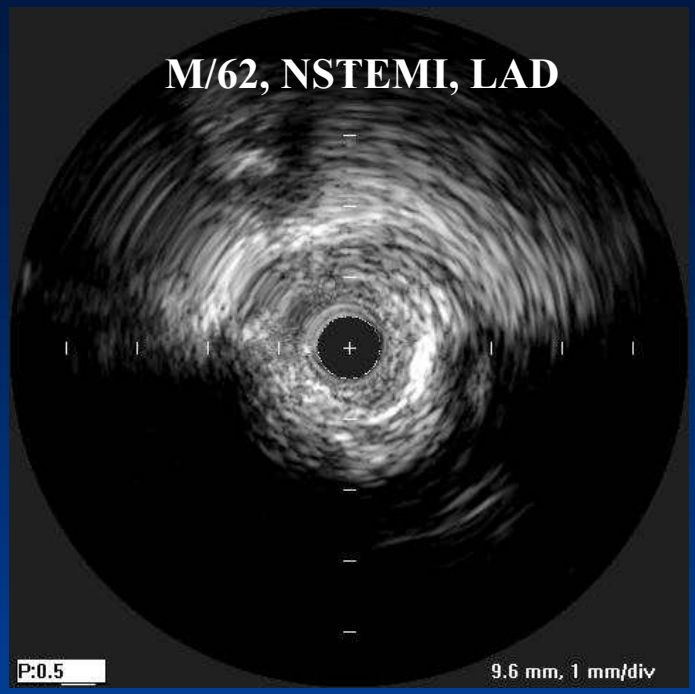
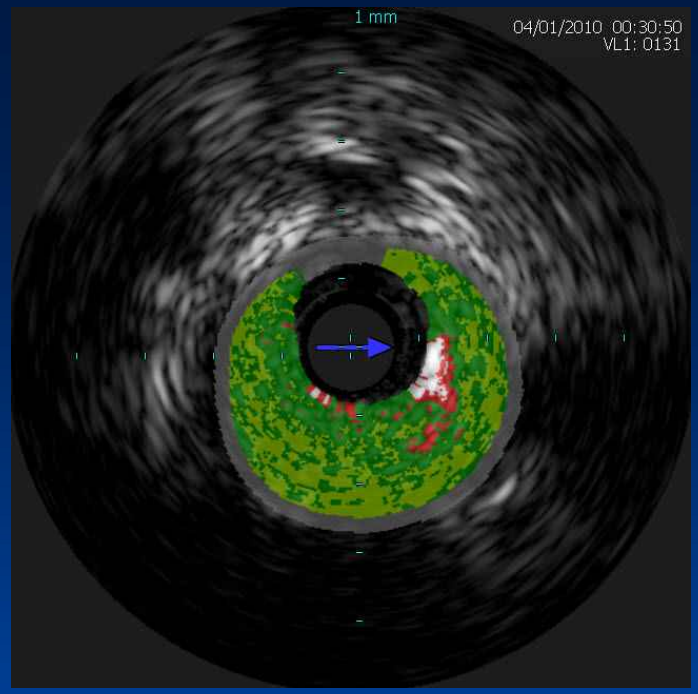
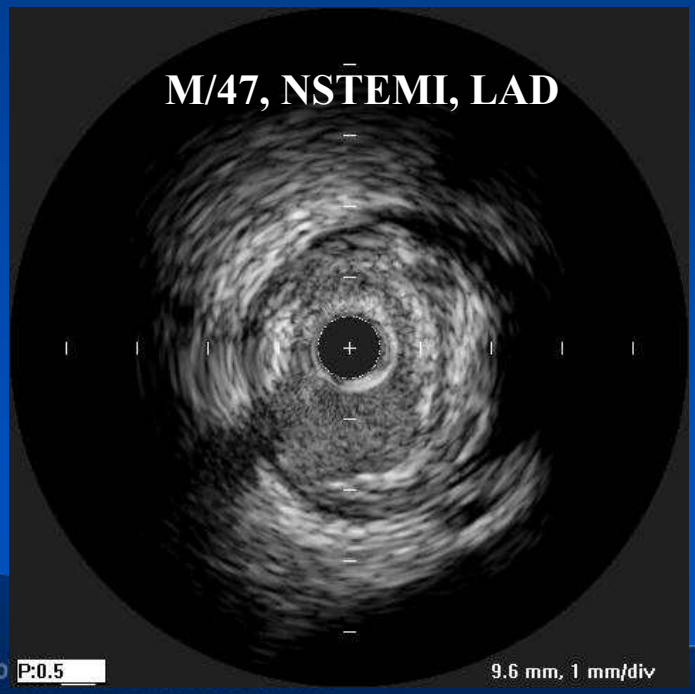
VH-IVUS

