

Hémodynamique et stimulation

Apport de l'écho

et le reste ...

S. Cazeau pour InParys

Clinique Bizet, CC Val d'Or

Si la fonction VG est normale et que l'on peut respecter la CAV spontanée il ne faut pas capturer le ventricule : modes inhibés donc JAMAIS (sauf cas particuliers)

Si la fonction VG est normale et que l'on doit capturer le ventricule : ??? + réglage hémodynamique du DAV

Si la fonction VG est anormale et que l'on peut respecter la CAV spontanée : y a t'il une indication “traditionnelle” de resynchronisation multisite ??

Si la fonction VG est anormale et qu'il faut stimuler, BIV d'emblée ??

Echo et stimulation

Choix du mode

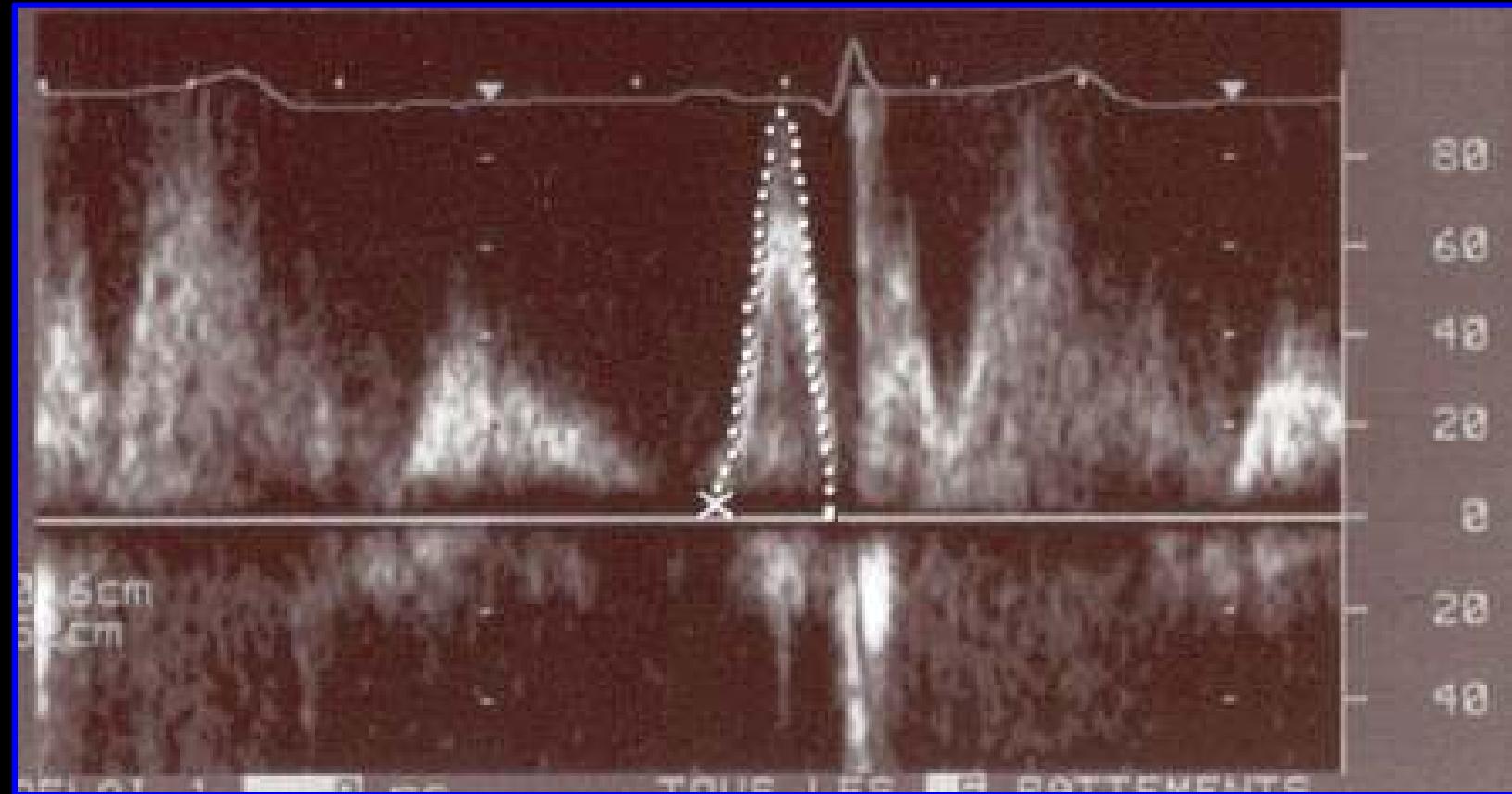
Capture or non capture

Réglage du DAV

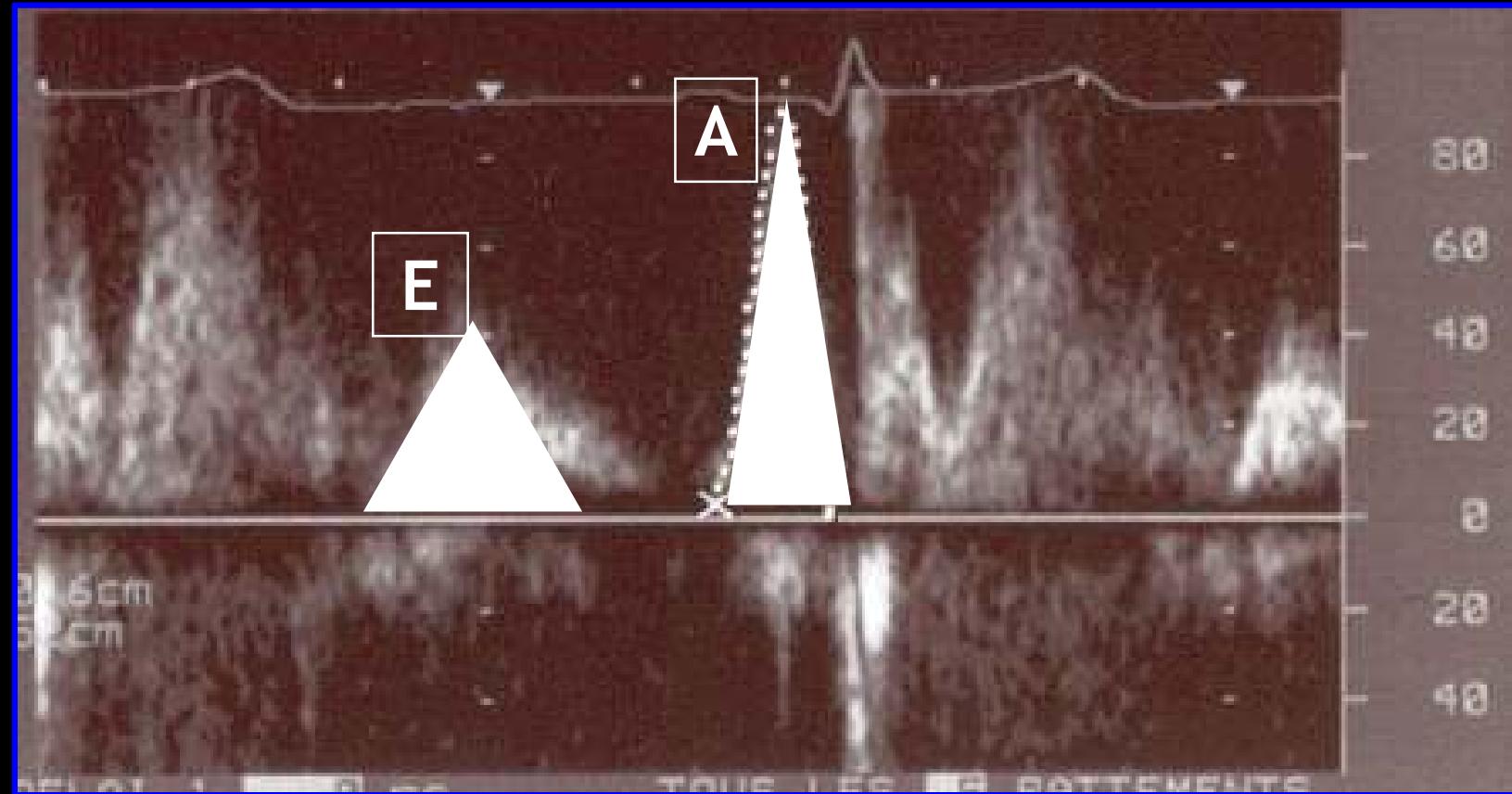
Identification des candidats à traitement électrique des cardiomyopathies

Vérification du caractère effectivement délivré de la thérapie

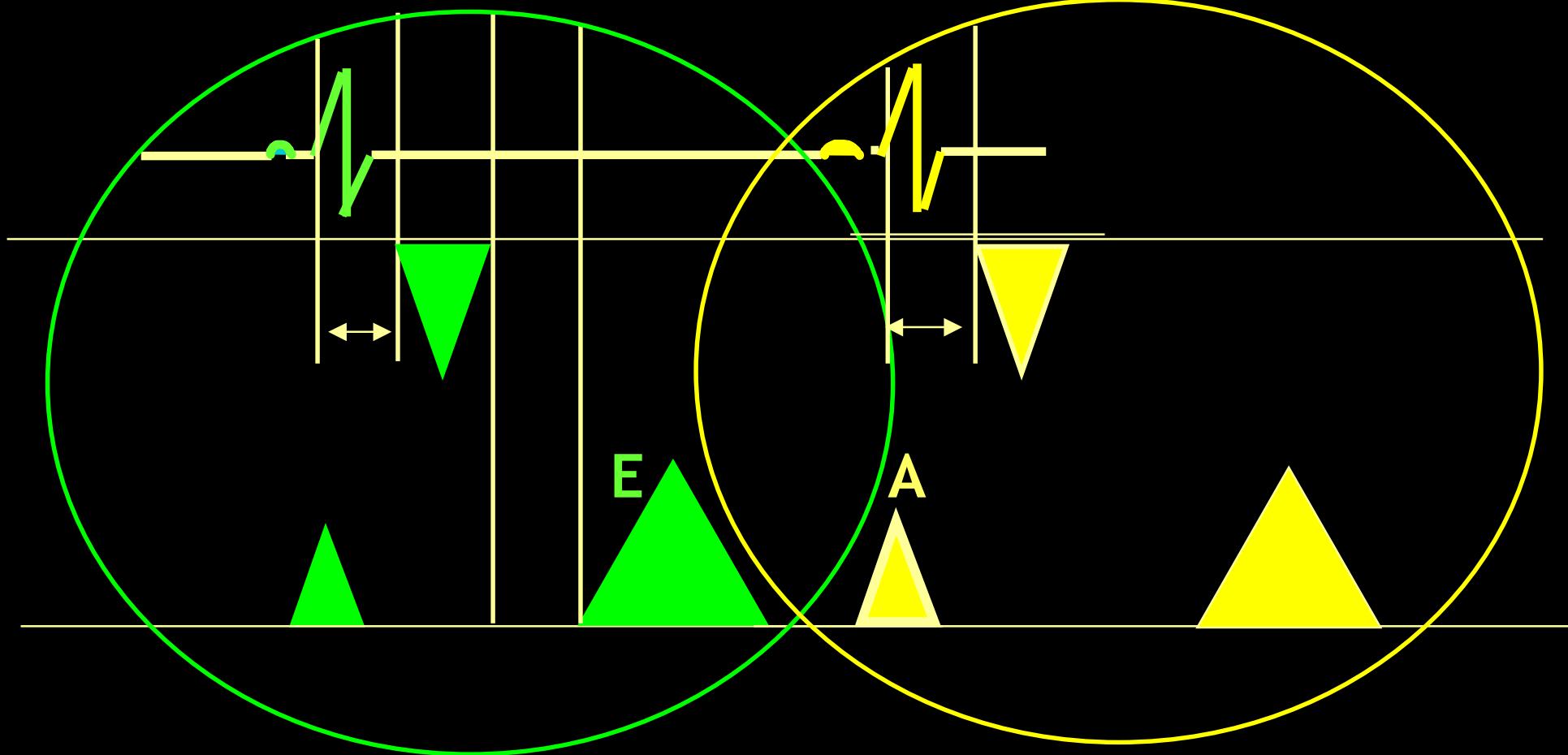
L'analyse du remplissage vue par l'échographiste



