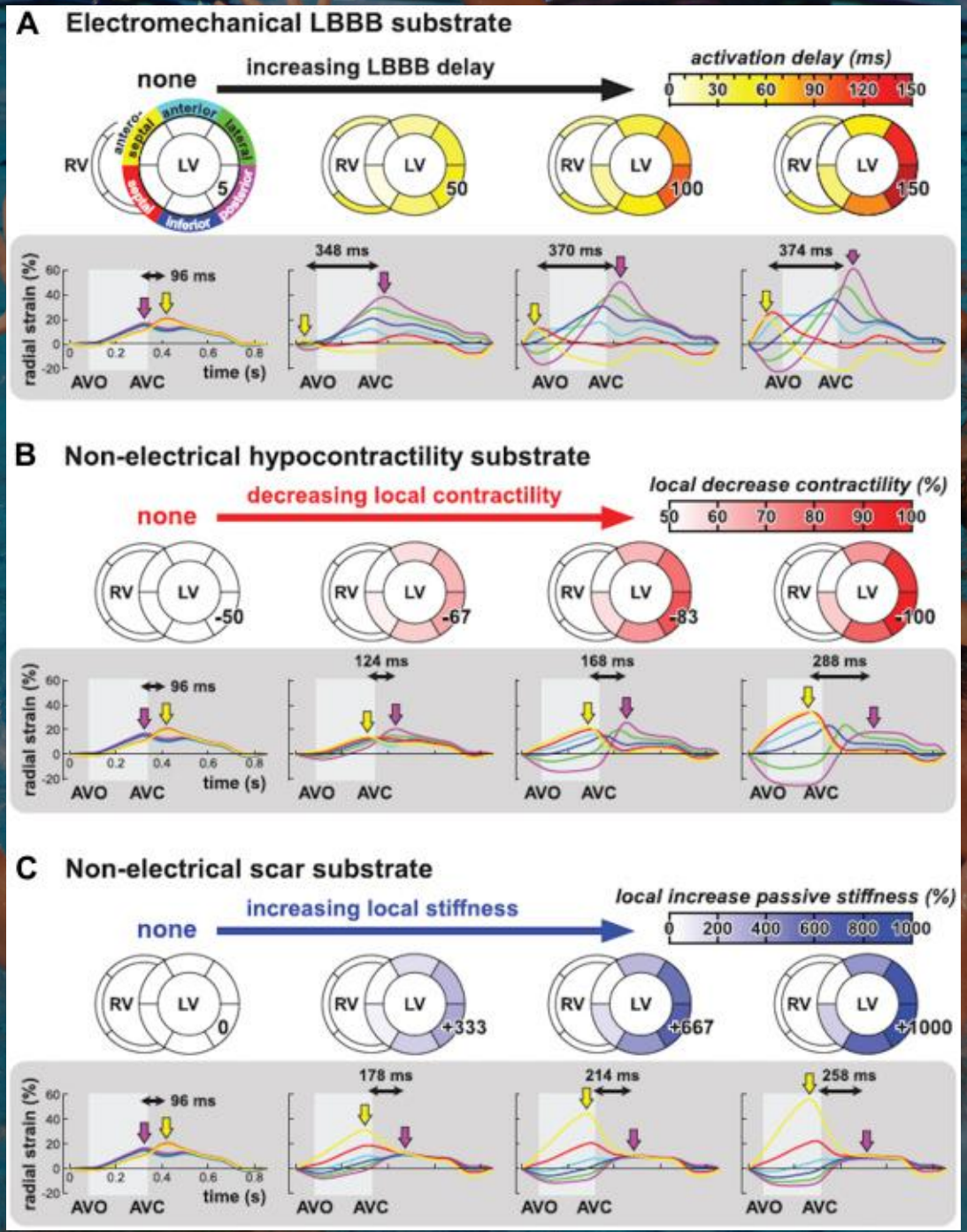
EMOCLINIC SYMPOSIUM

SULLE SPONDE DEL TICINO

“Cardiologia ieri, oggi e domani“

Utilizzo ottimale e personalizzato degli algoritmi di corretta resincronizzazione

Dr. NC. Dajelli Ermolli



Effetti del BBS

Circ Cardiovasc Img, 5 2012

È ancora utile l'ecocardiografia nella terapia di risincronizzazione cardiaca?

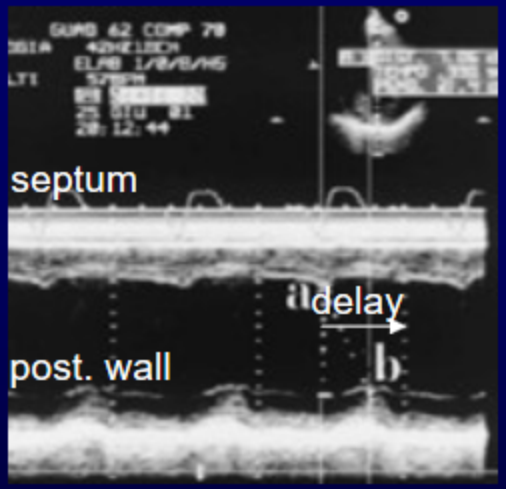
- Serve solo ECG basale?
- Per selezionare?
- Per migliorare l'impianto?
- Per ottimizzare dopo l'impianto?
- Serve altro (TAC, RMN e SEF)?
- Sbagliamo ad affidarci all'imaging?

Echocardiographic Dyssynchrony Index

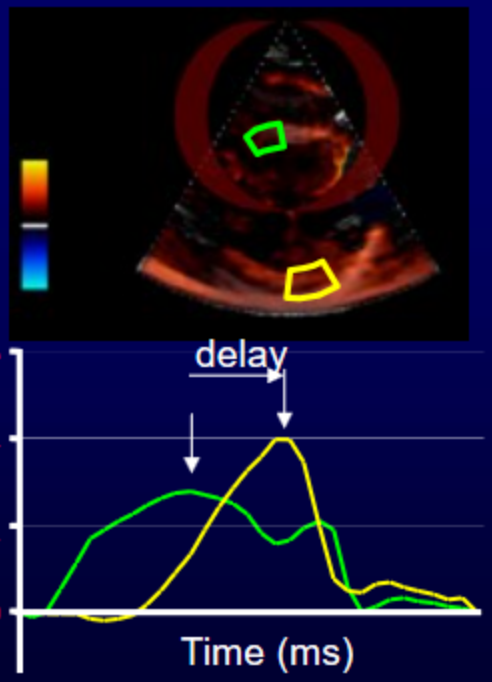
- Yu Index (Ts-SD)
- **Septal to free wall delay**

Yu CM J Cardiovasc Electrophysiol 2004 15:1058

Parasternal M-mode
Septum-Posterior Wall
time to peak wall motion
Cut-off ≥ 130ms



Parasternal Short Axis
Septum-Posterior Wall
time to peak
strain/displacement delay

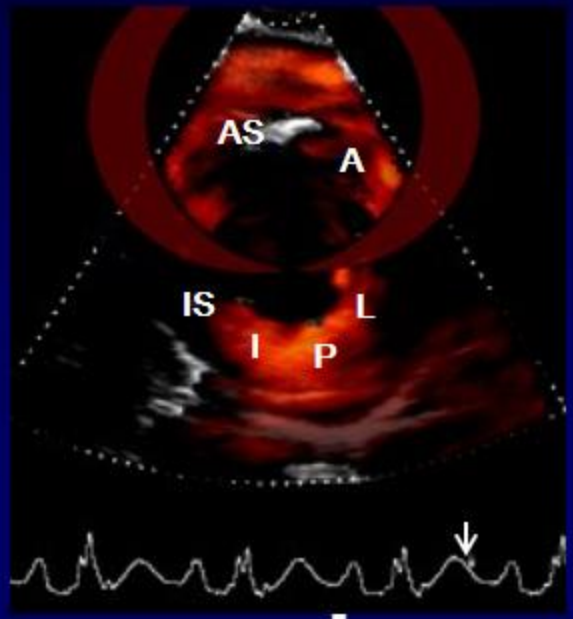


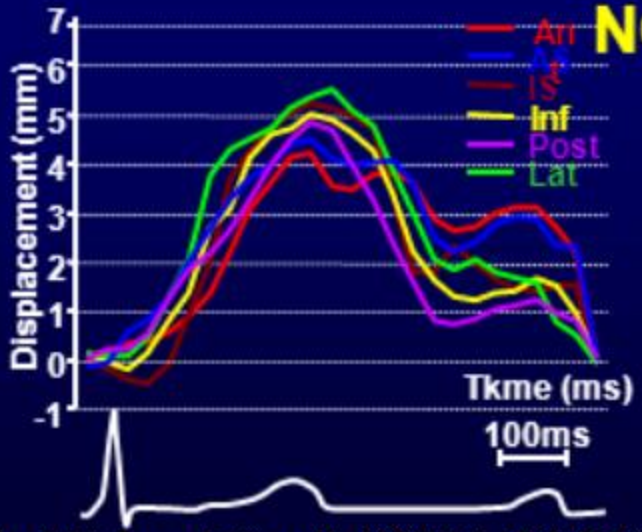
Apical views
Opposing wall
time to peak velocity dela
Cut-off ≥ 60ms