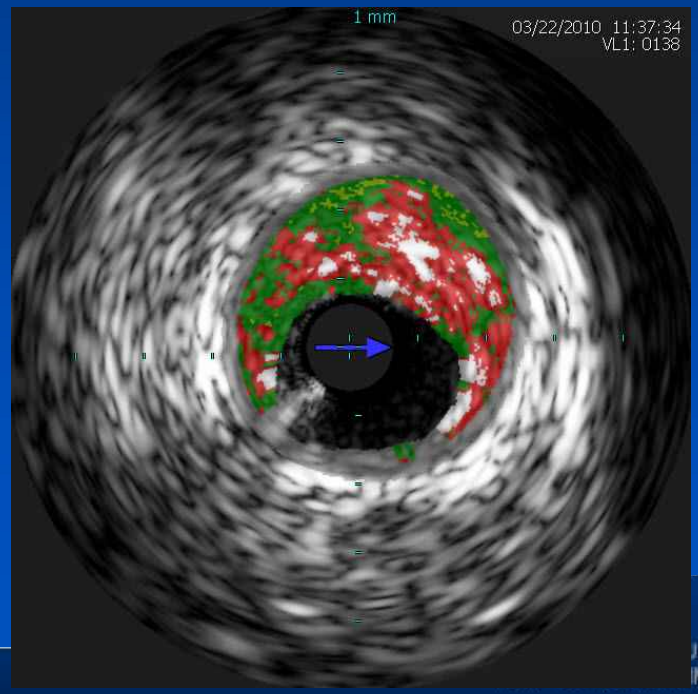
Su-Jeong Kim

Asan Medical Center, RN









Cardio

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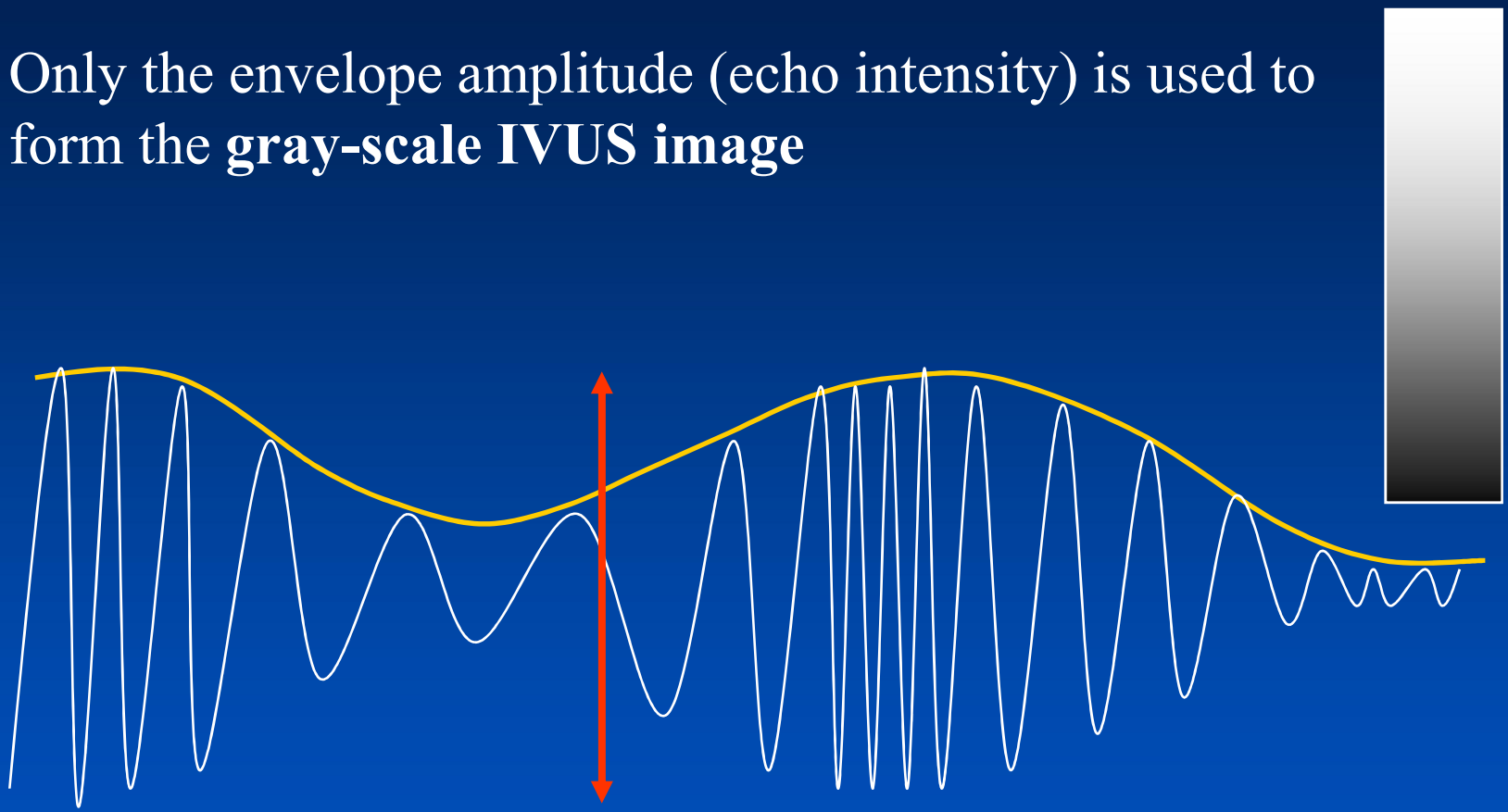
Gray Scale Image

