SIEMENS

Estelle Camus, *PhD*

IntraCardiac Echo Imaging: Today and Tomorrow

AcuNav

FACULTY/PRESENTER DISCLOSURE

- Faculty: Estelle Camus
- Relationships with commercial interests:
  - Grants/Research Support: N/A
  - Speakers Bureau/Honoraria: N/A
  - Consulting Fees: N/A
  - Other: Employee of Siemens Healthcare

Intra-Cardiac Echocardiography
Portfolio and History

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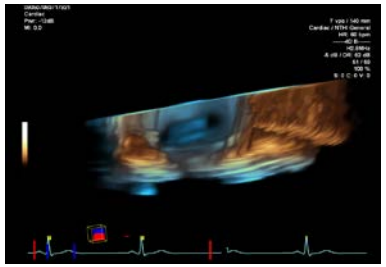
2D ICE

3D ICE

Volume ICE* * Distributed by Siemens



AcuNav™ 10F

AcuNav™ 8F

SoundStar™ 10F

AcuNav™ V 10F

SoundStar™ eco 10F

SoundStar™ eco 8F

2000 2004 2007 2012 2014

Biosense Webster® a Johnson & Johnson company

Catheters and Ultrasound Systems Compatibility

ACUSON Cypress™	ACUSON X300™, Premium Edition	ACUSON X700™	ACUSON Sequoia™	ACUSON SC2000™	ACUSON S Family™
					

ACUSON AcuNav™ ultrasound catheter (8F, 10F)

SoundStar™ (10F, *eco* 10F, *eco* 8F)

ACUSON AcuNav V™

Clinical Applications for 2D/3D ICE and Volume ICE

Expanding to Additional Clinical Disciplines

SIEMENS

Established

Electrophysiology

- Atrial Fibrillation Ablation (Radio-frequency)
- Cryoablation
- Ventricular Tachycardia Ablation

Interventional Cardiology

- Atrial Septal Defect (ASD)
- Patent Foramen Ovale (PFO)
- Left Atrial Appendage Closure (LAA)

Emerging

Percutaneous Valve Interventions

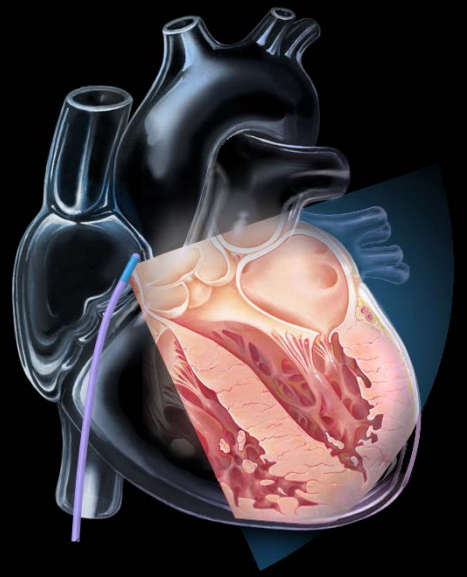
- Aortic Valve (TAVR)
- Mitral Valve
- Pulmonary Valve
- Tricuspid Valve

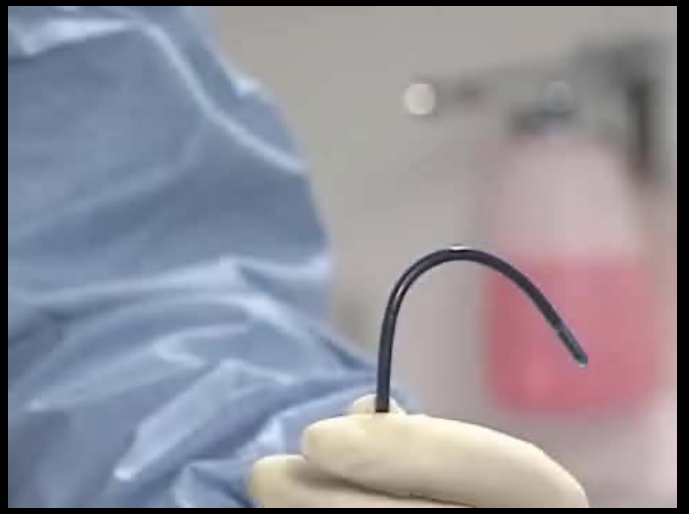
Interventional Radiology

- Direct Intrahepatic Portosystemic Shunt (DIPS)

AcuNav™ and SoundStar™
Real-Time 2D ICE Catheter Solutions

- Side-firing ultrasound catheter
- 8F or 10F
- 90 cm
- Real-time 2D imaging (B, Color)
- PW, CW modes
- 4-way 160° steering
  - Anterior / Posterior
  - Left / Right
- Allows imaging of left heart from right heart

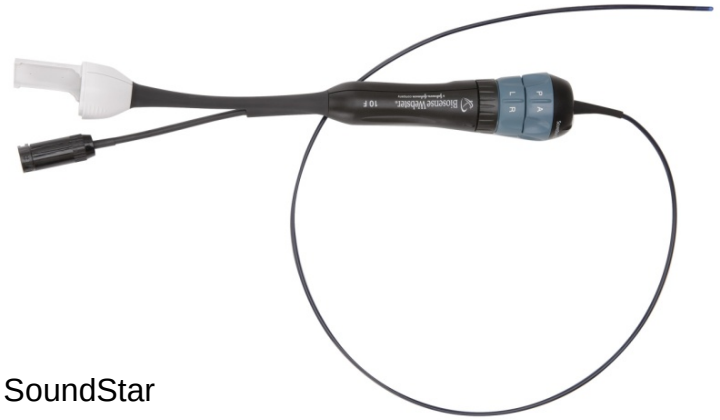




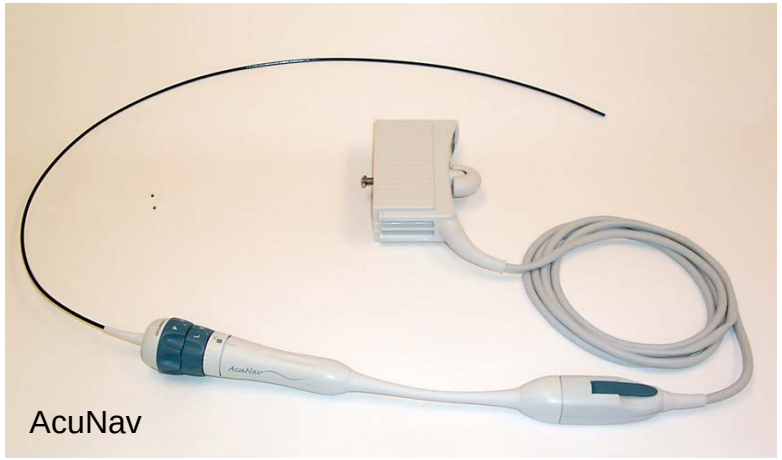
Indication for Use

"The ACUSON ACUNAV™ Ultrasound Catheter is intended for intra-cardiac and intra-luminal visualization of cardiac and great vessel anatomy and physiology, as well as visualization of other devices in the heart of adult and pediatric patients”

