



3D ACQUISITION: THEORY AND HANDS-ON

9:40 TEE Acquisition I - J. Moreno

LV, RV
AV, TAVR

TORONTO 3D TEE COURSE
Friday November 1, 2019

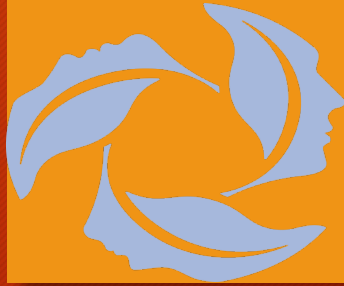


Interdepartmental
Division of Critical
Care Medicine

The Lynn & Arnold Irwin
APIIL Advanced
Perioperative
Imaging Lab



DISCLOSURE



- No academic conflict of interest
- No financial conflict of interest
- No compensation received for pharmaceuticals and/or devices discussed



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Acquisition of 3D TEE datasets: Module

This module is intended to assist trainees in learning to acquire and manipulate 3D TEE images. This module covers the steps in acquiring 3D TEE images using the Philips iE33, the Philips Epiq 7 and the GE Vivid E9 ultrasound machines. This will be followed with video tutorials illustrating the process of image manipulation and measurements that can be carried out with 3D TEE images.

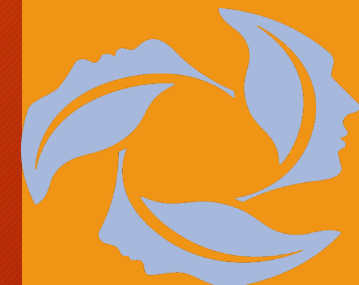


[Click here to open the Acquisition and Manipulation of 3D TEE application.](#)





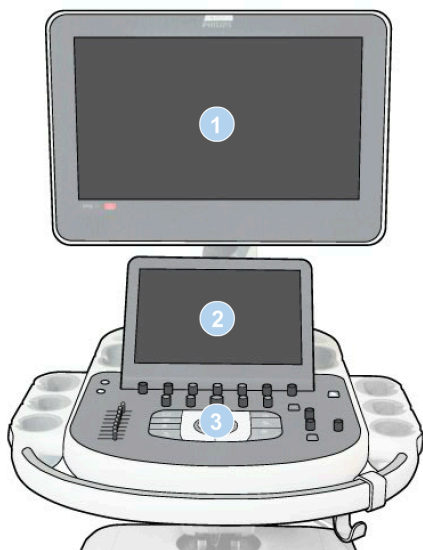
LV/RV ACQUISITION PHILIPS EPIQ 7



3D TEE Acquisition - Philips Epiq 7

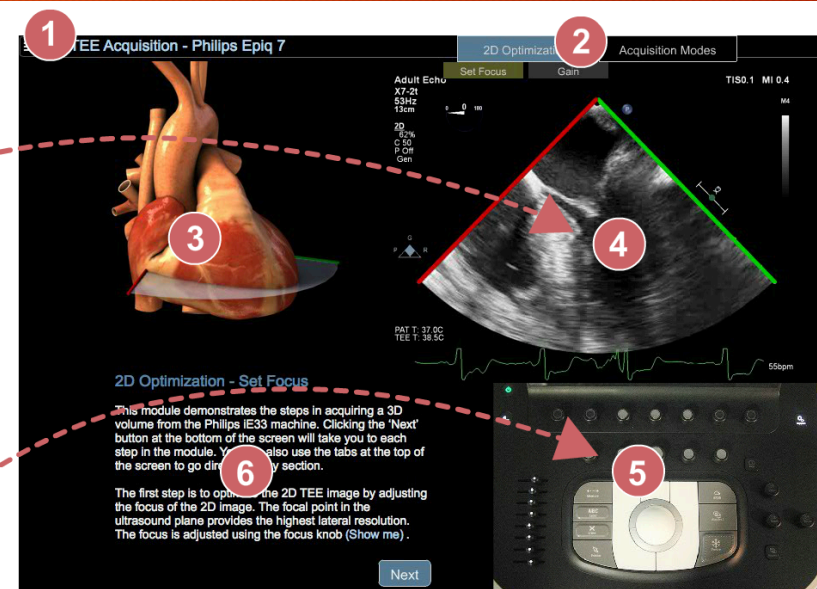
The Epiq 7 Machine

1. Video Monitor
2. Touch screen (includes seven knobs below the screen)
3. Control Panel



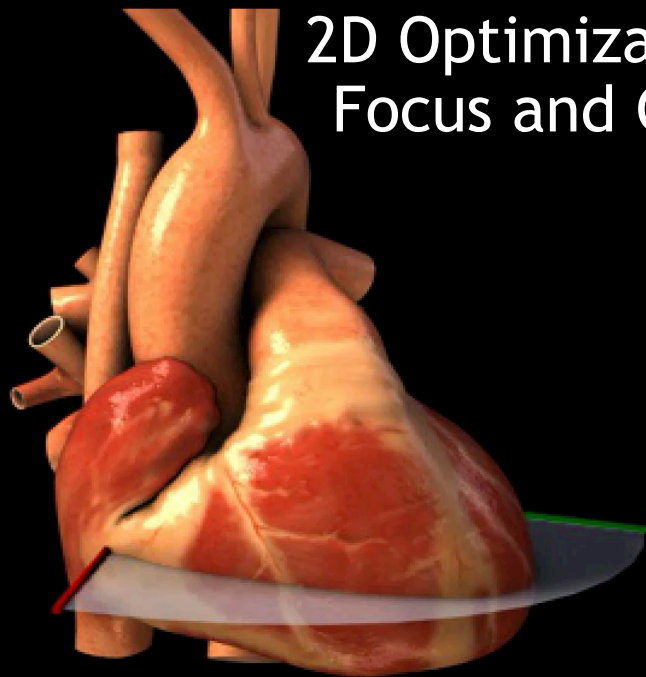
Continue

Start



1. Title (click to restart)
2. Navigation
3. 3D model (shows ultrasound plane/volume)
4. Displays video monitor
5. Control panels (alternates depending on what is currently being manipulated)
6. Text

Start



2D Optimization: Focus and Gain

Adult Echo
X7-2t
53Hz
13cm
2D
62%
C 50
P Off
Gen

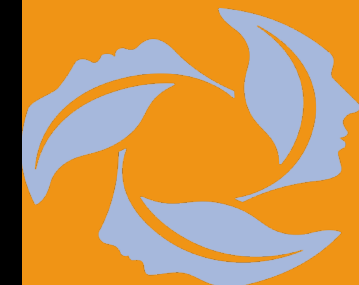
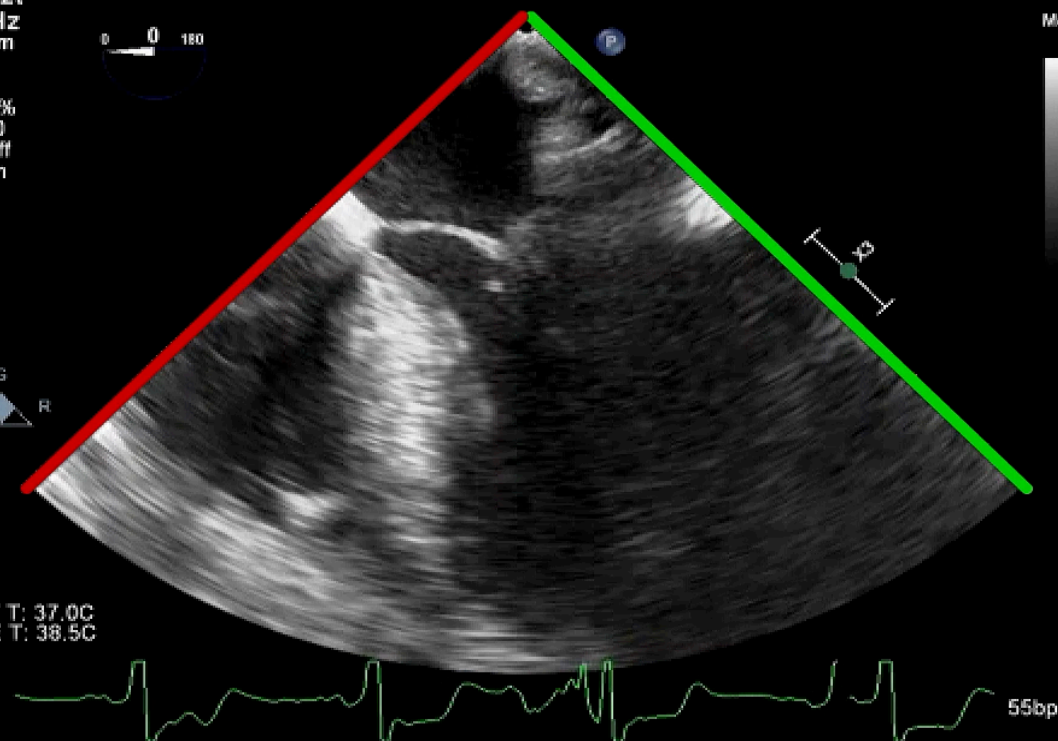
Set Focus

Gain

TISO.1 MI 0.4



PAT T: 37.0C
TEE T: 38.5C



2D Optimization - Set Focus

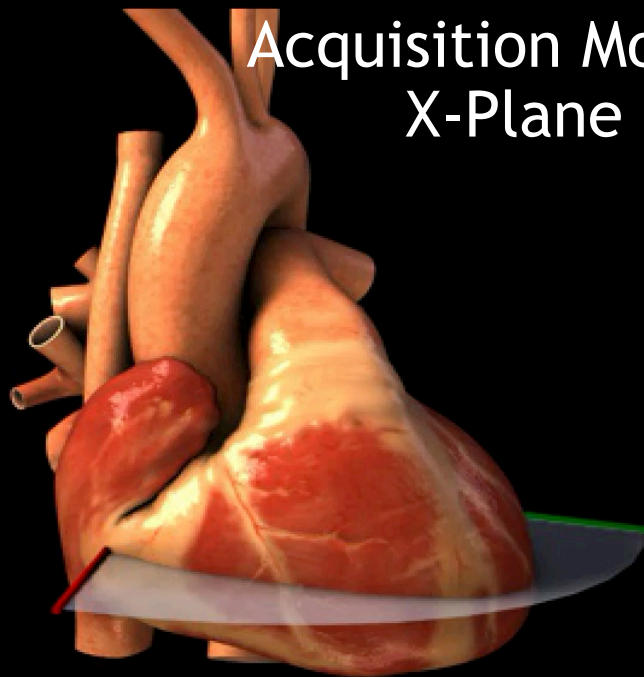
This module demonstrates the steps in acquiring a 3D volume from the Philips Epiq 7 machine. Clicking the 'Next' button at the bottom of the screen will take you to each step in the module. You can also use the tabs at the top of the screen to go directly to any section.

The first step is to optimize the 2D TEE image by adjusting the focus of the 2D image. The focal point in the ultrasound plane provides the highest lateral resolution. The focus is adjusted using the focus knob (Show me) .

[Next](#)



Acquisition Modes: X-Plane

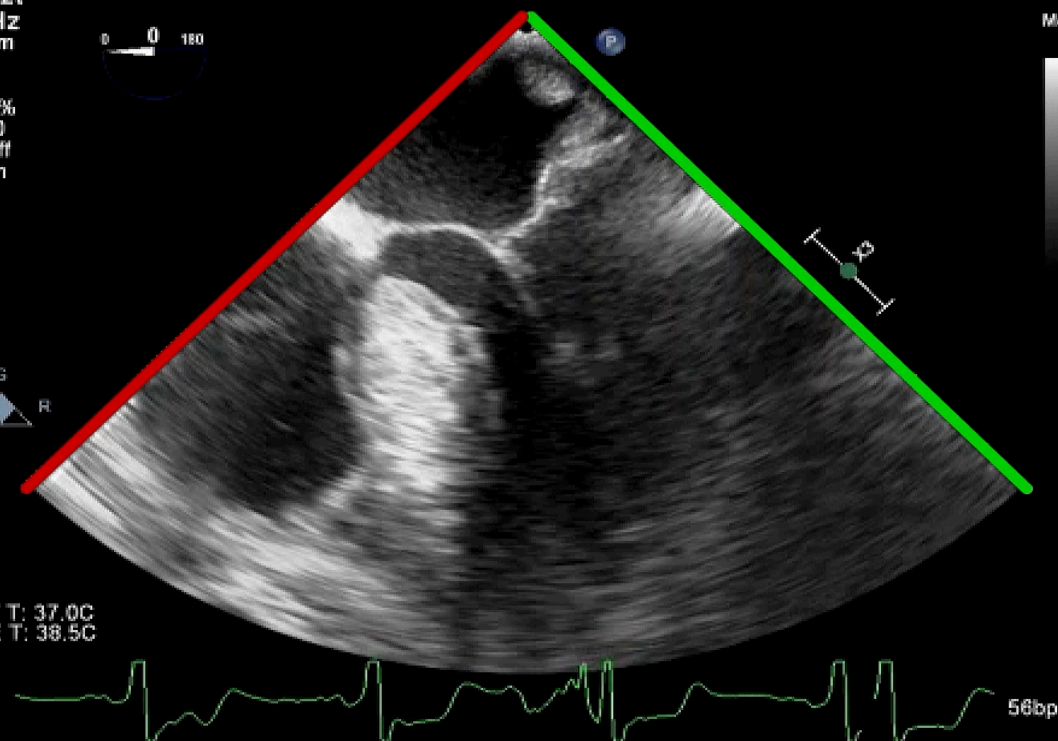


Adult Echo
X7-2t
53Hz
13cm

2D
62%
C 50
P Off
Gen



PAT T: 37.0C
TEE T: 38.5C



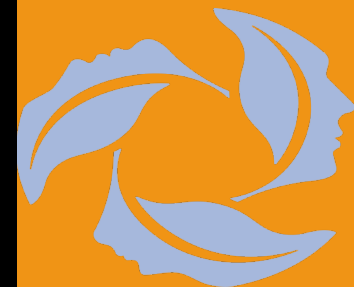
Acquisition Modes - xPlane

The xPlane mode of acquisition allows the simultaneous scanning and display of two perpendicular planes.

To enter the xPlane mode, press the xPlane button. (Show me) .