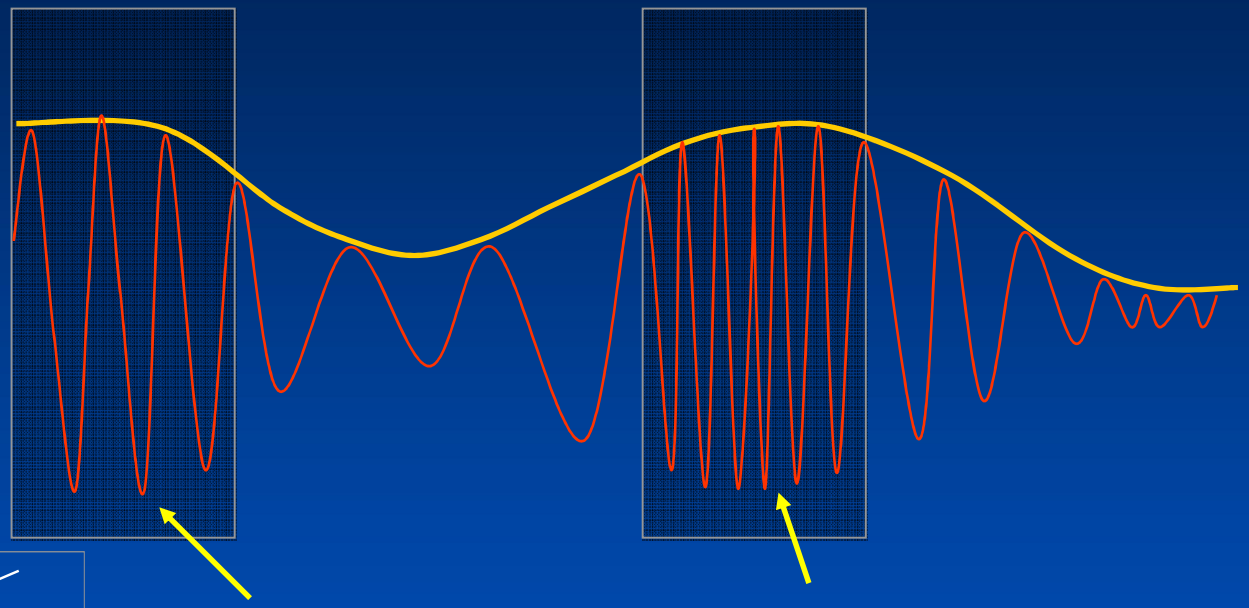
Only the envelope amplitude (echo intensity) is used to form the **gray-scale IVUS image**