AcuNav™ and SoundStar™
Bringing Benefits to Interventional Procedures



SoundStar



AcuNav

Clinical Benefits

- Visualization of anatomy and devices
- Conscious sedation vs. general anesthesia
- Reduced fluoroscopy and contrast doses
- Improved patient safety and recovery

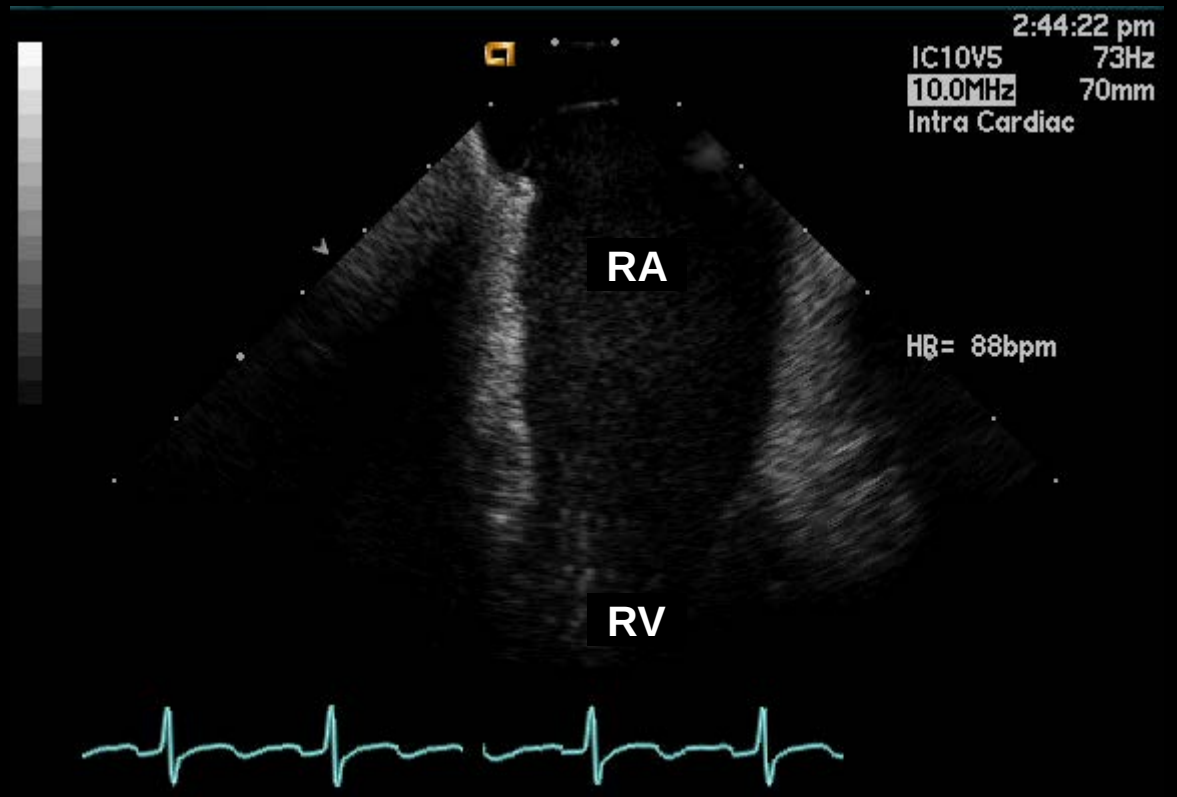
Workflow Benefits

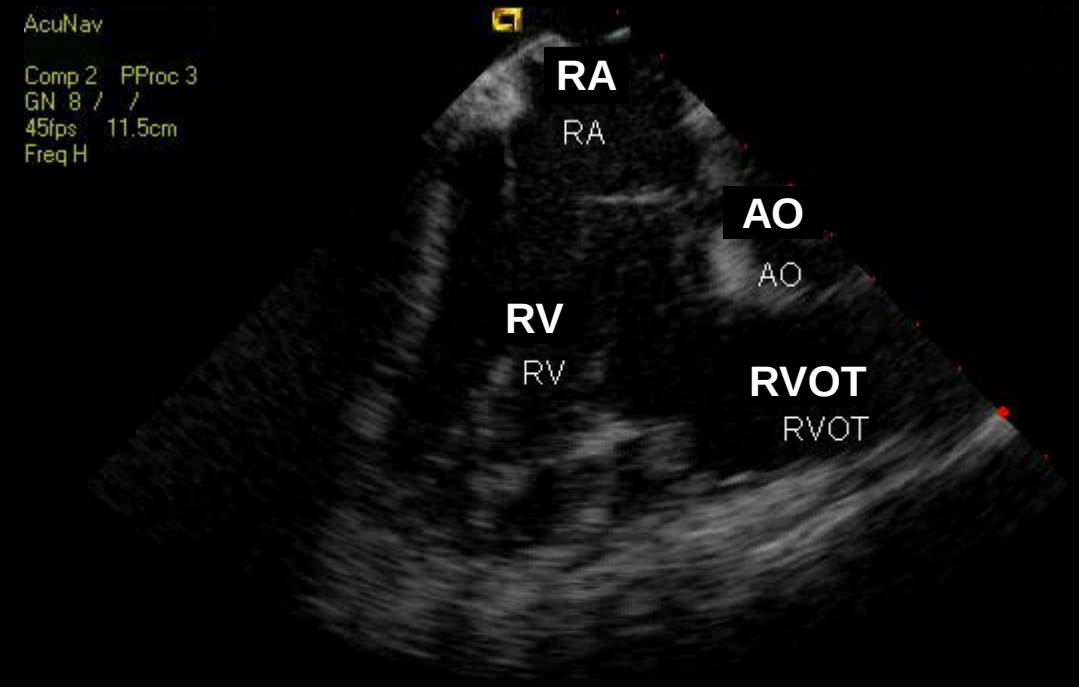
- Reduced procedural time
- Image guidance by single operator

Financial Benefits

- Increased patient volume
- Reduced staffing need
- Reduced need for more invasive imaging modalities

