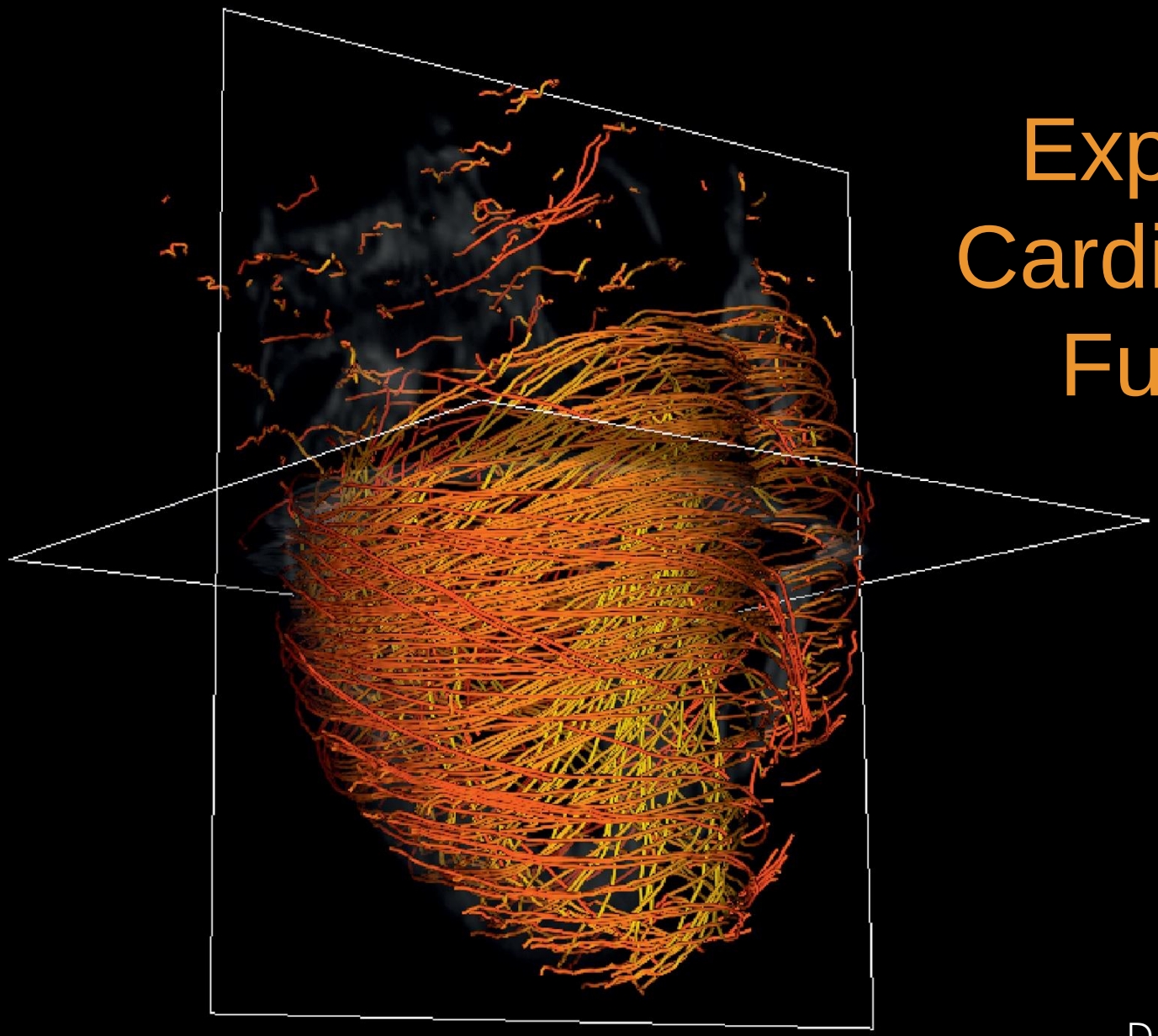


Exploración Cardiovascular Funcional

Dr. Ignacio Farro

Historia

Erasistrato 304-250 a.C.

- Antepuso dilatación ventricular sobre la contracción.

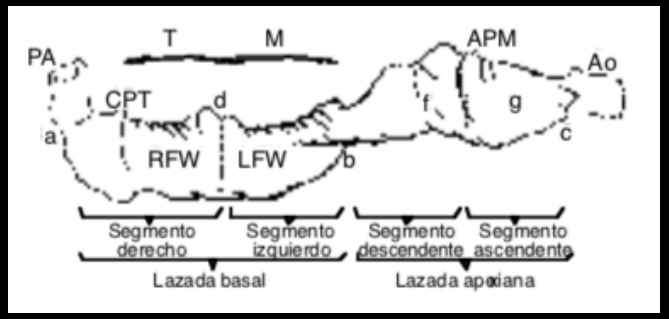
Galeno 129-216

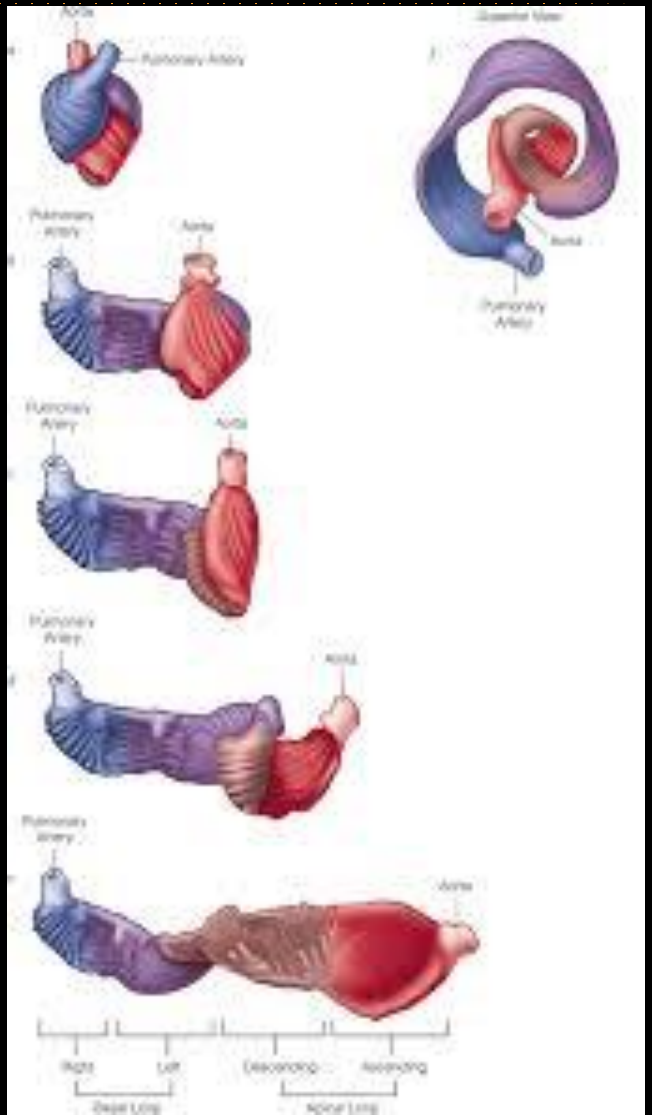
W. Harvey 1578-1657

- Describe la circulación de la sangre
- Función de bomba del corazón

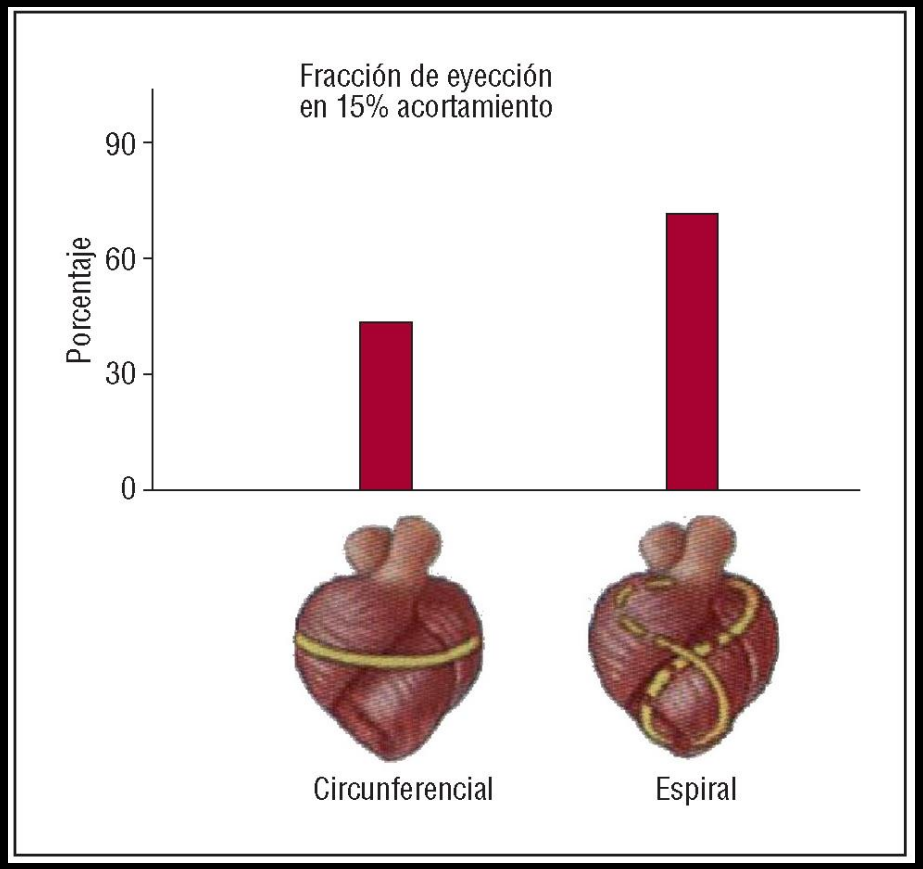
Mecánica ventricular

Video 1 Torrent Guasp
(reproducción automática)

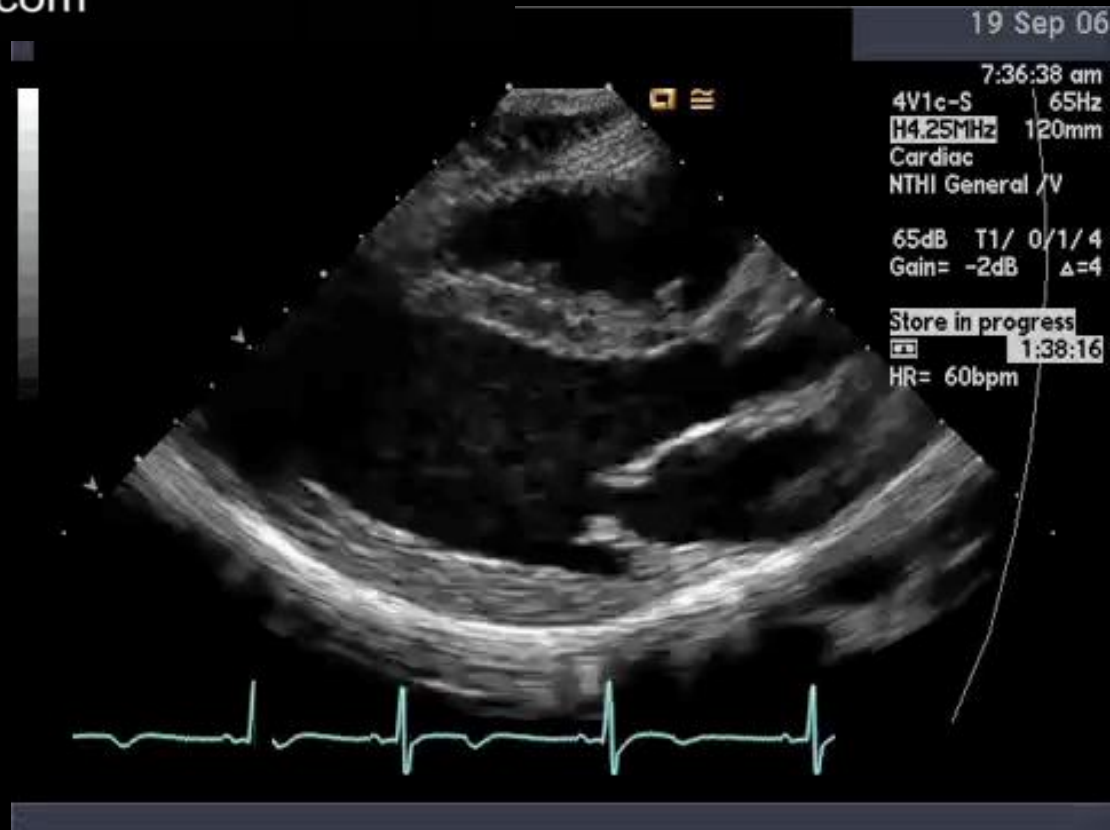




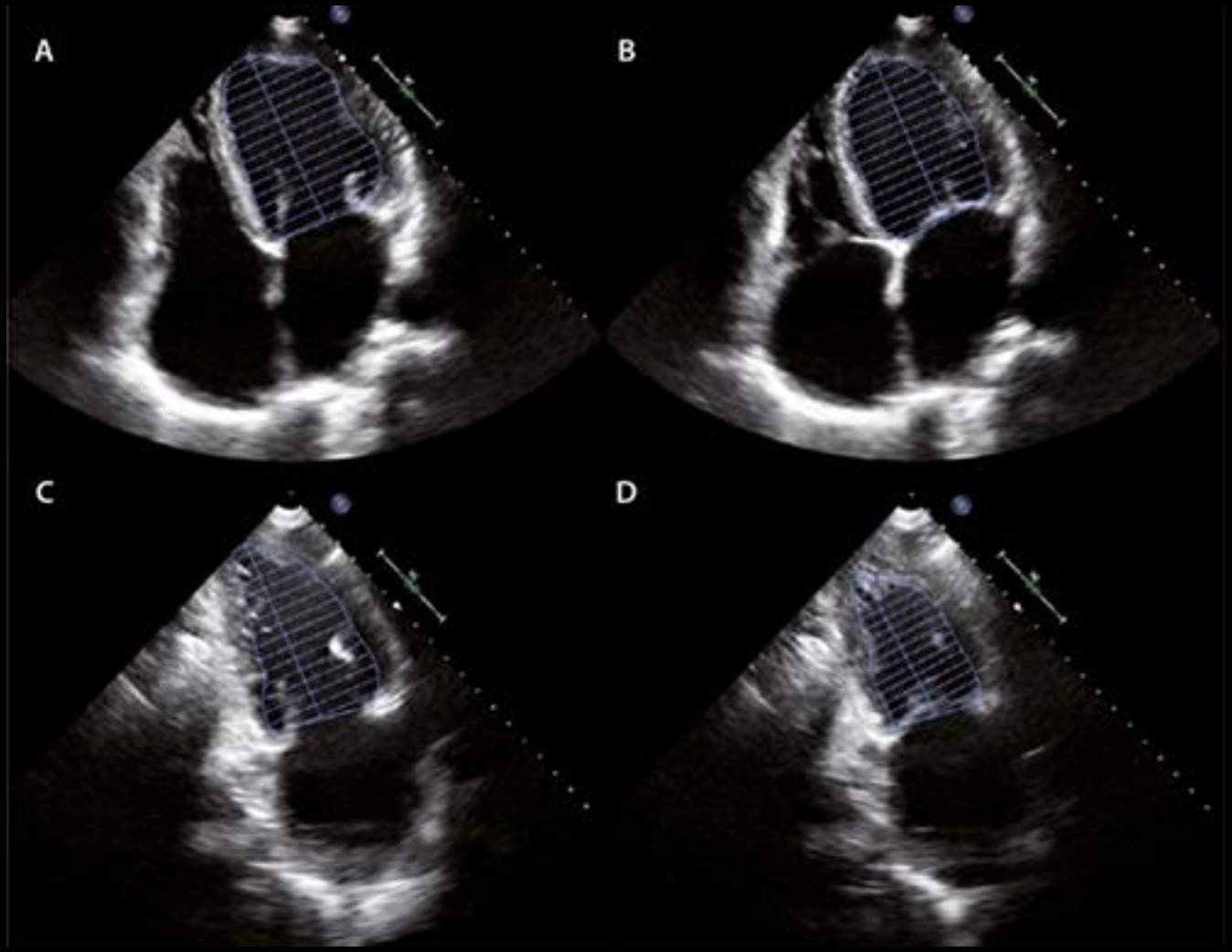
Mecánica ventricular




Left Parasternal Long:
Parasternal Long
ASEmarketplace.com


19 Sep 06
7:36:38 am
4V1c-S
65Hz
H4.25MHz
120mm
Cardiac
NTHI General /V
65dB T1/ 0/1/4
Gain= -2dB Δ=4
Store in progress
1:38:16
HR= 60bpm