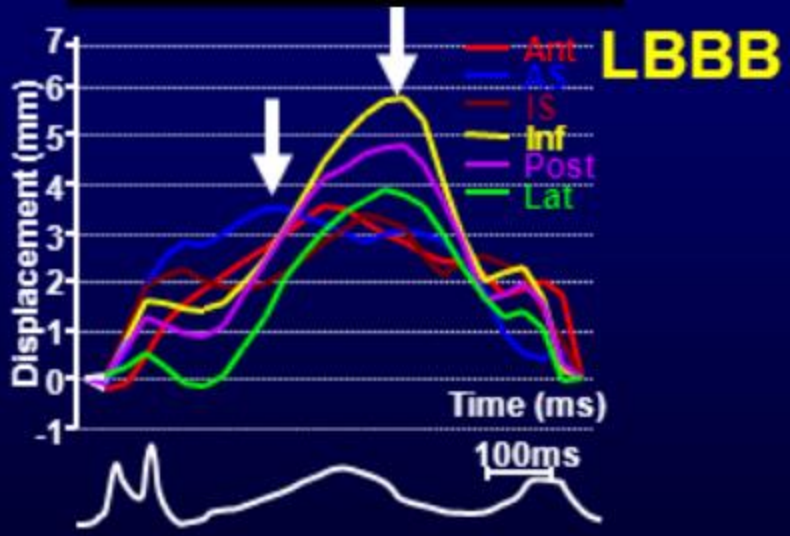
Quantification of Regional Dysynchrony

Angle-corrected Tissue Displacement Imaging

Short axis
6-segment
model

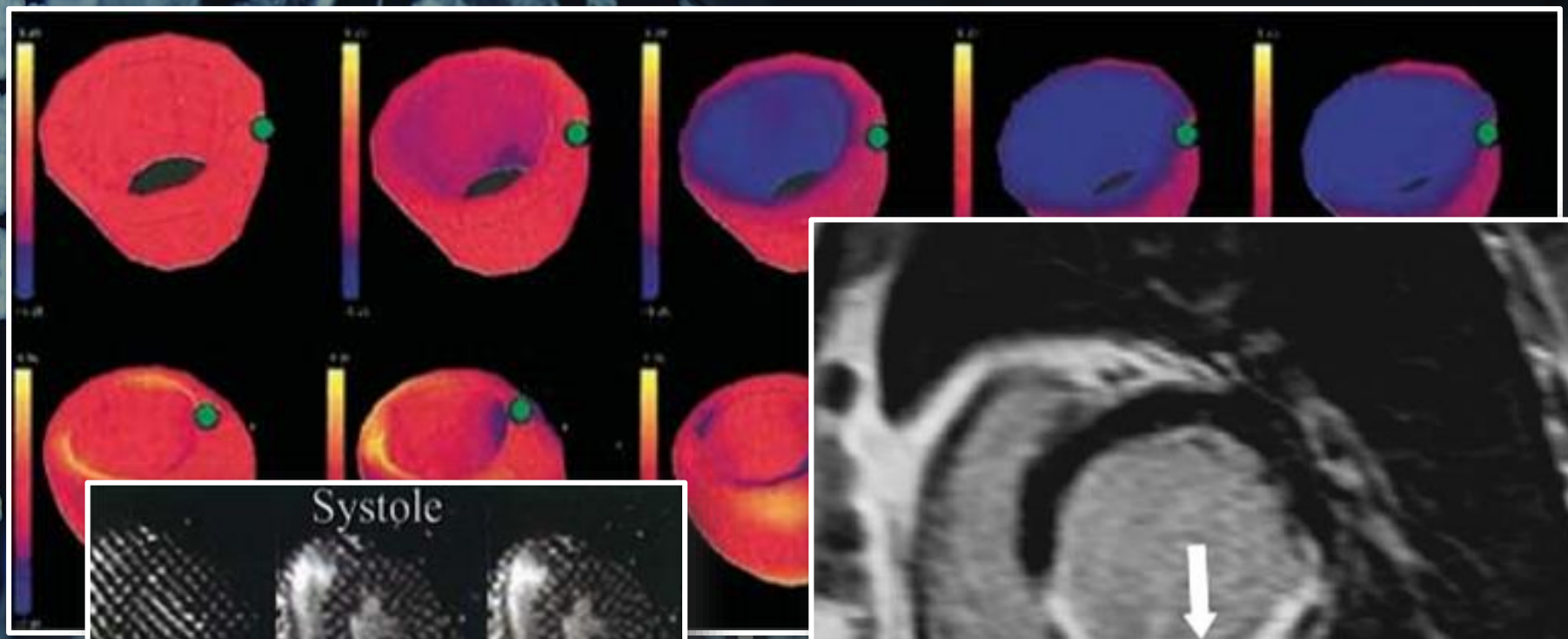


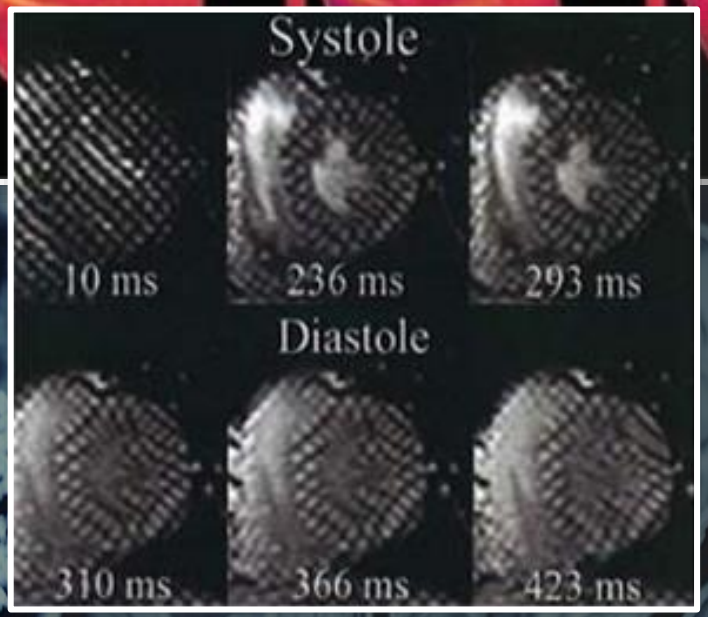




Sade LE Am J Cardiol 2004; 94:514

RMN pre-procedurale

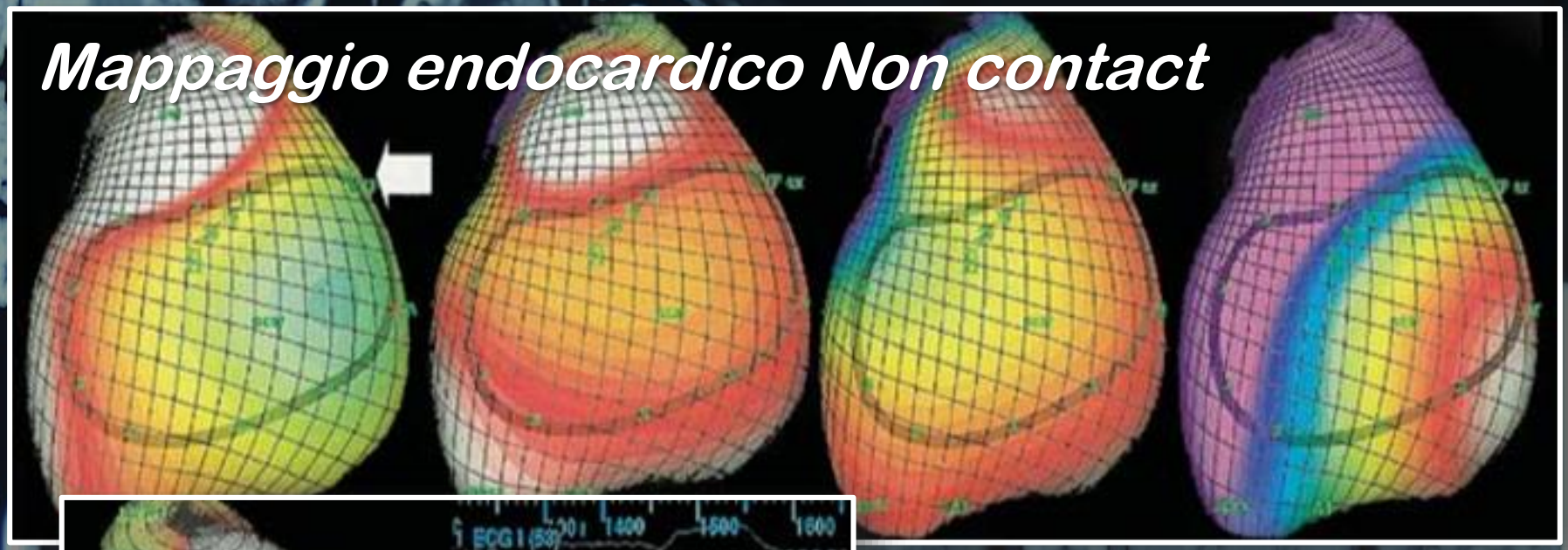


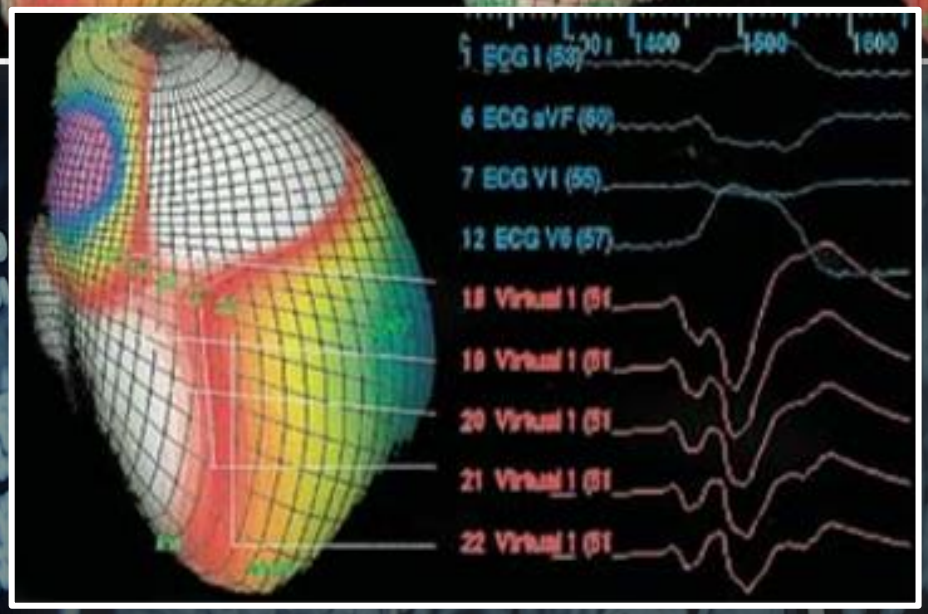


Lardo et al

SEF pre-procedurale

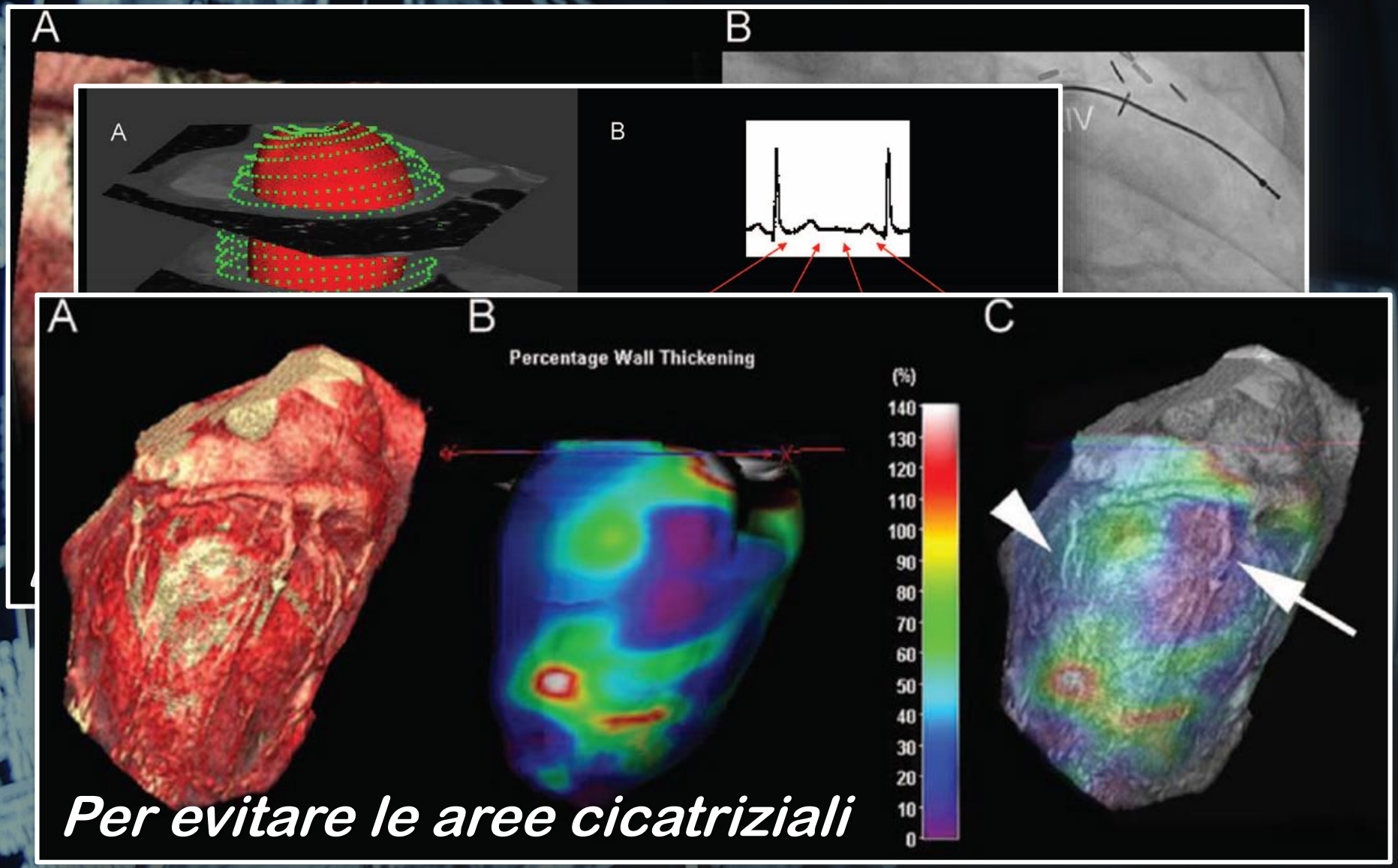
Mappaggio endocardico Non contact





Bax et al

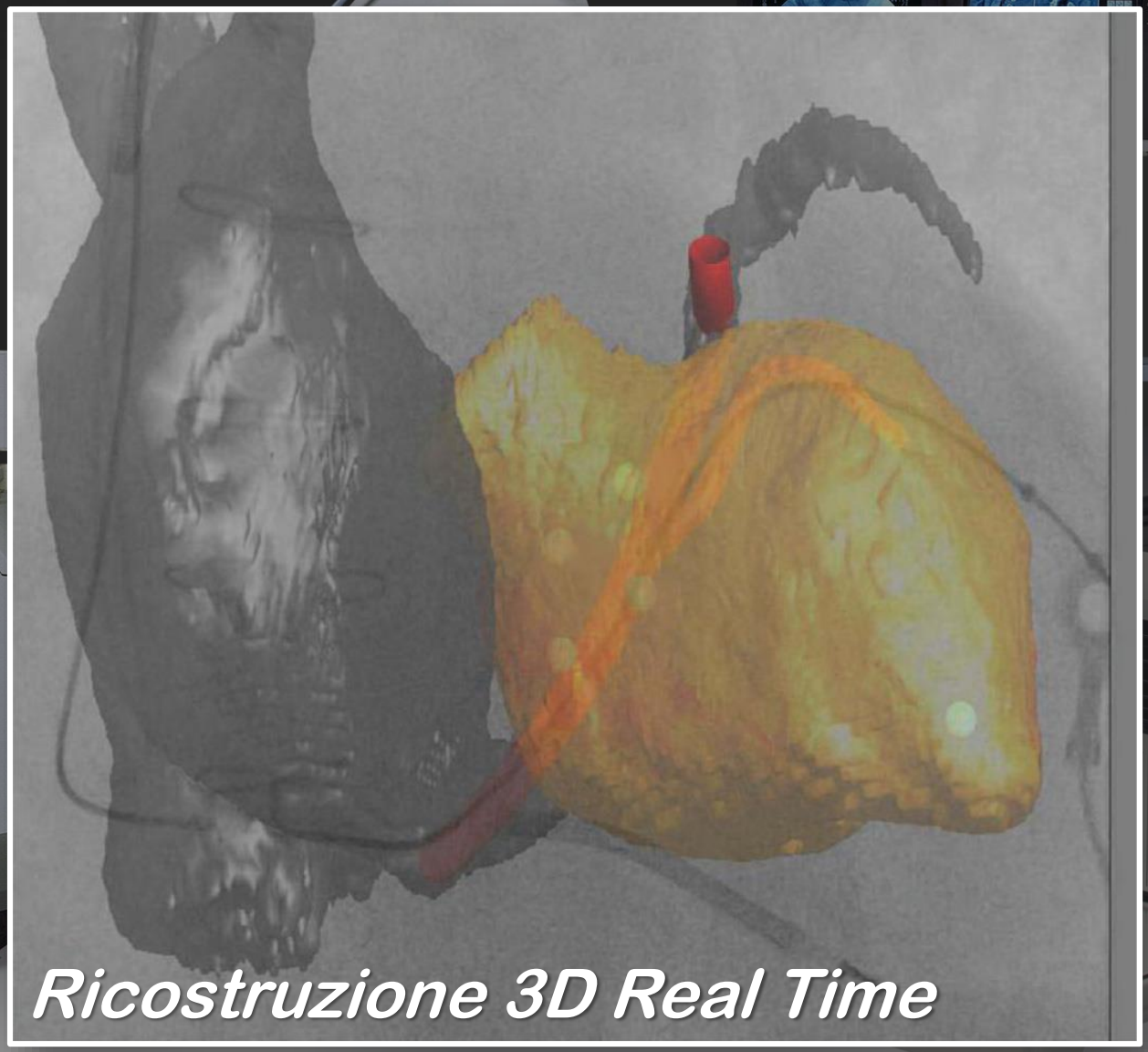
CT pre-procedurale



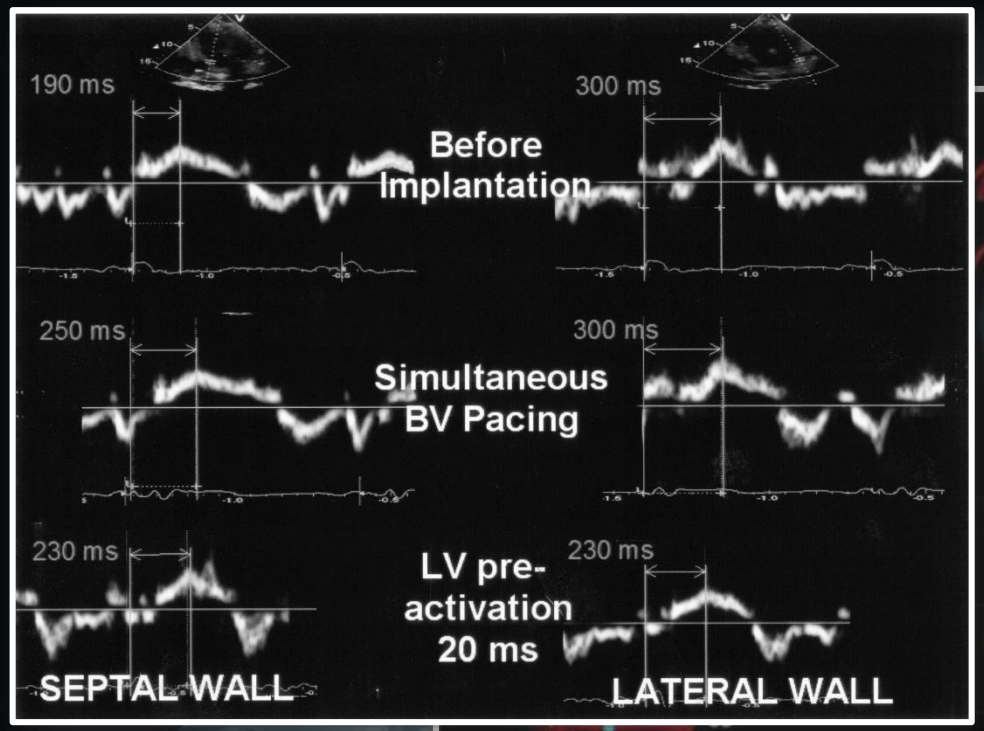
Per evitare le aree cicatriziali

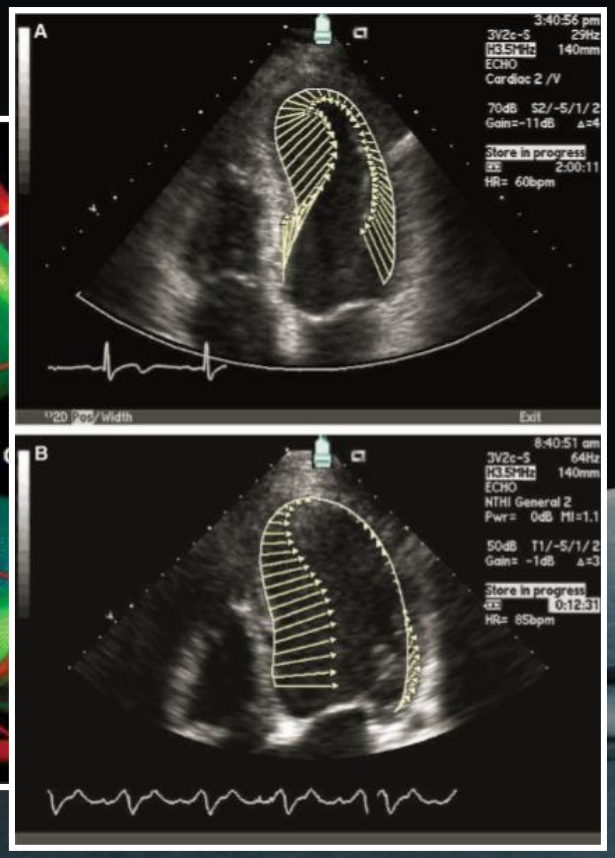
Crit PathW Cardiol 2008

CT intra-procedurale



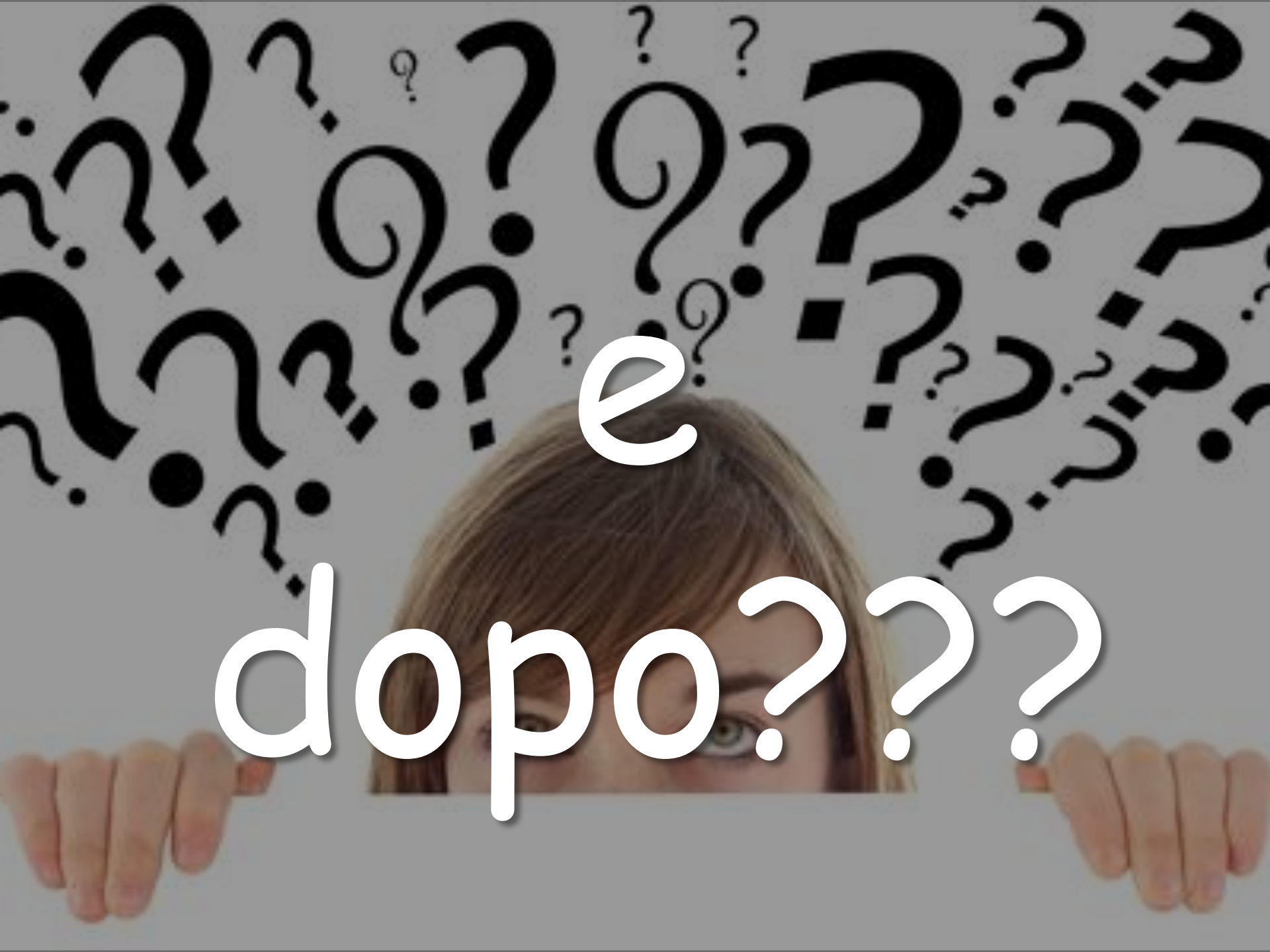
ECO intra-procedurale





Piccoli studi retrospettici ne suggeriscono l'efficacia nell'evitare aree cicatriziali e nella scelta della vena di impianto con maggior ritardo di attivazione

J Cardiovasc Electrophysiol. 2011


e
dopo???

Problemi di Ritardi

TABELLA I.
Metodi più utilizzati per l'ottimizzazione dell'intervallo atrio-ventricolare e inter/intraventricolare.

INTERVALLO	METODO	VALORE OTTIMALE
AV	Metodo Ritter	AV opt = AV long – (QA short-QA long)
	Metodo Iterativo	Maggior tempo di riempimento ventricolare sin; maggior EA
	VTI mitralico	Maggior VTI mitralico
	VTI aortico	Maggior VTI aortico