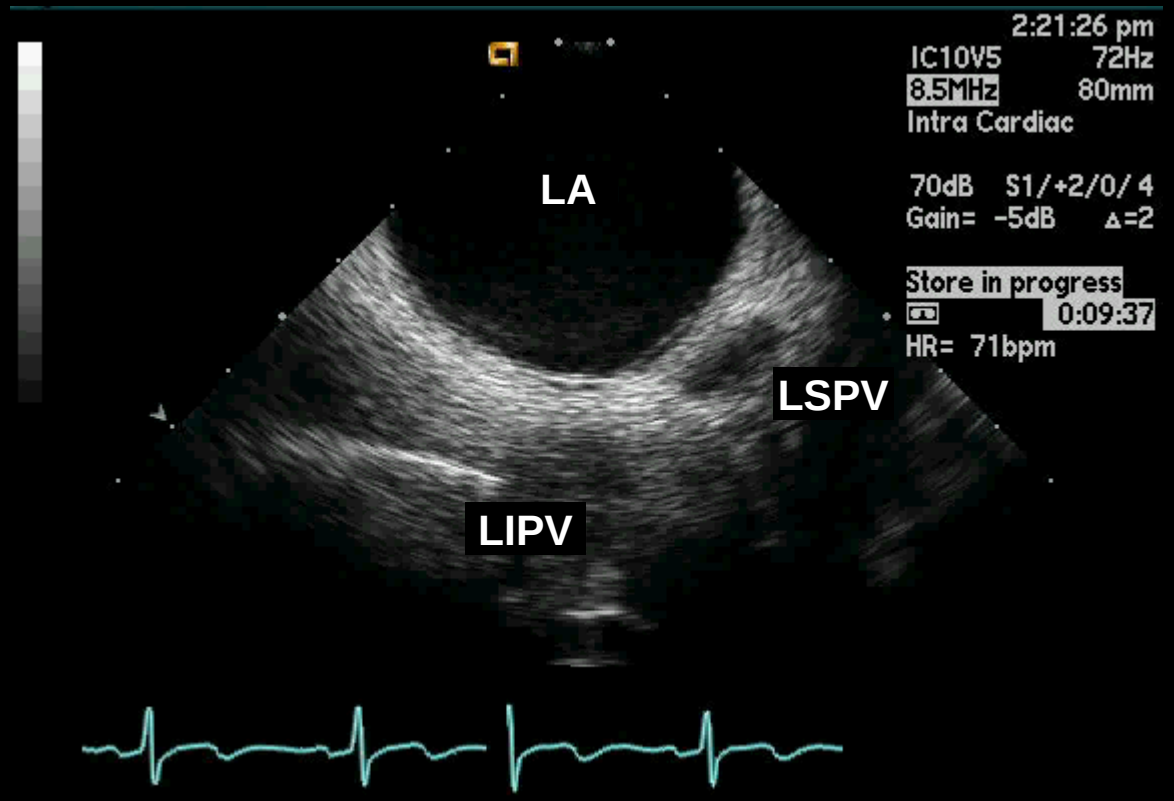
Cavo-Tricuspid Isthmus and RVOT

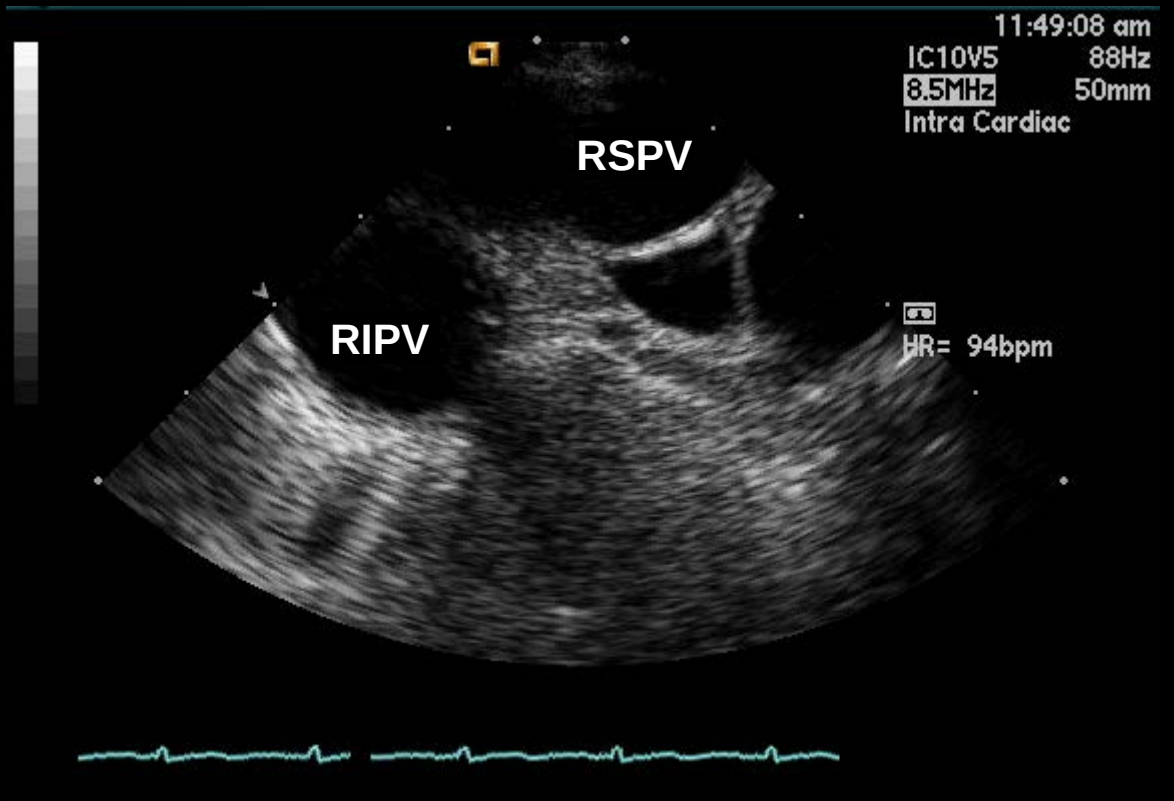




Courtesy of Biosense Webster's Inc.