L'analyse du remplissage vue par l'échographiste

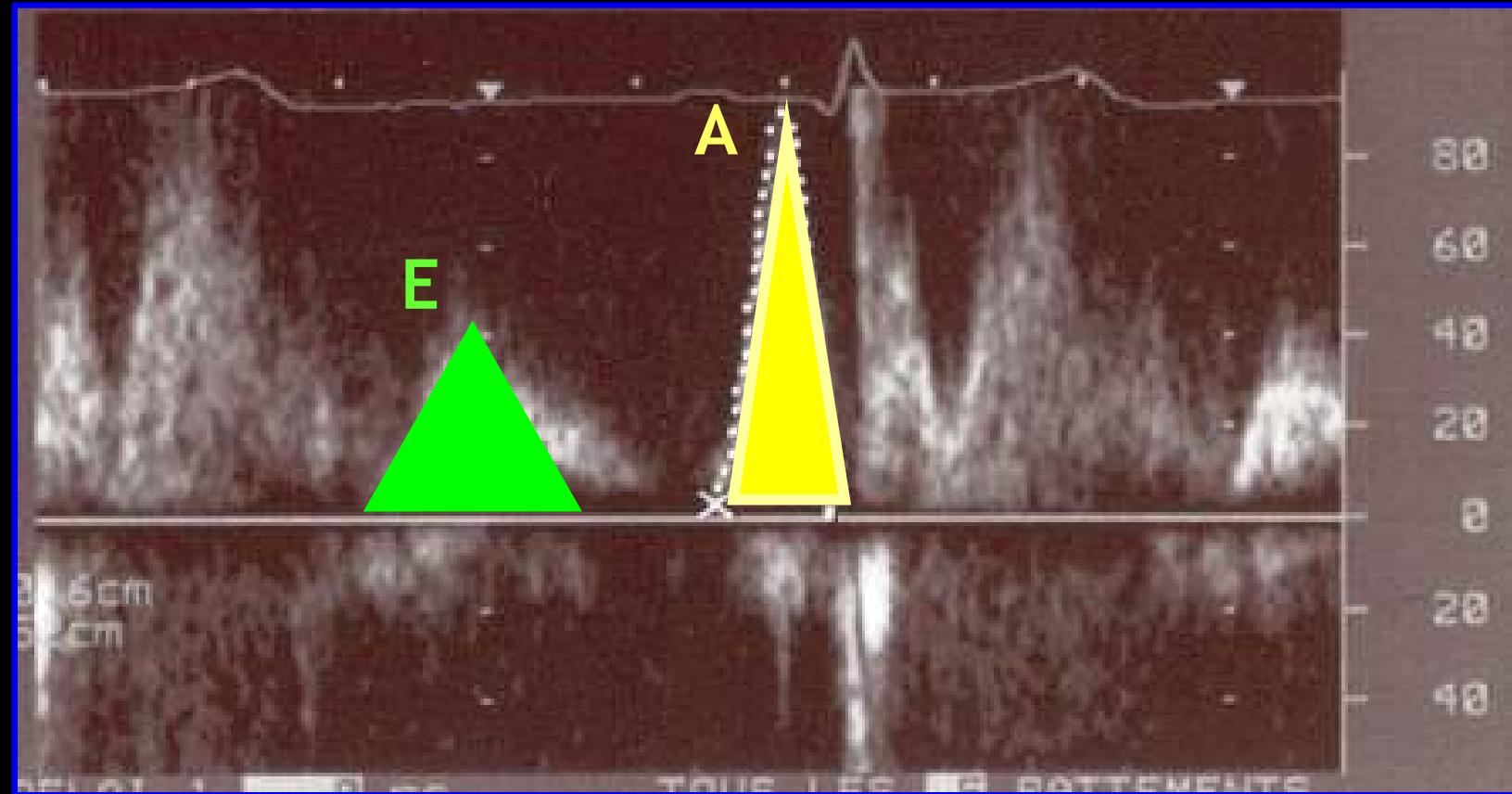


Cycle Cardiaque n



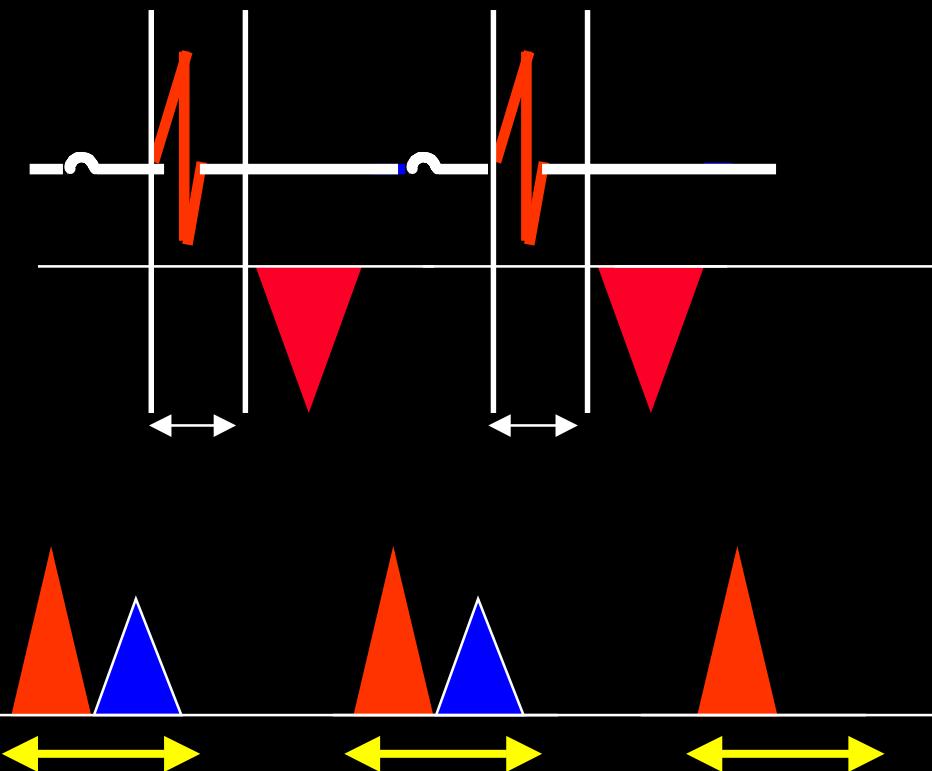
Cycle Cardiaque $n + 1$

L'analyse du remplissage vue par le stimuliste



Normal

Normal

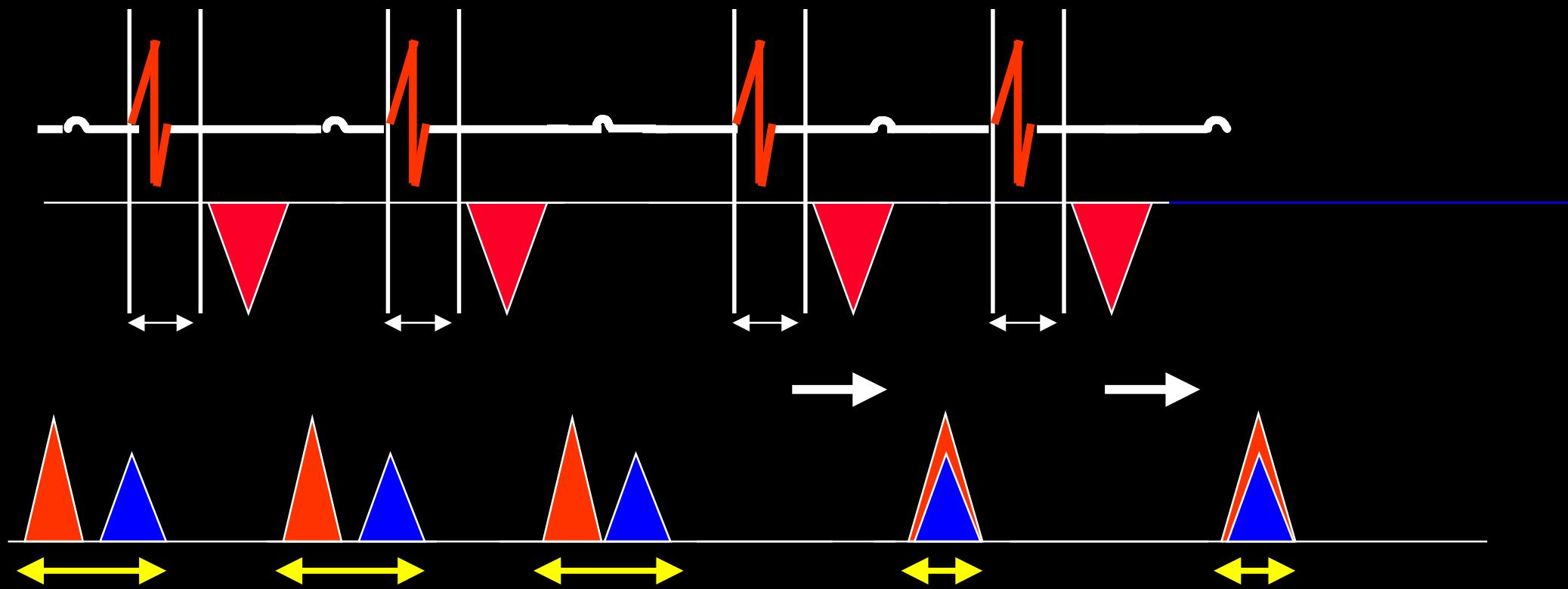


Normal

Normal

AVB 1

AVB 1

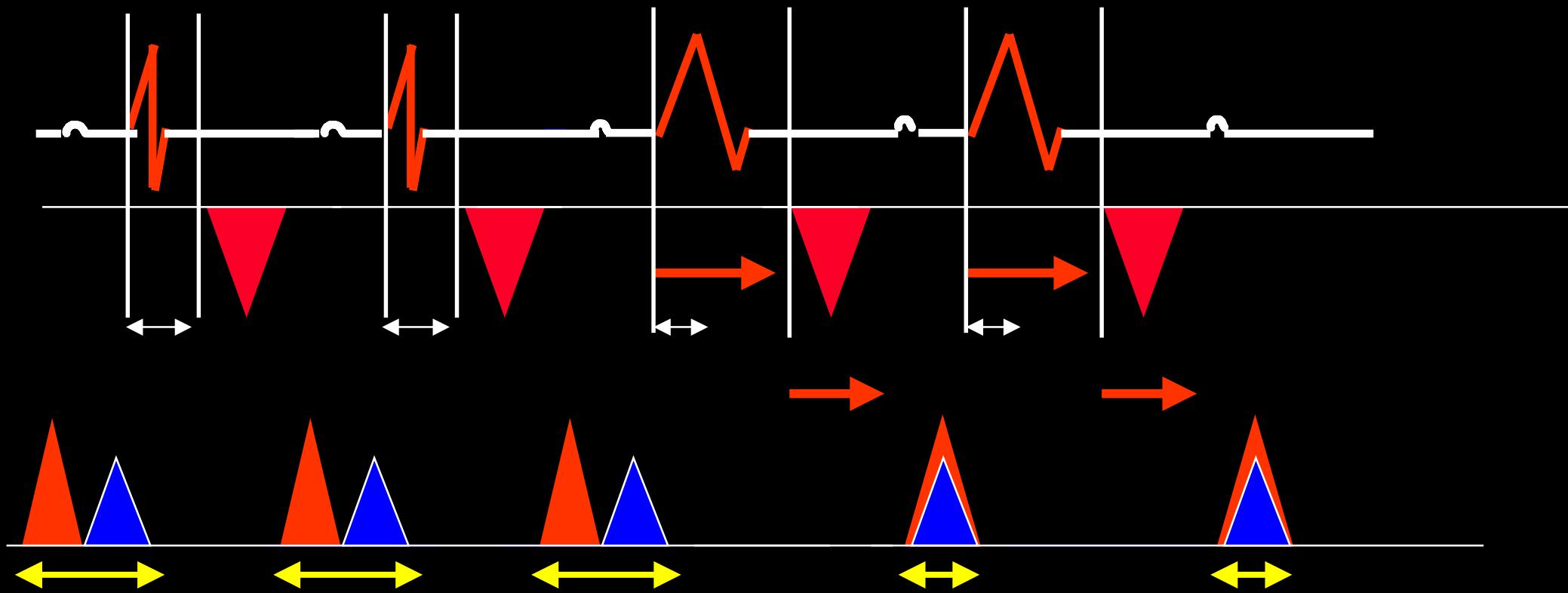


Normal

Normal

LBBB

LBBB

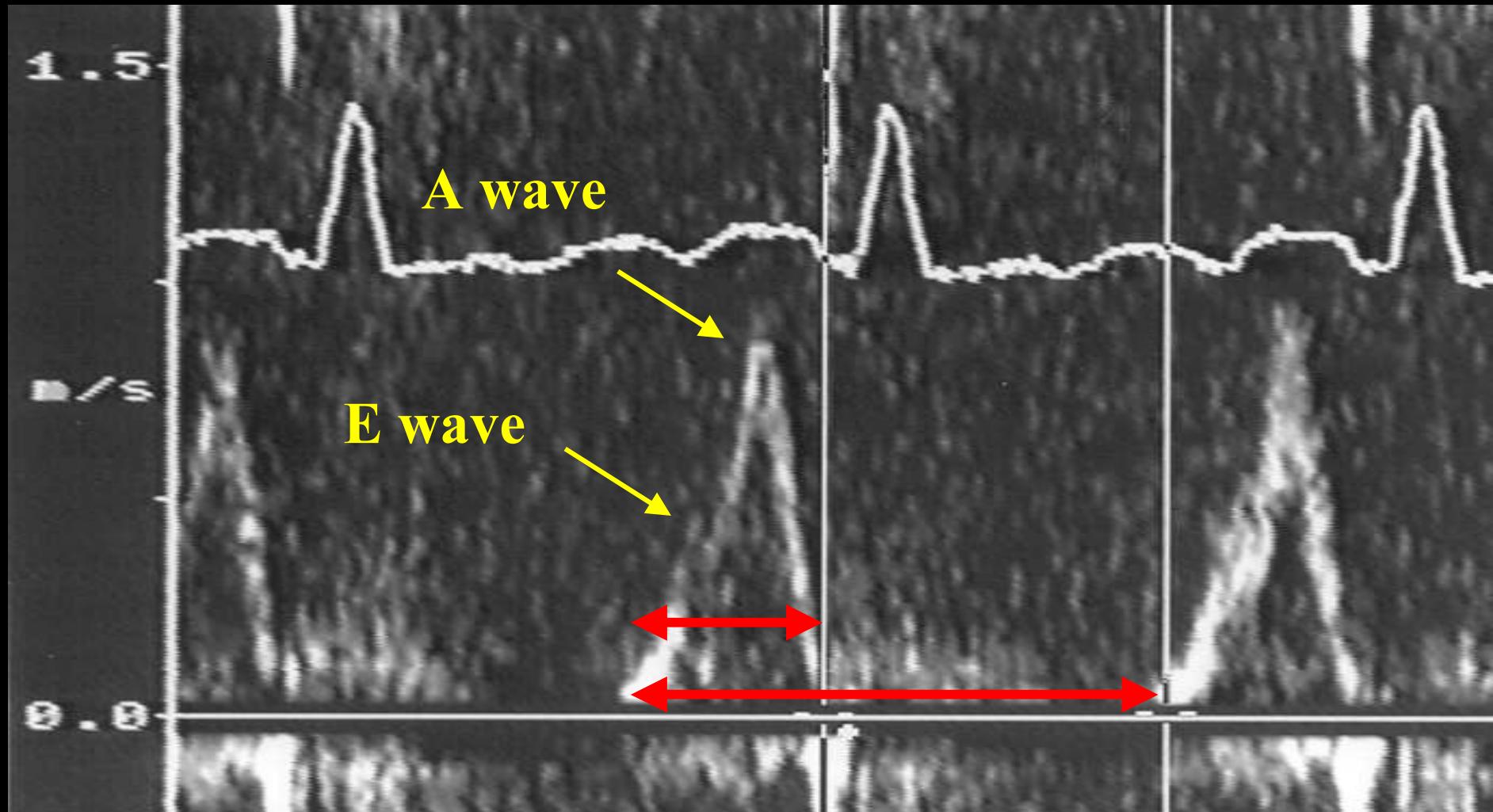


Cardiac dyssynchrony ...

Modelization for analysis

AV dyssynchrony : LVFT < 40% of the cardiac cycle

LV Diastolic filling time < 40% of Cardiac cycle



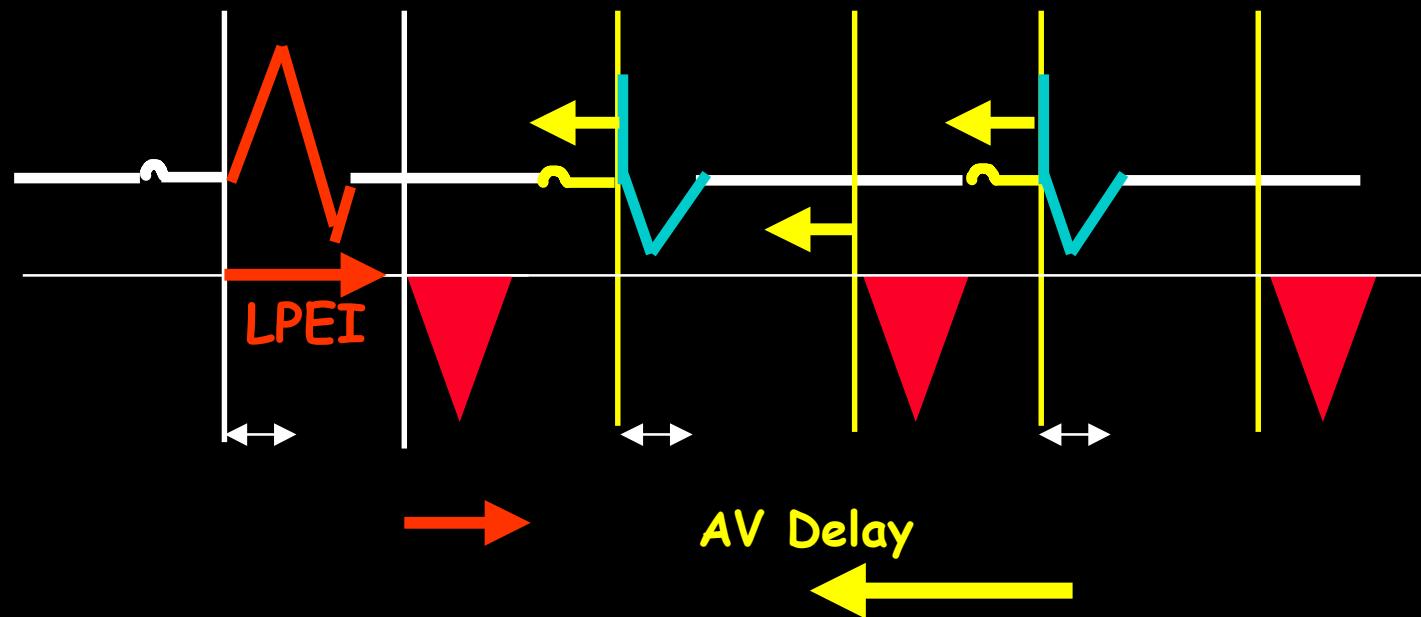
Serge Cazeau
Adapted from Cazeau, Lazarus, Ritter et al
DICU 2007

Heart Dec 2000

InParys

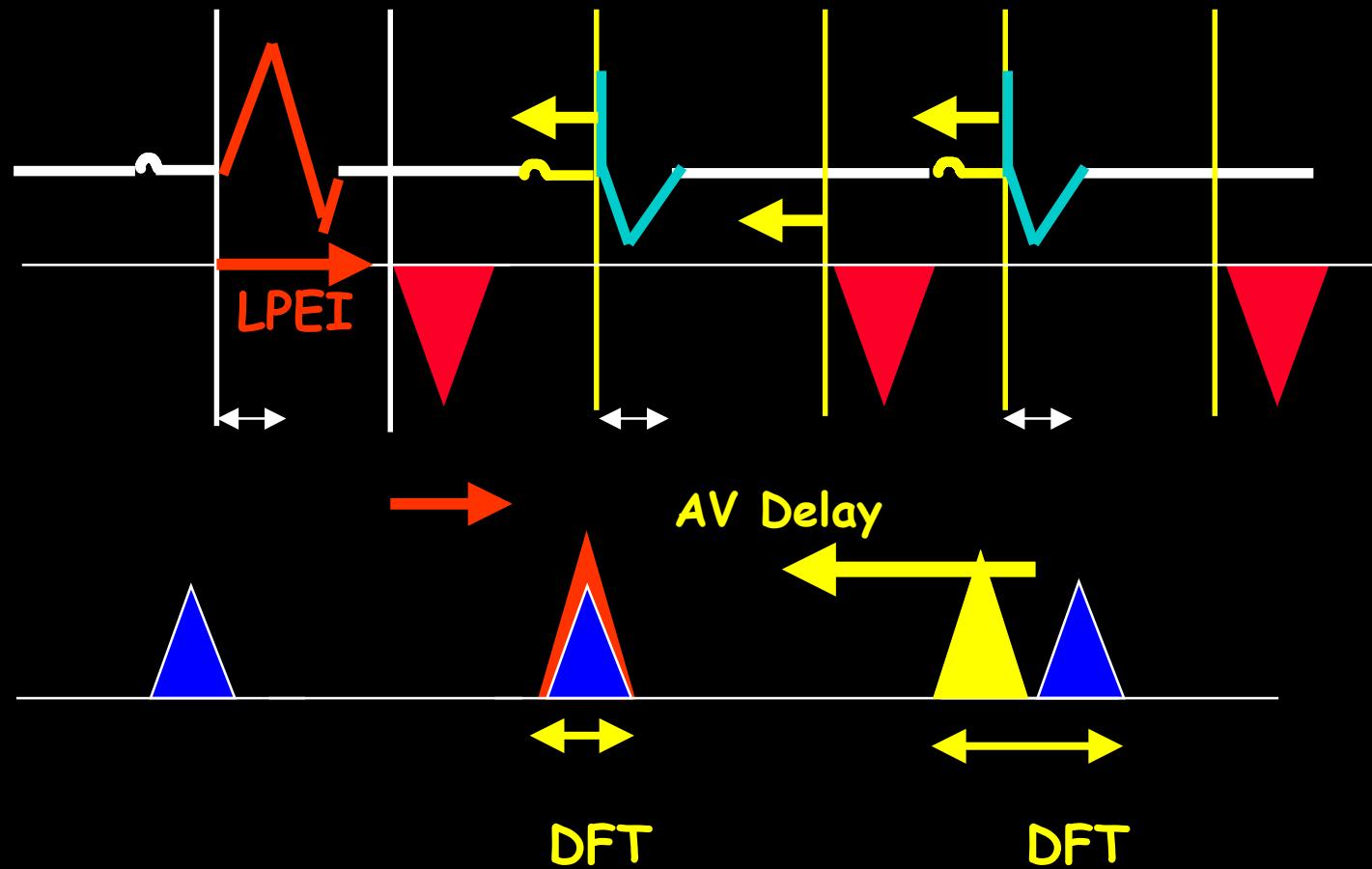
IVCD

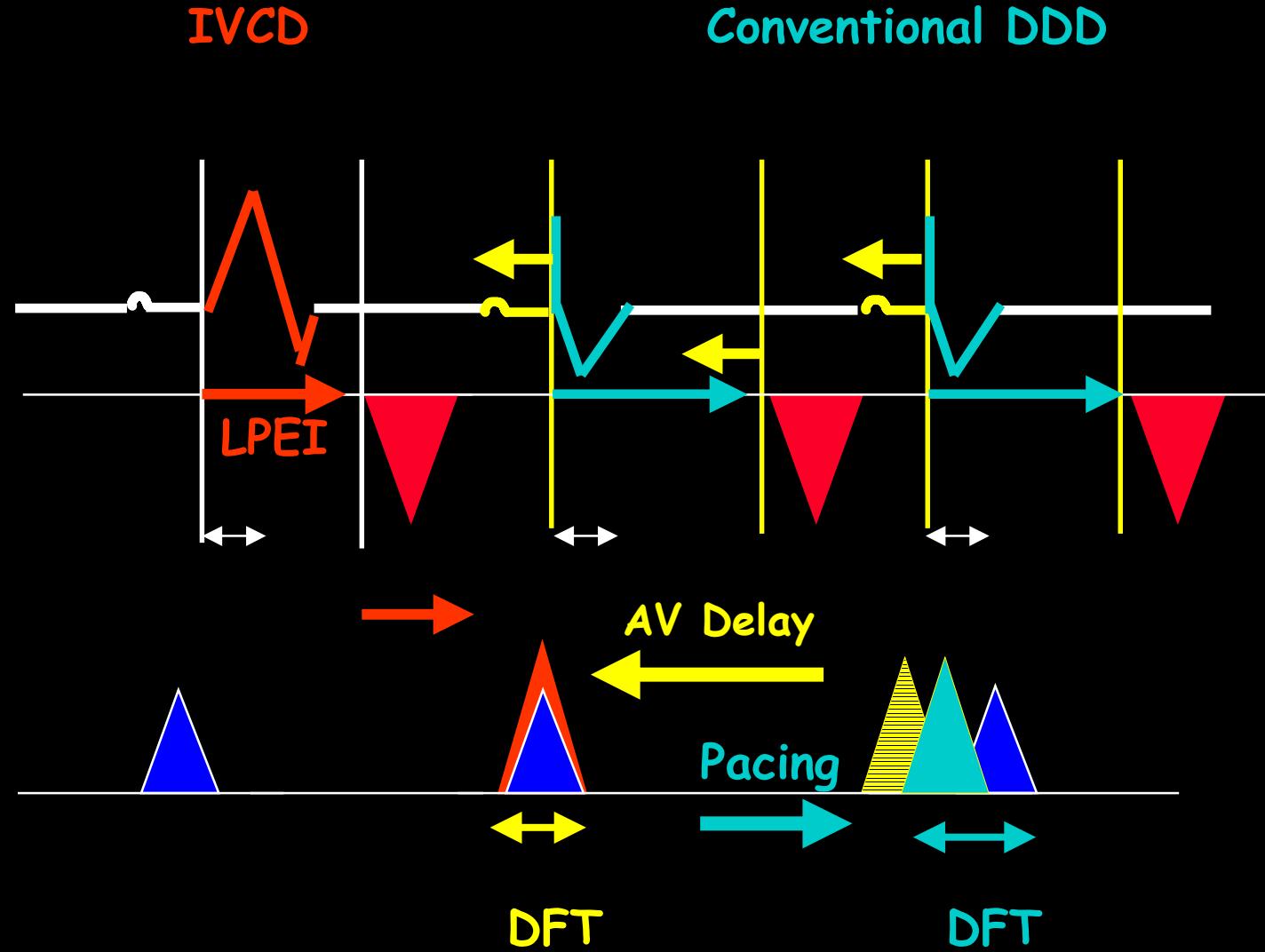
Conventional DDD



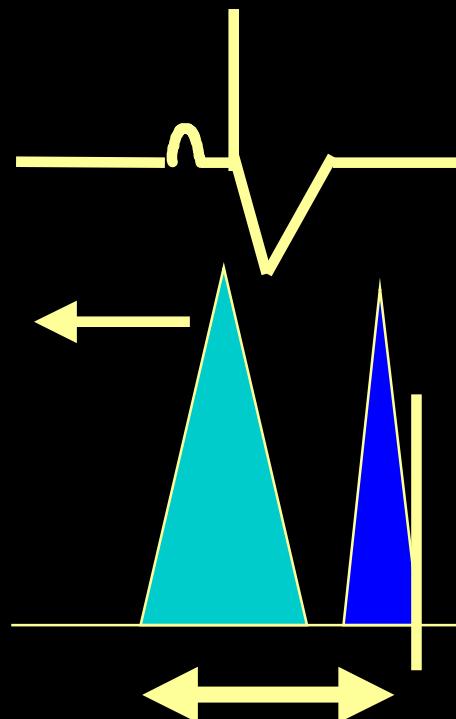
IVCD

Conventional DDD

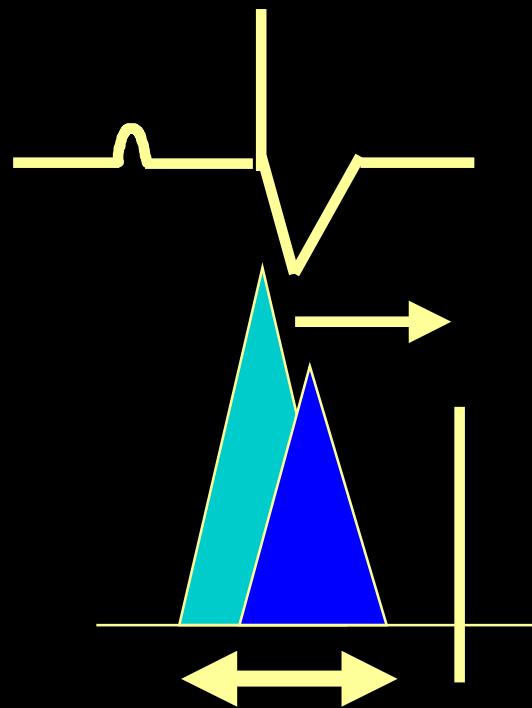




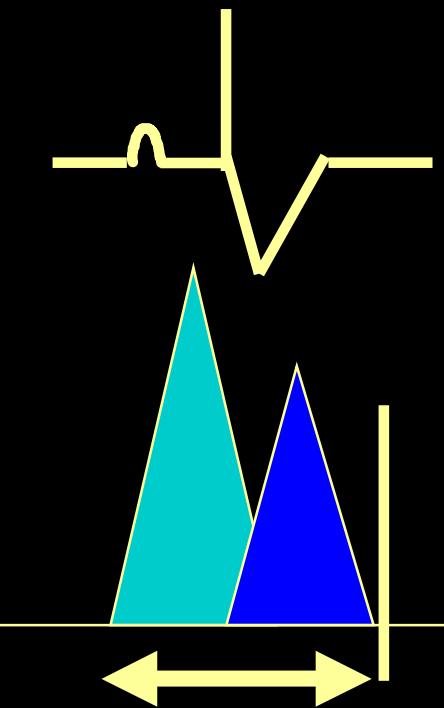
Un DAV ça se programme DAV « optimal » sur Bloc complet