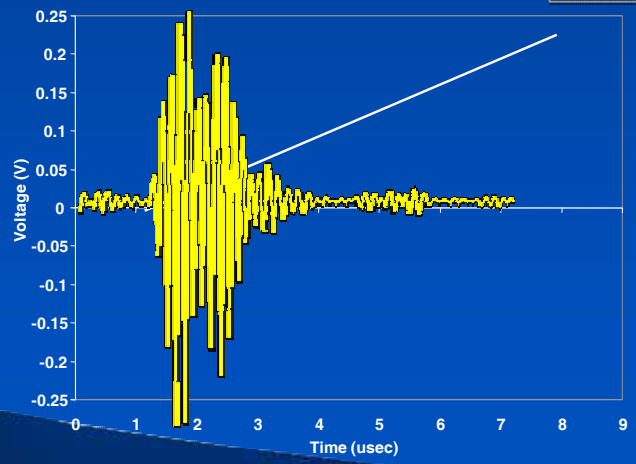


Palmer 1999; Peters 1994

VH-IVUS
Use Power and Frequency

Amplitude



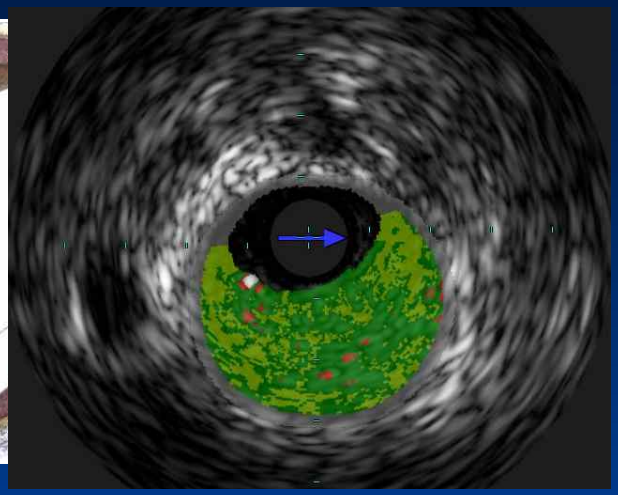


Same amplitude, different frequency

Frequency of echo signal can vary, depending on the tissue content

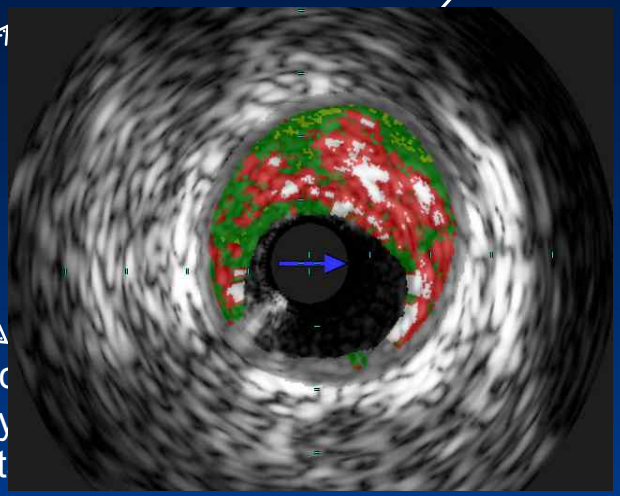
Plaque composition

Fibrous Tissue



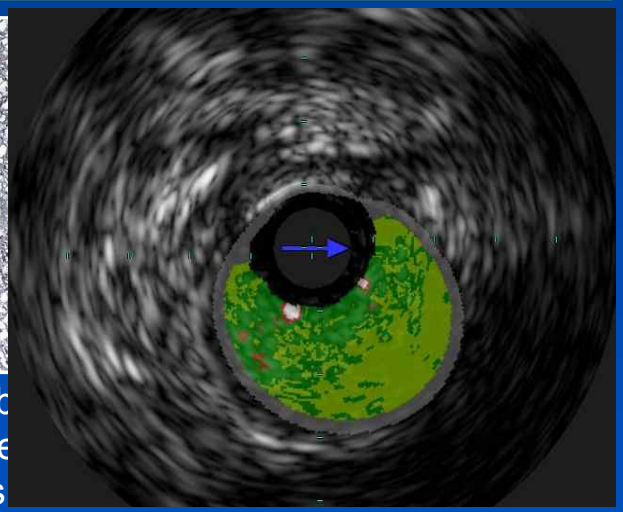
Necrotic Core

Highly lipidic nec
cells and dead ly
Cholesterol cleft

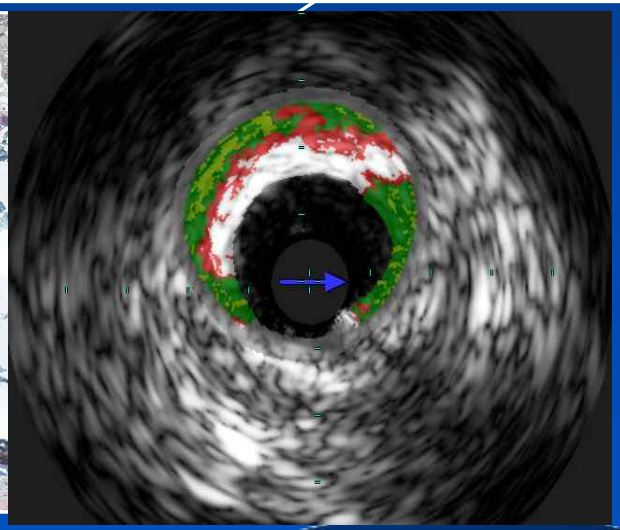