	MPI	Minor MPI
	dp/dt max	Maggior dp/dt max
VV	VTI aortico	Maggior VTI aortico
	IVMD	Minor IVMD
	TDI	Minor dissincronia intraventricolare
	Strain	Minor ritardo tra il più precoce e il più tardivo picco di strain
	Eco 3D	Minor systolic dyssynchrony index
	ECG	QRS più stretto
	Algoritmi device	Secondo algoritmo

AV = atrio-ventricolare; VV = interventricolare; IVMD = ritardo meccanico interventricolare; VTI = integrale velocità-tempo al doppler pulsato; MPI = indice di performance miocardica; TDI = Tissue Doppler.

Ritardo V-V

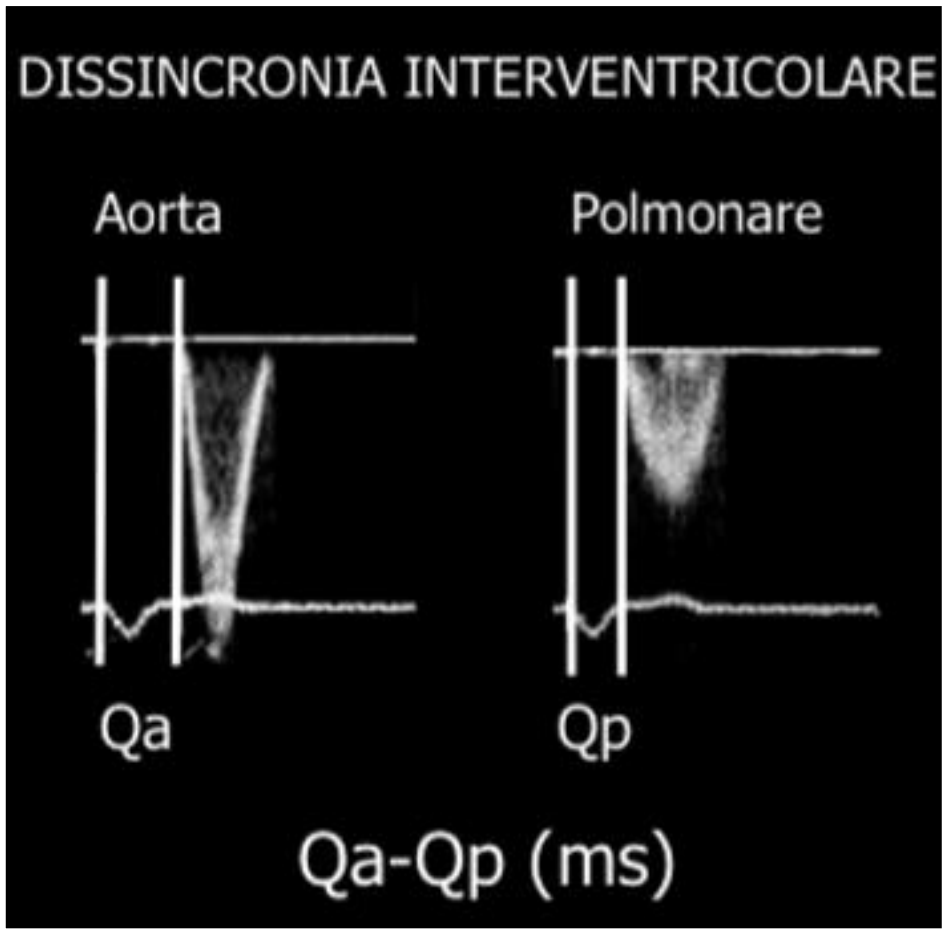


Tabella 4. Principali indici di dissincronia cardiaca di prima generazione.

Indice	Tecnica	Cut-off di predittività
Dissincronia atrio-ventricolare		
• Insufficienza mitralica pre-sistolica	Doppler CW	Presente/ assente
Dissincronia interventricolare		
• Interventricular mechanical delay (IVMD) o Qa-Qp	Doppler PW	49.2 ms
Dissincronia intraventricolare longitudinale		
• Septal-to-lateral delay (IS-L delay)	Color-DTI	65 ms
• Septal-to-posterior delay (AS-P delay)	Color-DTI	65 ms
• Tv-SD (o Ts-SD o indice di Yu)	Color-DTI	33 ms
• Tε-SD	Color-DTI	60 ms
• oExT	Strain DTI	760 ms
Dissincronia intraventricolare radiale		
• Septal-to-posterior wall motion delay (SPWMD)	M-mode	130 ms
Dissincronia combinata inter-intraventricolare		
• Sum index	DTI PW	102 ms

CW, ad onda continua; DTI, Doppler tissutale; PW, ad onda pulsata.