Trop Court

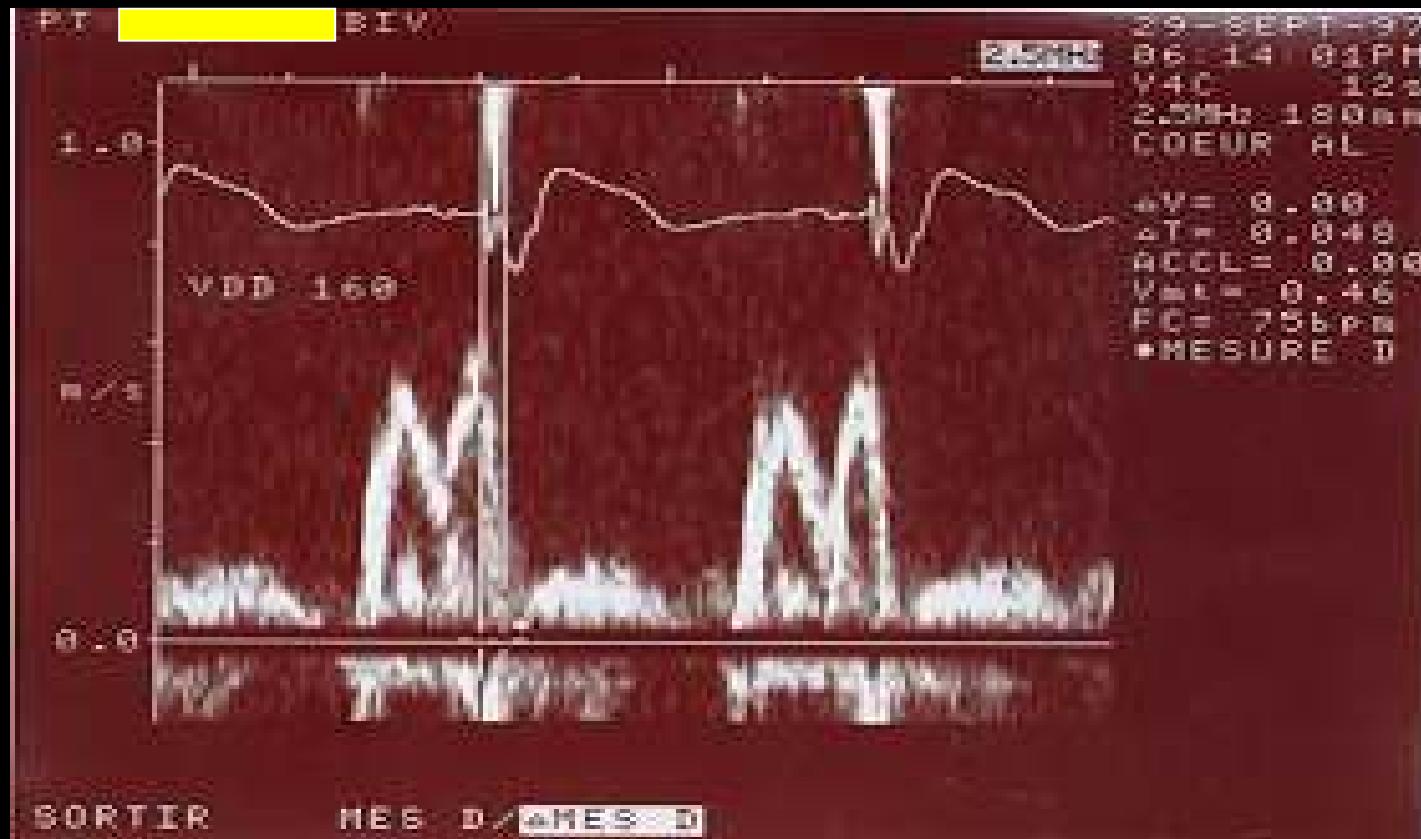


Trop Long



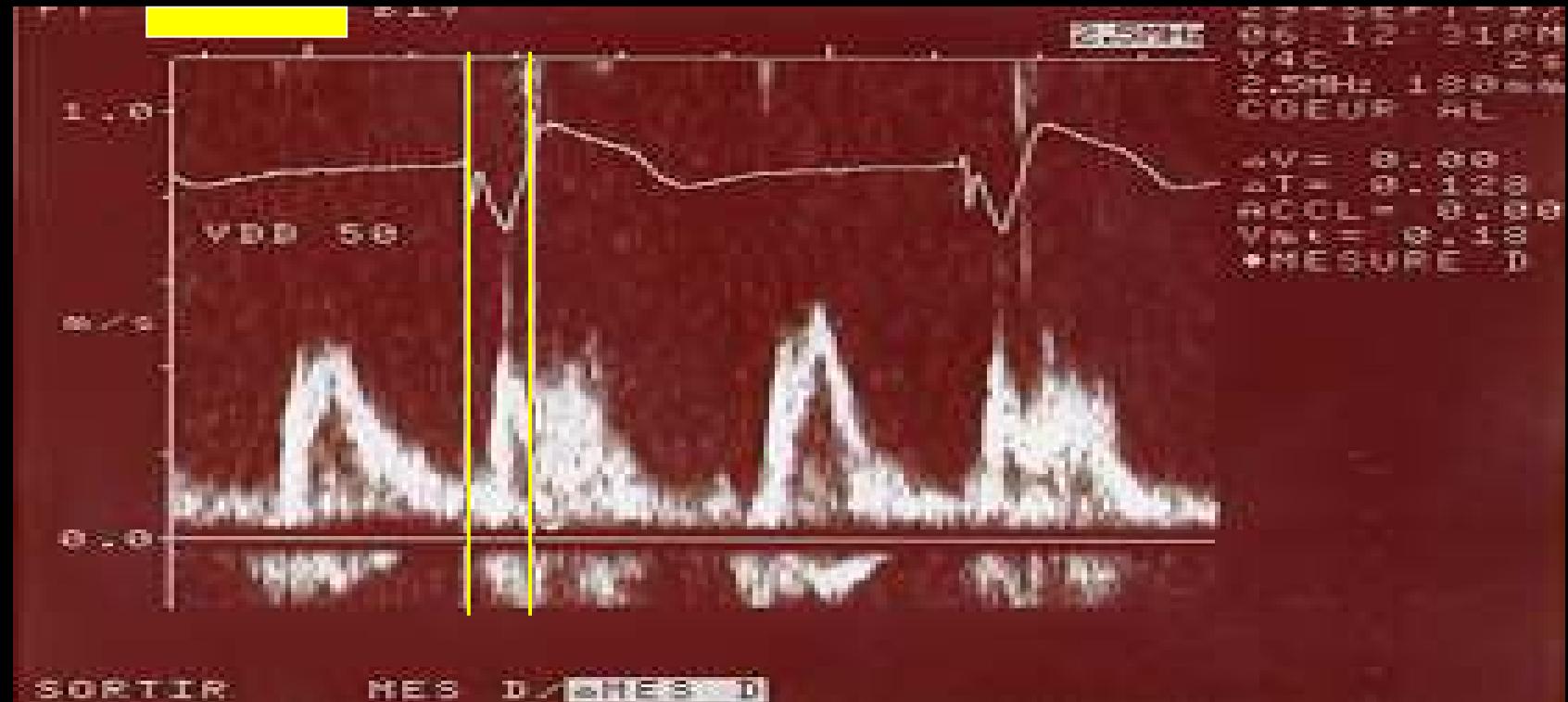
Correct

Program a too long AVD



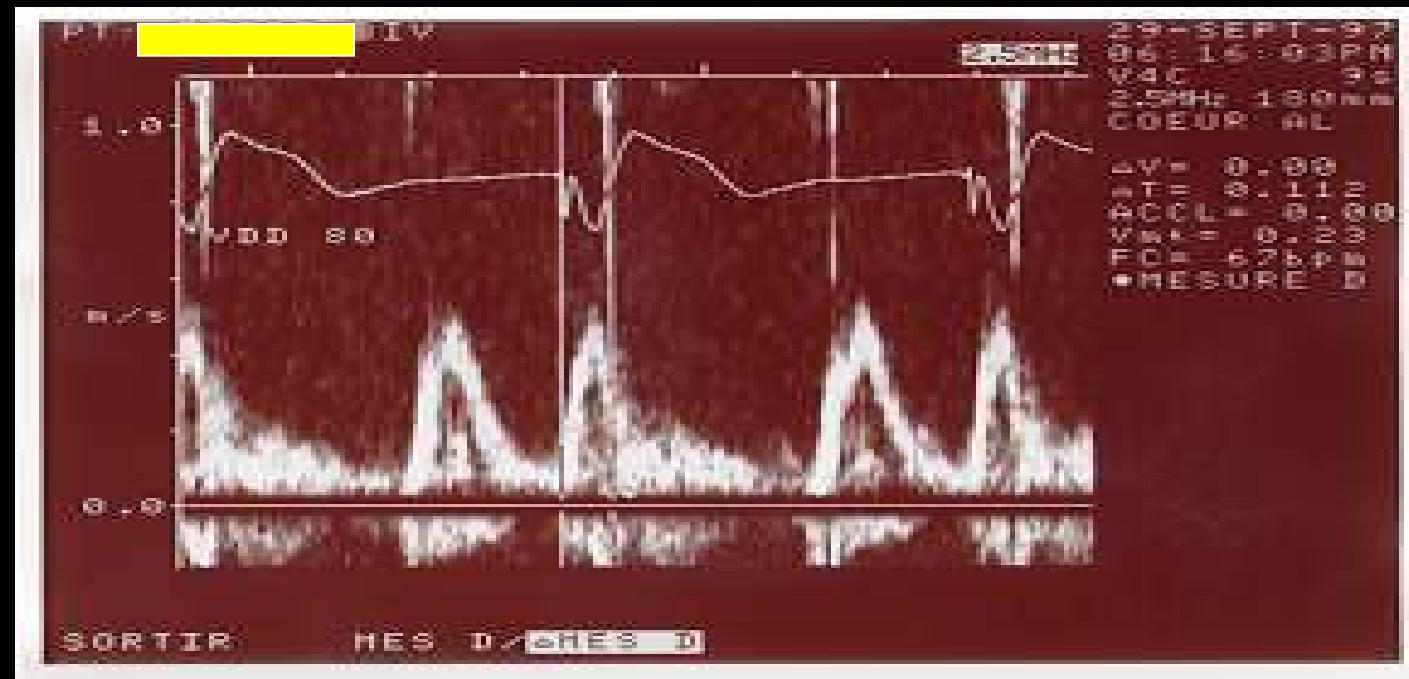
$AVD_2 = 160 \text{ ms}$
SpikeV - end A wave = 48 ms

Program a too short AVD



$AVD_1 = 50 \text{ ms}$
 $\text{SpikeV} - \text{end A wave} = 128 \text{ ms}$

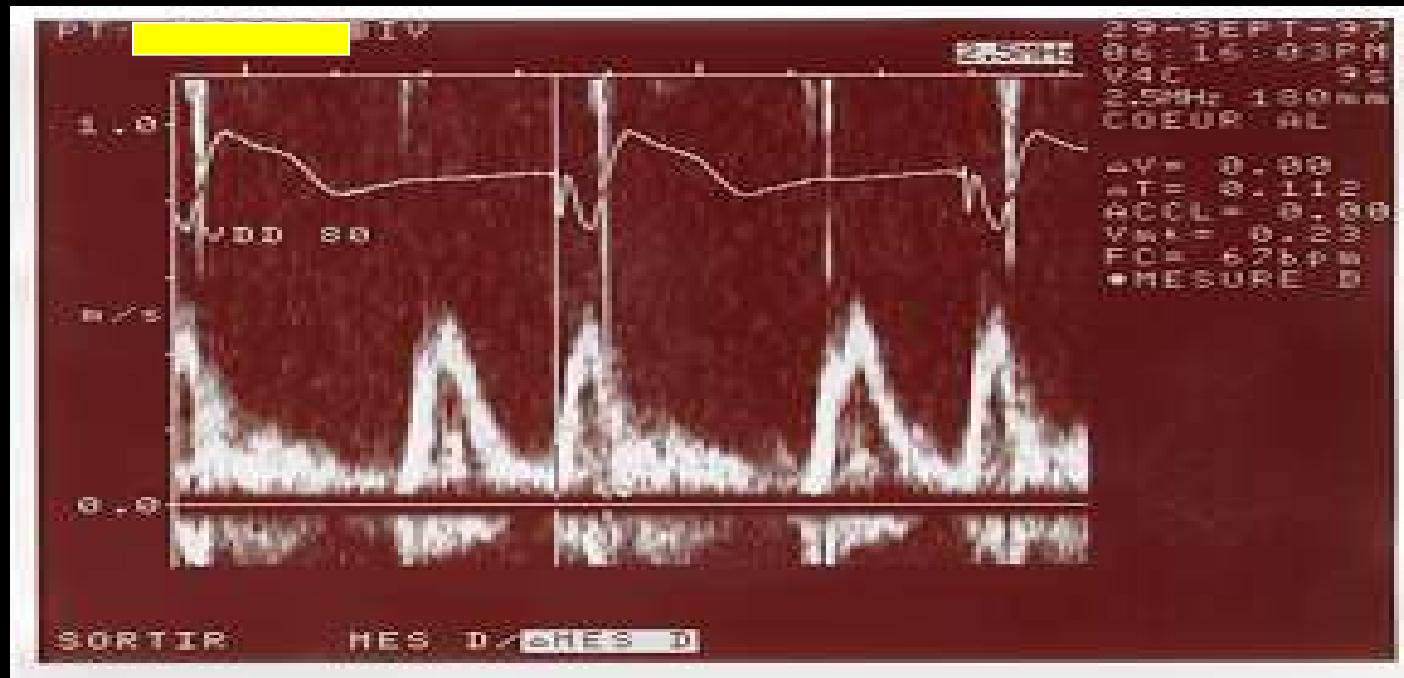
Excess of Shortening 30 ms



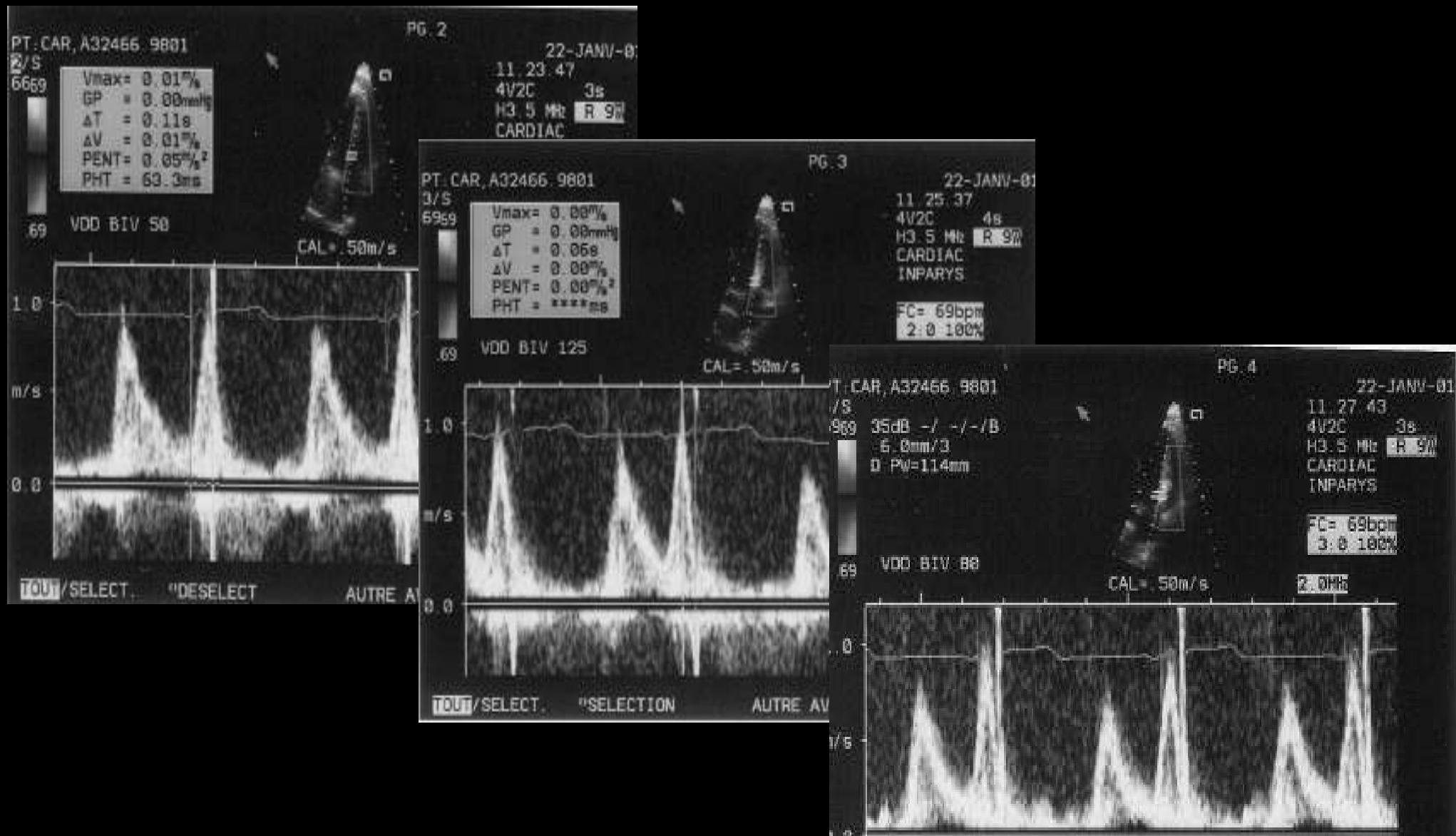
Difference of AVD - Difference on A waves
 $(160 - 50) - (128 - 48)$

30 ms

AVD for optimal filling



30 ms = Excess of shortening
Targeted AVD = short AVD + 30 ms
Targeted AVDelay = 80 ms



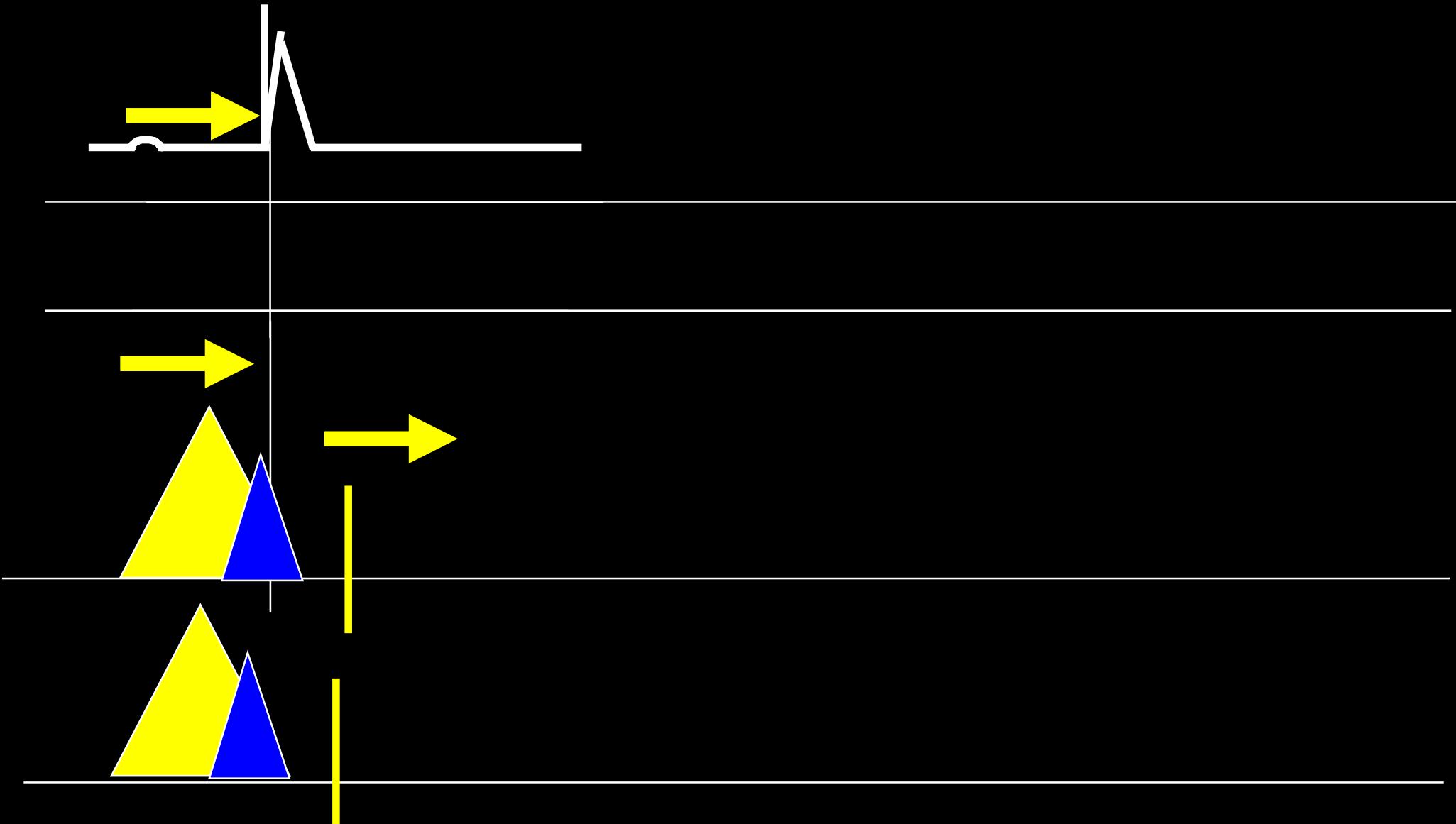
**Ritter formula : so-called Optimal AVD
Only in presence of complete AV Block**