Fibro-Fatty

Loosely packed b
regions of lipid de
clefts or necrosis



Dense Calcium



Eagle Eye (20MHz Electronic Transducer)

VH IVUS vs histopathology from 51 fresh, post mortem LADs (115 sections and 407 regions of interest)

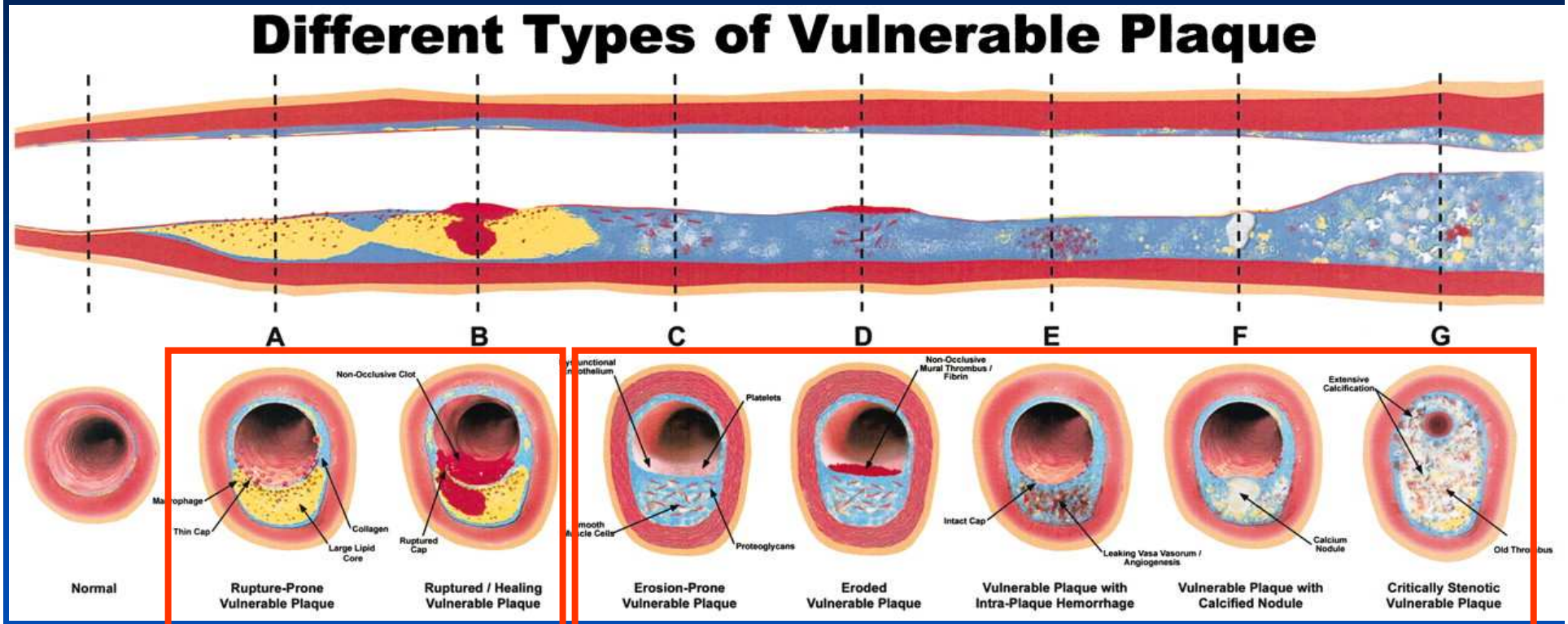
	Sensitivity	Specificity	Accuracy
Fibrous tissue (n=162)	84.0%	98.8%	92.8%
Fibrofatty (n=84)	86.9%	95.1%	93.4%
Necrotic core (n=69)	97.1%	93.8%	94.4%
Dense calcium (n=92)	97.8%	99.7%	99.3%