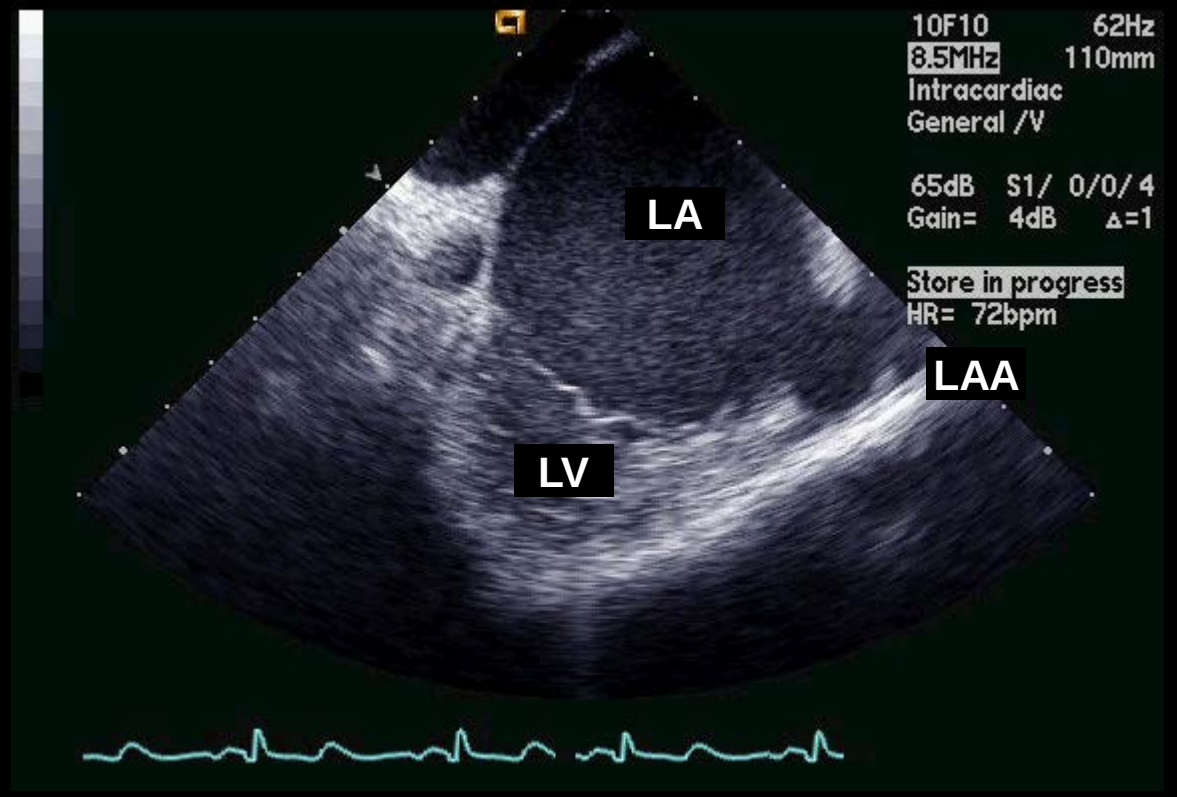
Left and Right Pulmonary Veins

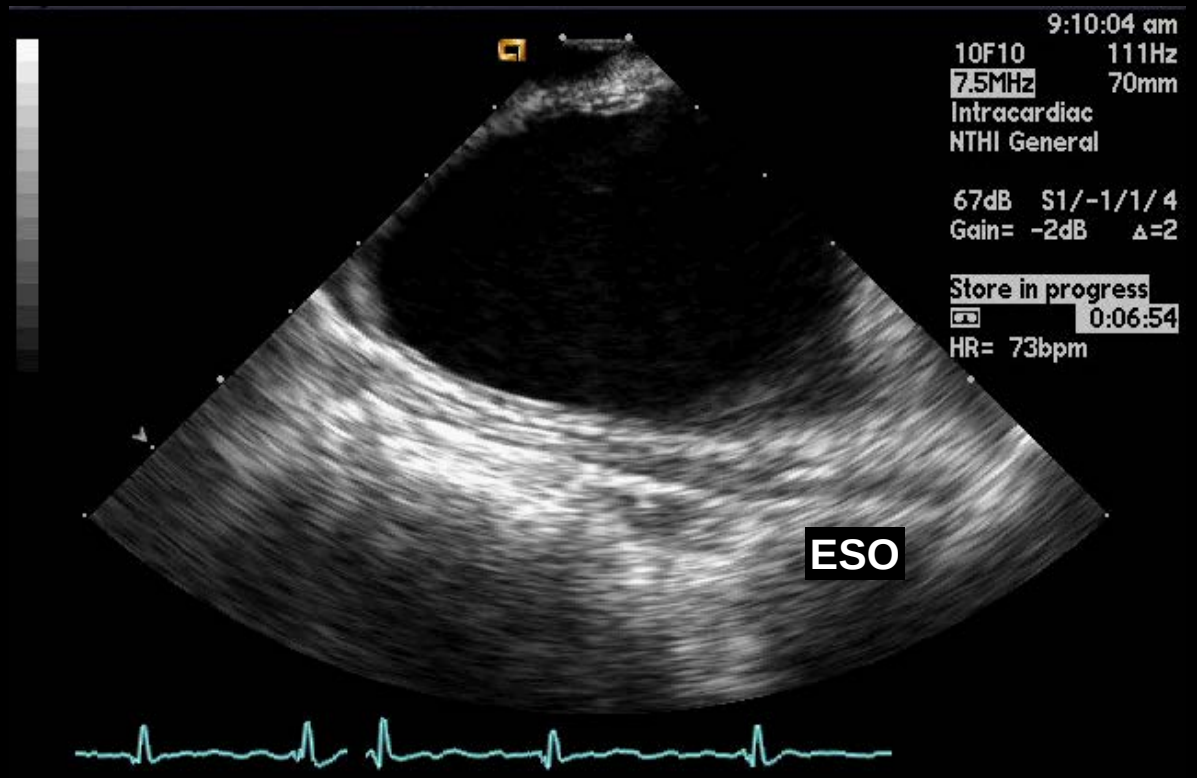




Courtesy of Biosense Webster's Inc.

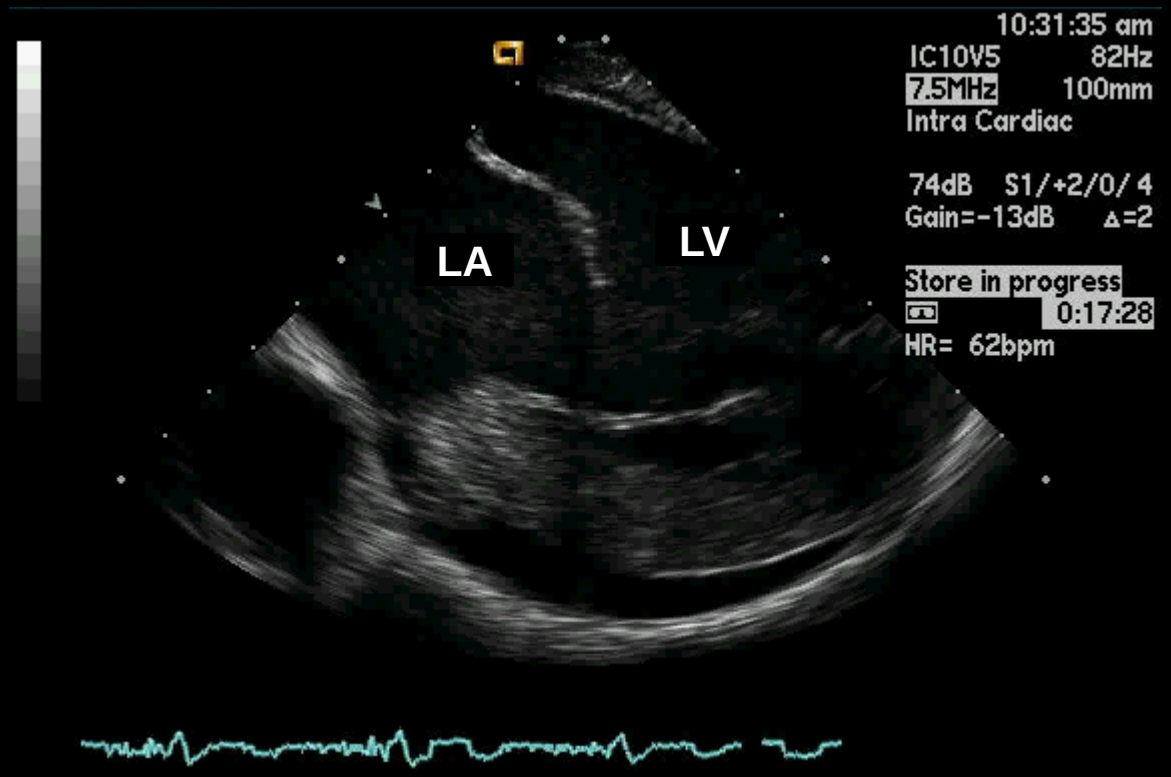
Left Atrial Appendage and Esophagus





Courtesy of Biosense Webster's Inc.

Left Ventricular Long Axis View
Pericardial Effusion



Courtesy of Biosense Webster's Inc.