However

In case of preserved natural AV conduction

**Prolonging the AVD may paradoxically
increase LVFT**

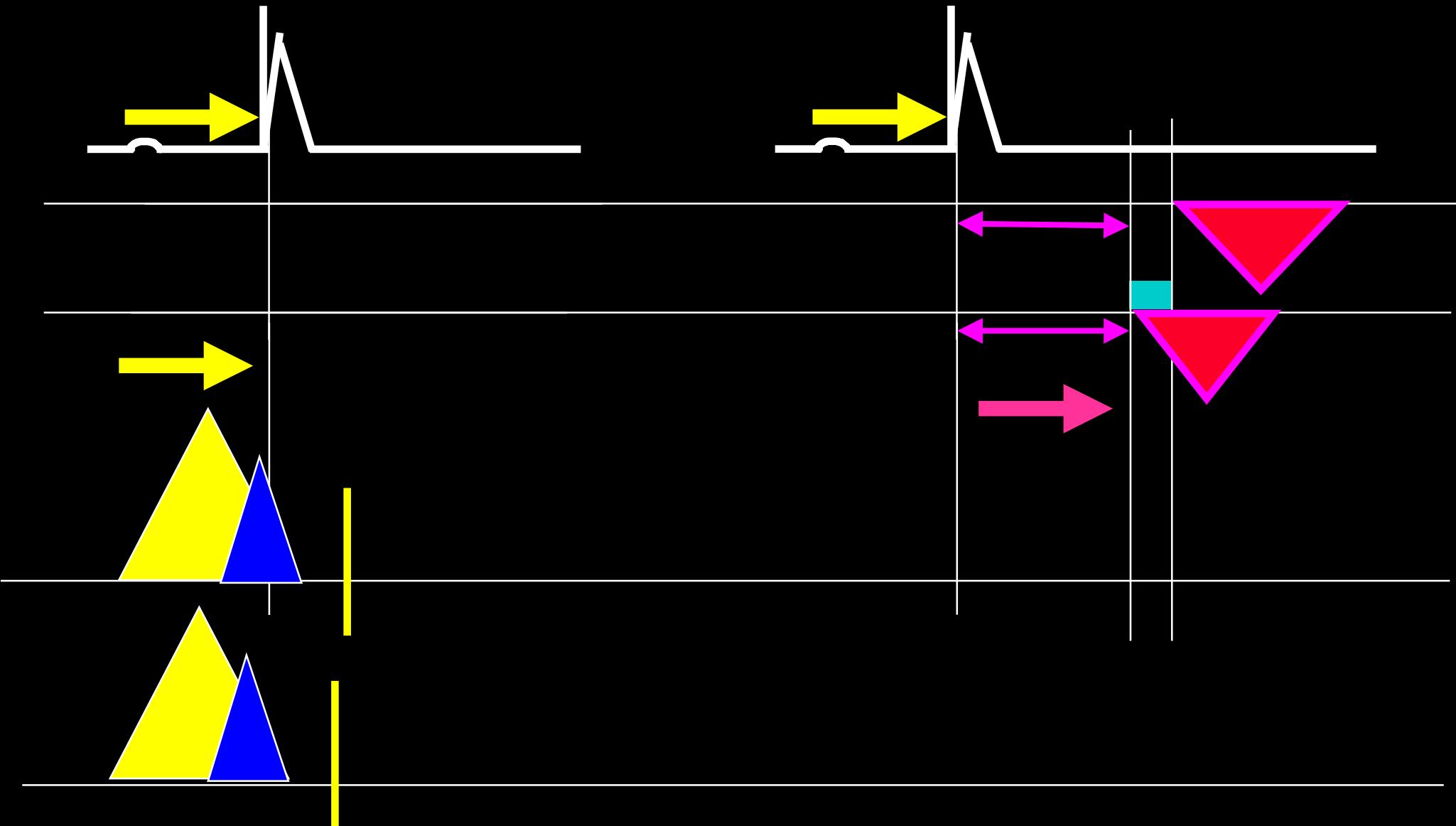
AVD lengthening



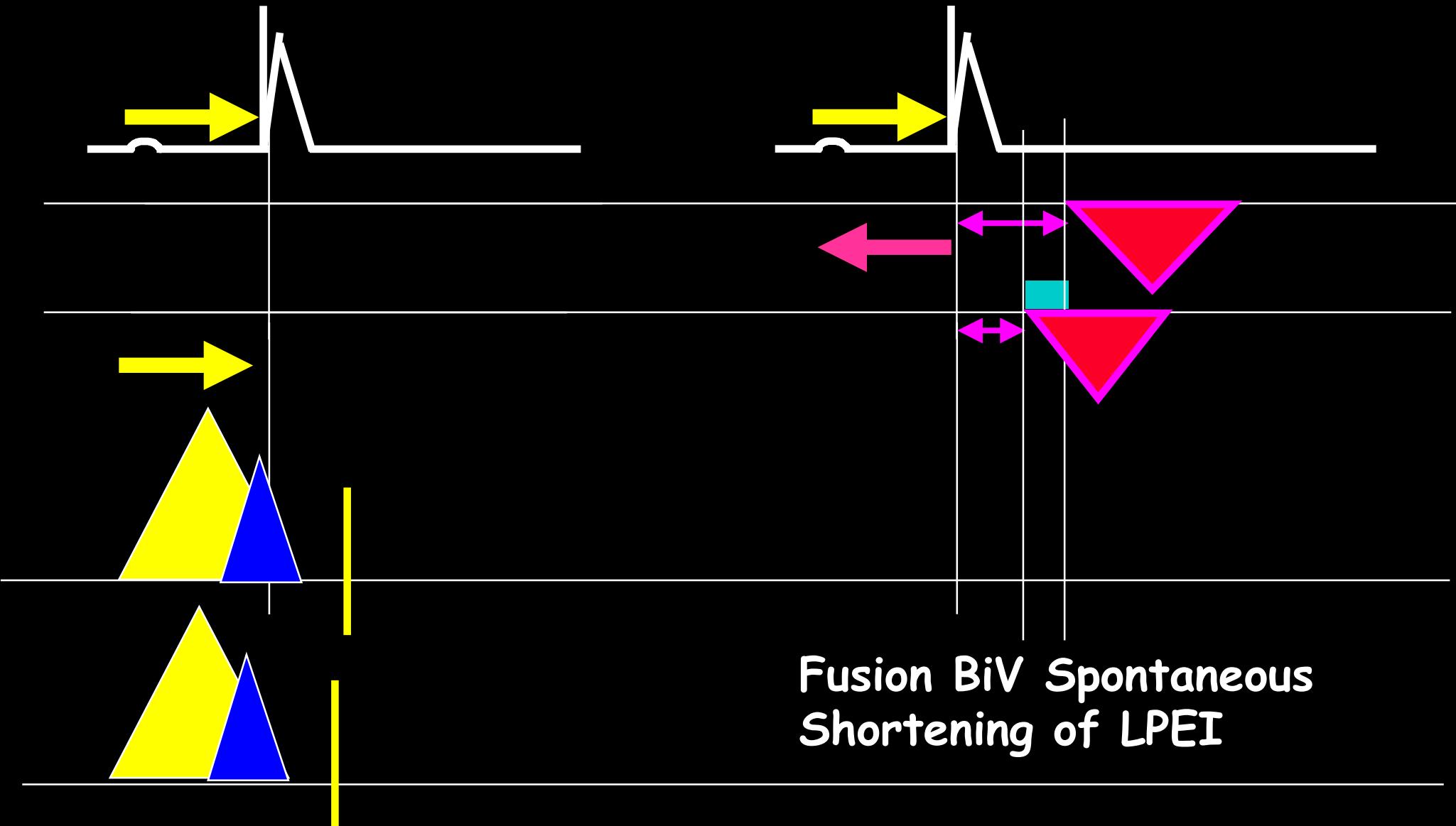
AVD lengthening



AVD lengthening

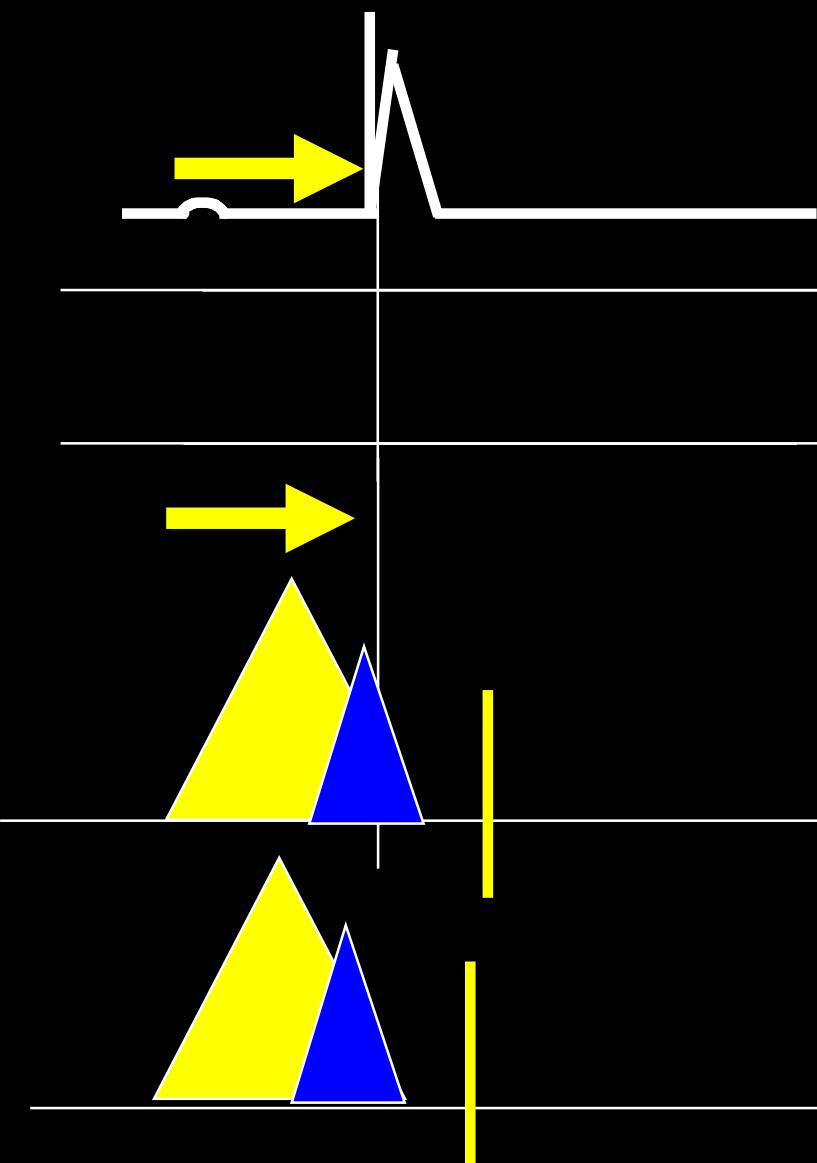


Fusion BiV Spontaneous

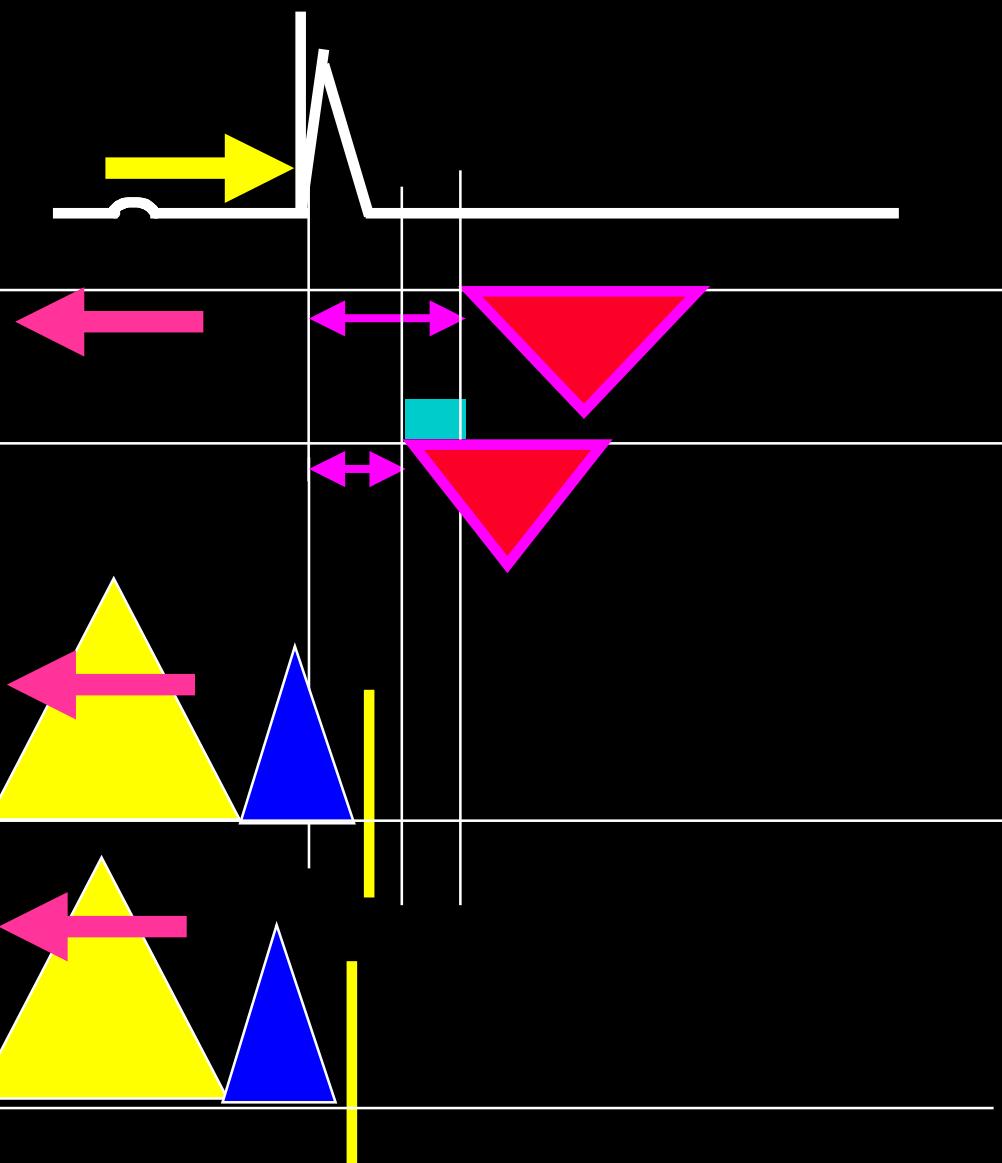


Fusion BiV Spontaneous
Shortening of LPEI

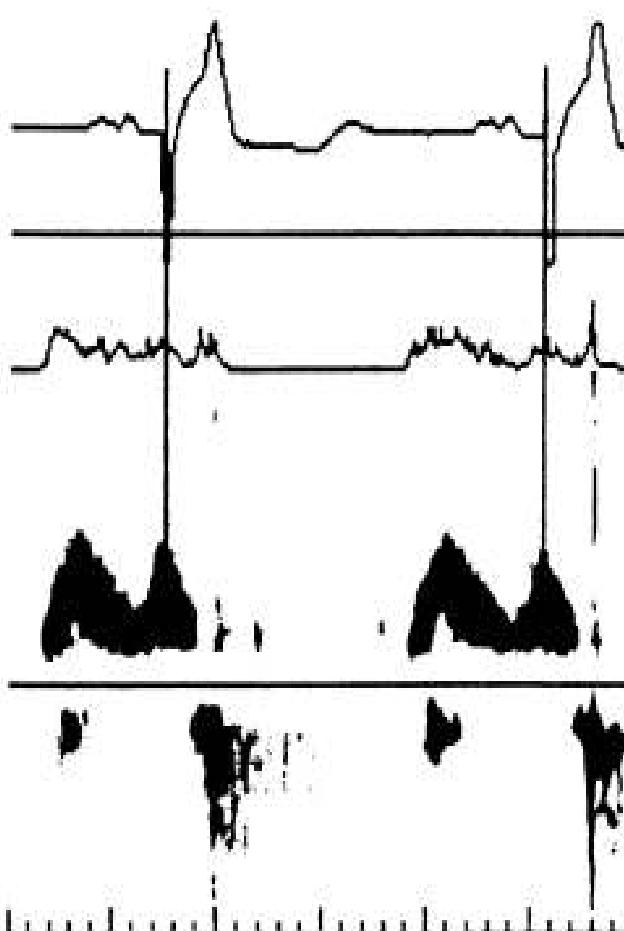
Fusion BiV Spontaneous



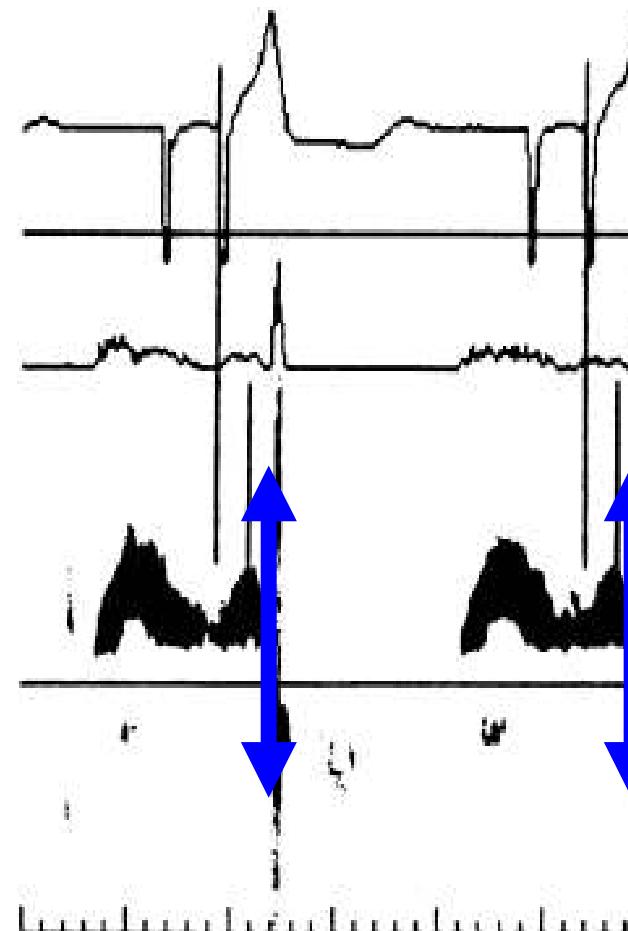
Modification in E wave timing



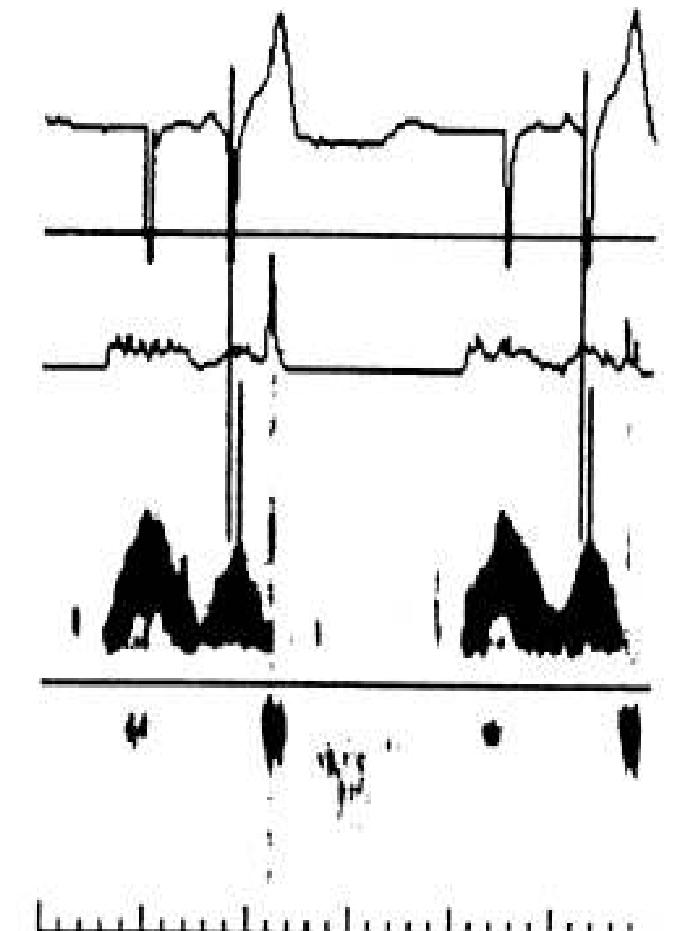
AV Delay extension from VDD to DDD



a VDD AVD = 150



b DDD AVD = 150



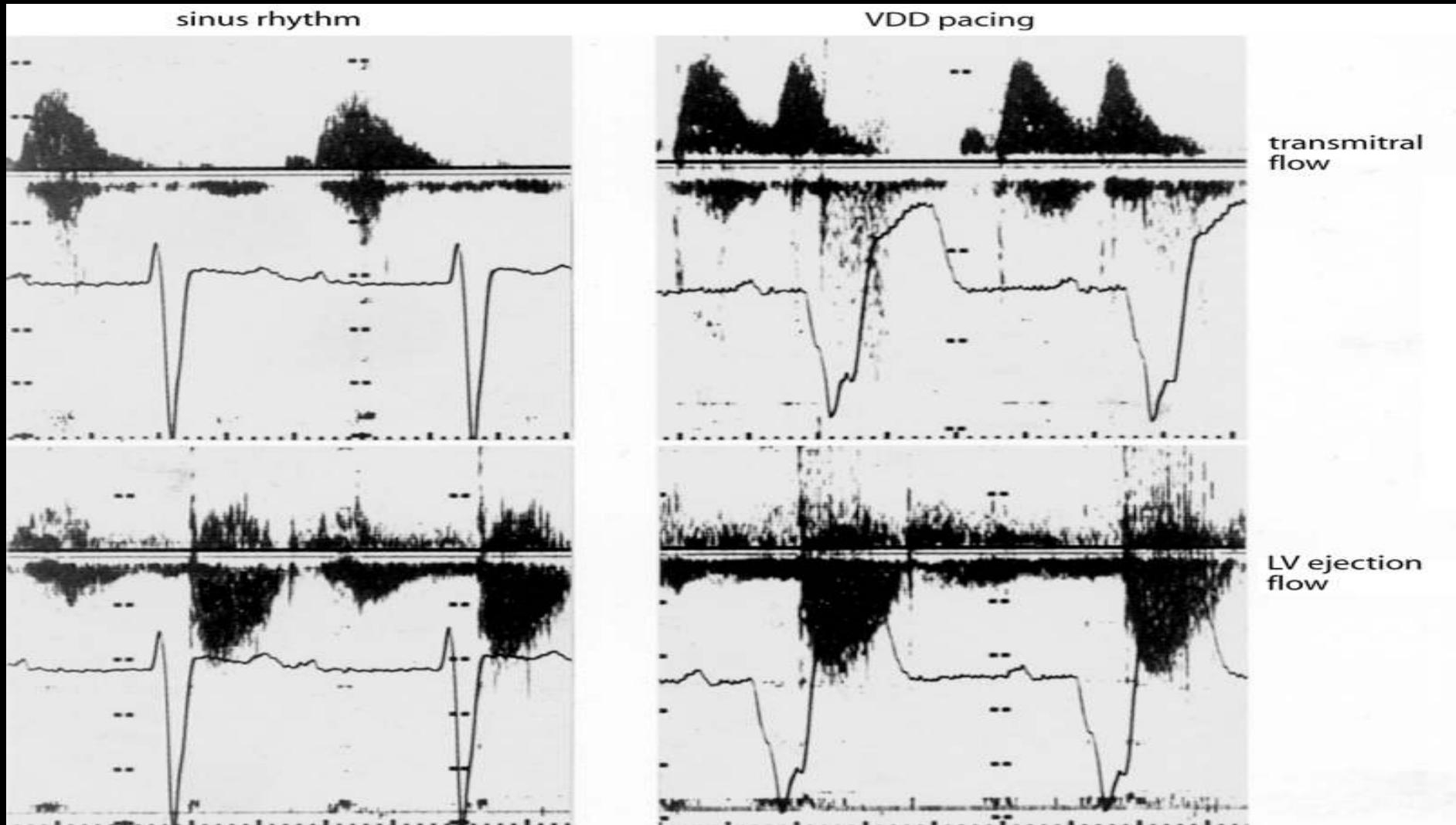
DDD AVD = 150 + 50

Cas particuliers

Le PR long

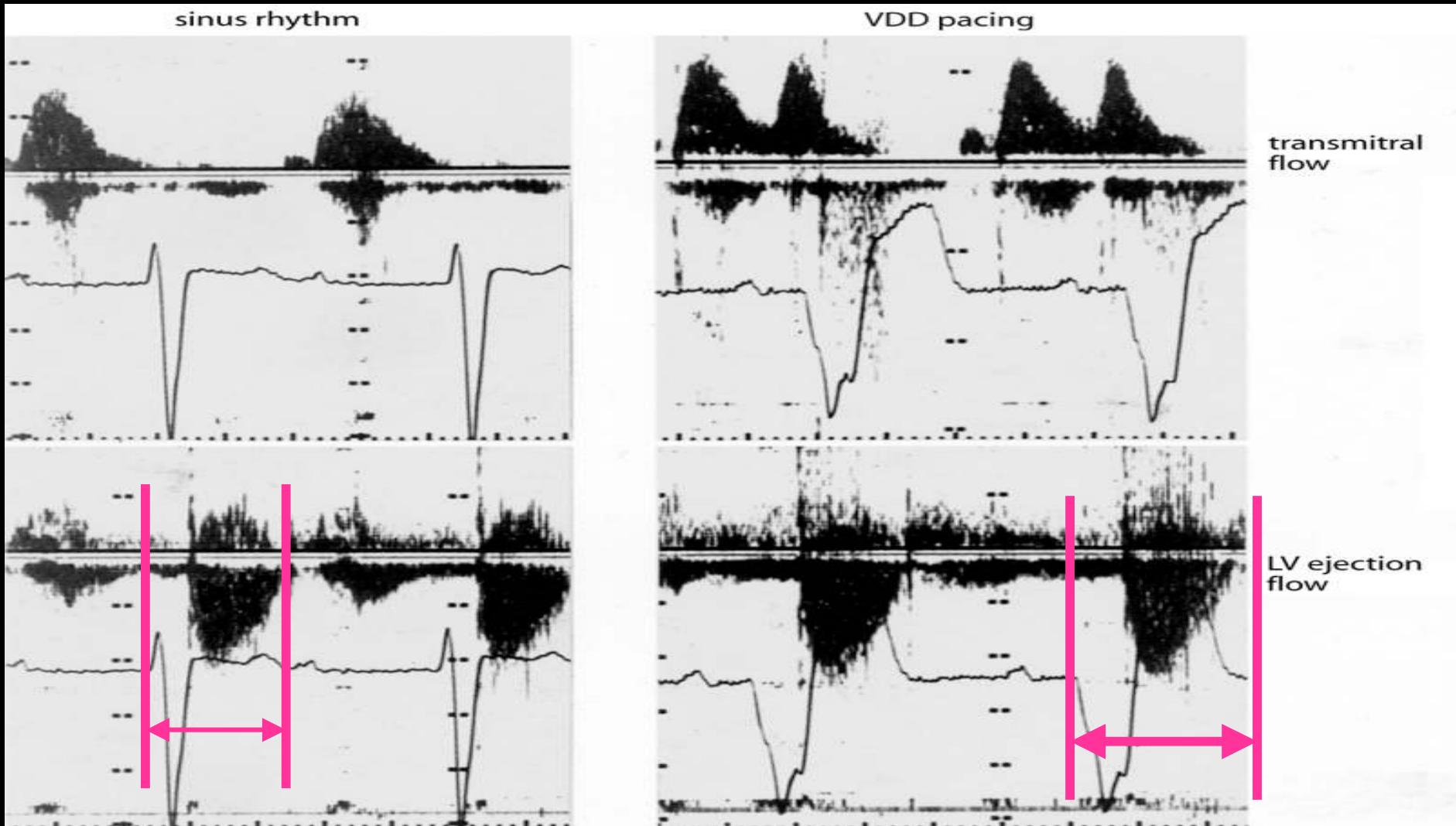
La CMO

Un cas particulier : le PR long



Mabo et coll PACE 1992 A
InParys

Le PR long : ???



