Imaging Planning for Device Type and Size Selection

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20 min

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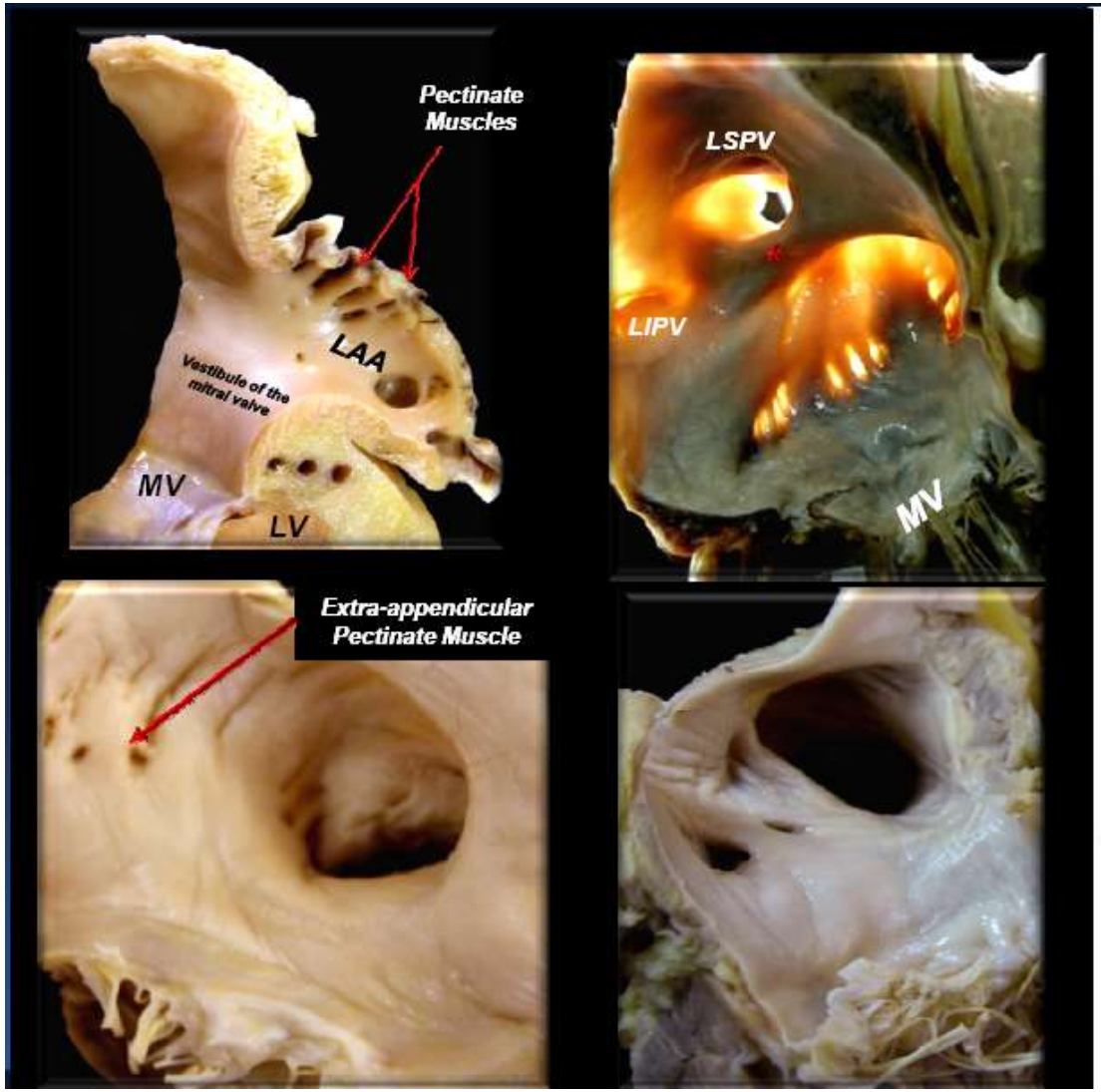
Disclosure

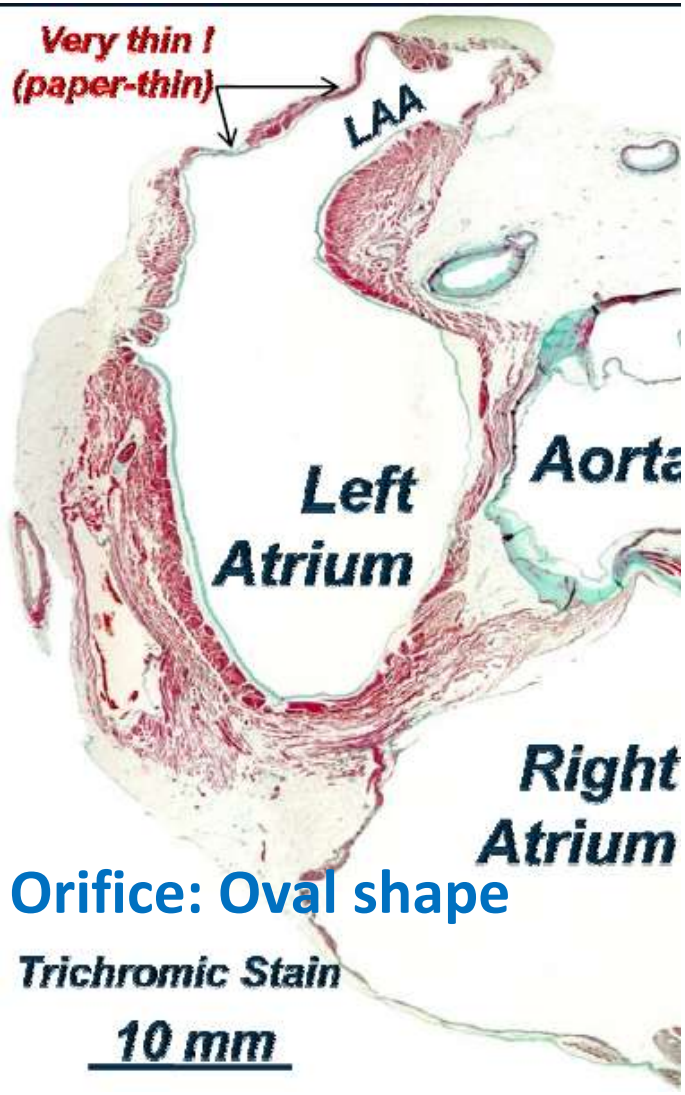
- **Relationships with commercial interests:**

- **Support/Consultant:** ACP and Amulet Proctor of Abbott

- **Speaker's Bureau:** Abbott

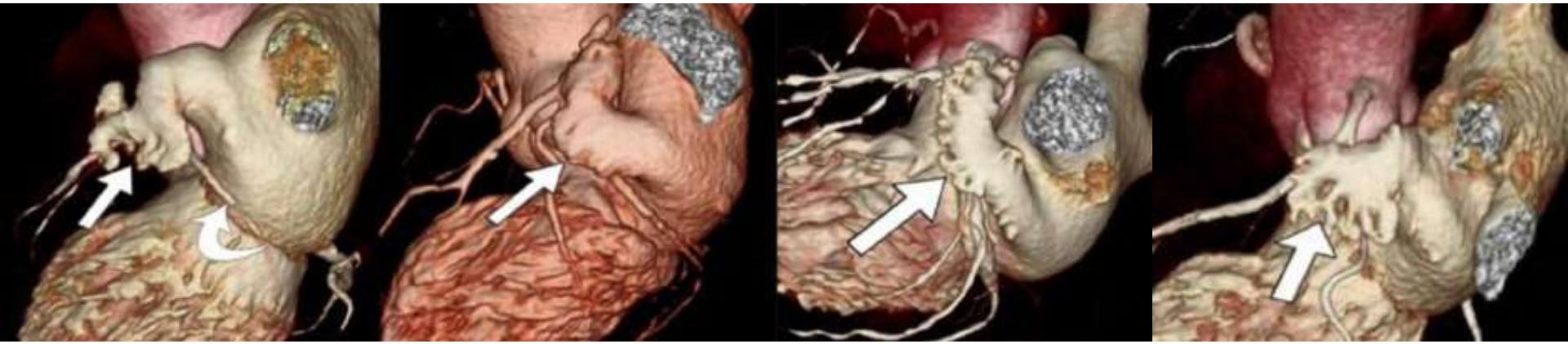
Distal LAA is very thin structure easily to perforate



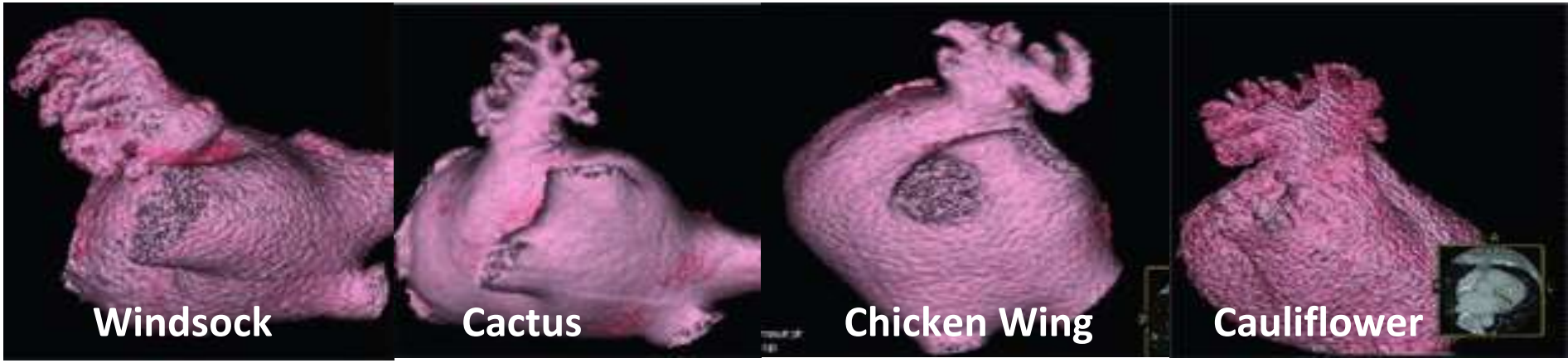


Courtesy Slide of Prof. D. Sanchez Quintana

LAA Shape by Cardiac CT



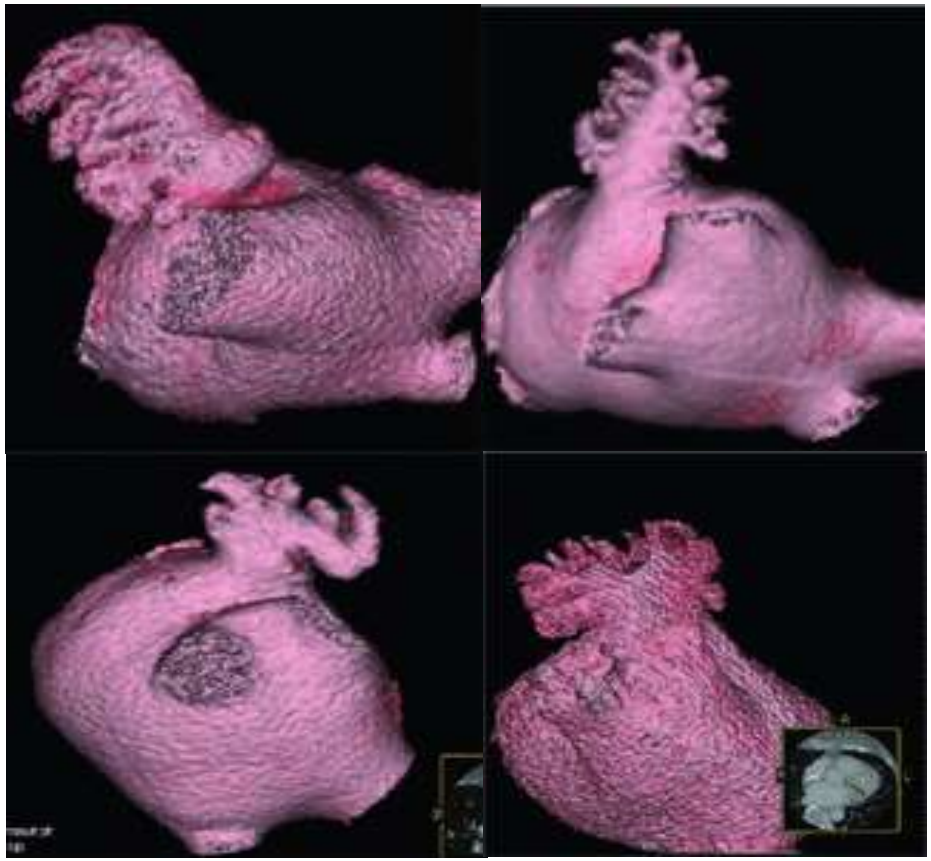
Volume rendering is VERY USEFUL to determine LAA Morphology!



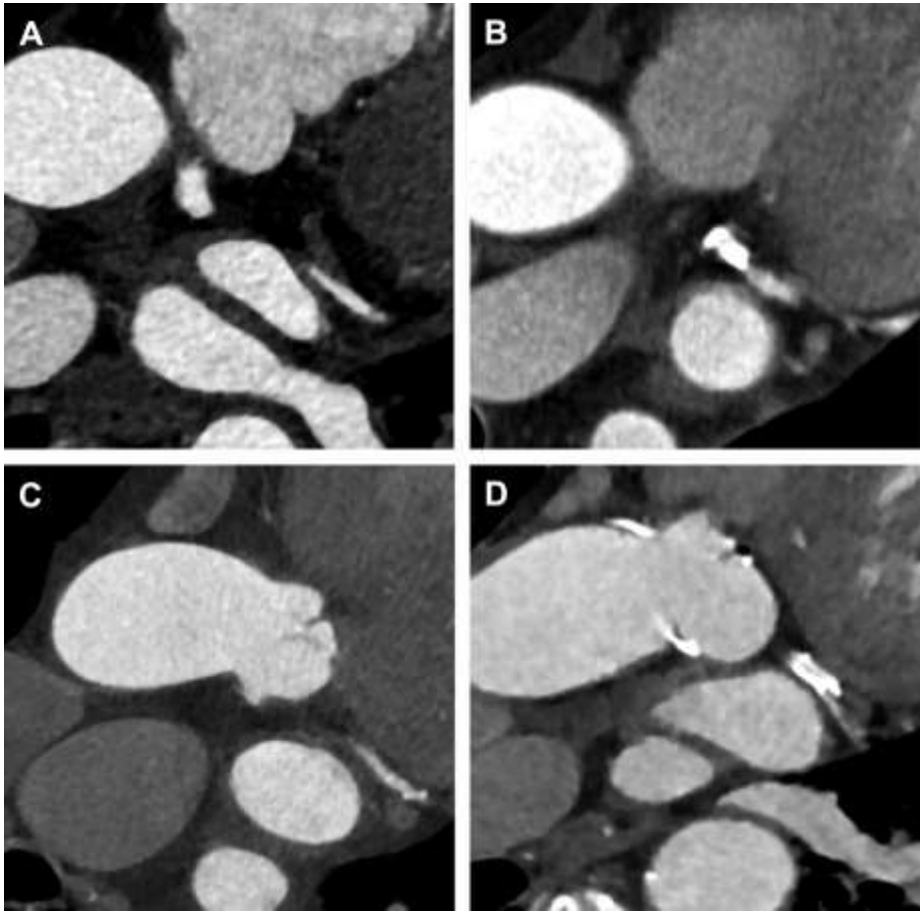
Patti G, et al., *EHJ* 2016

LAA Morphology

3D LAA Morphology



Shape of LAA Oriface



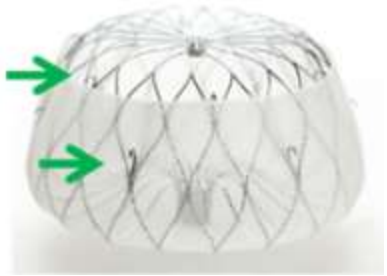
Korsholm K, et al. Intervent Cardiol Clinc 2018:229–242

Selection of Devices

WATCHMAN® System (Boston Scientific)

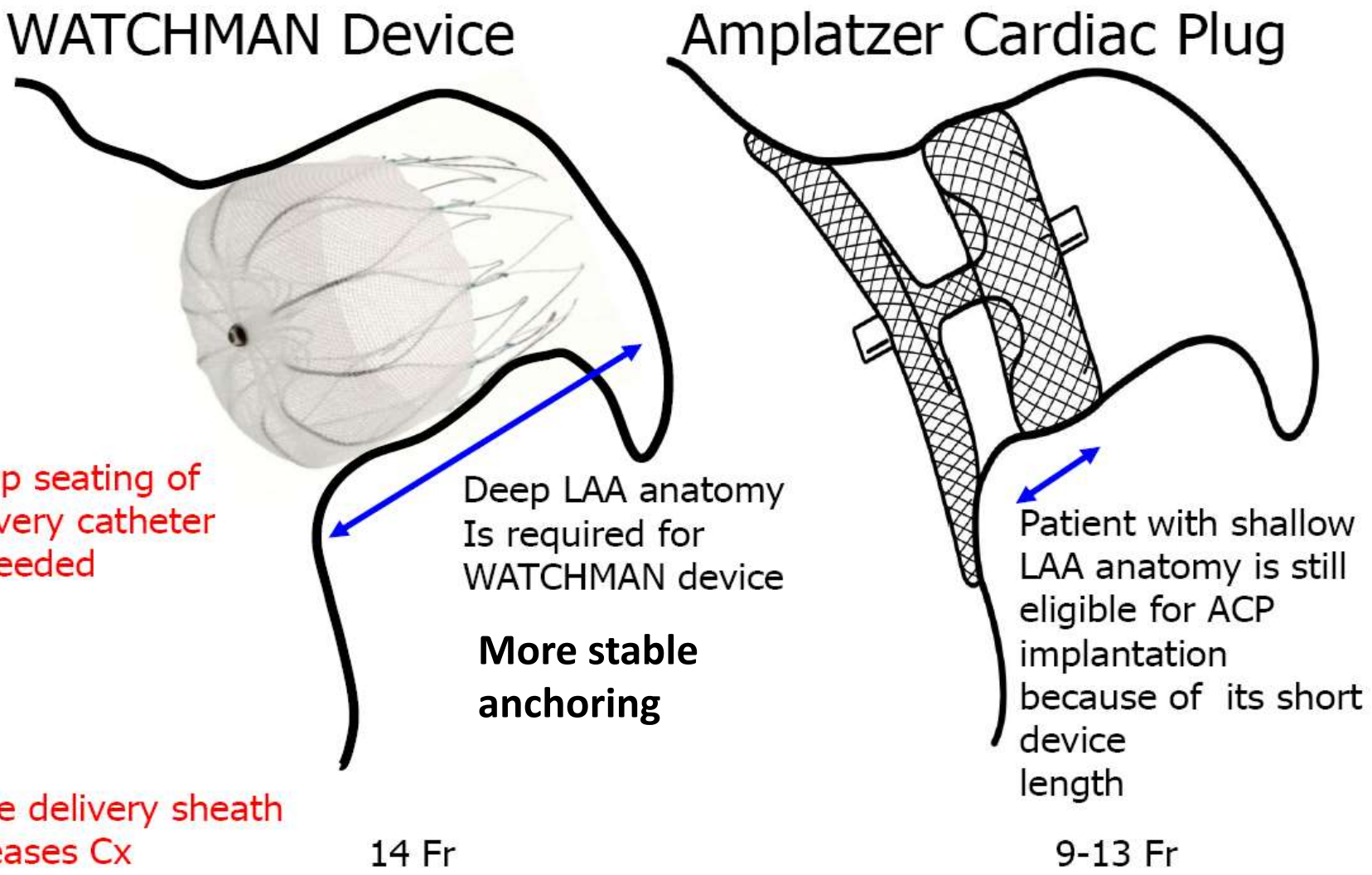
Amplatzer Cardiac Plug and Amulet (Abbott)

Next generation devices are just around the corner.
WATCHMAN FLX, WAVECREST, LAMBRE, and OCCLUTECH



