High Resolution IVUS: See the Unseen!

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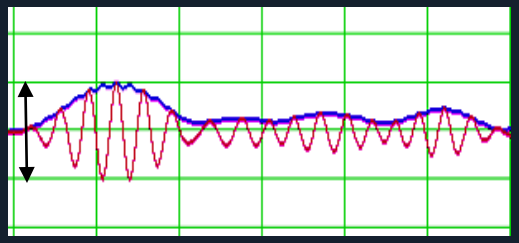
Disclosure Statement of Financial Interest

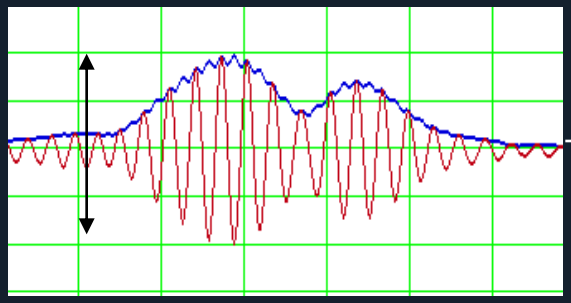
Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

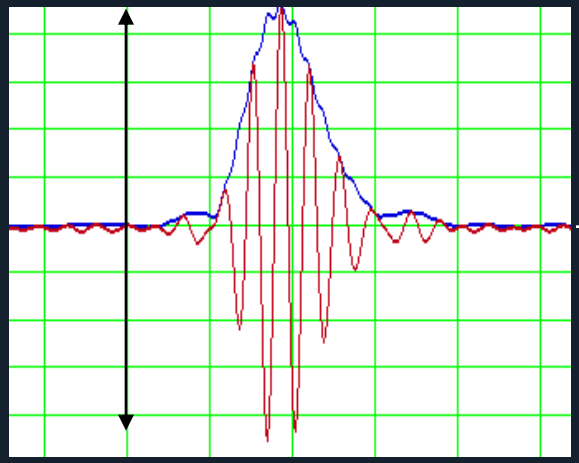
Affiliation/Financial Relationship	Company
• Grant/Research Support	• Boston Scientific Corporation
• Consulting Fees/Honoraria	• Boston Scientific Corporation, ACIST
• Speaker Fee	• Volcano Corporation, St Jude Medical

Gray Scale IVUS Tissue Characterization

Ultrasound Wave

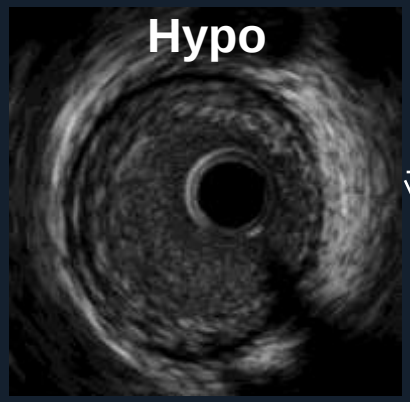






Grey Scale

Hypo

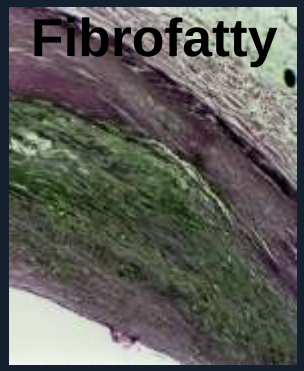


Iso/Hyper

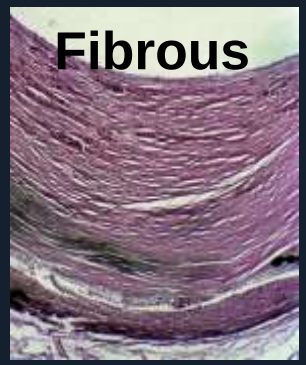
Hyper with Shadow

Pathology

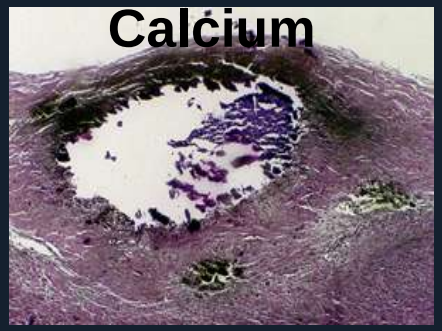
Fibrofatty



Fibrous



Calcium



Four Companies Are Working on Next Generation IVUS Systems

- **ACIST (purchased SVMI - has been working on next generation IVUS since 2007)**
- **Boston Scientific**
- **Volcano**
- **InfraReDx**