Smart-AV study

Ritardo intra-V

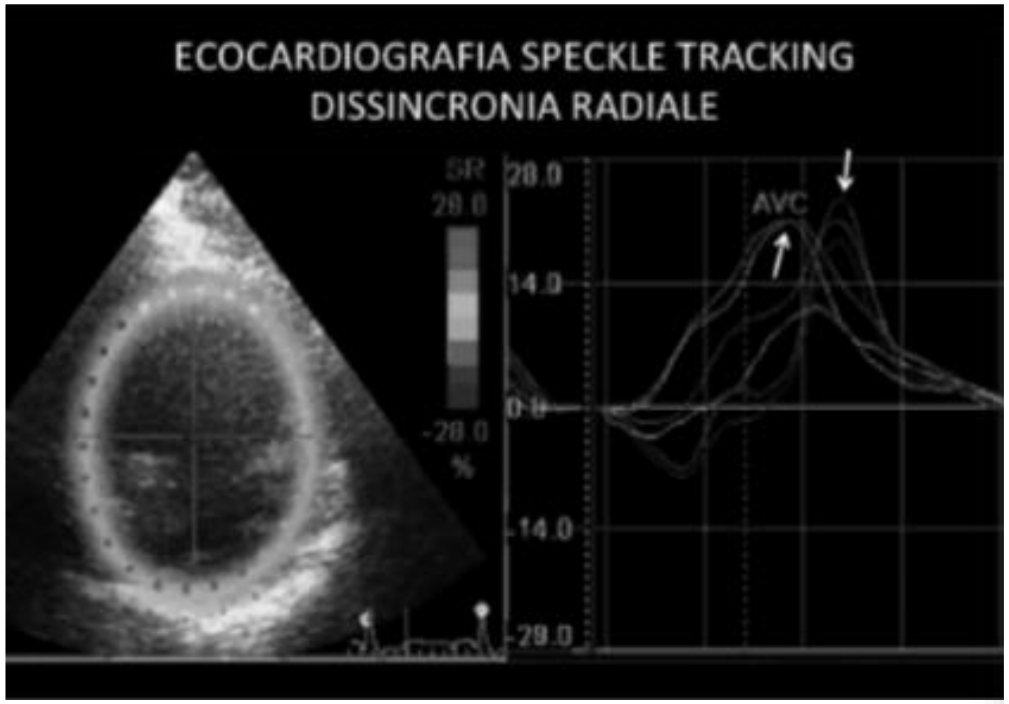


Tabella 5. Principali indici di dissincronia cardiaca di seconda generazione.

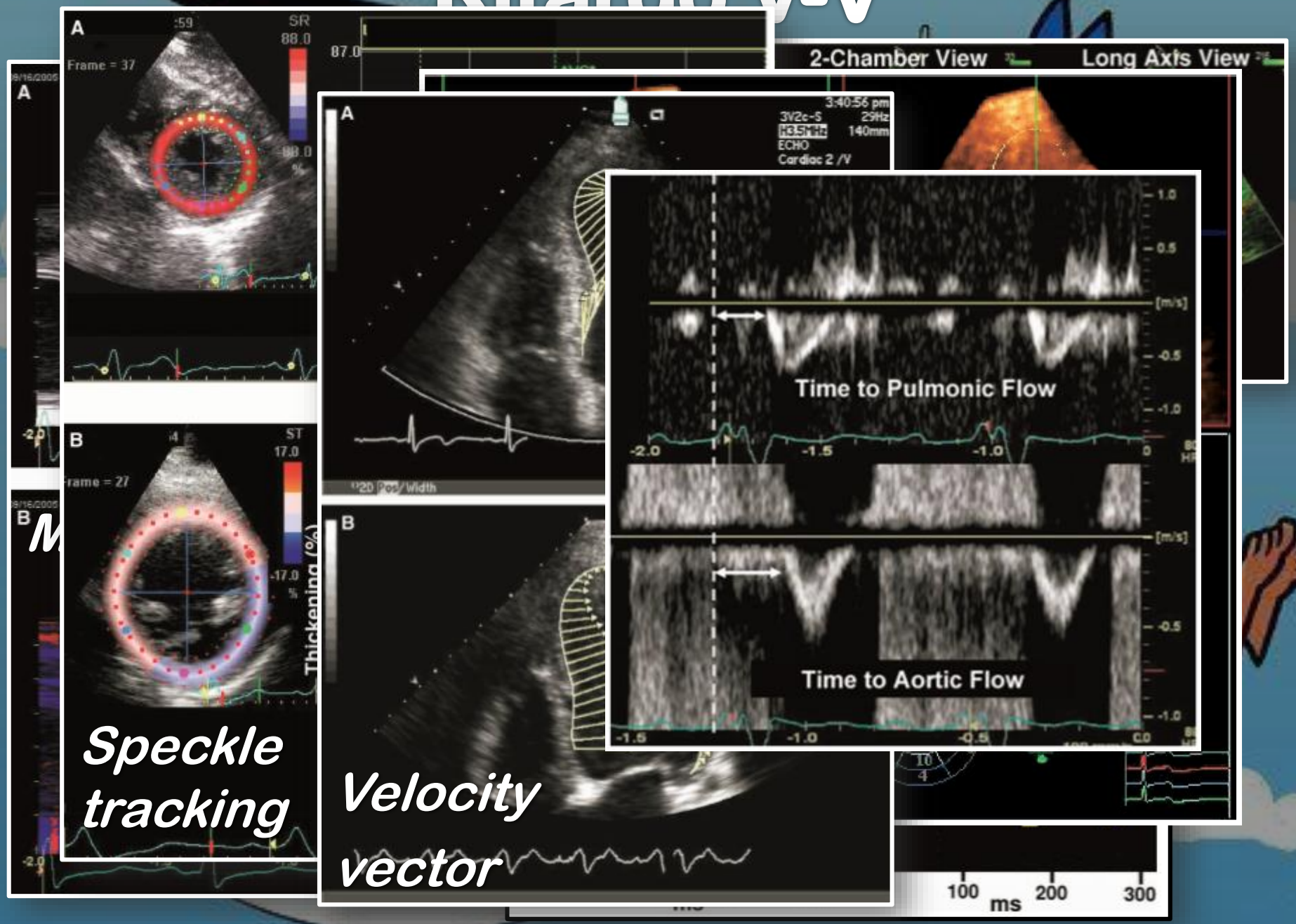
Indice	Tecnica	Cut-off di predittività
Dissincronia intraventricolare longitudinale		
• Strain delay index (SDI)	STE 2D	25%
• Indice di dissincronia longitudinale	STE 2D	130 ms
Dissincronia intraventricolare radiale		
• Septal-to-posterior wall delay	STE 2D	130 ms
Dissincronia intraventricolare trasversa		
• Indice di dissincronia trasversa	STE 2D	130 ms
Dissincronia intraventricolare volumetrica		
• Systolic dyssynchrony index (SDI)	Eco 3D	9.8%
Dissincronia torsionale		
• Torsione del VS alla chiusura aortica	STE 2D	0.1°/cm
• Twist del VS alla chiusura aortica	STE 2D	1°

2D, bidimensionale; 3D, tridimensionale; STE, ecocardiografia speckle tracking; VS, ventricolo sinistro.

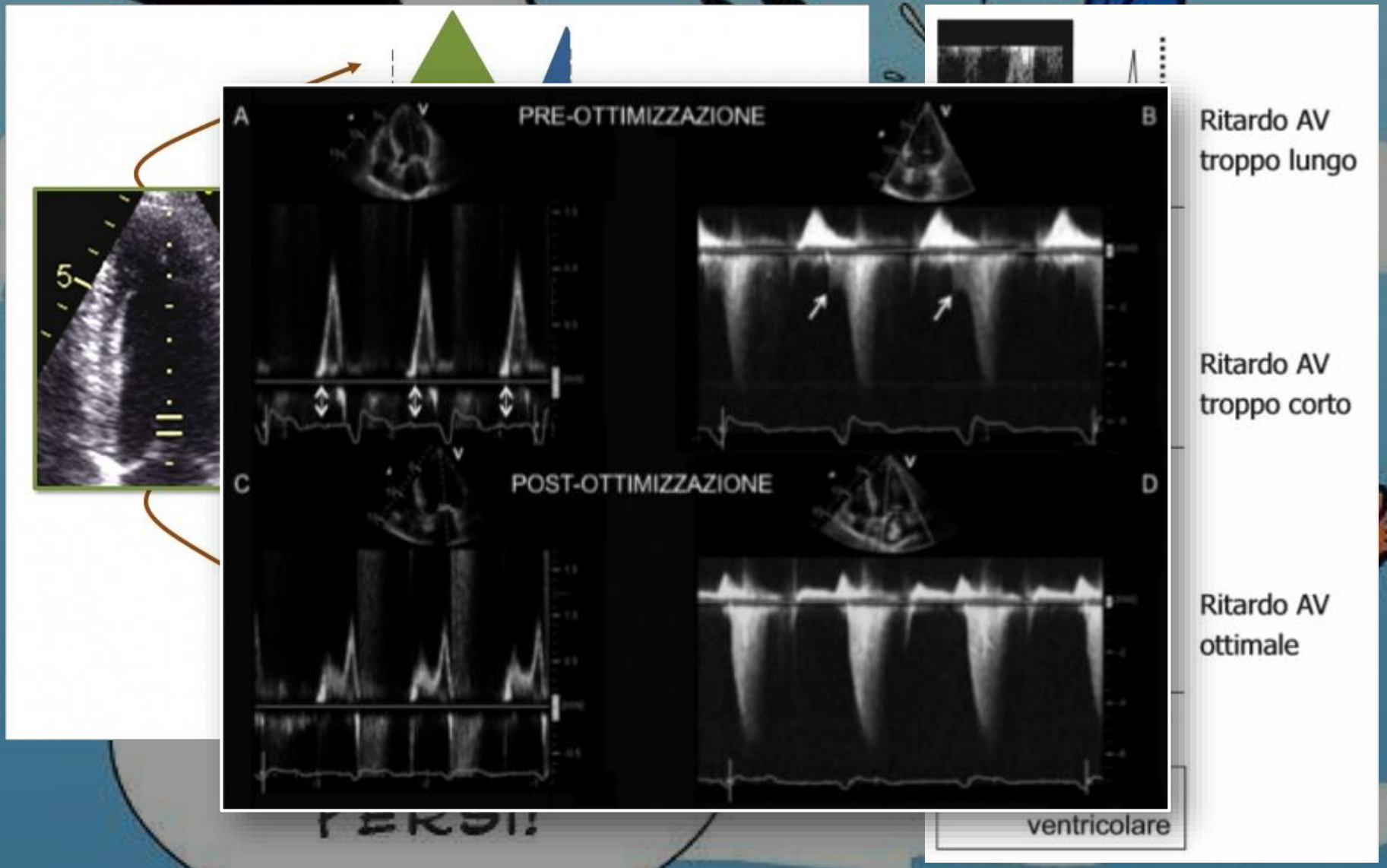
CI SIAMO PERSI!

Smart-AV study

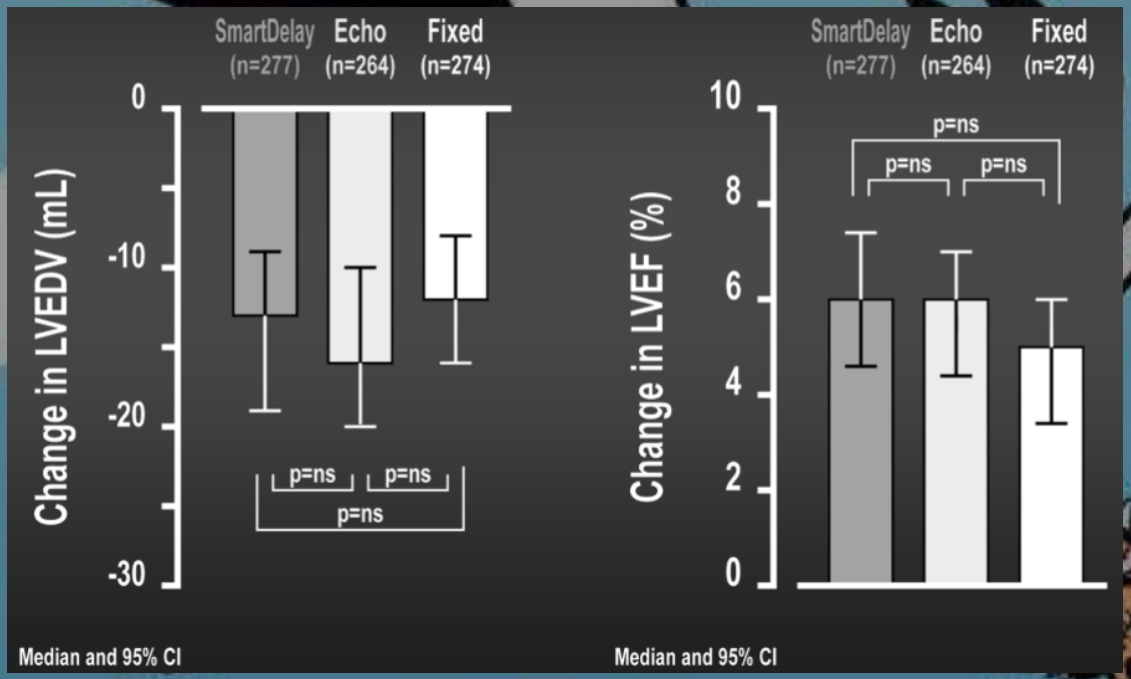
Ritardo V-V

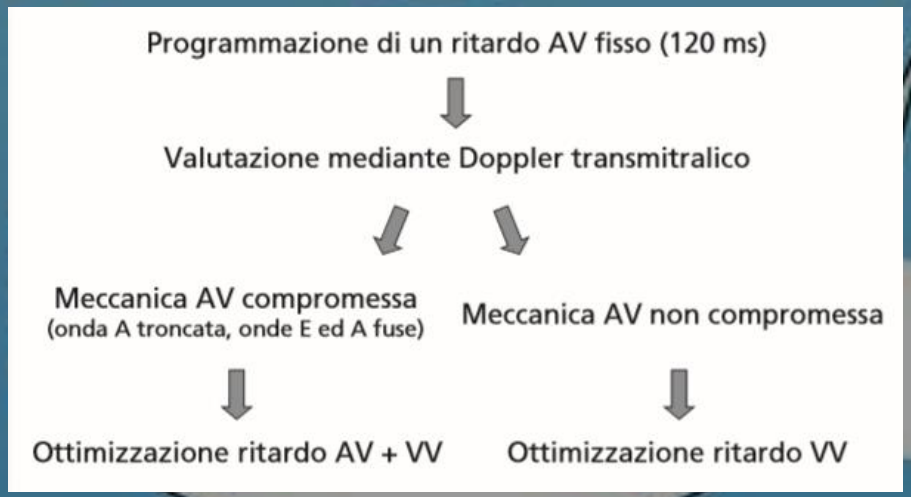

2-Chamber View
Long Axis View
Time to Pulmonic Flow
Time to Aortic Flow
Speckle tracking
Velocity vector
100
200
300
ms