Device Design – Watchman and ACP

Different Feature



Modified with Lam YY, et al. Catheter Cardiovasc Interv 2012;79:794-800

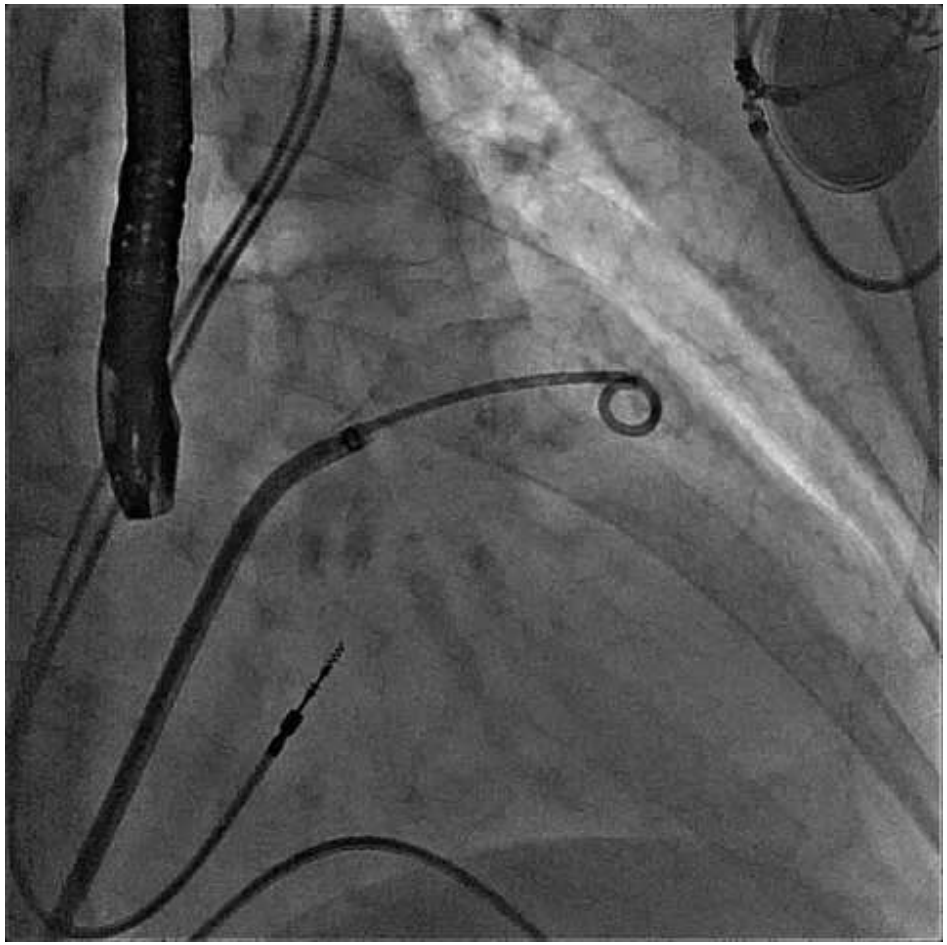
Measure Landing Zone

- Check if LA Pressure is ≥ 10 mmHg
- Although angiographic assessments are slightly larger than TEE, both assessments should be consistent within 2 mm. If not, check the calibration error in angiography.
- Personally, TEE measurement may be more reliable.
- Device selected will be 10-20 % greater than measurement.

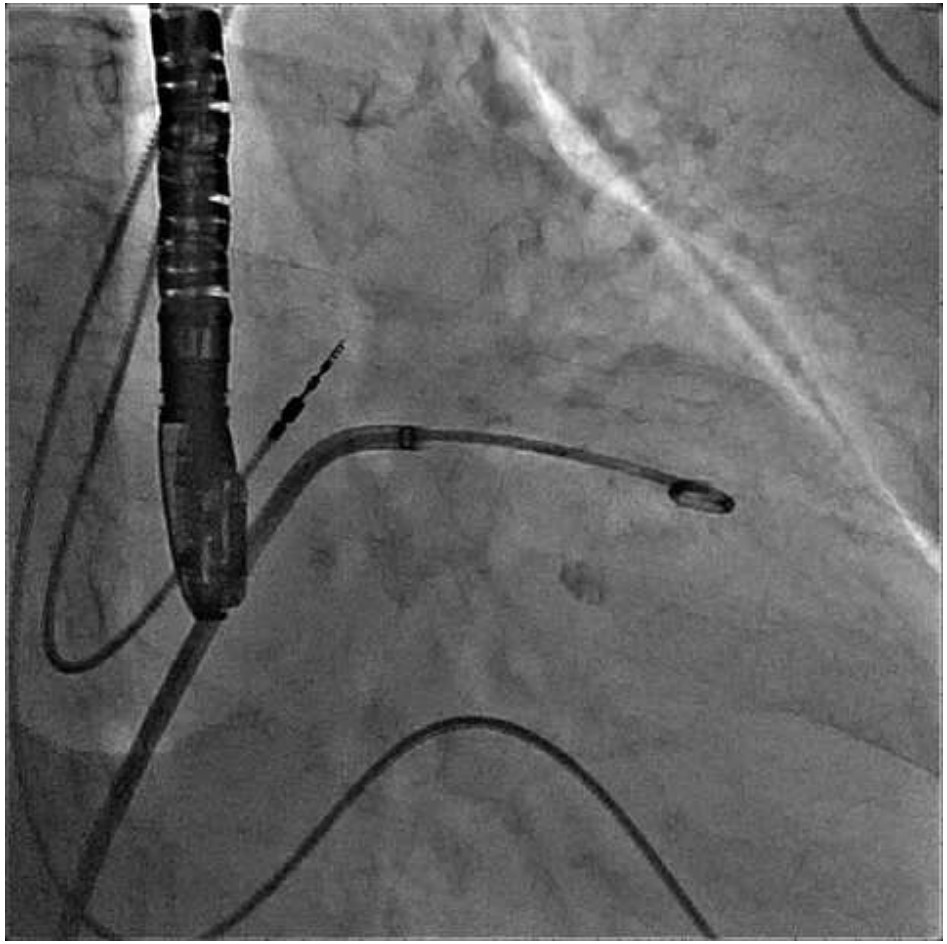
Angiography of the LAA

Same Step

- **Expected landing zone**
  - Approximate 10 mm inside the orifice (projected line)
  - The transverse axis of the ACP lob should be perpendicular to the axis of the neck **(Blue)**



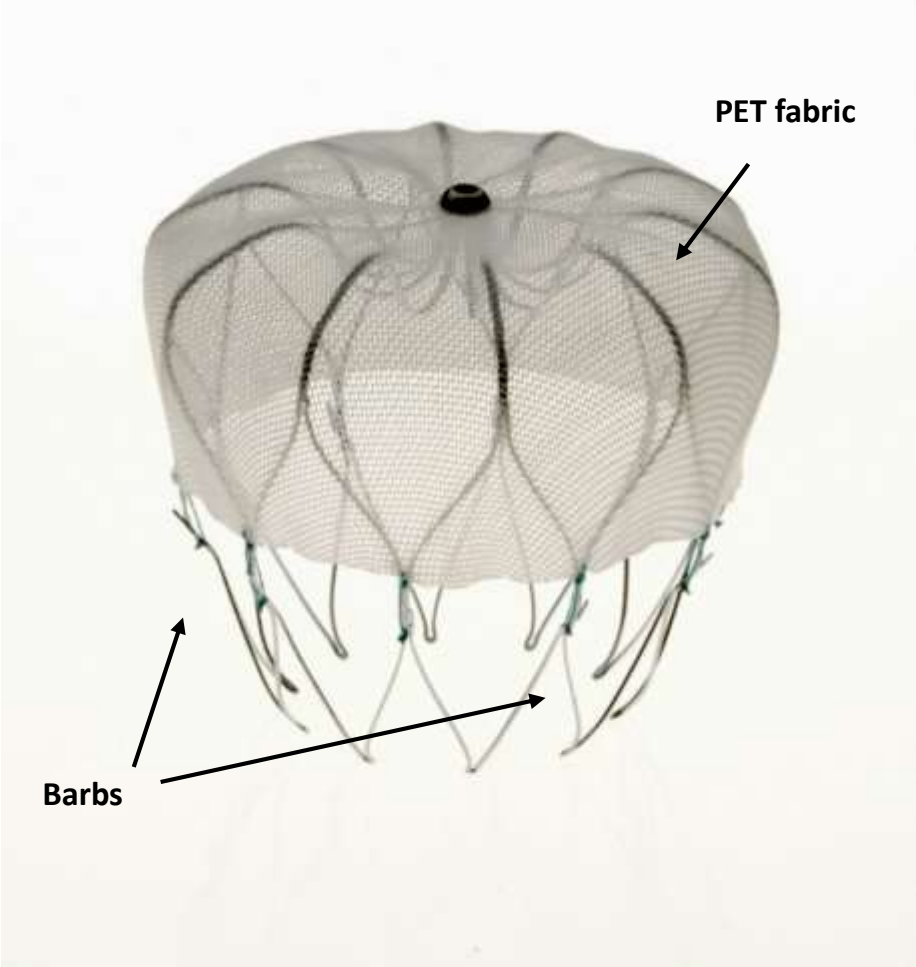
RAO 30 CRA 20



RAO 30 CAU 20

Watchman

WATCHMAN LAA Closure System Components



Frame: Nitinol structure

- Available sizes: **21, 24, 27, 30, 33 mm (diameter)**
- 10 Fixation barbs around device perimeter engage LAA tissue
- Contour shape accommodates most LAA anatomy

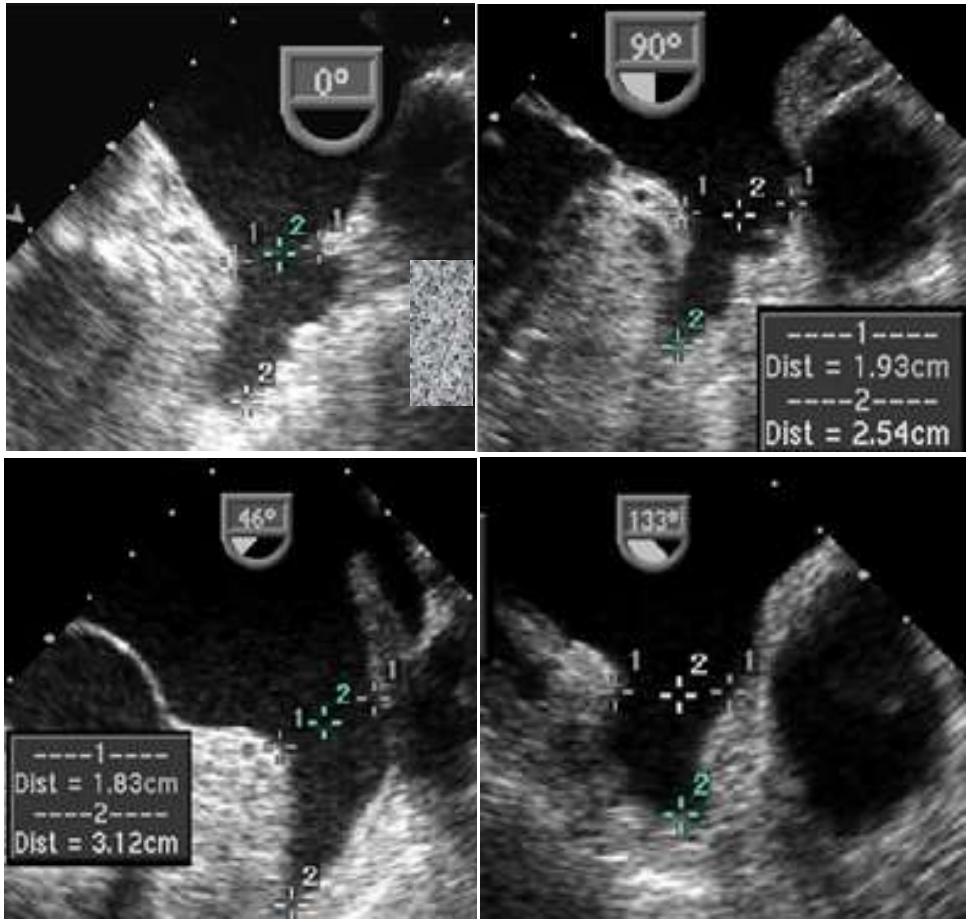
Fabric Cap: (PET) Fabric Polyethyl terephthalate

- Prevents harmful emboli from exiting during the healing process
- 160 micron filter

LAA Sizing for Watchman Device

Watchman

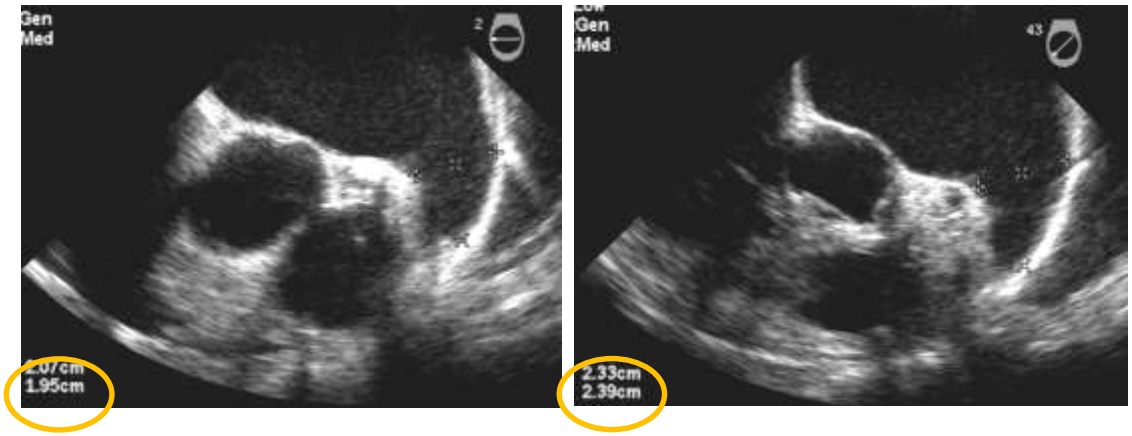
- **Confirm the absence of LA/LAA thrombus**
- Measure LAA ostium in at least 4 TEE views
- At **0 deg** *(from left coronary artery to a point 2 cm from tip of the LUPV limbus)*
- At **45, 90, 135 deg** *(from the top of the MV annulus to a point 2 cm from tip of the LUPV limbus)*
- Measure the approximate **LAA usuable length** from the ostium line to the apex of the LAA



Determine proper device selection

Watchman

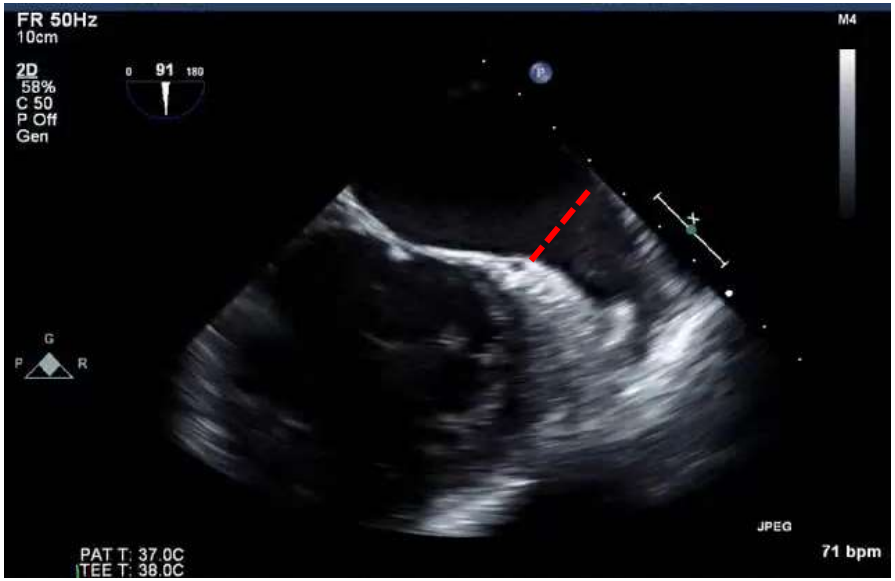
Maximum LAA Ostium (mm)	Device Size (mm) *(uncompressed diameter)*
17-19	21
20-22	24
23-25	27
26-28	30
29-31	33

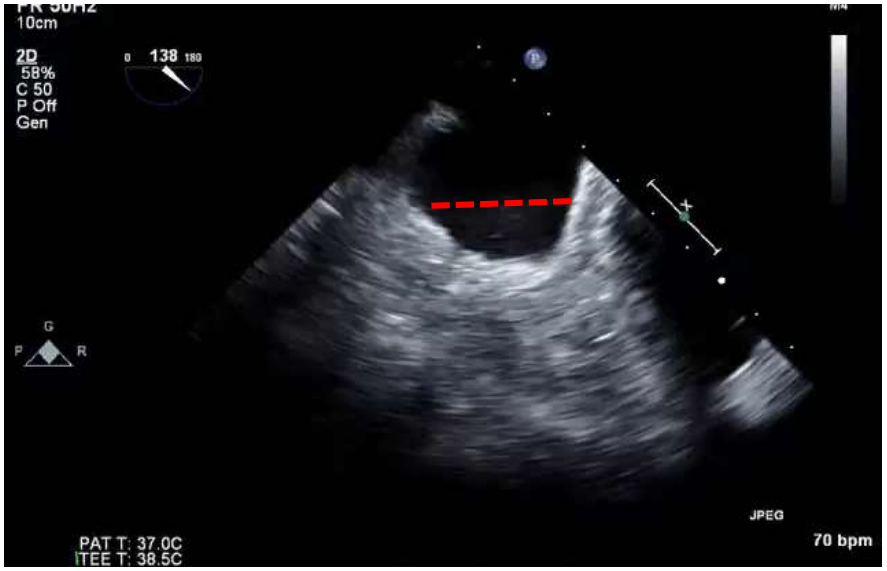


- **Device sizing is based on maximum LAA diameter**
- **Maximum LAA ostium size should be >17mm or <31mm to accommodate available device sizes**
- **Available/useable LAA length should be equal to or greater than the ostium**

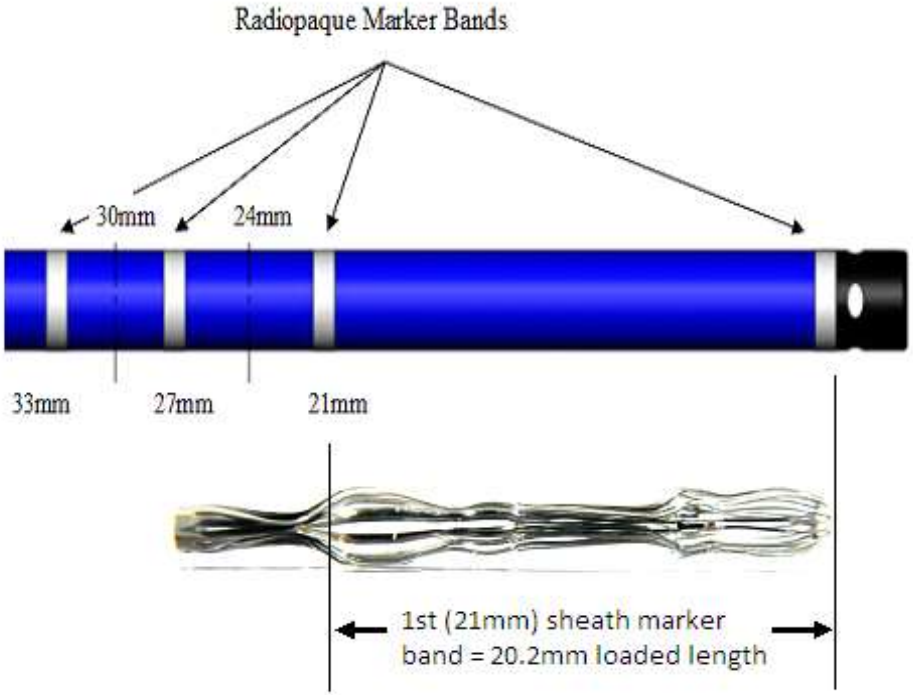
TEE measure during Procedure

Watchman





Sheath navigation/manipulation *(marker bands)*



Watchman

Access Sheath Marker Band	Loaded Device Length*
21mm	20.2mm
24mm	***22.9mm***
27mm	26.5mm
30mm	***29.4mm***
33mm	31.5mm