Método Simpson



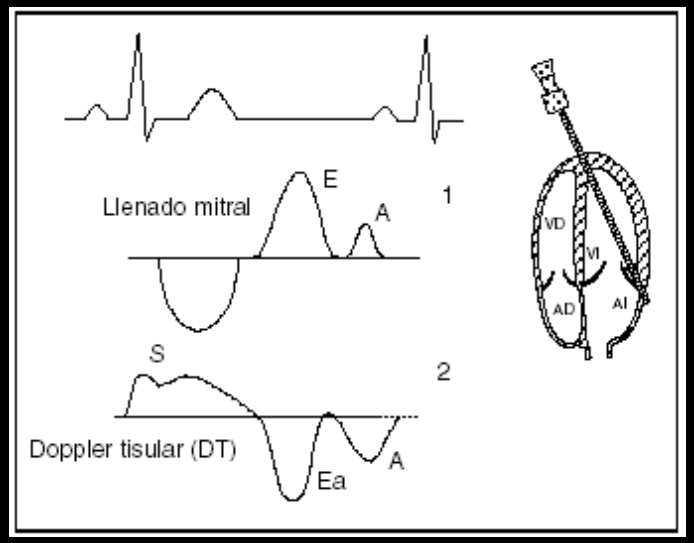
Auto FEVI

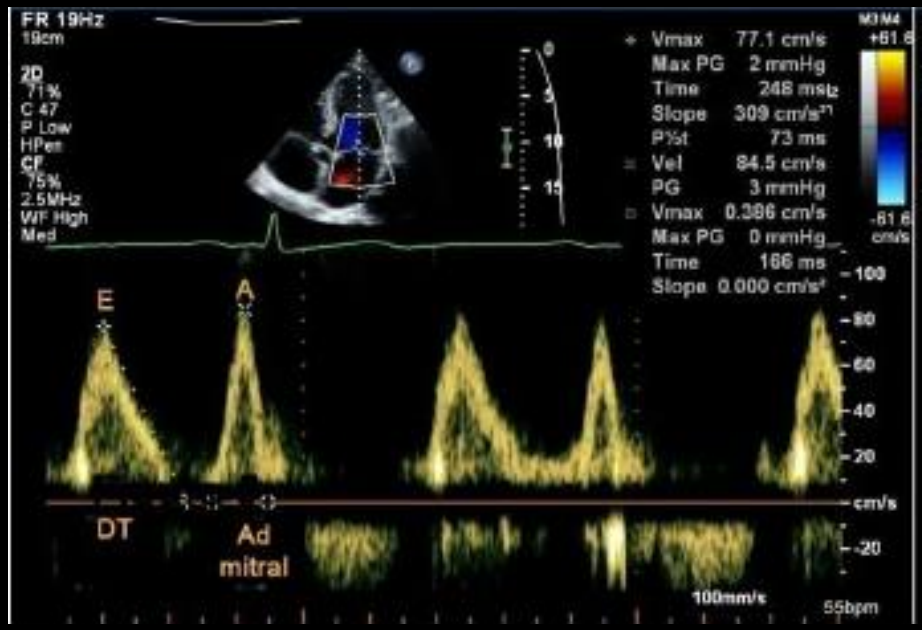
Video 2 Auto FEVI
(reproducción automática)

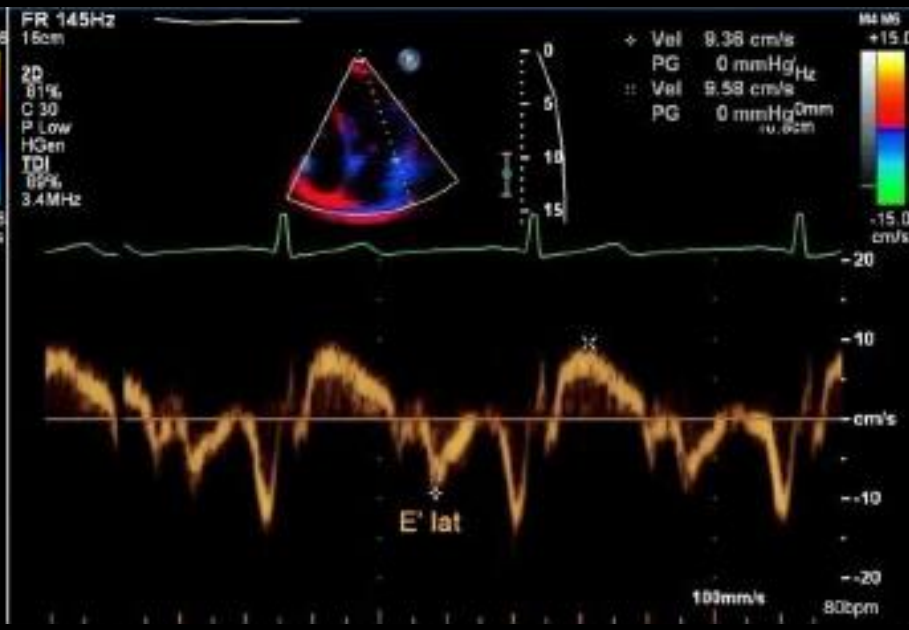
Doppler tisular

Video 3.1 Doppler tisular (reproducción automática-loop de 1 seg)

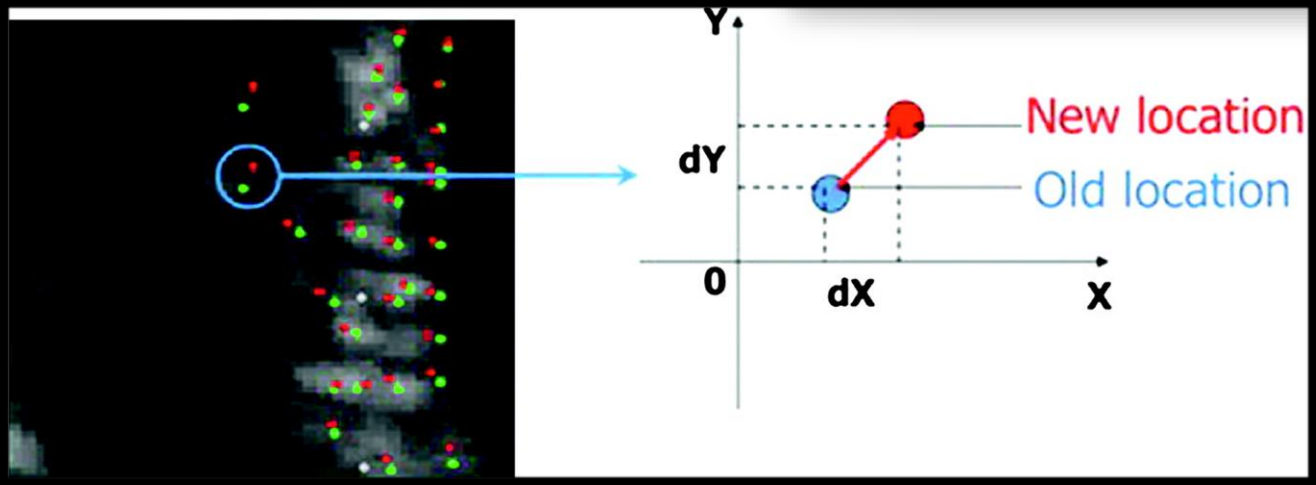
Doppler tisular







Speckle tracking



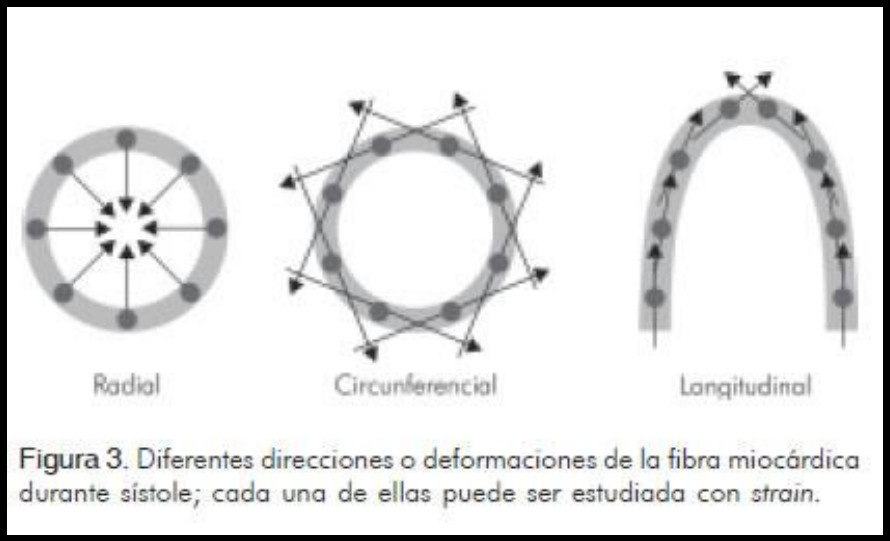
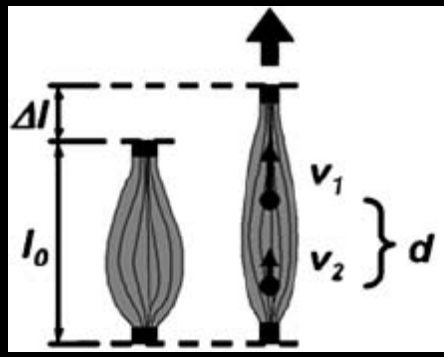


Figura 3. Diferentes direcciones o deformaciones de la fibra miocárdica durante sístole; cada una de ellas puede ser estudiada con *strain*.