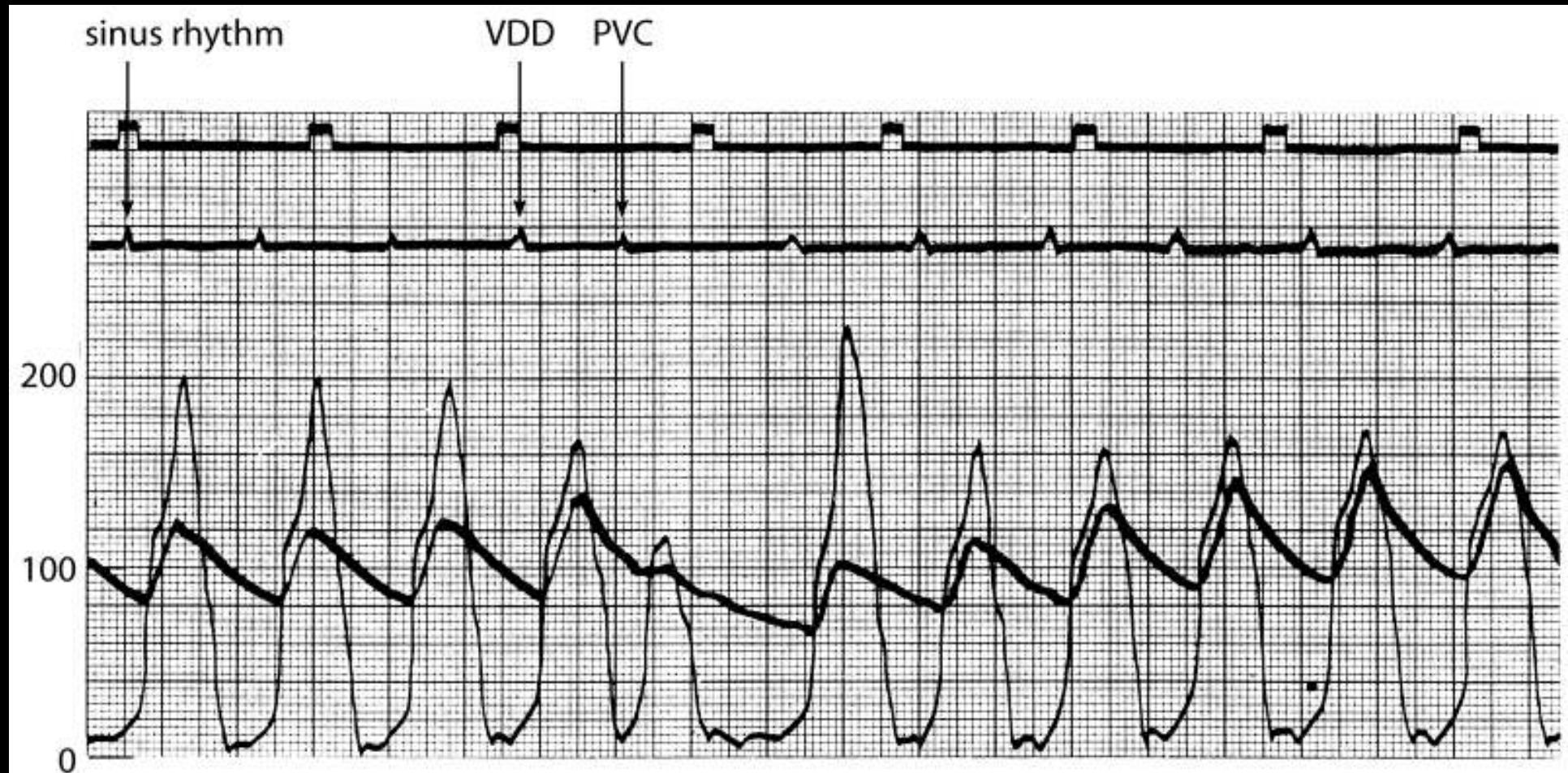
Mabo et coll PACE 1992 A
InParys

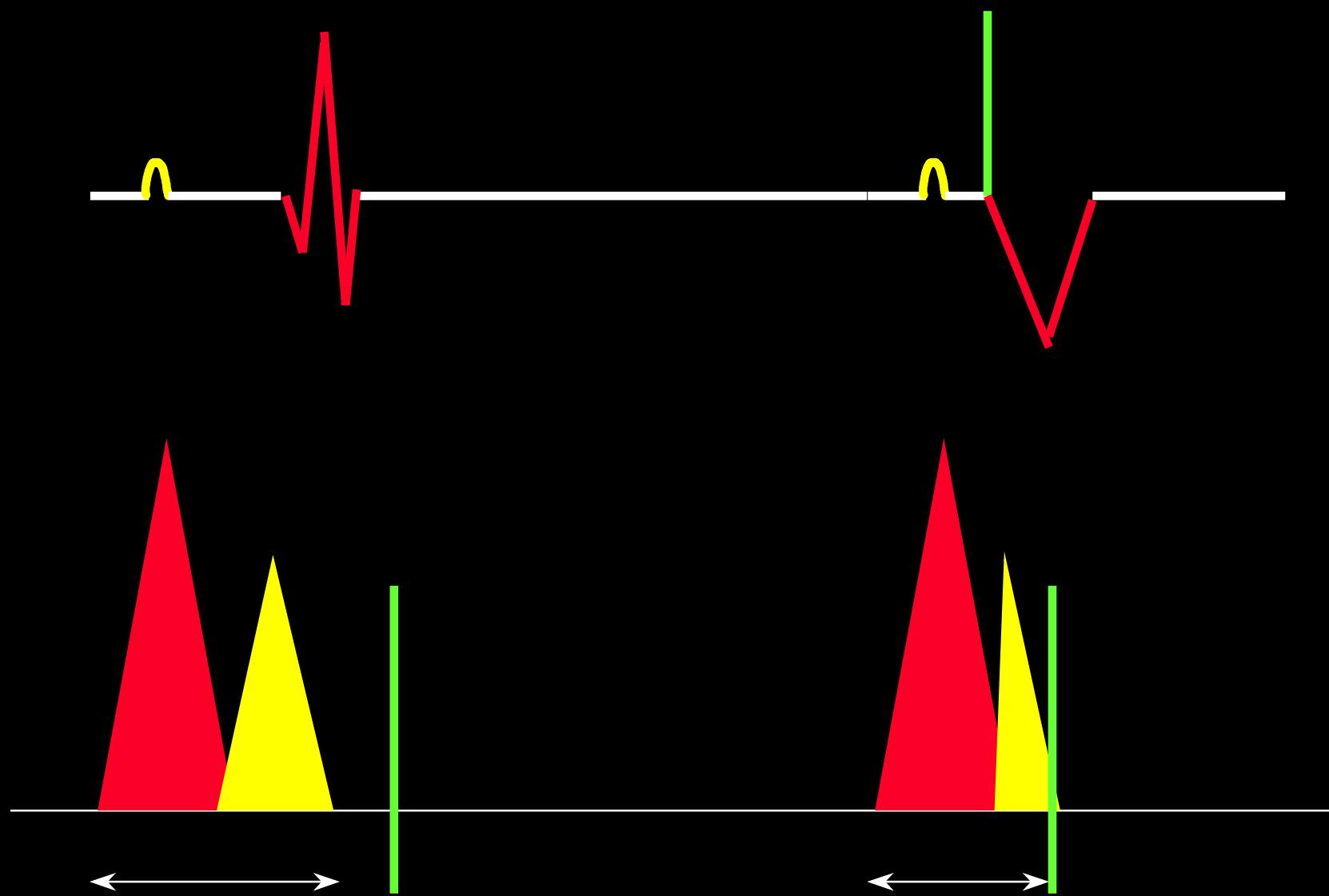
Un cas particulier la Cardiomyopathie Obstructive

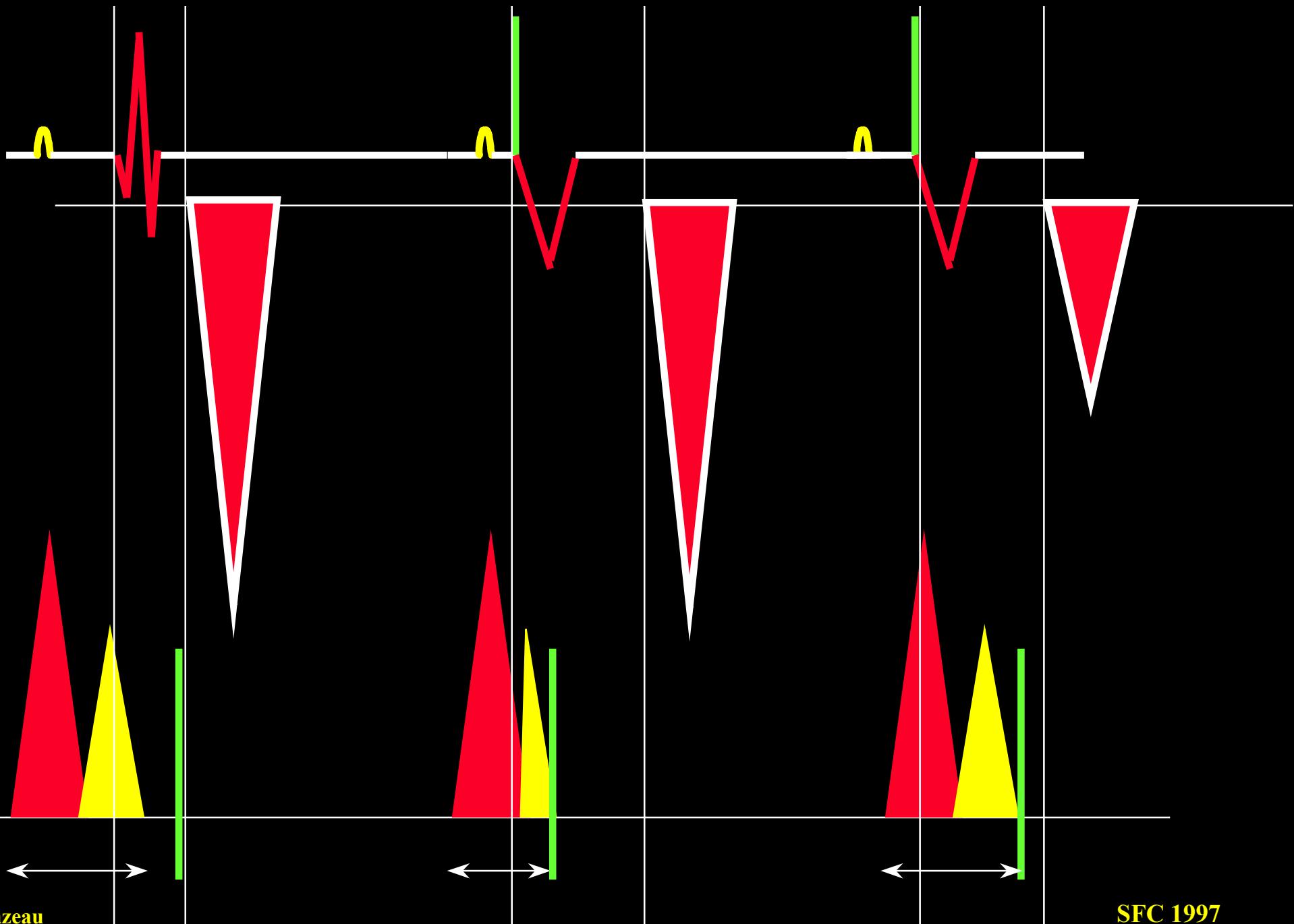
**Se servir de l'altération de la
séquence d'activation mécanique
pour améliorer l'hémodynamique**

**Stimuler à l'apex VD
Capturer le Ventricule gauche
Ne pas compromettre le remplissage**

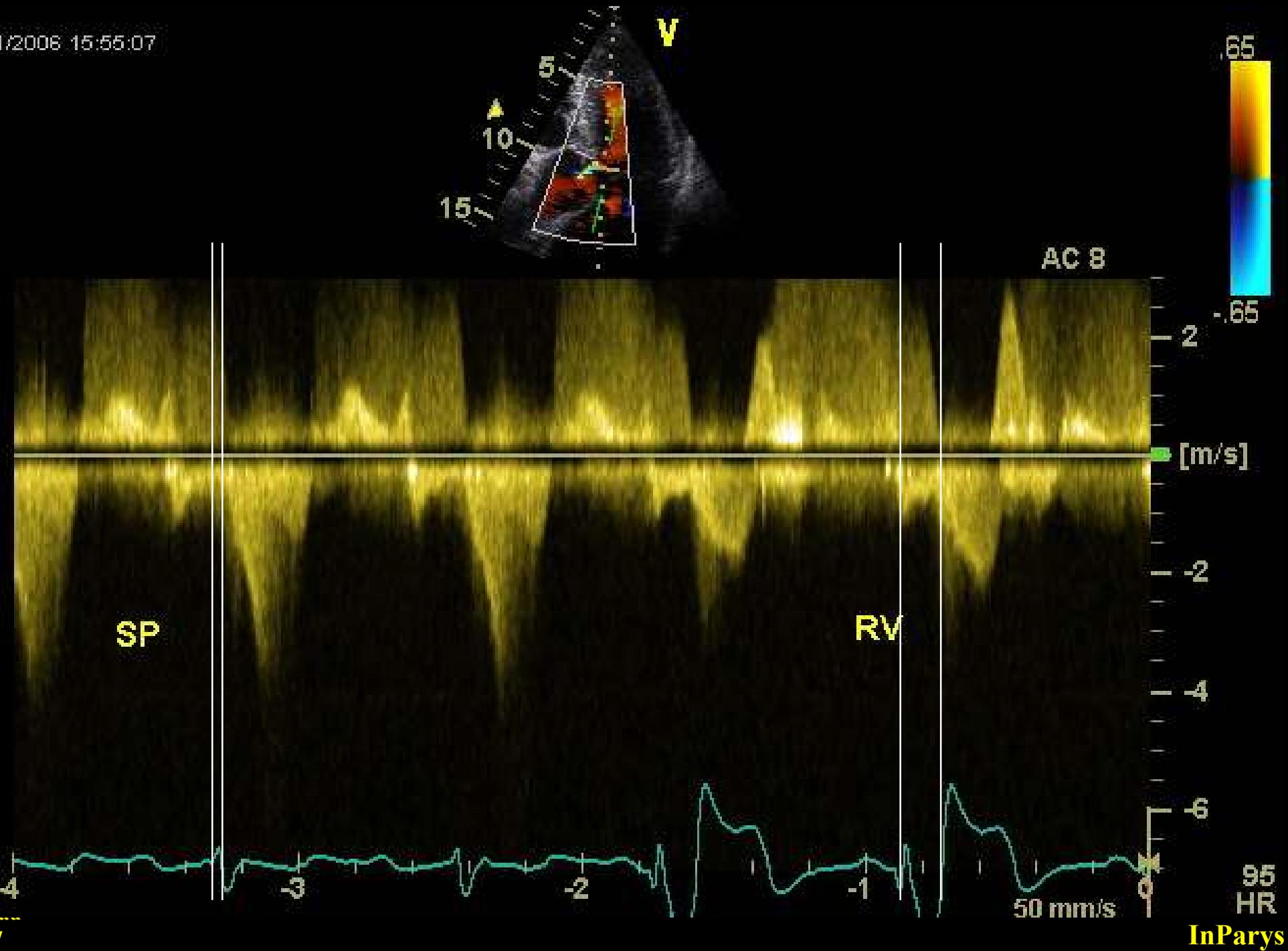
La Cardiomyopathie Obstructive



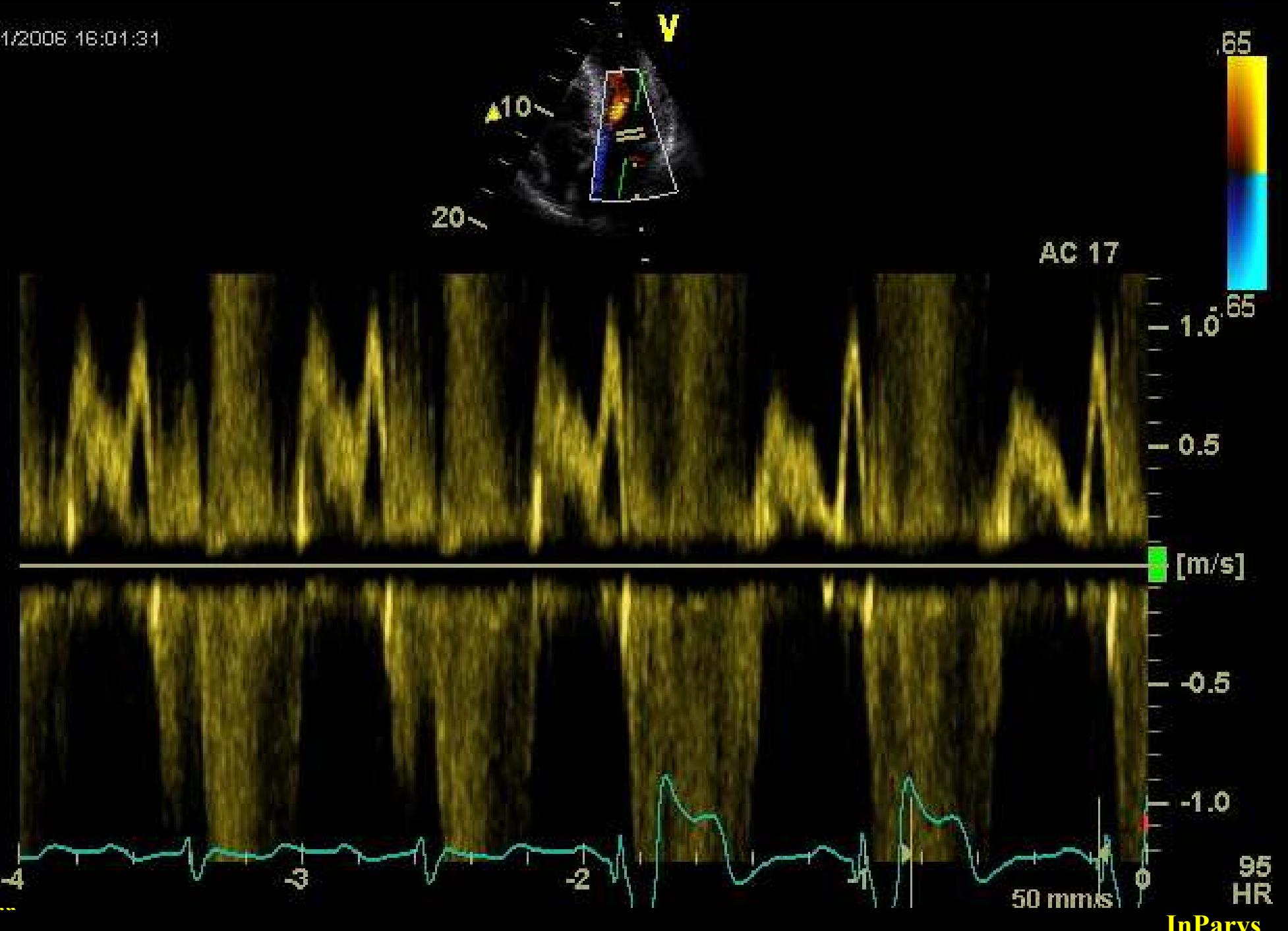


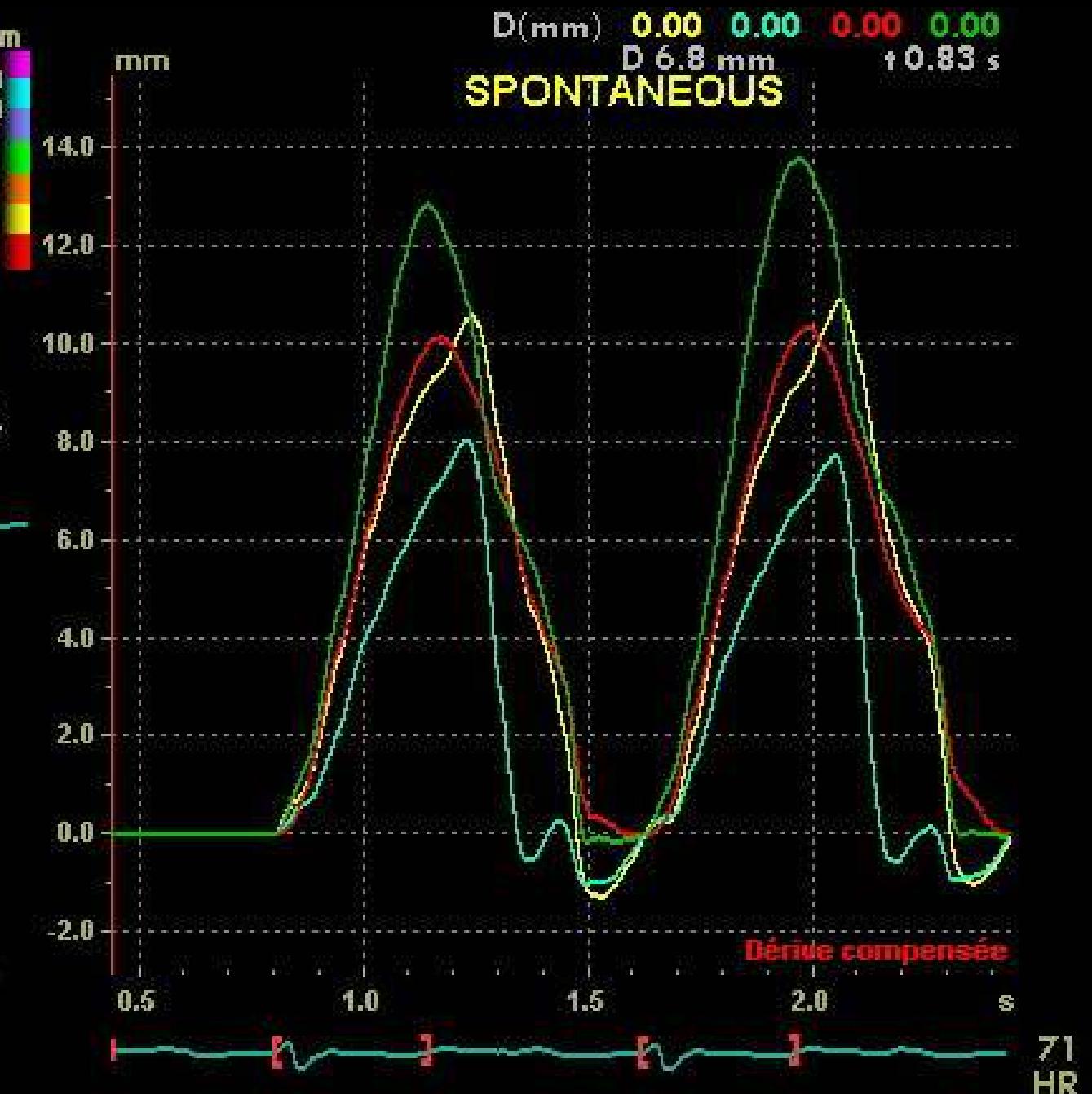
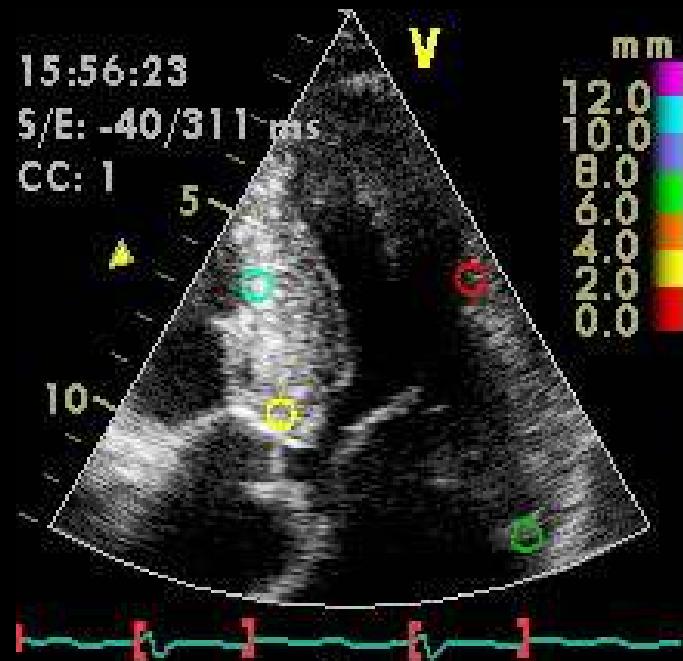


