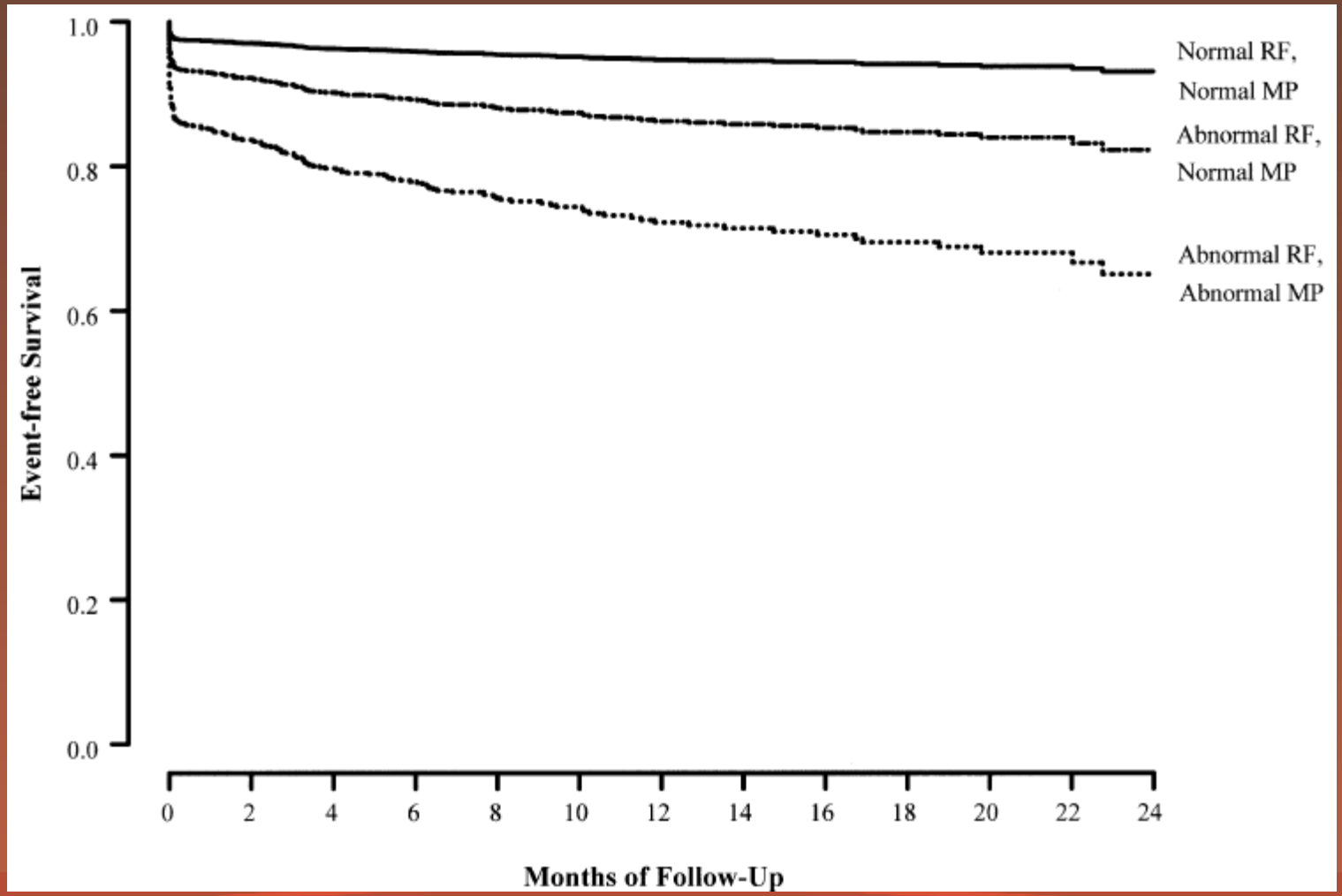


Figure 1. Ability of tests performed in a hierarchical order for predicting early events. See text for details. MP = myocardial perfusion; mTIMI = modified Thrombolysis In Myocardial Infarction; RF = regional function; TIMI = Thrombolysis In Myocardial Infarction. **Open bars** = mTIMI; **gray bars** = mTIMI + RF; **black bars** = mTIMI + RF + MP; **ruled bars** = TIMI.