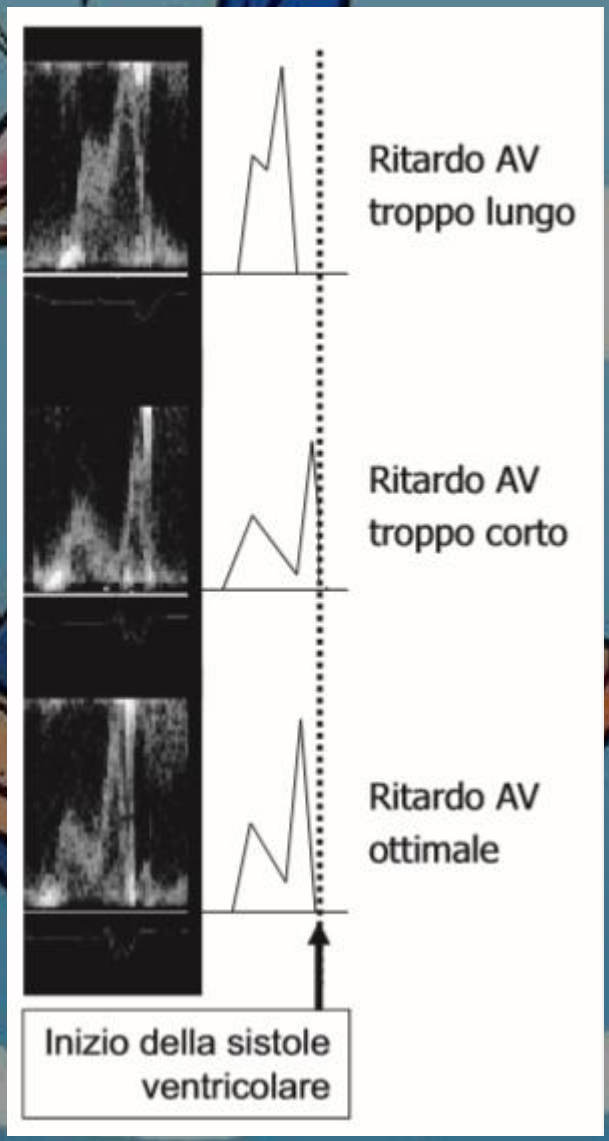
Ritardo AV


A
PRE-OTTIMIZZAZIONE
B
C
POST-OTTIMIZZAZIONE
D
Ritardo AV troppo lungo
Ritardo AV troppo corto
Ritardo AV ottimale
ventricolare

Serve ottimizzare ritardo AV?

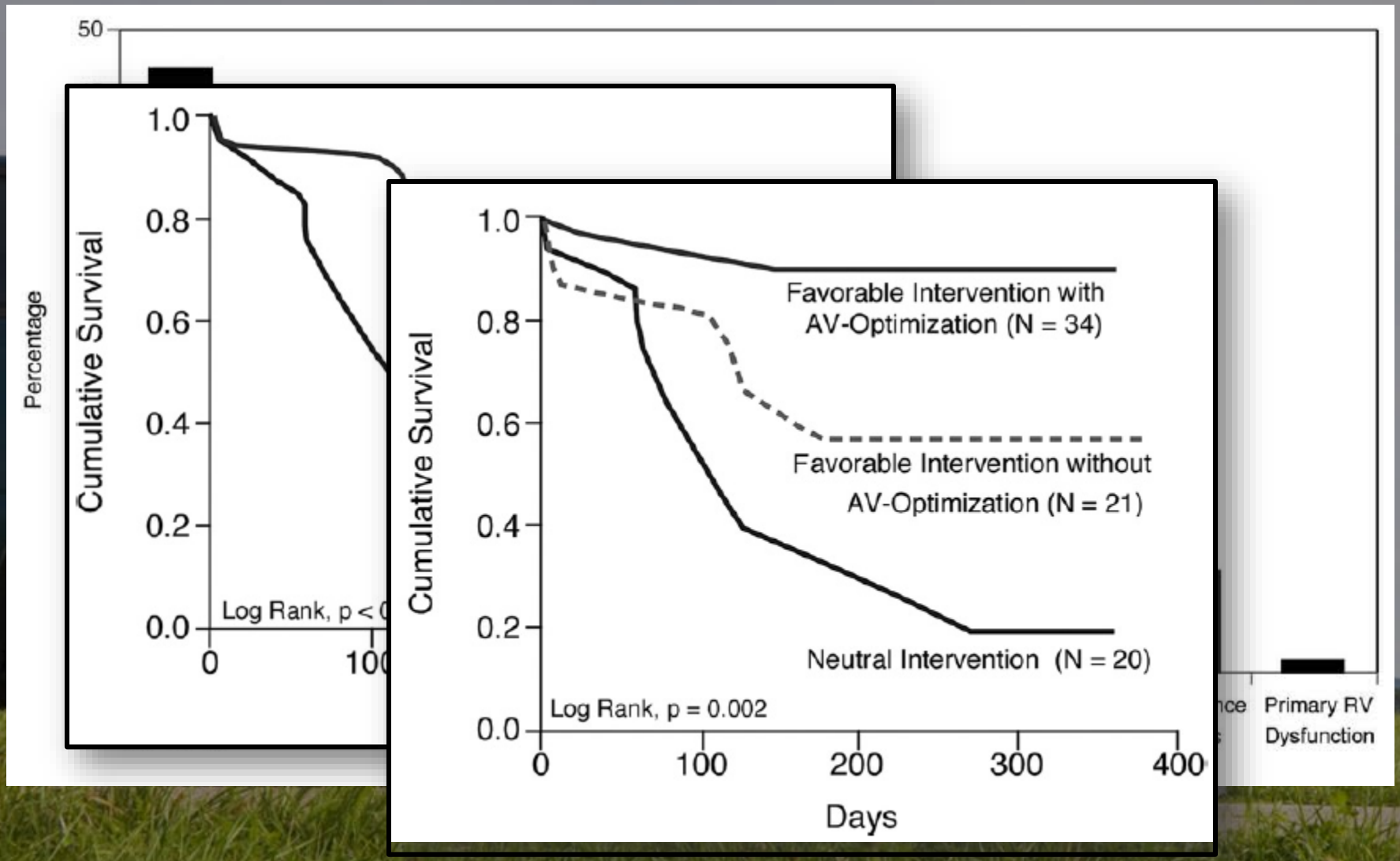






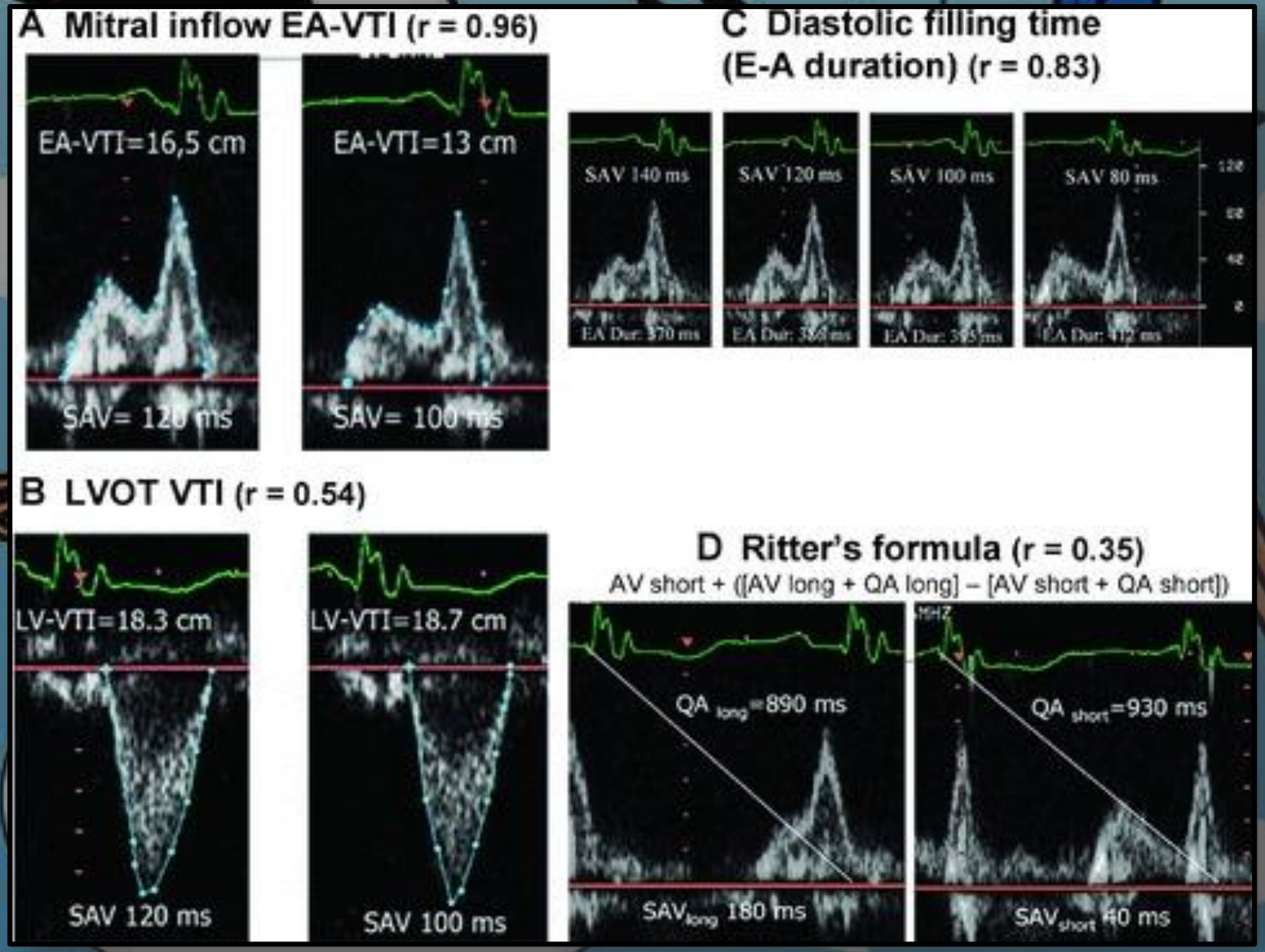
Smart-AV study

Serve nel post-impianto?