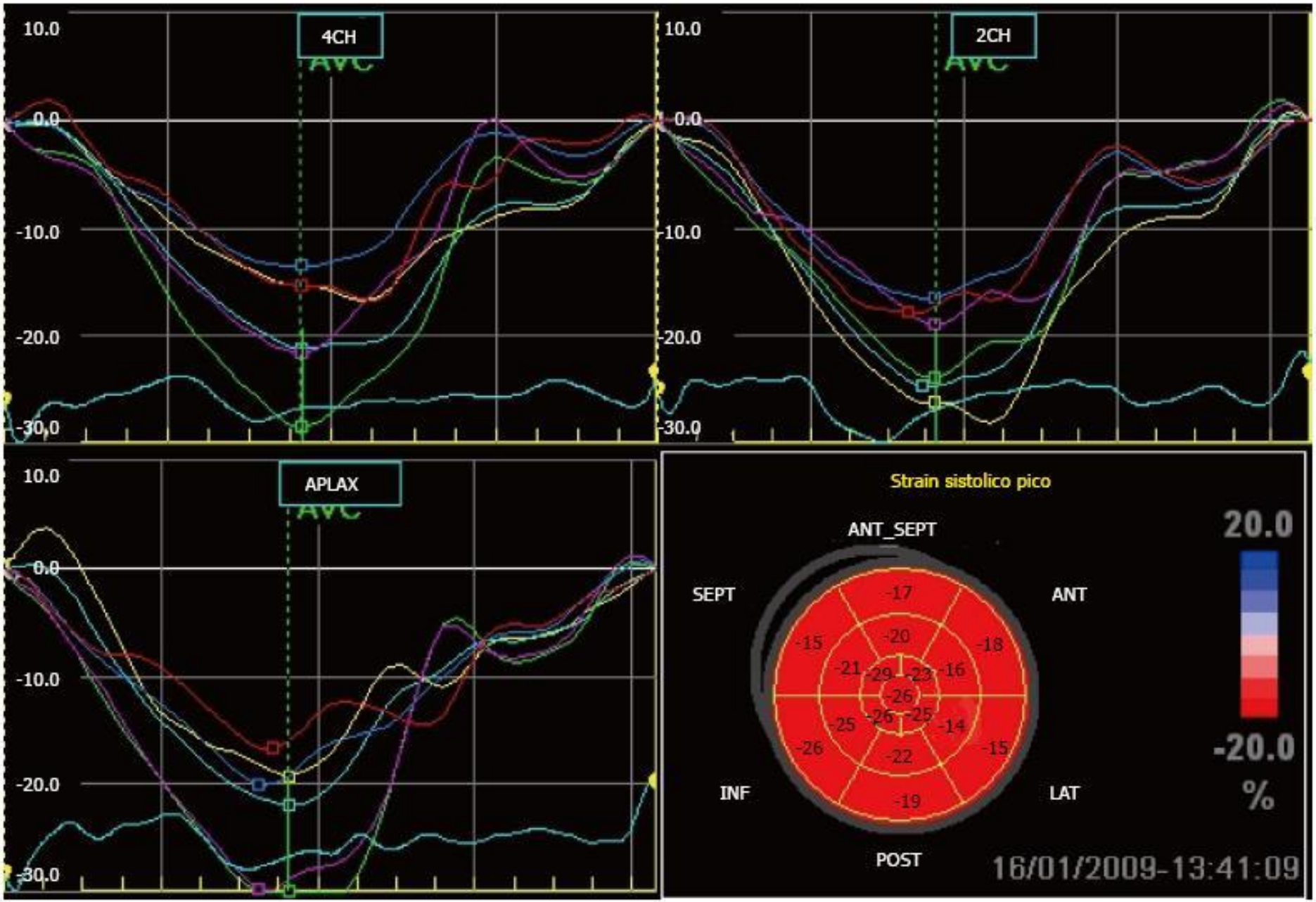


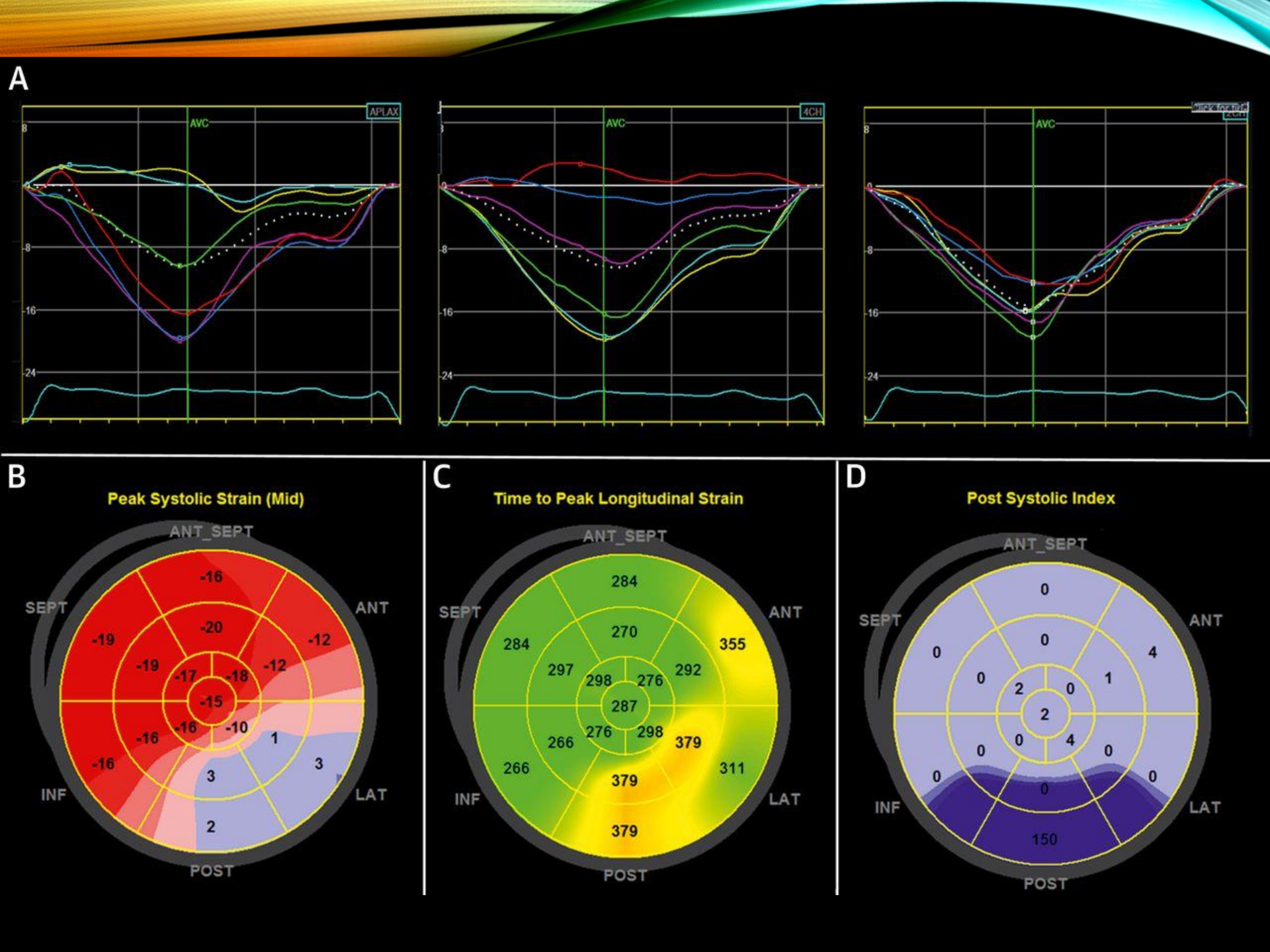
$$Strain = \frac{\Delta l}{l_0}$$

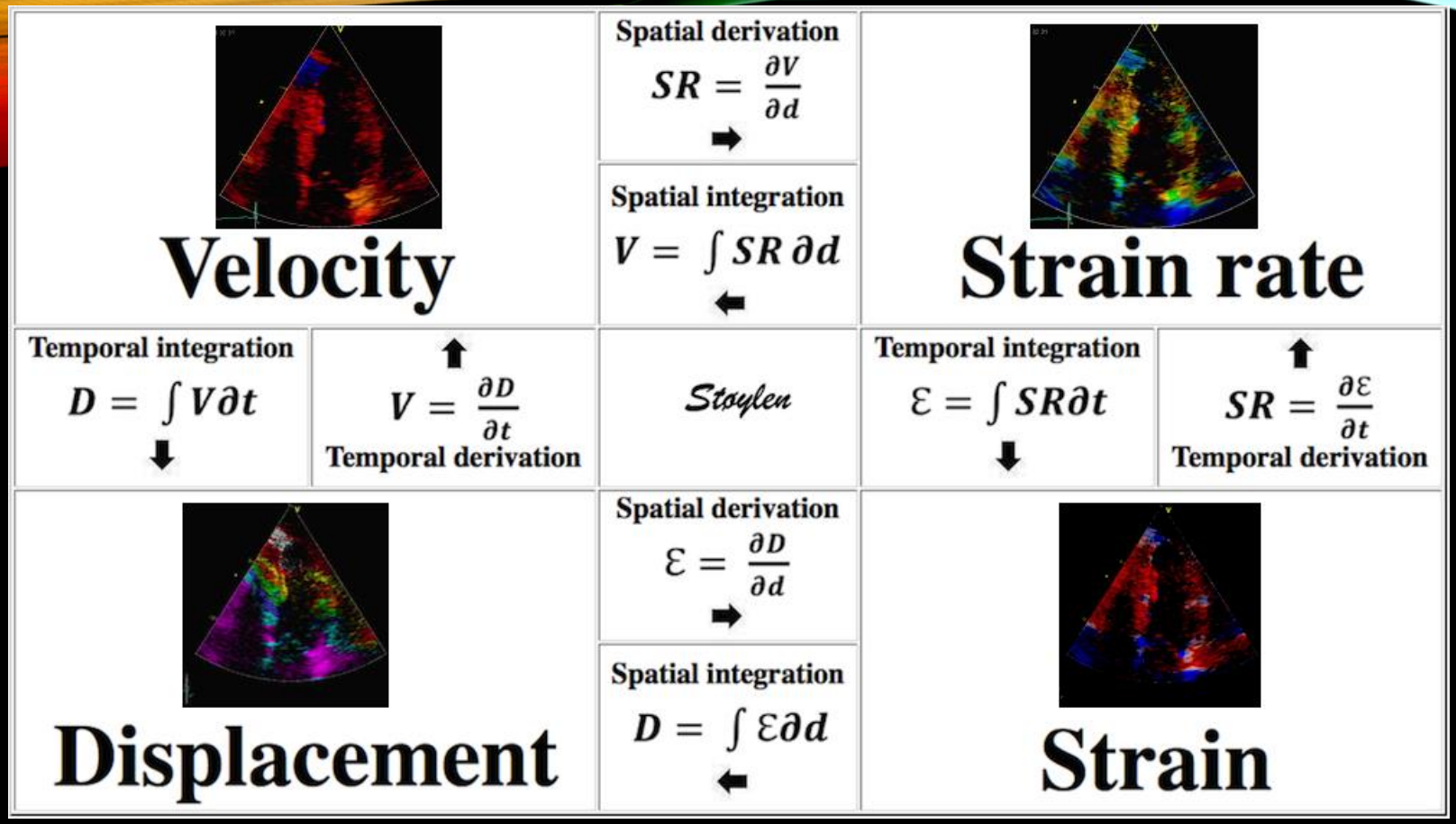
$$Strain\ Rate = \frac{v_1 - v_2}{d}$$

Strain

Video 3 Strain
(reproducción automática)


4CH
10.0
0.0
-10.0
-20.0
-30.0
AVC
2CH
10.0
0.0
-10.0
-20.0
-30.0
AVC
APLAX
10.0
0.0
-10.0
-20.0
-30.0
AVC
Strain sistolico pico
ANT_SEPT
SEPT
ANT
INF
LAT
POST
-17
-15
-20
-18
-21
-29
-23
-16
-26
-25
-26
-25
-14
-26
-22
-15
-19
20.0
-20.0
%
16/01/2009-13:41:09

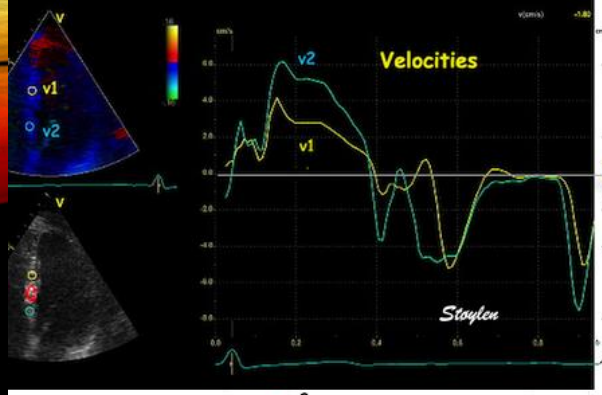

A
APLAX
AVC
8
-8
-16
-24
4CH
AVC
8
-8
-16
-24
AVC
8
-8
-16
-24
B
Peak Systolic Strain (Mid)
ANT_SEPT
SEPT
ANT
INF
LAT
POST
-16
-20
-19
-12
-19
-17
-18
-12
-15
-16
-16
-10
1
-16
3
3
2
C
Time to Peak Longitudinal Strain
ANT_SEPT
SEPT
ANT
INF
LAT
POST
284
270
284
355
297
298
276
292
287
266
276
298
379
266
311
379
379
D
Post Systolic Index
ANT_SEPT
SEPT
ANT
INF
LAT
POST
0
0
0
4
0
2
0
1
2
0
4
0
0
0
0
0
150

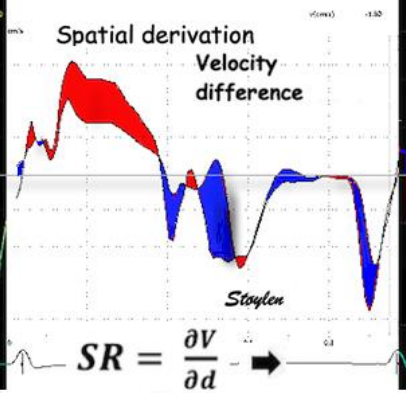


Velocidad es desplazamiento por unidad de tiempo (dx/dt).

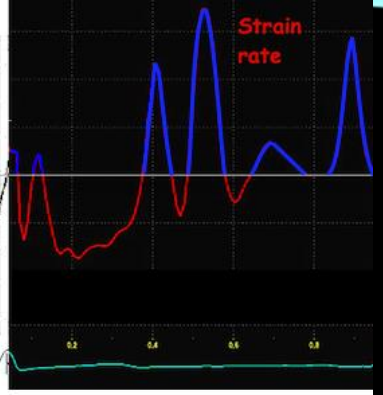
Strain: Se define como la deformación de un objeto respecto a su forma original (%)

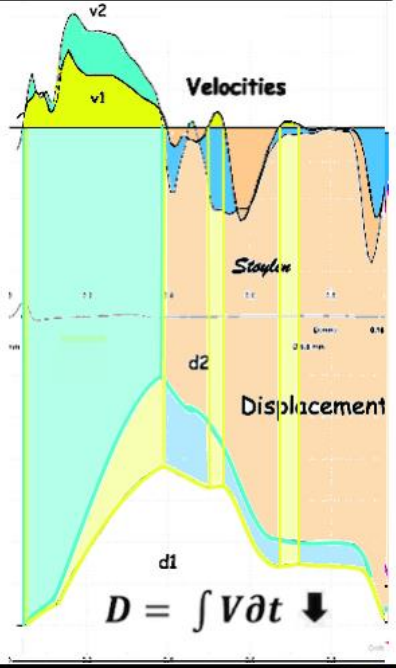
Strain rate: Velocidad a la cual se produce esta deformación (s^{-1}).





$$SR = \frac{\partial V}{\partial d}$$ ➡

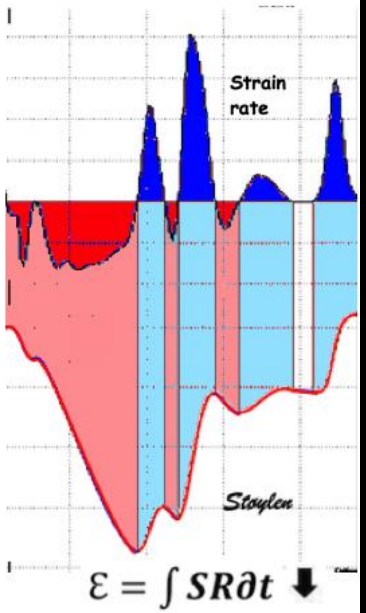




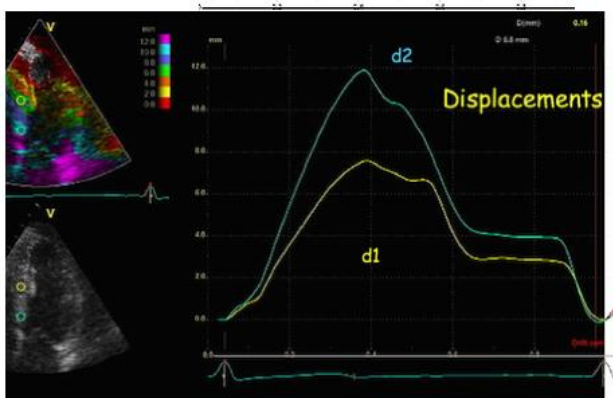
$$D = \int V \partial t$$ ⬇

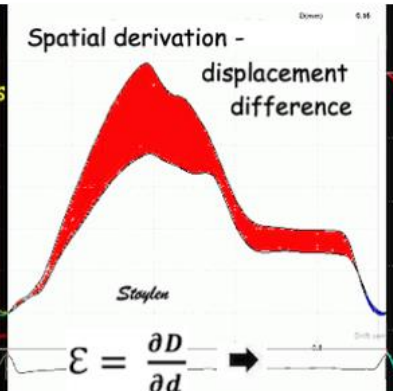
Spatial derivation: ➡
relative <u>instantaneous</u> differences between velocity or displacement curves

Temporal integration: ⬇
<u>Cumulated</u> sum of instantaneous velocity or strain ratecurves x time interval between frames (= area under the velocity or strain rate curves)