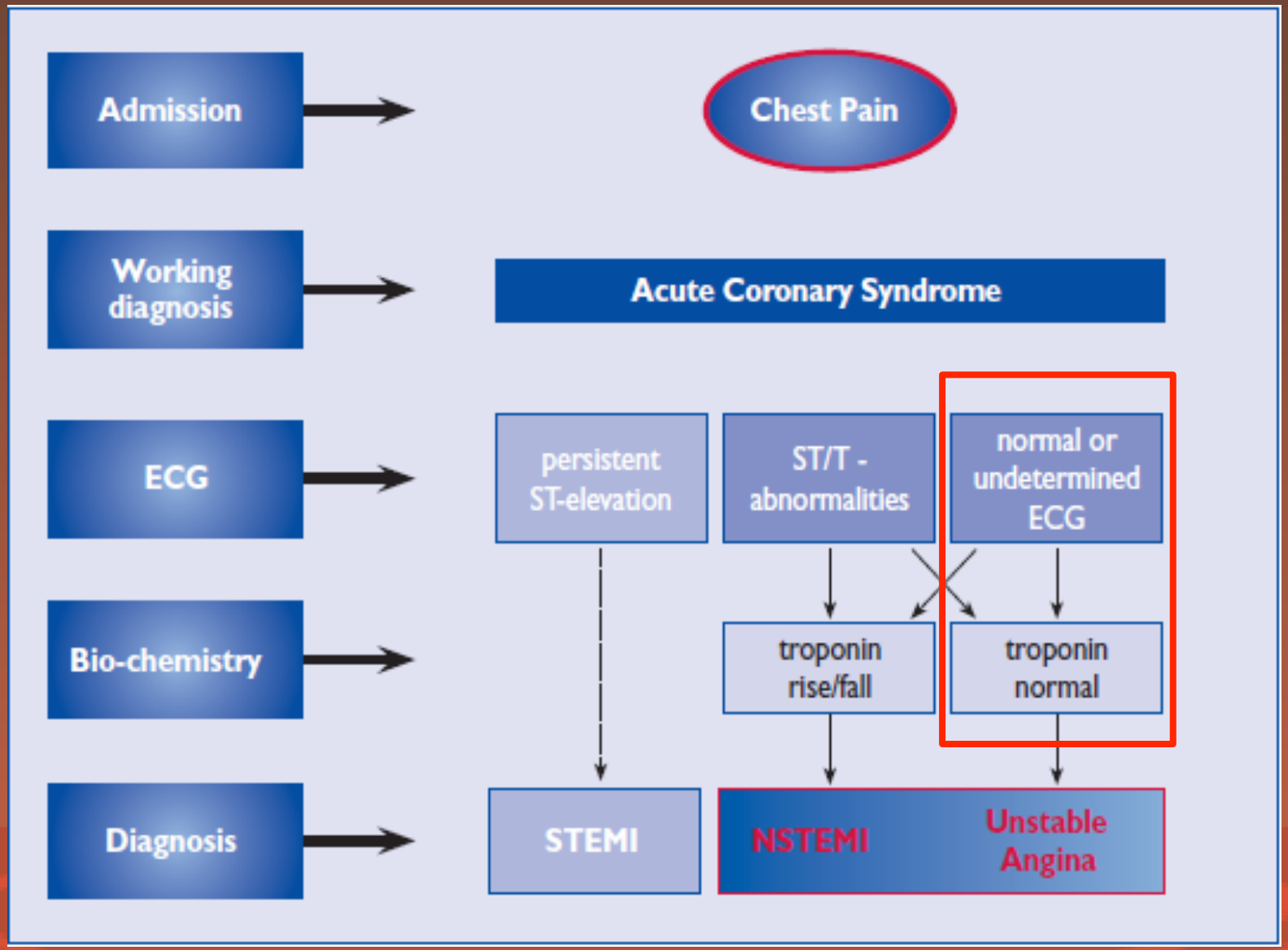
Tong, JACC 2005

MCE nella prognosi di SCA



Tong, JACC 2005

Sindrome coronarica acuta



MCE nella diagnosi di SCA

545 pz in PS per DT + ECG non diagnostico + Troponina neg a 12h

TIMI risk score
- Alto rischio
- Basso rischio

Stress Eco:
- Wall motion (WM)
- Perfusione (MCE)

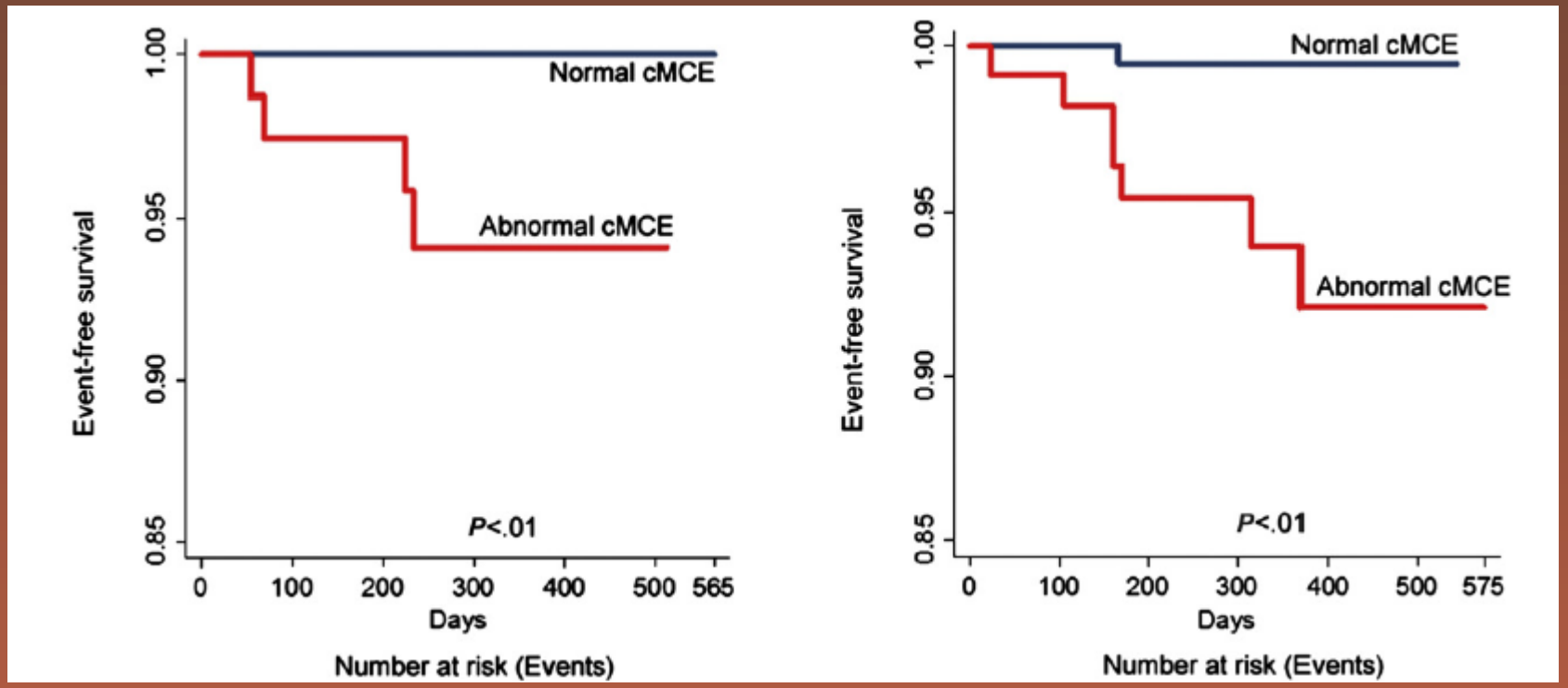
↓

- WM + MCE normali
- WM normale+ difetto MCE
- WM anormale + MCE normale
- WM anormale + difetto MCE