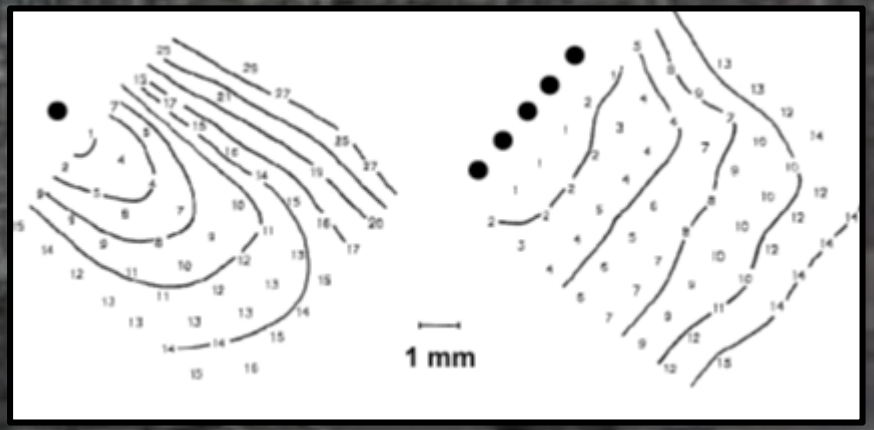
Mullens et JACC Vol. 53, No. 9, 2009

Riproducibilità



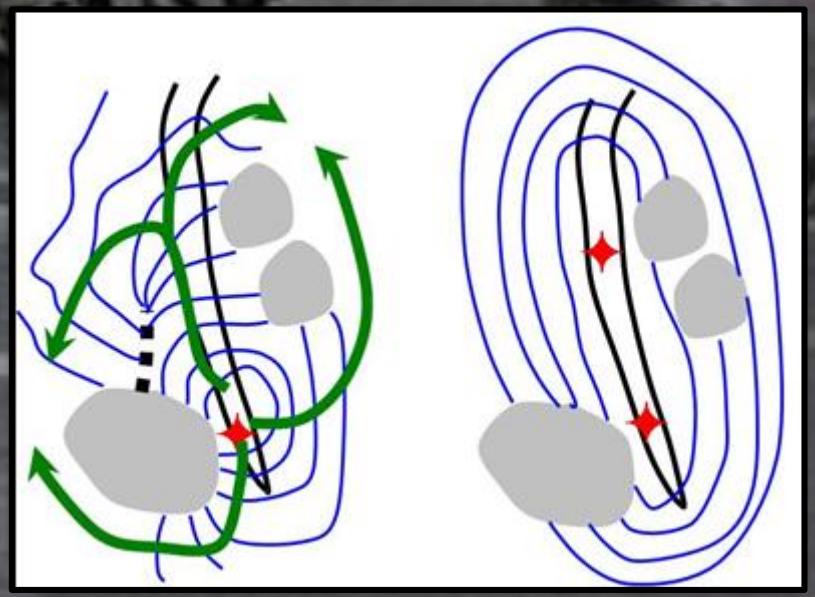
Se piu' di una combinazione?

- Site stimulation



- **Multi-area stimulation**

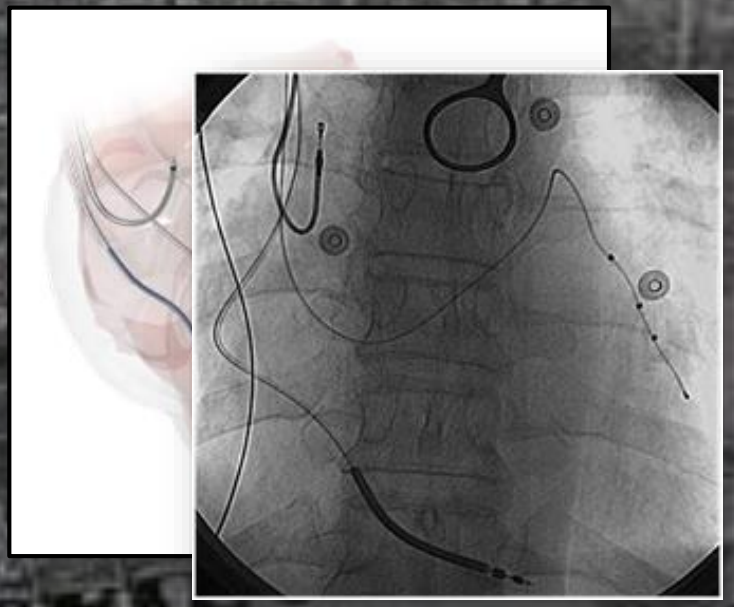
  (RV + 2 LV // 2 RV + LV)



- **Multi site stimulation**

Se piu' di una combinazione?

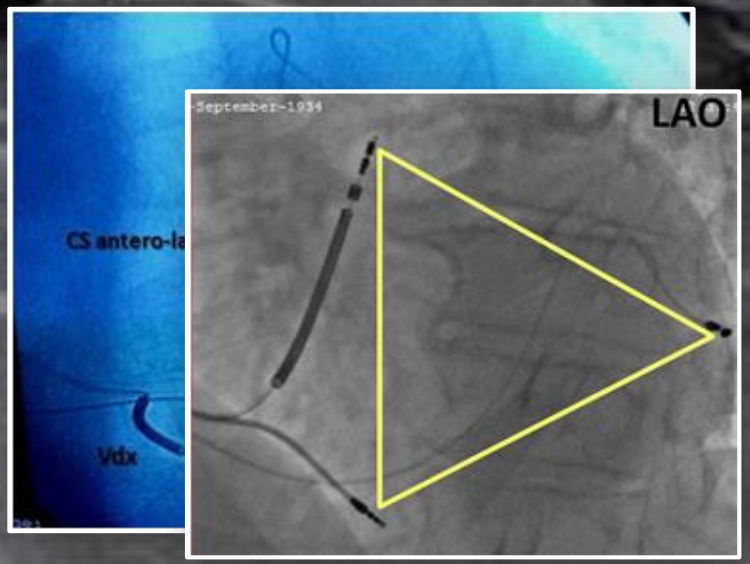
- Site stimulation



- **Multi-area stimulation**

  (RV + 2 LV // 2 RV + LV)

- **Multi site stimulation**

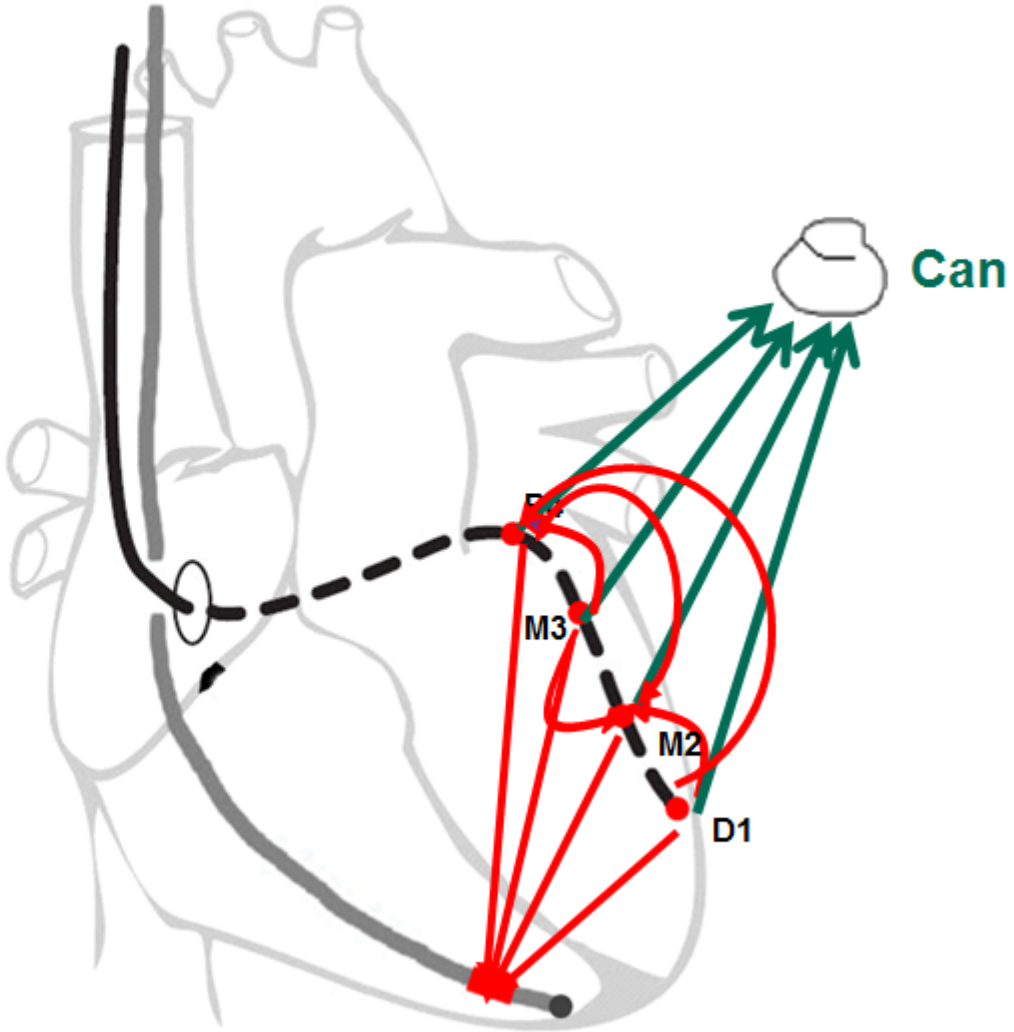


Se piu' di una combinazione?

Table 1. Commercially Available Pacing Algorithms for Single-Lead Left Ventricular Multipoint Pacing and

LV Configurations

- D1 – M2
- D1 – P4
- D1 – RV ring
- M2 – P4
- M2 – RV ring
- M3 – M2
- M3 – P4
- M3 – RV ring
- P4 – M2
- P4 – RV ring
- D1 – Can
- M2 – Can
- M3 – Can
- P4 – Can



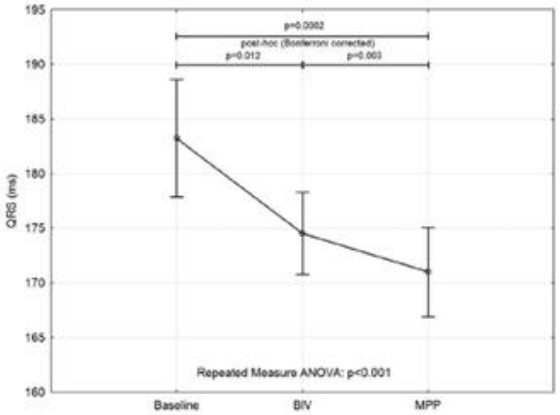
LV only

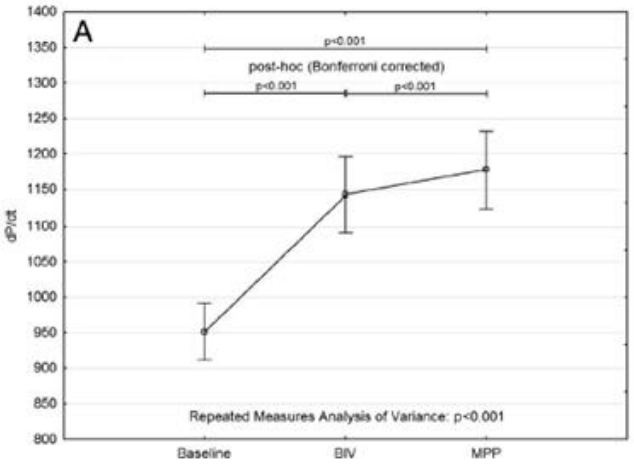
LV only

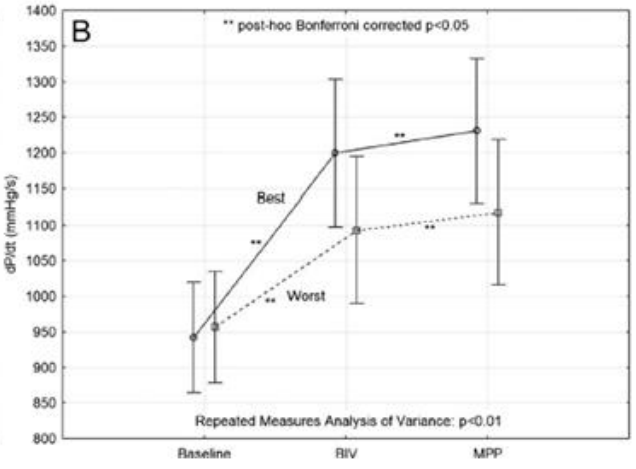
Funziona?

Multipoint pacing by a left ventricular quadripolar lead improves the acute hemodynamic response to CRT compared with conventional biventricular pacing at any site

Total population, n	29
ICM, n (%)	18 (62)
Age, years	72 ± 12
Male, n (%)	23 (79)
NYHA class II/III, n (%)	5 (17)/24 (83)
SR/AF, n (%)	19; 66 % / 10; 34%
LVEF, %	29 ± 7
QRS, ms	183 ± 23
LBBB, n (%)	19 (66)
RBBB, n (%)	6 (21)
IVCD, n (%)	2 (7%)
PM dependent, n (%)	2 (7%)







Zanon et all Heart Rhythm Vol.15 N° 5 2015

Updates in Cardiac Resynchronization Therapy for Chronic Heart Failure: Review of Multisite Pacing