Next

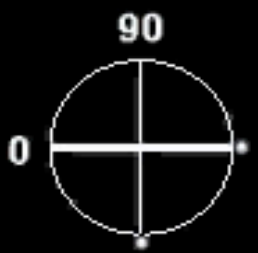


FR 29Hz
10cm

xPlane
77%
77%
48dB
P Off
Res

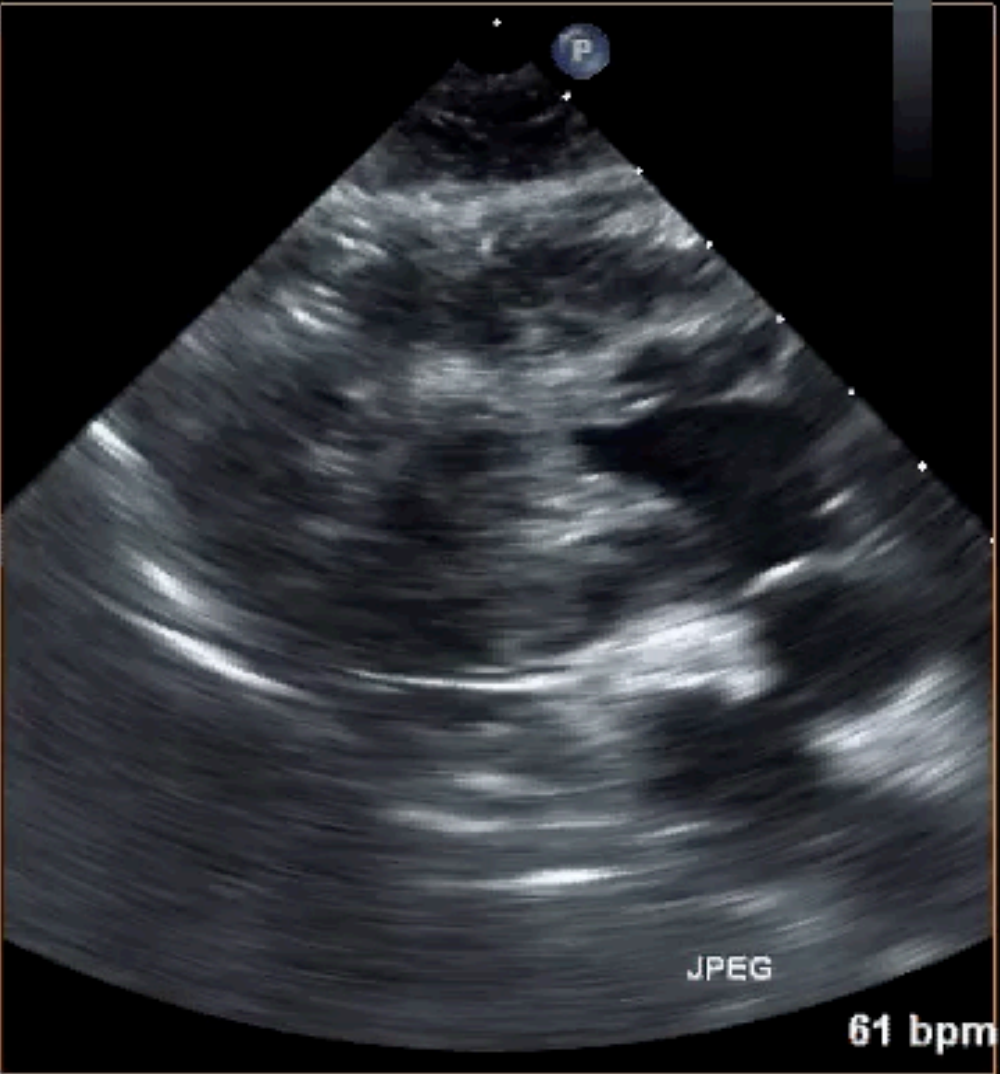
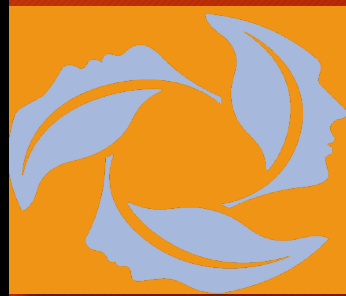


Acquisition Modes:
X-Plane



LV TG SAX
X-Plane

M4

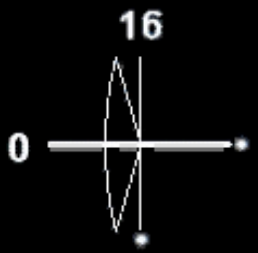


FR 29Hz
10cm

xPlane
67%
67%
48dB
P Off
Gen

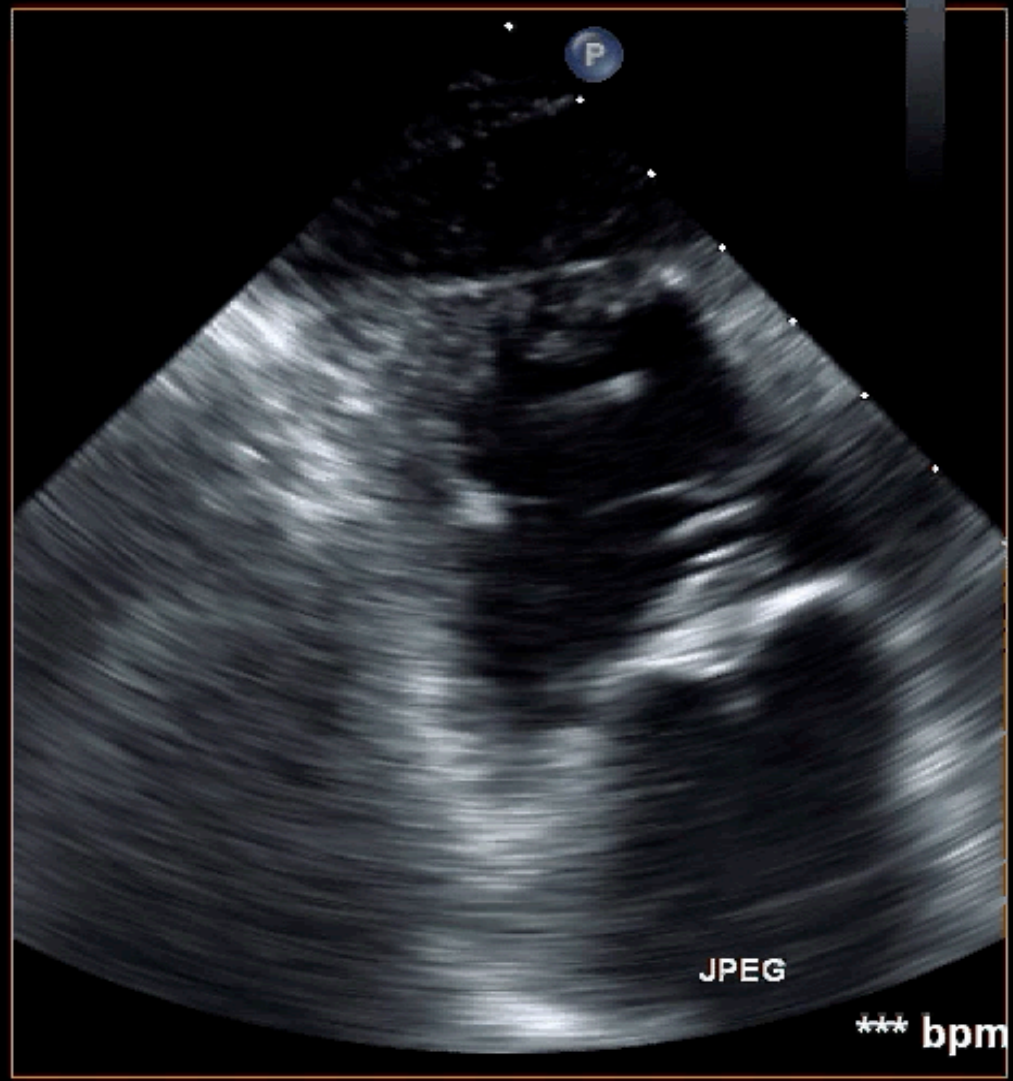
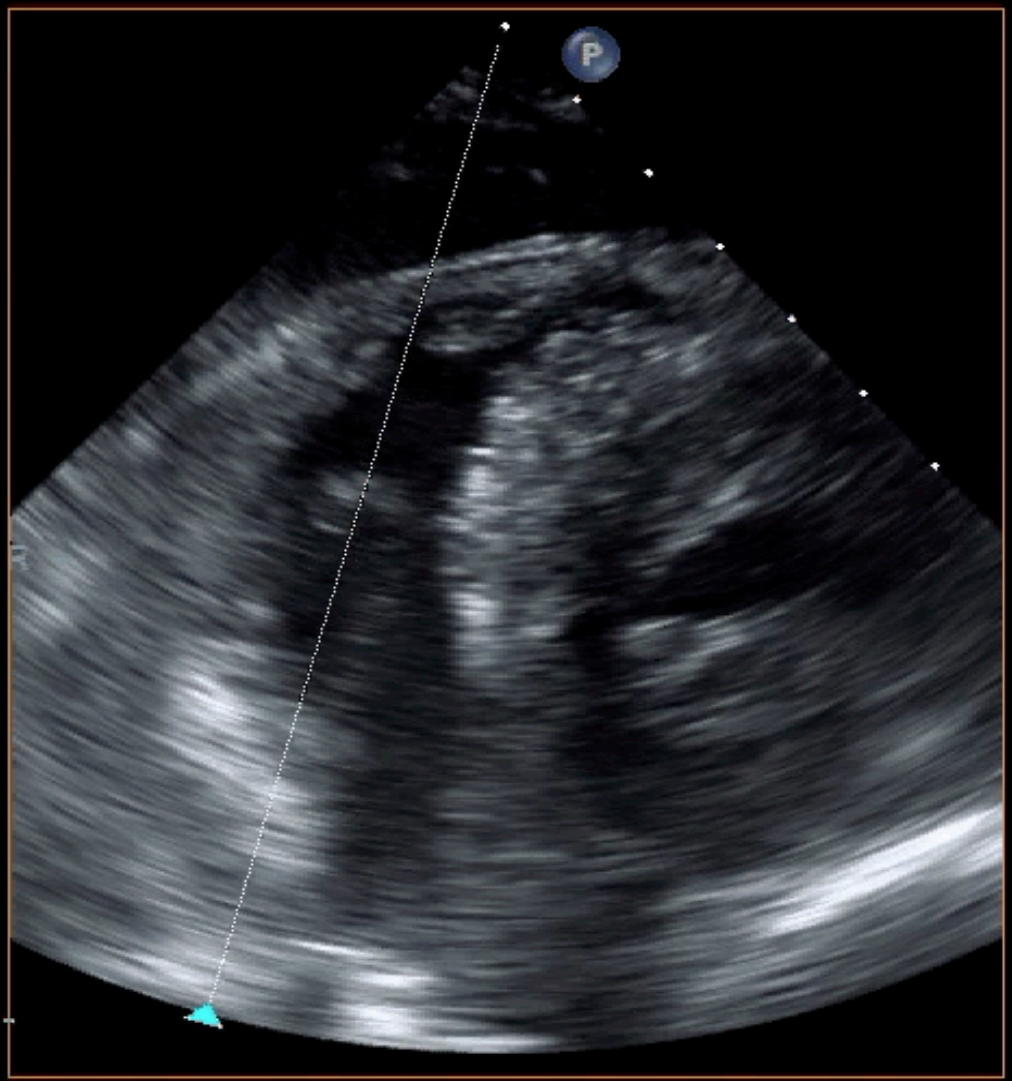
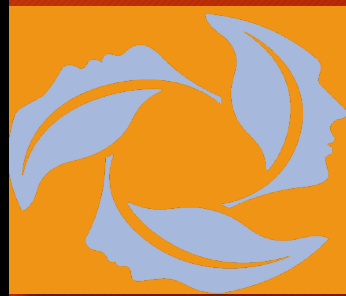


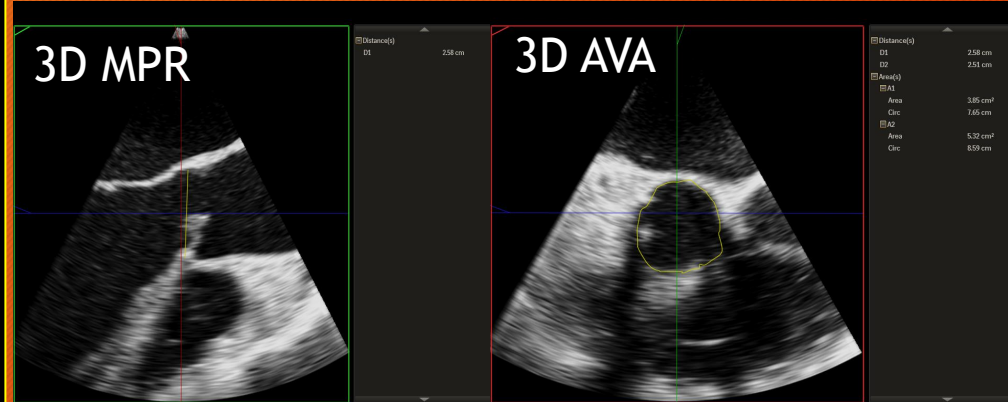
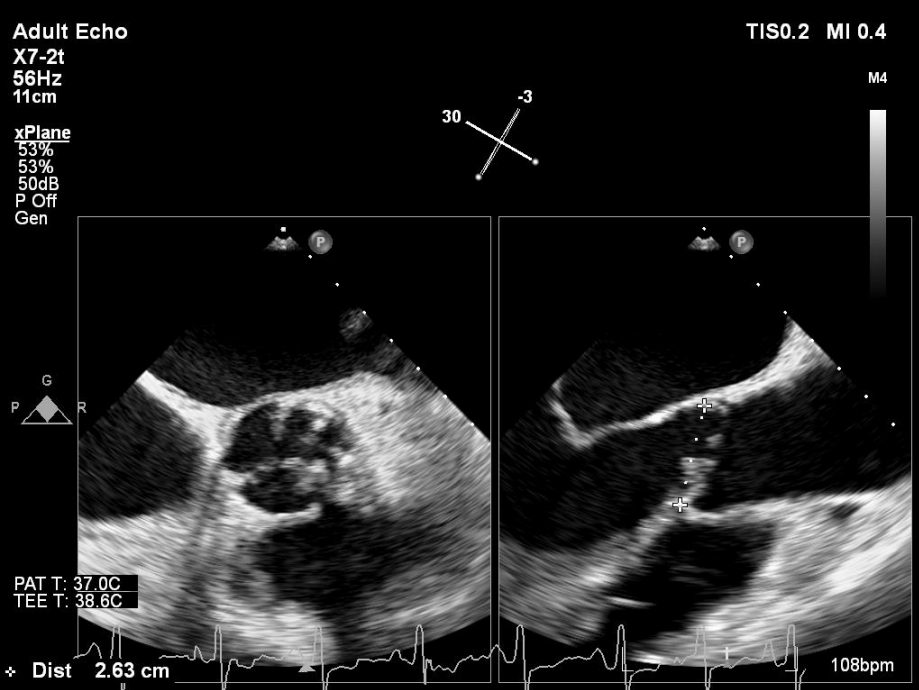
Acquisition Modes:
X-Plane