Follow-up a 1 anno
Eventi hard= morte per causa cardiaca o AMI
- Eventi combinati: morte, AMI o UA/ rivascolarizzazione

Gaibazzi, JASE 2011

MCE nella diagnosi di SCA

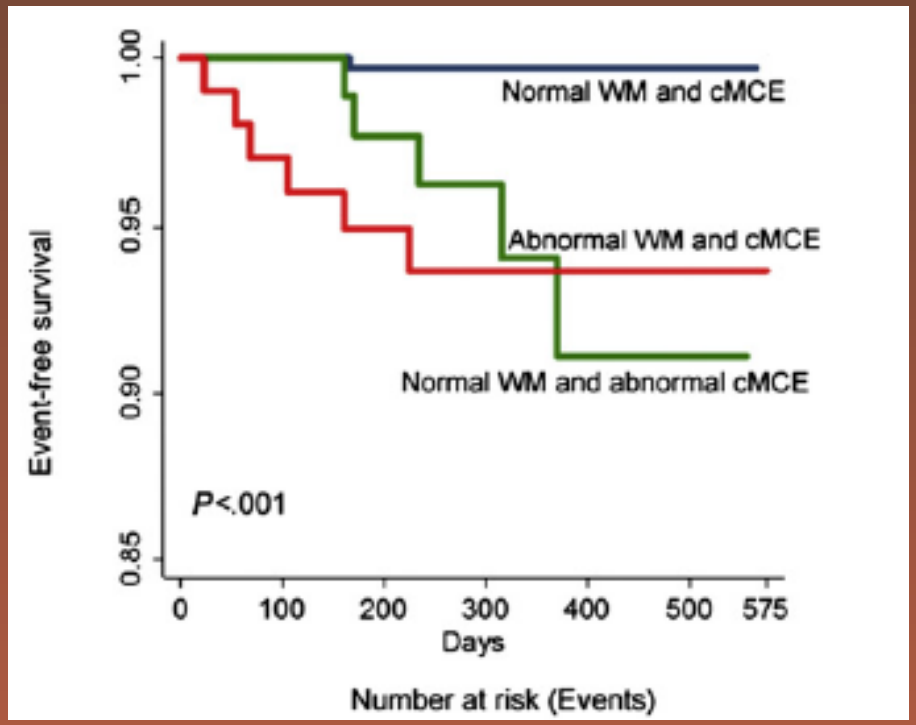


Basso rischio

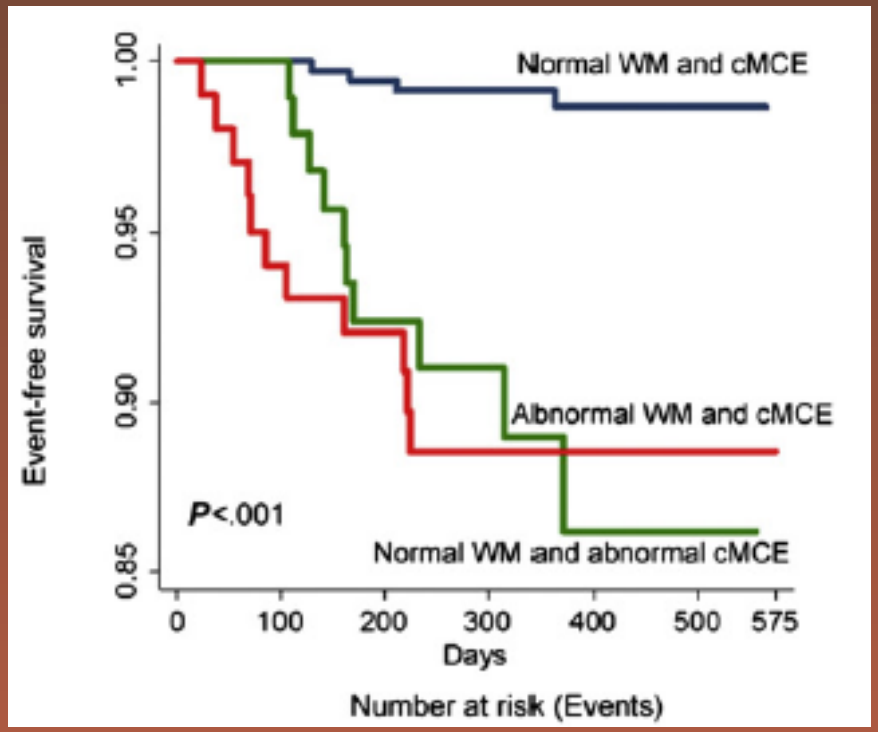
Alto rischio

Gaibazzi, JASE 2011

MCE nella diagnosi di SCA



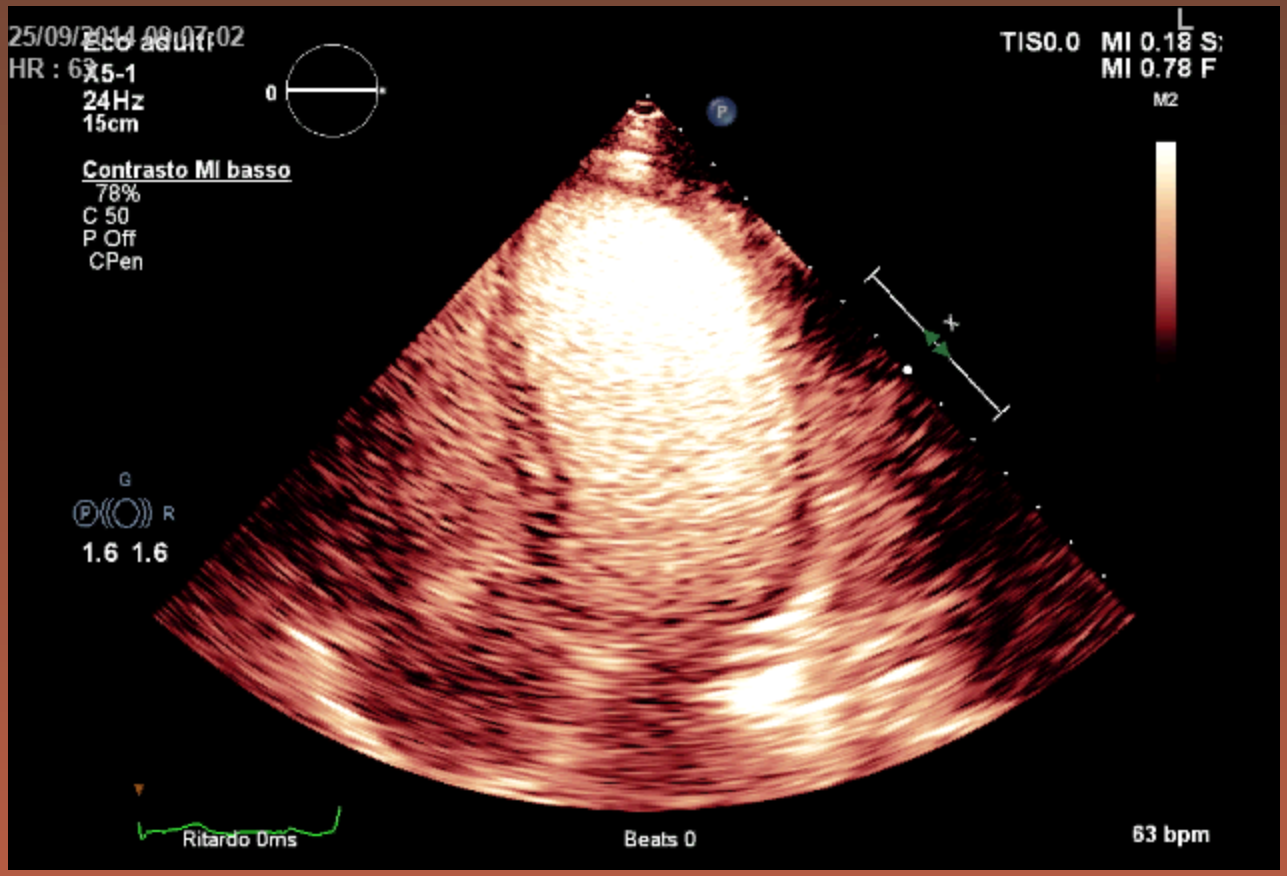