- **Radiopaque marker bands guide initial sheath placement/depth in the LAA**
- **Align appropriate marker band with the LAA ostium according to device size selected**

Sheath navigation/manipulation

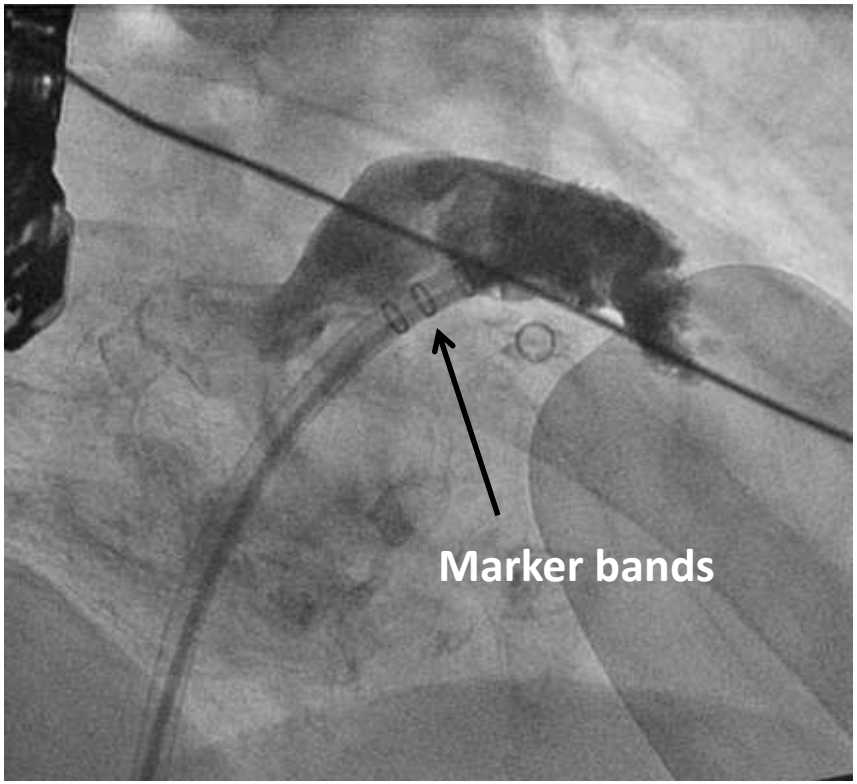
(advancing in the LAA)

To better visualize complex LAA anatomy and verify access sheath tip position:

Obtain multiple views with

- Angiography (minimum RAO cranial/caudal)
- TEE (minimum 0-135 deg sweep)

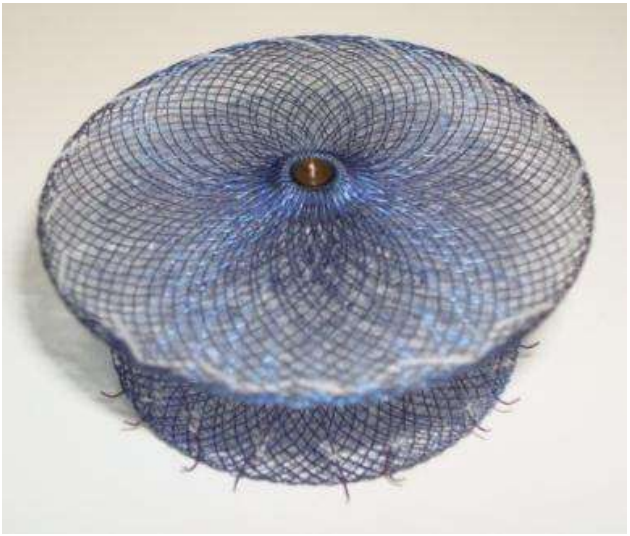
Most important when sheath is advanced near the wall or apex of LAA and while advancing more distally in any anatomy.



Amulet

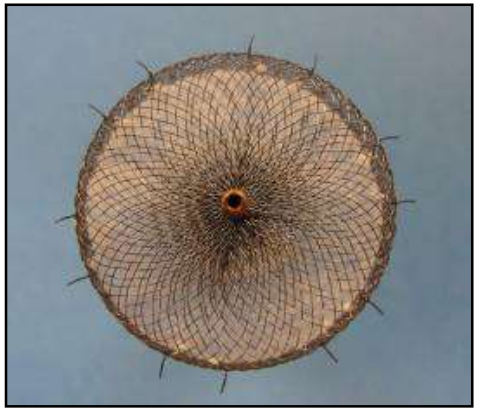
Amulet

- Pre-loaded
- Recessed end screw
- Larger disc diameter
- Longer lobe length
- Longer waist length
- Larger sizes up to 34mm
- Stiffer stabilizing wires (.0065)
- More stabilizing wires on larger devices

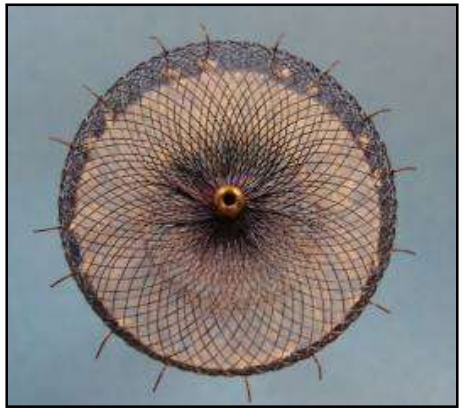


Stabilizing Wire Changes

- Number of stabilizing wires dependent on lobe diameter
- Designed to increase stability of the lobe inside the left atrial appendage



AMPLATZER™ Cardiac Plug
Sizes 16 – 30 mm: 6 pairs



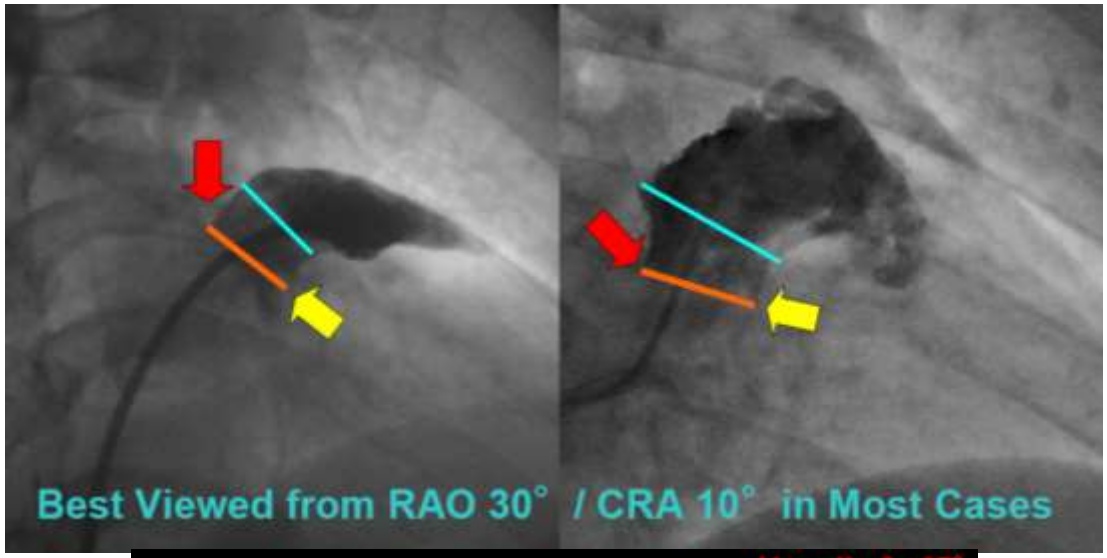
Amulet™ Device
Sizes 16 – 18 mm: 6 pairs
Sizes 20 – 25 mm: 8 pairs
Sizes 28 – 34 mm: 10 pairs

Device Specifications

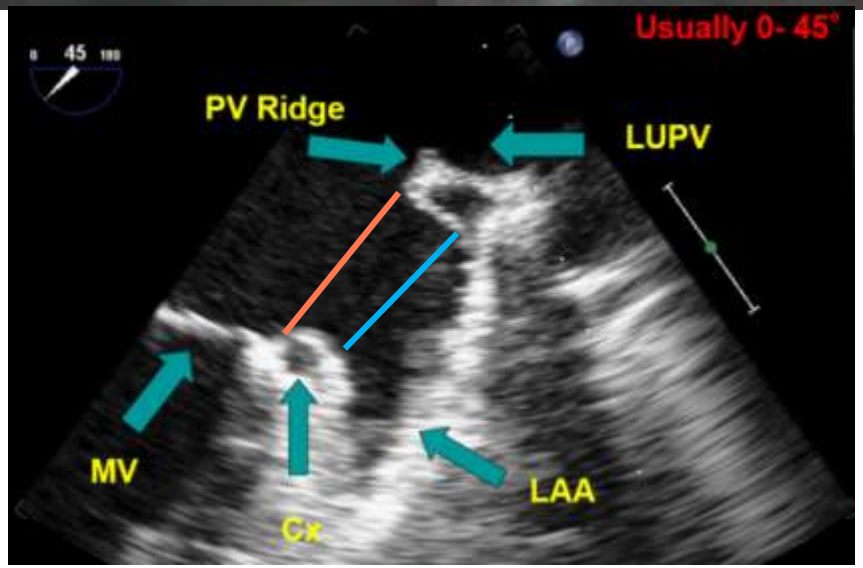
Feature	AMPLATZER™ Amulet™								AMPLATZER™ Cardiac Plug							
Size / Lobe Diameter (mm)	16	18	20	22	25	28	31	34	16	18	20	22	24	26	28	30
Disc Diameter	Lobe + 6 mm				Lobe + 7 mm				Lobe + 4 mm				Lobe + 6 mm			
Lobe Length	7.5 mm				10 mm				6.5 mm							
Waist Length	5.5 mm				8 mm				4 mm							
Stabilizing Wires	6 pairs		8 pairs			10 pairs			6 pairs							
Sheath Diameter	12F 14F (with Adaptor)					14F			9F	10F				13F		