Available

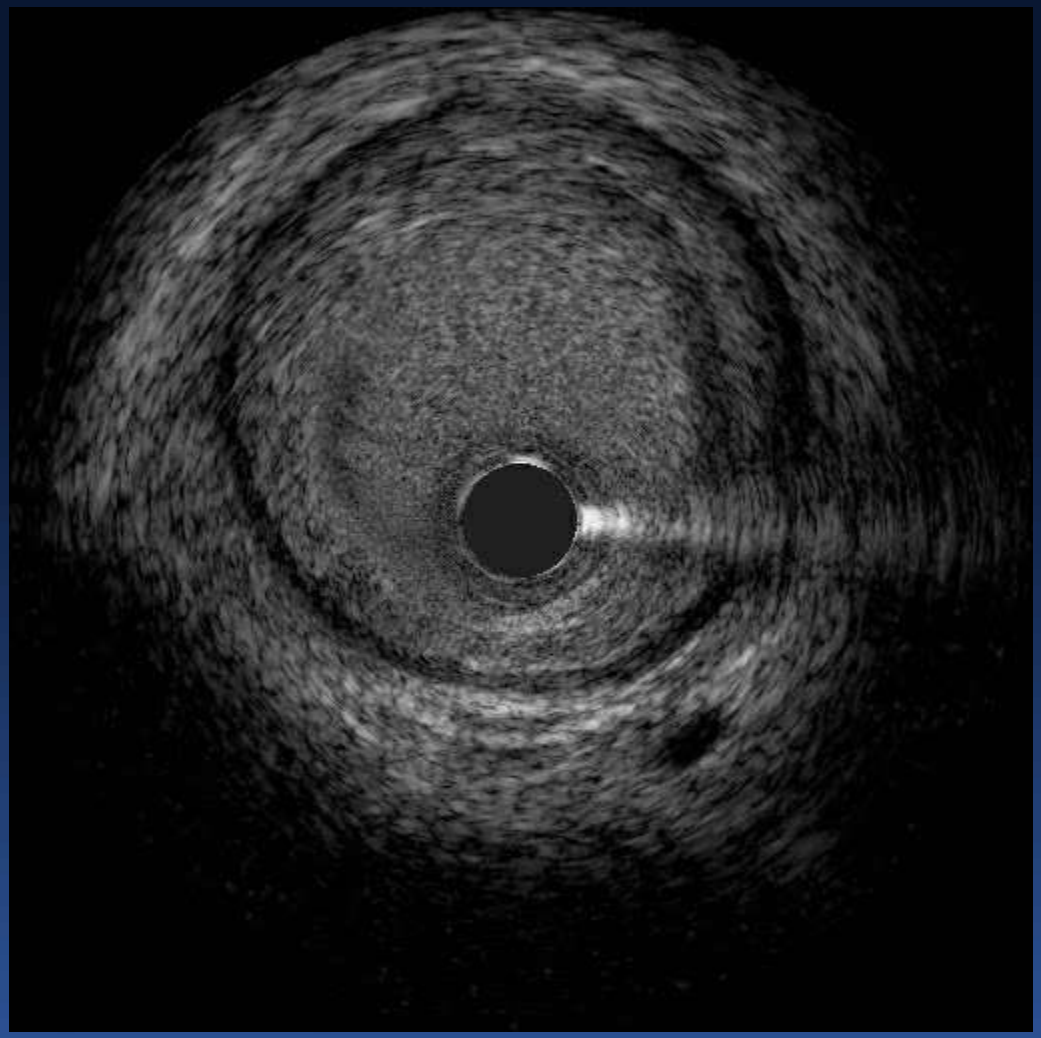
Under development

Intravascular Imaging System Comparison

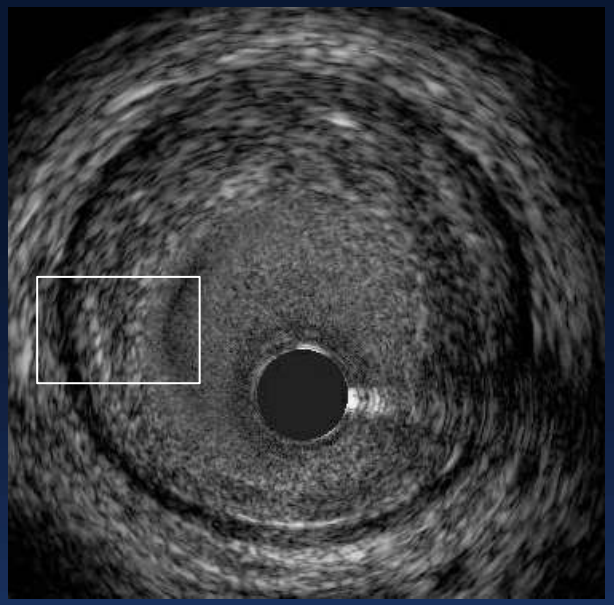
Feature	ACIST HDi / Kodama	ACIST HDi / Kodama	BSC iLab / Atlantis	Volcano S5 / Revolution	SJM Ilumien/ Dragonfly
Frequency or Wavelength	60 MHz	40 MHz	40 MHz	45 MHz	1.3 µm
Nature of the Energy	Ultrasound				Optical
Axial Resolution	40 µm	60 µm	90 µm	100 µm	15 µm
Lateral Resolution	90 µm	140 µm	480 µm	620 µm	40 µm
Soft Tissue Penetration	> 2.5 mm	> 3.0 mm	>3.5 mm		0.8-1.2 mm*
Blood Penetration	> 3.4 mm	> 4.0 mm	>4.0 mm		≤ 1.2 mm
Pullback Speed (mm/s)	0.5, 1.0, 2.5, 5.0, 10		0.5,1.0		20
Pullback Length (mm)	120		100		75

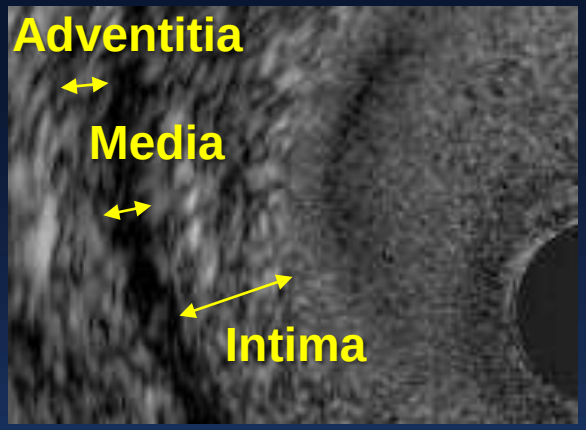
* Soft Tissue Penetration with contrast injection to achieve blood clearing.