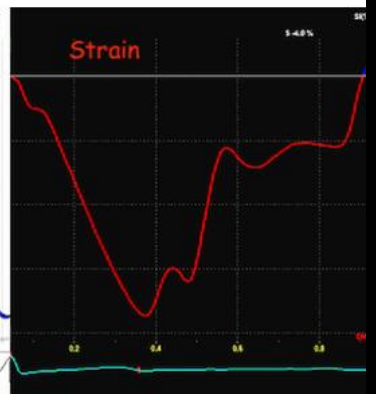


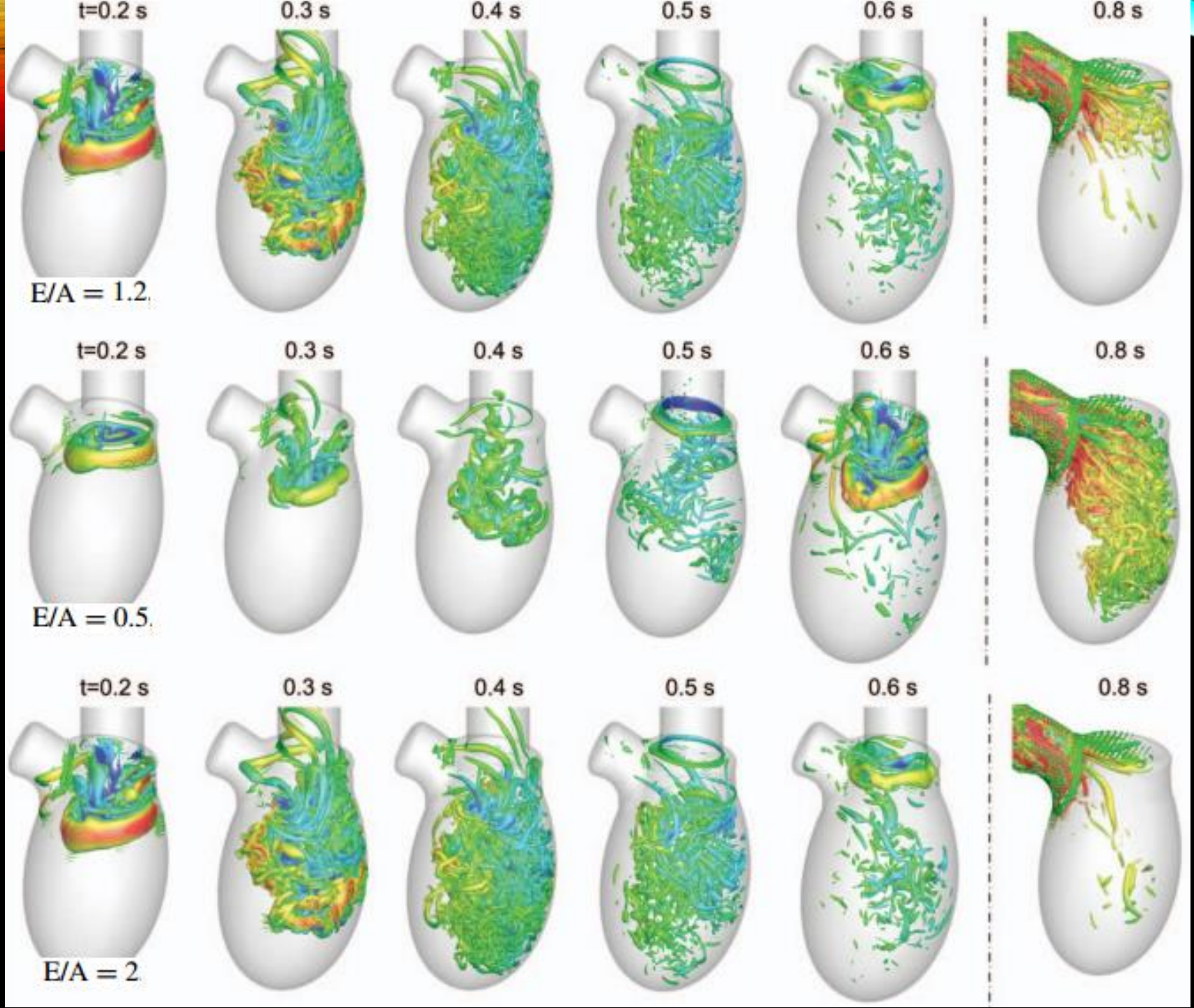
$$\varepsilon = \int SR \partial t$$ ⬇

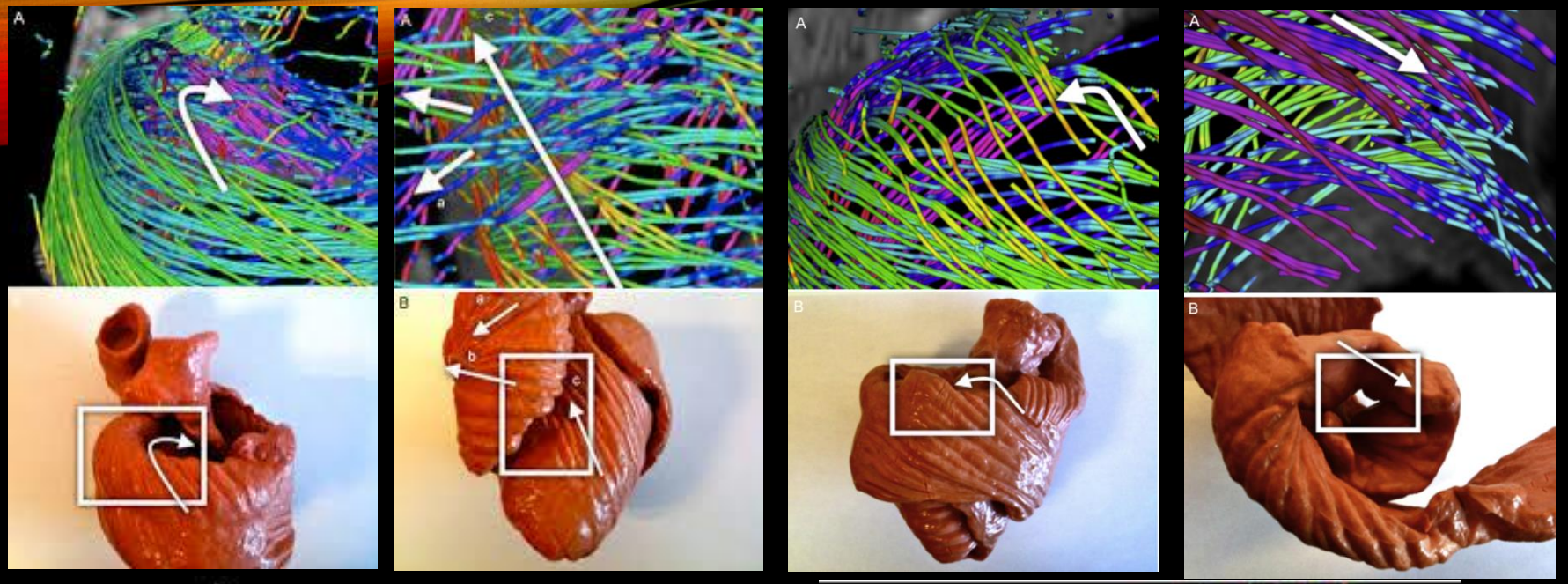


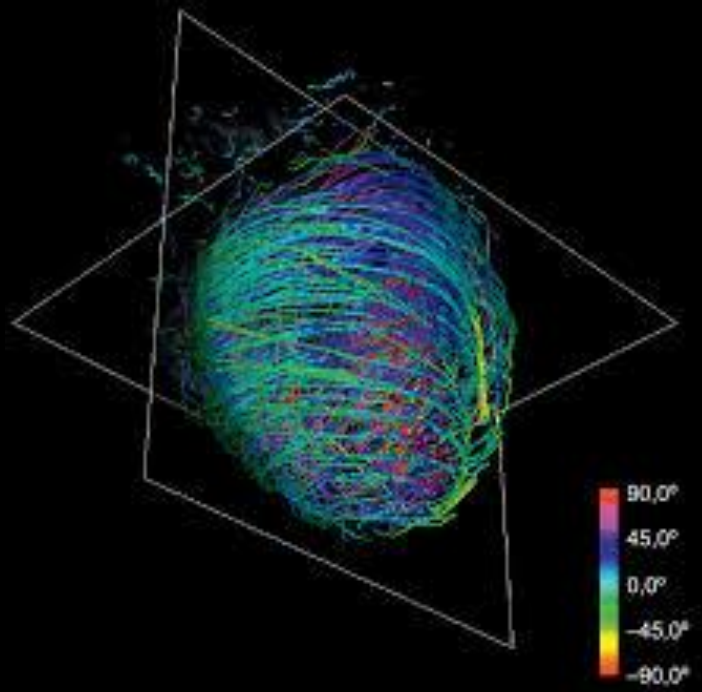


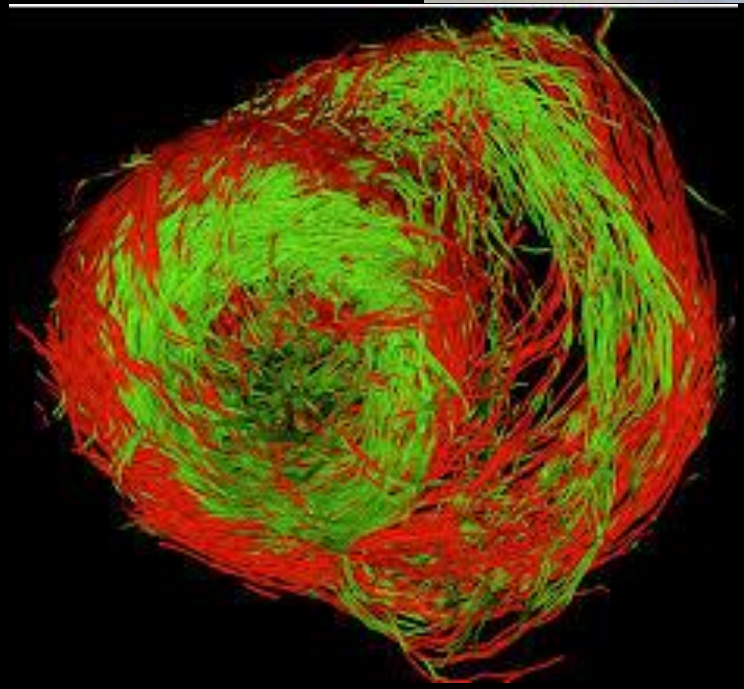
$$\varepsilon = \frac{\partial D}{\partial d}$$ ➡




t=0.2 s
0.3 s
0.4 s
0.5 s
0.6 s
0.8 s
E/A = 1.2
t=0.2 s
0.3 s
0.4 s
0.5 s
0.6 s
0.8 s
E/A = 0.5
t=0.2 s
0.3 s
0.4 s
0.5 s
0.6 s
0.8 s
E/A = 2