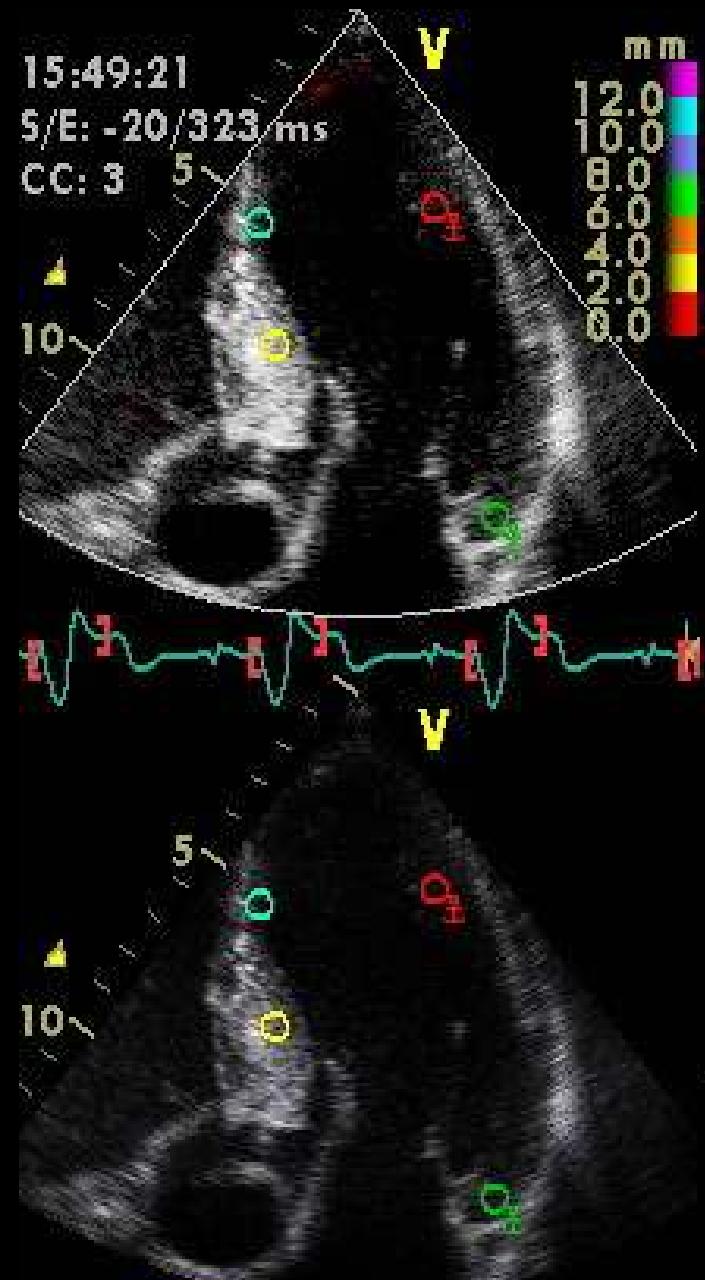
29/11/2006 15:55:07



29/11/2006 16:01:31

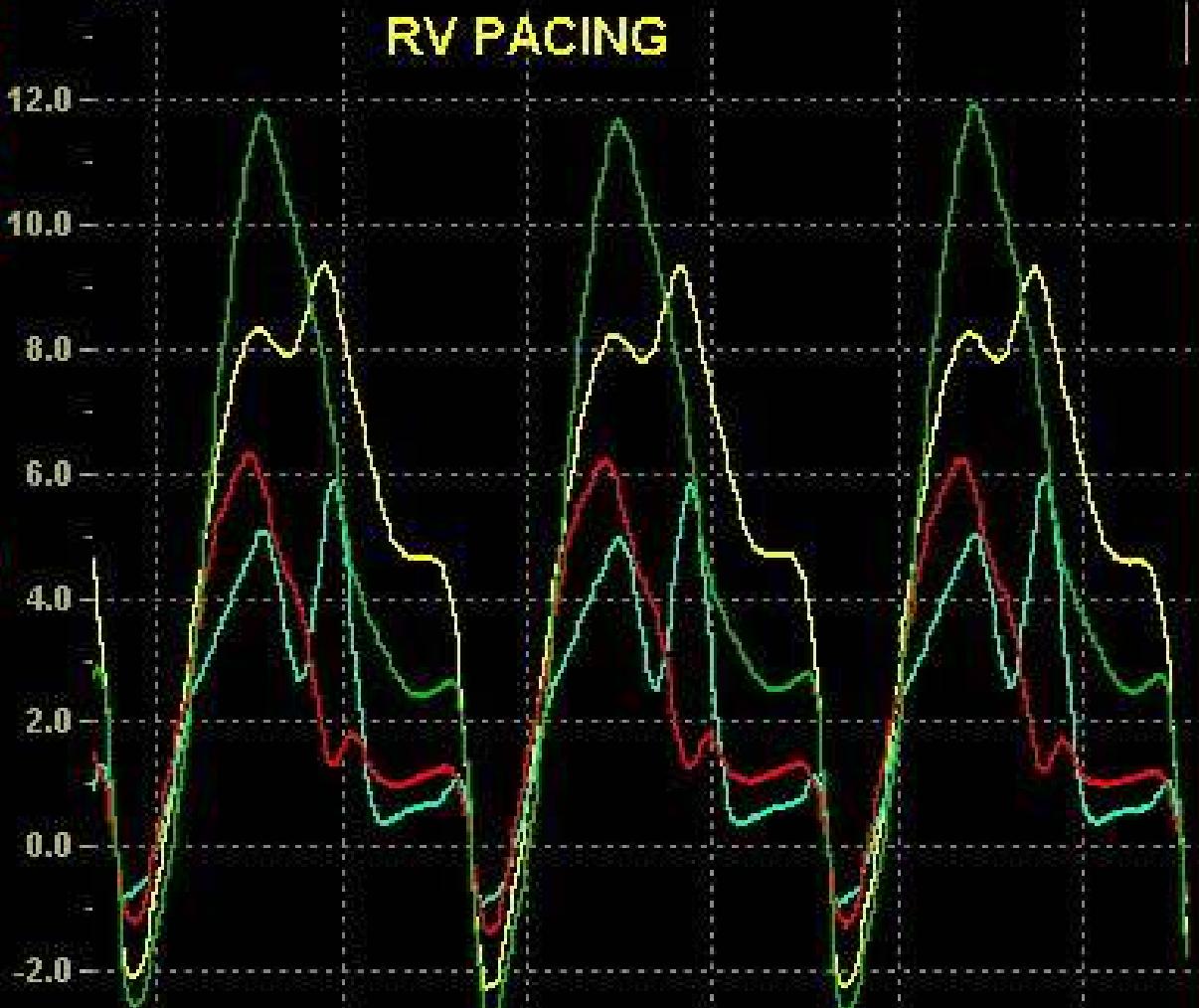






D(mm) -1.41 -0.84 -0.68 -1.69

RV PACING



Dérive compensée



Quel DAV peut être qualifié “d’optimal” ?

Le DAV est un paramètre sournois

Contrôle la synchro AV (diastole)

Contrôle aussi la séquence d’activation mécanique ventriculaire (systole)

Participe à la période réfractaire totale (2:1 point)

Participe aux algorithmes de sécurité (anti-TRE, Mode switch)

Cardiac dyssynchrony ...

Modelization for analysis

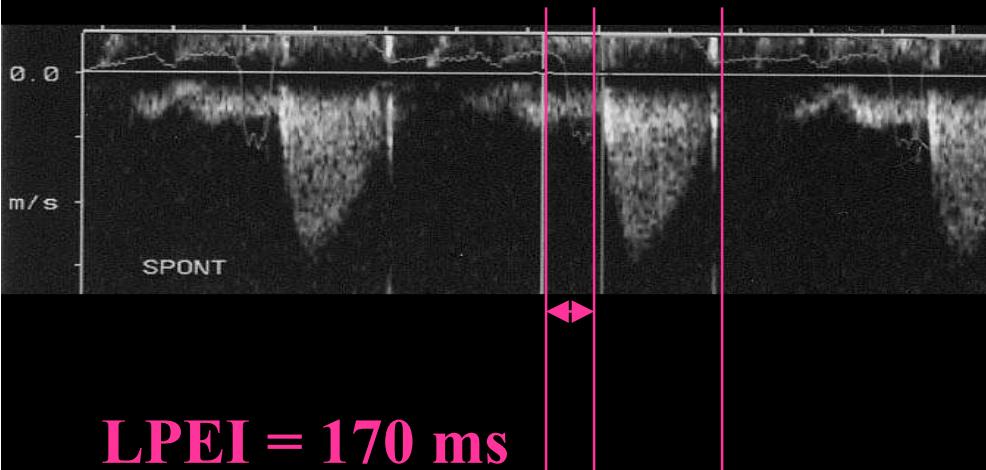
AV dyssynchrony : LVFT < 40% of the cardiac cycle

InterV dyssynchrony : InterV delay > 40 ms

Mechanical IVDelay > 40 ms

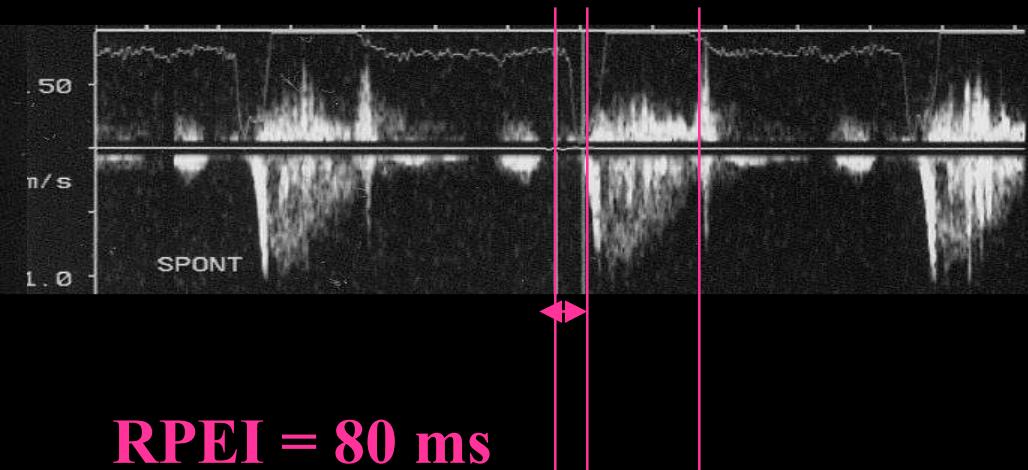
Left preejection interval - Right Preejection interval

$\Delta T = 0.17\text{ s}$
 $AV = 2.5\text{ cm/s}$



LPEI = 170 ms

$\Delta T = 0.08\text{ s}$
 $AV = 2.5\text{ cm/s}$



RPEI = 80 ms

InterVentricular dyssynchrony

Its participation to heart failure remains controversial

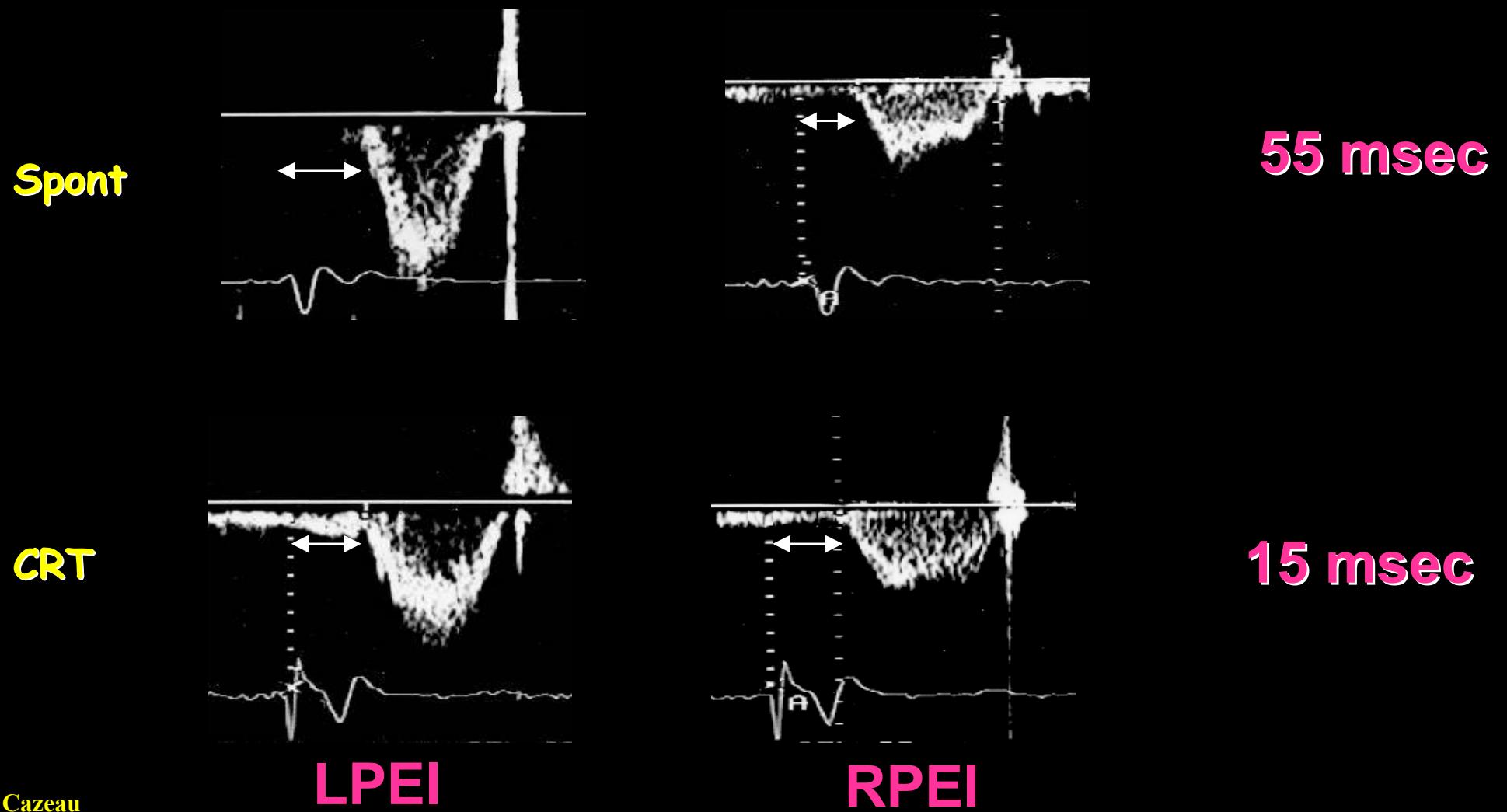
Correction by reducing the longest pre-ejection interval ?

Correction by prolonging the shortest pre-ejection interval

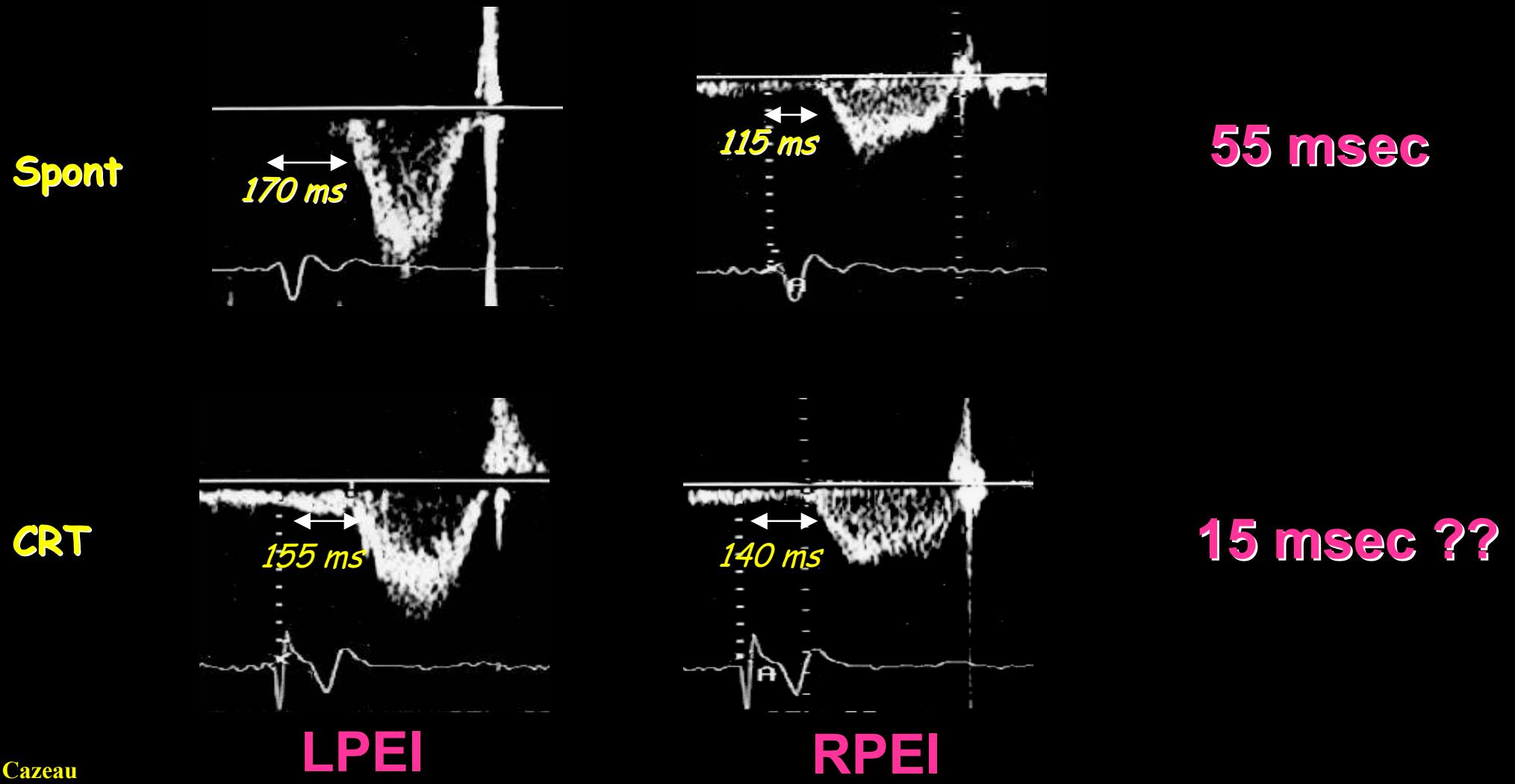
Is the Interventricular Interval a marker or an effector in HF ?

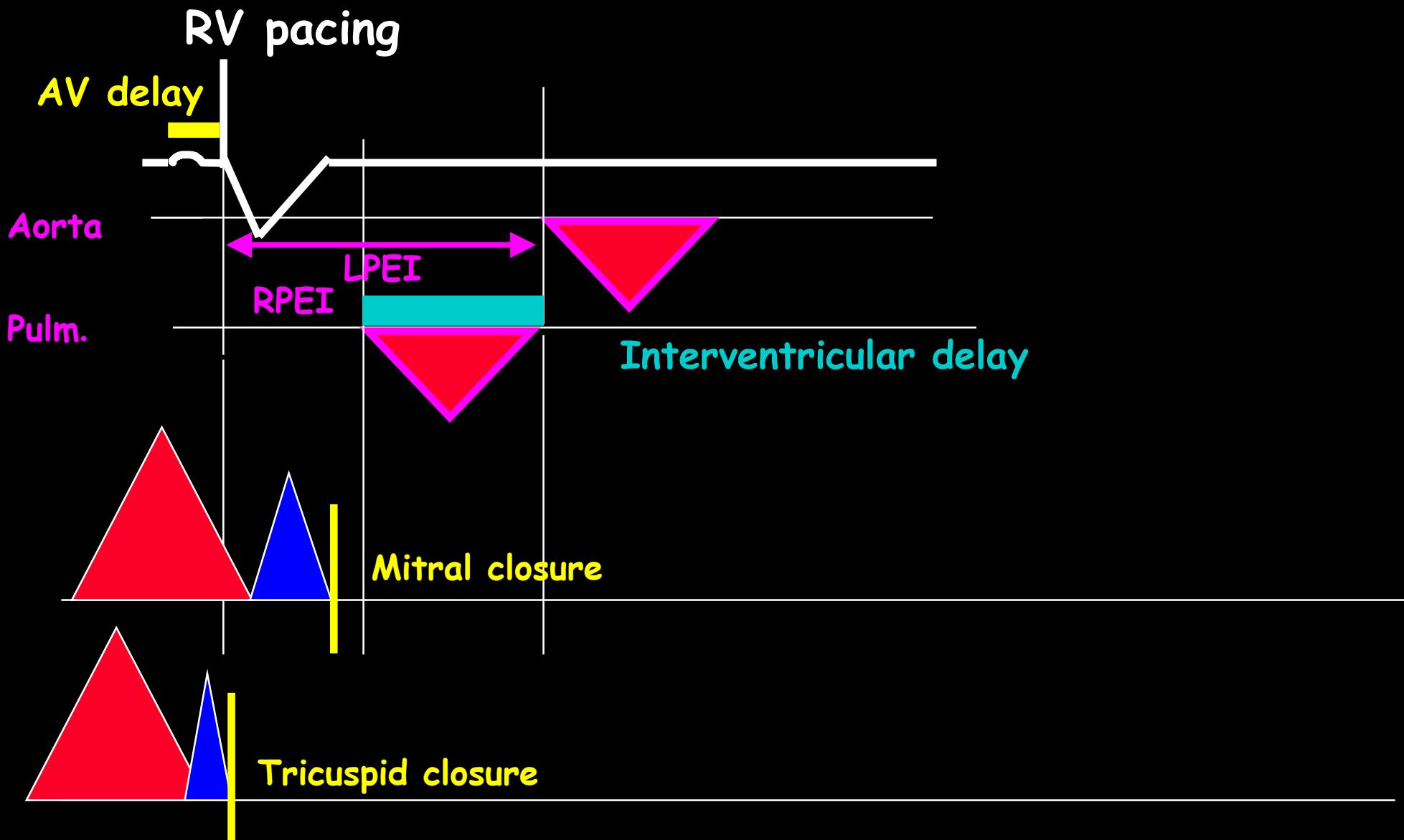
Its reduction plays a major role in AV optimization for both right and left hearts