Measure LAA Oriface and Landing Zone

Amulet



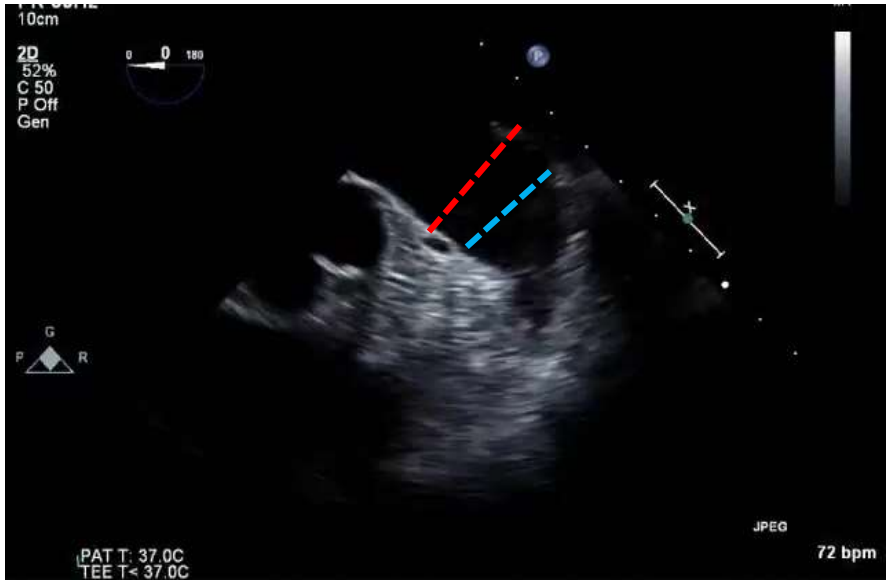
Angiography

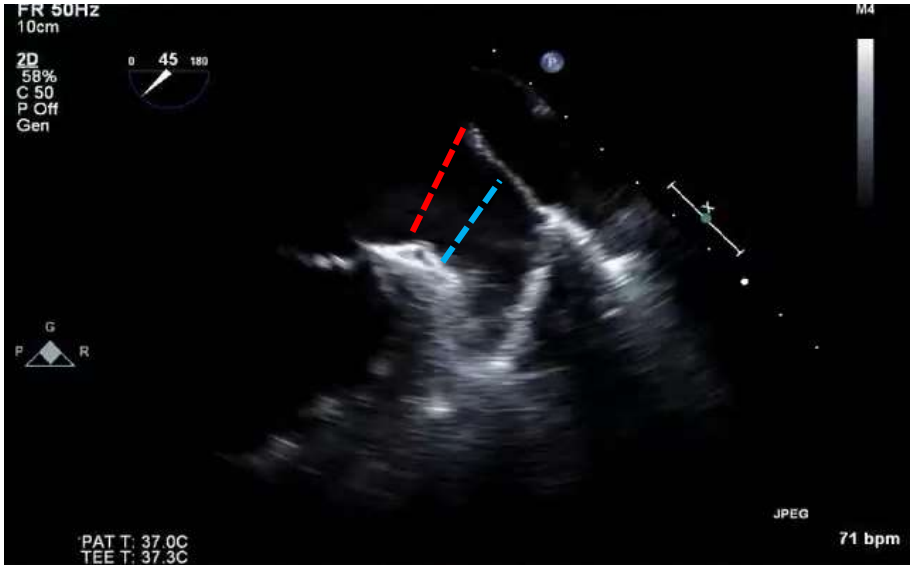


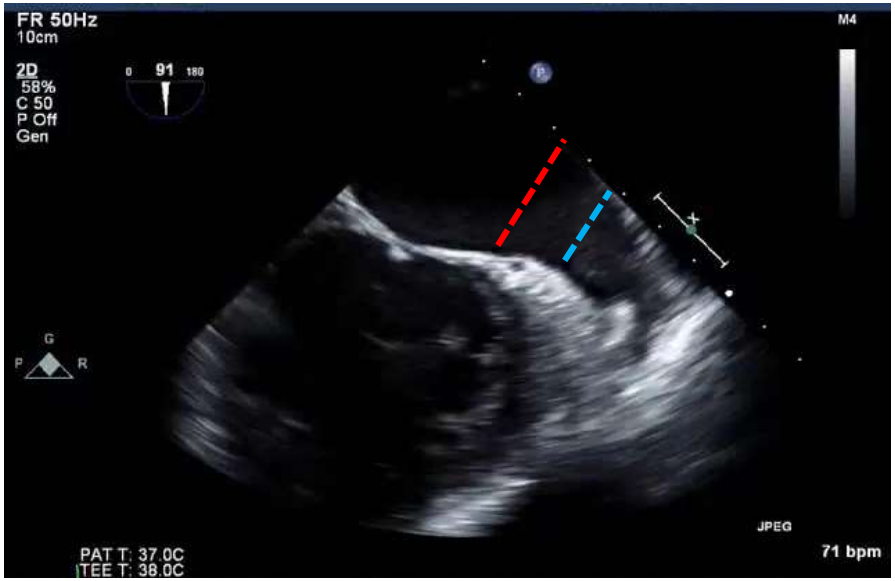
TEE

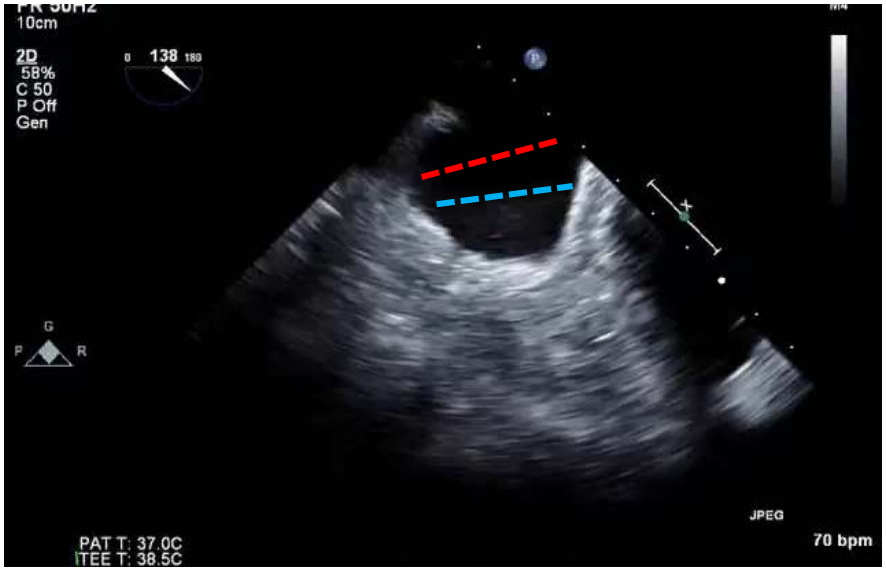
TEE measure during Procedure

Amulet



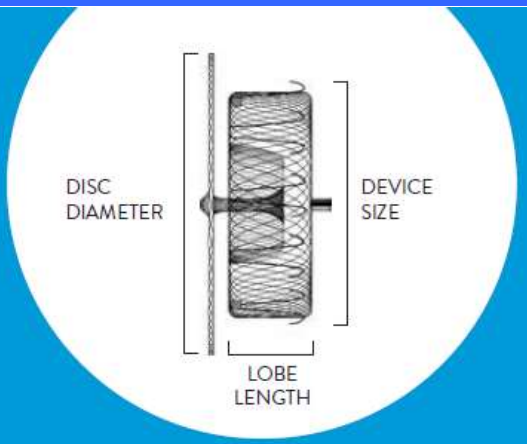






AMPLATZER™ Amulet™

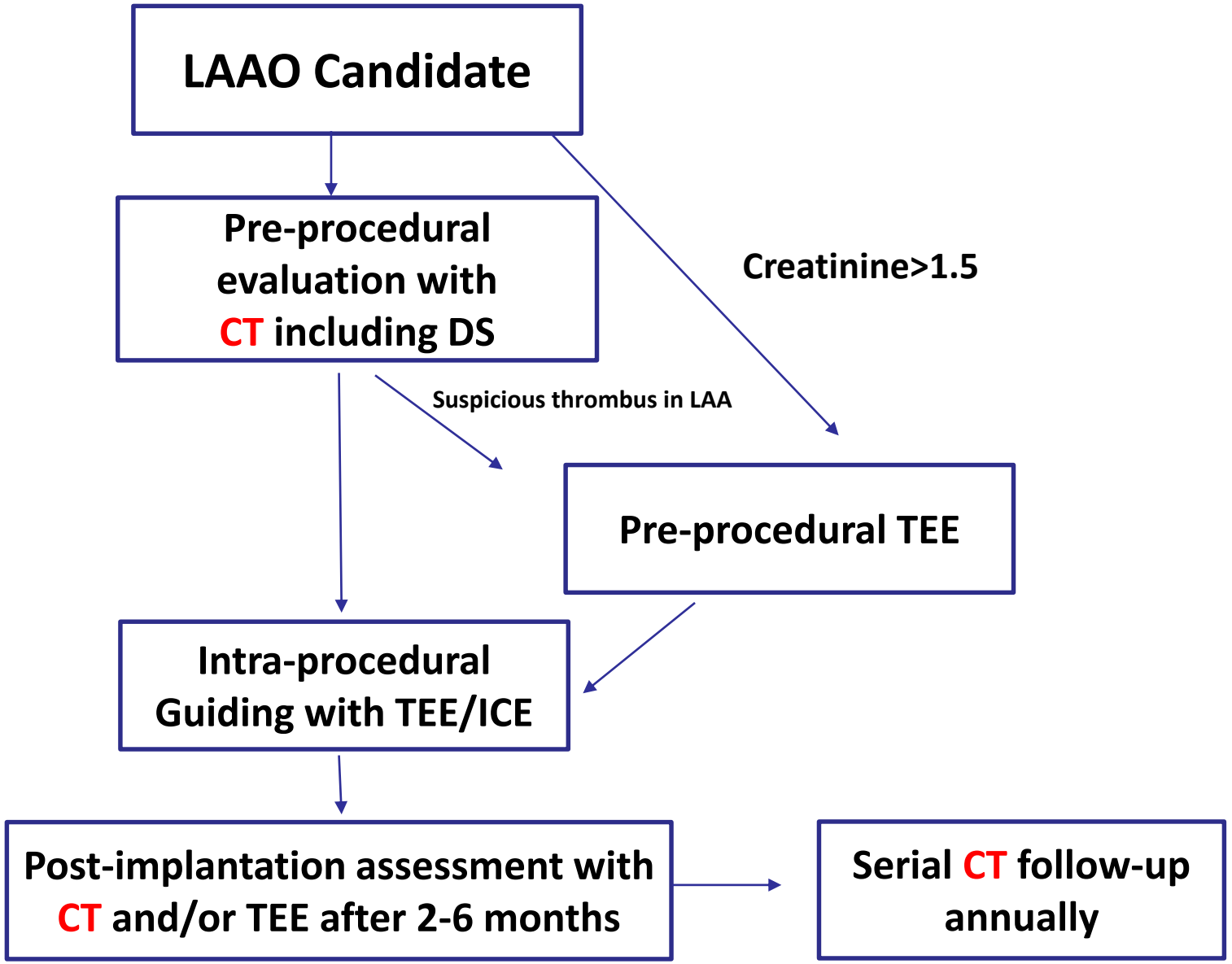
LEFT ATRIAL APPENDAGE OCCLUDER



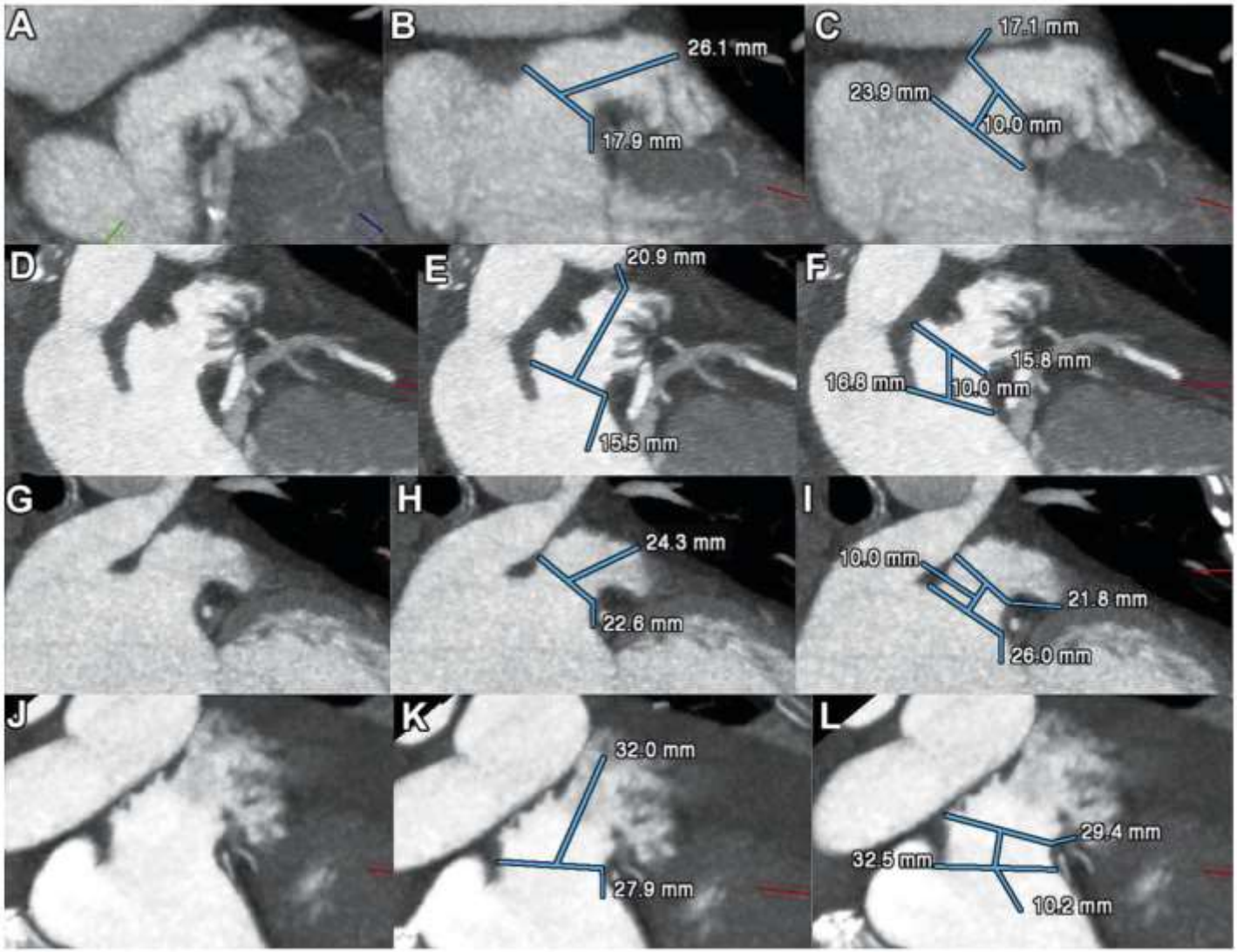
DEVICE DIMENSIONS AND SIZING CHART

MAXIMUM LANDING ZONE WIDTH (MM)	DEVICE SIZE (MM)	LOBE LENGTH (MM)	MINIMUM LAA DEPTH (MM)	DISC DIAMETER (MM)	SHEATH DIAMETER
11.0-13.0	16	7.5	≥ 10	22	12 F or 14 F (with adaptor)
13.0-15.0	18	7.5	≥ 10	24	
15.0-17.0	20	7.5	≥ 10	26	
17.0-19.0	22	7.5	≥ 10	28	
19.0-22.0	25	10	≥ 12	32	
22.0-25.0	28	10	≥ 12	35	14 F
25.0-28.0	31	10	≥ 12	38	
28.0-31.0	34	10	≥ 12	41	

CT First Workflow for LAAO Procedure

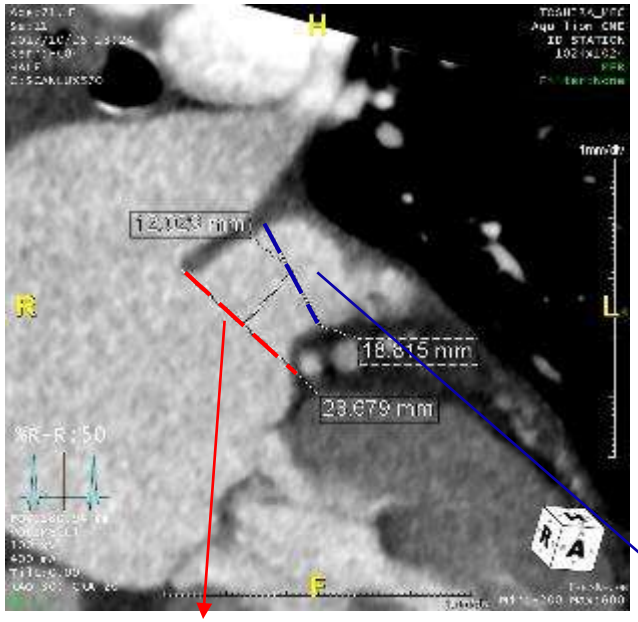


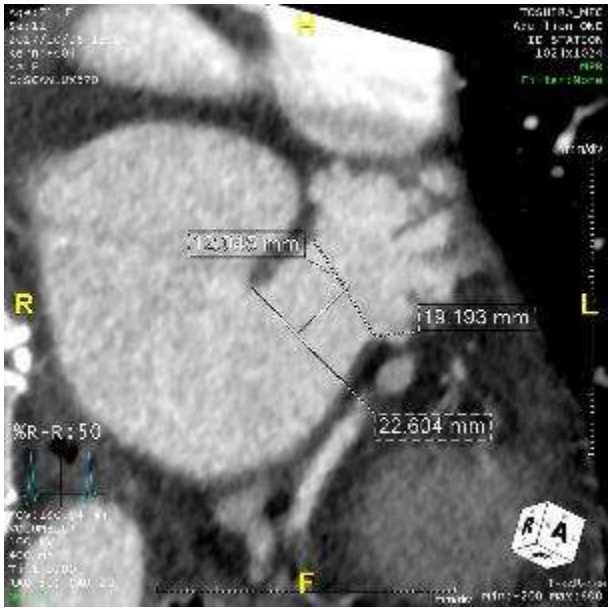
Conventional 2D Measures



Saw J, et al., *J Am Coll Cardiol Intv* 2014;7:1205–20

Cardiac CT Assessment

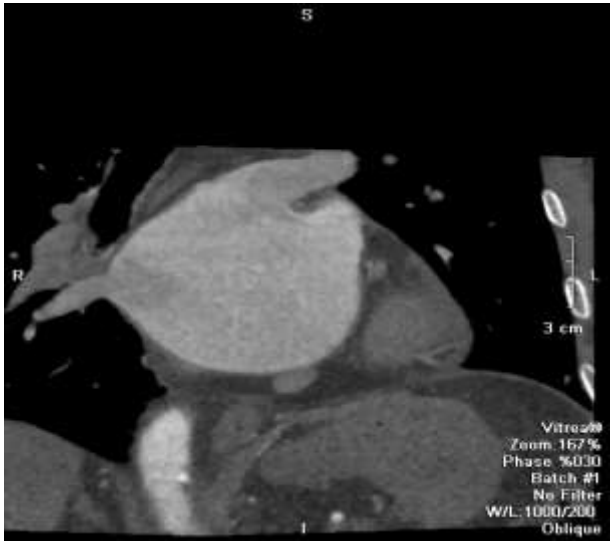




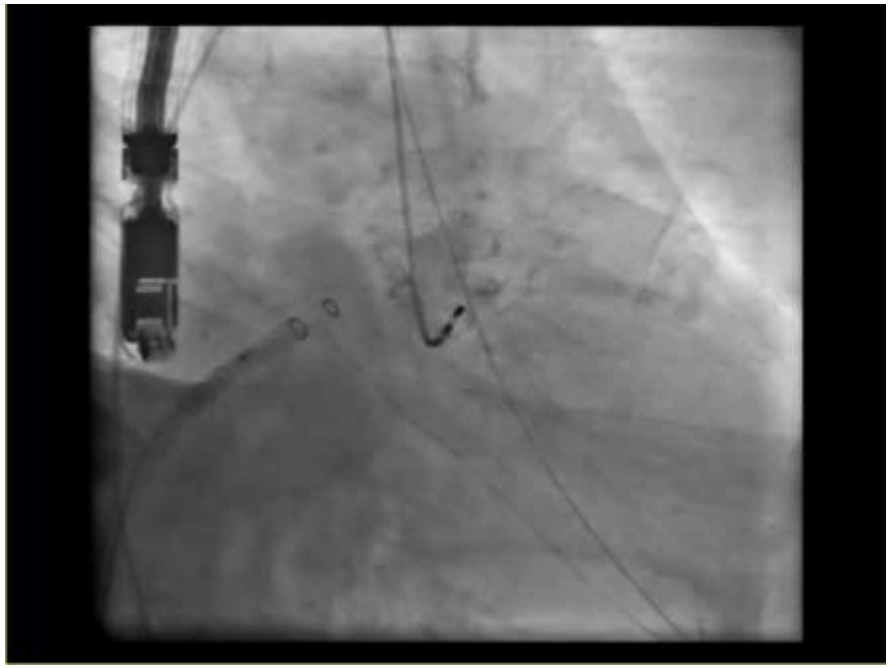
Good Results vs.

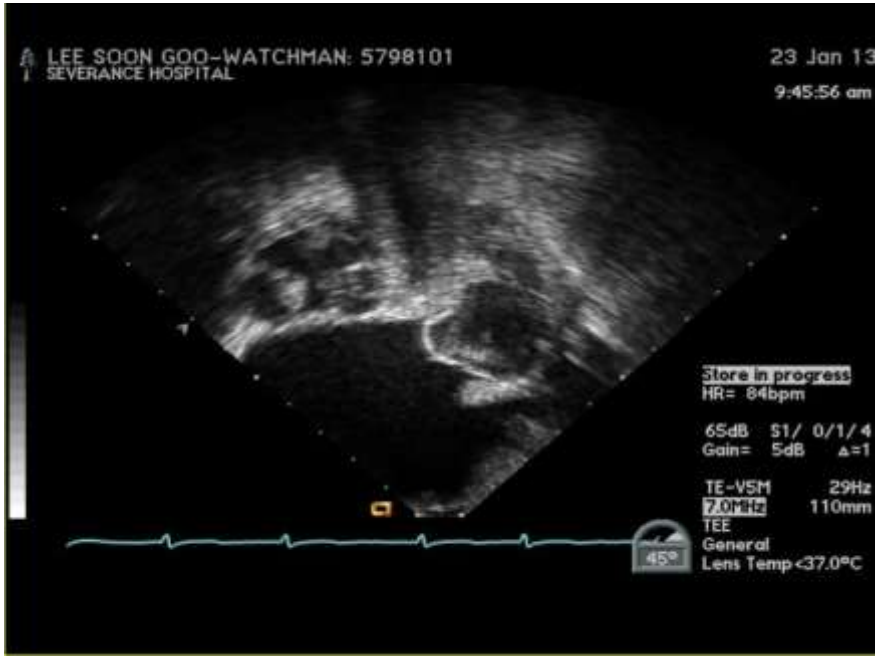
Bad Results.