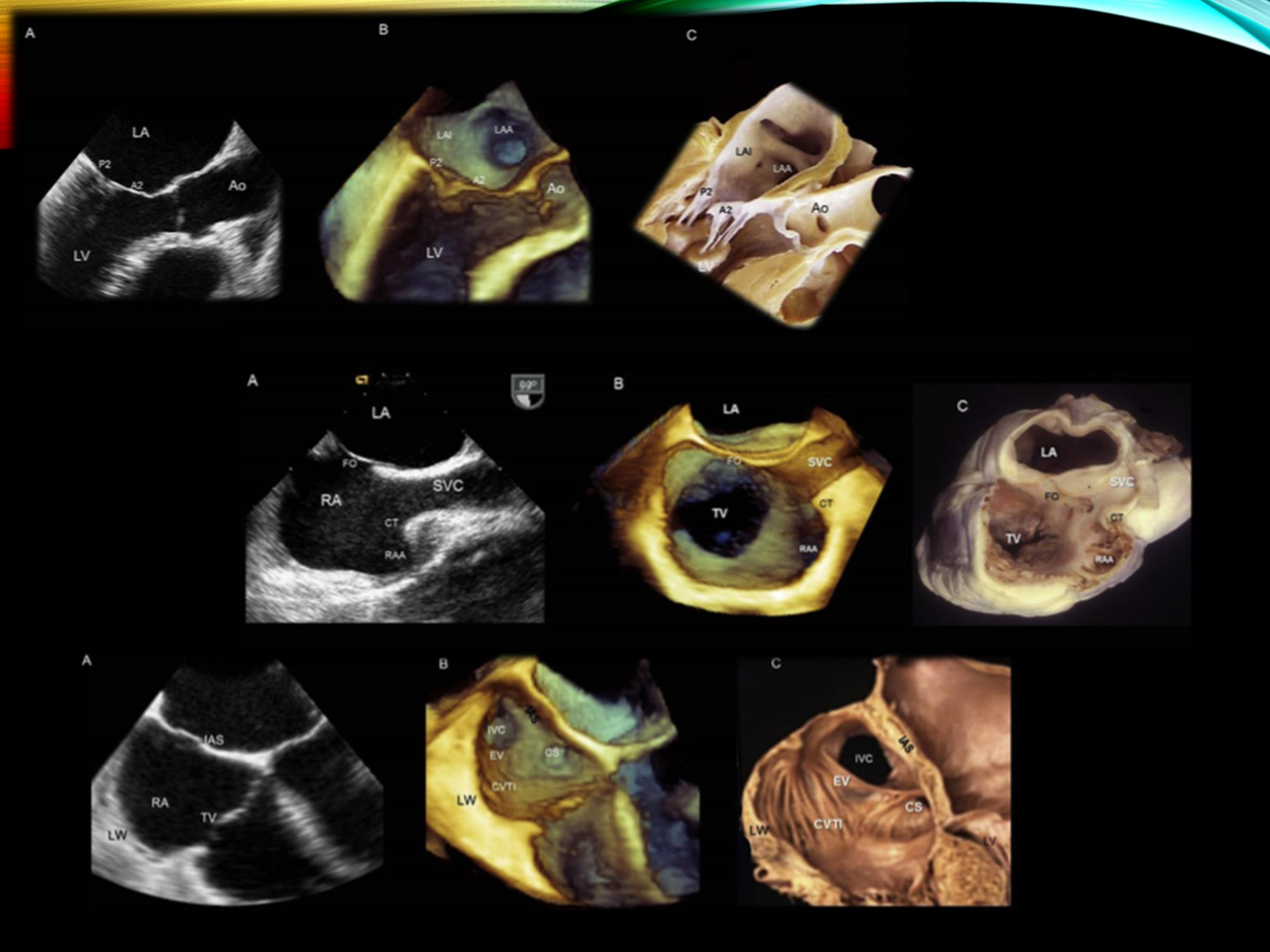

A
B
a
b
c

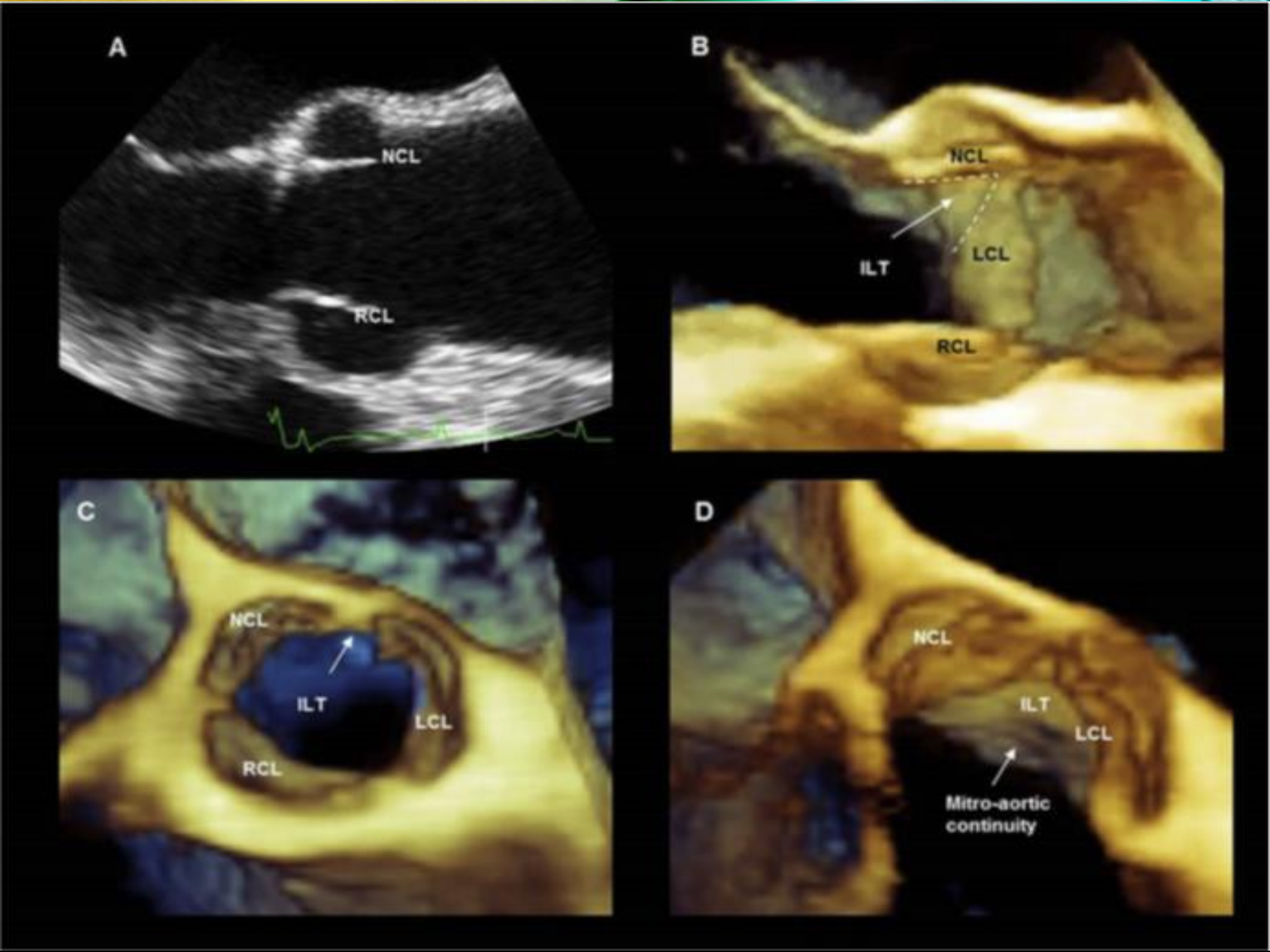

90,0°
45,0°
0,0°
-45,0°
-90,0°



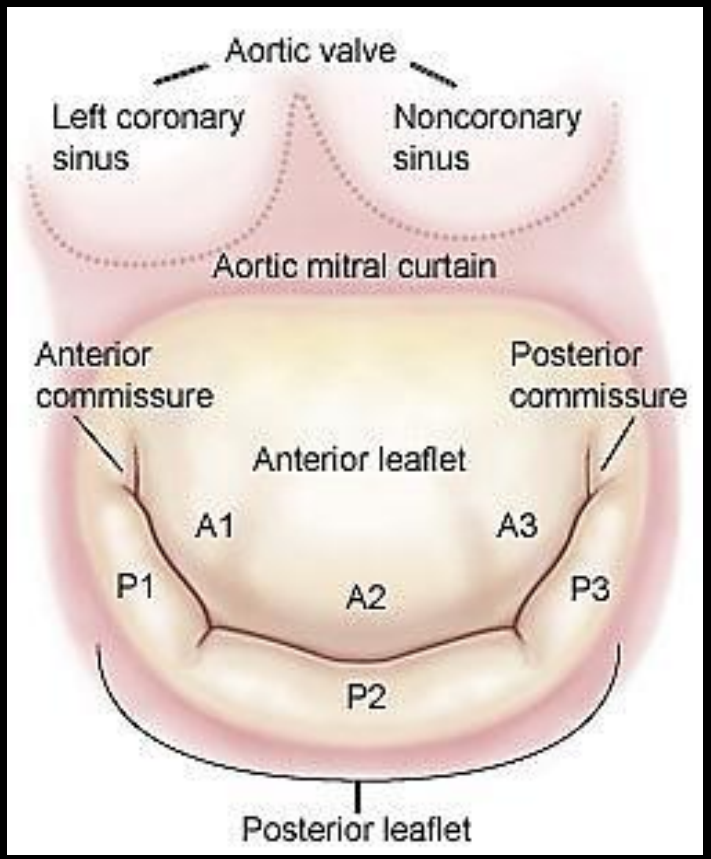
Ecocardiografía 3D

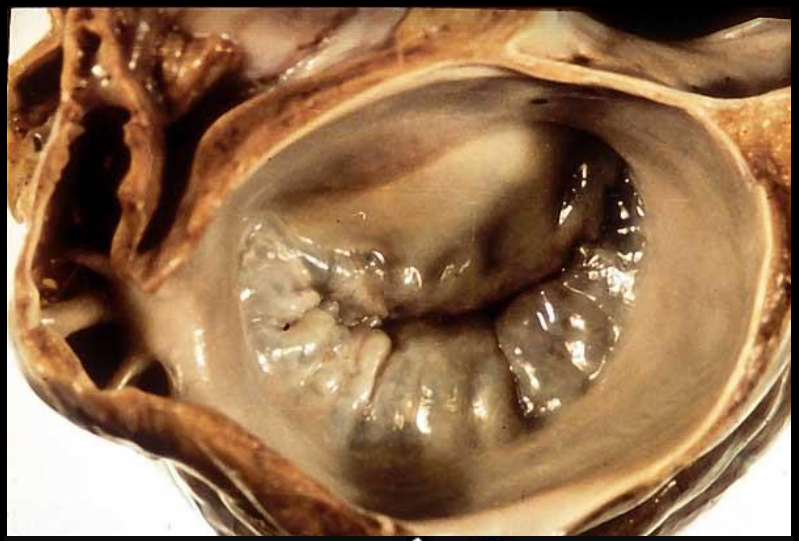
Video 4 3D
(reproducción automática)

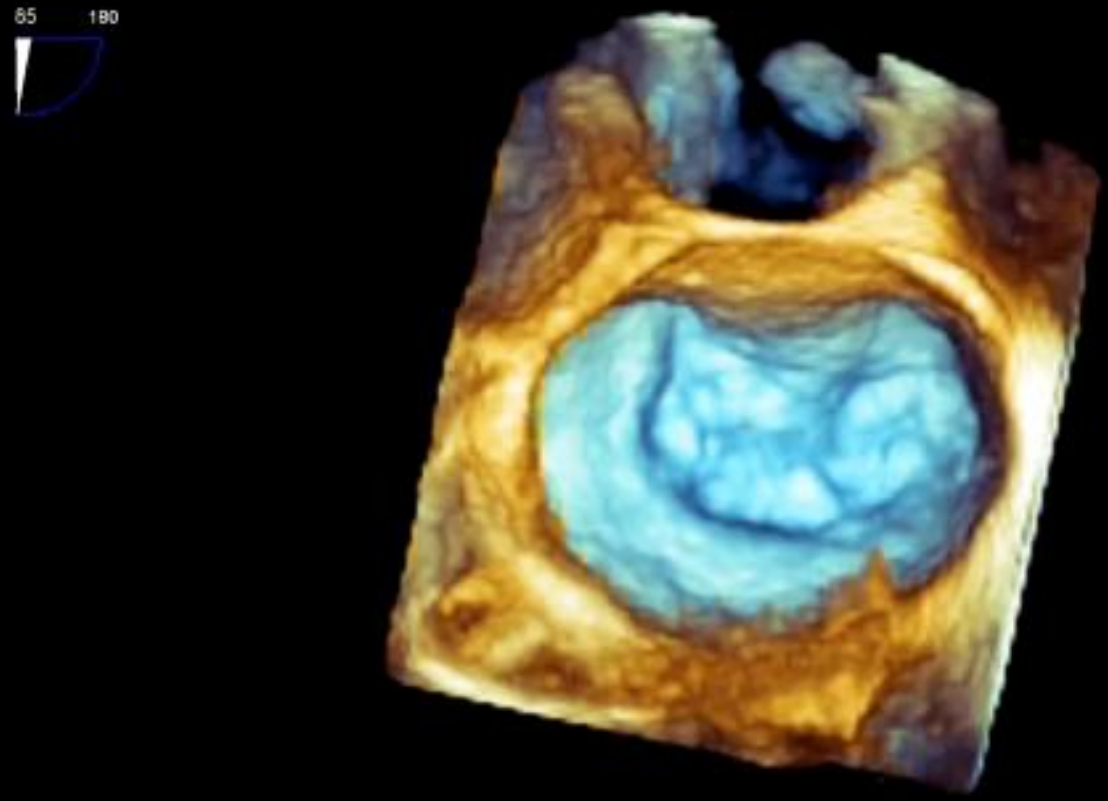

A
LA
P2
A2
Ao
LV
B
LAI
LAA
P2
A2
Ao
LV
C
LAI
LAA
P2
A2
Ao
LV
A
LA
FO
SVC
RA
CT
RAA
B
LA
FO
SVC
TV
CT
RAA
C
LA
SVC
FO
CT
TV
RAA
A
IAS
RA
TV
LW
B
IAS
IVC
EV
CS
CVTI
LW
C
IAS
IVC
EV
CS
LW
CVTI
LV


A
NCL
RCL
B
NCL
ILT
LCL
RCL
C
NCL
ILT
LCL
RCL
D
NCL
ILT
LCL
Mitro-aortic
continuity

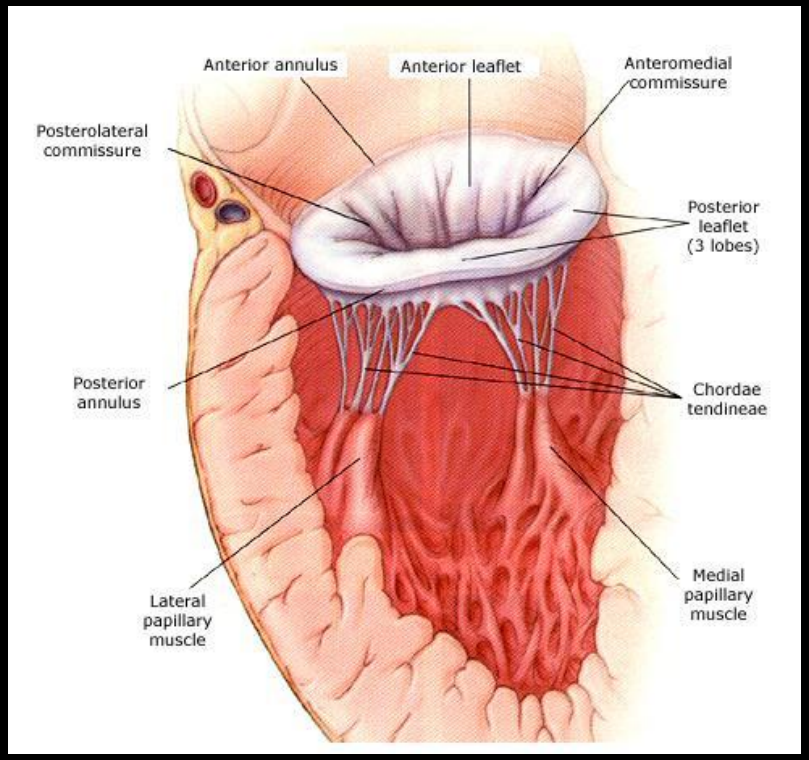
VALVAS

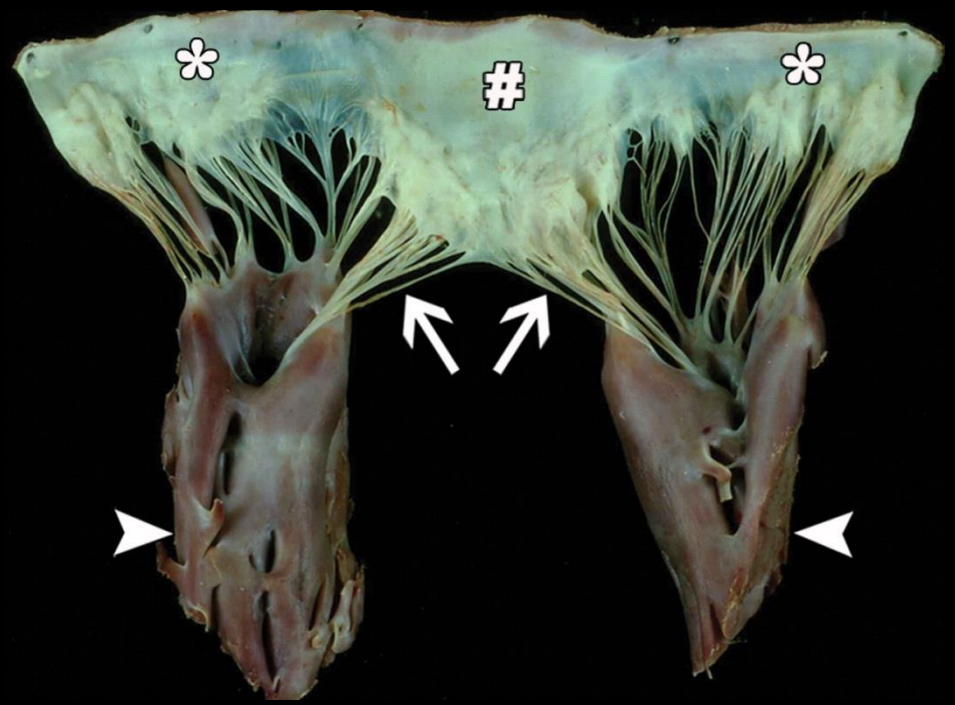

Aortic valve
Left coronary sinus
Noncoronary sinus
Aortic mitral curtain
Anterior commissure
Posterior commissure
Anterior leaflet
A1
A3
P1
A2
P3
P2
Posterior leaflet



