IVUS: image generation, interpretation and measurements.

Vera Rodríguez García-Abad
Vessel Layers

Lumen Area 18.92mm²
Vessel Area 19.83mm²
Plaque 5%

Lumen Area 7.34mm²
Vessel Area 15.73mm²
Plaque 53.5%
Findings

Calcium / (struts):
- high echorefectivity and shadowing

Fatty tissue / thrombus:
- echorefectivity < adventitia

Dense fibrous tissue:
- echorefectivity ≥ adventitia
Prognostic Value

Event-free survival

24 months (92%)

Limit intermediate-severe lesions assessed by IVUS:

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<tr>
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<th>IVUS</th>
<th>FFR</th>
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<tbody>
<tr>
<td>Left Main</td>
<td>MLD ≥ 2.8 mm</td>
<td>≥ 0.75 - 0.8</td>
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<tr>
<td></td>
<td>MLA ≥ 5.9 mm²</td>
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<tr>
<td>Native Coronary Arteries</td>
<td>MLD ≥ 1.8 mm</td>
<td>≥ 0.75</td>
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<tr>
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<td>MLA ≥ 4.0 mm²</td>
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MLA: Minimum Luminal Area
MLD: Minimum Lumen Diameter

Aciza d'AS et al. Circulation 1999; 100: 256-261
NEW: JACC. 2007; 1; 49(9): 835-48. Review
Male 52. Stable angina

#2769

MLA = 6.4 mm²
Male 62. Elective PCI LCx. During procedure, marginal branch occluded.
Stent Evaluation: In Stent Restenosis

Male 69. BMS Clinical trial 9 month FU – IVUS was requested –
Female 70. In-stent restenosis (border effect). 1st balloon inflation: 24 atm
Clarify Angiograms: Hematoma

Female 34. STEMI (< 1h)
Potential conflicts of interest

Speaker’s name: Vera Rodríguez García-Abad

☐ I have the following potential conflicts of interest to report:

☐ Research contracts
☐ Consulting
☐ Employment in industry
☐ Stockholder of a healthcare company
☐ Owner of a healthcare company
☐ Other(s)

☐ I do not have any potential conflict of interest
Male 60. LAD CTO (2DES). 2 months later: ACS
Conclusions

1) IVUS is a reliable and well developed tool to evaluate patients with high sensitivity and specificity.

2) Sometimes the strategy to manage the patients depends on the measurements and it depends on the correct image interpretation.

3) Lesions MLA $\geq 5.9\text{mm}^2$ for the LM and MLA $\geq 4\text{mm}^2$ for native coronary arteries, have a low cardiac event rate.
THANK YOU
1971: First IVUS system designed by Nicolaas Bom & Rotterdam team.

1988: intraluminal human arteries visualization by Paul G. Yock

Dr. N Bom

Dr. PG Yock
**IVUS Basics**

**IVUS** (intravascular ultrasound): Black and white images of the vessel wall produced by ultrasonic waves echoes of the emitted signals over the arterial tissues.

- 20 MHz waves
- 40 MHz waves

![Diagram showing different frequency waves and imaging results](image-url)
Mechanical IVUS catheter

Simple rotation transducer. 1800rpm.

Electronical IVUS catheter

64 consecutive activated elements transducer.
## Advantages/ Disadvantages

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| **Advantages** | ・No calibration needed  
・Allows to see the vessel wall (3 layers)  
・Plaque characterization based on IVUS |
| **Disadvantages** | ・Echoes cannot pass calcium  
・Measurements mistakes related with catheter coaxiality (elliptical view) |
| **Indications** | ・LM / Ostial RCA disease  
・Unclear angiogram images  
・Bifurcations  
・ISA suspected  
・Instent thrombosis  
・Clinical trials  
・Coronary artery disease after heart transplantation |
IVUS Measurements