60MHz

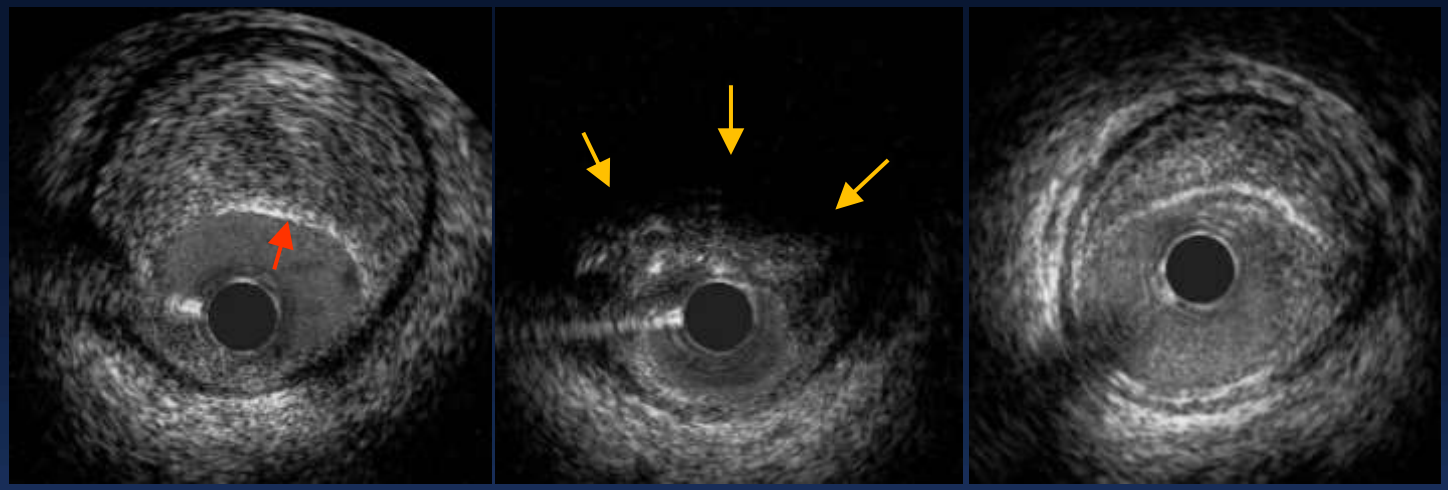


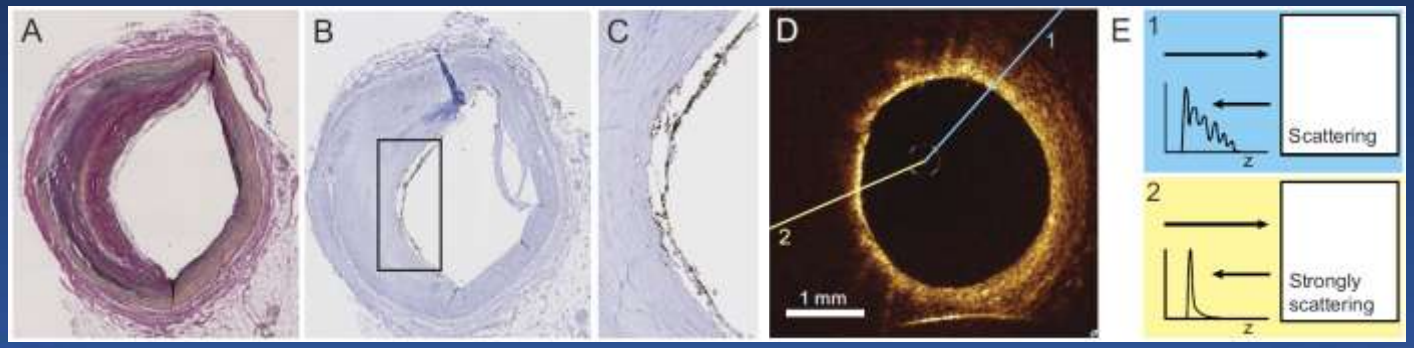
Three Layers Appearance





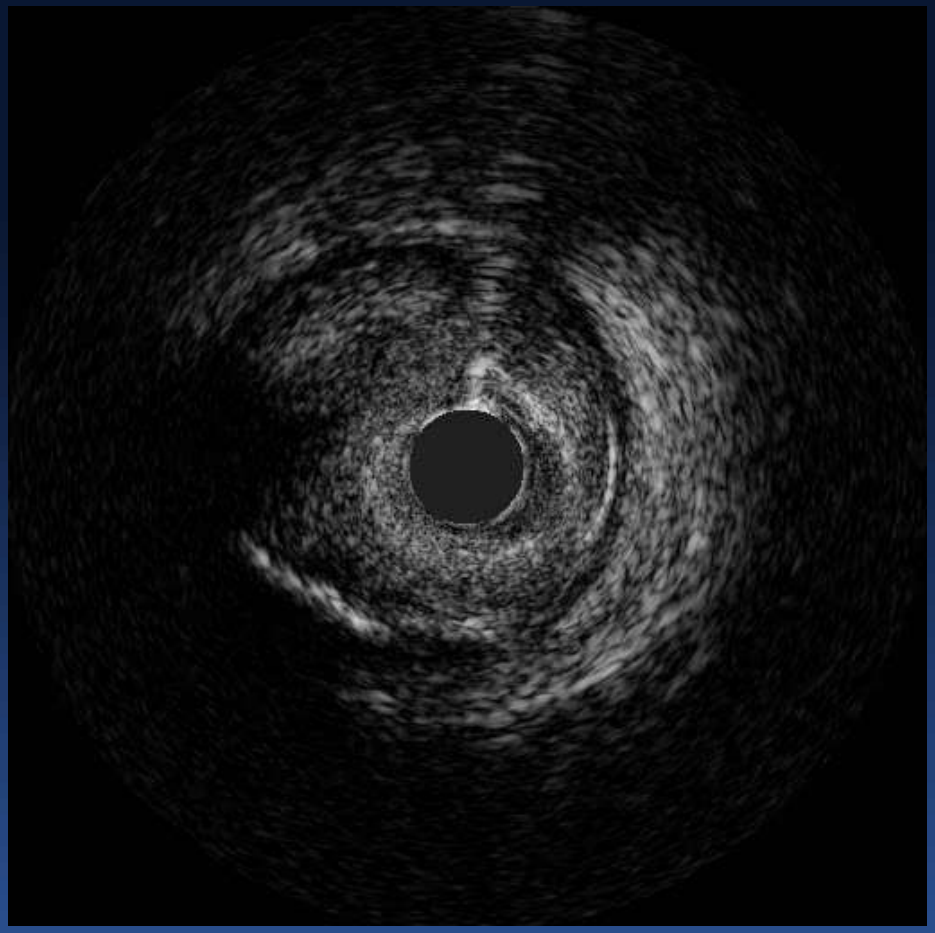
Attenuated Plaque



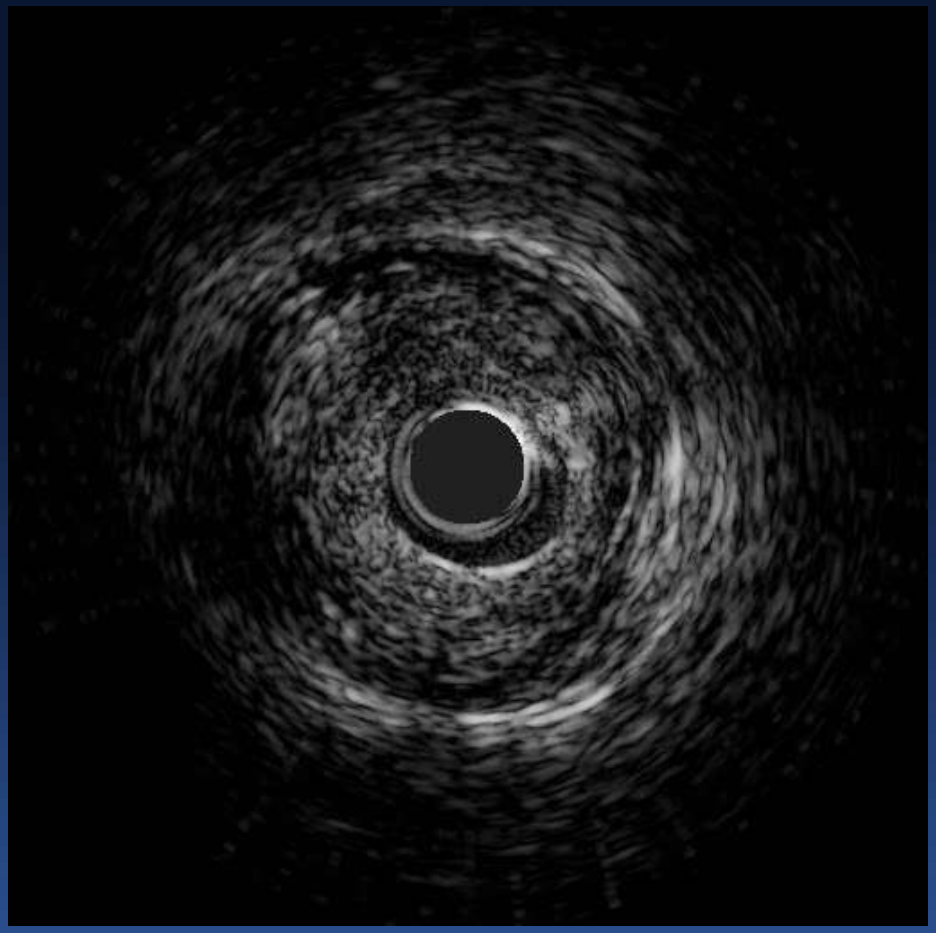


Soest G et al, JACC Img 2011; 4:810-3.