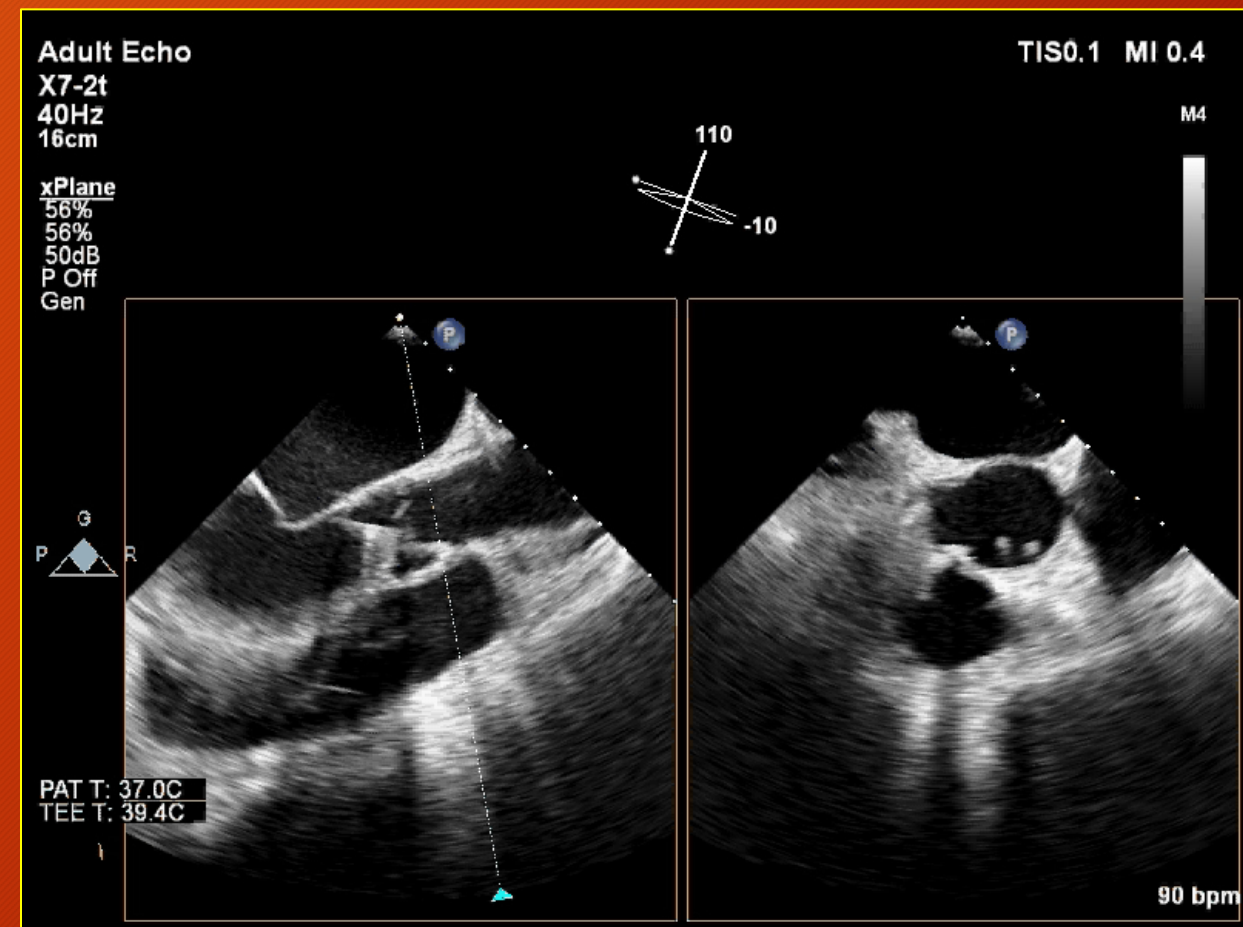
RV TG SAX
X-Plane

M4





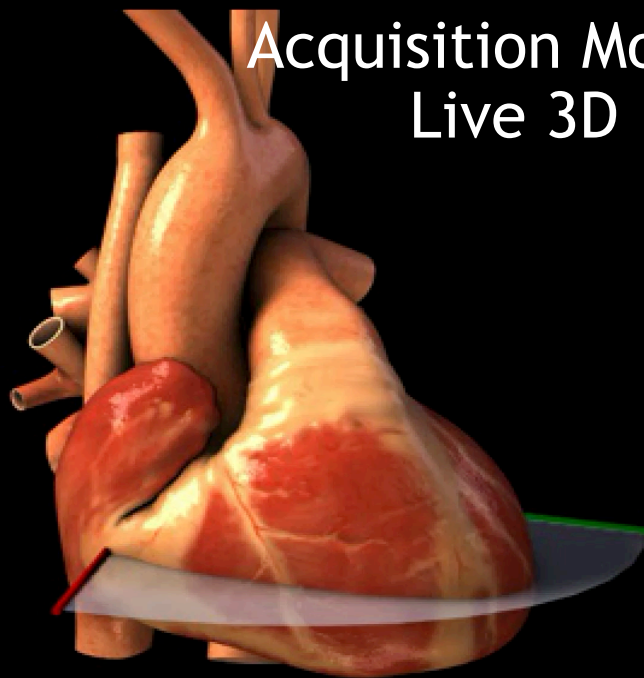
Sapien III



3D TAVR XPLANE



Acquisition Modes: Live 3D

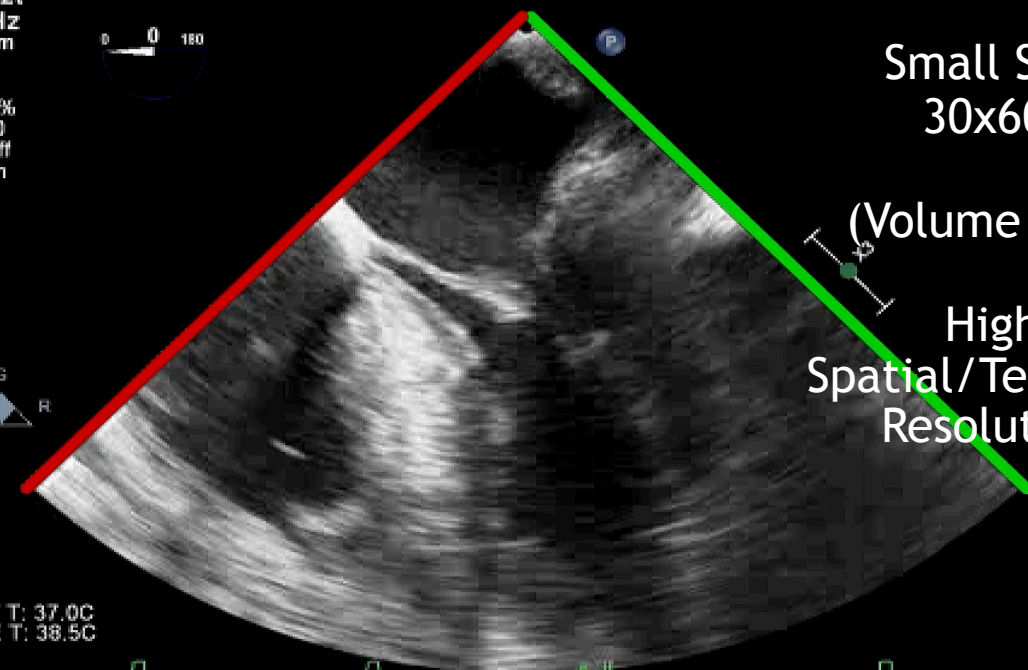


Adult Echo
X7-2t
53Hz
13cm

2D
62%
C 50
P Off
Gen



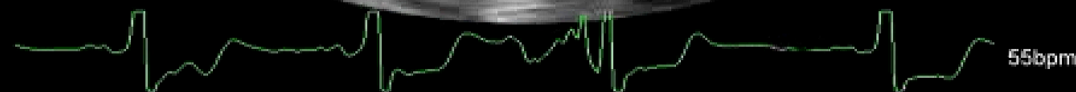
PAT T: 37.0C
TEE T: 38.5C



Small Size
30x60°

(Volume Size)

High
Spatial/Temporal
Resolution

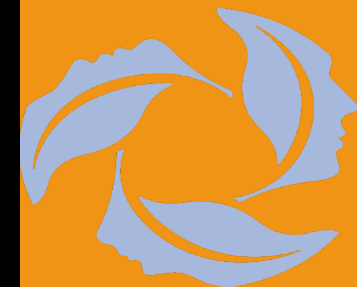


Acquisition Modes - Live 3D

The 'Live 3D' acquisition mode produces small size, 3D volumes allowing for high spatial and temporal resolution, although it may be insufficient to contain the entire structure of interest. This modality is often used as a 3D image test and to guide the placement of wires or devices.

To acquire a 3D volume using 'Live 3D' the Live 3D button (Show me) on the right control touch screen is pressed when in the 2D mode.

Next



3D Opt:
Real Time
(1 Beat)

ECG Gated
(2-6 Beats)

Elevational
Plane
(Elevation,
Width, Lateral)

Front
Center
Back

Adult Echo

X8-2t

41Hz

6.0cm

Live 3D

2D / 3D

% 49 / 45

C 50 / 30

Pen

3D Beats 1

TISO.1 MI 0.2

M4

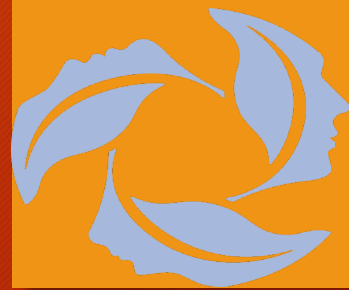
POST



PAT T: 37.0C
TEE T: 39.4C

65 bpm

AV LIVE 3D



Adult Echo

X8-2t

16Hz

6.0cm

Live 3D

2D / 3D

% 55 / 45

C 50 / 30

Pen

CF

% 51 / 50

5772Hz

WF 577Hz

4.4MHz

3D Beats 1

TISO.7 MI 0.3

M4 M4

+56.3

M4 M4

+56.3

M4 M4

+56.3

M4 M4

+56.3

M4 M4

+56.3

M4 M4

+56.3

M4 M4

+56.3

M4 M4

+56.3

M4 M4

+56.3

M4 M4

+56.3

M4 M4

+56.3

M4 M4

+56.3

M4 M4

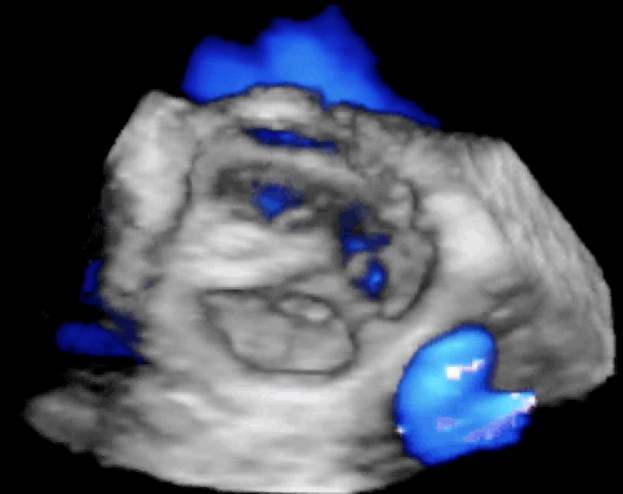
+56.3

M4 M4

+56.3

M4 M4

POST



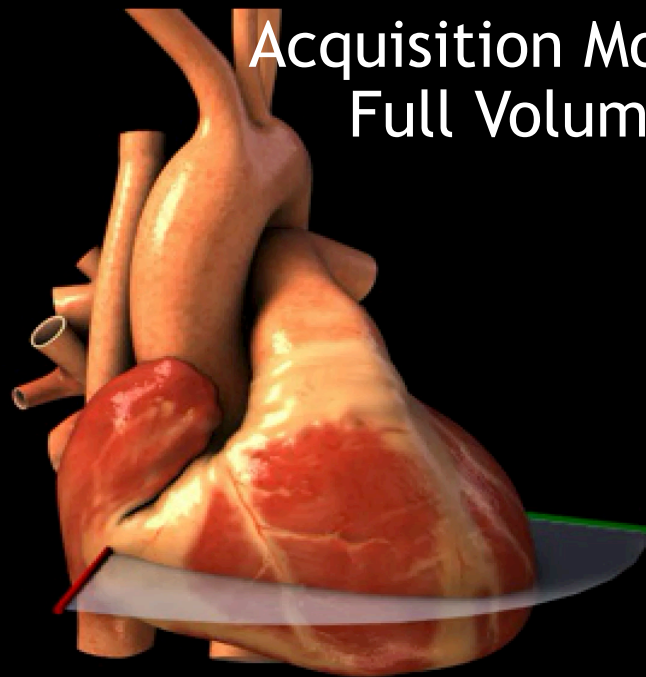
PAT T: 37.0C
TEE T: 39.5C

82 bpm





Acquisition Modes: Full Volume

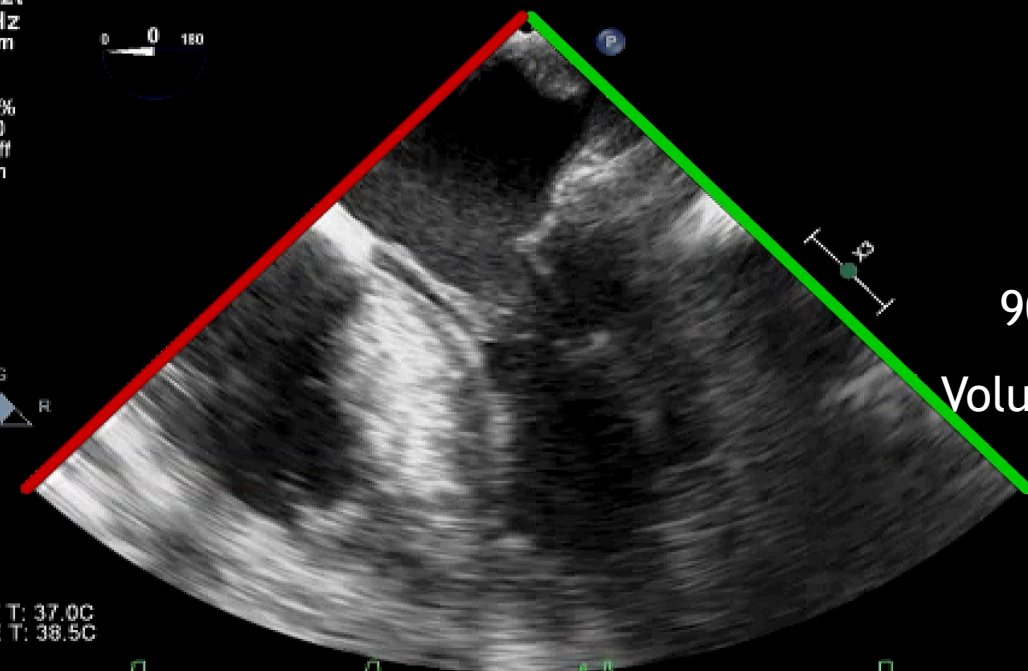


Adult Echo
X7-2t
53Hz
13cm

2D
62%
C 50
P Off
Gen

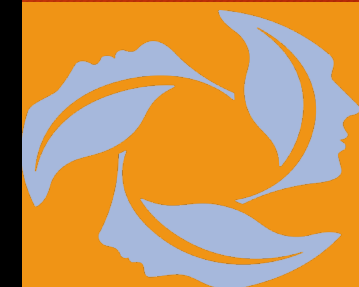


PAT T: 37.0C
TEE T: 38.5C



Size
90x90°

Volume Size



3D Opt:
Real Time
(1 Beat)

ECG Gated
(2-6 Beats)

Elevational
Width

Lateral
Width
(Max 120 °)

Acquisition Modes - Full Volume

The 'Full Volume' mode is commonly used in the assessment of large structures such as the ventricles.

To enter 'Full Volume' mode, the 'Full Volume' button (Show me) is pressed.