Eventi hard



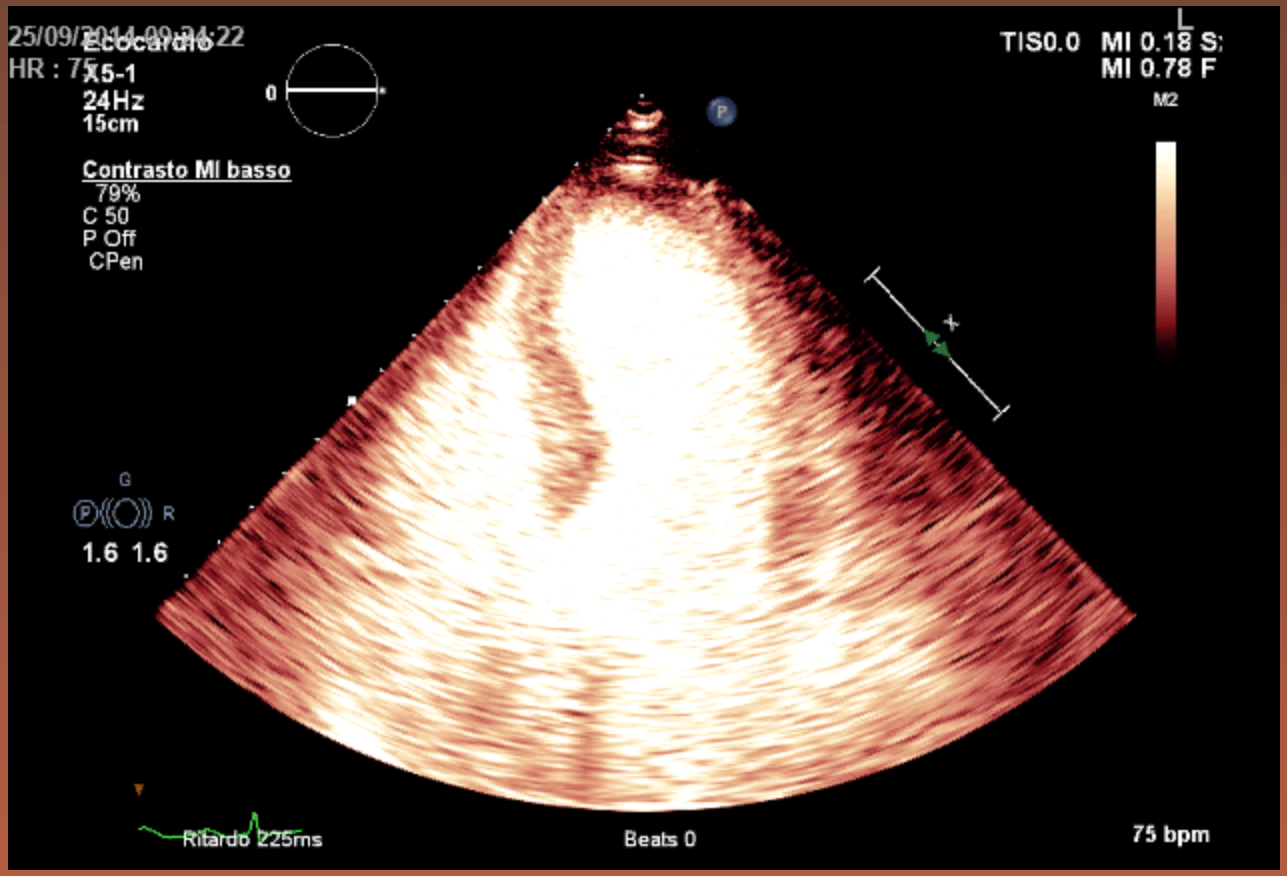
Eventi combinati

Gaibazzi, JASE 2011

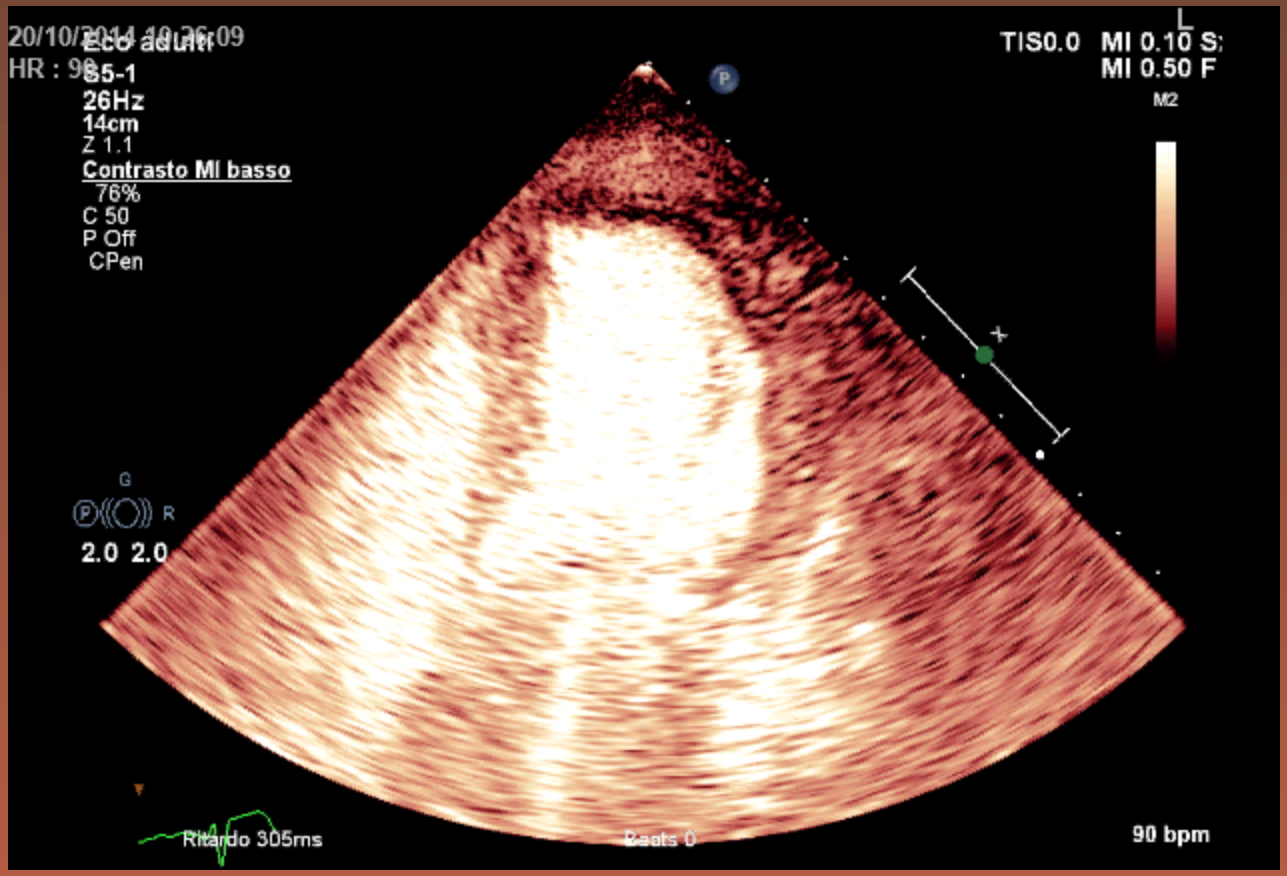
Perfusione basale