60MHz

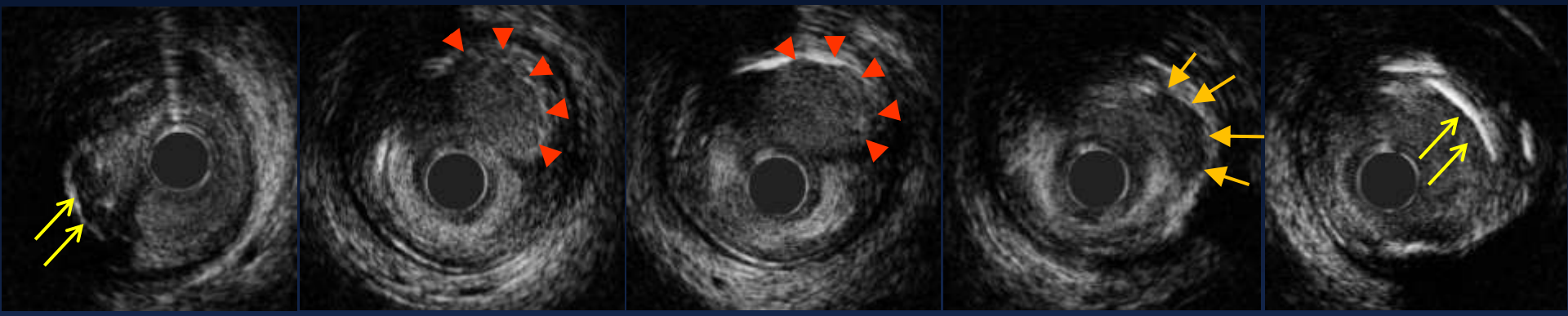


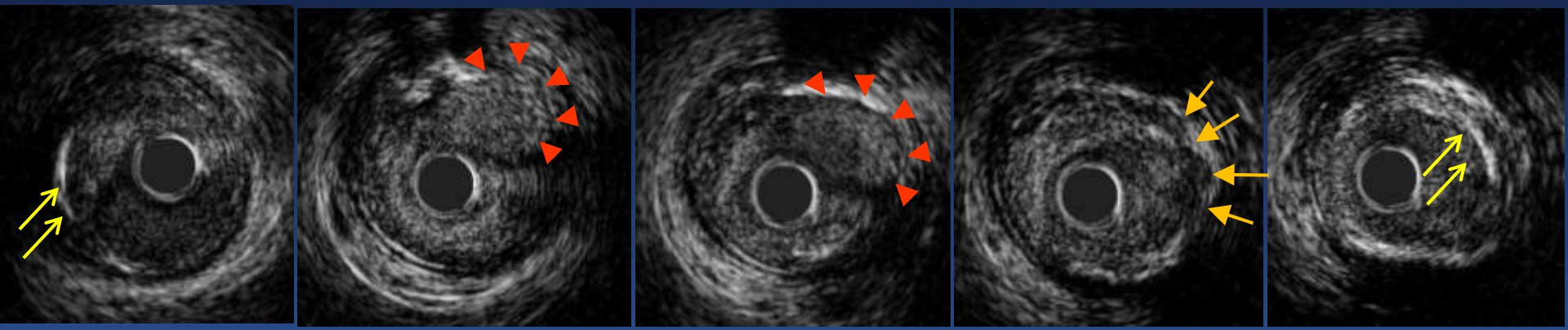
40MHz



Ruptured Plaque

60MHz

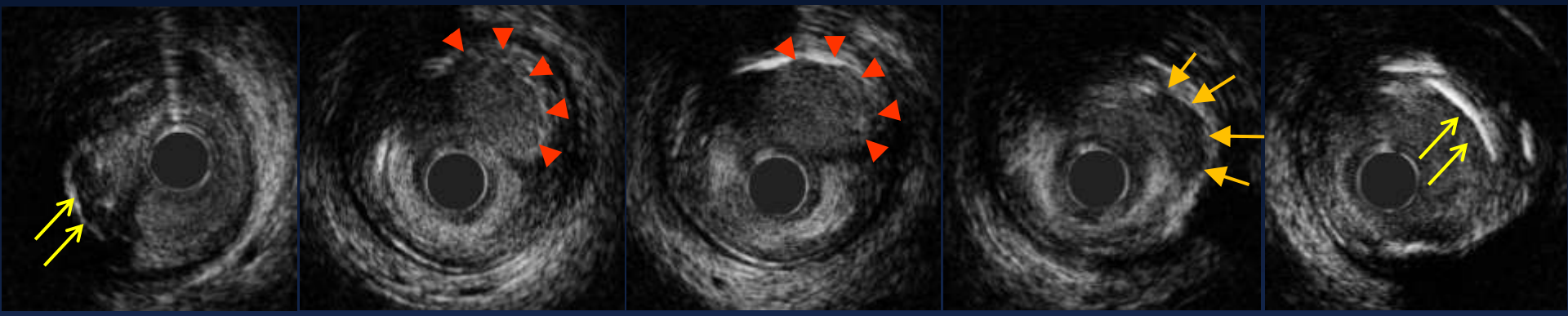


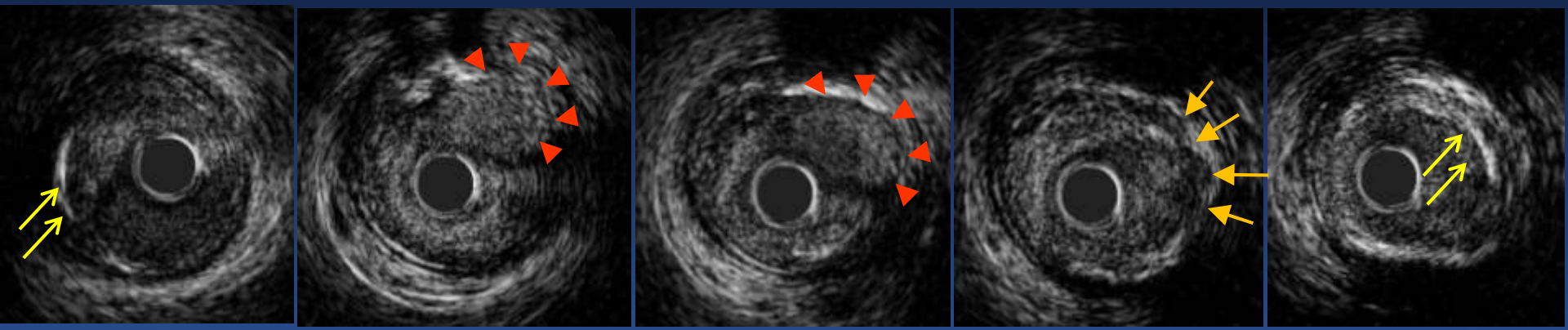


