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

2D ICE

3D ICE

Volume ICE*
* Distributed by Siemens

Volume ICE

SoundStar™ eco
10F

SoundStar™ eco
8F

2014

AcuNav™ V
10F

AcuNav™ 10F

AcuNav™ 8F

SoundStar™
10F

SoundStar™
8F

2000

2004

2007
<table>
<thead>
<tr>
<th>Catheters and Ultrasound Systems Compatibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACUSON</strong> Cypress™</td>
</tr>
<tr>
<td><strong>ACUSON</strong> X300™, Premium Edition</td>
</tr>
<tr>
<td><strong>ACUSON</strong> X700™</td>
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<tr>
<td><strong>ACUSON</strong> Sequoia™</td>
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<tr>
<td><strong>ACUSON</strong> SC2000™</td>
</tr>
<tr>
<td><strong>ACUSON</strong> S Family™</td>
</tr>
<tr>
<td><strong>ACUSON AcuNav™ ultrasound catheter (8F, 10F)</strong></td>
</tr>
<tr>
<td><strong>SoundStar™ (10F, eco 10F, eco 8F)</strong></td>
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<tr>
<td><strong>ACUSON AcuNav V™</strong></td>
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Clinical Applications for 2D/3D ICE and Volume ICE
Expanding to Additional Clinical Disciplines

<table>
<thead>
<tr>
<th>Established</th>
<th>Interventional Cardiology</th>
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<tbody>
<tr>
<td>Electrophysiology</td>
<td>Interventional Cardiology</td>
</tr>
<tr>
<td>Atrial Fibrillation Ablation (Radio-frequency)</td>
<td>Atrial Septal Defect (ASD)</td>
</tr>
<tr>
<td>Cryoablation</td>
<td>Patent Foramen Ovale (PFO)</td>
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<tr>
<td>Ventricular Tachycardia Ablation</td>
<td>Left Atrial Appendage Closure (LAA)</td>
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<thead>
<tr>
<th>Emerging</th>
<th>Interventional Radiology</th>
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<tbody>
<tr>
<td>Percutaneous Valve Interventions</td>
<td>Direct Intrahepatic Portosystemic Shunt (DIPS)</td>
</tr>
<tr>
<td>Aortic Valve (TAVR)</td>
<td>Mitral Valve</td>
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<tr>
<td>Mitral Valve</td>
<td>Pulmonary Valve</td>
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<tr>
<td>Pulmonary Valve</td>
<td>Tricuspid Valve</td>
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</table>
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

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

LA
LSPV
LIPV
RIPV
RSPV

Courtesy of Biosense Webster’s Inc.
Left Atrial Appendage and Esophagus

LA  LV
LAA
ESO

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
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* Distributed by Siemens

Courtesy of Mayo Clinic Rochester, MN

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Estelle Camus – 12th Winter Arrhythmia School
ACUSON AcuNav™ V Catheter
Superior Visualization of Tissue and Needle

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


*Works in Progress – Not Commercially Available