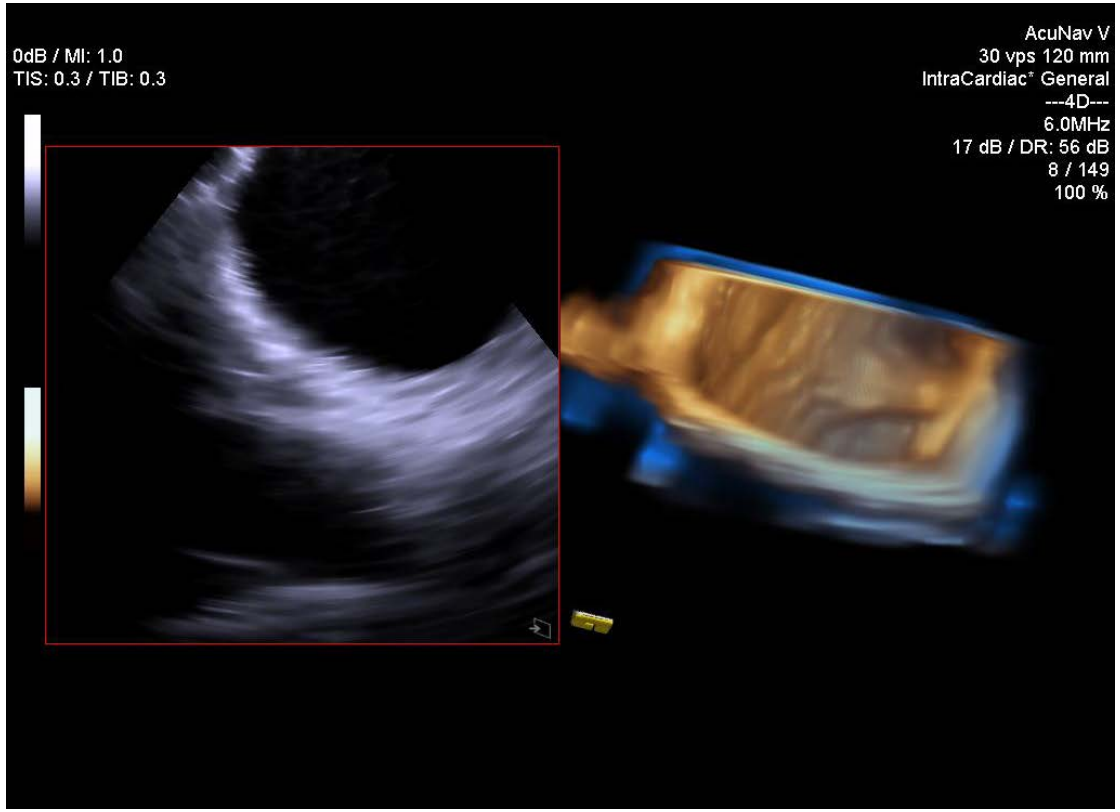
ACUSON AcuNav™ V Catheter*

World's First Real-Time Volume ICE Catheter

- 10F
- 90 cm
- Volume size: 24° x 90° volume
- Real-time volume imaging (B, Color)
- Powered by ACUSON SC2000 system
- Superior visualization of anatomy and devices over 2D ICE
- Real-time 3D color provides valuable blood flow information
- "Flashlight in the heart"

ACUSON AcuNav™ V Catheter*

World's First Real-Time Volume ICE Catheter



Clinical Benefits

- Superior visualization of anatomy and devices over 2D ICE
- Conscious sedation vs. general anesthesia
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Workflow Benefits

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Financial Benefits

- Increased patient volume
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- Reduced need for more invasive imaging modalities

Courtesy of Mayo Clinic Rochester, MN

* Distributed by Siemens

ACUSON AcuNav™ V Catheter

Superior Visualization of Tissue and Needle

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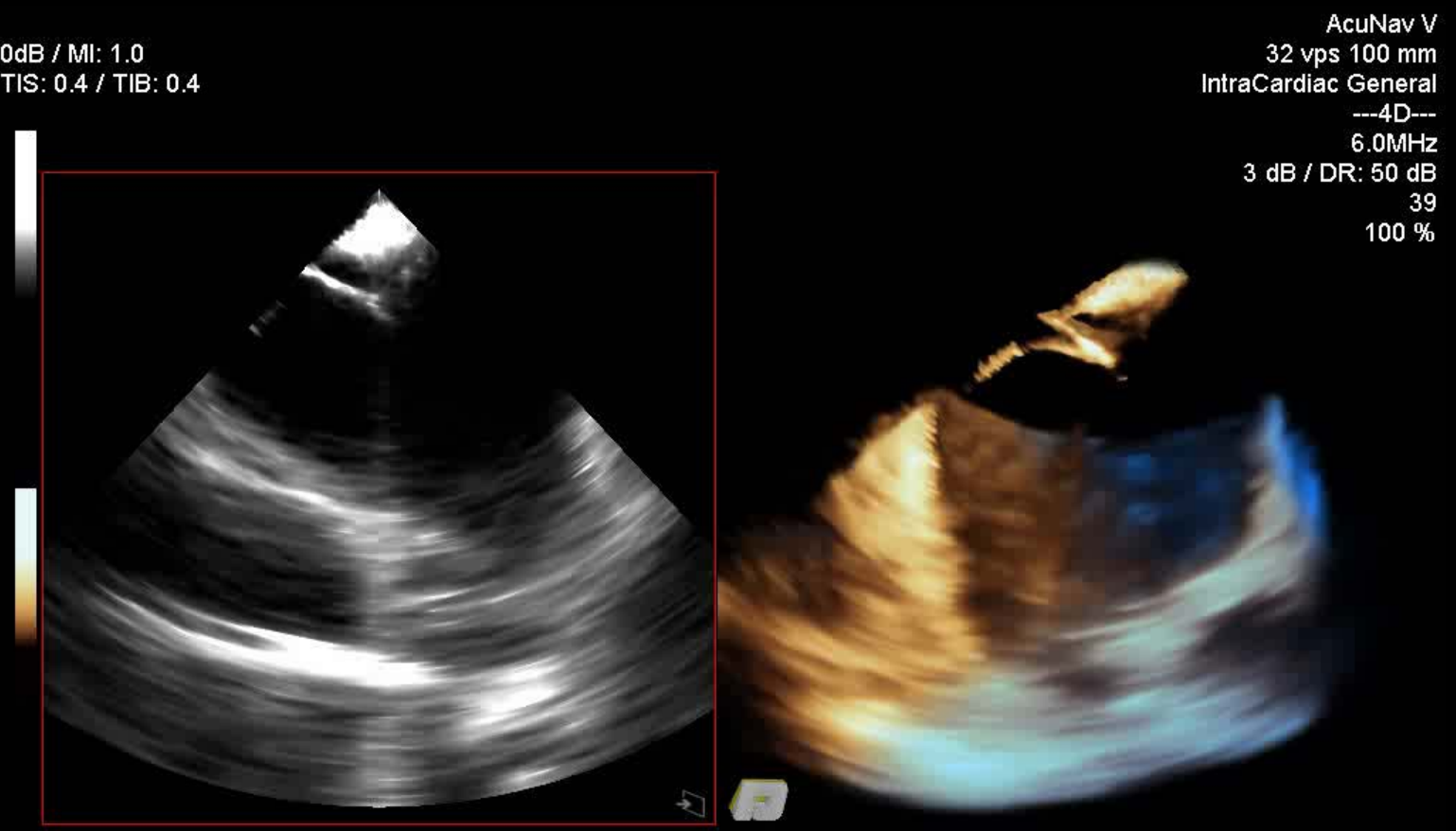
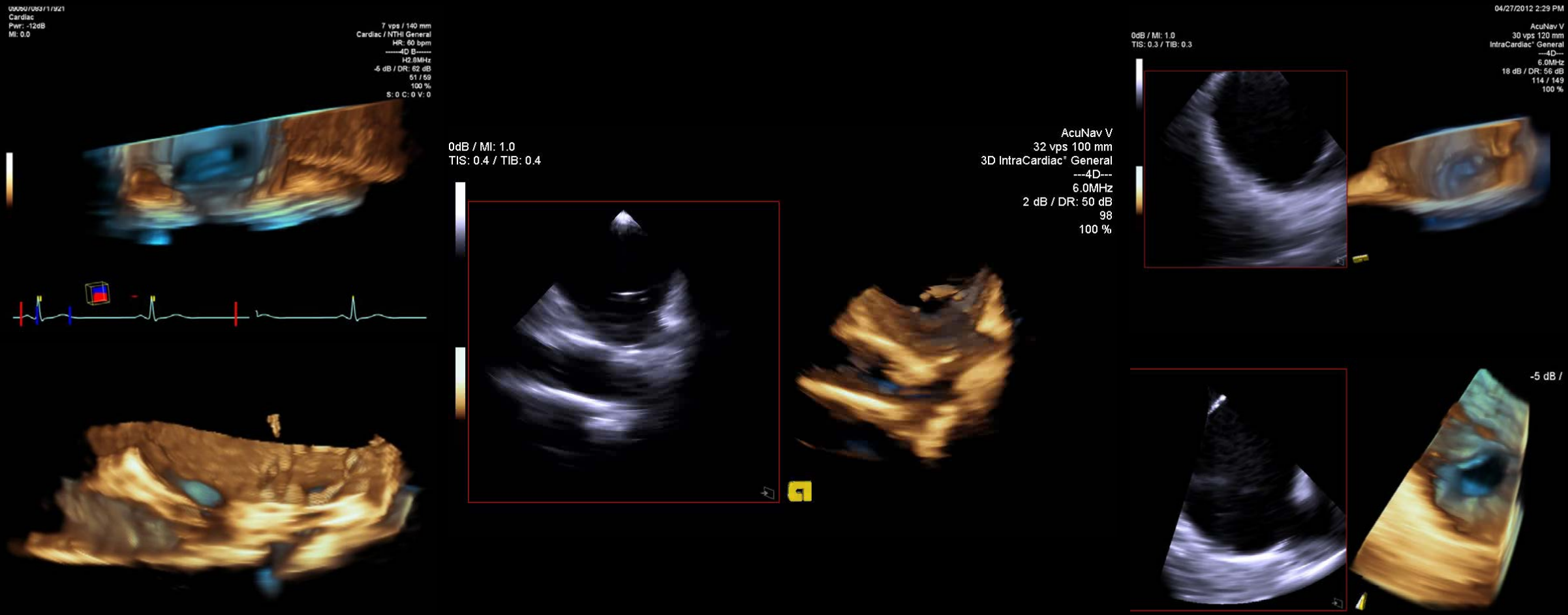
Transeptal Puncture