Table 1 Studies on Multisite Pacing

Authors	Method of MSP delivery	No of patients	Time of assessment	Primary outcome measure	Effects of MSP
Thibault et al. [29]	Quadripolar LV lead	19	At implantation	LV dP/dtmax	Positive in most patients
Pappone et al. [30]	Quadripolar LV lead	42	At implantation	Pressure-volume loop parameters	Positive
Rinaldi et al. [31]	Quadripolar LV lead	41	At implantation	Standard deviation of time to peak contraction of 12 LV segments and delayed longitudinal contraction	Positive in most patients
Rinaldi et al. [32••]	Quadripolar LV lead	40	At implantation	Global peak LV radial strain and LV outflow velocity time integral	Positive in most patients
Pappone et al. [33]	Quadripolar LV lead	40	12 months post implantation	LV end-systolic volume and ejection fraction	Positive
Zanon et al. [34]	Quadripolar LV lead	29	At implantation	Q-LV, LV dP/dtmax, QRS duration	Positive
Zanon et al. [35]	Quadripolar LV lead	110	Around 10 months post implantation	End-systolic volume index, New York Heart Association (NYHA) class and Packer score	Positive
Umar et al. [36]	Quadripolar LV lead	16	At implantation	LV + dP/dtmax	Better that CRT from a basal or mid LV pacing site but similar to CRT from an apical LV pacing site
Siciliano et al. [37]	Quadripolar LV lead	11	6 months post implantation	3D echocardiography and echocardiograp particle imaging velocimetry	Reduction in end-diastolic and end-systolic volumes, no difference in LV ejection fraction and cardiac output
Forleo et al. [38]	Quadripolar LV lead	232	6 months post implantation	EF, clinical composite score, QRS duration	Positive
Sterlinski et al. [39]	Quadripolar LV lead	24	At implantation	LV + dP/dtmax, QRS duration, Q-LV	No difference
Yoshida et al. [40]	Two RV leads (one in the apex and one in the outflow tract) with one LV lead	21	At implantation	LV + dP/dtmax, Cardiac output, standard deviation of the time to peak myocardial velocity during the systolic phase in 12 LV segments	Positive
Yamasaki et al. [41]	Two RV leads (one in the apex and one in the outflow tract) with one LV lead	32	At implantation	LV + dP/dtmax, tau	Positive, more marked in patients with large LVend-diastolic volume
Pappone et al. [42]	One RV lead and two LV leads	14	At implantation	LV dP/dt, aortic pulse pressure, LV end-diastolic pressure	Positive
Lenarczyk et al. [43]	One RV lead and two LV leads	26	At implantation and after 3 months	NYHA class, QRS duration, echocardiographic parameters, peak oxygen consumption, and 6 min walking distance	Improved outcomes in 3 months compared to baseline
Leclercq et al. [44]	One RV lead and two LV leads	26	6 and 9 months post implantation (crossover)	Quality of ventricular resynchronization (Z ratio), reverse LV remodeling, quality of life, 6-min walk test, and procedure-related morbidity and mortality	Higher LV ejection fraction and smaller LVend-systolic volume. No difference in other parameters
Lenarczyk et al. [45]	One RV lead and two LV leads	54	3 months post implantation	NYHA class, VO2 max, 6-min walk test	Positive
Rogers et al. [46]	One RV lead and two LV leads	37	12 months post implantation with crossover every 3 months	6-min walk distance (6 MW), Minnesota Living With Heart Failure (MLWHF) scores, LV dimensions and function.	Positive
Ogano et al. [47•]	One RV lead and two LV leads	58	16 months post implantation	Ventricular arrhythmias	Reduced ventricular arrhythmias
Padeletti et al. [48]	One RV lead and two LV leads	12	At implantation	Pressure-volume measurements	No difference compared to optimal LV pacing site and AV interval
Ginks et al. [21]	One RV lead and two LV leads	19	At implantation	ΔLV dP/dt max	Positive, but particularly in in patients with posterolateral scar

Aumenterà o ridurrà il lavoro?

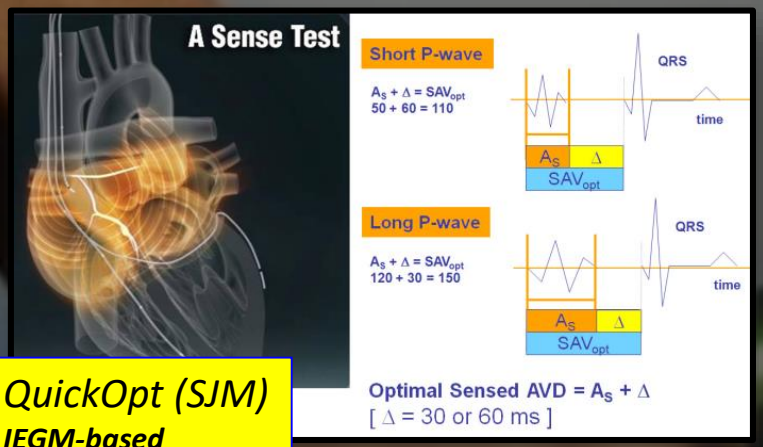
Curr Heart Fail rep (2017)

Il passaggio del testimone

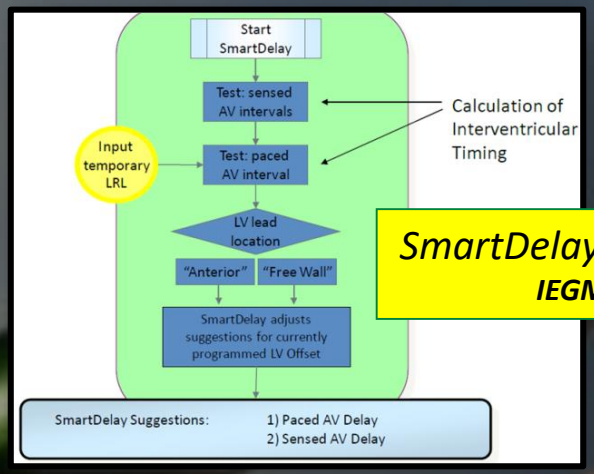
JAFIB
Featured Review
Journal of Atrial Fibrillation
www.jafib.com

Clinical Relevance Of Systematic CRT Device Optimization

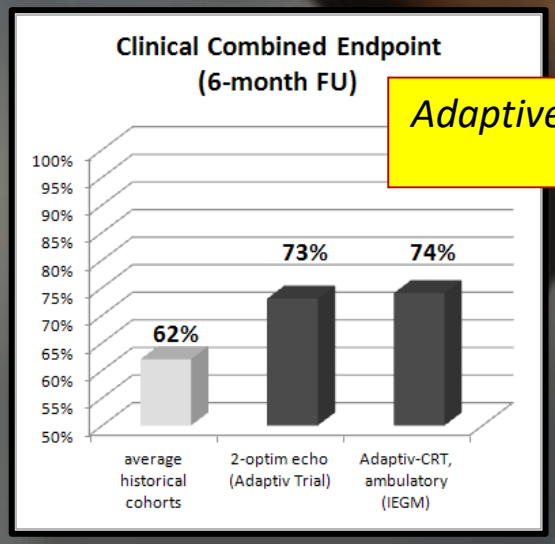
Maurizio Lunati[1], Giovanni Magenta[1], Giuseppe Cattafi[1], Antonella Moreo[1], Giacomo Falaschi[2], Danilo Contardi[2], Emanuela Locati[1]



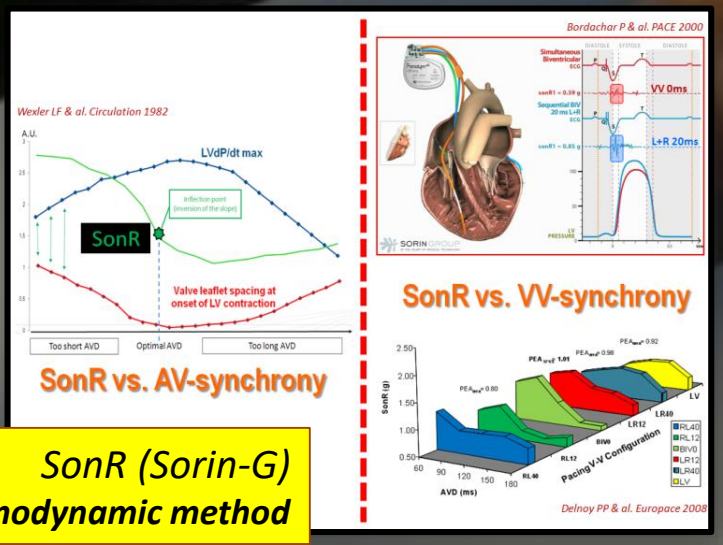
QuickOpt (SJM)
IEGM-based



SmartDelay (BSx)
IEGM-based



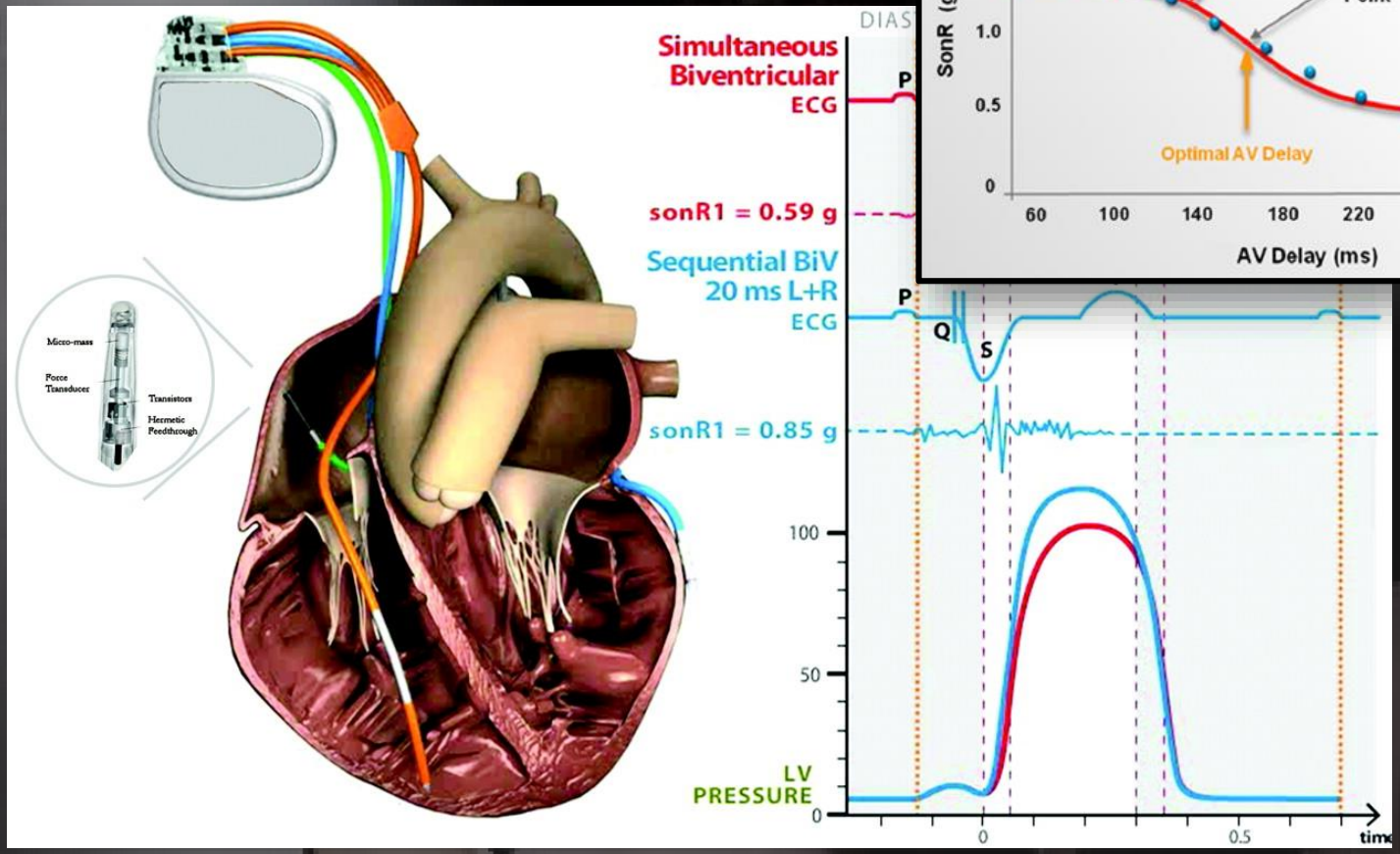
Adaptive-CRT (Mdt)
IEGM-based

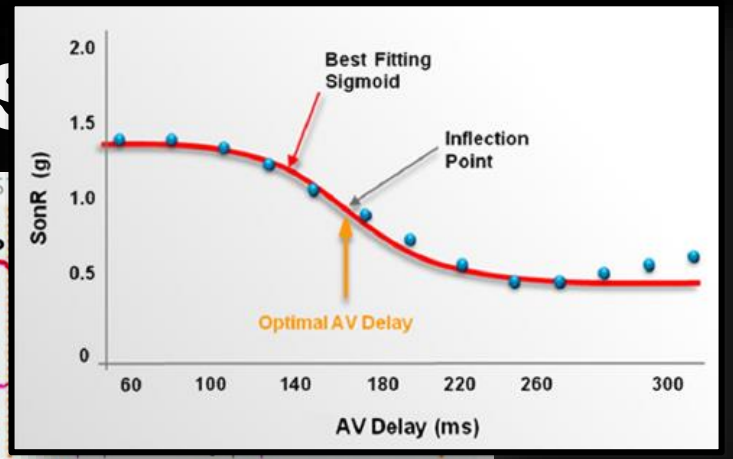


SonR (Sorin-G)
hemodynamic method

Lunati M & al. JAFIB 2014;7(2)

Da un'altra pros



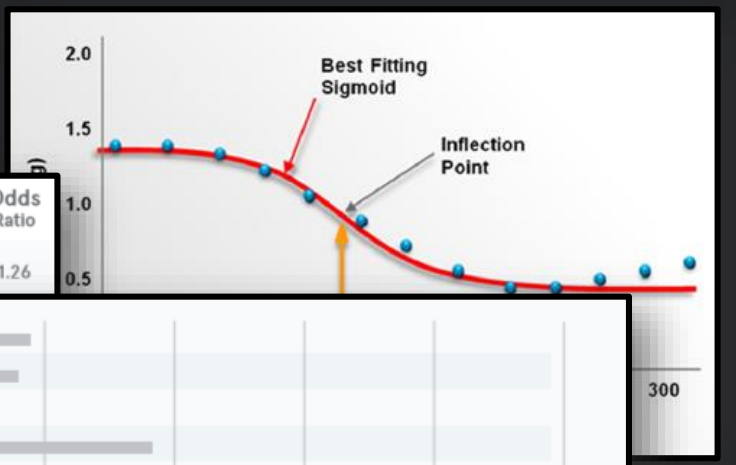


L'intensità del segnale misurato dal sensore SonR corrisponde alle vibrazioni generate dal ciclo cardiaco nella fase di contrazione isovolumetrica (primo tono cardiaco) e si correla alle variazioni invasive del dP/dT max