Next



Adult Echo
X7-2t
52Hz
13cm
Full Volume
2D / 3D
% 57 / 44
C 50 / 30
Gen

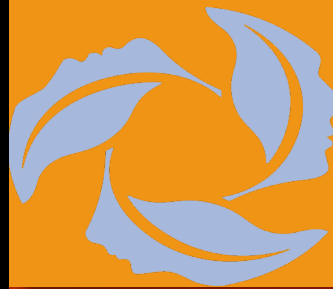
3D Beats 6Q

TISO.1 MI 0.3
M4

Adult Echo
X7-2t
52Hz
13cm
Full Volume
2D / 3D
% 53 / 44
C 50 / 30
Gen

3D Beats 6Q

TISO.1 MI 0.3
M4



PAT T: 37.0C
TEE T: 38.9C

Delay 0ms

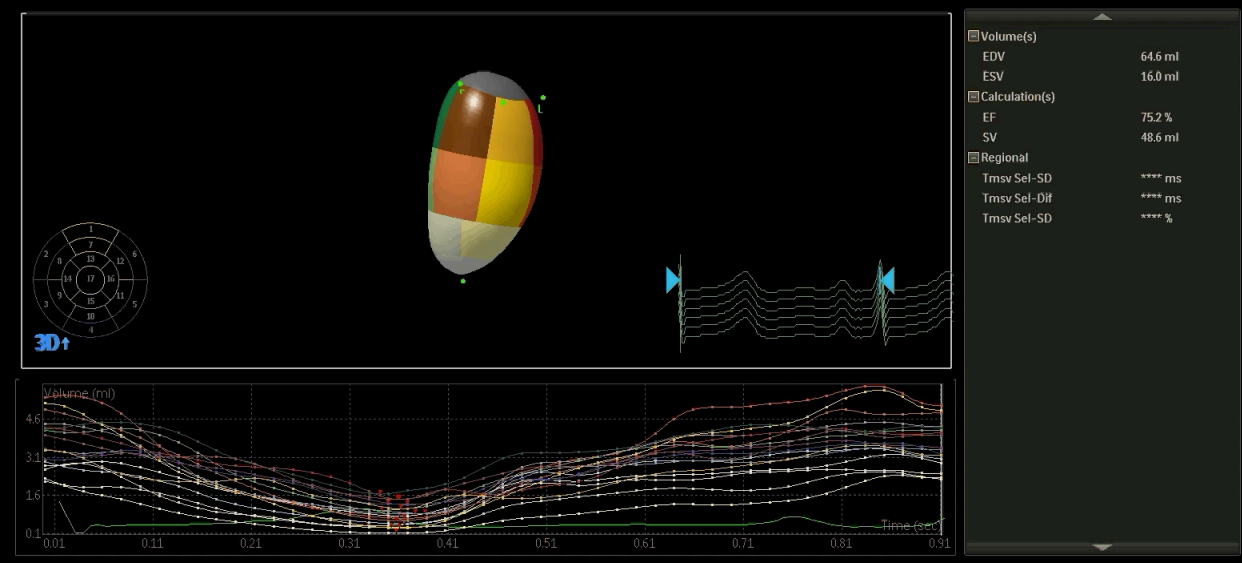
60 bpm

PAT T: 37.0C
TEE T: 39.2C

Delay 0ms

64 bpm

LV Full Volume





RV Full Volume

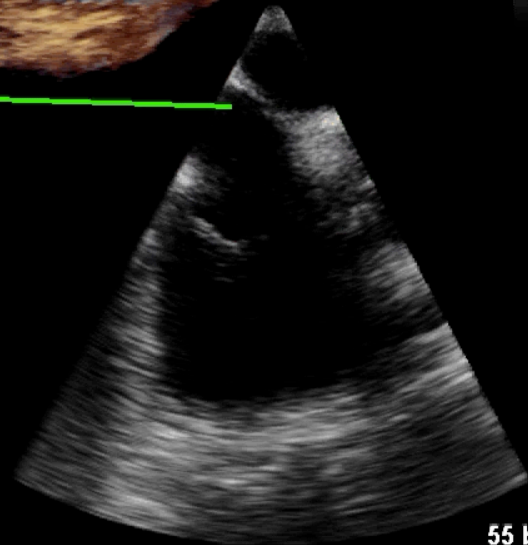
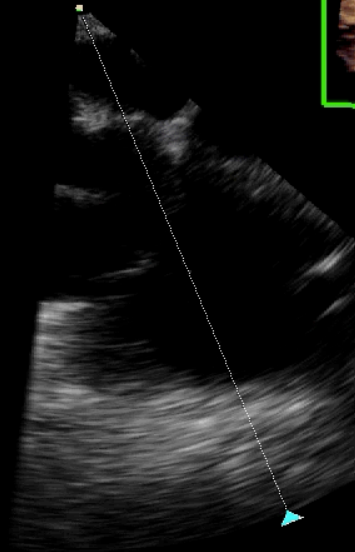
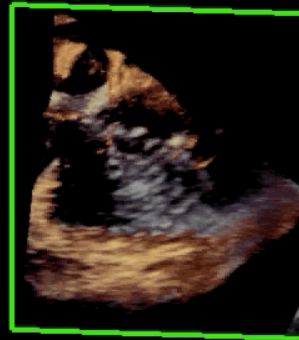
Adult Echo
X7-2t
58Hz
12cm

3D Beats 6Q

TISO.1 MI 0.3

M4

Full Volume
2D / 3D
% 57 / 44
C 50 / 30
Gen

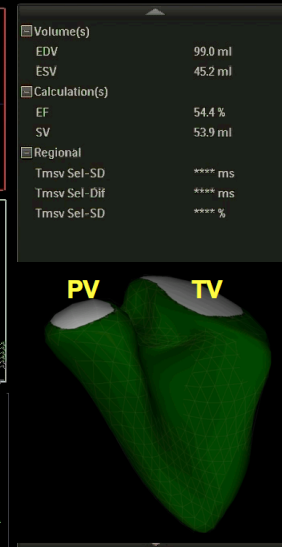
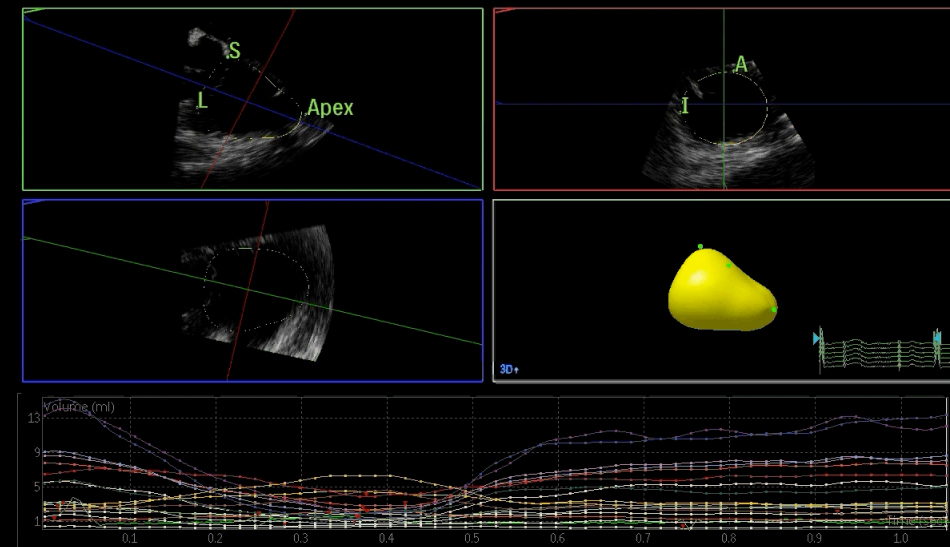
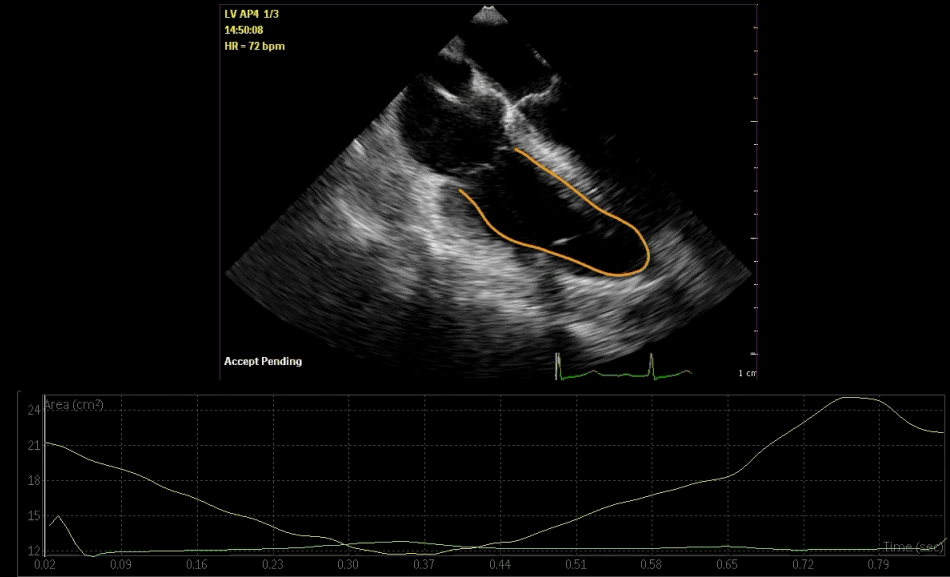


55 bpm

Delay 0ms

PAT T: 37.0C
TEE T: 39.2C

RV 3D EF 3D FAC



Adult Echo

X7-2t

68Hz

8.1cm

Full Volume

2D / 3D

% 39 / 44

C 50 / 30

Pen

3D Beats 6Q

TISO.1 MI 0.3

M4

Adult Echo

X7-2t

12Hz

8.1cm

Full Volume

2D / 3D

% 53 / 44

C 50 / 30

Pen

CF

% 48 / 50

5772Hz

WF 577Hz

4.4MHz

3D Beats 6

TISO.7 MI 0.3

M4 M4
+50.0

-50.0

PAT T: 37.0C
TEE T: 40.0C

Delay 0ms

75 bpm

PAT T: 37.0C
TEE T: 39.5C

Delay 0ms

75 bpm

Adult Echo

X7-2t

12Hz

8.1cm

Full Volume

2D / 3D

% 53 / 44

C 50 / 30

Pen

CF

% 48 / 50

5772Hz

WF 577Hz

4.4MHz

3D Beats 6

TISO.7 MI 0.3

M4 M4
+50.0

-50.0

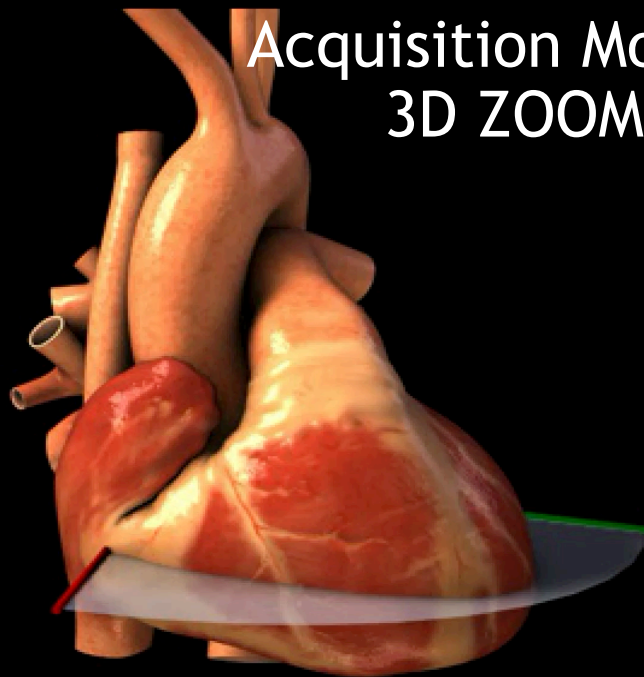
PAT T: 37.0C
TEE T: 39.5C

Delay 0ms

75 bpm

AV 3D Full Volume





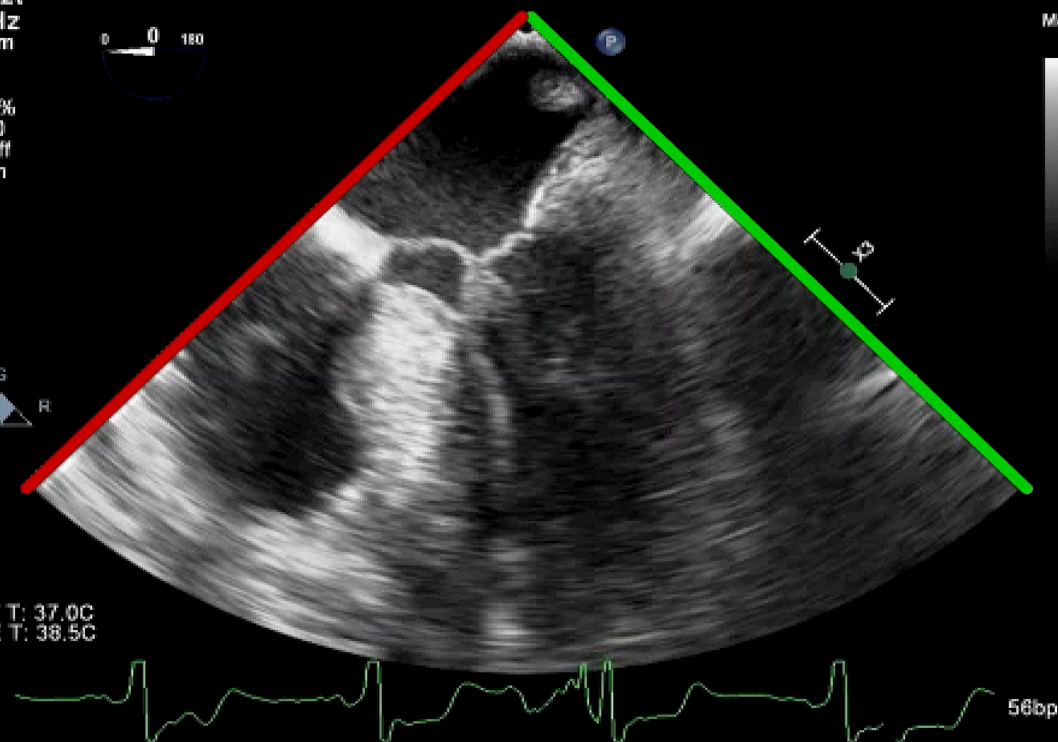
Acquisition Modes: 3D ZOOM

Adult Echo
X7-2t
53Hz
13cm

2D
62%
C 50
P Off
Gen



PAT T: 37.0C
TEE T: 38.5C



Acquisition Modes - 3D Zoom

The '3D Zoom' mode is commonly used for the assessment of individual valves and small structures.

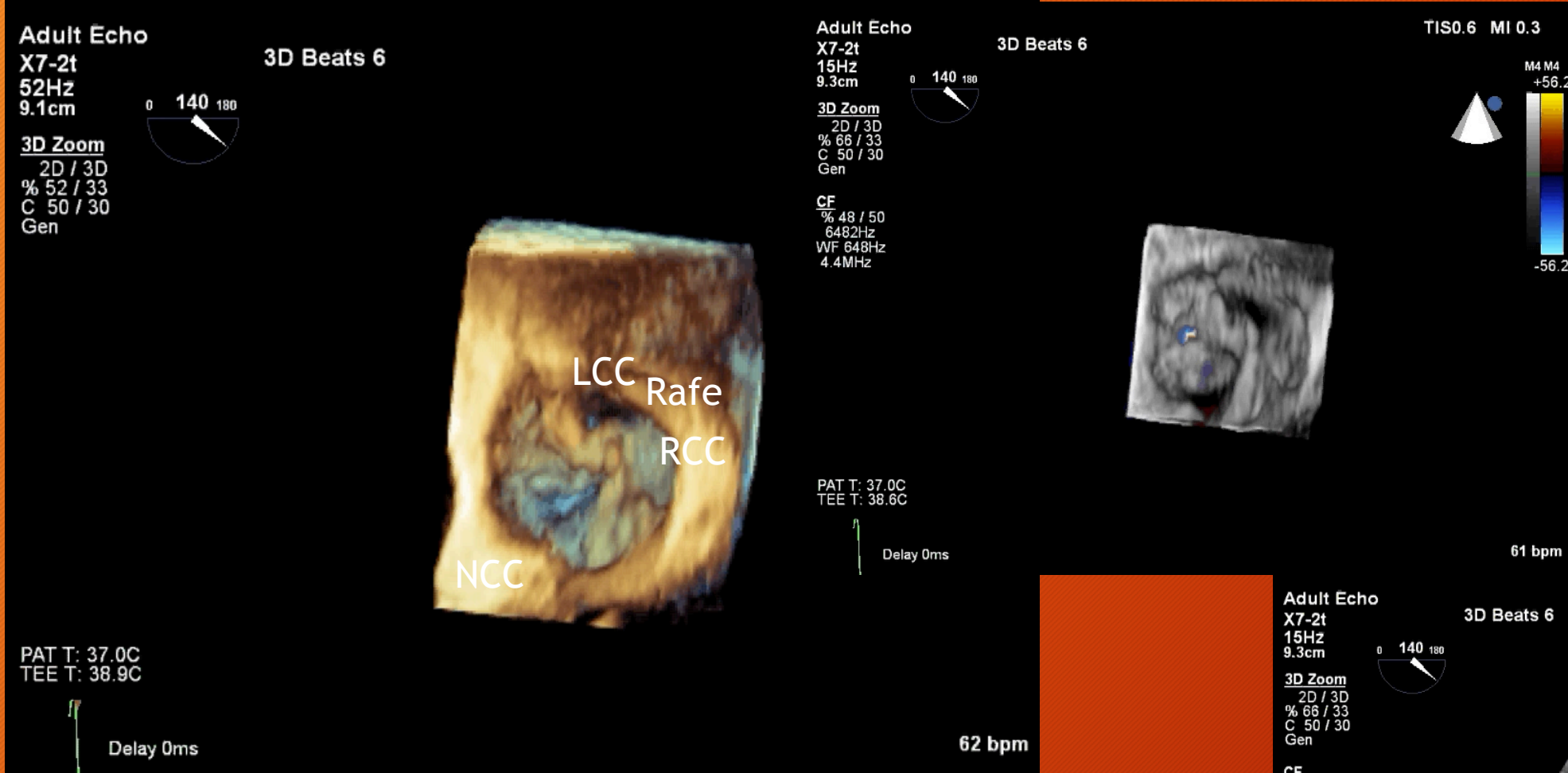
To begin '3D Zoom' acquisition the '3D Zoom' button (Show me) is pressed.