Courtesy of Yale Medical Center, New Haven, CT

ACUSON AcuNav™ V Catheter

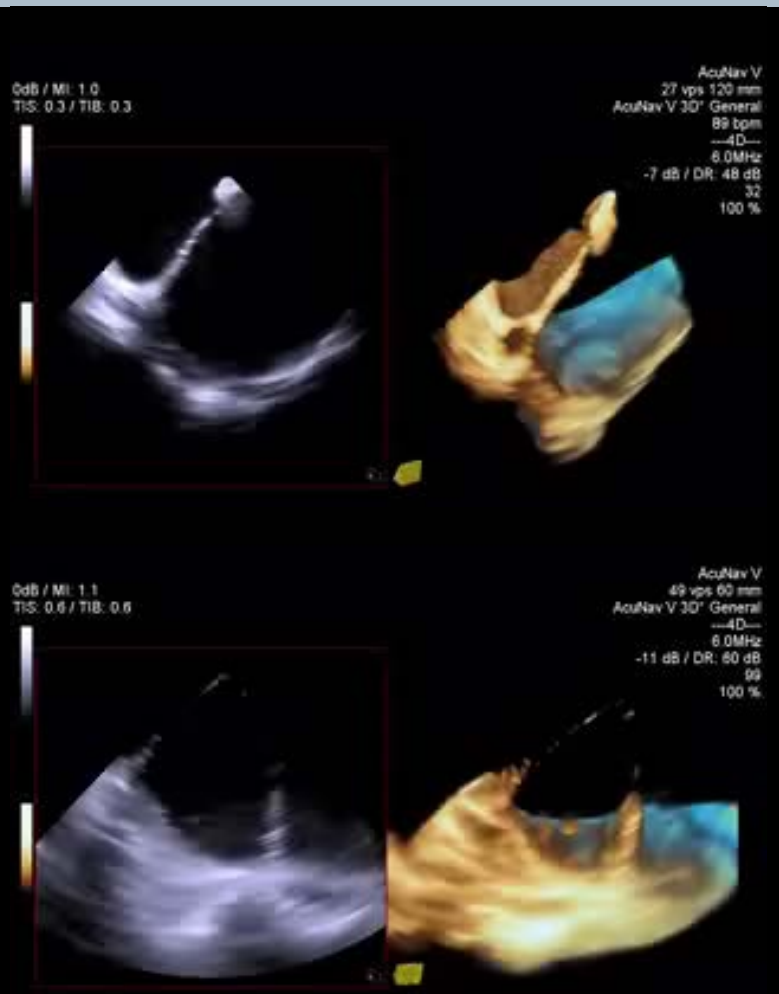
Superior Visualization of Pulmonary Veins and Lasso Catheter