Bordachar P, J Cardiovasc Electrophysiol 2008

Automatic Optimization of Cardiac Resynchronization Therapy Using SonR—Rationale and Design of the Clinical Trial of the *SonRtip* Lead and Automatic AV-VV Op (RE

Stu pro au rita



VARIABILE		SonR N=649	Eco N=318	P value	Eco superiore	SonR superiore	Odds Ratio
Tutti i pazienti		75.0	70.4				1.26
Età	<68.5 anni	72.6	68.1				
	≥68.5 anni	77.3	73.2				
Sesso	Maschi	71.6	68.6				
	Femmine	83.1	73.9				
BMI	<30 kg/m2	76.5	69.5				
	≥30kg/m2	72.2	72.0				
LVEF	>25%	74.7	72.7				
	≤25%	75.8	65.3				
Morfologia QRS	LBBB	76.8	71.1				
	Non LBBB	66.0	65.8				
Durata QRS	<150 ms	68.0	59.5				
	≥150 ms	77.9	74.3				
Intervallo PR	≤200 ms	78.0	74.0				
	>200 ms	71.6	65.9				
Cardiomiopatia	Ischemici	69.9	66.7				
	Non-Ischemici	79.1	74.3				
Storia di FA	Si	70.2	48.1				
	No	75.9	74.8				
Disfunzione Renale	Si	61.9	46.3				
	No	79.1	78.6				
Diabete	Si	72.3	67.9				
	No	76.8	72.2				
Fumatore	Si	69.6	70.6				
Betablocca							

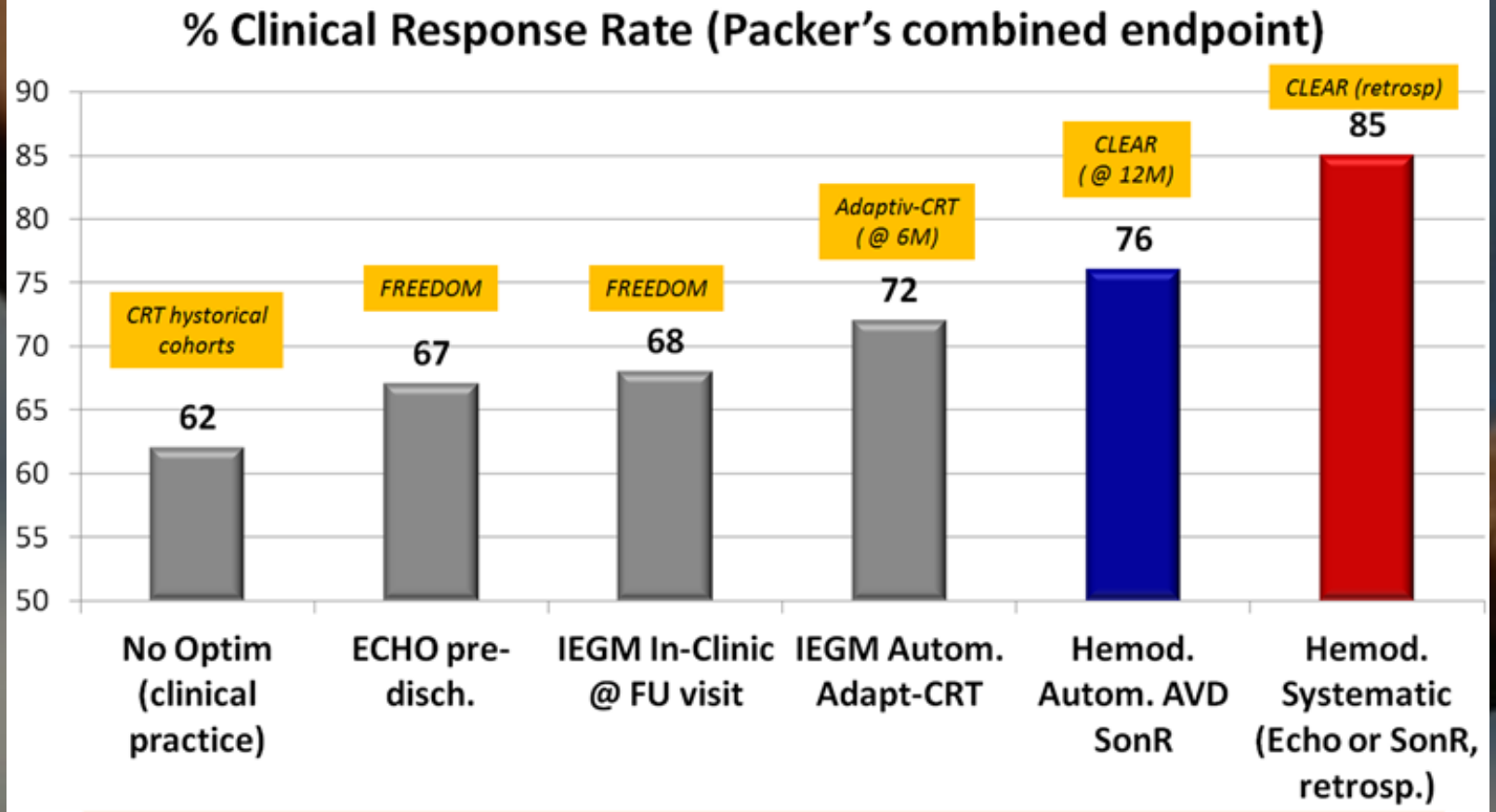
22 % risposta assoluta più elevata per i pazienti con storia di FA [4]

16 % risposta assoluta più elevata per i pazienti con disfunzione renale [4]

J Brugada Heart Rhythm 2016

Follow-up intensivo

FU of CRT pts: the effects of optimization



*The combination of proper tools (**hemodynamic sensor**) together with a **frequent re-optimization** associates with a very high clinical response rate*
→ this relationship must be PROSPECTIVELY confirmed …

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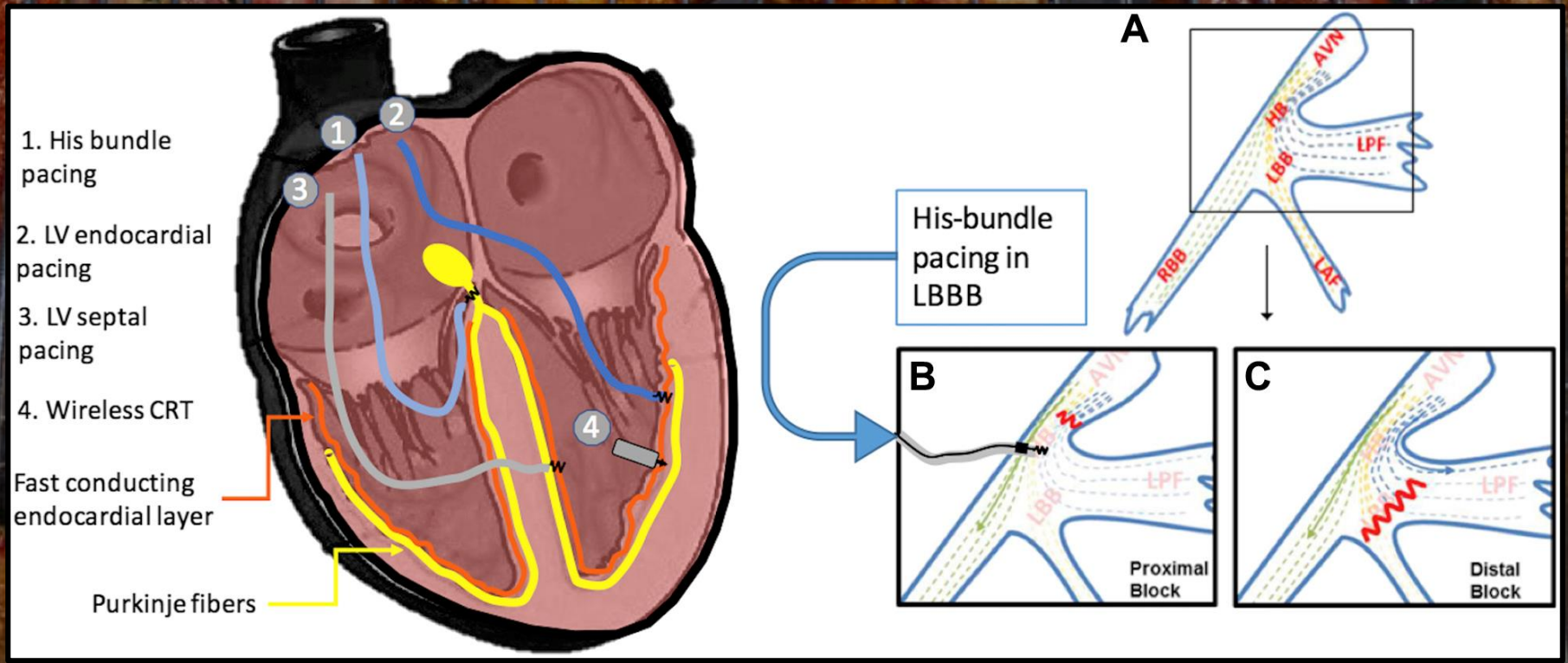
Piu’ carne sul fuoco



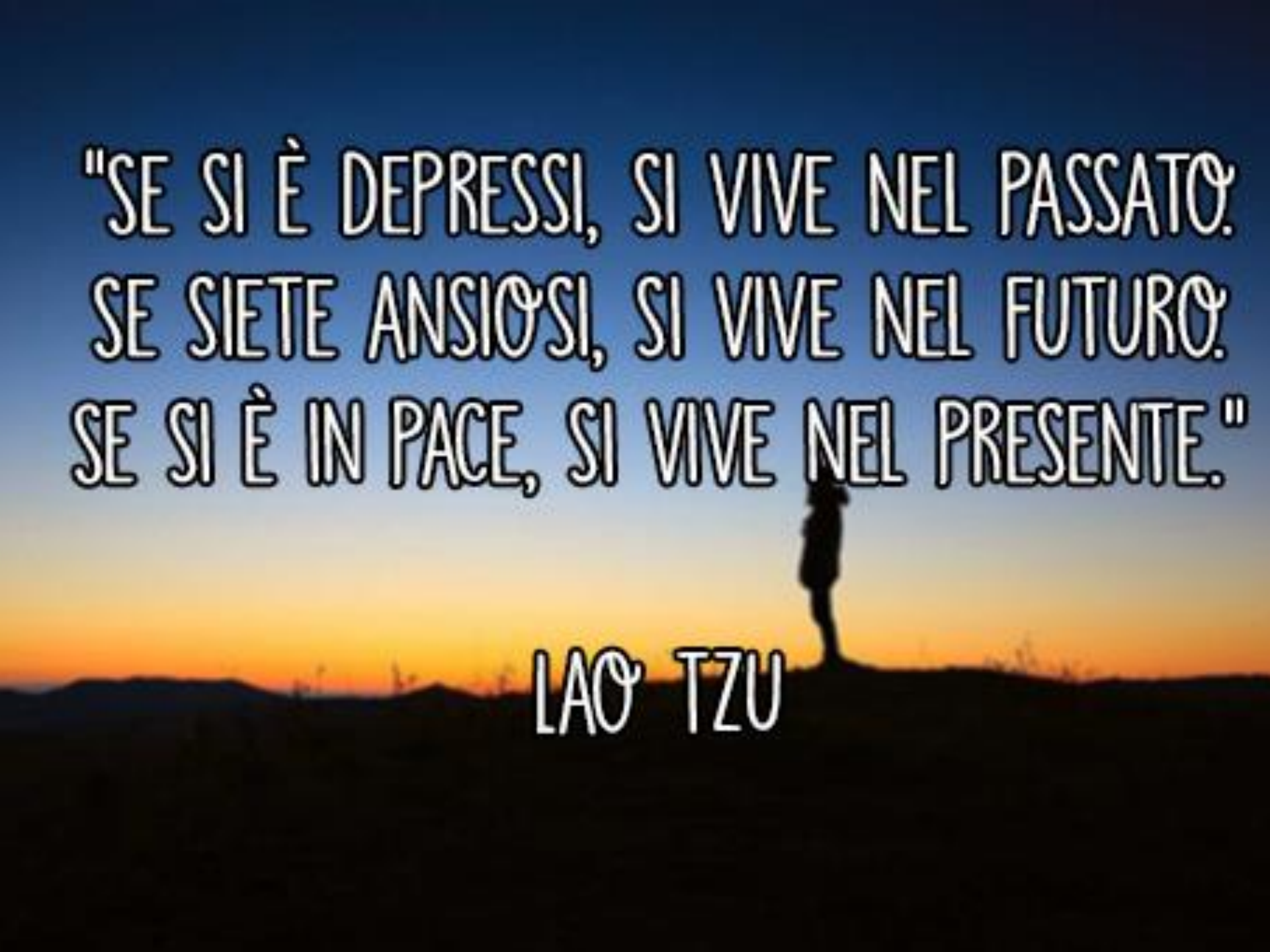
Conclusioni

ALTE RISORSE

- ***Auto-Resincro***
- ***Resincro AV e VV da ricoverato***
- ***Follow-up ecocardiografico e resincro periodico***

RISORSE MEDIO/BASSE

- ***Auto-Resincro***
- ***Resincro AV e VV in caso di nuova ospedalizzazione***
- ***Resincro in caso di mancata risposta clinica al follow-up***


"SE SI È DEPRESSI, SI VIVE NEL PASSATO.
SE SIETE ANSIOSI, SI VIVE NEL FUTURO.
SE SI È IN PACE, SI VIVE NEL PRESENTE."
LAO TZU