Next

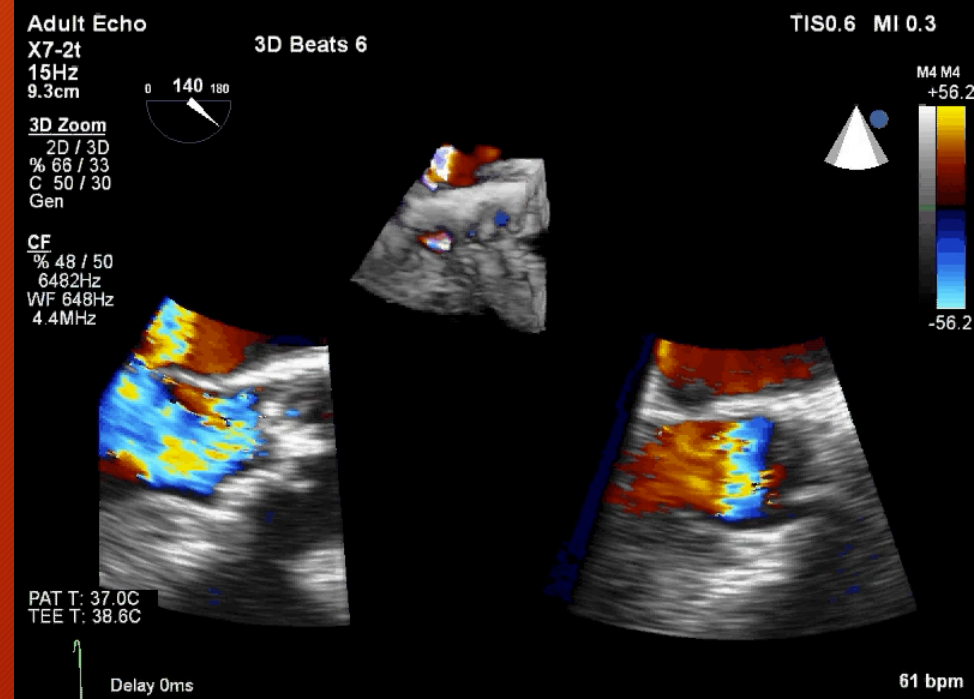


3D ZOOM

ROI
Position-Size



3D ZOOM AV BAV (RCC-LCC)





LV/RV ACQUISITION GE VIVID E9



3D TEE Acquisition - GE Vivid E9

The Vivid E9 Machine

1. Video Monitor
2. Touch screen (includes five knobs below the screen)
3. Control Panel



Continue

Start

1. Title (click to restart)

2. Navigation

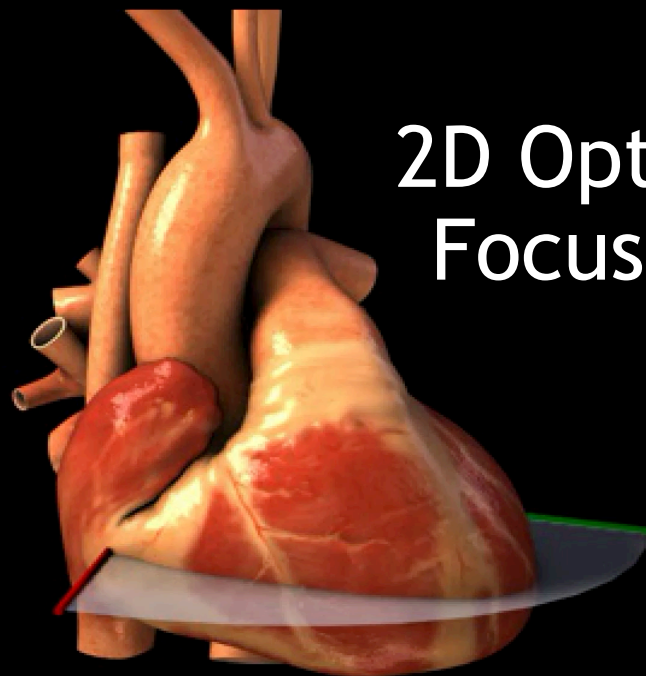
3. 3D model (shows ultrasound plane/volume)

4. Displays video monitor

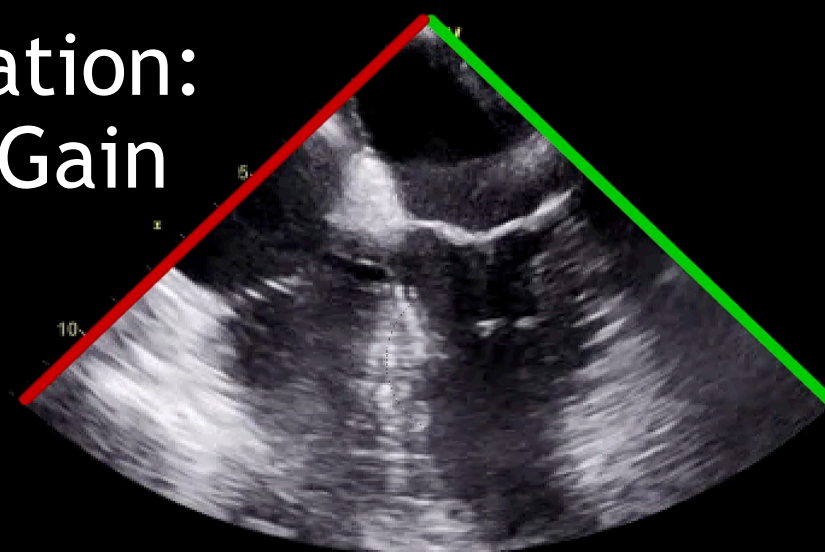
5. Control panels (alternates depending on what is currently being manipulated)

6. Text

Start



2D Optimization: Focus and Gain

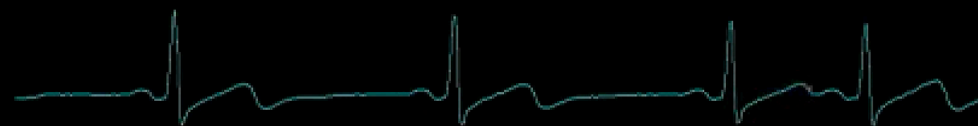


Tissue
Freq. 5.0 MHz
Proc. 10/50/0/2/0.7
Power -1 dB
FPS 46.7
Depth 12.0 cm



2D knob: Gain

Active Mode:
Characteristics
Of the surface



52
HR

2D Optimization - Set Focus

This module demonstrates the steps in acquiring a 3D volume from the GE Vivid E9 machine. Clicking the 'Next' button at the bottom of the screen will take you to each step in the module. You can also use the tabs at the top of the screen to go directly to any section.

The first step is to optimize the 2D TEE image by adjusting the focus of the 2D image. The focal point in the ultrasound plane provides the highest lateral resolution. The focus is adjusted using the focus knob (Show me) .

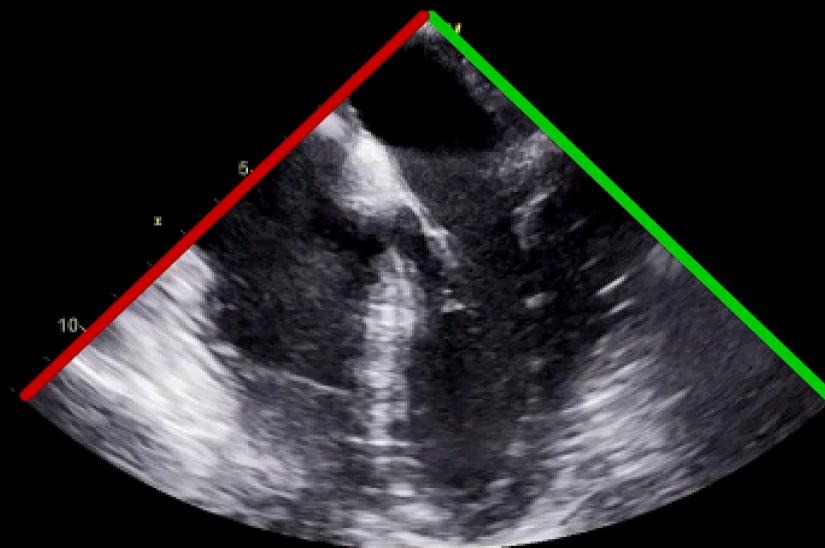
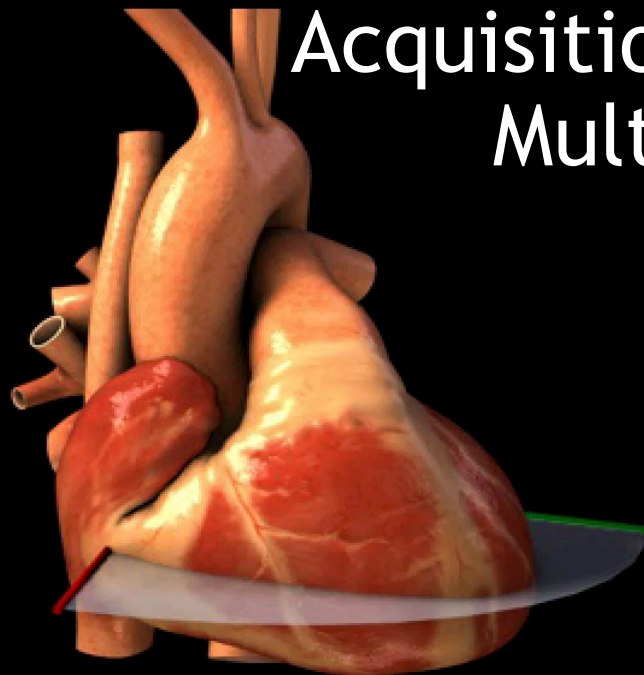
Next



Freq. 5.0 MHz
Proc. 10/50/0/2/0.7
Power -1 dB
FPS 46.7
Depth 12.0 cm



Acquisition Mode: Multi-D



Simultaneous Scanning

90 degrees to the primary plane

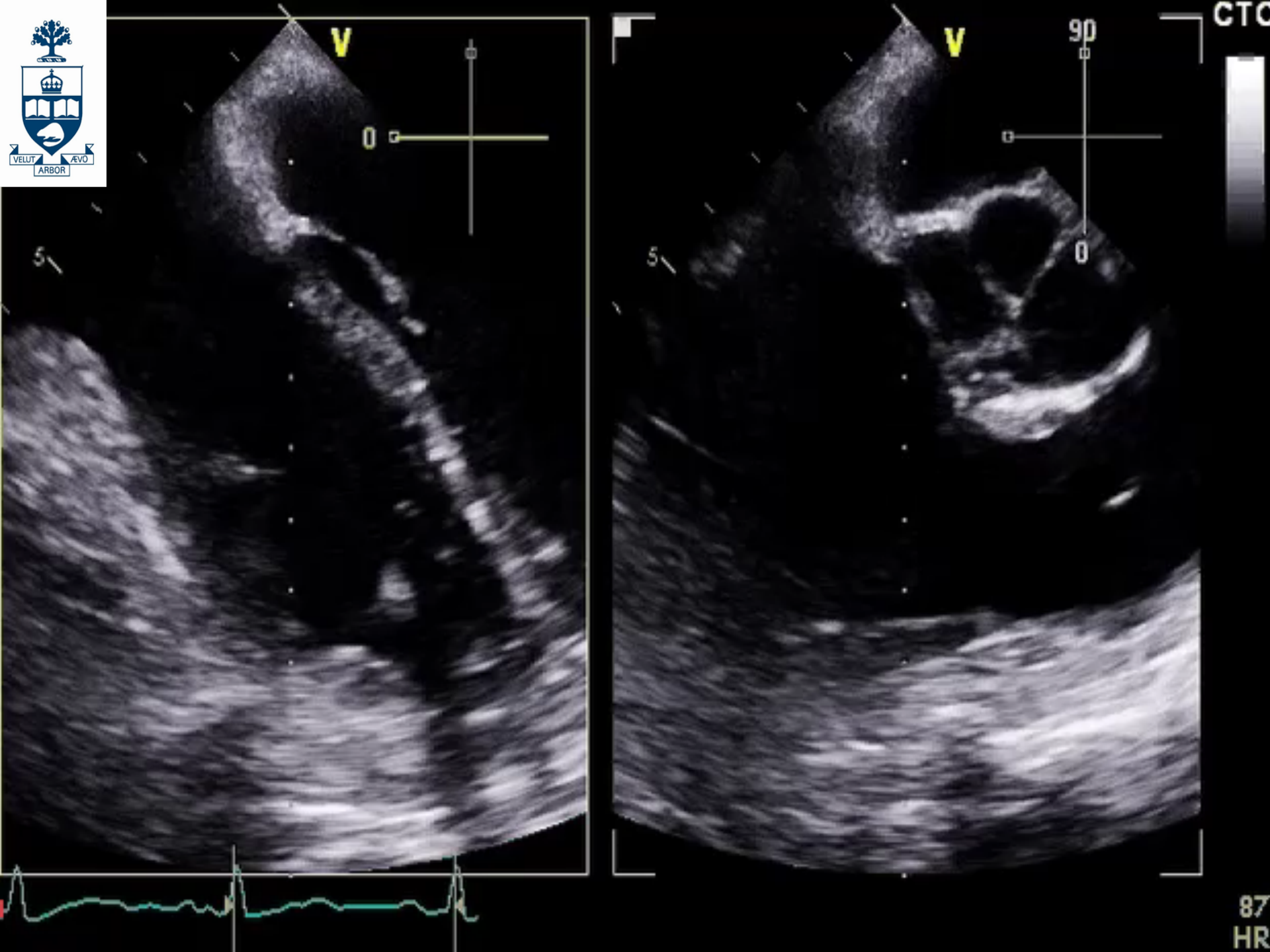
Acquisition Modes - Multi Dimension

The 'Multi Dimension' mode of acquisition allows the simultaneous scanning and display of multiple 2D planes.

To enter the Multi Dimension mode, press the 'Multi D' button on the control panel. (Show me) .