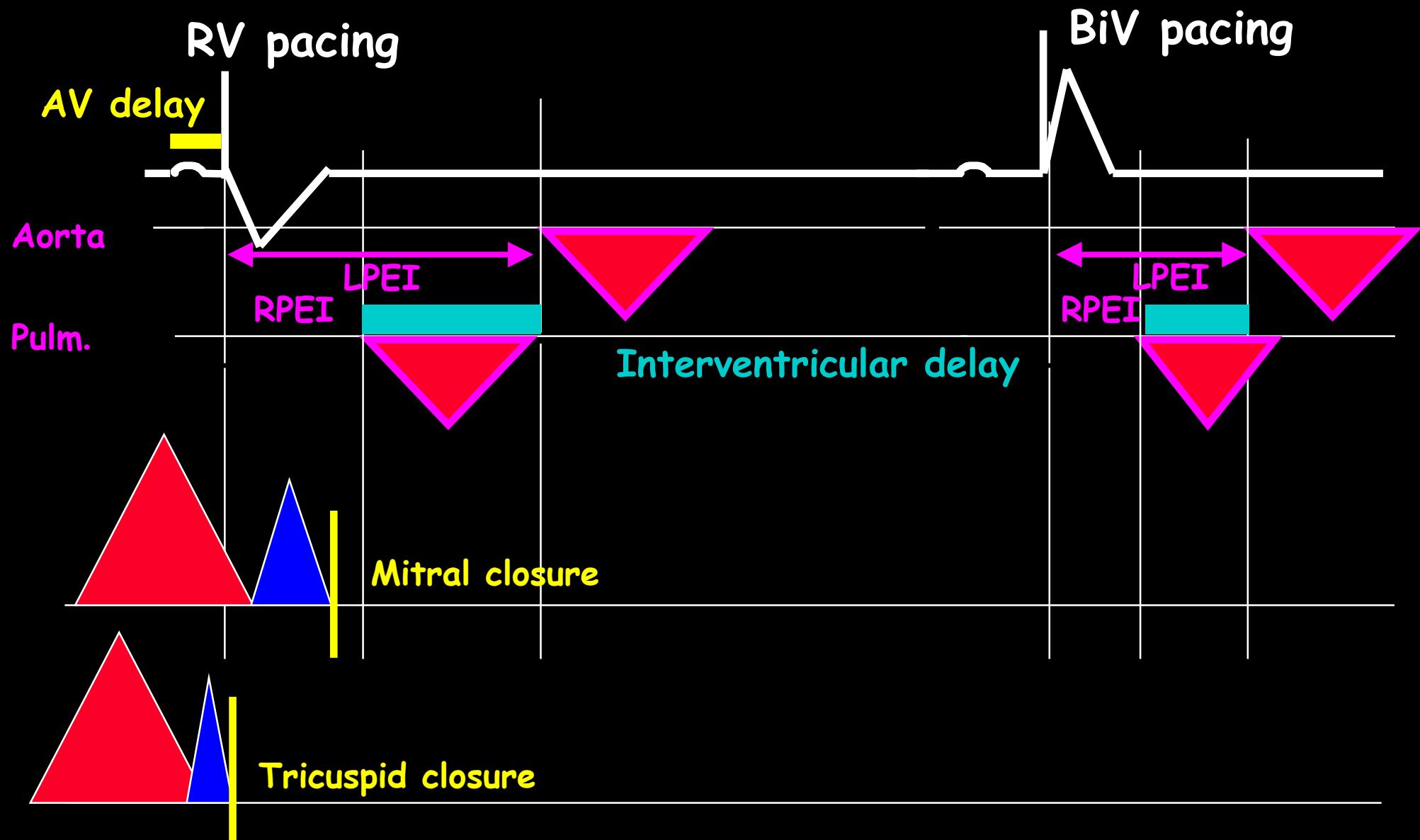
IVD REDUCTION WITH CRT

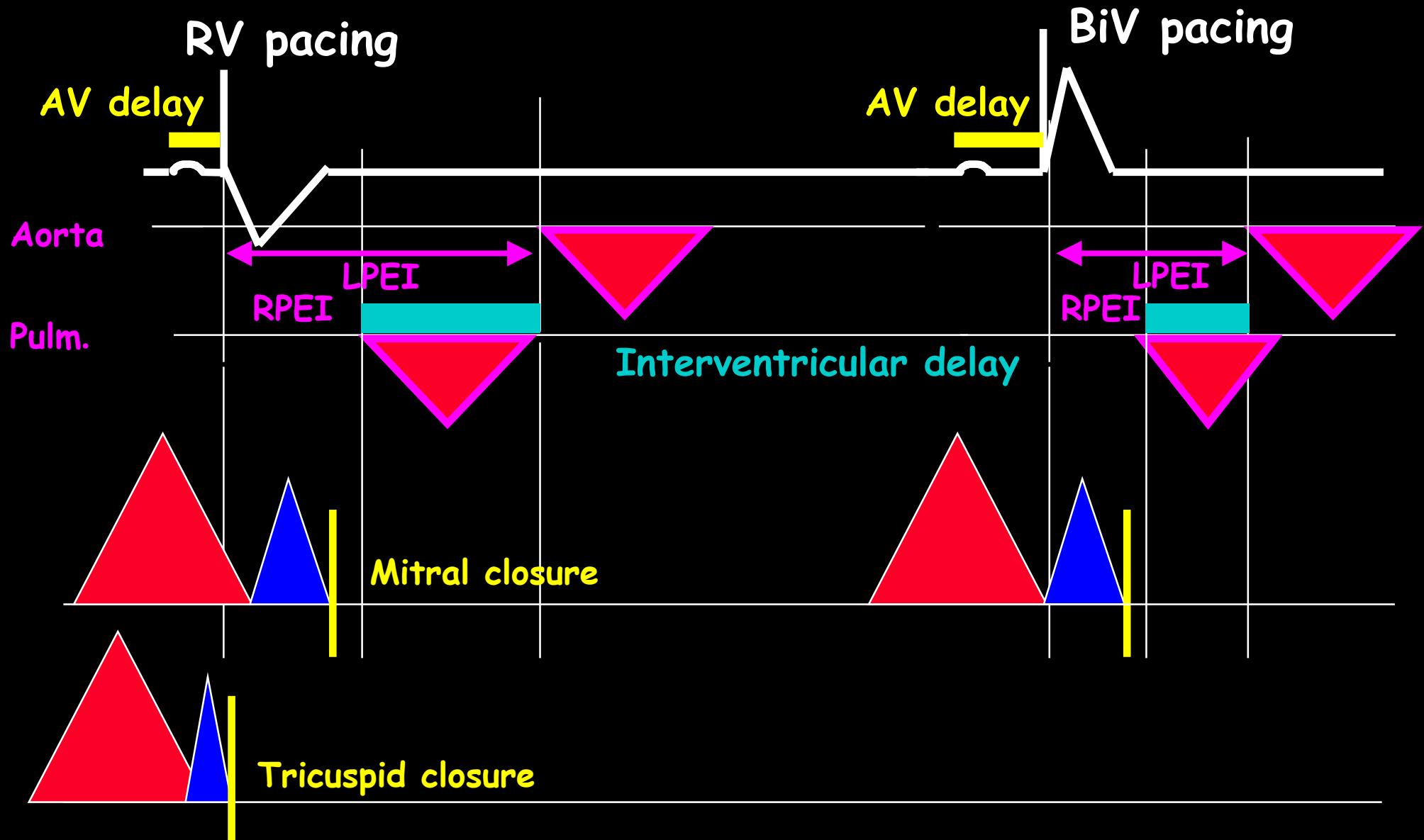


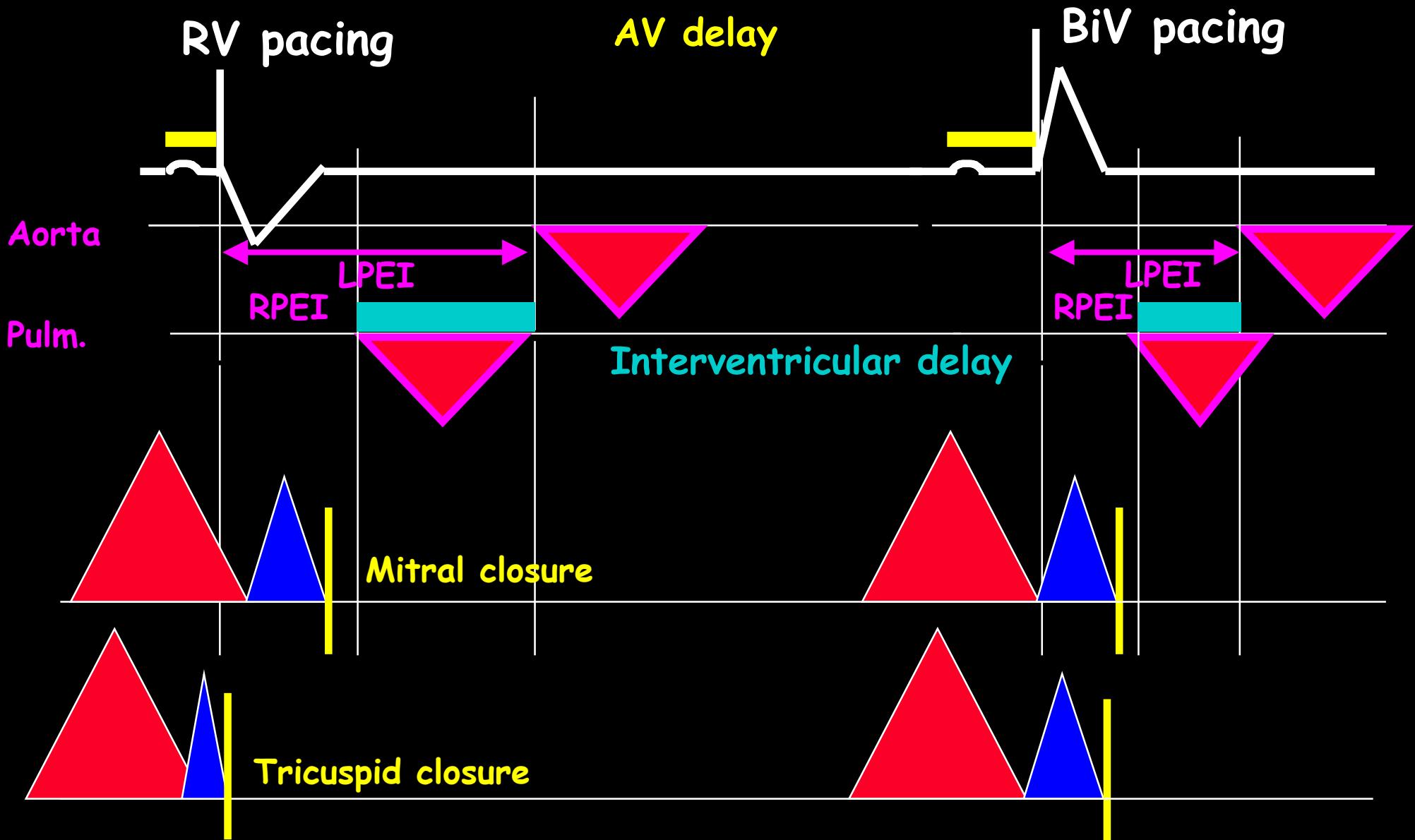
IVD REDUCTION WITH CRT











Cardiac dyssynchrony ...

Modelization for analysis

AV dyssynchrony : LVFT < 40% of the cardiac cycle

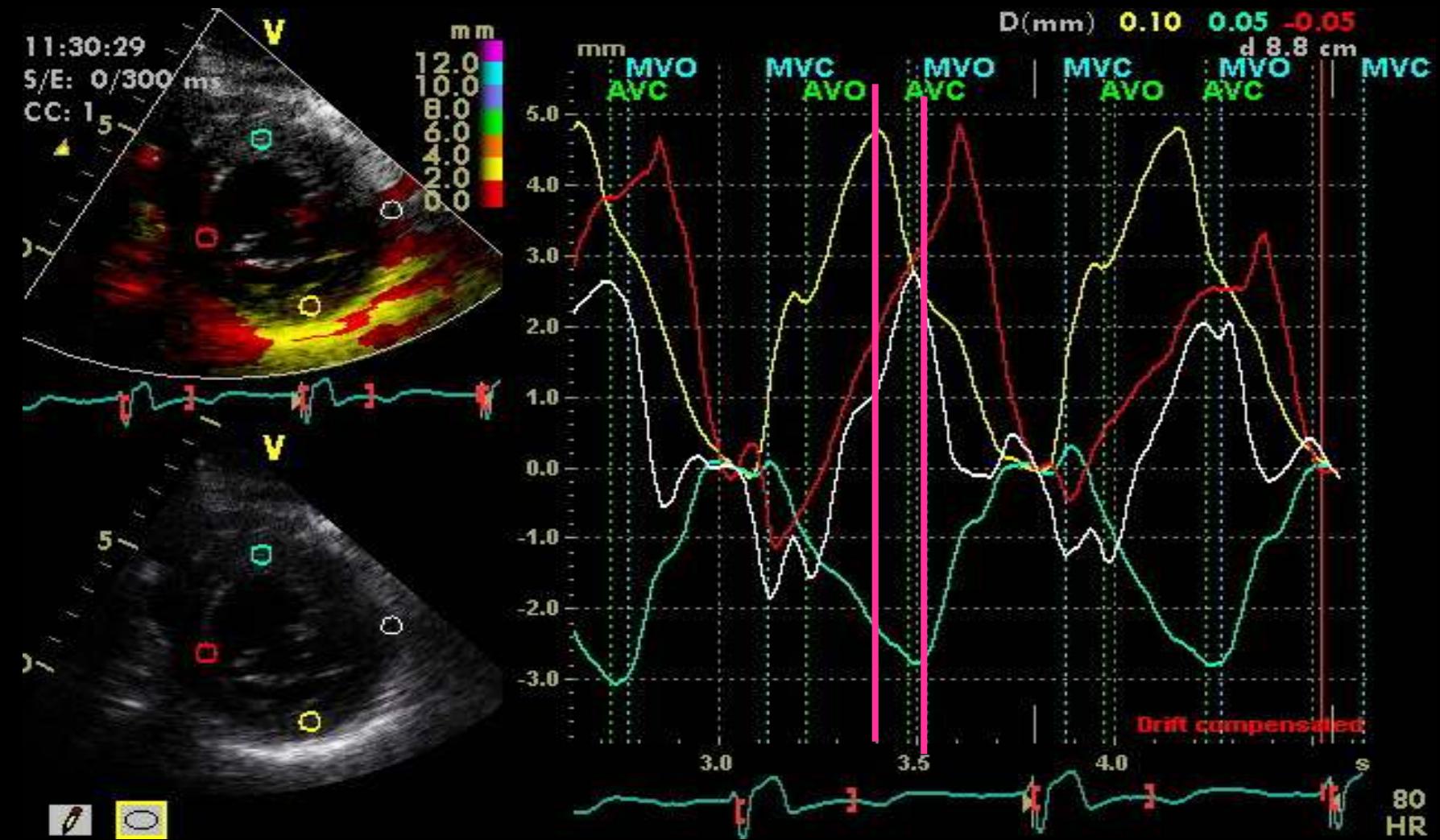
InterV dyssynchrony : InterV delay > 40 ms

IntraV dyssynchrony (whatever your method)

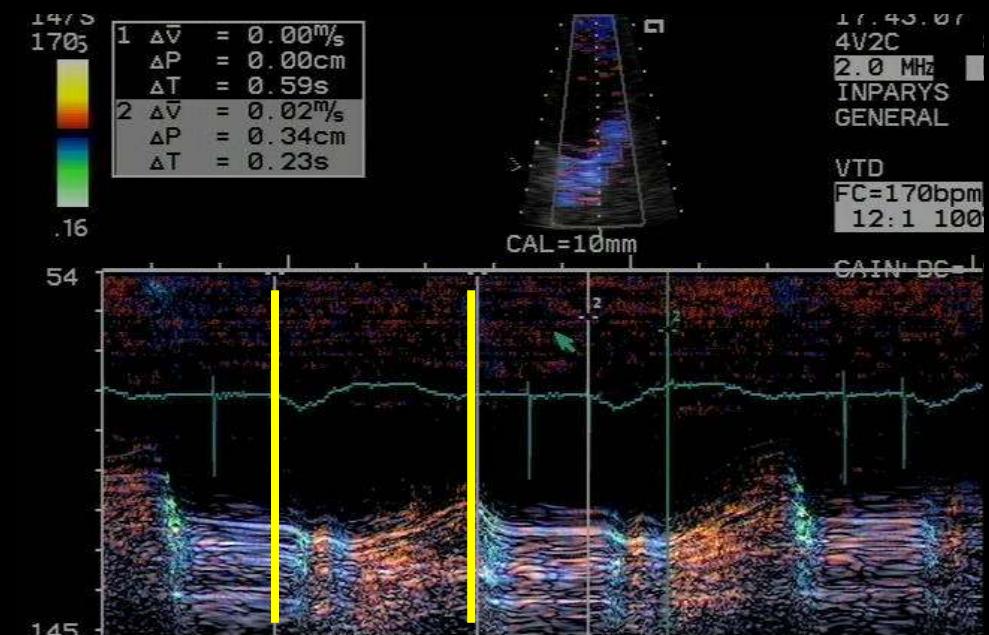
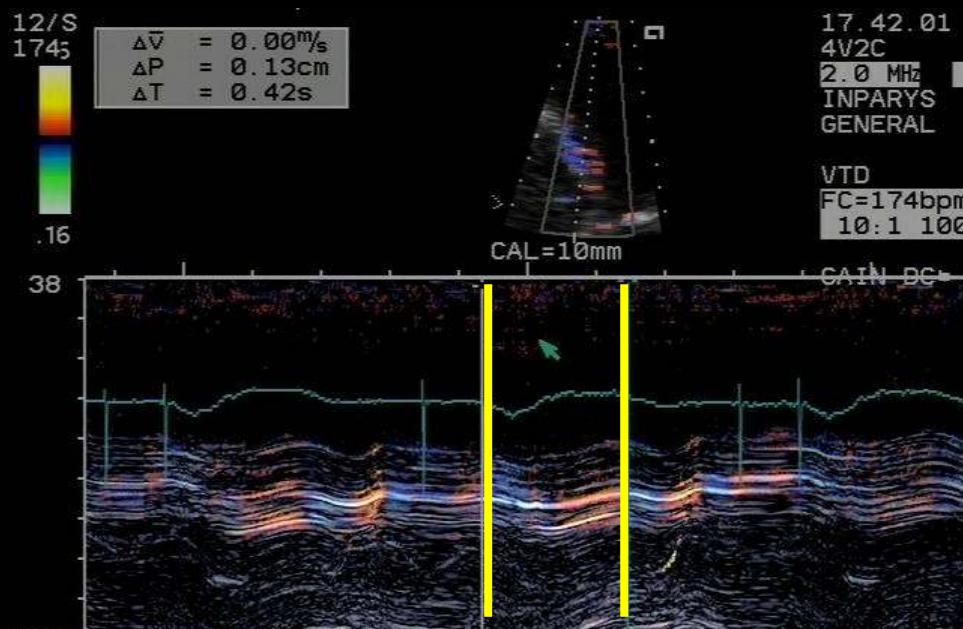
- Spatial ++

Differences between myocardial segments

Intraventricular dyssynchrony : the spatial point of view

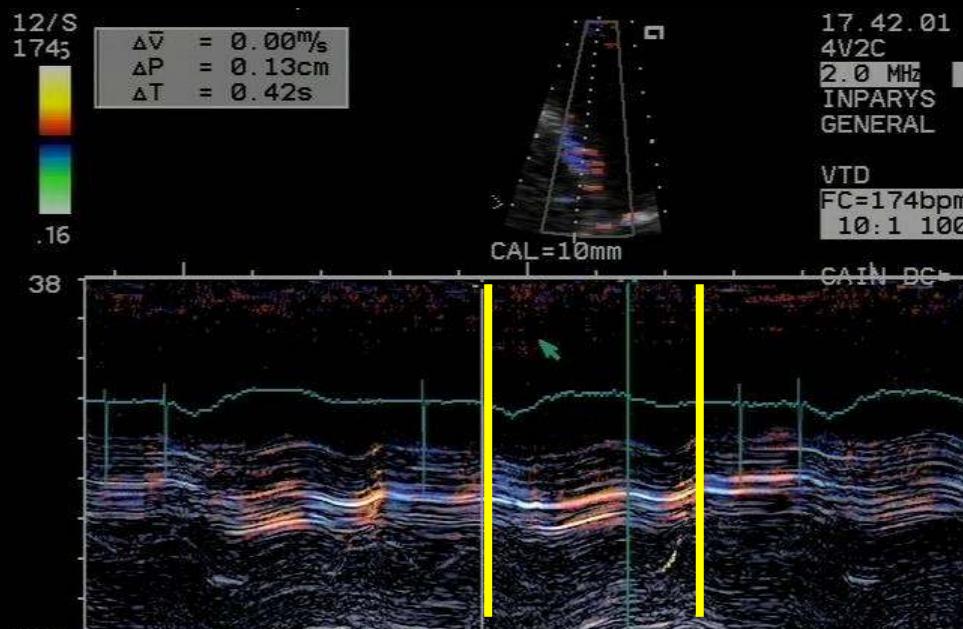


Direct measurement (???) of Spatial IntraVentricular Dyssynchrony

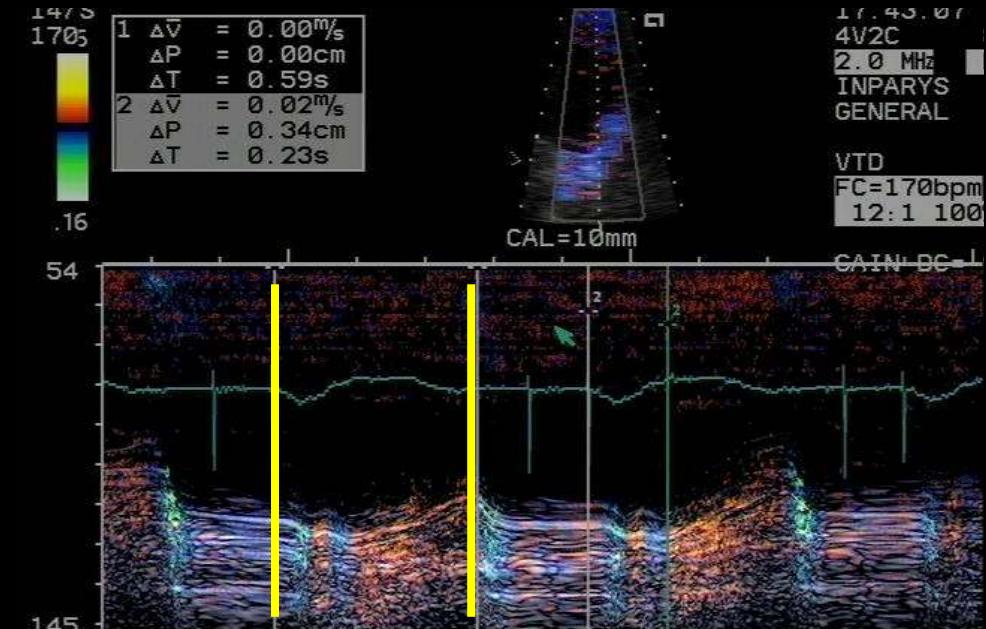


$$\text{LWES} - \text{SWES} = 170 \text{ ms}$$

Direct measurement (???) of Spatial IntraVentricular Dyssynchrony

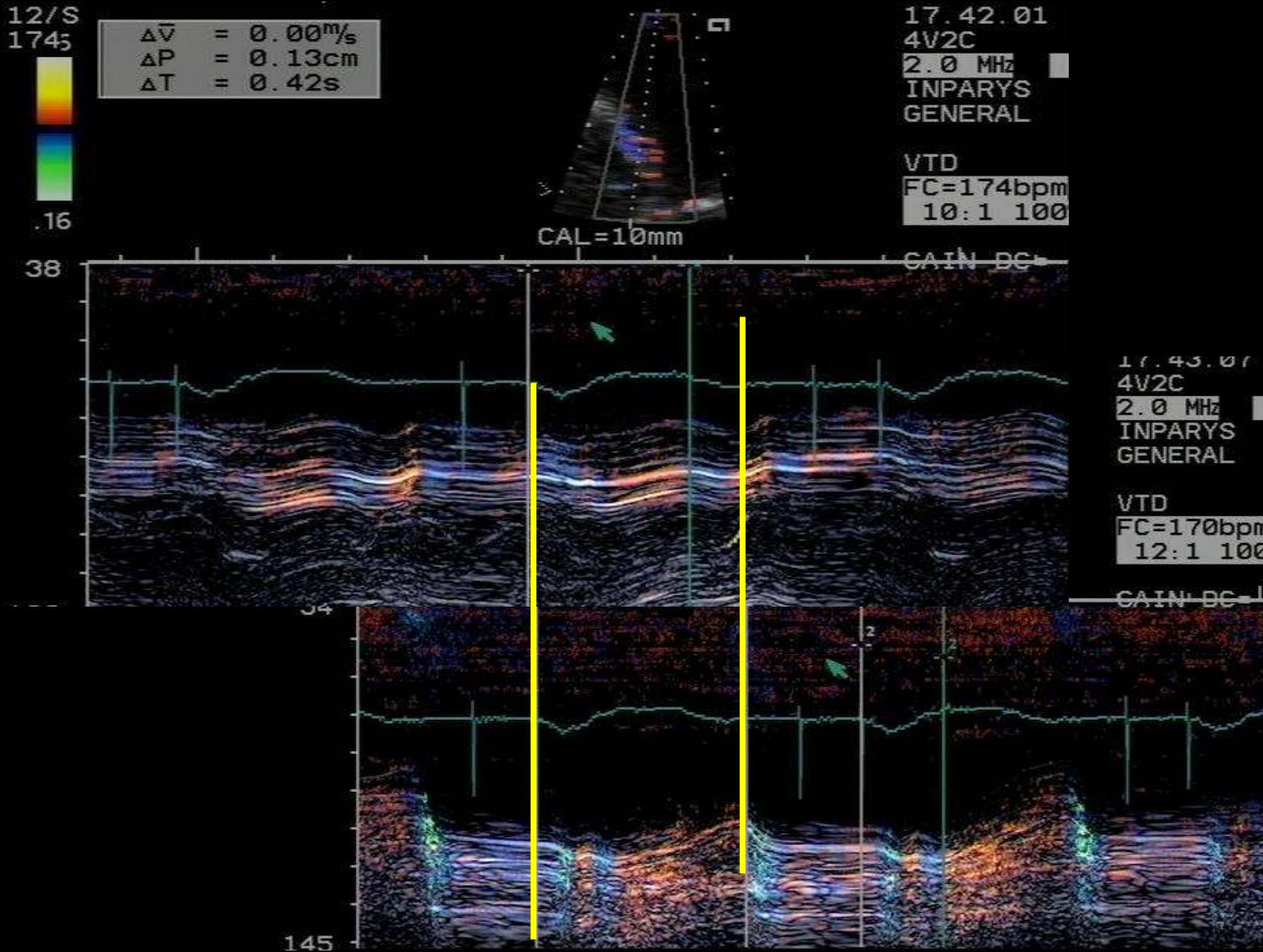


SWES : 620 ms

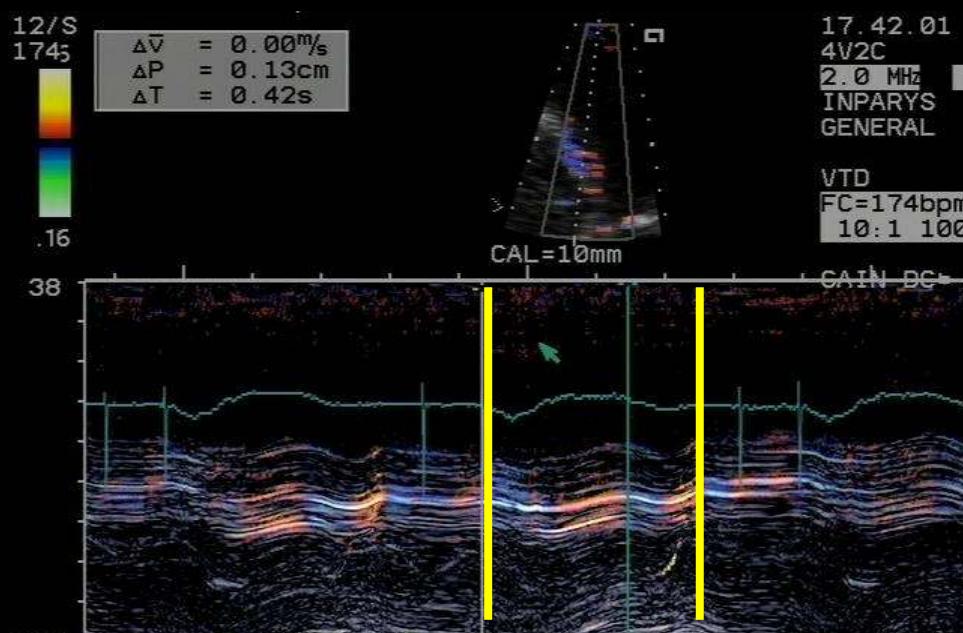


LWES : 590 ms

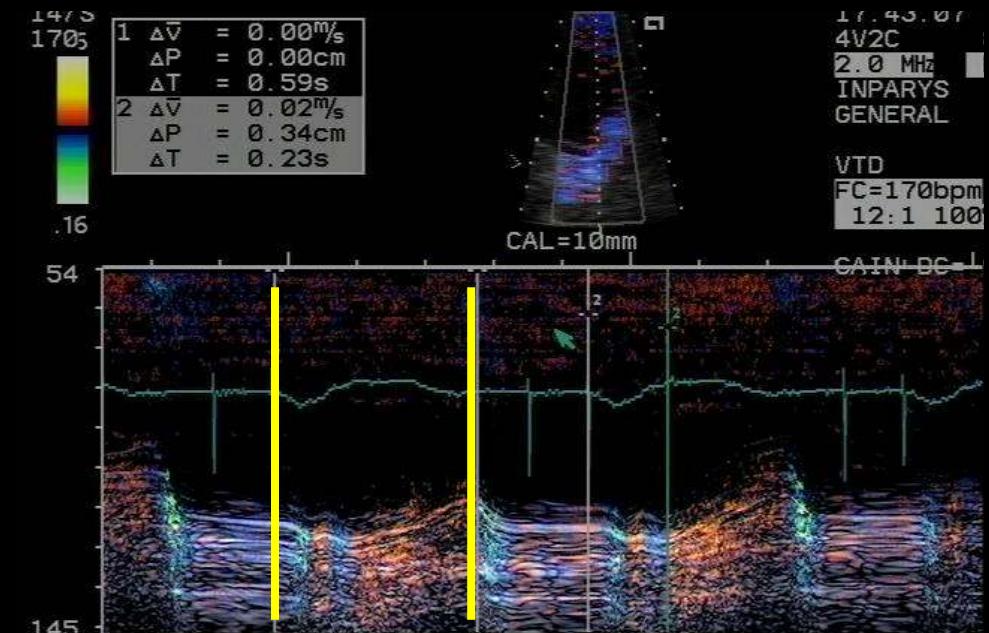
$$\text{SWES} - \text{LWES} = 30 \text{ ms}$$