Courtesy of Stanford Medical Center, Palo Alto, CA

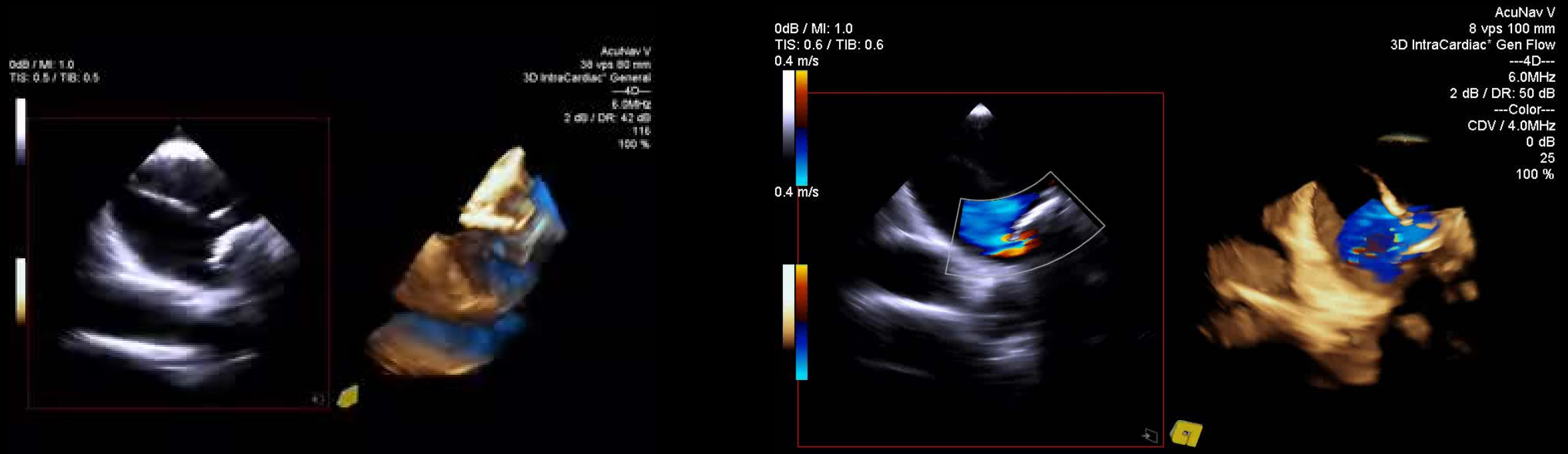
ACUSON AcuNav™ V Catheter

Superior Visualization of Pulmonary Vein for RF Ablation



Courtesy of Mayo Clinic Rochester, MN

ACUSON AcuNav™ V Catheter
Successful Guidance of Cryoablation



Courtesy of Stanford Medical Center, Palo Alto, CA

ACUSON AcuNav™ V Catheter

Benefits of the ACUSON AcuNav V™ Ultrasound Catheter

- Improved visualization of anatomy and devices with real time 3D imaging
- Safer and faster procedures
- 3D color flow Doppler provides immediate evaluation of outcomes
- Seamless integration into today and tomorrow's EP and structural heart programs

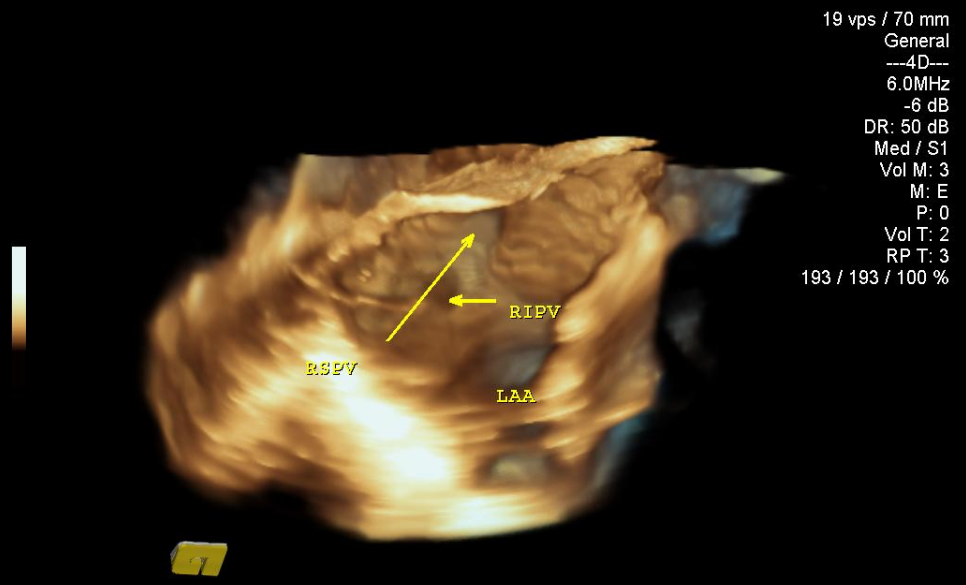
Benefit Comparison to Transesophageal Echocardiography

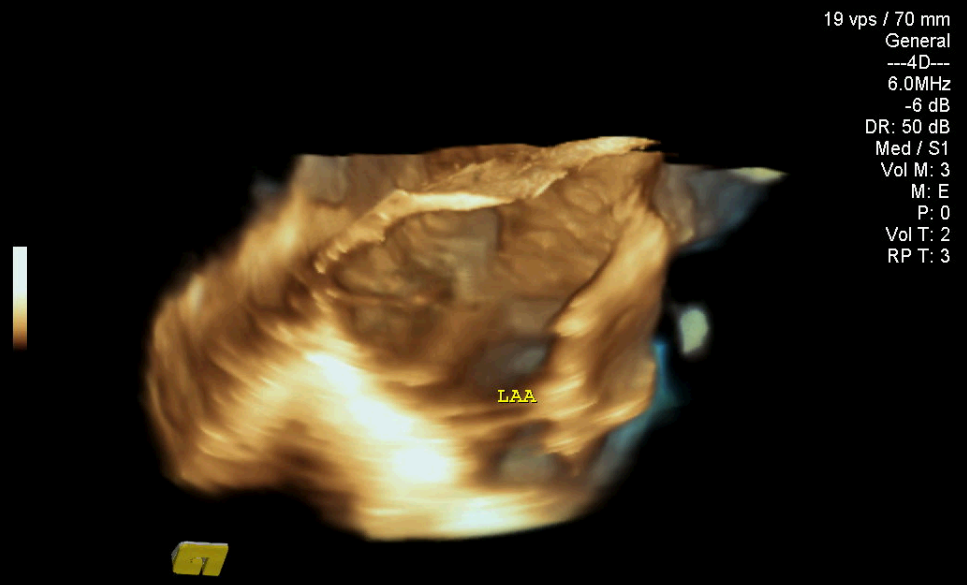
- Single operator procedure
- Ideal platform for guiding procedures and continuous monitoring
- Reduced need for general anesthesia reducing costs and complications
- Dramatic improvement in patient comfort especially during long procedures

What comes tomorrow?