Next



RV
Modified 4CH
Multi-D

87
HR

Freq. 5.0 MHz
Proc. 10/50/0/2/0.7
Power -1 dB
FPS 46.7
Depth 12.0 cm

Small Size
10x50°

(Volume Size)

High
Spatial/Temporal
Resolution



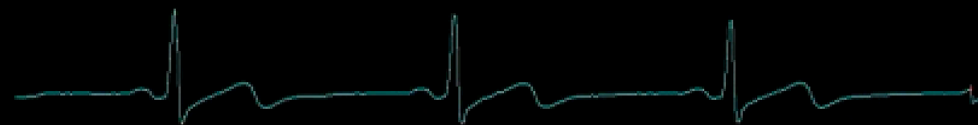
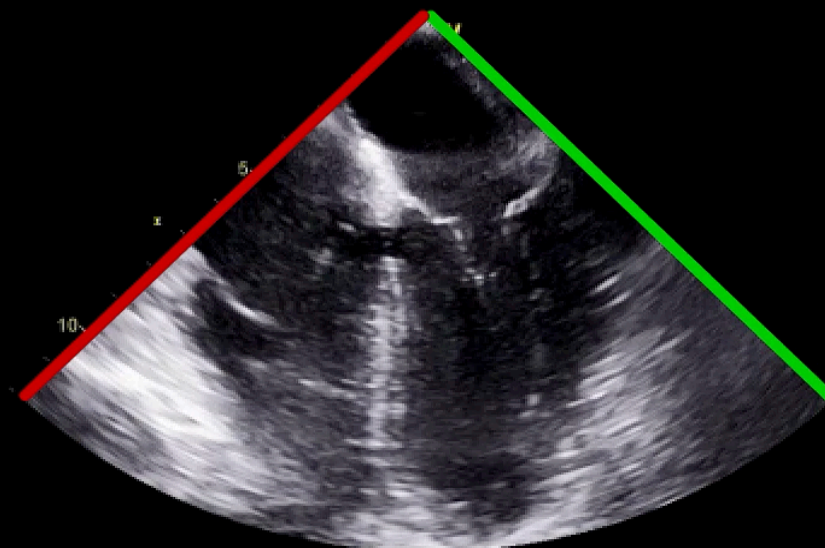
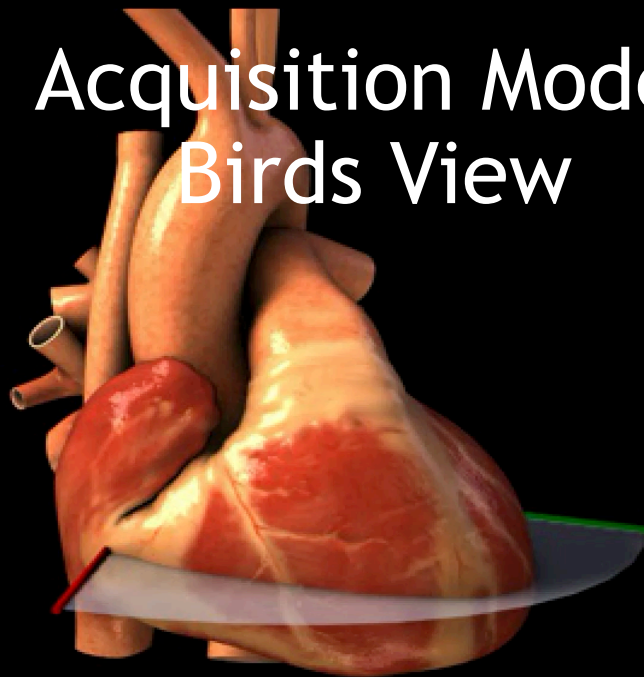
Real Time
(1 Beat)

ECG Gated
(2-6 Beats)

Elevational
Plane
(ElevationTilt)

Front
Center
Back

Acquisition Mode: Birds View



52
HR

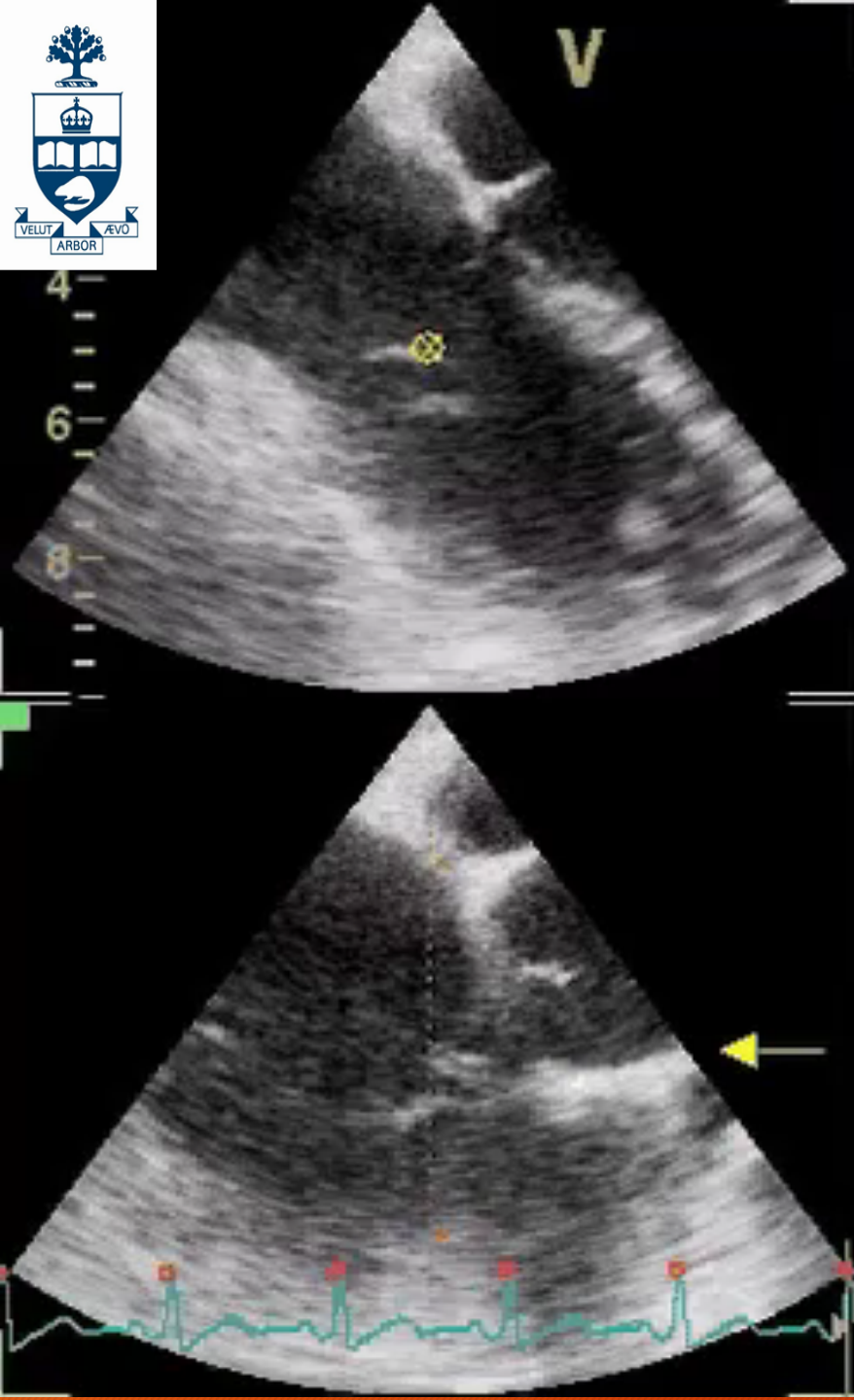
Acquisition Modes - Birds View

The 'Birds View' acquisition mode produces small size, 3D volumes allowing for high spatial and temporal resolution, although it may be insufficient to contain the entire structure of interest. This modality is often used as a 3D image test and to guide the placement of wires or devices.

To acquire a 3D volume using 'Birds View' the Birds View button (Show me) on the touch screen is pressed when in the 2D or 4D mode.

Next





Freq. 5.0 MHz
Proc. 10/50/0/2/0.7
Power -1 dB
FPS 46.7
Depth 12.0 cm

Medium Size
35x35°

Large Size
60x60°

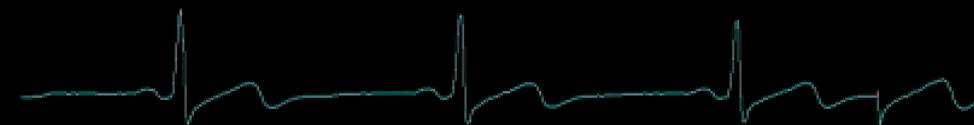
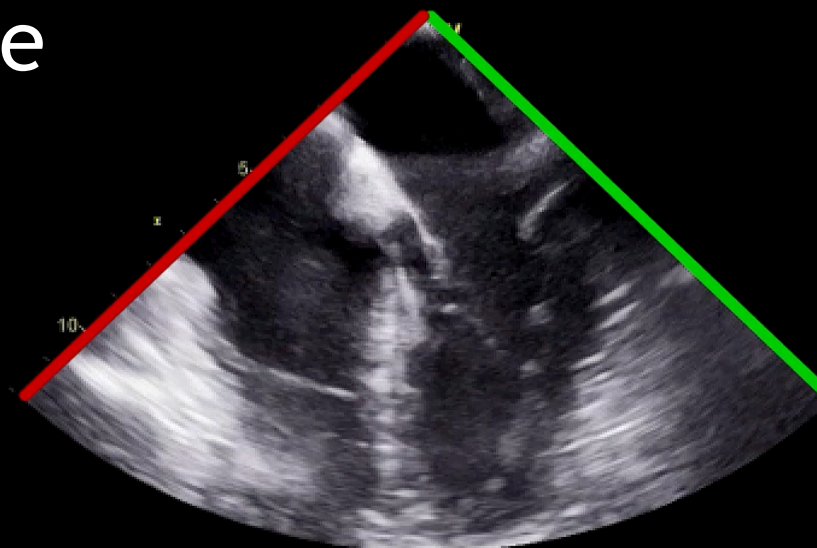
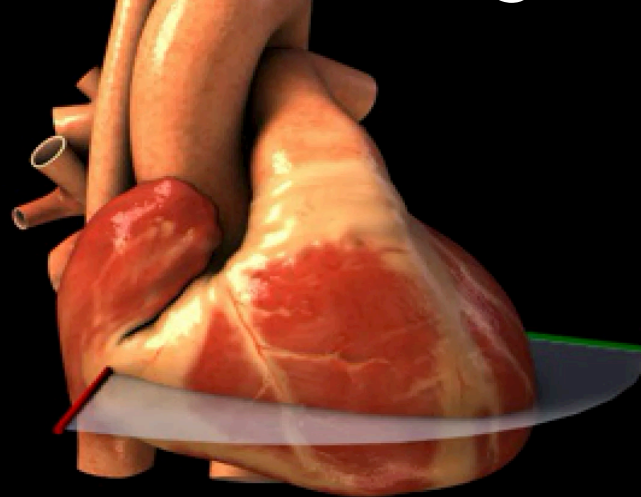
Volume Size



Real Time
(1 Beat)

ECG Gated
(2-6 Beats)