40MHz

Ruptured Plaque

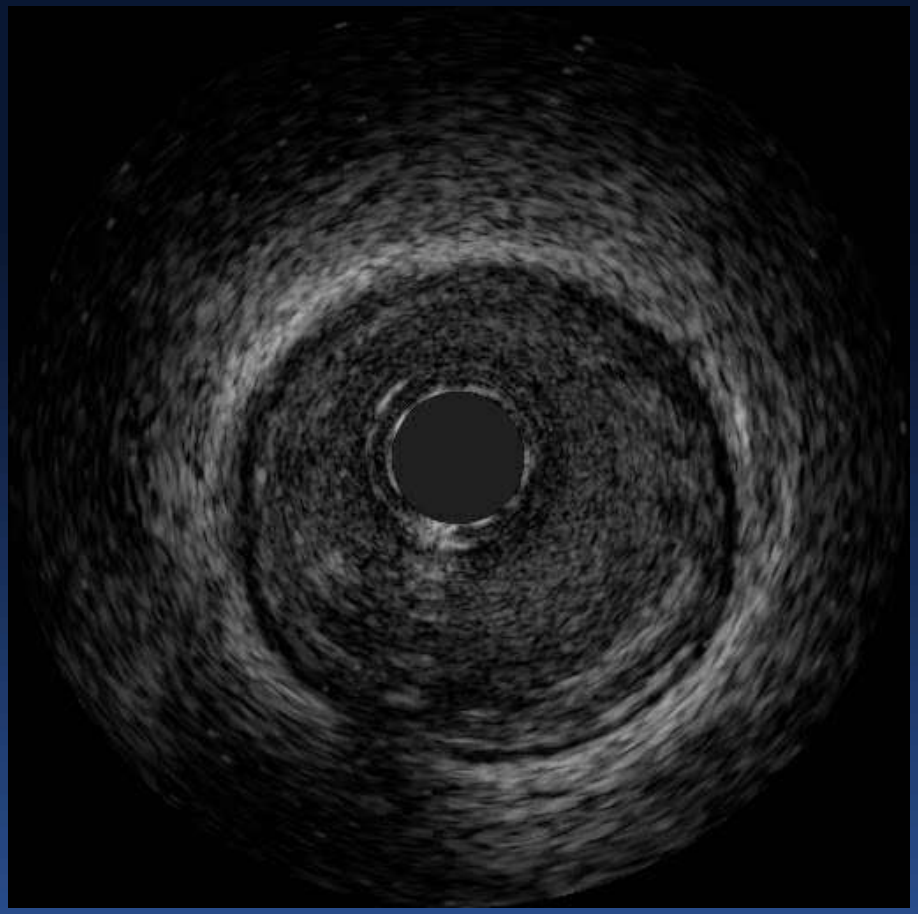
60MHz



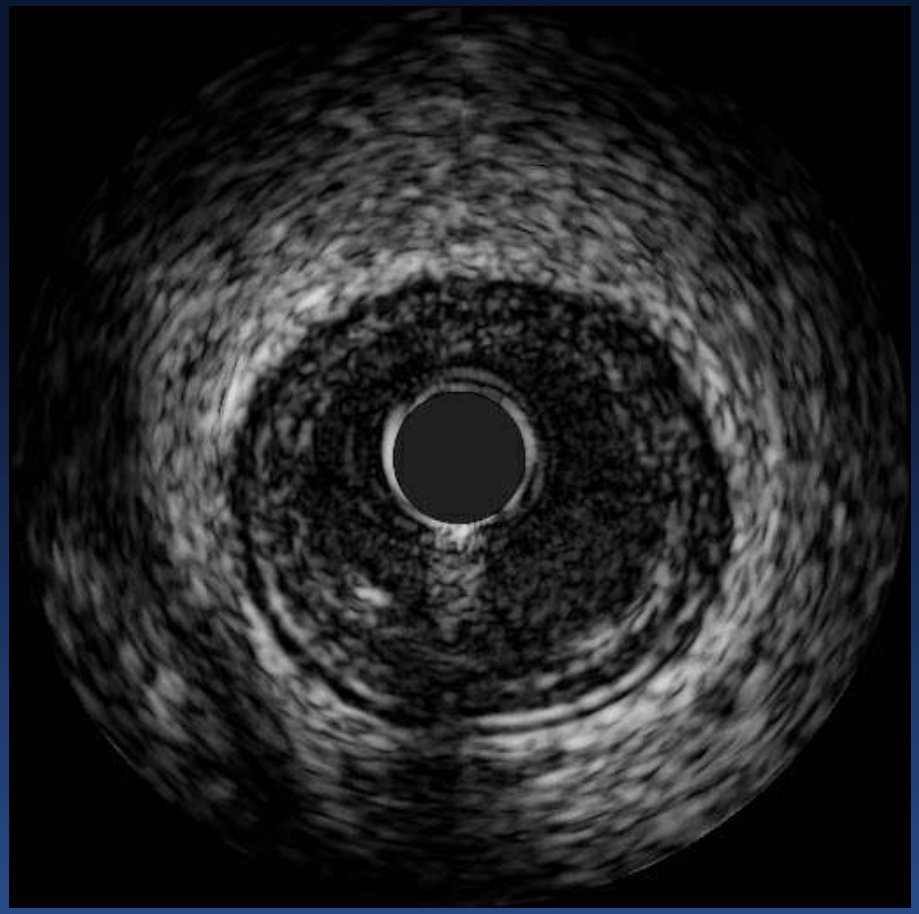


40MHz

60MHz

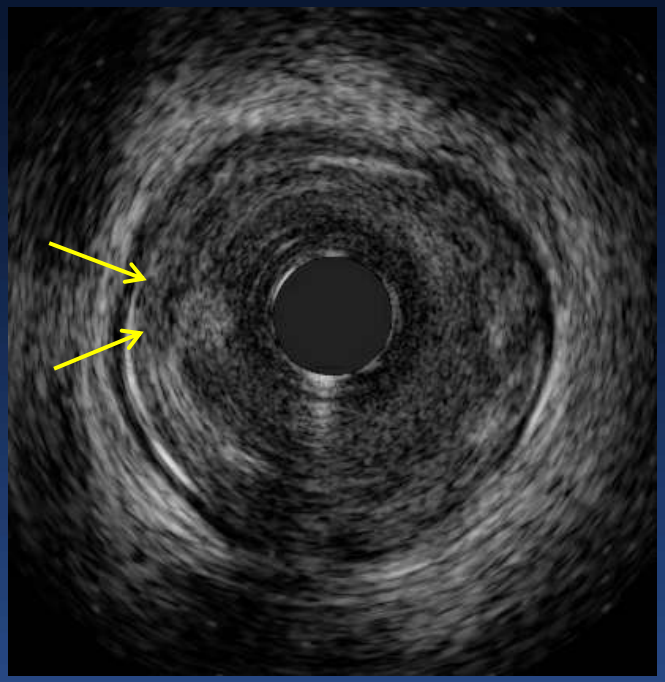


40MHz

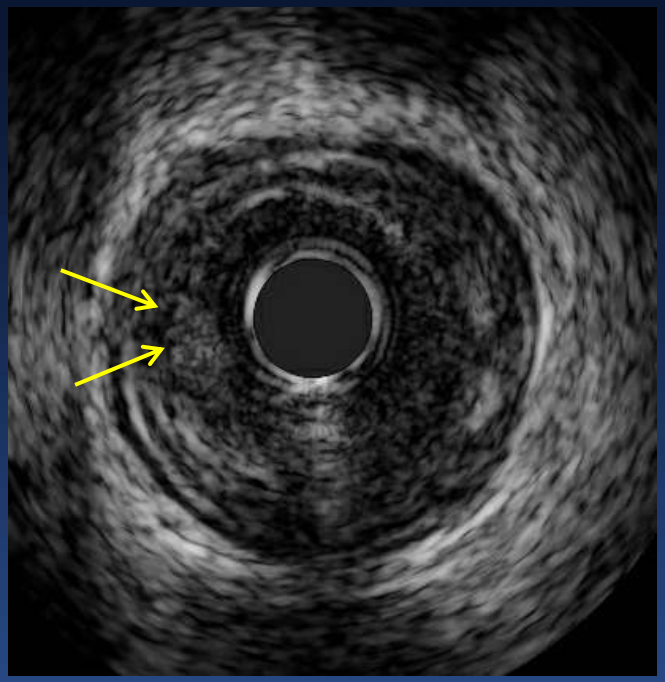