Recapture & deployment – Good Results

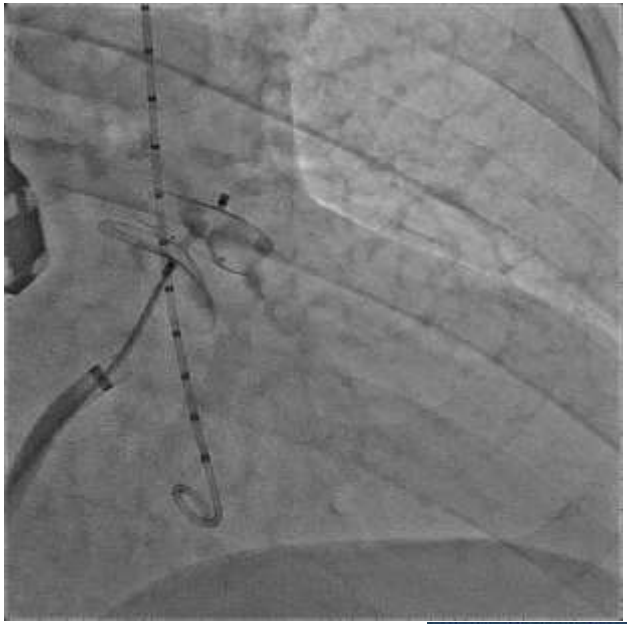


Good Results

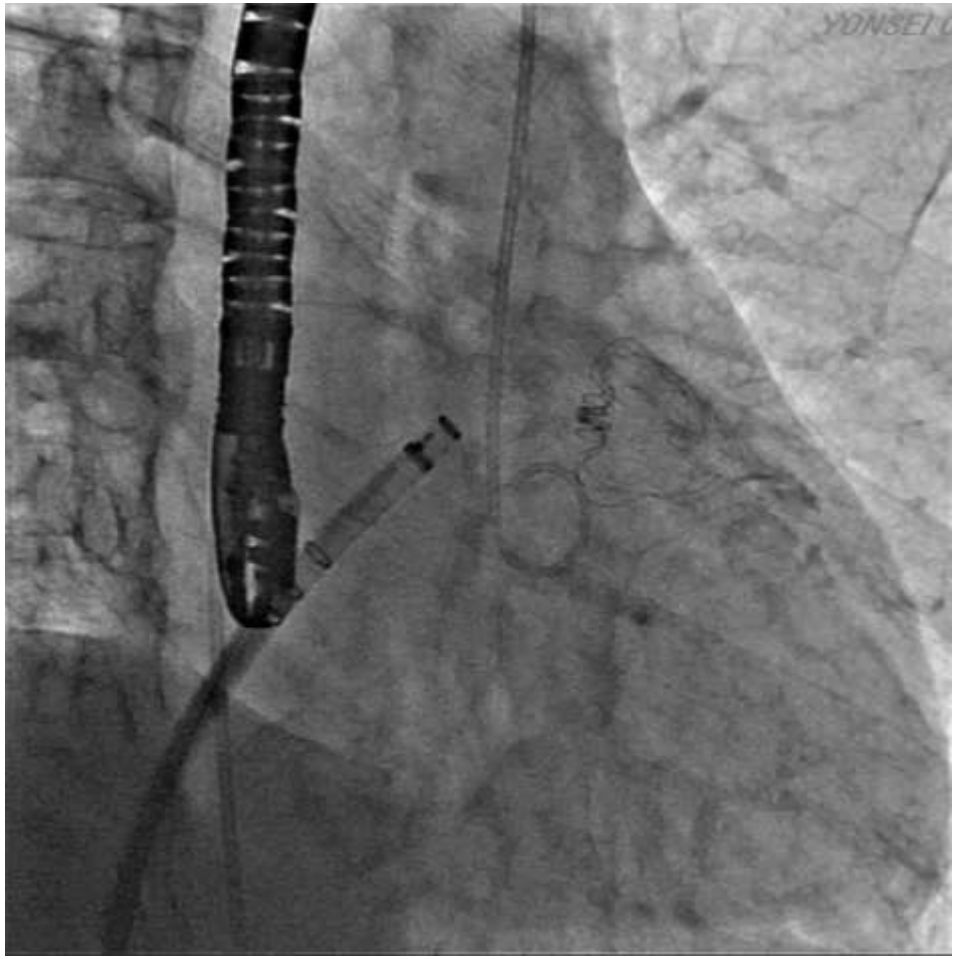


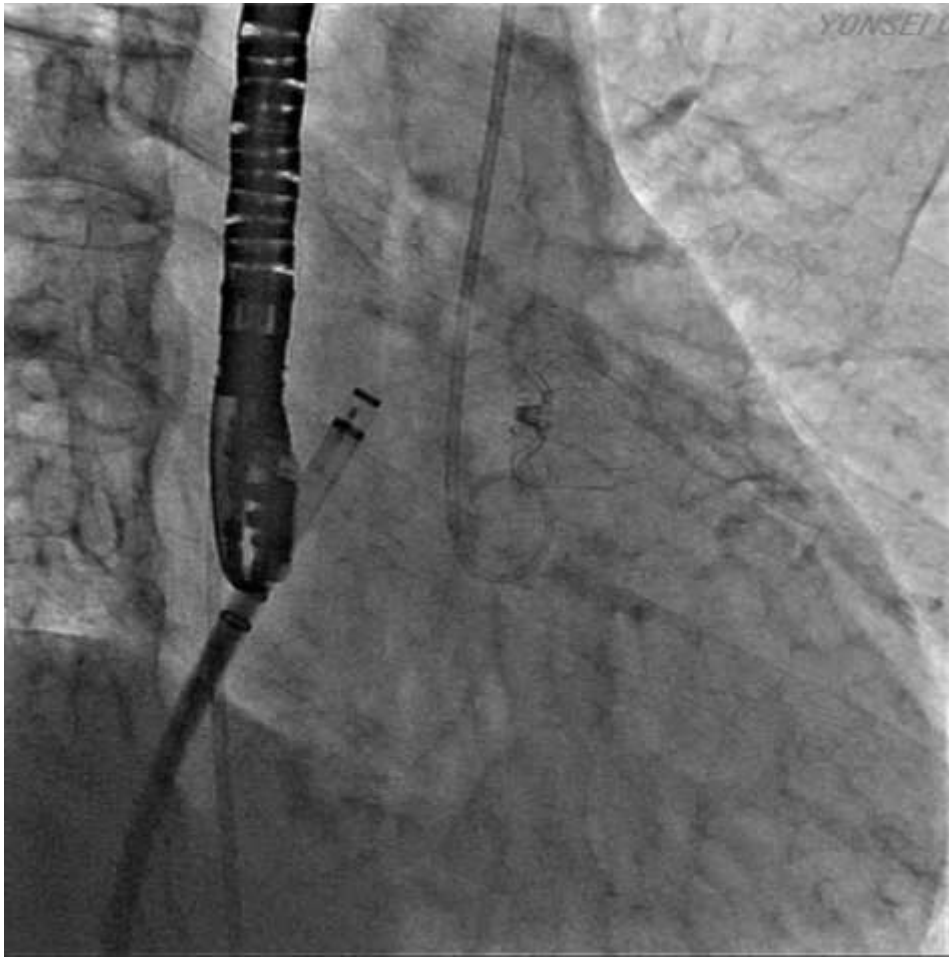


Good Results



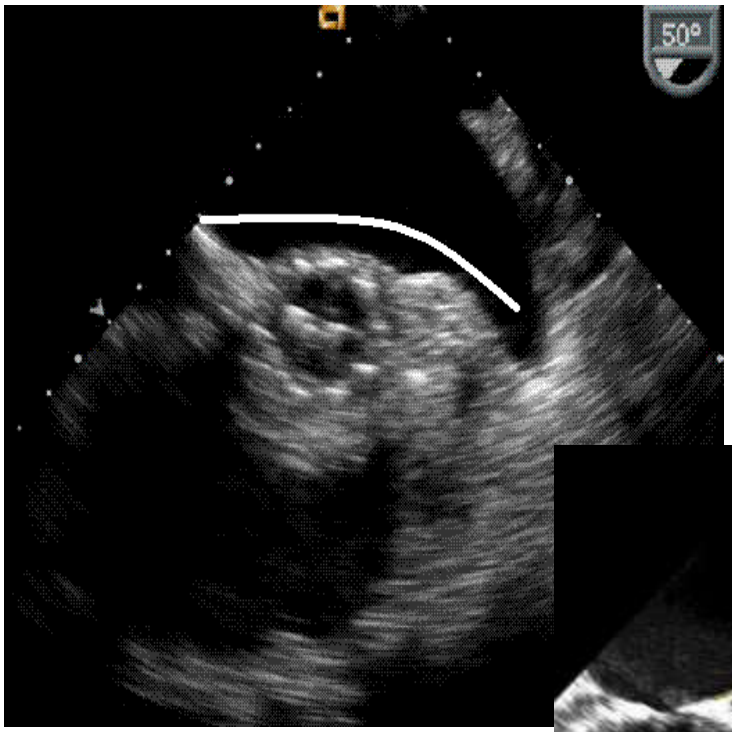
Inappropriate Results

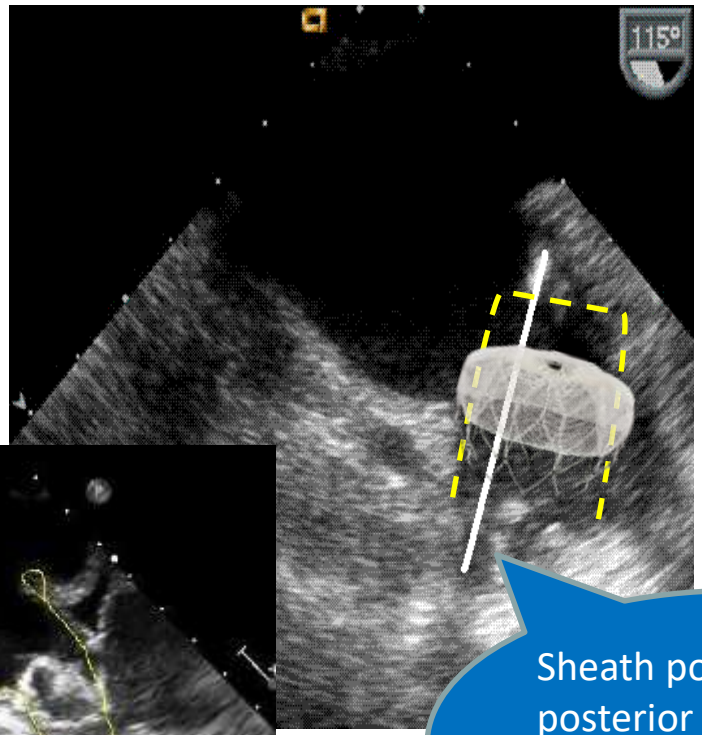




Successful implantation (?) of LAA occlusion device (24mm WATCHMAN)

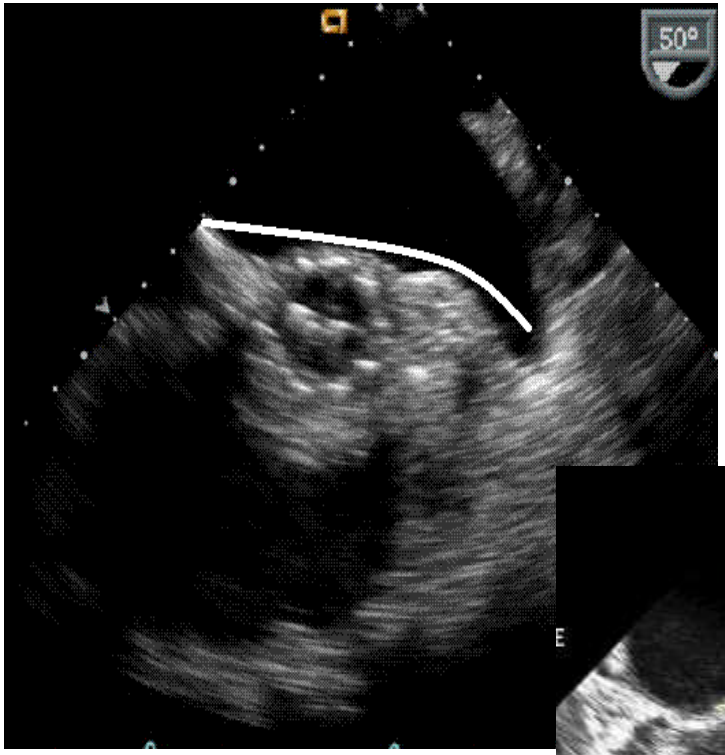
IAS Crossing / Sheath Ramifications - Double Curve / Post. Stick no Torque

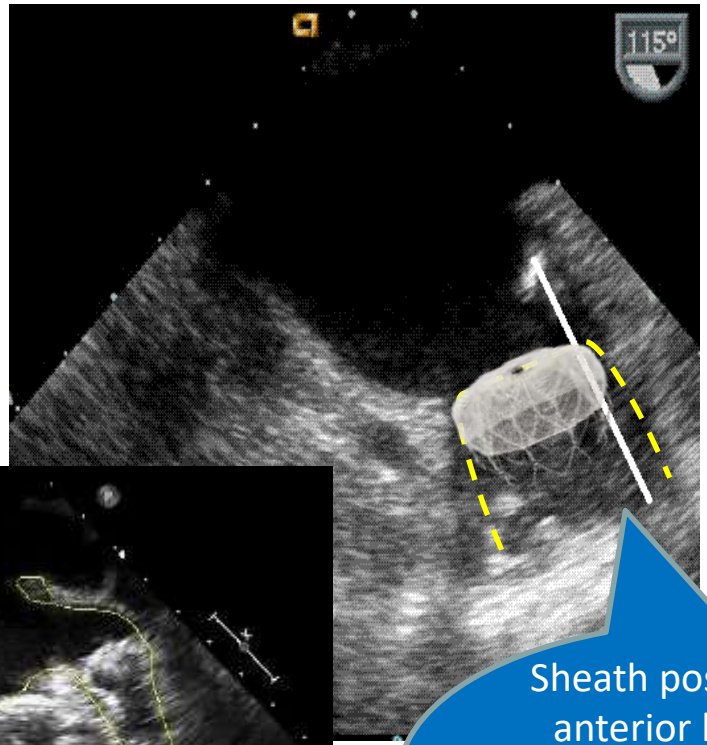




Sheath position in the posterior lobe leaves more posterior shoulder protrusion.

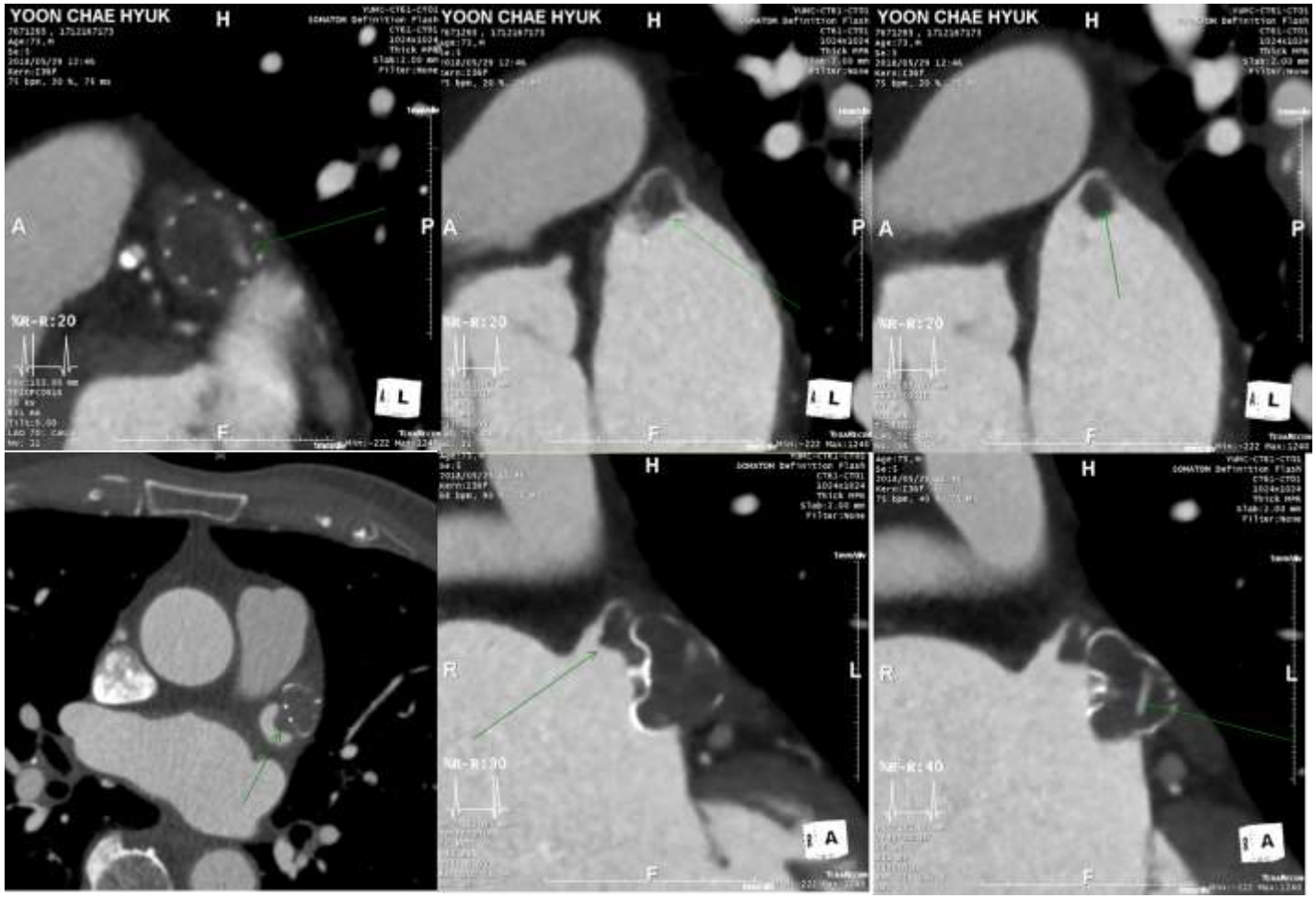
IAS Crossing / Sheath Ramifications - Double Curve / Post. Stick with CCW Torque





Sheath position in the anterior lobe aligns device more coaxial with ostium minimizing shoulder protrusion.

Thrombus detected 5 year after LAAO

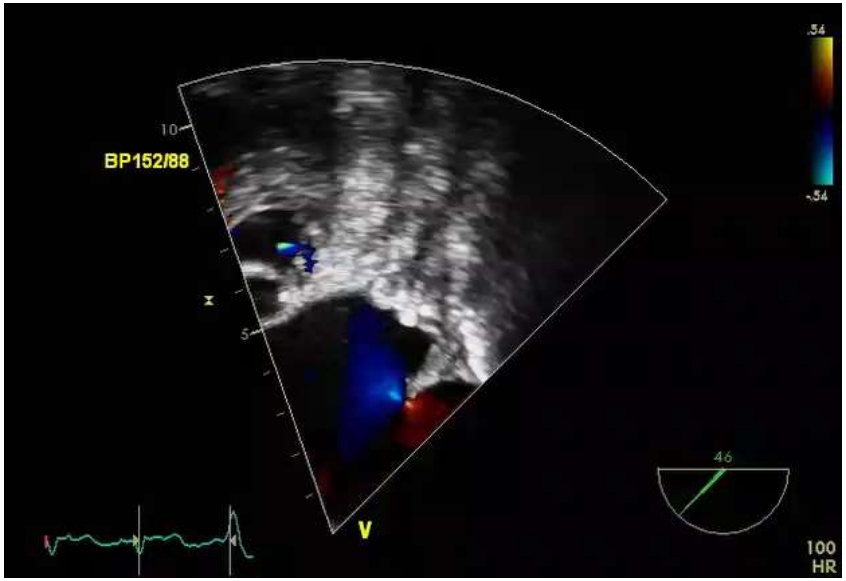


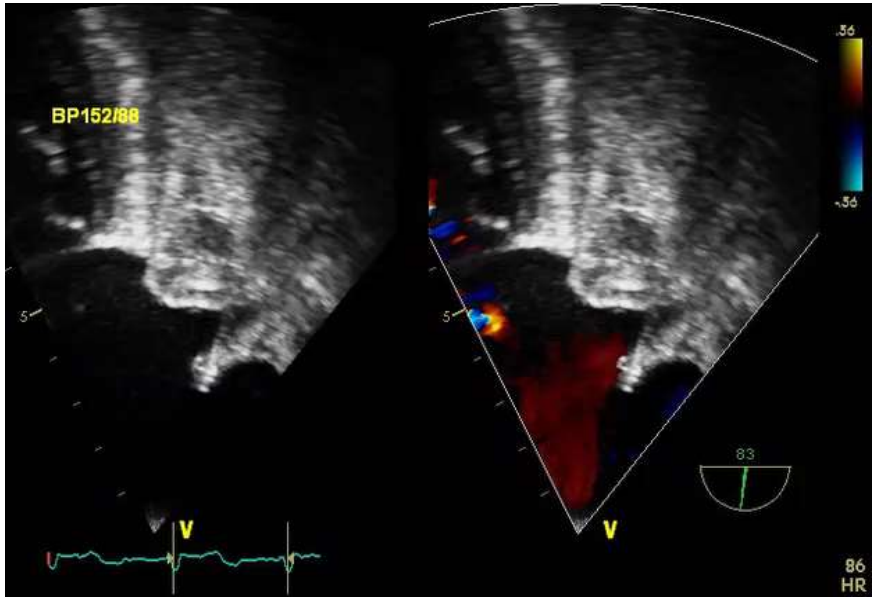
S/P LAA occlusion with Watchman device

- Small atrial side device thrombosis.

- Small amount of residual contrast leakage into the LAA.

2 month follow-up TEE after NOAC

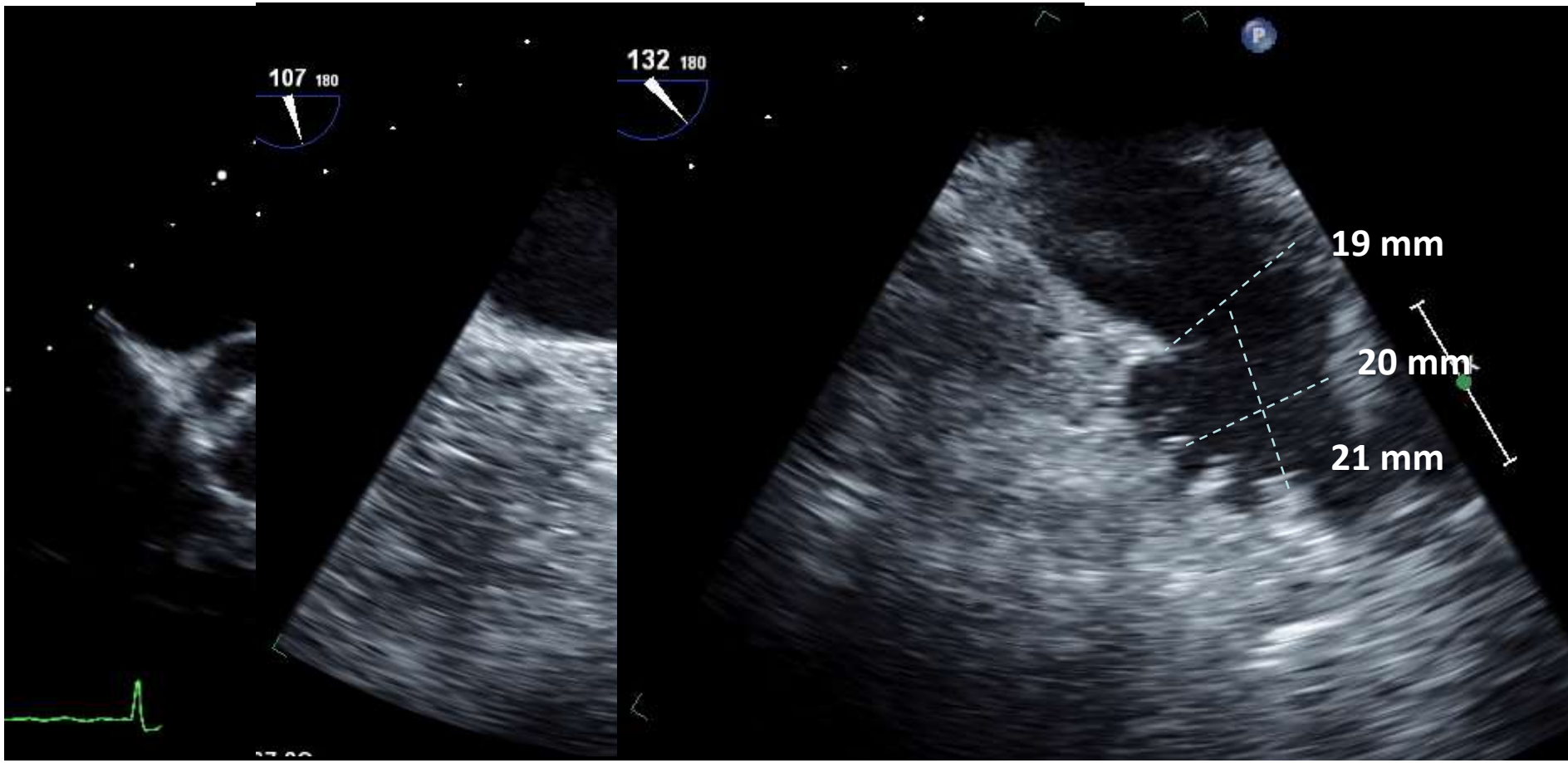




Real Cases

TEE

Amulet

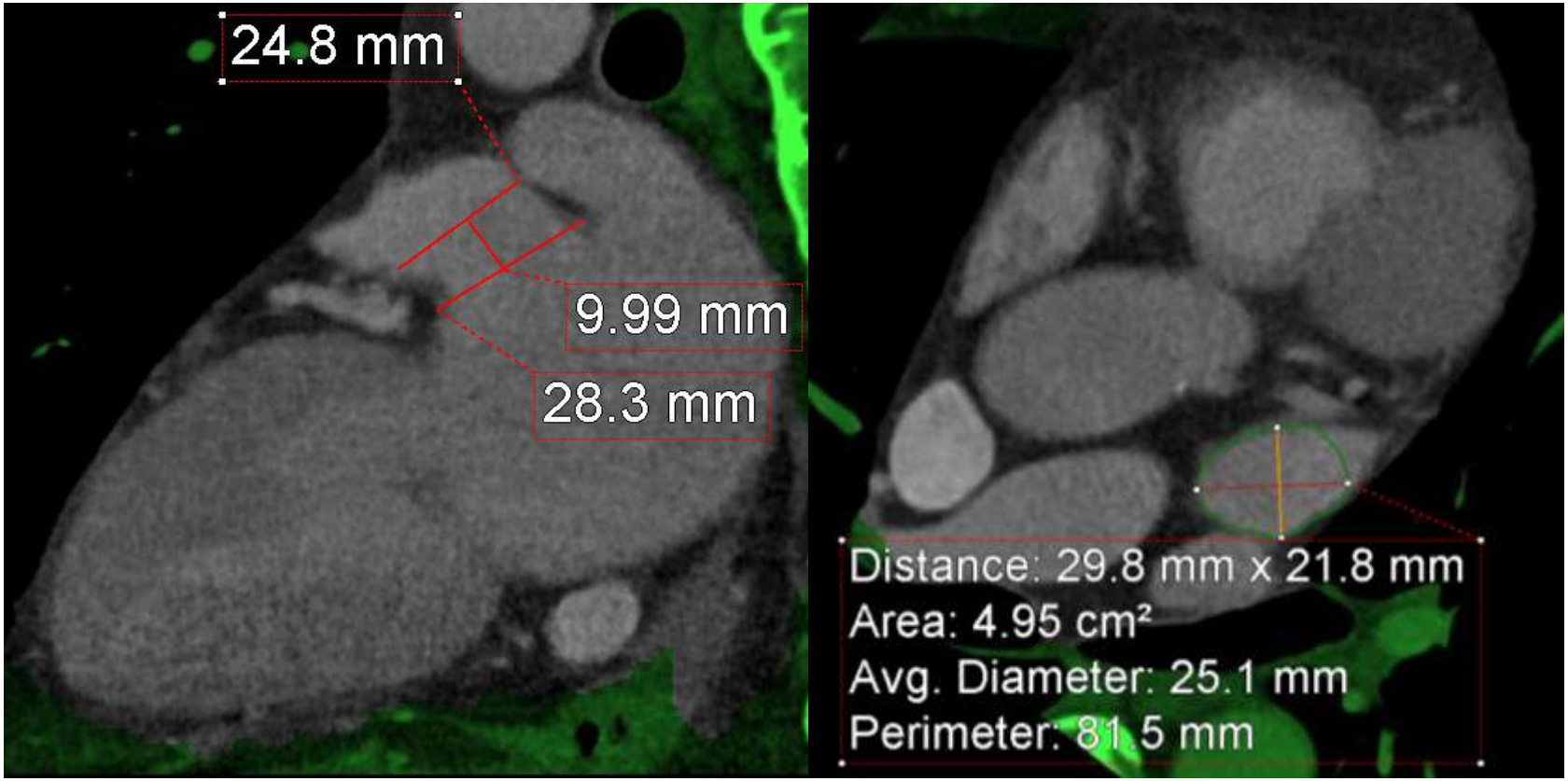


In 45 degree, Os 27 mm/Landing **22mm**/Depth 26 mm
In 107 degree, Os 23 mm/Landing **20 mm**/Depth 24 mm
In 135 degree, Os 19 mm/Landing **20 mm**, Depth 21 mm