Direct measurement of Temporal IntraVentricular Dyssynchrony



SWES : 620 ms



LWES : 590 ms

$$\text{SWES} - \text{LWES} = 30 \text{ ms}$$

Cardiac dyssynchrony ...

Modelization for analysis

AV dyssynchrony : LVFT < 40% of the cardiac cycle

InterV dyssynchrony : InterV delay > 40 ms

IntraV dyssynchrony (whatever your method)

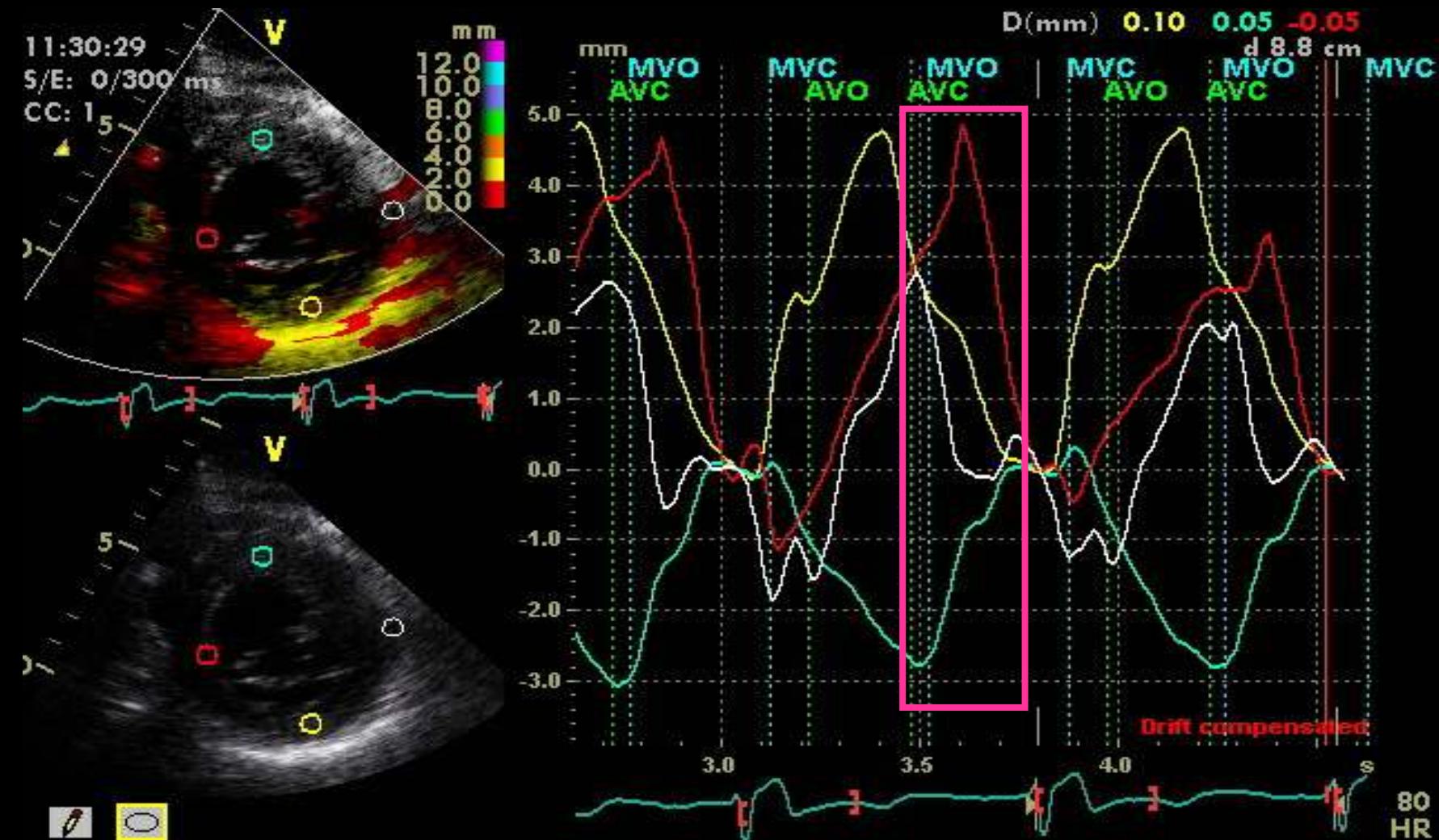
- Spatial ++

Differences between myocardial segments

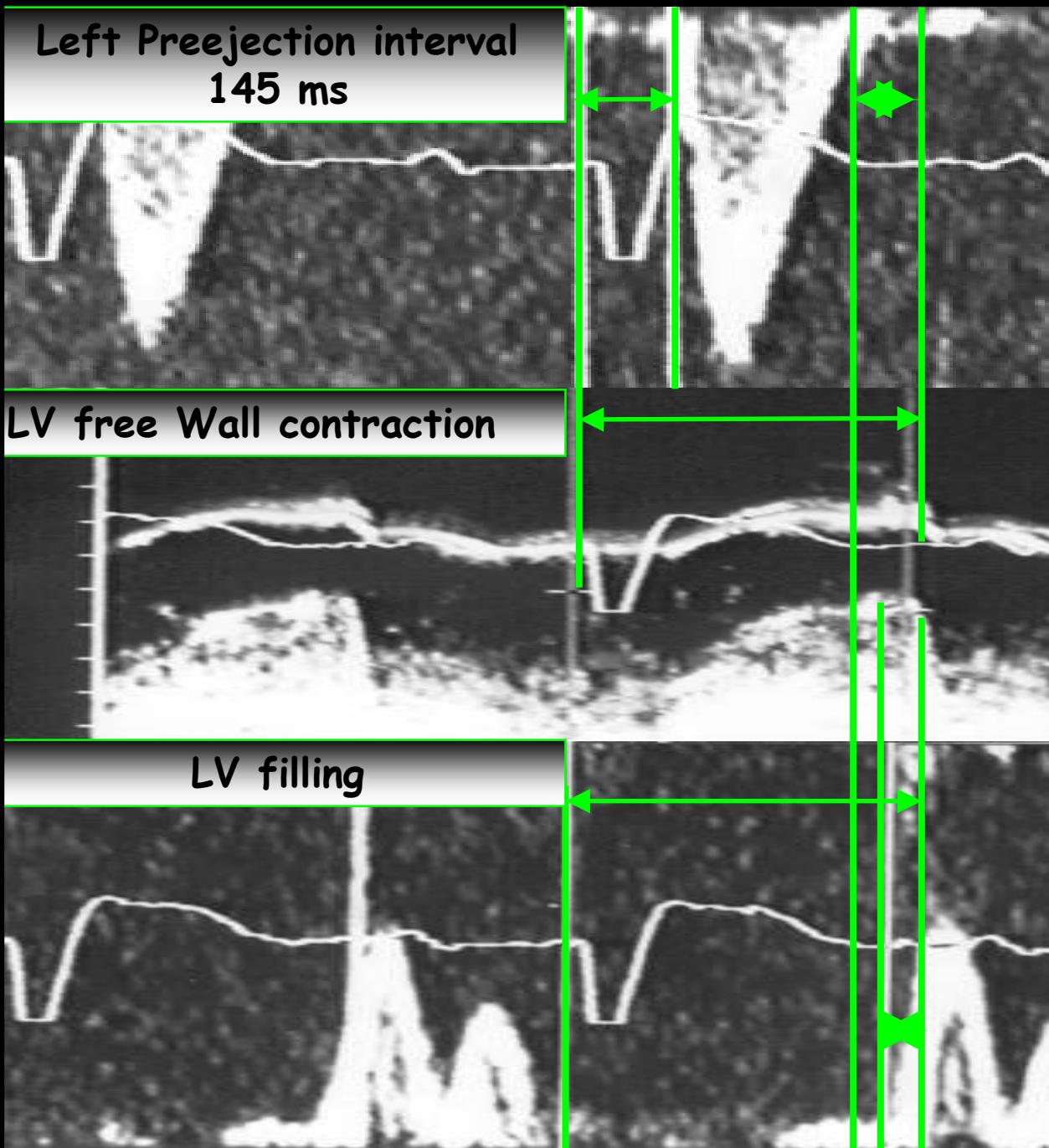
- Temporal +++

Diastolic contraction and/or overlap between contraction and filling

Intraventricular dyssynchrony : the temporal point of view



Left Preejection interval
145 ms



Diastolic Contraction
100 ms

LV free Wall contraction

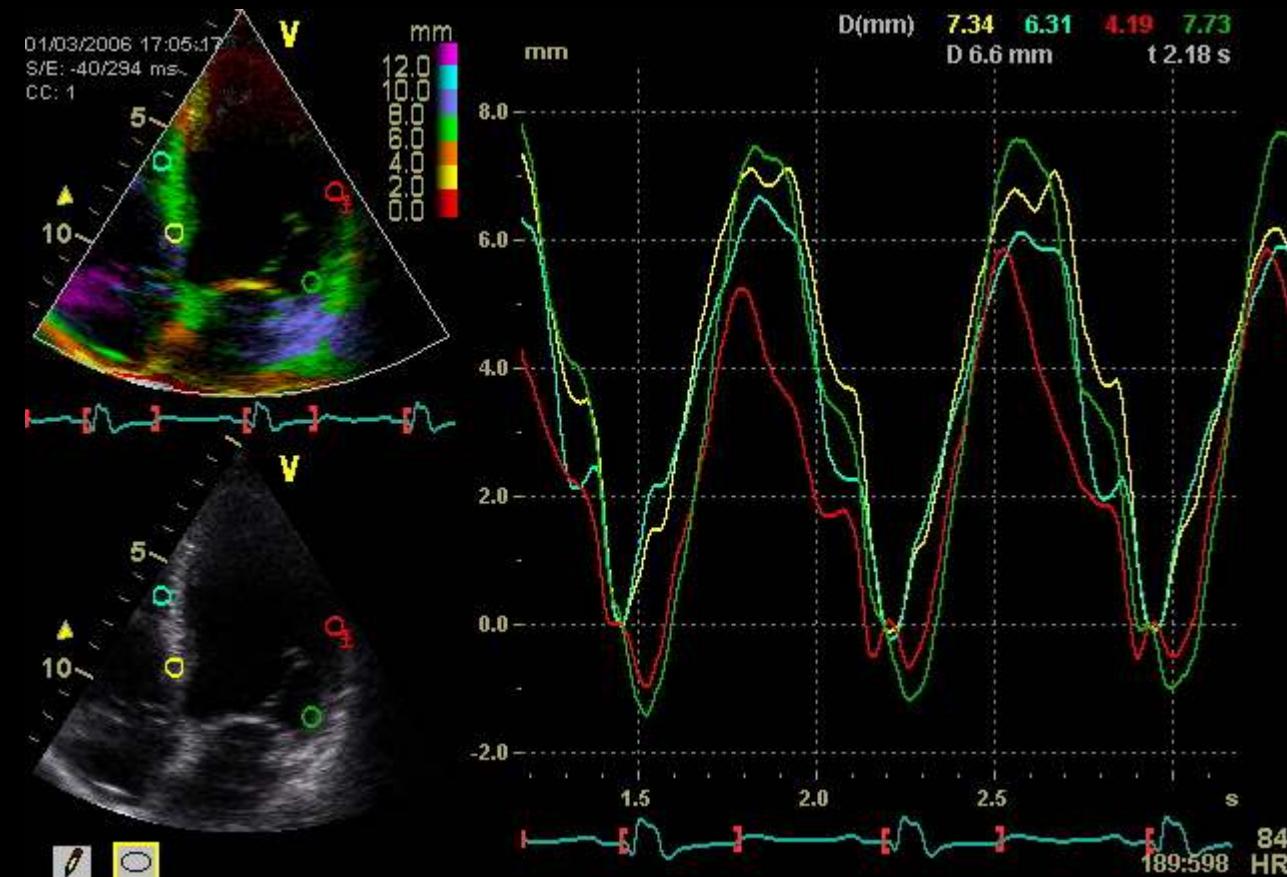
QRS - LLW
524 ms

LV filling

LV filling

Overlap contraction-filling
- 20 ms

Pure temporal Intraventricular dyssynchrony



IntraVentricular dyssynchrony correction

Spatial dyssynchrony

By delaying the earliest segments ?

By advancing in the cycle the latest segments ?

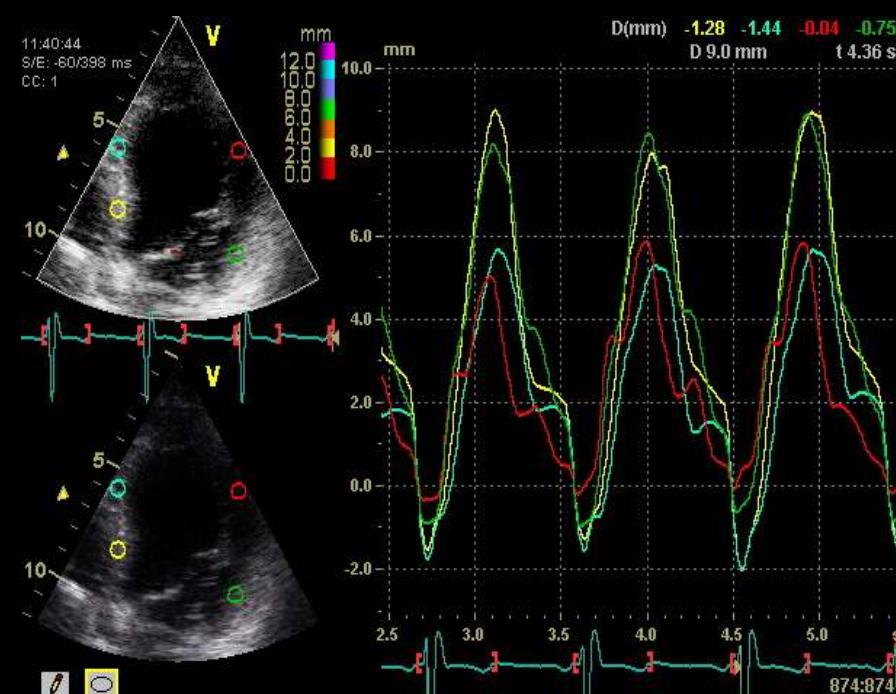
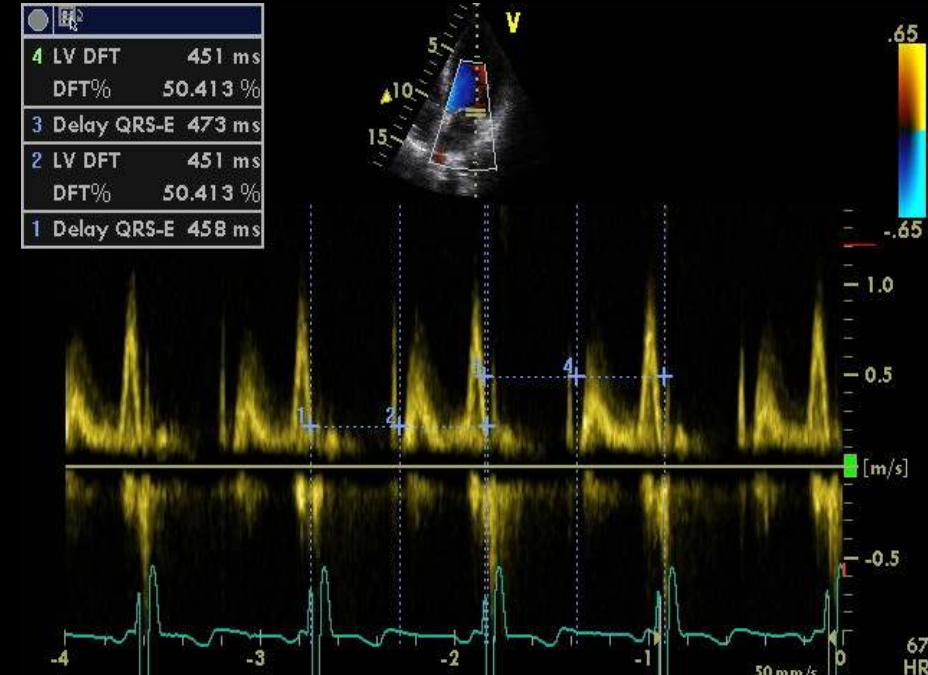
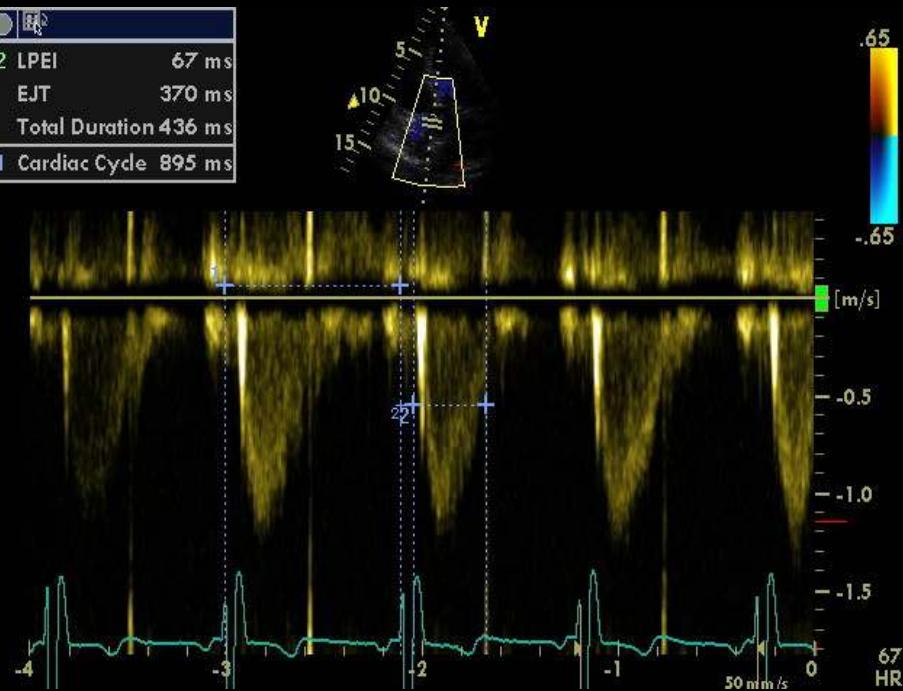
Temporal dyssynchrony

Its reduction plays a major role in AV optimization

Pure temporal Intraventricular dyssynchrony



2 LPEI	67 ms
EJT	370 ms
Total Duration	436 ms
1 Cardiac Cycle	895 ms



Cardiac dyssynchrony ...

Modelization for analysis

AV dyssynchrony : LVFT < 40% of the cardiac cycle

InterV dyssynchrony : InterV delay > 40 ms

IntraV dyssynchrony (whatever your method)

- Spatial ++

Differences between myocardial segments

- Temporal +++++

Diastolic contraction and/or overlap between contraction and filling

Echocardiographic modeling of **cardiac dyssynchrony** before and during multisite stimulation : a prospective evaluation in wide QRS pts

n = 66, QRS 187 ms, NYHA III or IV

LV filling duration/HR < 40%

$38 \pm 12 \%$

Inter V delay > 40 ms

$63 \pm 30 \text{ ms}$

IntraV dyssynchrony

LPEI > 140 ms

$\text{LPEI} = 186 \pm 20 \text{ ms}$

Diastolic contraction time Left Lateral Wall

$\text{Diastolic contraction time} = 111 \pm 117 \text{ ms}$

$\text{Overlap between next filling} = 20 \pm 68 \text{ ms}$

Si la fonction VG est normale et que l'on peut respecter la CAV spontanée il ne faut pas capturer le ventricule : modes inhibés donc JAMAIS

Si la fonction VG est normale et que l'on doit capturer le ventricule : ??? + réglage hémodynamique du DAV

Si la fonction VG est anormale et que l'on peut respecter la CAV spontanée : y a t'il une indication "traditionnelle" de resynchronisation multisite ??

Si la fonction VG est anormale et qu'il faut stimuler, BIV d'emblée ??

Echo et mode de stimulation

Tout pour ne pas stimuler le Ventricule
VVI fréquence basse : inhibition permanente
AAI, AAI – Safe R, MVP

**Si le DDD doit être choisi c'est l'Automatisme du
basculement AAI – DDD qui déterminera
l'hémodynamique**

**Glissement progressif à l'avenir vers le mode Atrio-BiV
Probable futur standard de la stimulation « physiologique»**

Outcomes and Follow-up of CRT patients

Natural interest of performing Echo in HF