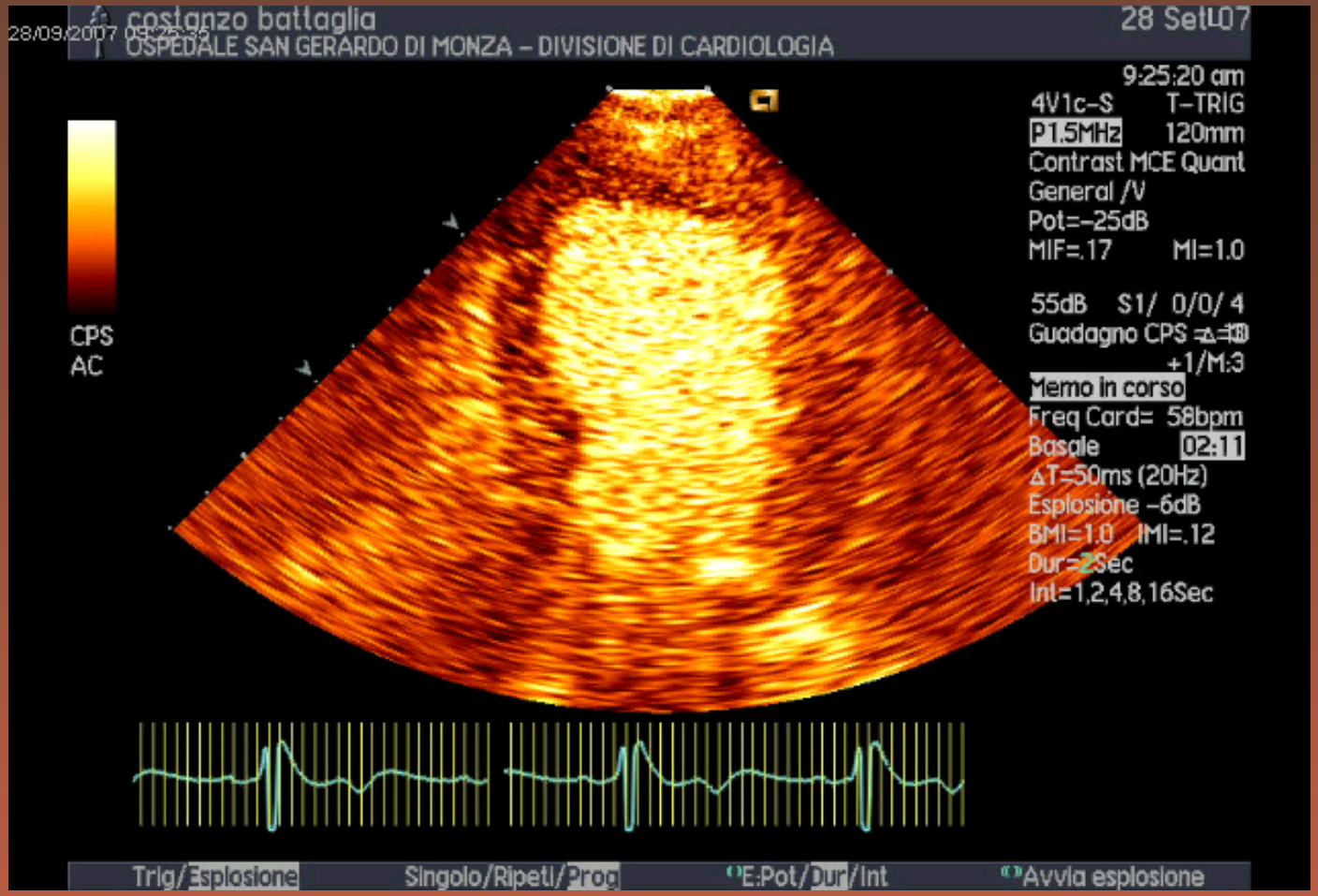
Perfusione dopo dipiridamolo alta dose



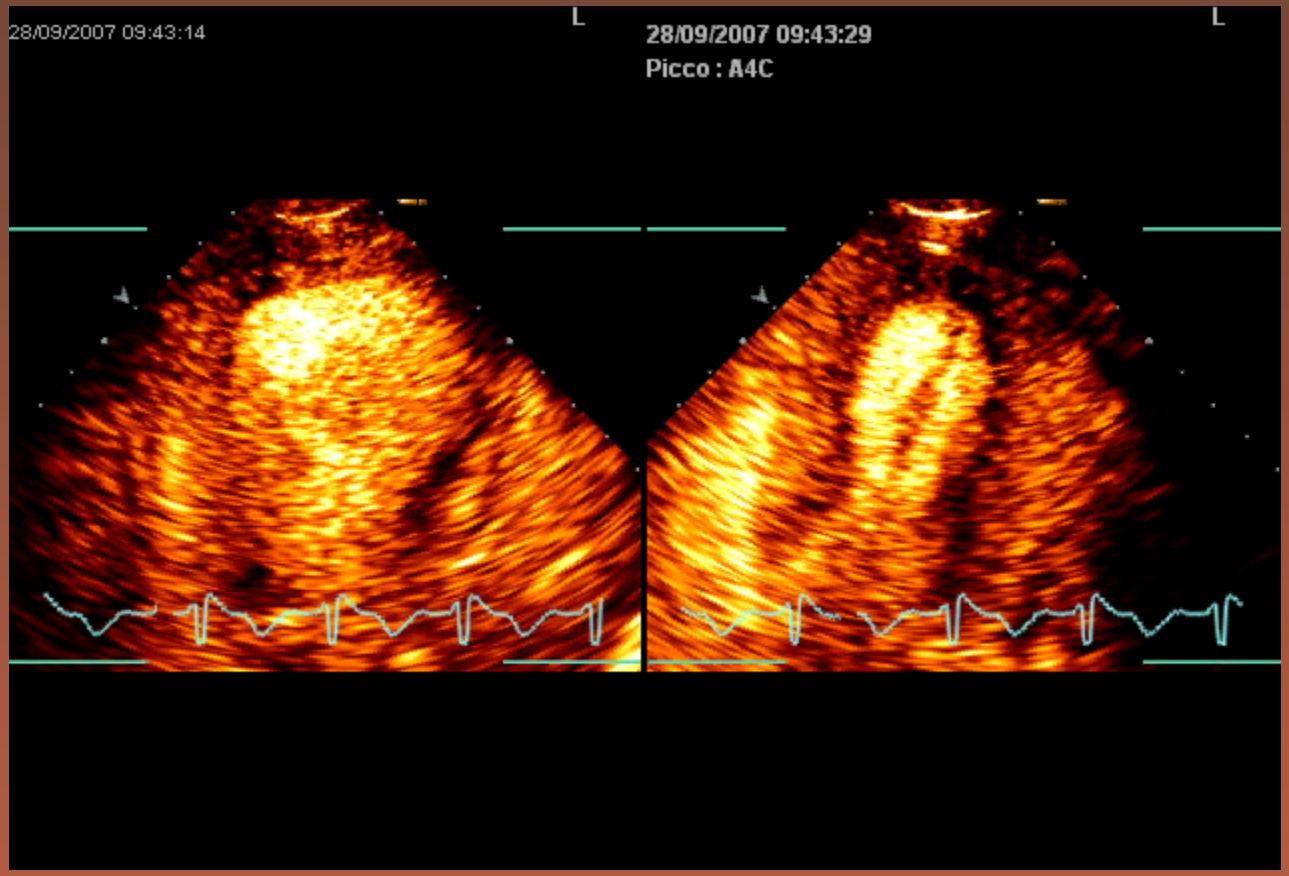
Difetto apicale dopo dipiridamolo. 4° ciclo postrottura