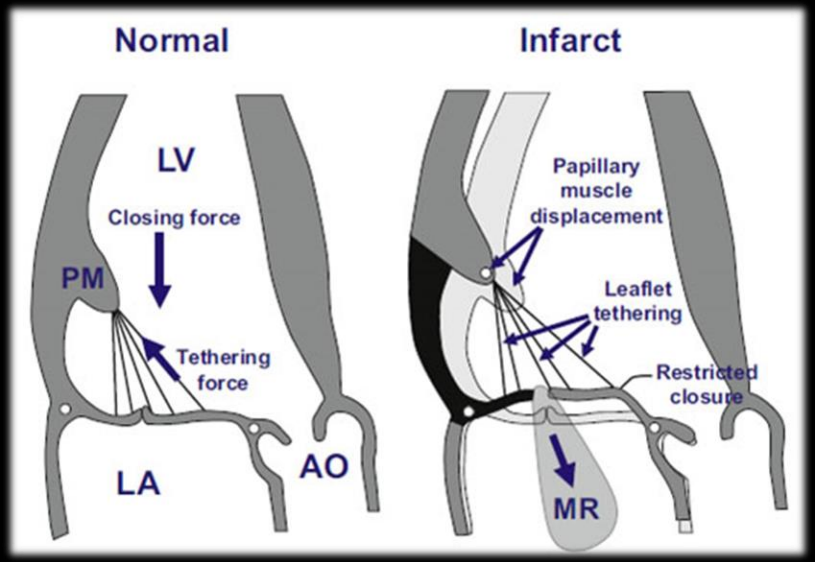

65
180

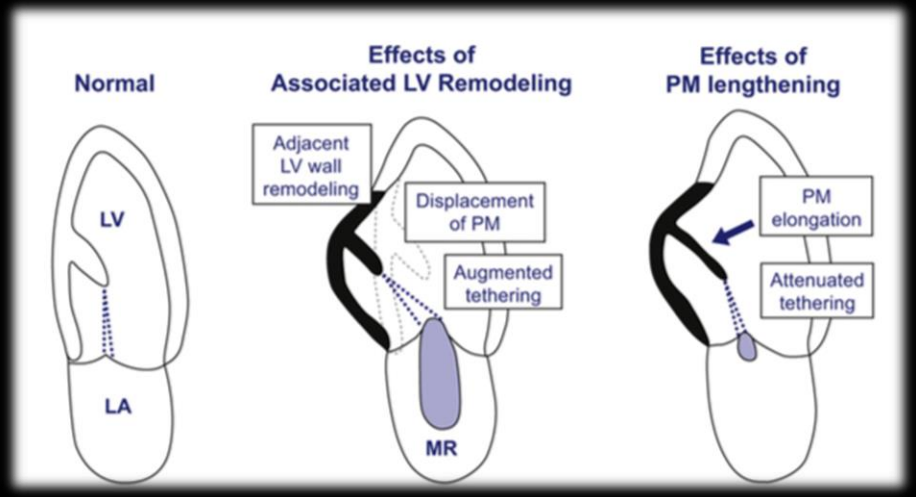
Músculo Papilar y Cuerdas Tendinosas

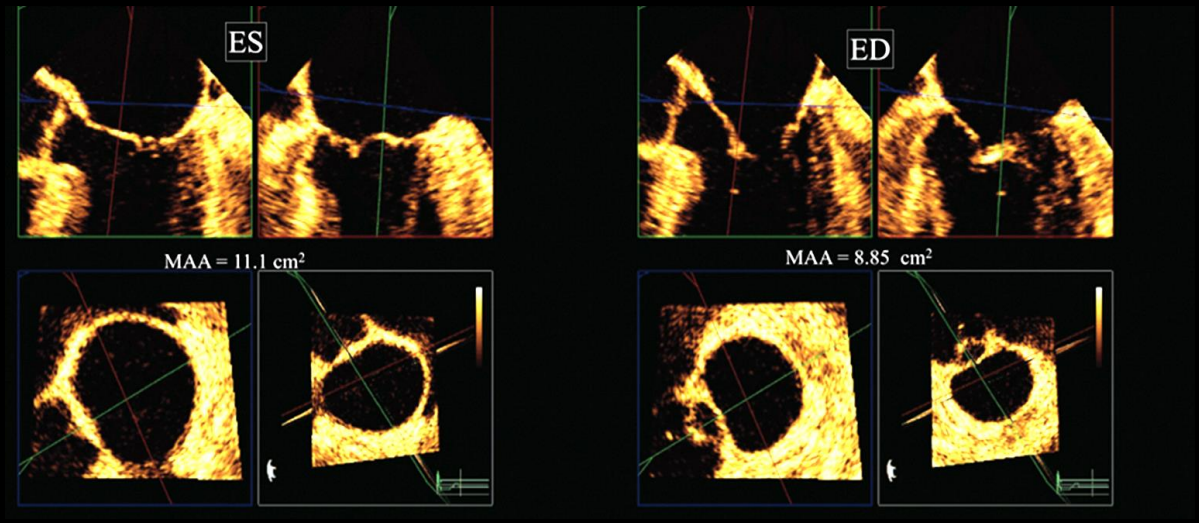


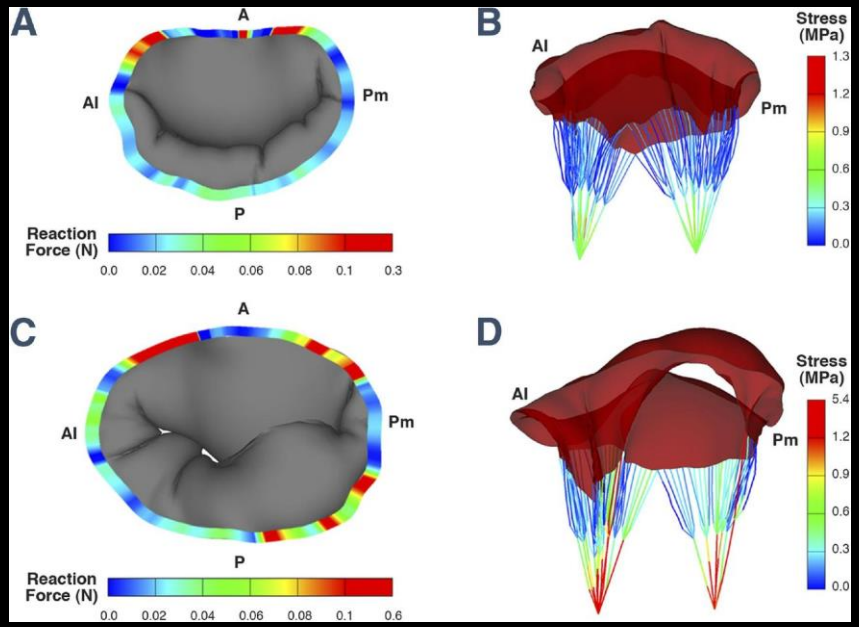


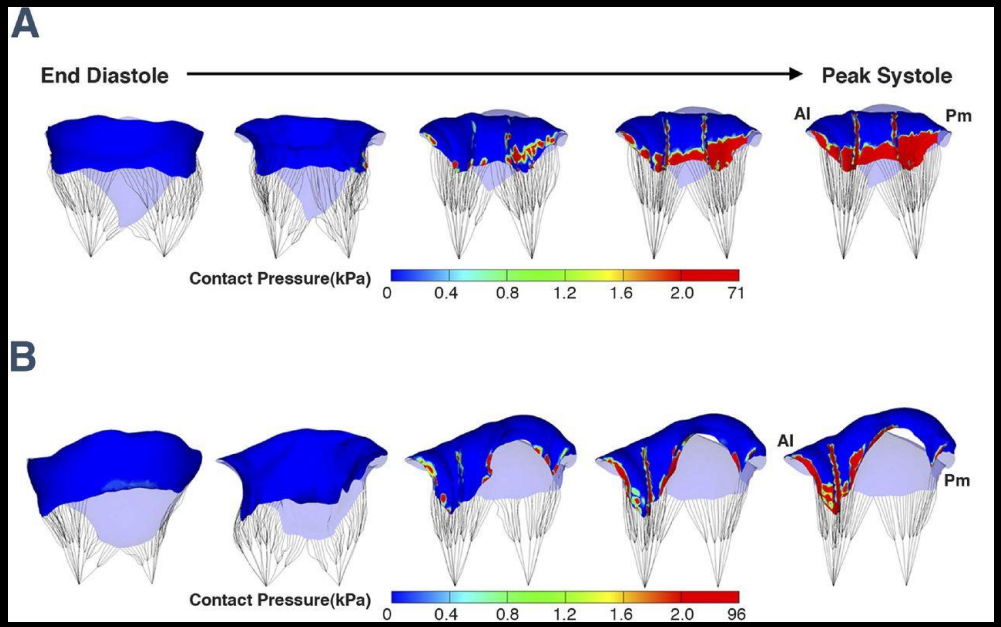
MECANISMOS IM





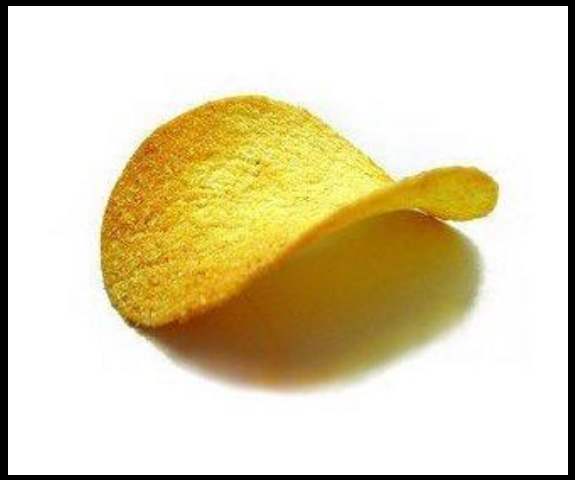

ES
ED
MAA = 11.1 cm²
MAA = 8.85 cm²

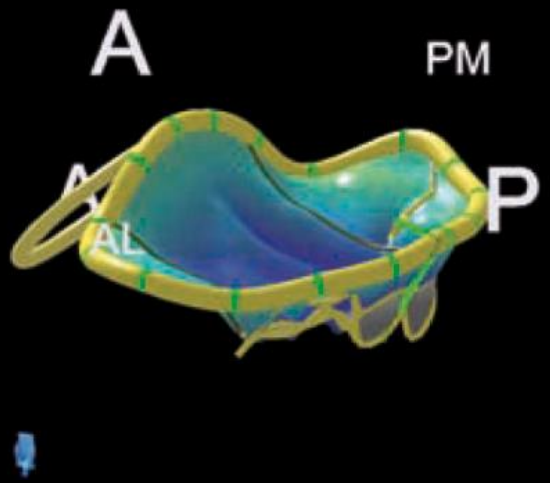

A
A
AI
Pm
P
Reaction Force (N)
0.0 0.02 0.04 0.06 0.08 0.1 0.3
B
AI
Pm
Stress (MPa)
1.3 1.2 0.9 0.6 0.3 0.0
C
A
AI
Pm
P
Reaction Force (N)
0.0 0.02 0.04 0.06 0.08 0.1 0.6
D
AI
Pm
Stress (MPa)
5.4 1.2 0.9 0.6 0.3 0.0

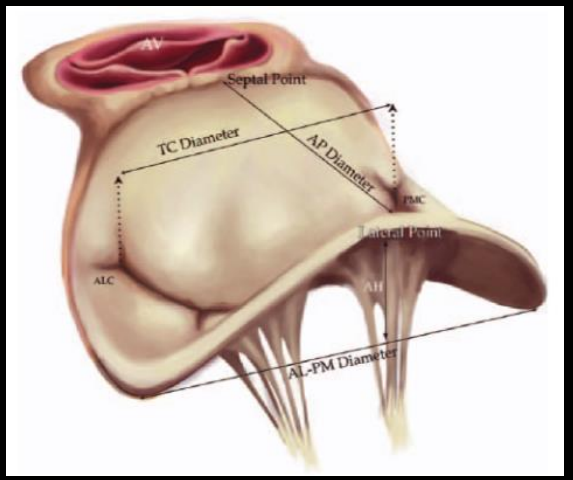

A
End Diastole
Peak Systole
AI
Pm
Contact Pressure(kPa)
0 0.4 0.8 1.2 1.6 2.0 71
B
AI
Pm
Contact Pressure(kPa)
0 0.4 0.8 1.2 1.6 2.0 96