Next Generation Volume ICE*

Pioneering on Echo Guidance of Minimally Invasive Procedures

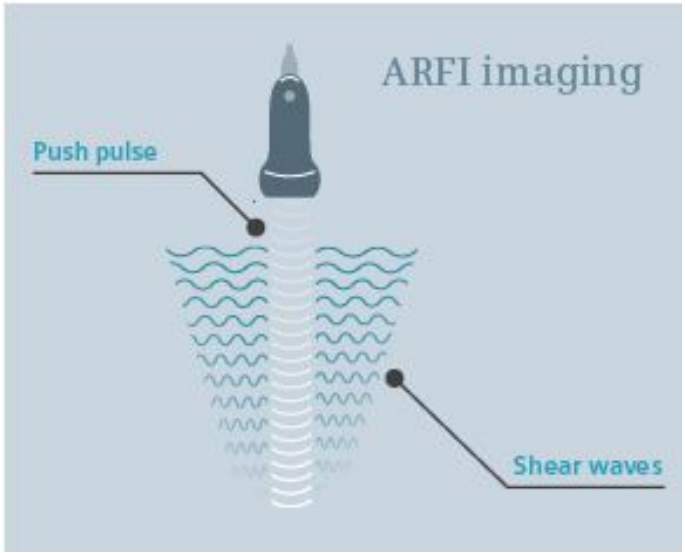


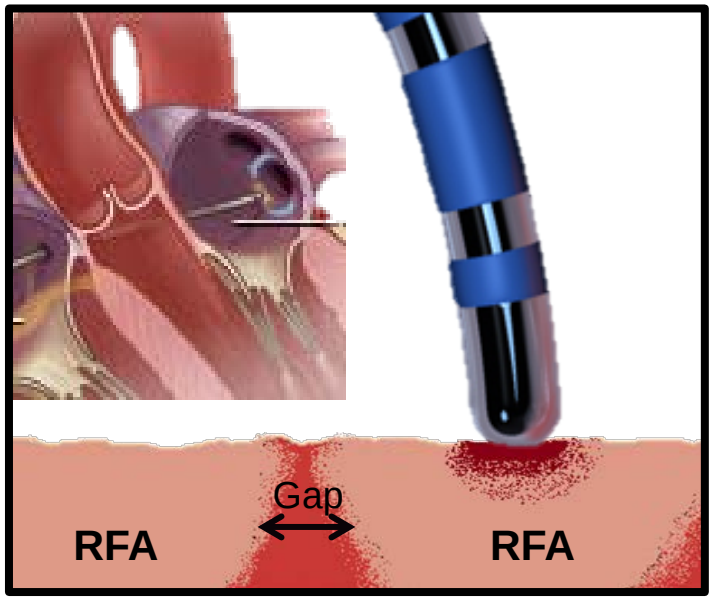


*Works in Progress – Not Commercially Available

Tissue Characterization with Acoustic Radiation Force Imaging (ARFI)

- Radiation-force applied to tissue at the focus, creates µm scale tissue displacements inversely proportional to the tissue mechanical properties
- Ultrasound scan lines monitor tissue response
- Multiple lateral push locations are acquired to build a 2D image
- 2D images of ARFI-induced displacements provide visualization of relative tissue elasticity





RF-induced tissue heating increases tissue stiffness:

- RFA lesion = relatively low displacements
- Unablated myocardium = relatively high displacements

**Works in Progress – Not Commercially Available*

ARFI Clinical Study – Preliminary Results*

- 11 Patients (8 atrial fibrillation, 2 atrial flutter, 1 atypical flutter)
- Previous studies indicate ARFI-induced displacements are due to thermocoagulation, not edema

Ablation of Tricuspid Annulus for Atrial Flutter

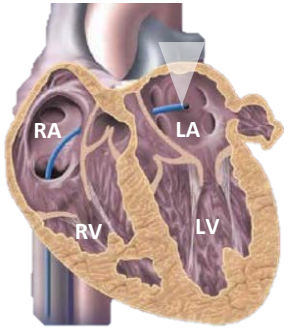
- Successful imaging and tricuspid annulus
- Final ARFI image showed complete linear ablation
- EP study showed block at annulus

Pulmonary vein isolation

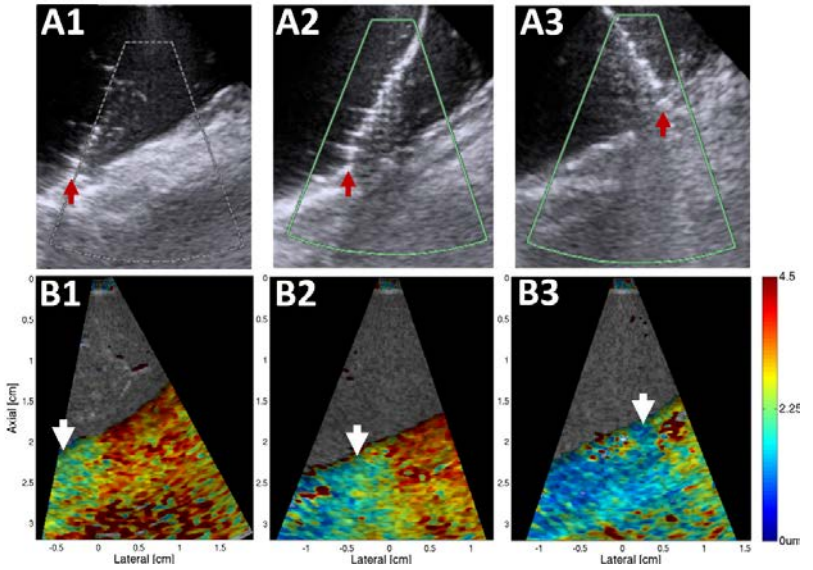
- Successful imaging around pulmonary veins

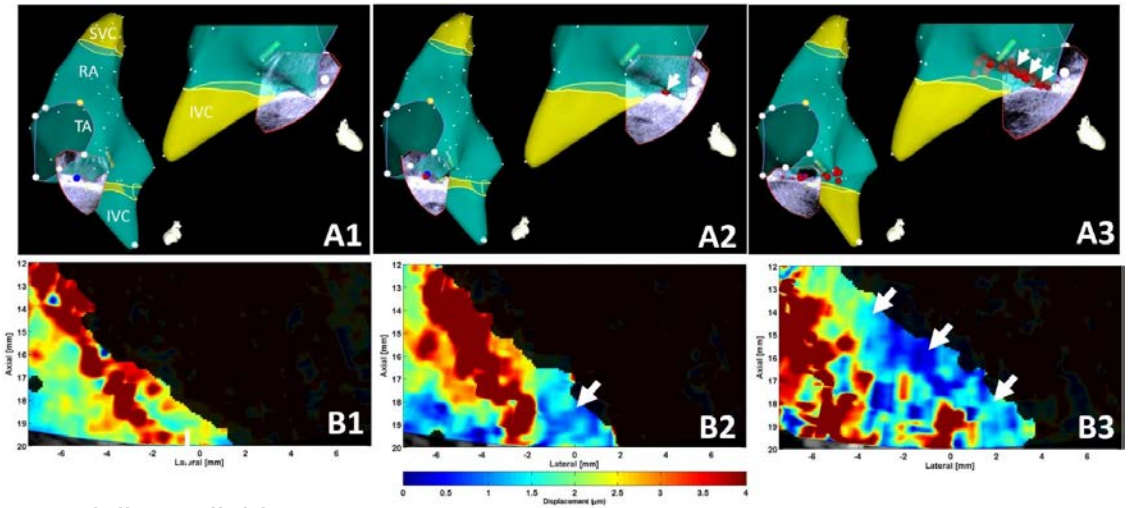
Ligament of Marshall

- Typically difficult to achieve sufficient contact force
- Successful imaging location in most preliminary patients



Successive imaging of ablation along LA roof line





TD Bahnson, SA Eyerly, PJ Hollender, JR Dorhety, YJ Kim, GE Trahey, PD Wolf. Feasibility of Near Real-Time Lesion Assessment during Radiofrequency Catheter Ablation in Humans using Acoustic Radiation Force Impulse Imaging. *Journal of Cardiovascular Electrophysiology, 2014, Vol 25 (12), p. 1275-1283*

DUKE BME BIOMEDICAL ENGINEERING Pratt School of Engineering

**Works in Progress – Not Commercially Available*

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Questions

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