Thrombus

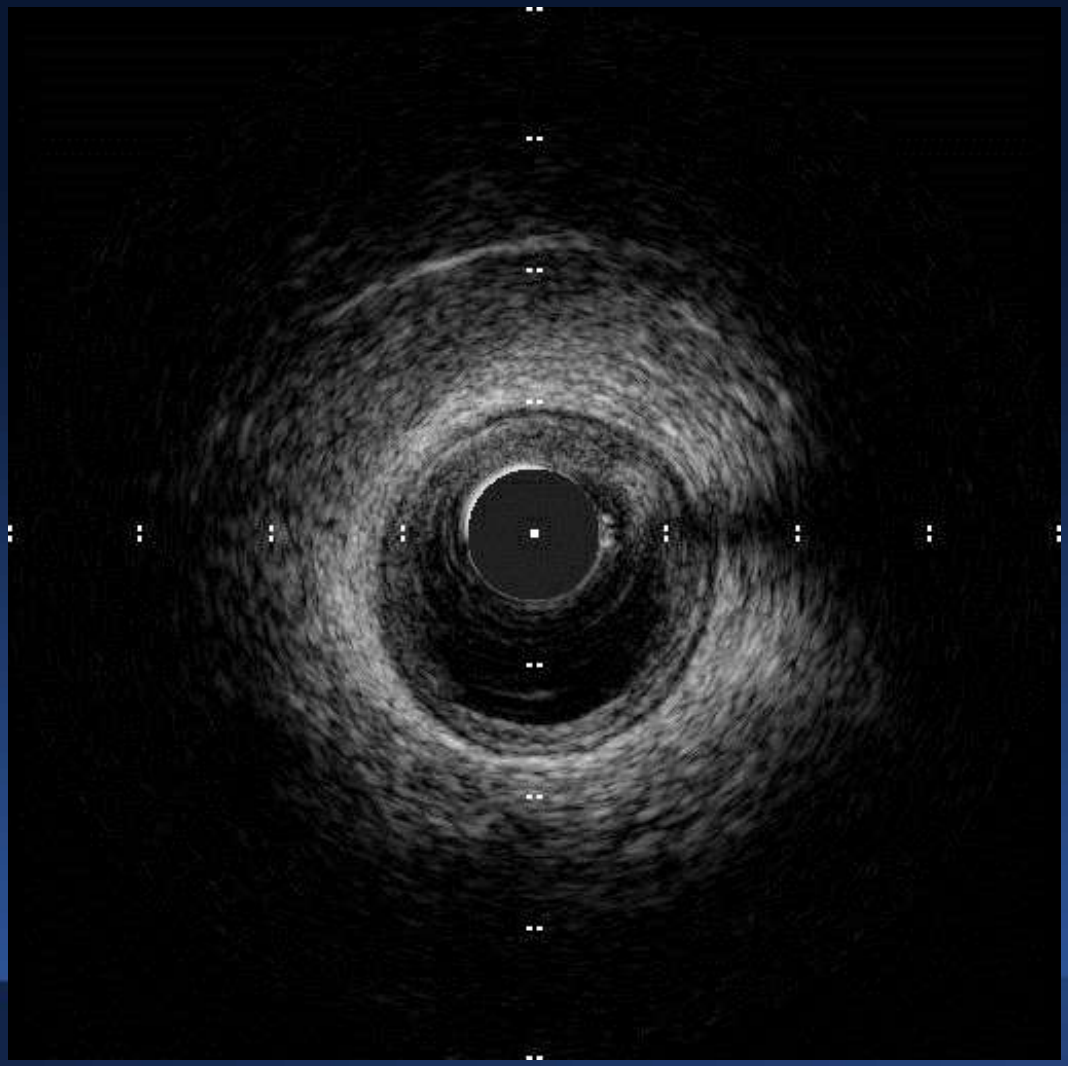
60MHz



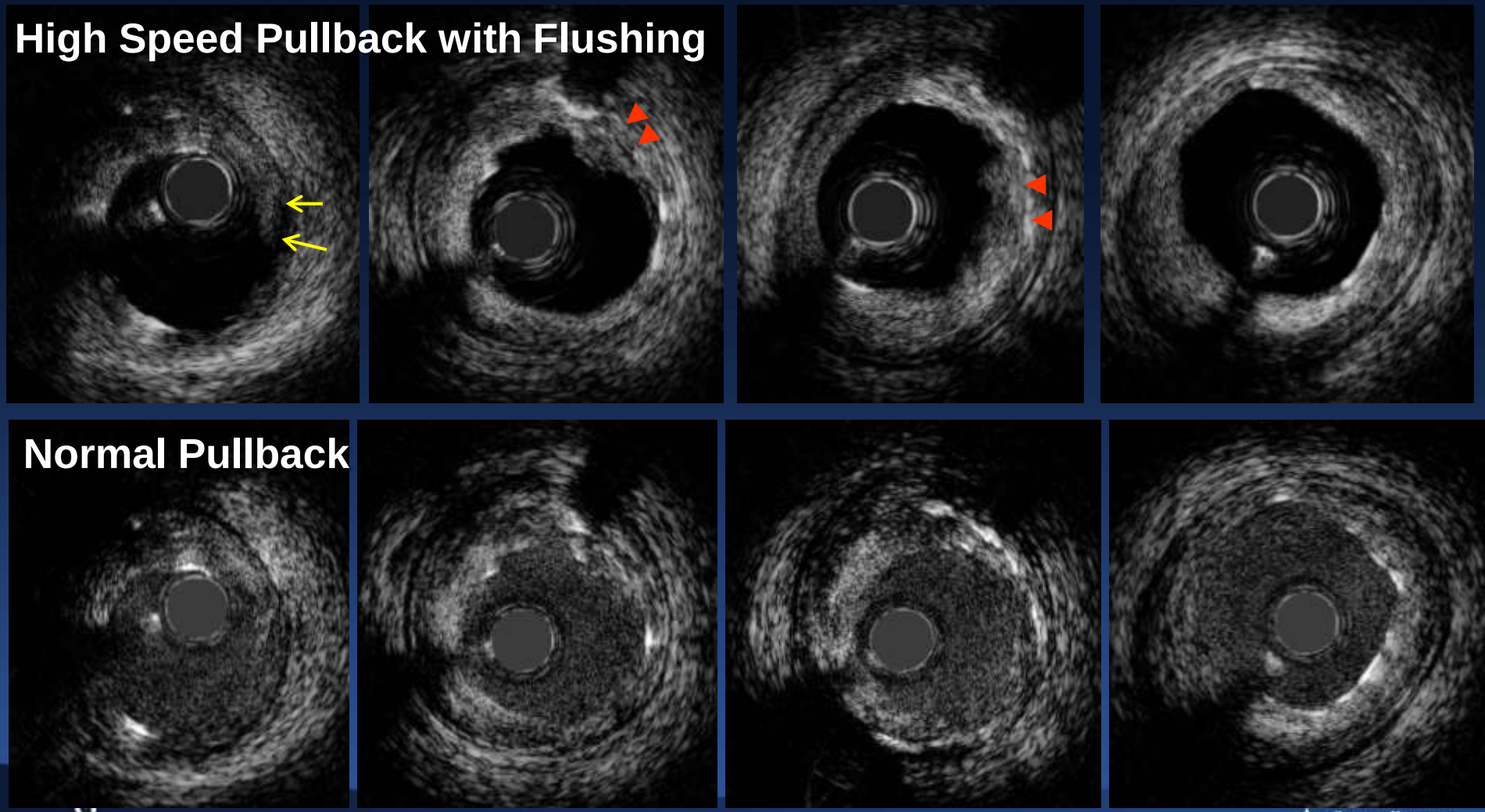
40MHz



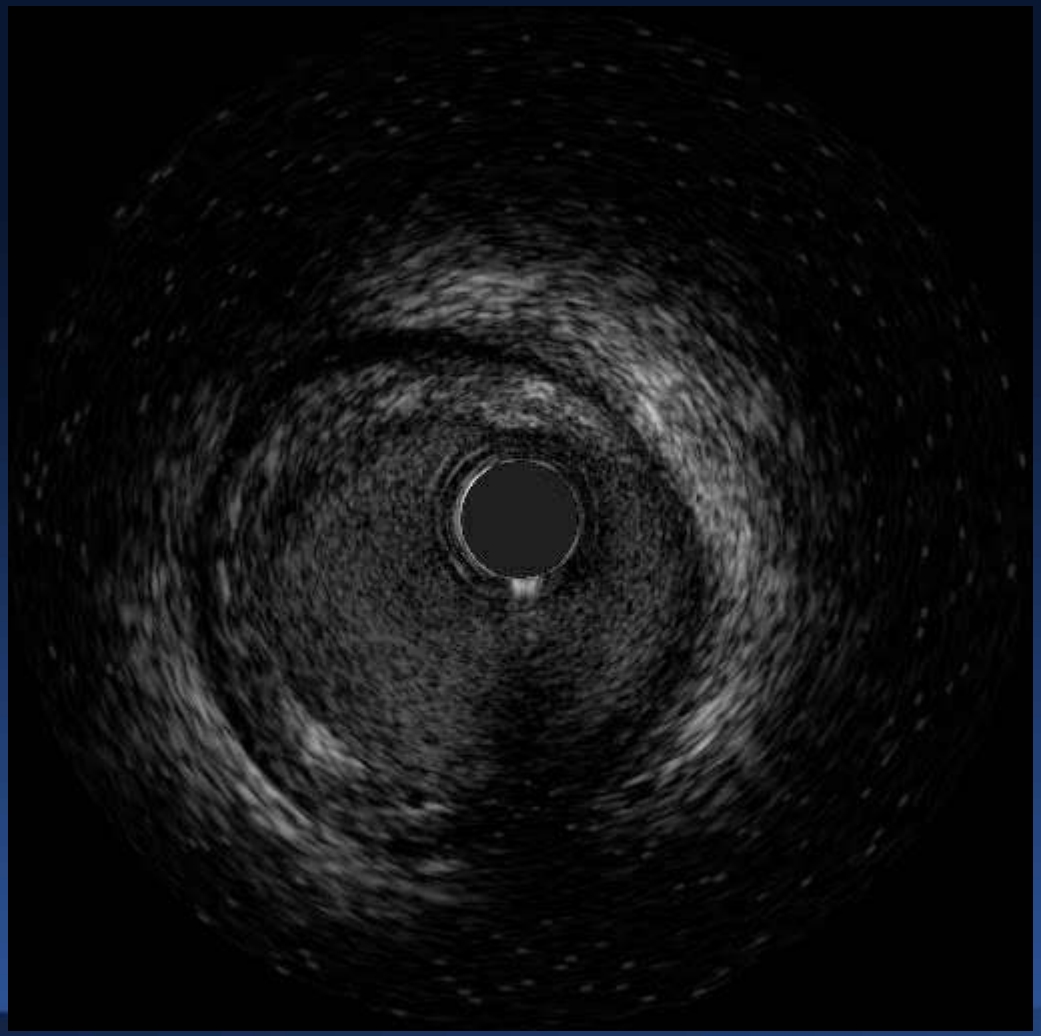
High Speed Pullback (10mm/sec) with Flushing