Courtesy slide of Dr. Cho IS

LAAO Size Determination

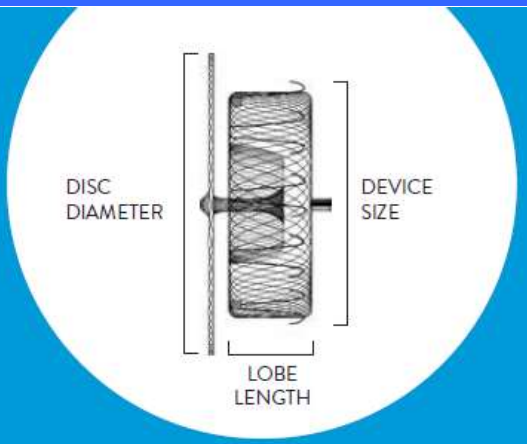
Amulet



Courtesy slide of Dr. Cho IS

AMPLATZER™ Amulet™

LEFT ATRIAL APPENDAGE OCCLUDER

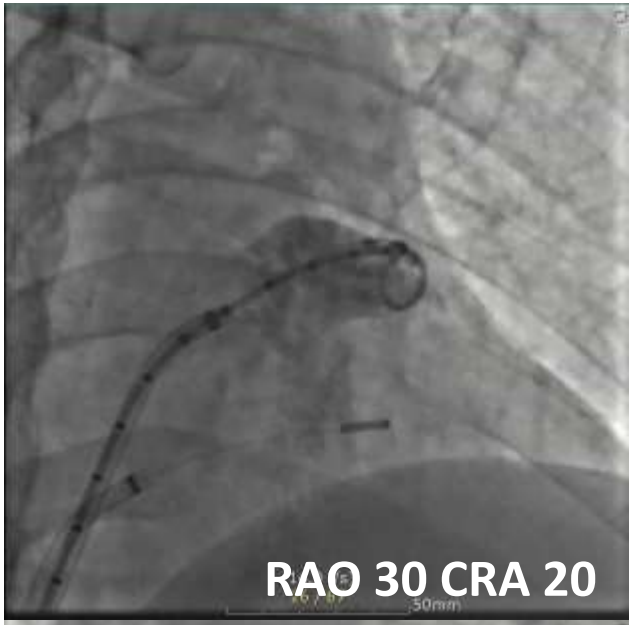


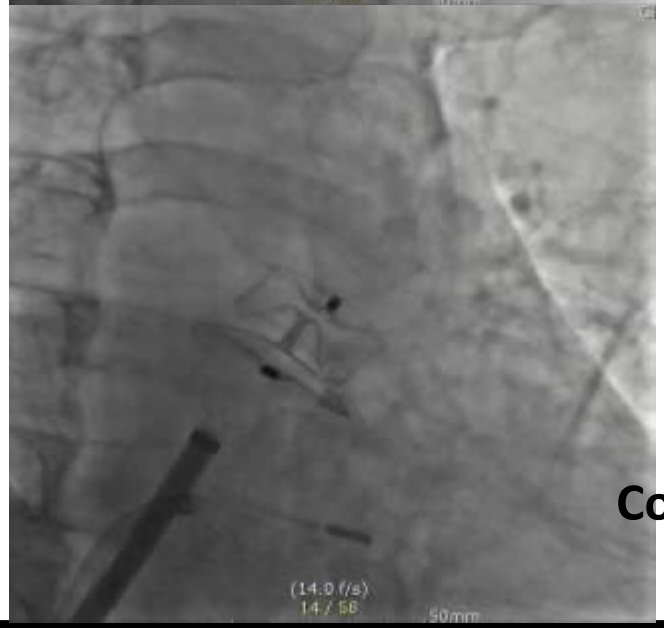
DEVICE DIMENSIONS AND SIZING CHART

MAXIMUM LANDING ZONE WIDTH (MM)	DEVICE SIZE (MM)	LOBE LENGTH (MM)	MINIMUM LAA DEPTH (MM)	DISC DIAMETER (MM)	SHEATH DIAMETER
11.0-13.0	16	7.5	≥ 10	22	
13.0-15.0	18	7.5	≥ 10	24	12 F
15.0-17.0	20	7.5	≥ 10	26	or
17.0-19.0	22	7.5	≥ 10	28	14 F (with adaptor)
19.0-22.0	25	10	≥ 12	32	
22.0-25.0	28	10	≥ 12	35	
25.0-28.0	31	10	≥ 12	38	14 F
28.0-31.0	34	10	≥ 12	41	

Amulet 25mm

Amulet





Courtesy slide of
Dr. Cho IS

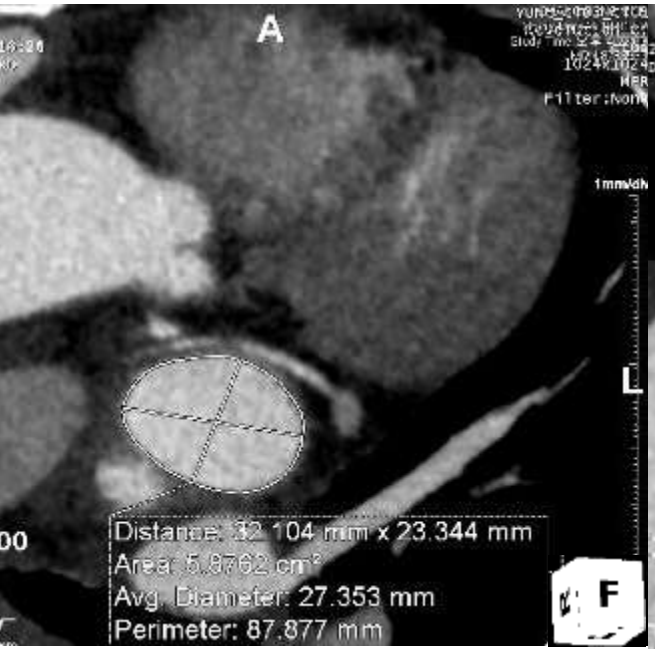
Brief history

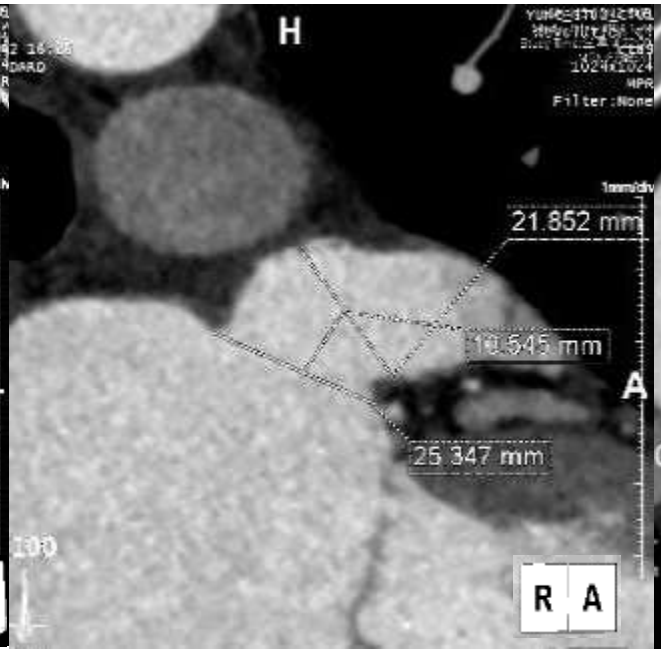
Amulet

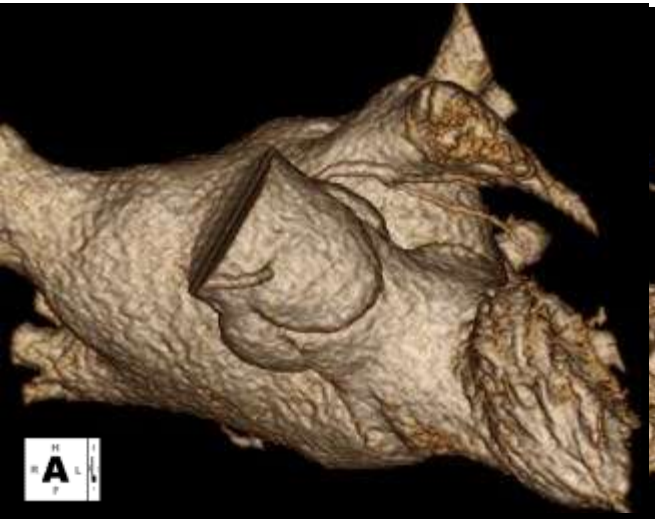
- M / 59, 167cm / 71 kg
- Current diagnosis
  - Persistent AF (2018.12, CHA_2DS_2-VASc: 3, HAS-BLED : 4)
  - Liver cirrhosis d/t CHB & alcohol
  - Esophageal varix bleeding s/p EVL (2018.12)
  - Old CVA at the Lt. frontal SCWM area

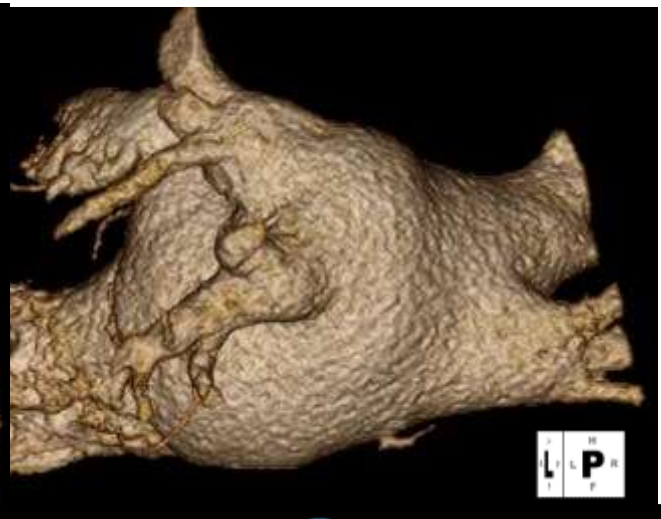
Preprocedural Planning CT

Amulet





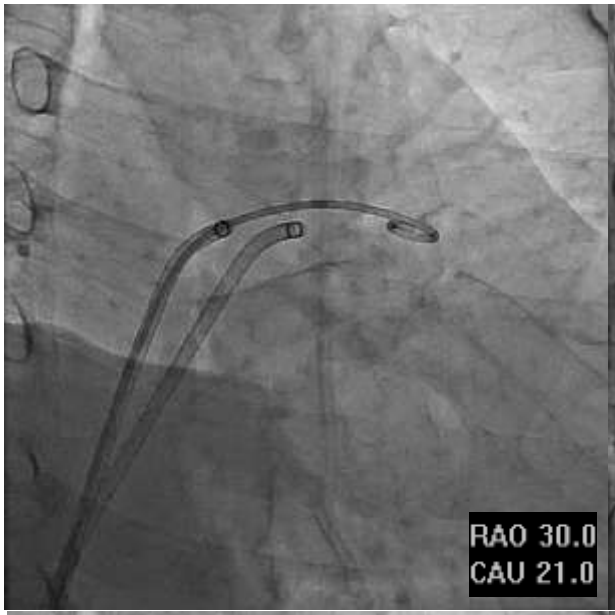


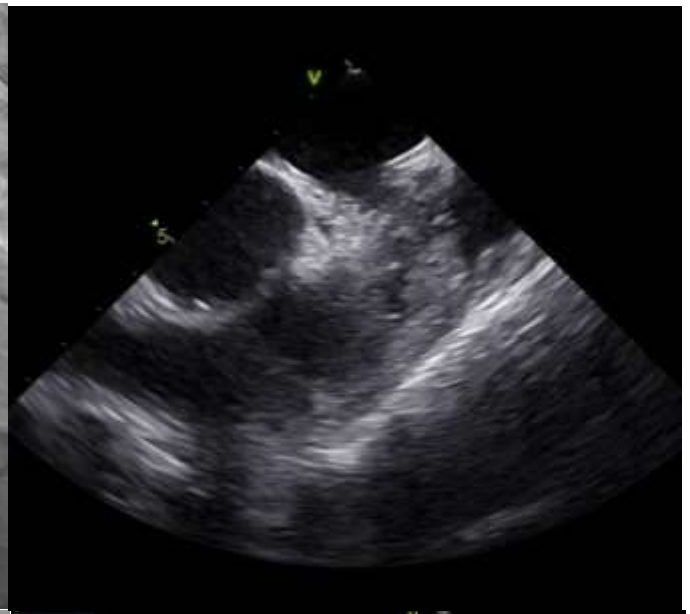


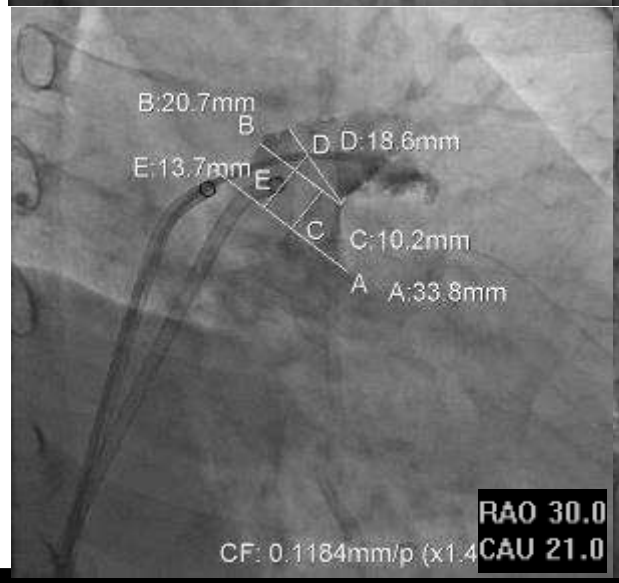
Mild circulatory stasis in LAA without thrombus
LAA ostium 32.1x23.3mm (average 27.4mm)
LAA perimeter 87.9mm
Landing zone diameter 21.9mm

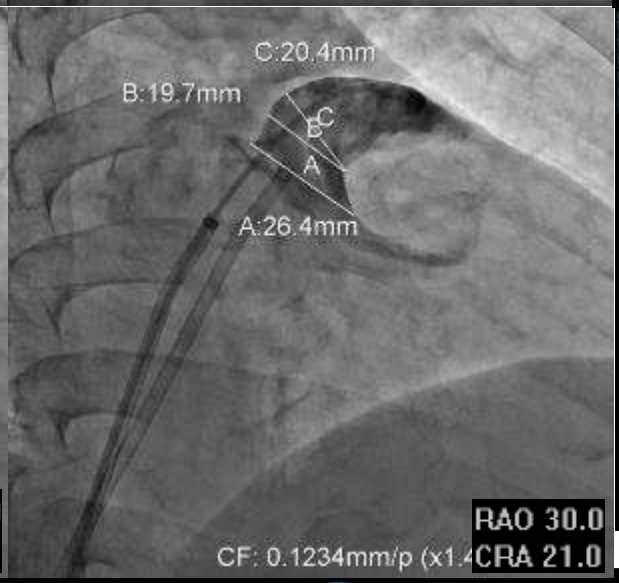
Measurements and Sizing

Amulet



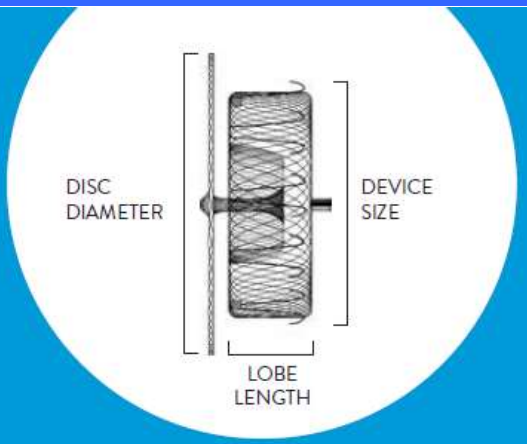






AMPLATZER™ Amulet™

LEFT ATRIAL APPENDAGE OCCLUDER



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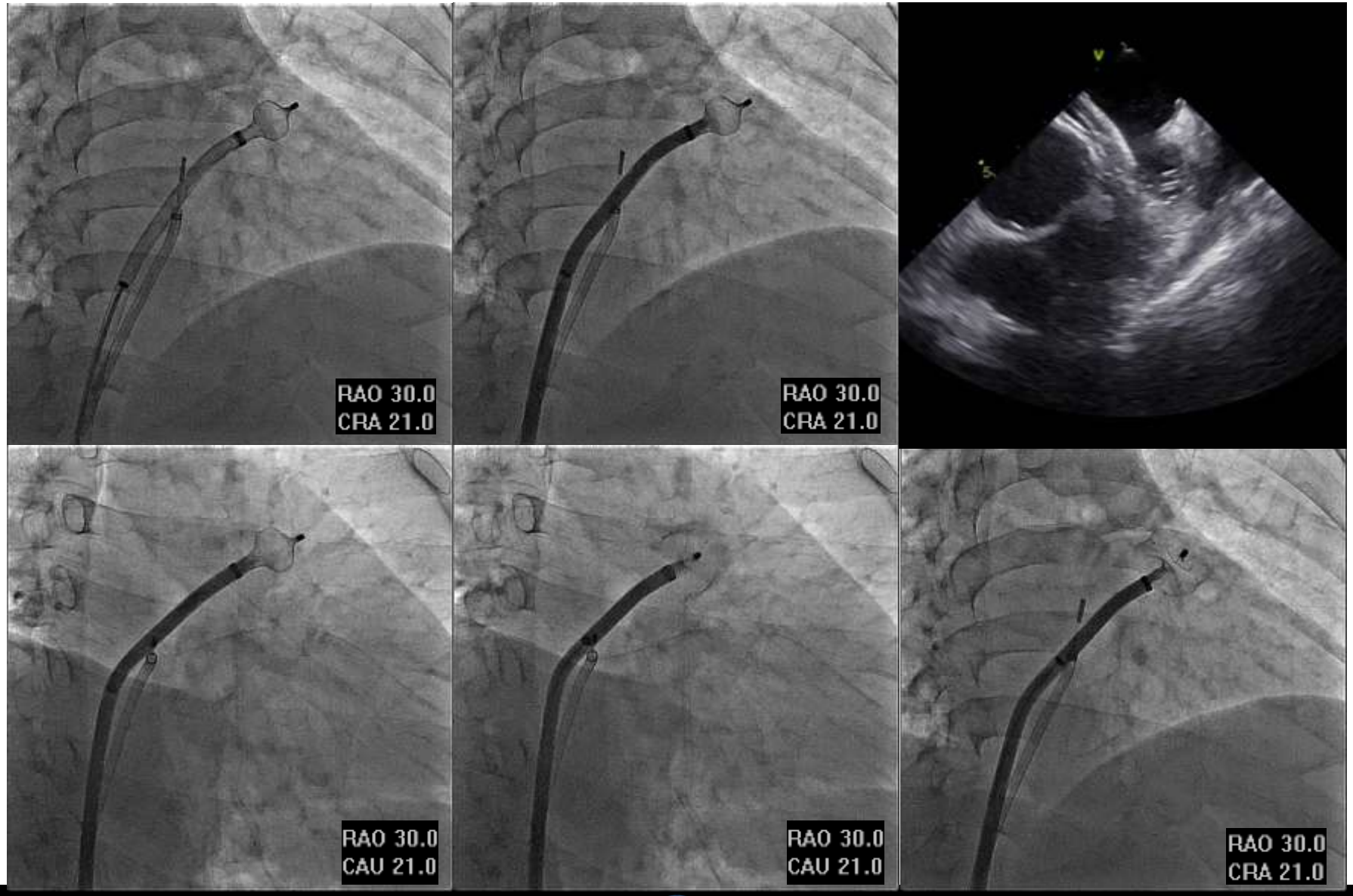
25.0-28.0	31	10	≥ 12	38	14 F
28.0-31.0	34	10	≥ 12	41	