Anillo Mitral

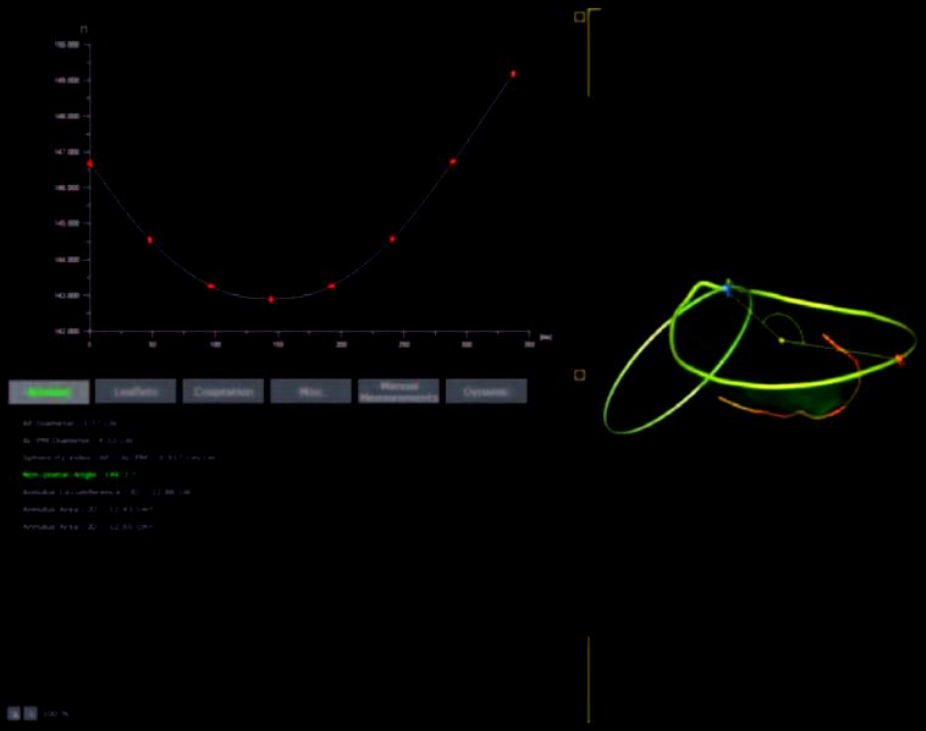
PARABOLOIDE HIPERBÓLICA

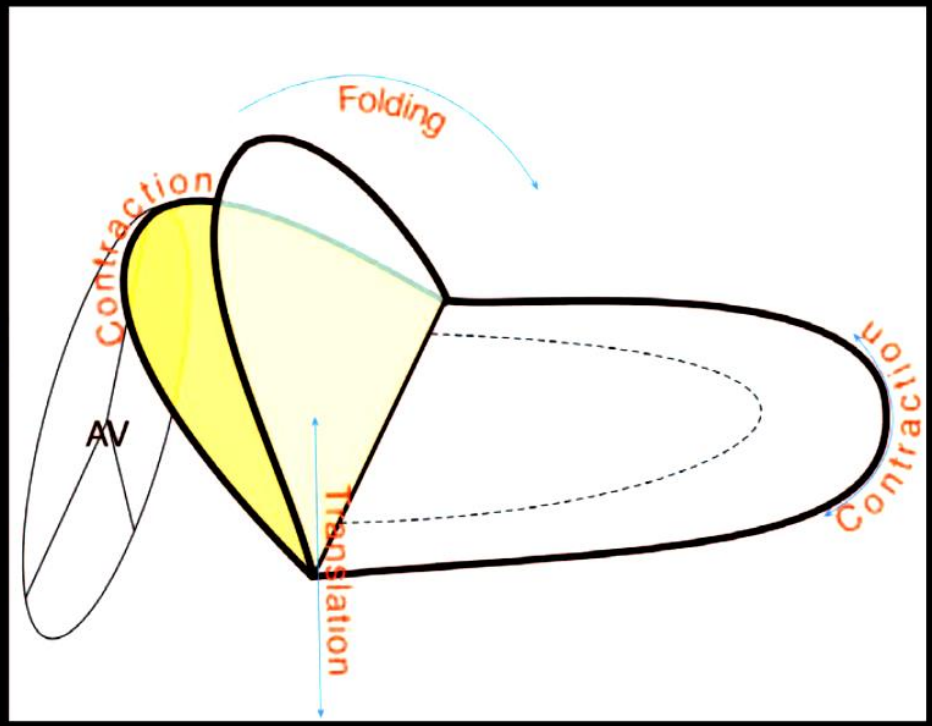




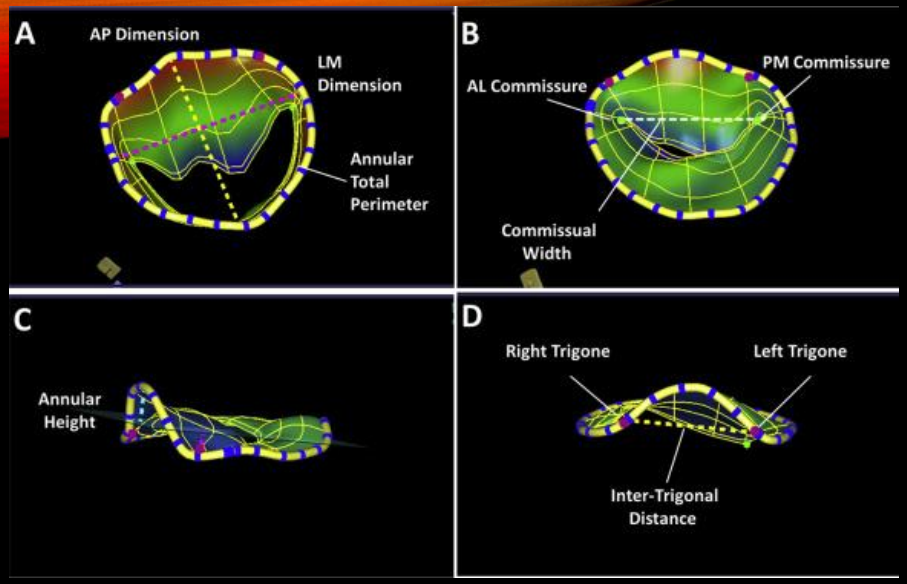


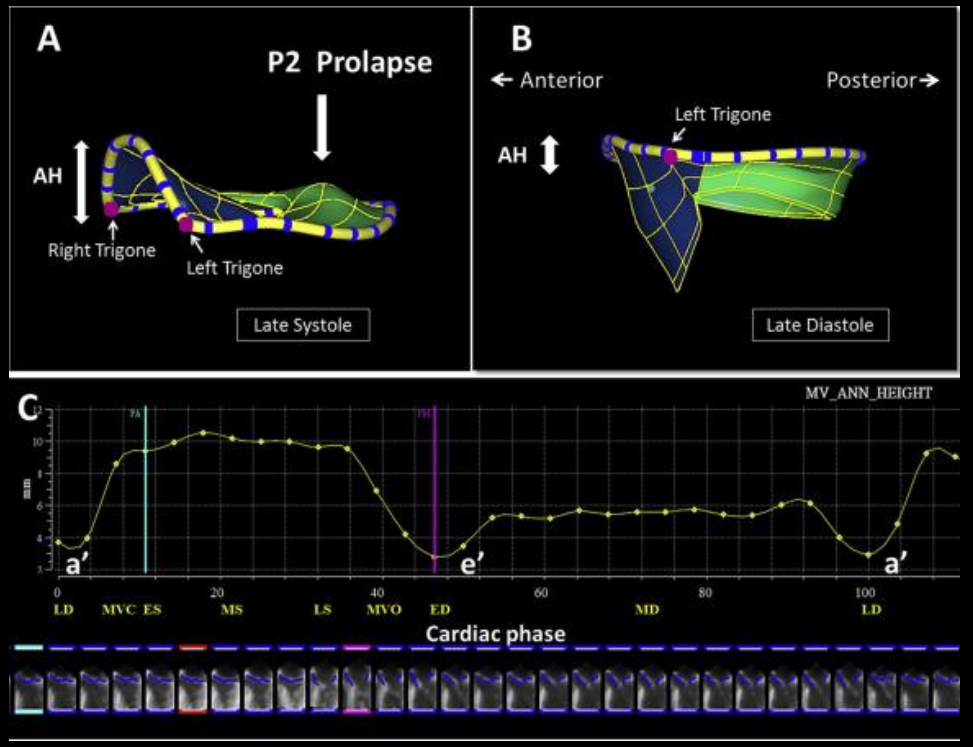
DINÁMICA DEL ANILLO MITRAL
CONTRACCIÓN Y PLEGAMIENTO





Modelos 3D

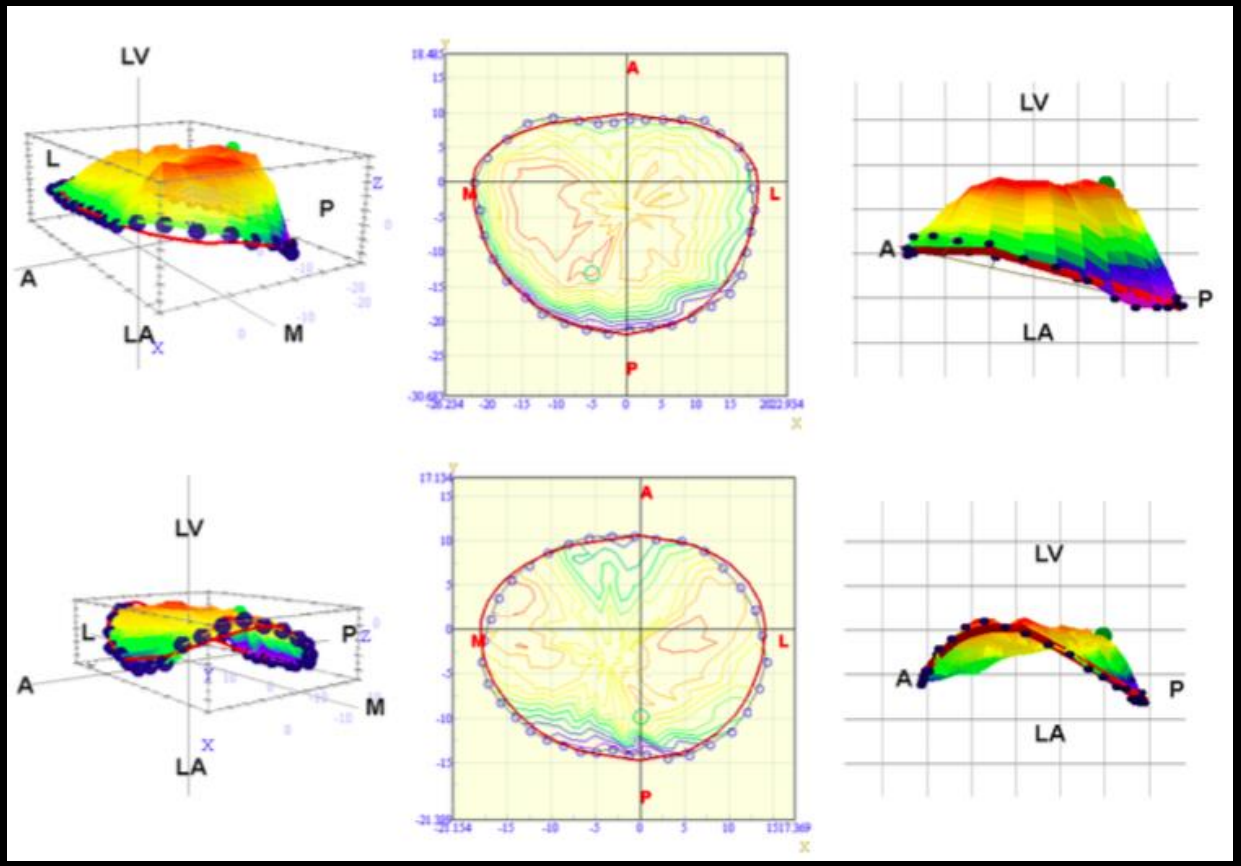

A
AP Dimension
LM Dimension
Annular Total Perimeter
B
AL Commissure
PM Commissure
Commissual Width
C
Annular Height
D
Right Trigone
Left Trigone
Inter-Trigonal Distance


A
P2 Prolapse
AH
Right Trigone
Left Trigone
Late Systole
B
← Anterior
Posterior →
Left Trigone
AH
Late Diastole
C
MV_ANN_HEIGHT
mm
a'
e'
a'
0
20
40
60
80
100
LD
MVC
ES
MS
LS
MVO
ED
MD
LD
Cardiac phase