Acquisition Mode: Medium/Large Volume

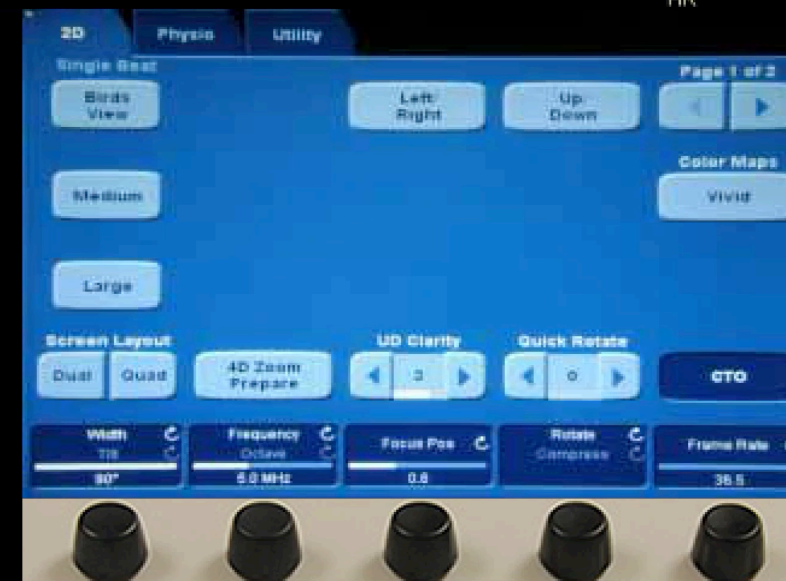


52
HR

Acquisition Modes - Medium/Large Volume

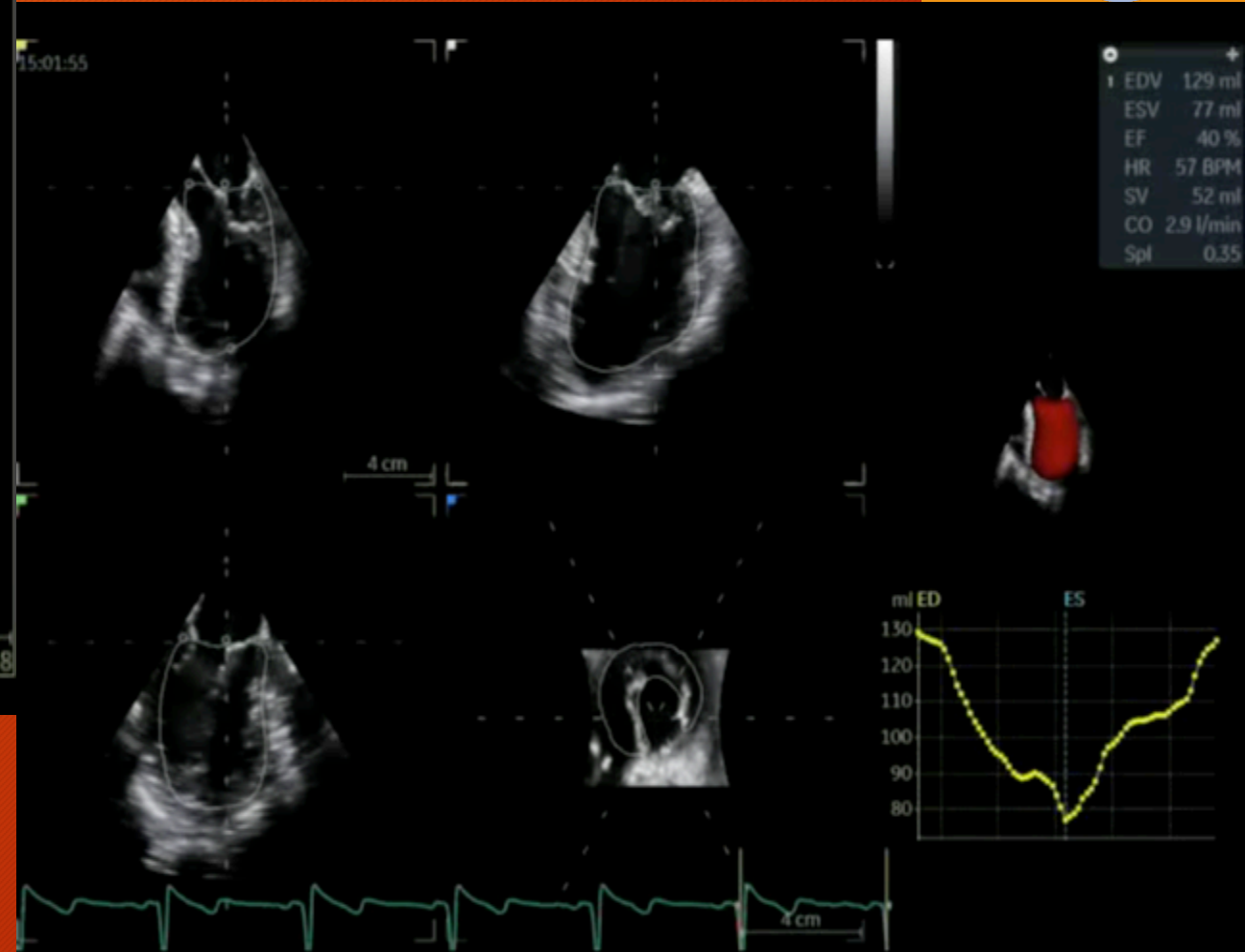
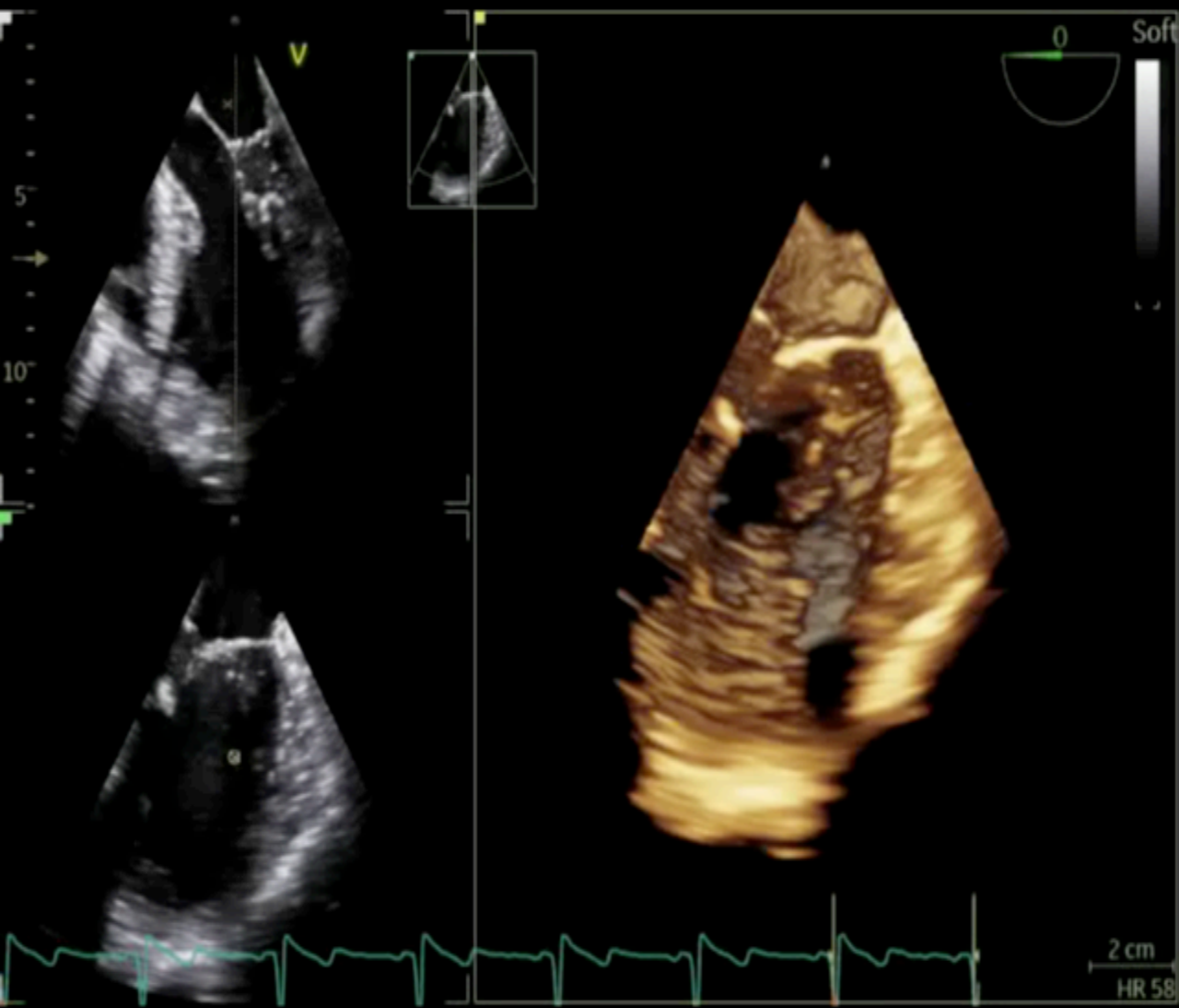
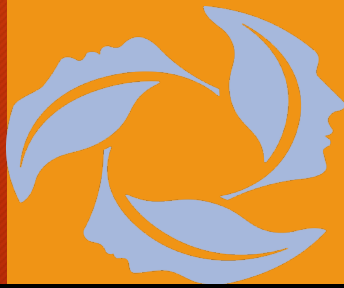
The 'Medium Volume' and the 'Large Volume' is used in assessment of larger structures such as the ventricles.

To enter 'Medium Volume' mode, the 'Medium' button is pressed. (Show me)



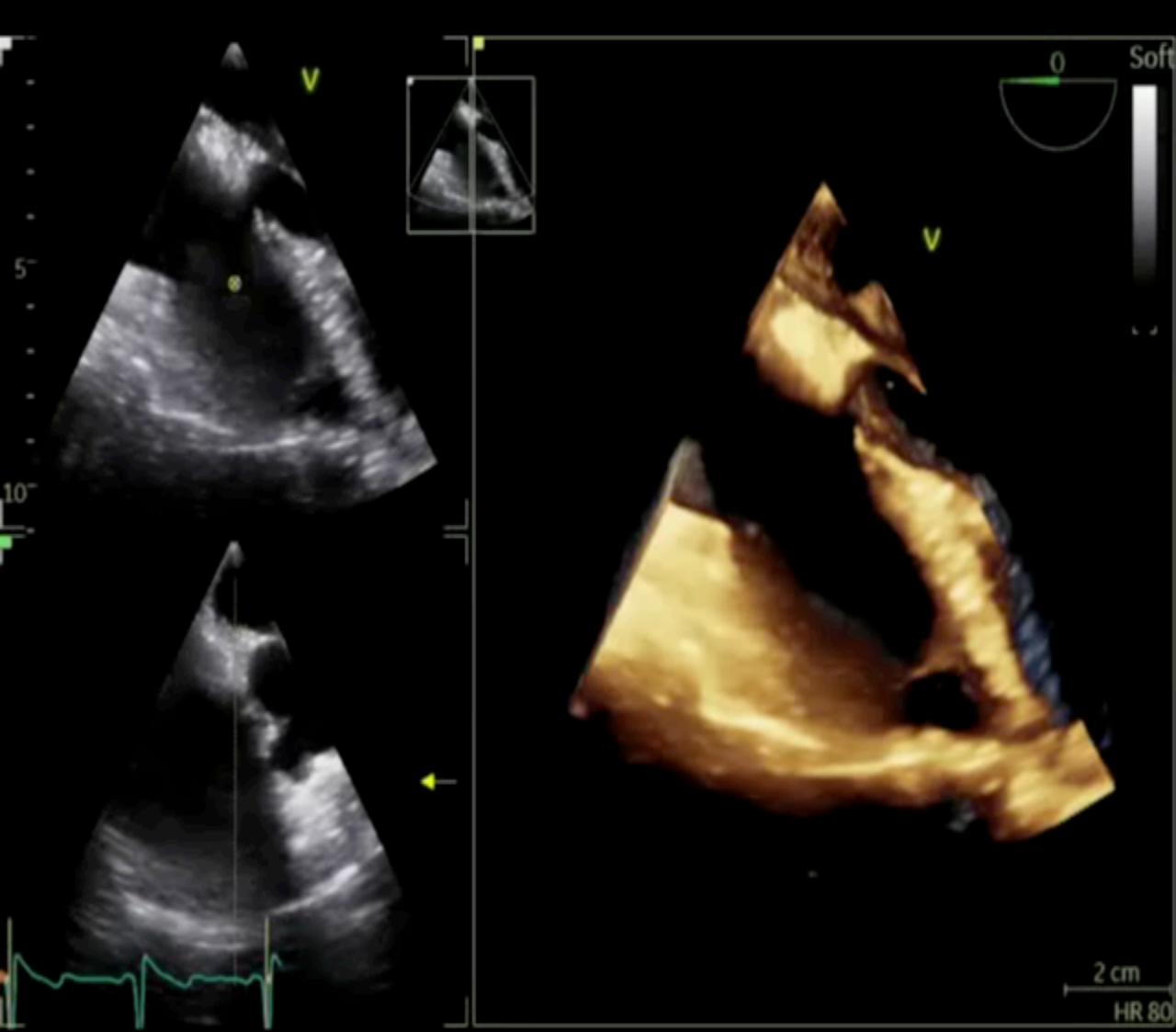
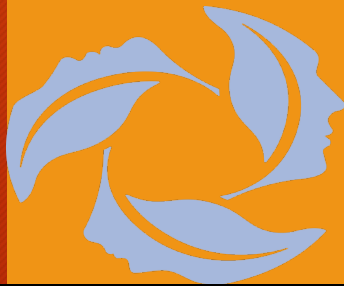
Next

GE LV LARGE VOLUME ACQUISITION

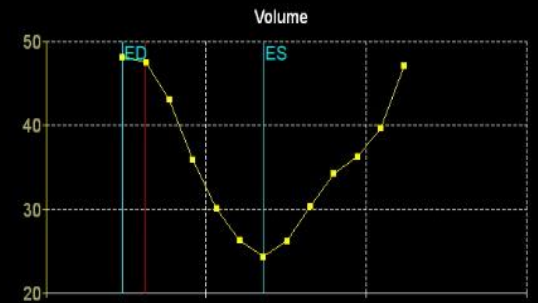


EDV	129 ml
ESV	77 ml
EF	40 %
HR	57 BPM
SV	52 ml
CO	2.9 l/min
Spl	0.35

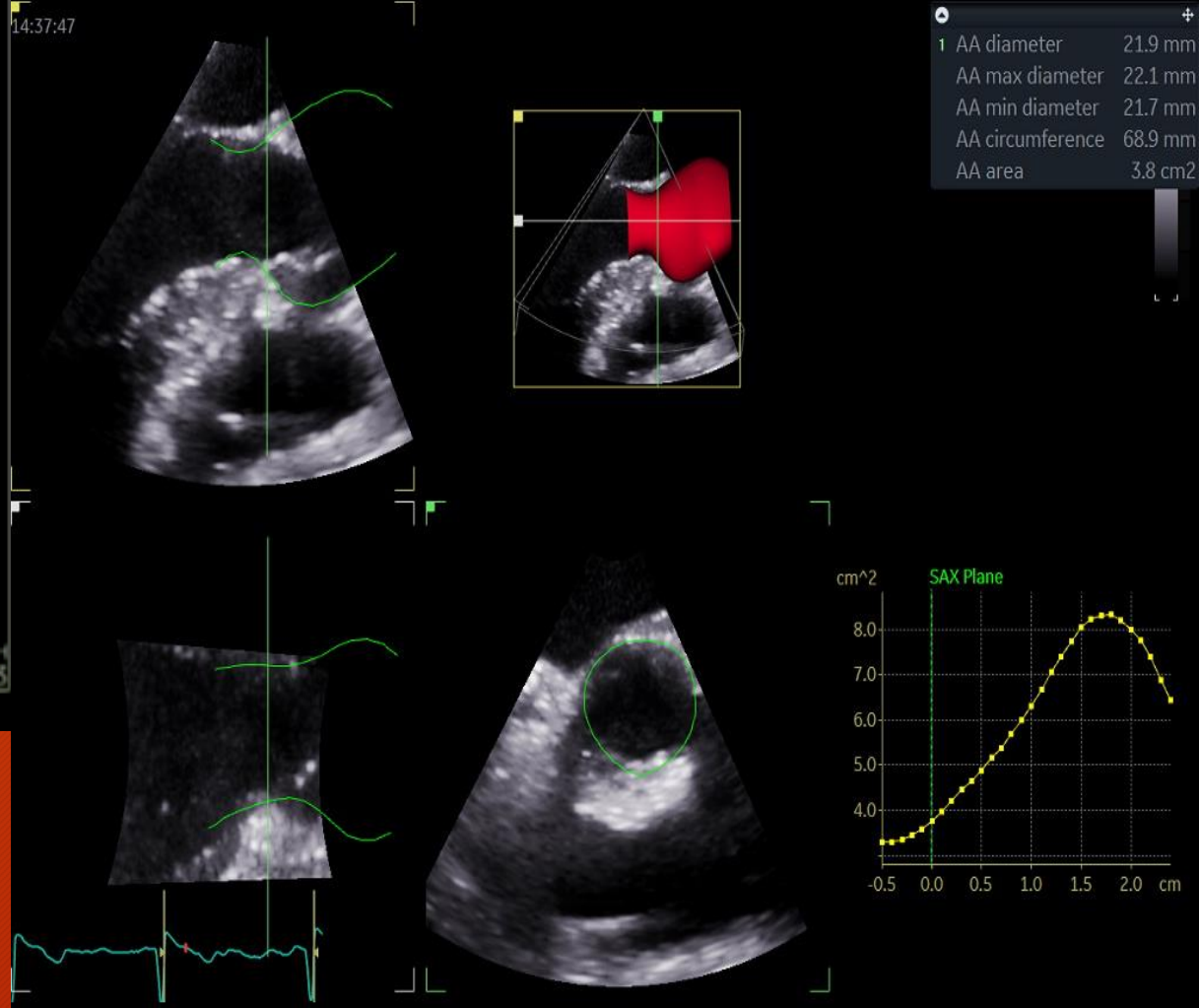
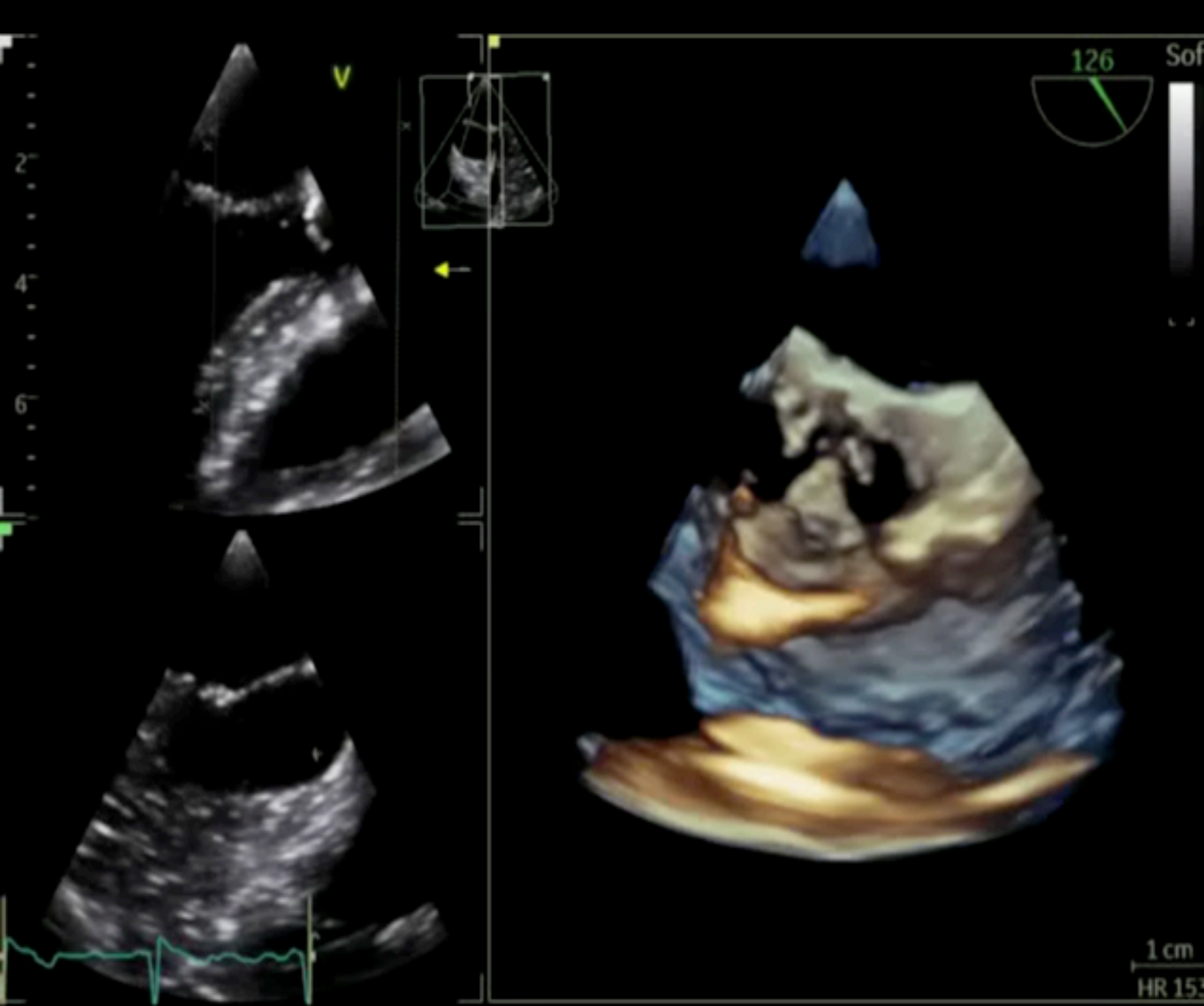
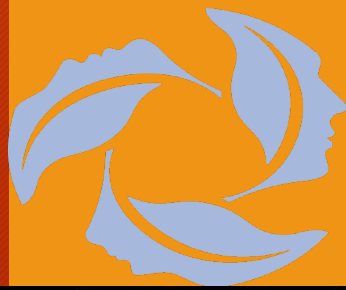
GE RV LARGE VOLUME ACQUISITION