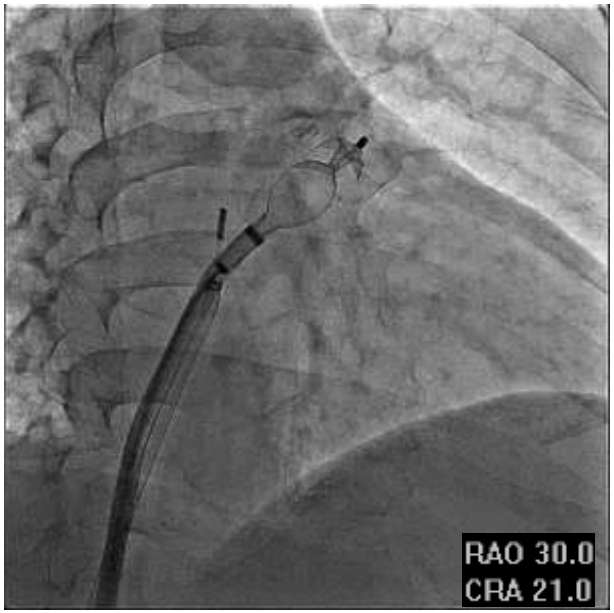
Lobe Deployment

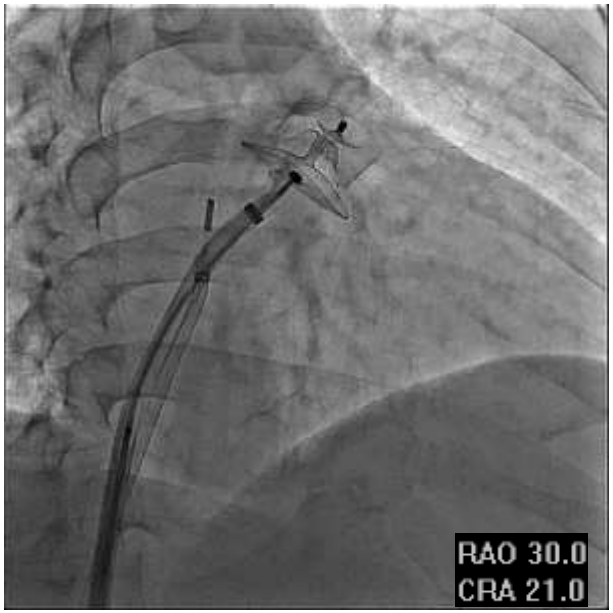
Amulet

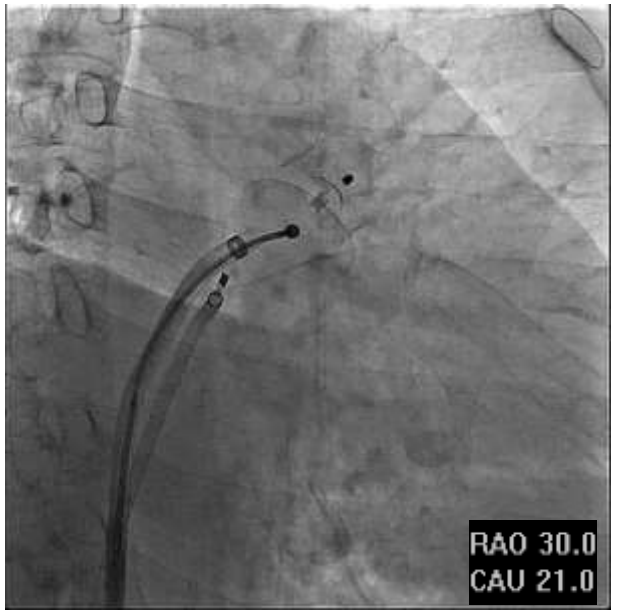


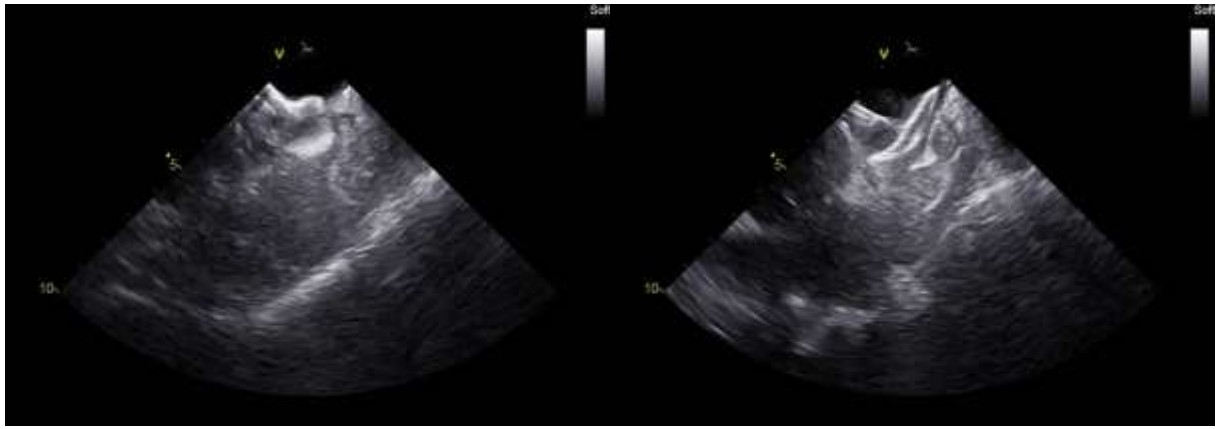
Disc Deployment (25 mm Amulet)

Amulet



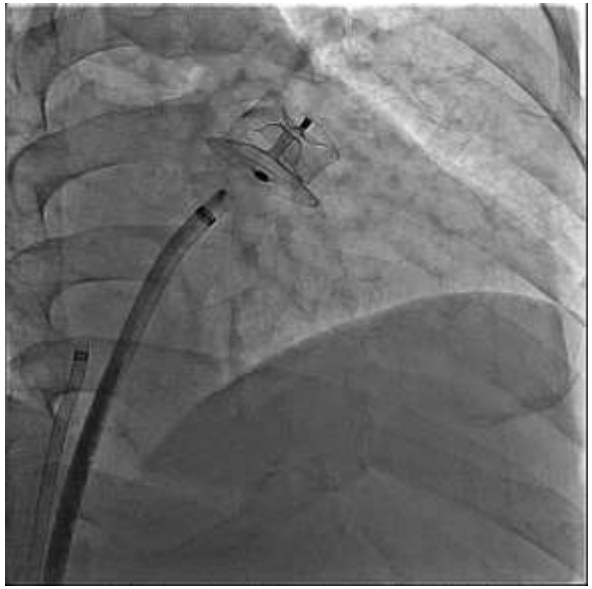


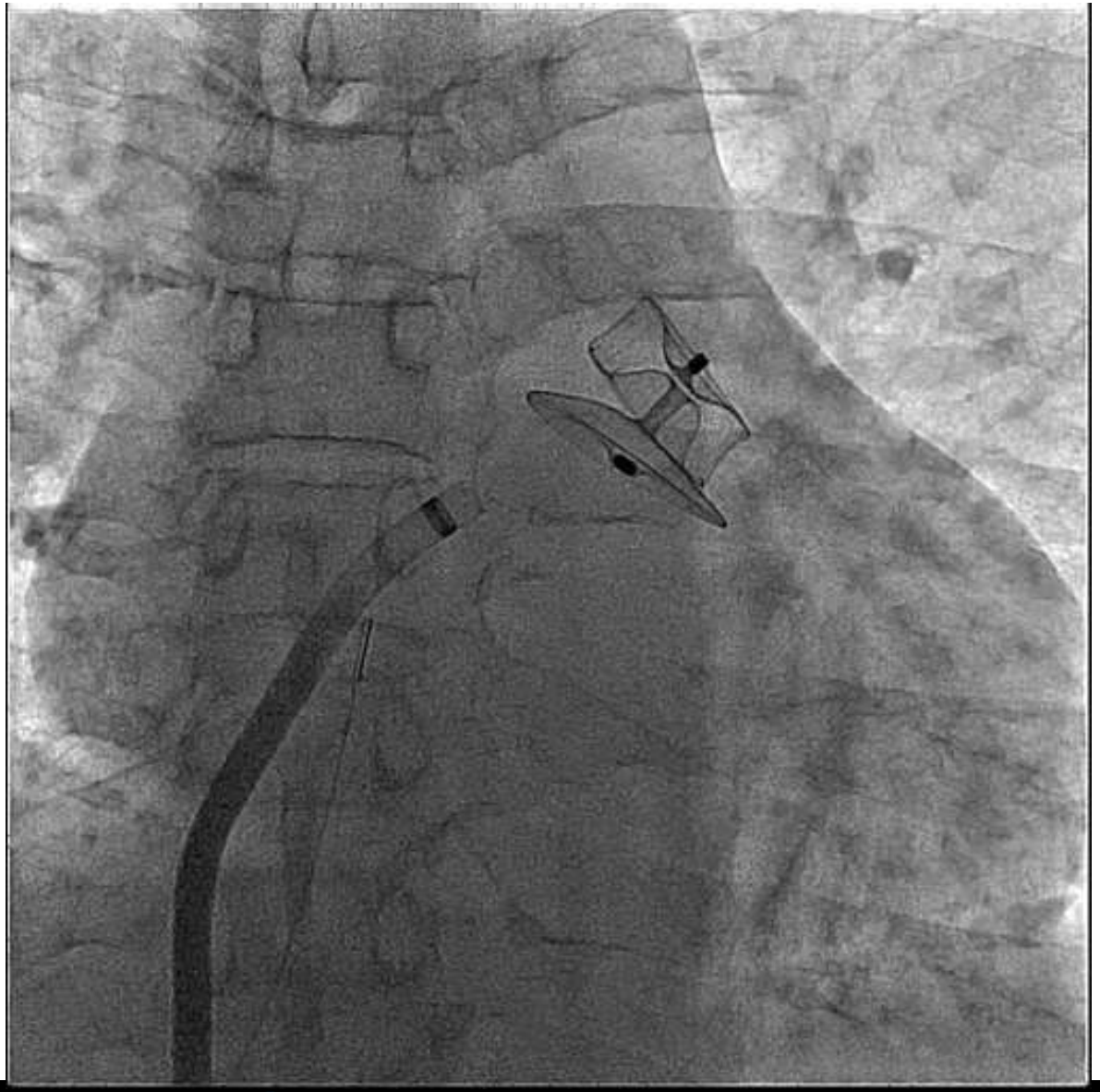




Final Angiography

Amulet





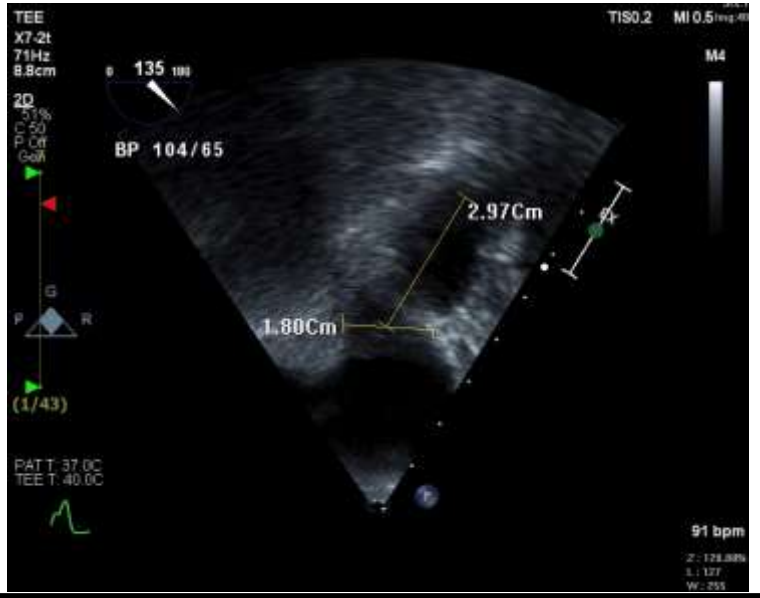
M/76

Watchman

- Stable angina pectoris
- S/P PTCA c stent
- PeAF (CHA_2DS_2-VASc score = 7, HAS-BLED score = 5)
- DM
- Brain hemorrhage (1995)
- s/p Carotid stenting
- CKD

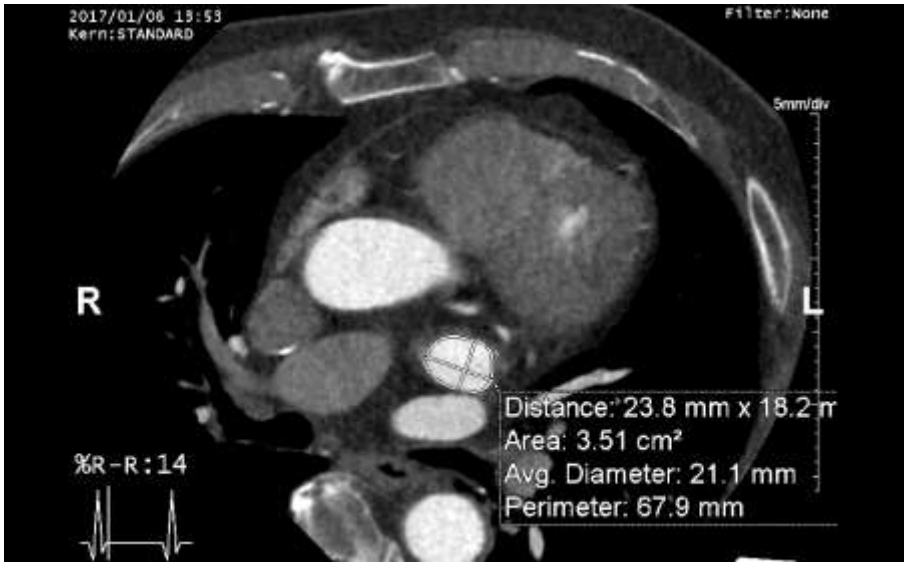
TEE measurement

Watchman



CT Measurement

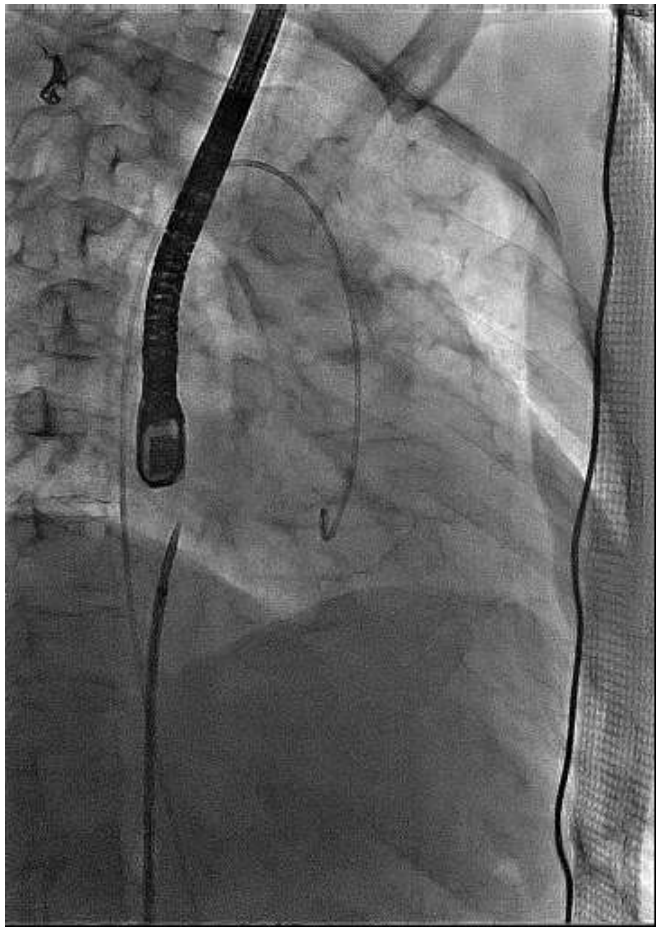
Watchman

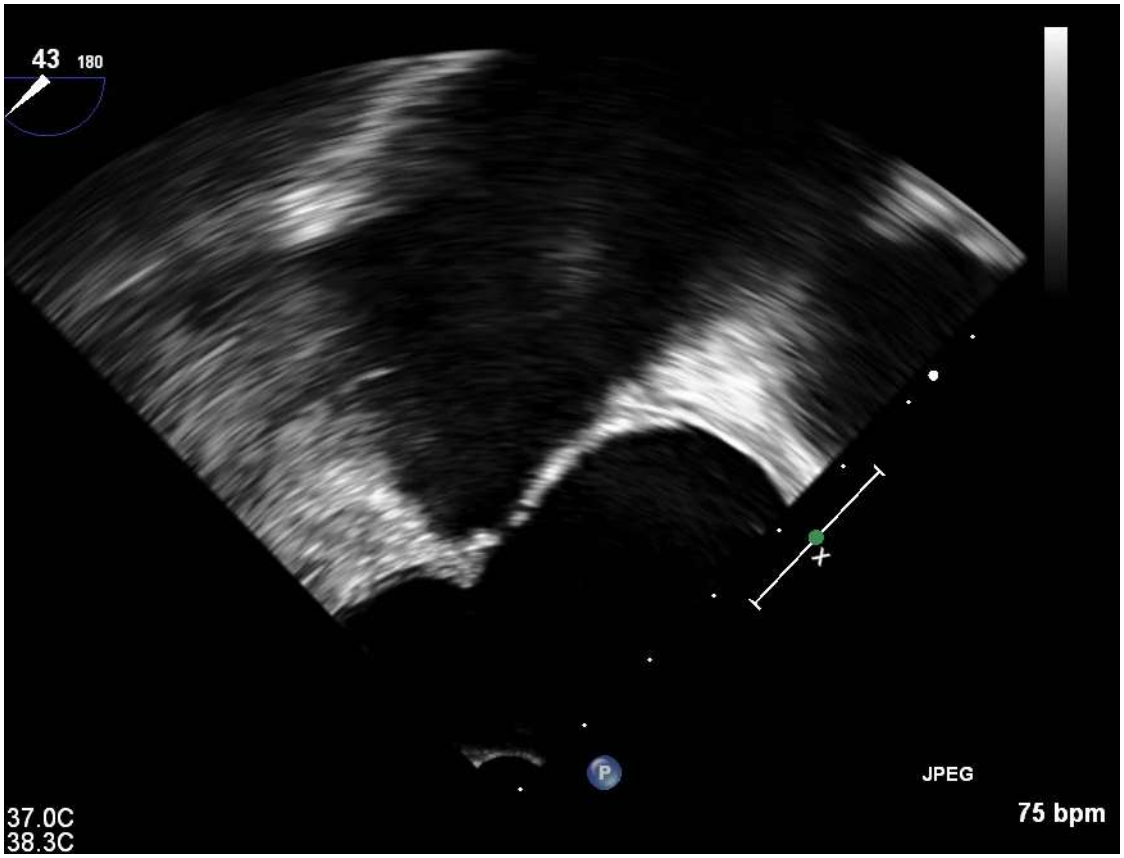


Maximum LAA Ostium (mm)	Device Size (mm) *(uncompressed diameter)*
17-19	21
20-22	**24**
23-25	27
26-28	30
29-31	33