Comparison with vs without Flush

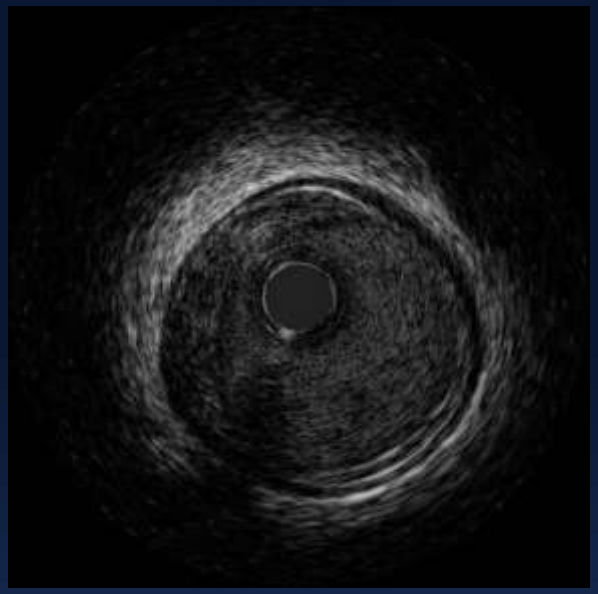


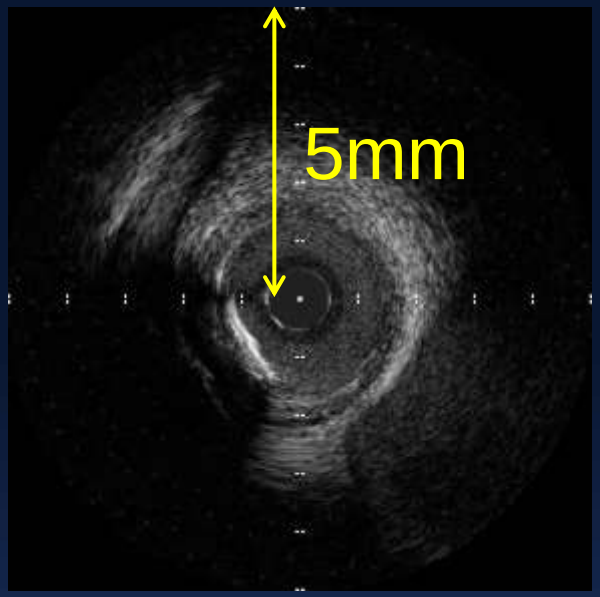
Penetration



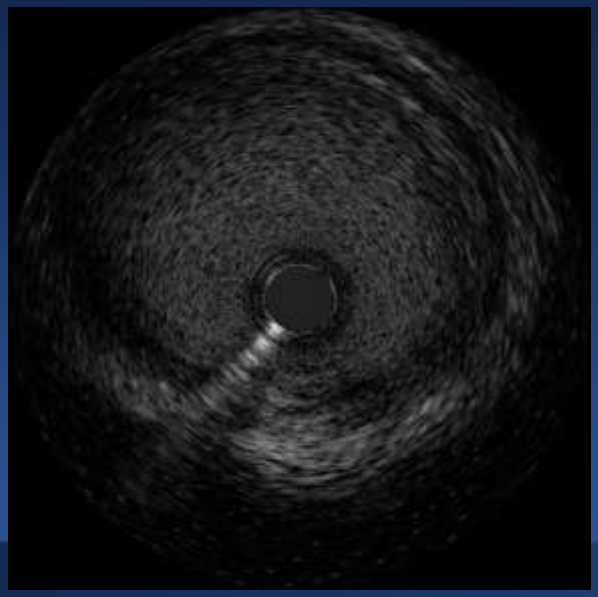
Penetration

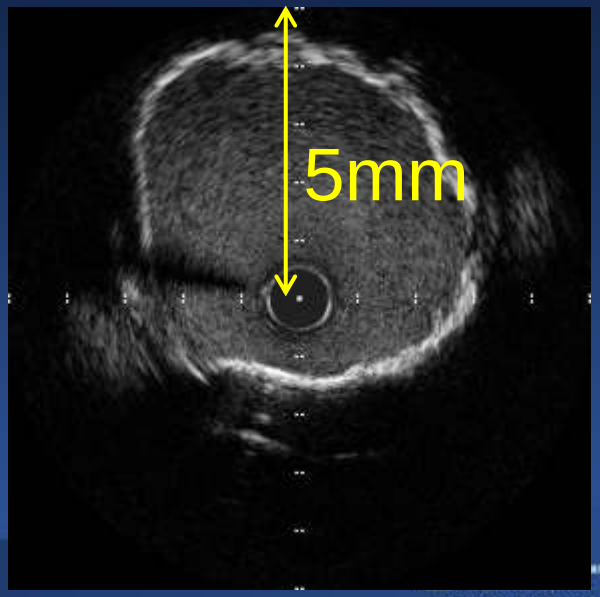
Soft Tissue Penetration



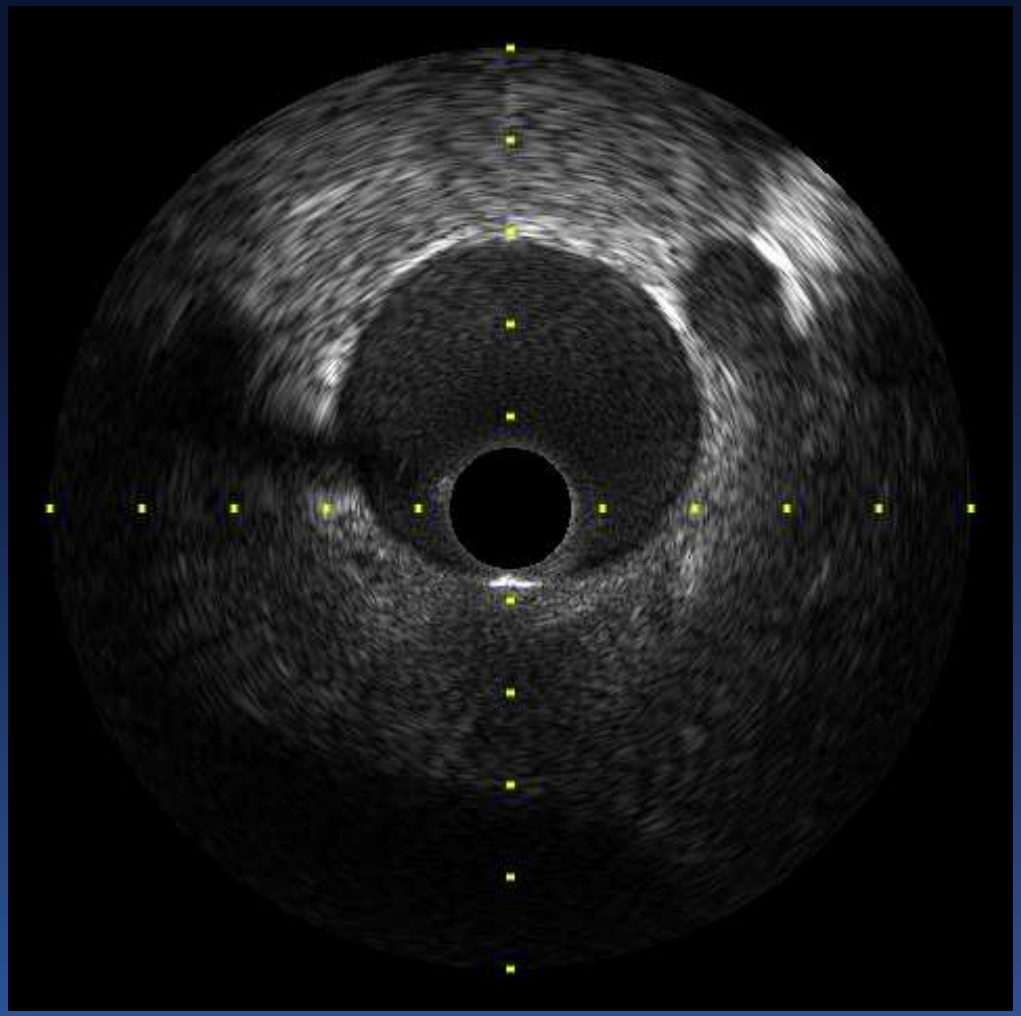


Blood Penetration



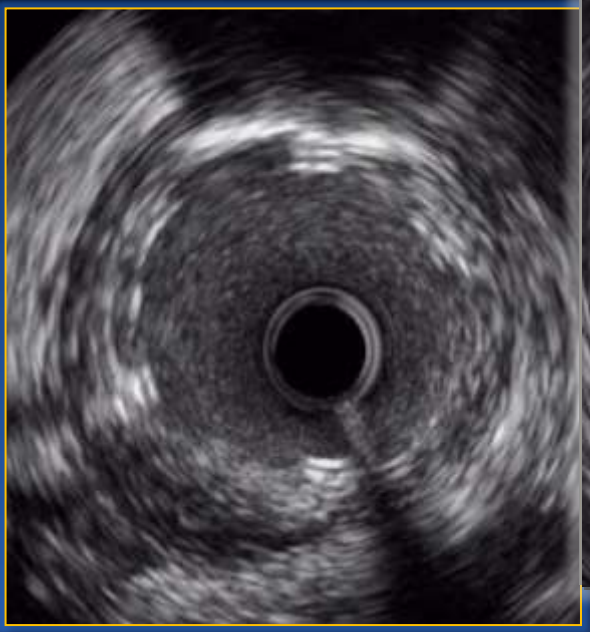


50MHz IVUS by InfraReDx

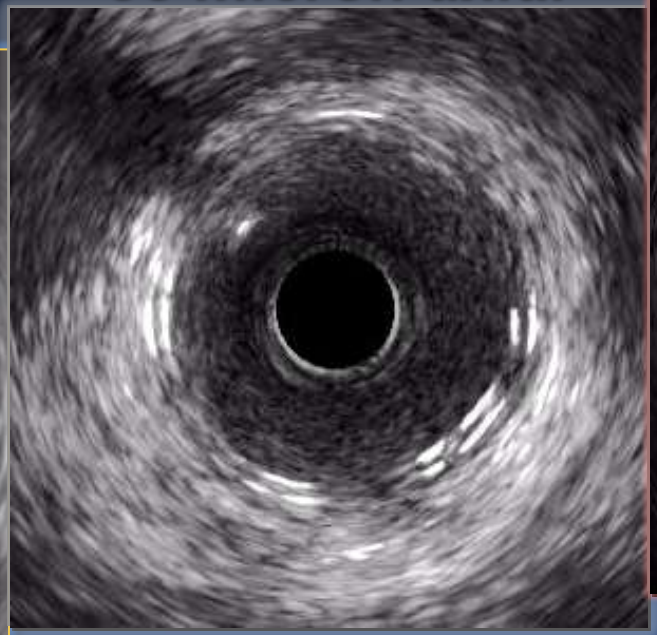


Boston Scientific: HD-IVUS and Bioresorbable Vascular Scaffolds

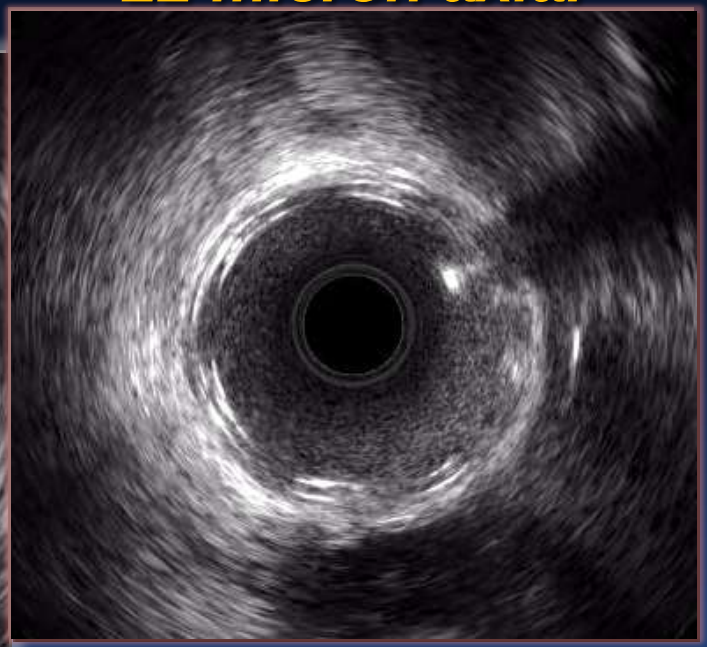
Pro/iCross 40 MHz
43 micron axial



OptiCross 40 MHz
38 micron axial

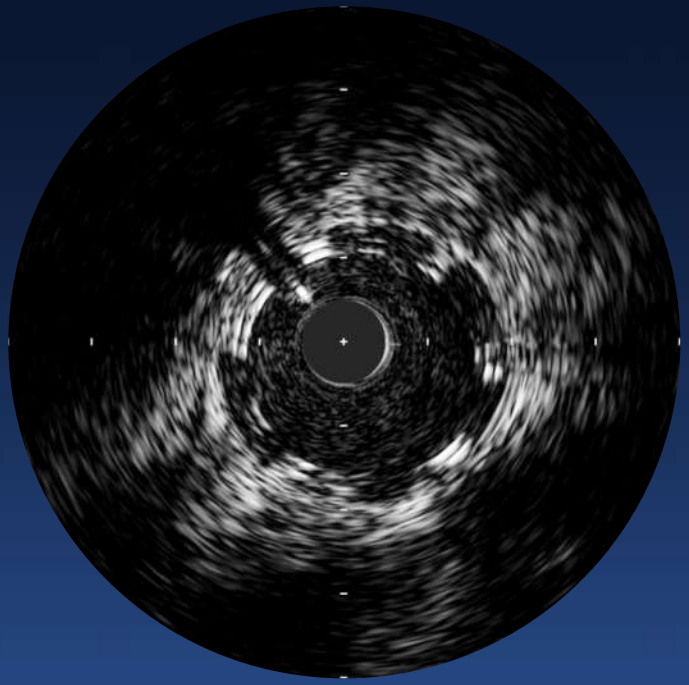


Next Gen IVUS 55 MHz
22 micron axial



Improving IVUS Resolution without Compromising Penetration

Volcano: FACT (Focused Acoustic Computed Tomography) and Bioresorbable Vascular Scaffolds



FACT ultrasound transducer intended to generate a “cleaner” signal than traditional PZT, near field resolution close to OCT, visibility of the entire plaque and vessel wall, and without the need for a blood clearing flush

Take Home Message

1. High frequency IVUS may visualize more detailed plaque morphology without compromising penetration.
2. Advanced technology allows high frame rate with high speed pullback with flushing which also help better visualization of plaque.