Modelo C. Isquémica

IM isquémica

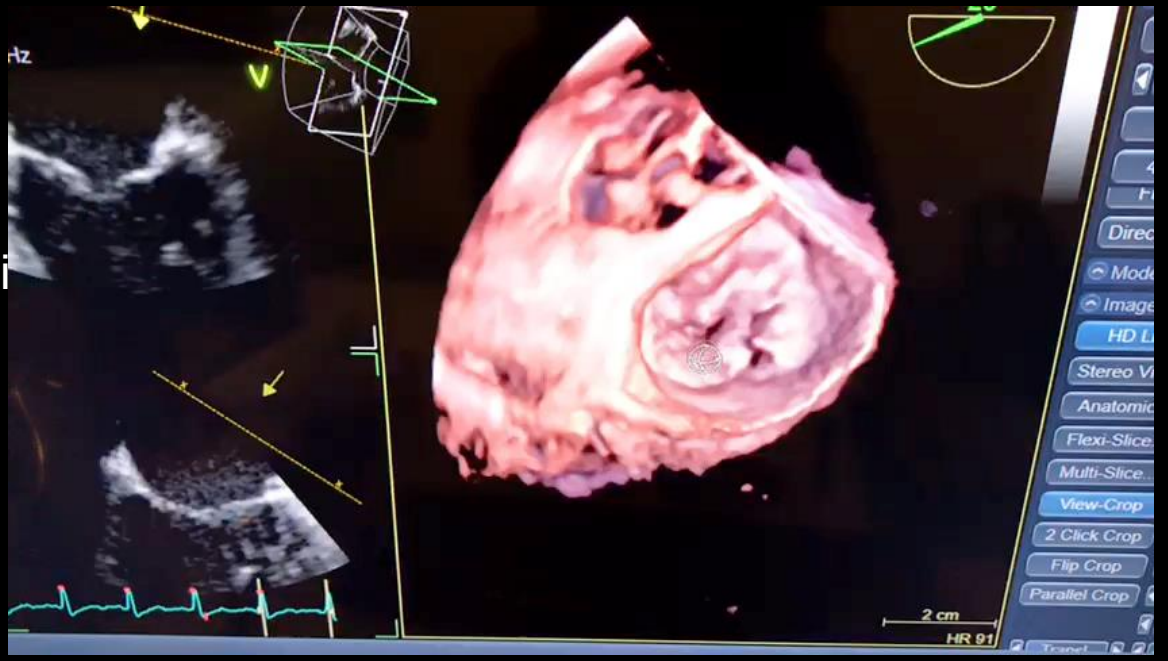
Normal



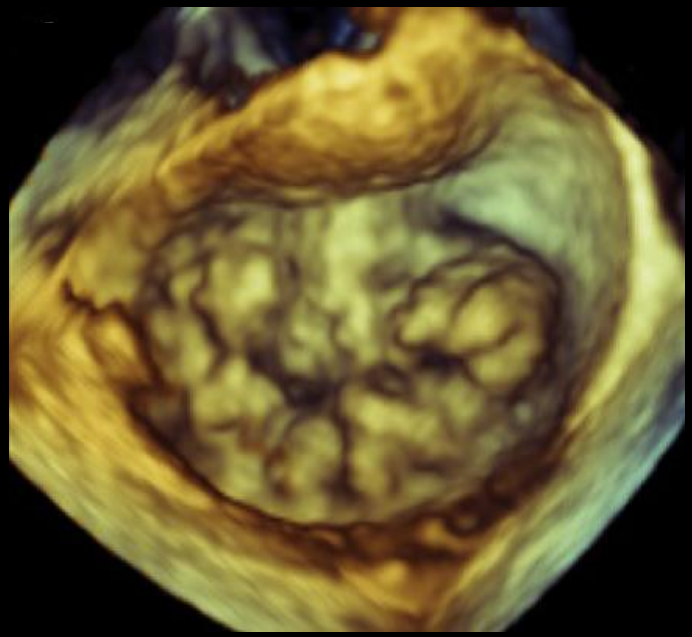
Patología

Video 5 Estenosis aórtica

Video 6 Perforaci

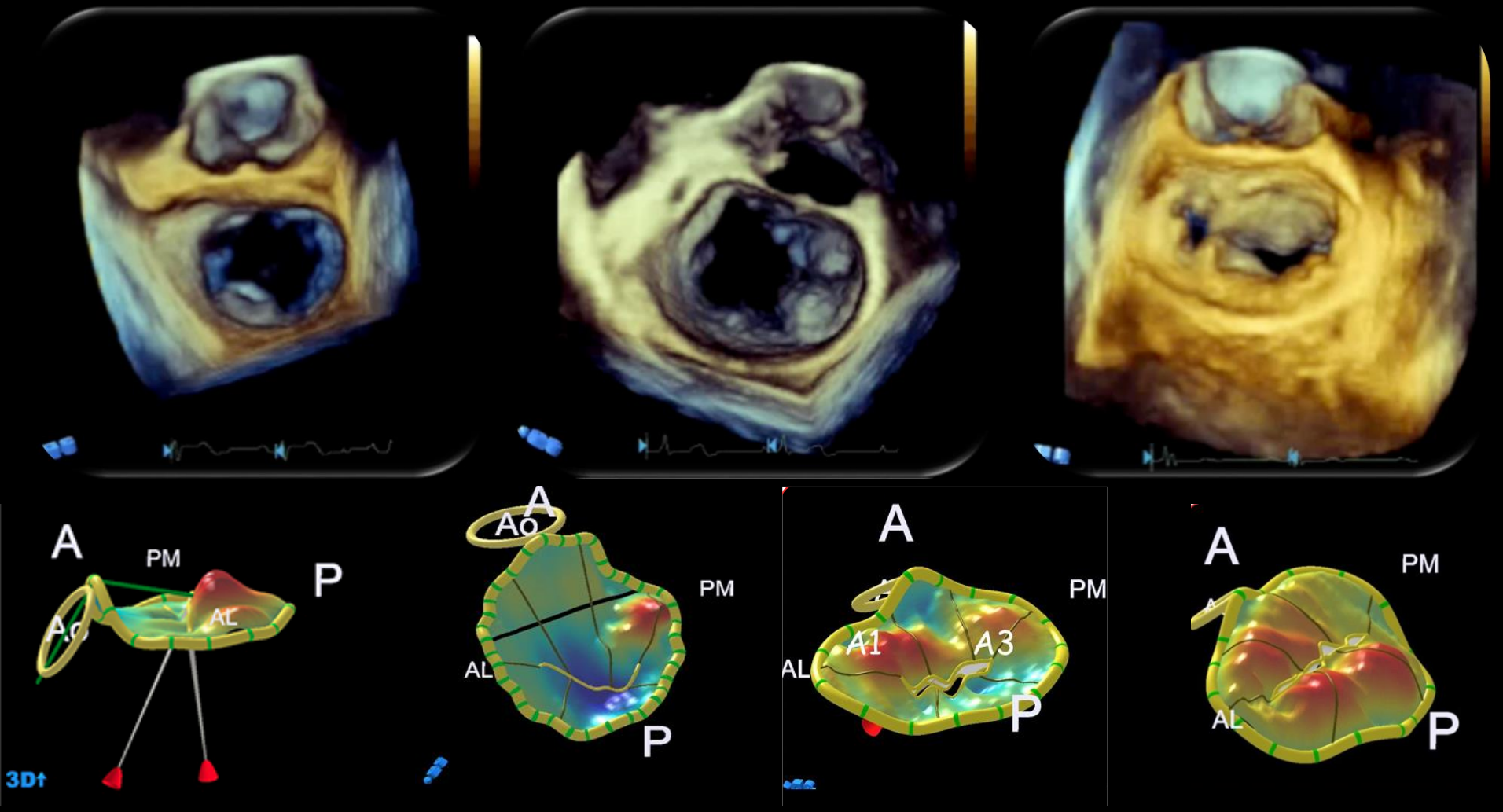


Enf Mitral Degenerativa

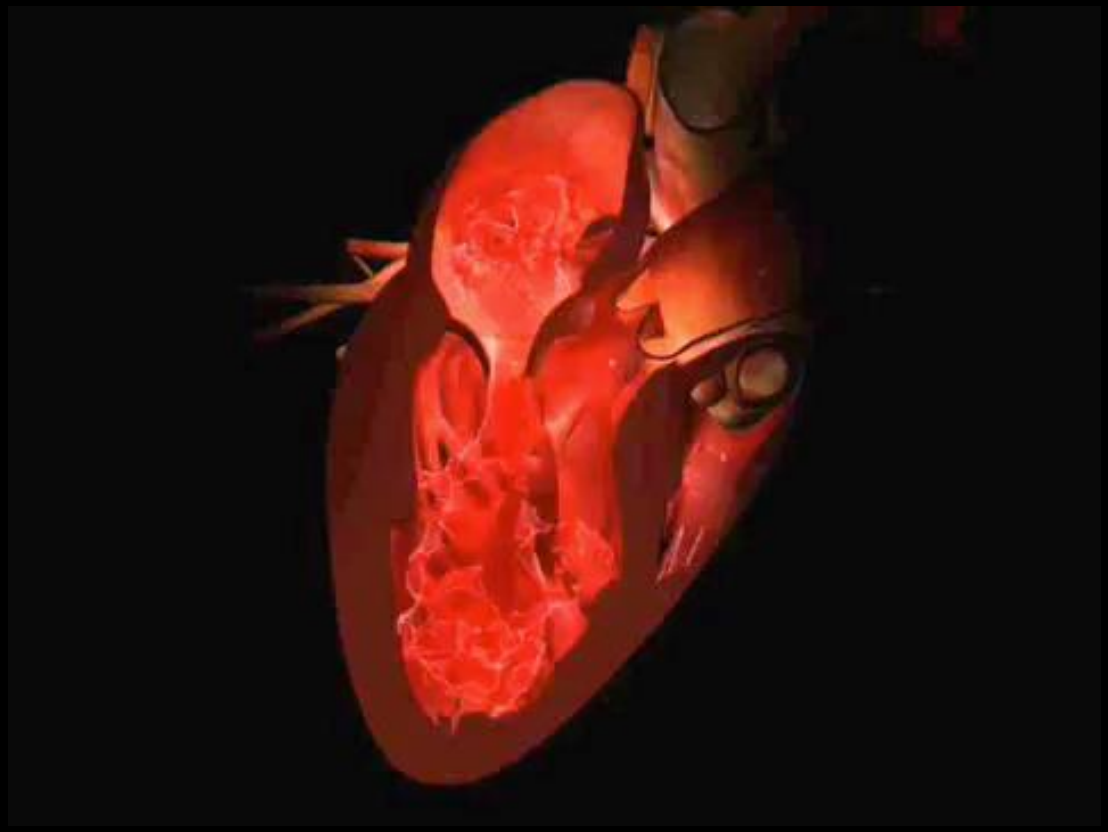


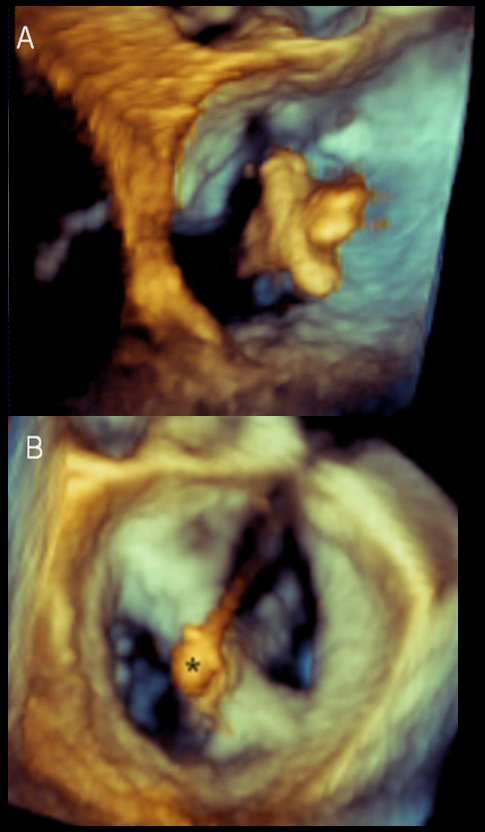
POR QUÉ DIFERENCIAR ETIOLOGÍA

Reparabilidad

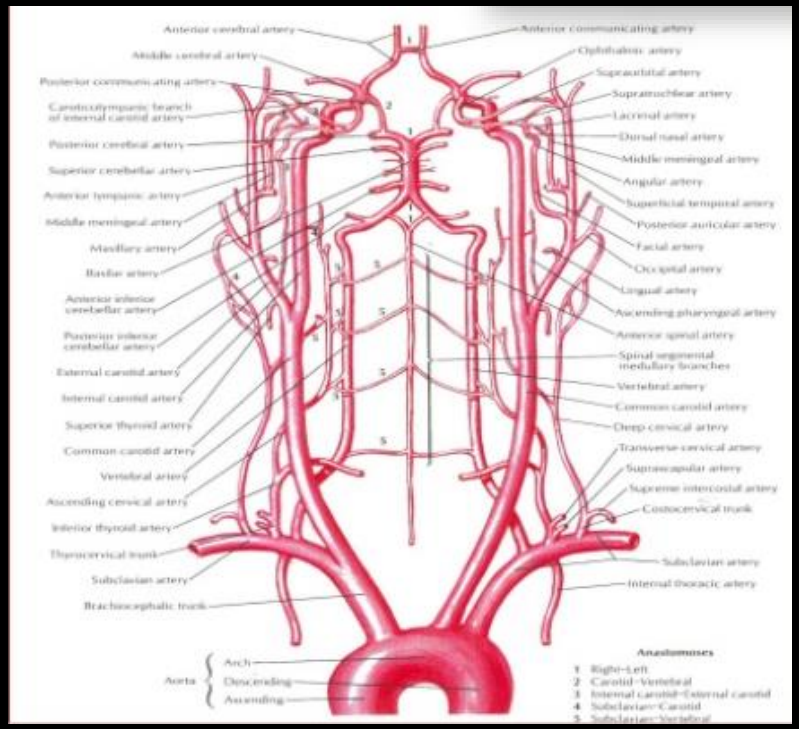


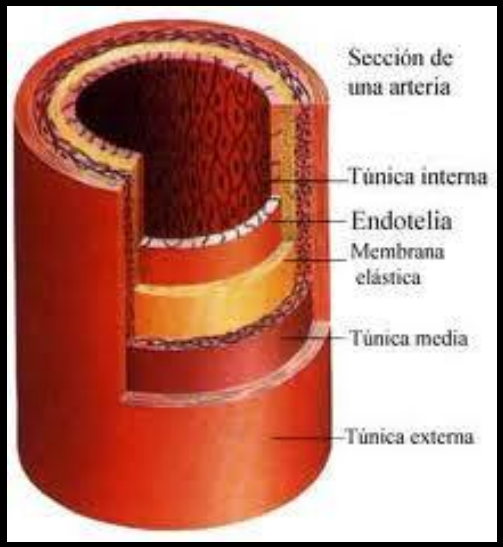
MITRACLIP





Exploración vasos de cuello

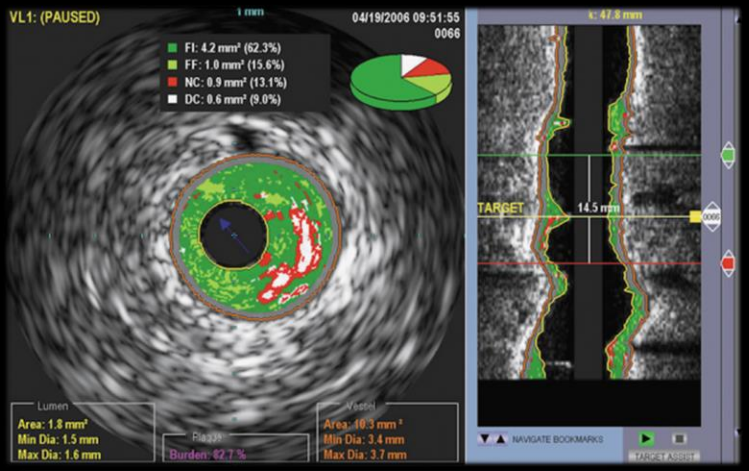


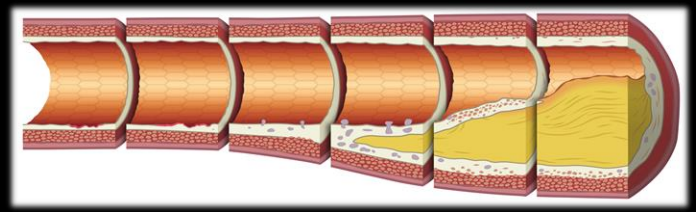


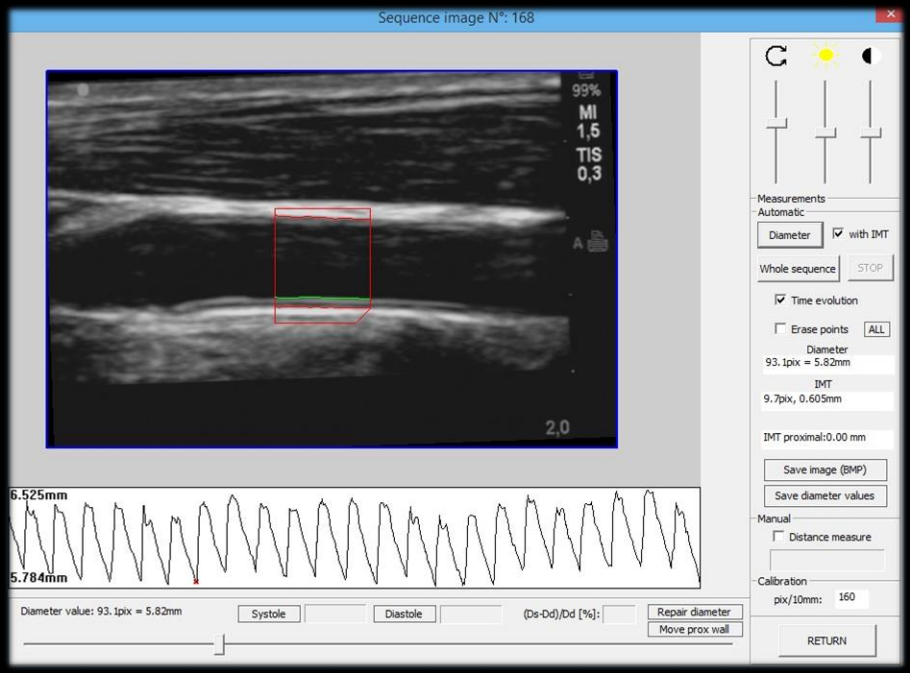
Estructura vascular

Espesor íntima media y placa de ateroma

- ✓ El EIM o la presencia de placas de ateroma predice la incidencia de IAM y ACV independientemente de los FRCV tradicionales.
- ✓ Valor predictivo adicional en individuos asintomáticos con riesgo CV intermedio.







Estructura vascular

Espesor íntima media y placa de ateroma