Septal Puncture

Watchman

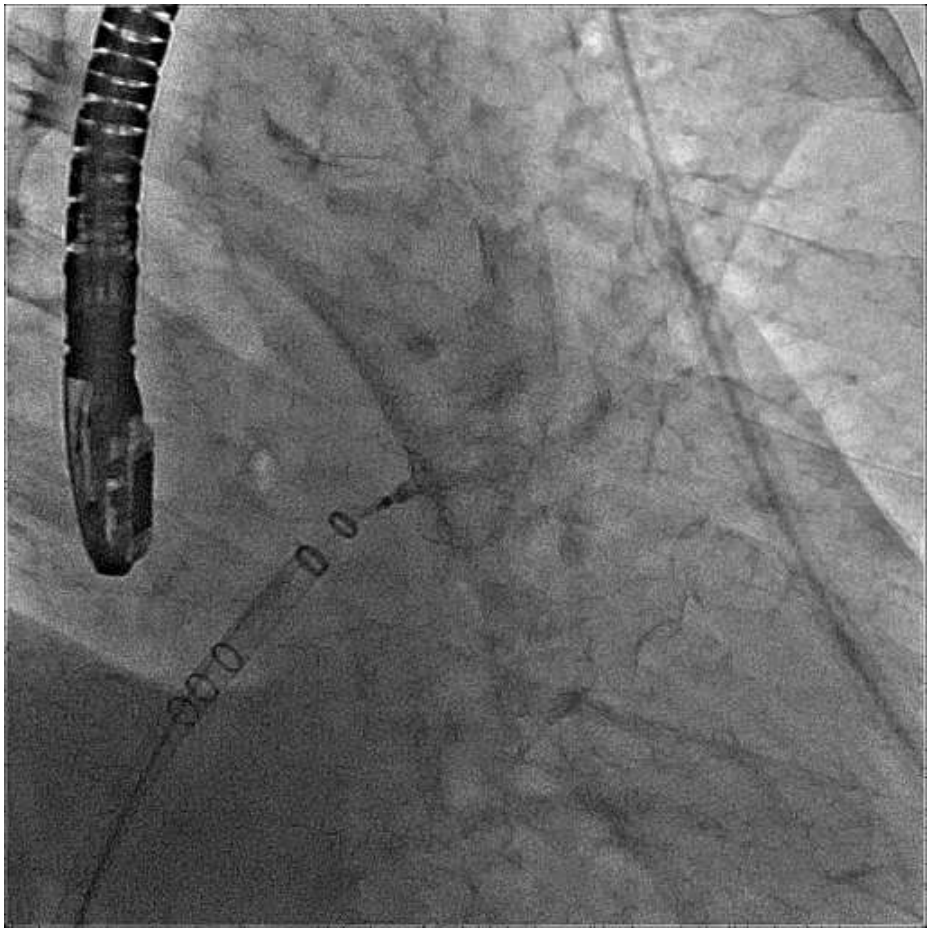


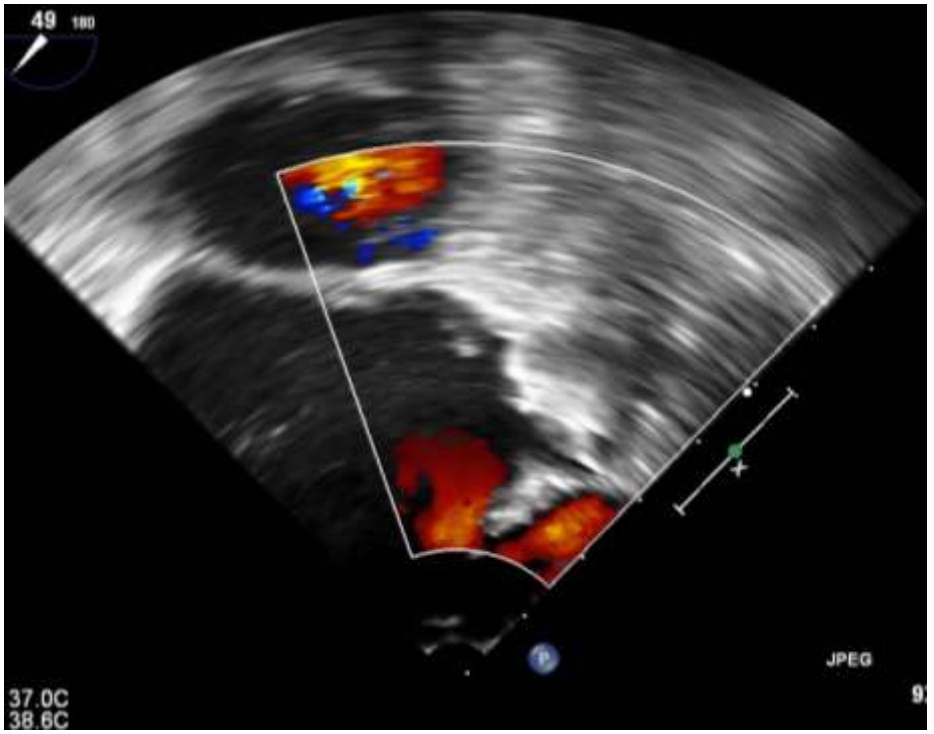


Targeting posterior-inferior septum under TEE-guidance

Deployment

Watchman

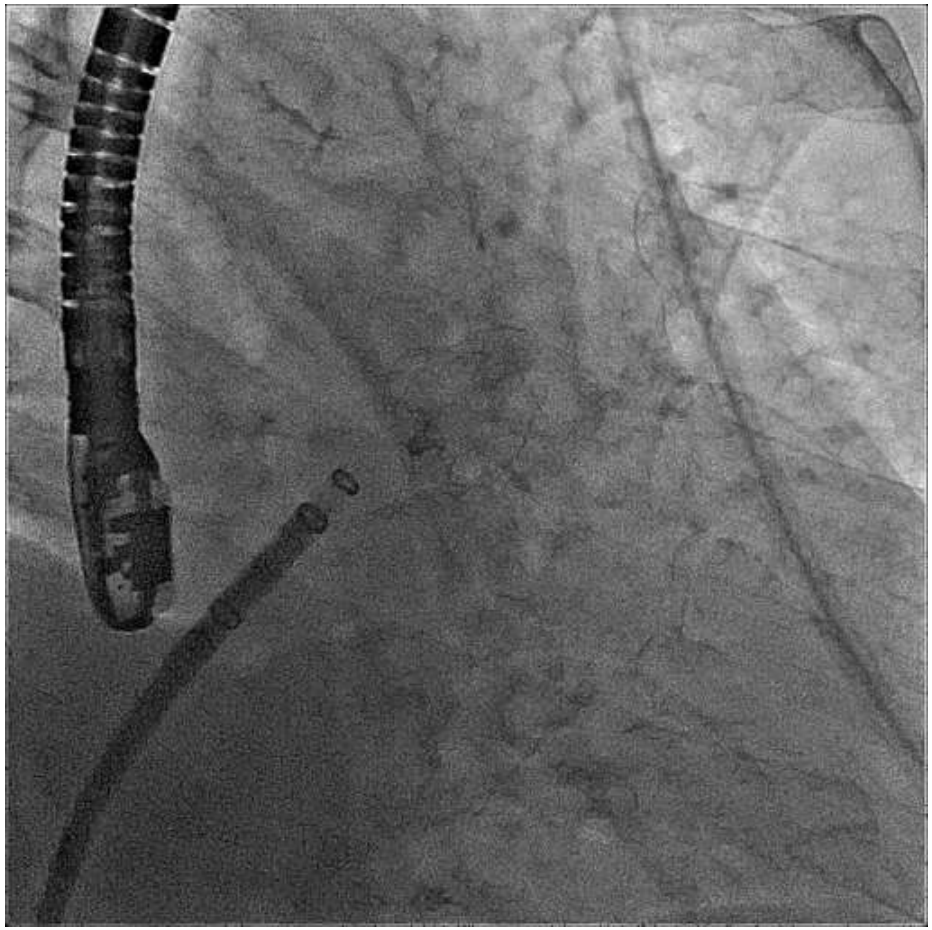




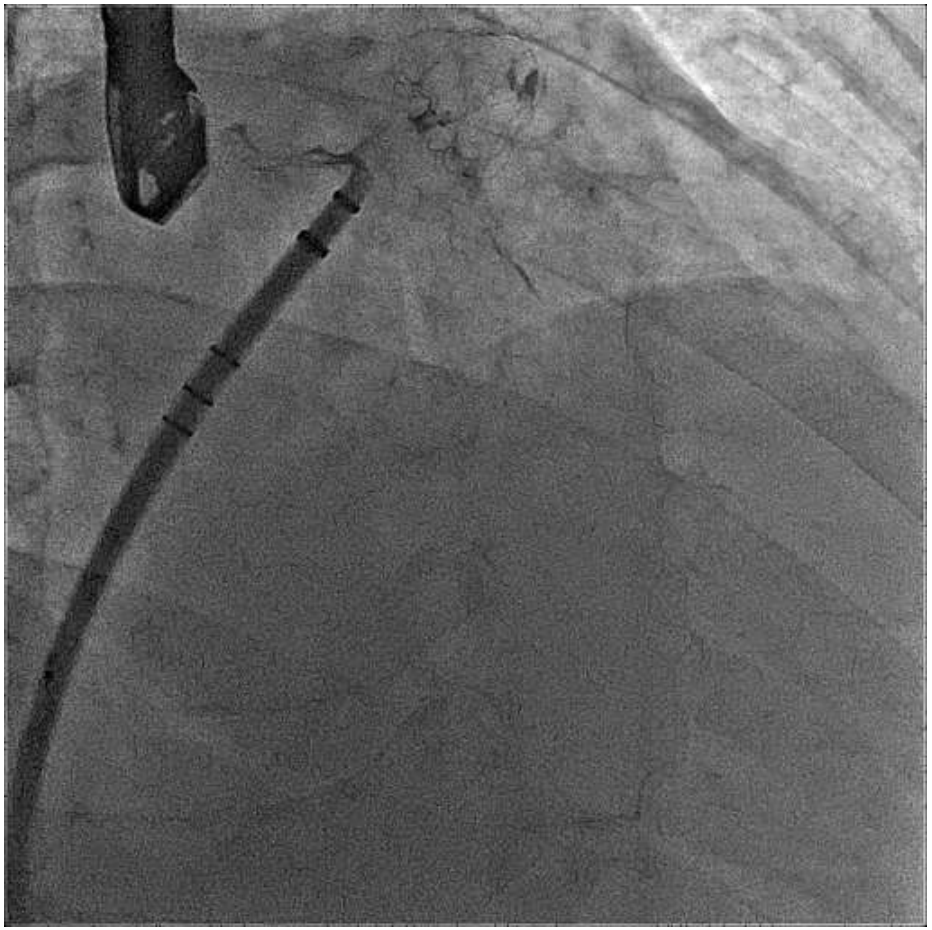
Watchman 24mm

Angiographic Confirmation

Watchman



RAO 30 CAU 20



RAO 30 CRA 20

M/77

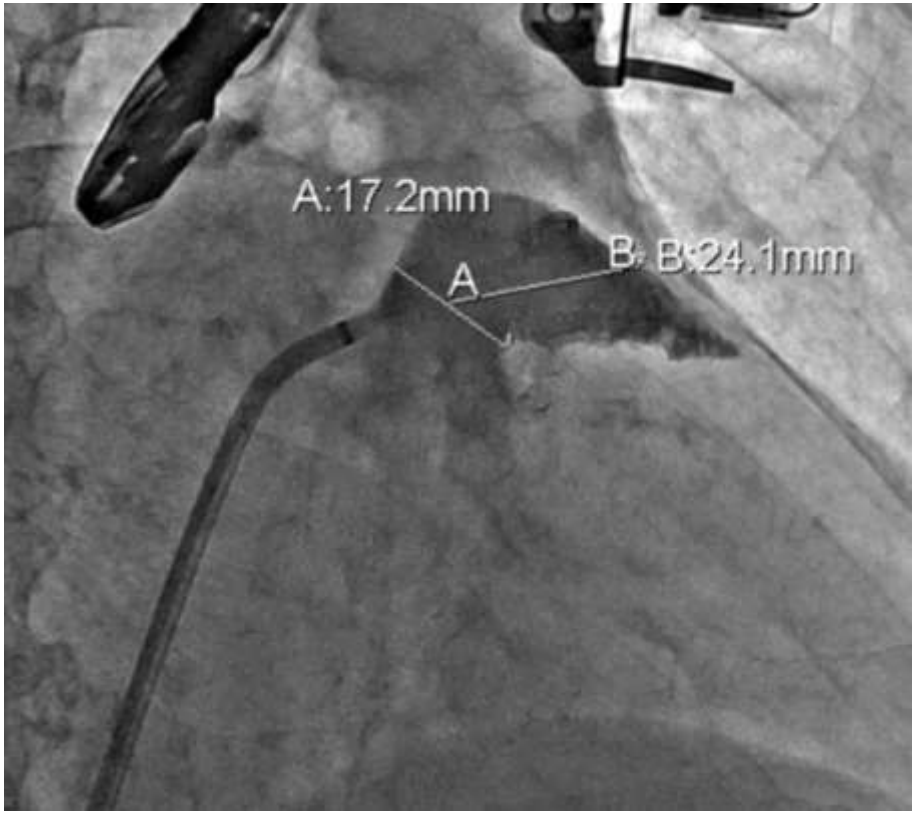
- Old MI
- s/p PTCA c stent
- Small bowel bleeding
- PAF (CAHD VASc 4, HASBLED 3)

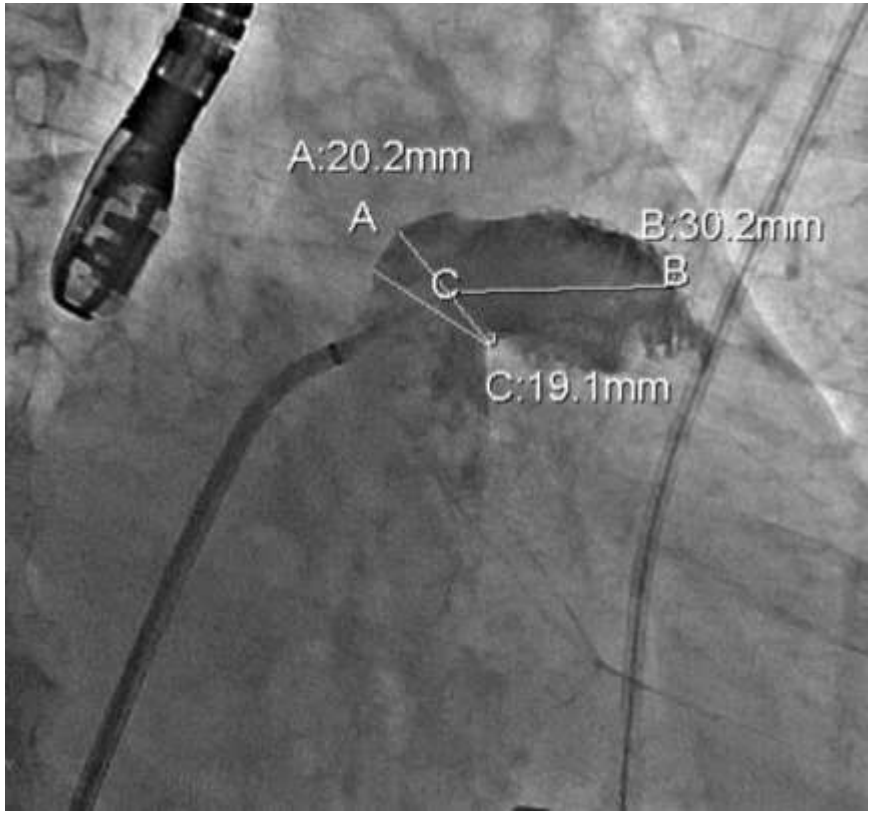
TEE measurement

Watchman

Angiographic Measurement

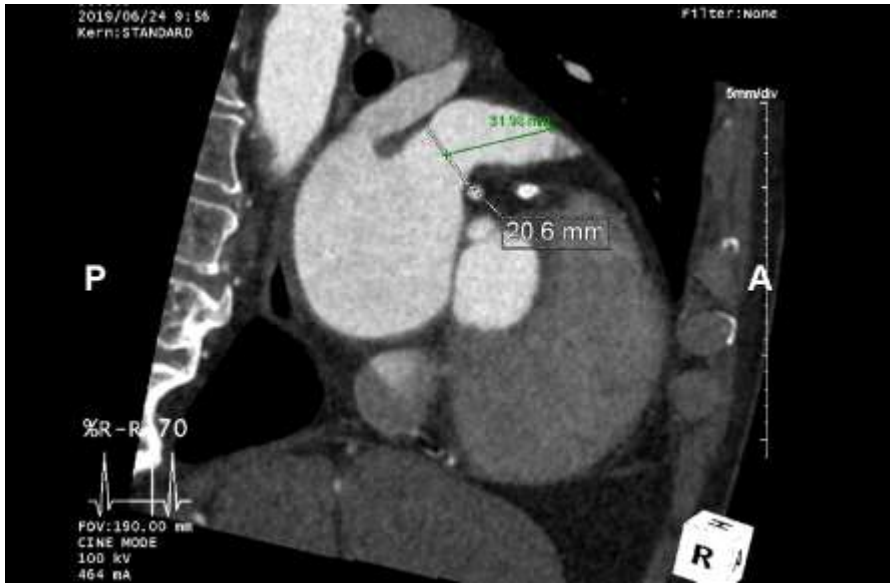
Watchman

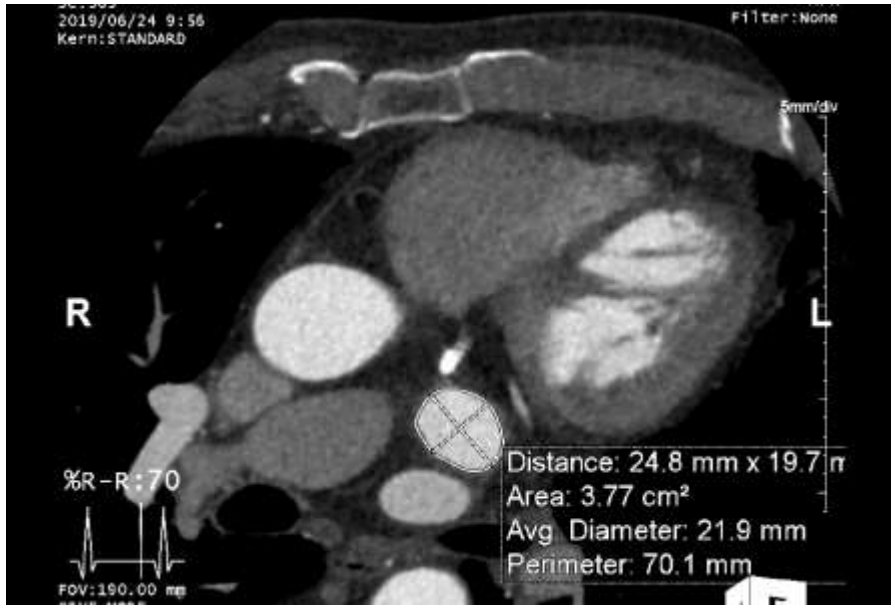




CT Measurement

Watchman





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CT Measurement

Watchman