Caso 2 – perfusione basale

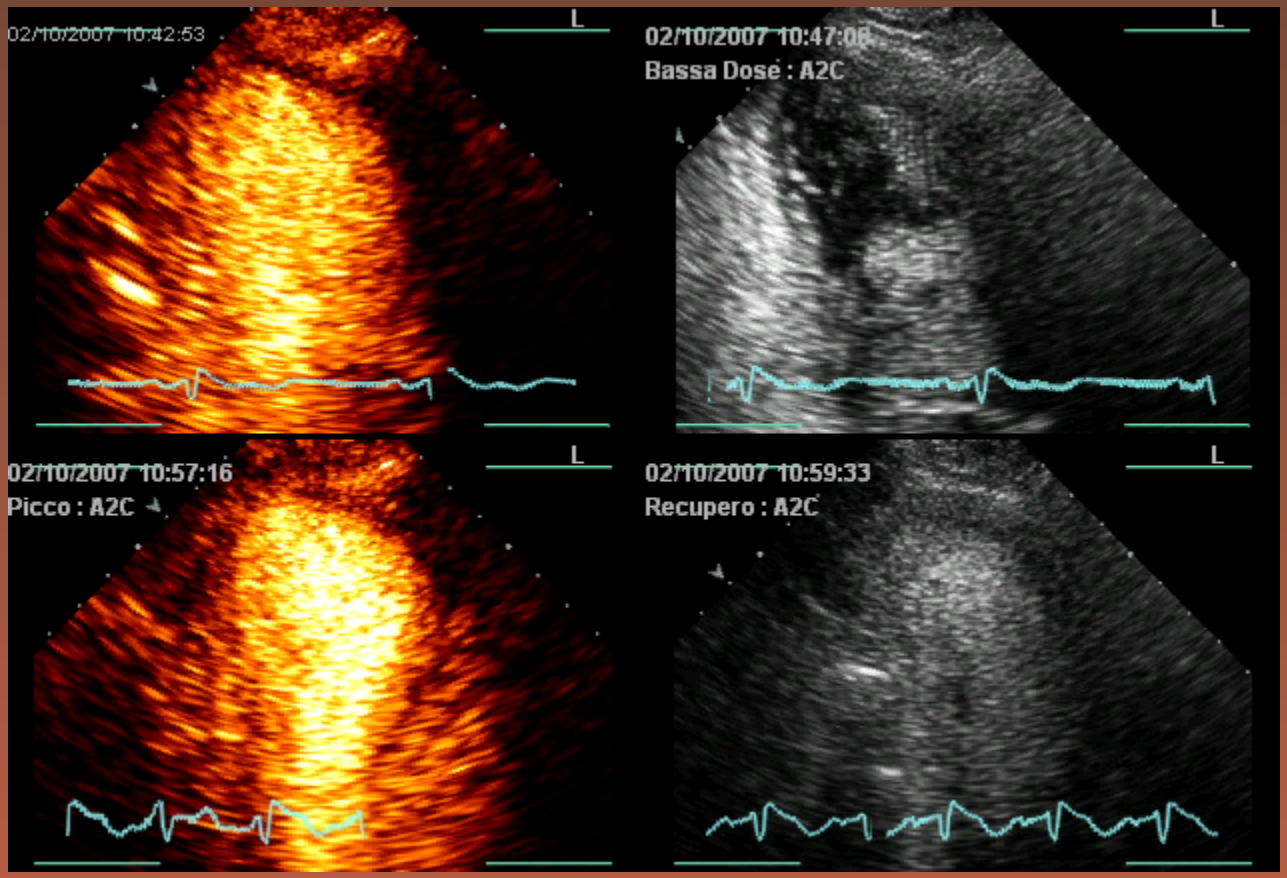


Caso 2 – perfusione al picco



Caso 3 – valutazione della contrattilità

Basale

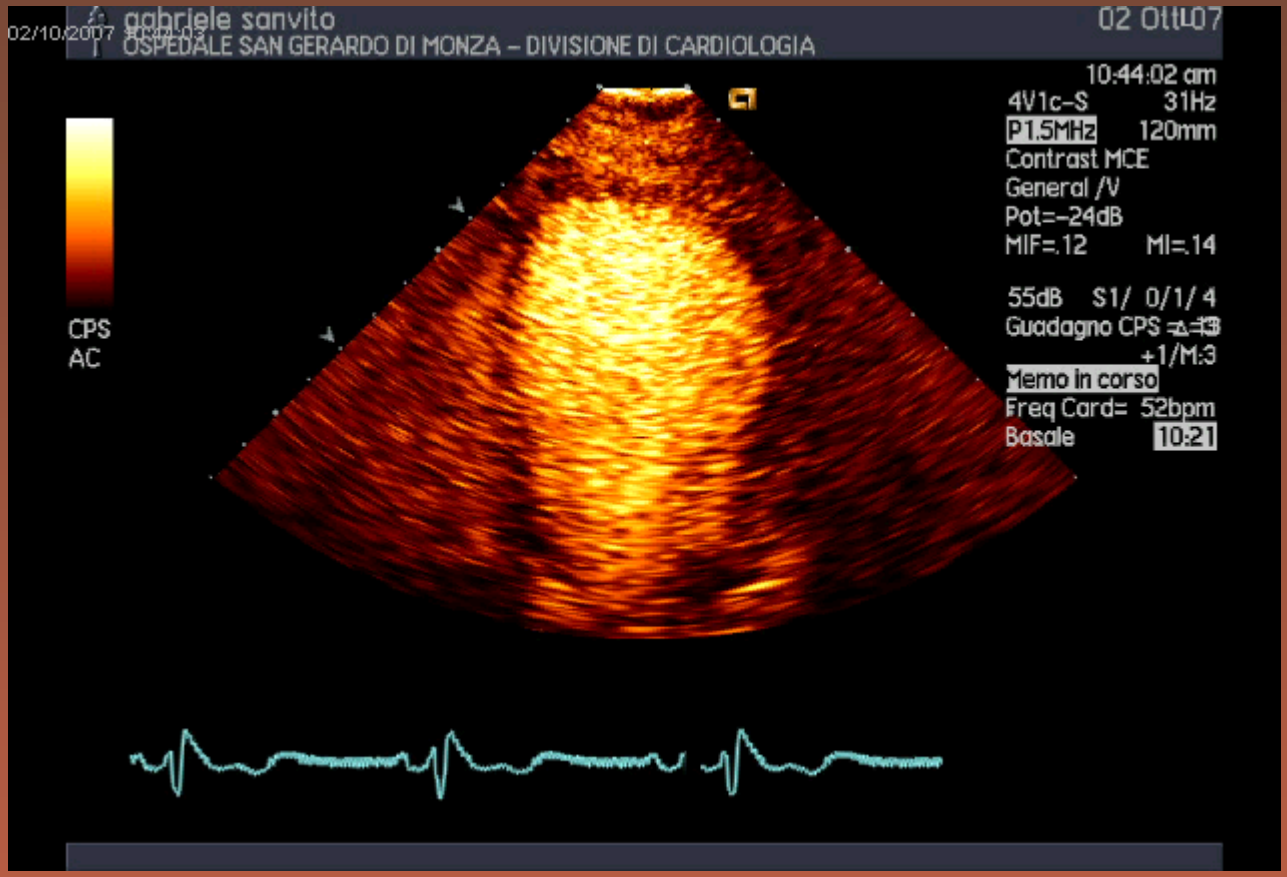


Bassa Dose

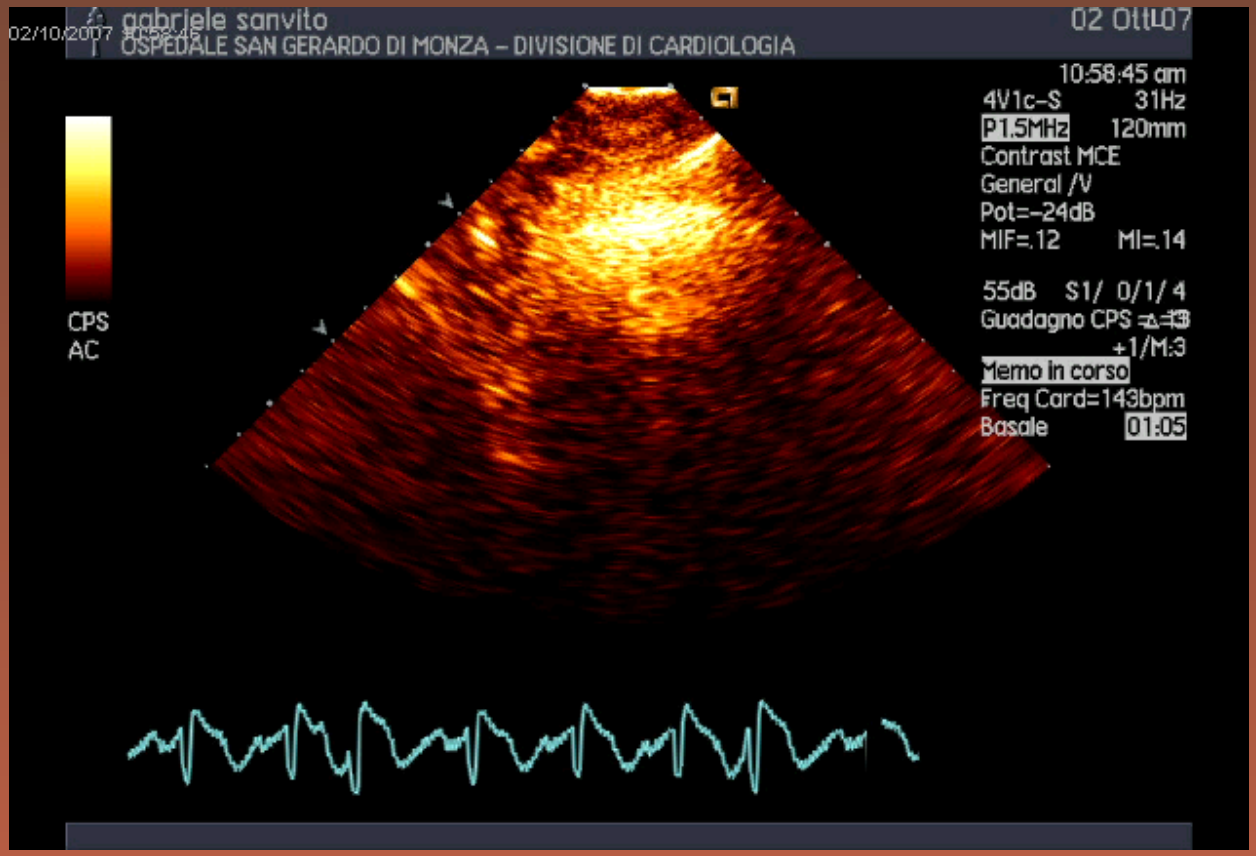
Picco

Recupero

Caso 3 – perfusione basale



Caso 3 – perfusione al picco



Ecocontrastografia con perfusione ci aggiunge dati indispensabili

- Metodica per cui è necessario training
- Facile raggiungimento di competenza di esecuzione
- Dati incrementali rispetto alla diagnosi con mezzi ‘standard’
- Potenziale risparmio di tempo e di risorse in PS