Worksheet	
RV EDV	48 ml
RV ESV	24 ml
RV EF	49.4 %
RV SV	24 ml
RV Dd base	37 mm
RV Dd mid	38 mm
RV Ld	58 mm
TAPSE	20 mm
RV FAC	45.6 %



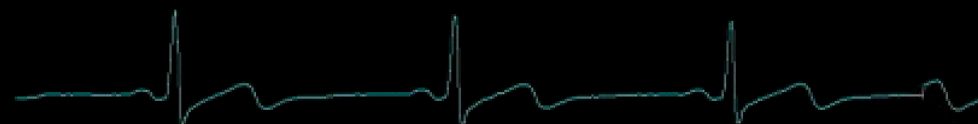
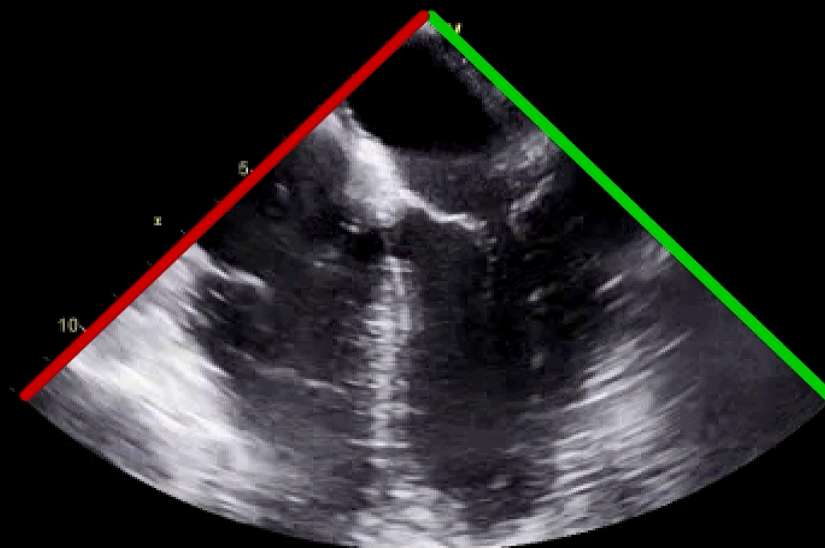
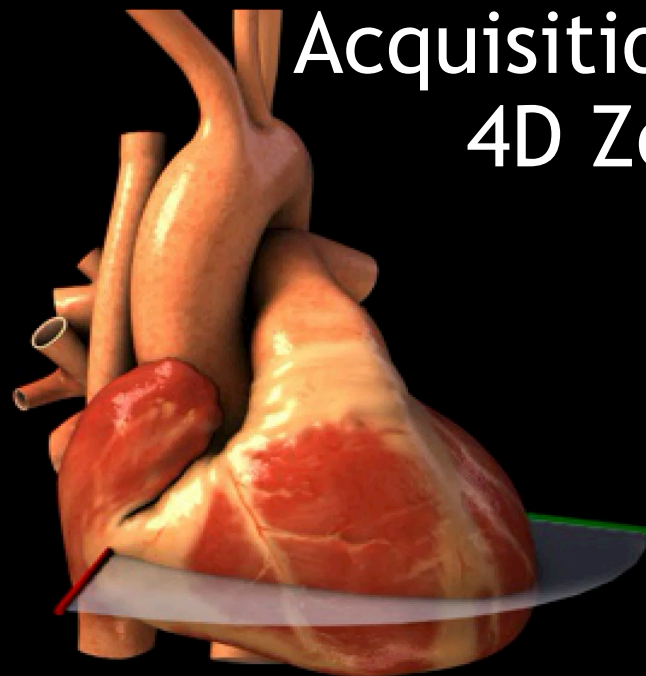
GE AV Medium Volume ACQUISITION



Freq. 5.0 MHz
Proc. 10/50/0/2/0.7
Power -1 dB
FPS 46.7
Depth 12.0 cm



Acquisition Mode: 4D Zoom



52
HR

Acquisition Modes - 4D Zoom Prepare

The '4D Zoom Prepare' mode is commonly used for the assessment of individual valves and small structures. It is also known as "flexizoom" and allows users to define a 3D block and orient it automatically to provide en-face views of specific structures (mitral valve, the aortic valve and the inter atrial septum).

To begin '4D Zoom Prepare' acquisition the '4D Zoom Prepare' button is pressed. (Show me)

Next

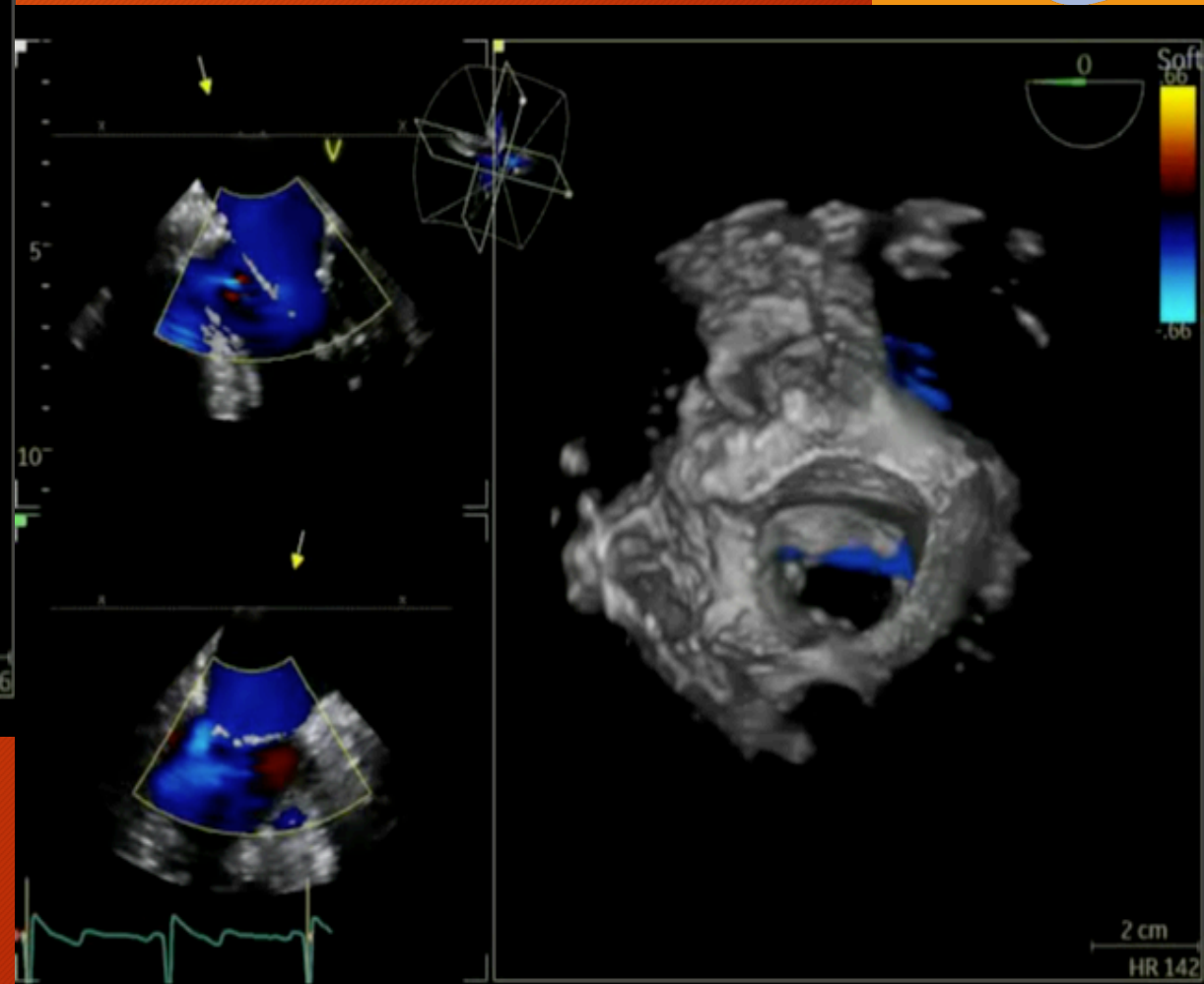
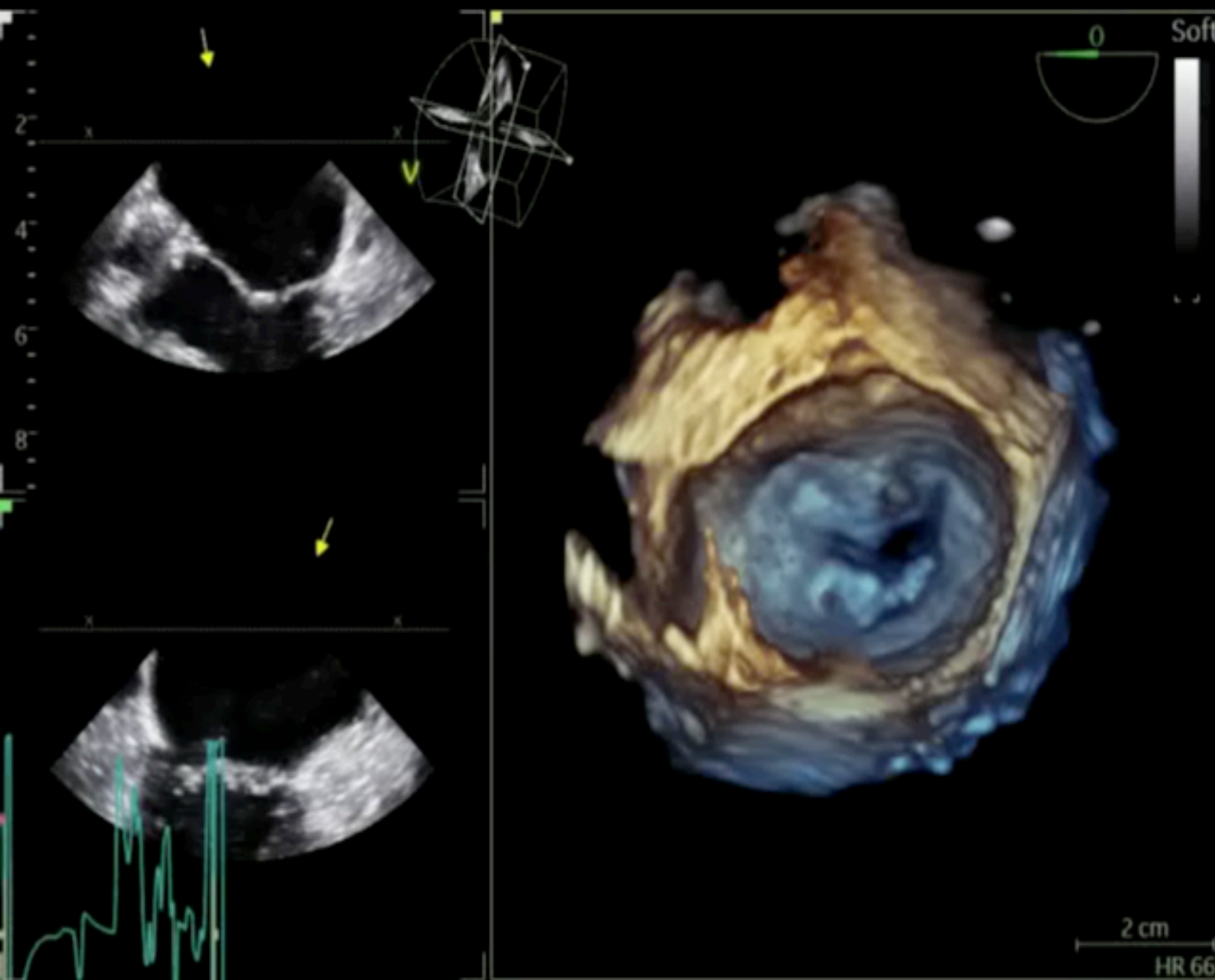


Zoom Prepare
or
Flexizoom

ROI
Position-Size

AV SAX/LAX
MV

GE MV 4D ZOOM ACQUISITION



Virtual Transesophageal
 Echocardiography

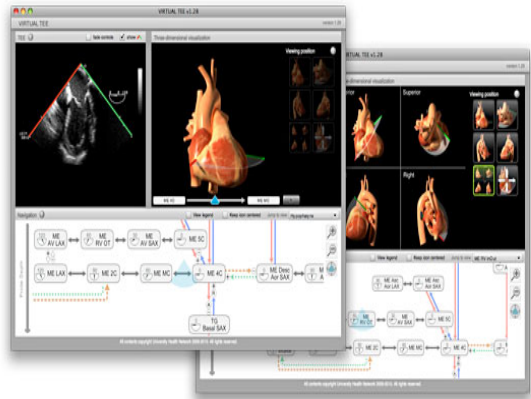
Toronto General Hospital Department of Anesthesia
 Perioperative Interactive Education

Peter Munk
 Cardiac Centre UHN

Site Menu

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- Assessment of Cardiac Valves
- Colour Doppler
- Pathology
- Spectral Doppler
- Standard Views
- TEE Exam Study Notes
- TEE Handbooks
- TEE Simulation
- Virtual TEE

VIRTUAL TEE



[Click here to open the VIRTUAL TEE application.](#)

Other PIE sites

External Links



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