Plaque rupture

ACS(Acute coronary syndrom),
SCD(Sudden cardiac death) 의 주요인

"Vulnerable Plaque"

Thrombosis-prone plaque and plaque with a high probability of undergoing rapid progression



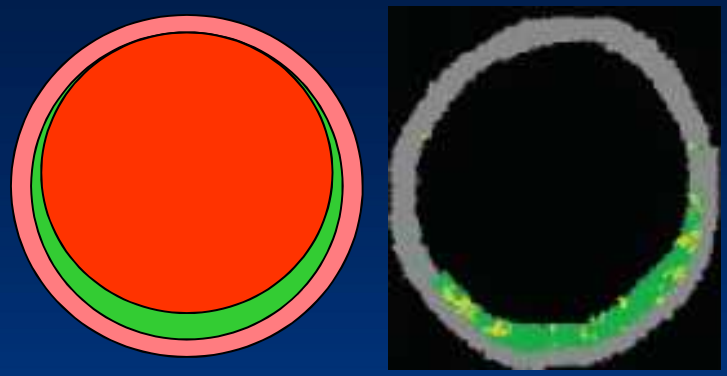
70% of ACS culprit

30% of ACS culprit

Naghavi et al. Circulation 2003;108:1664-72

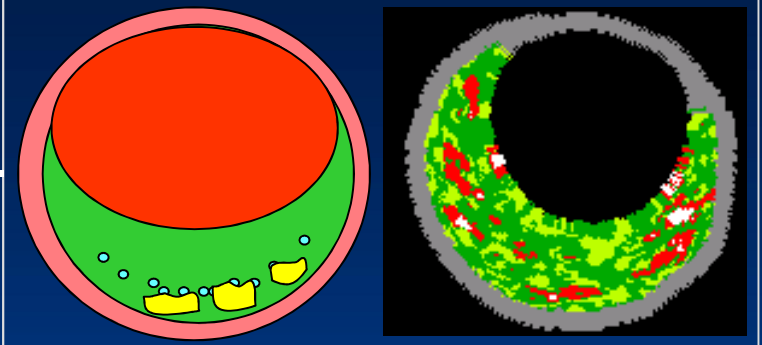
Plaque classification

AIT



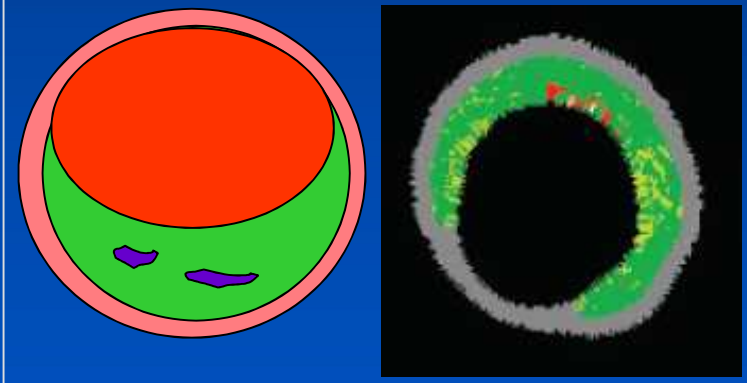
Plaque thickness ≤600um

PIT



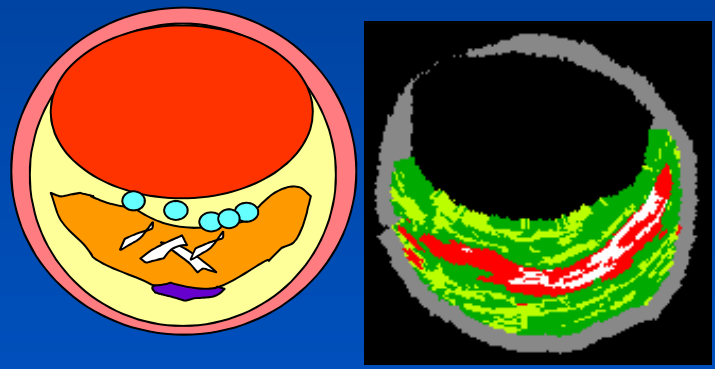
Plaque thickness > 600um
Fibrofatty >15%

Fibrous

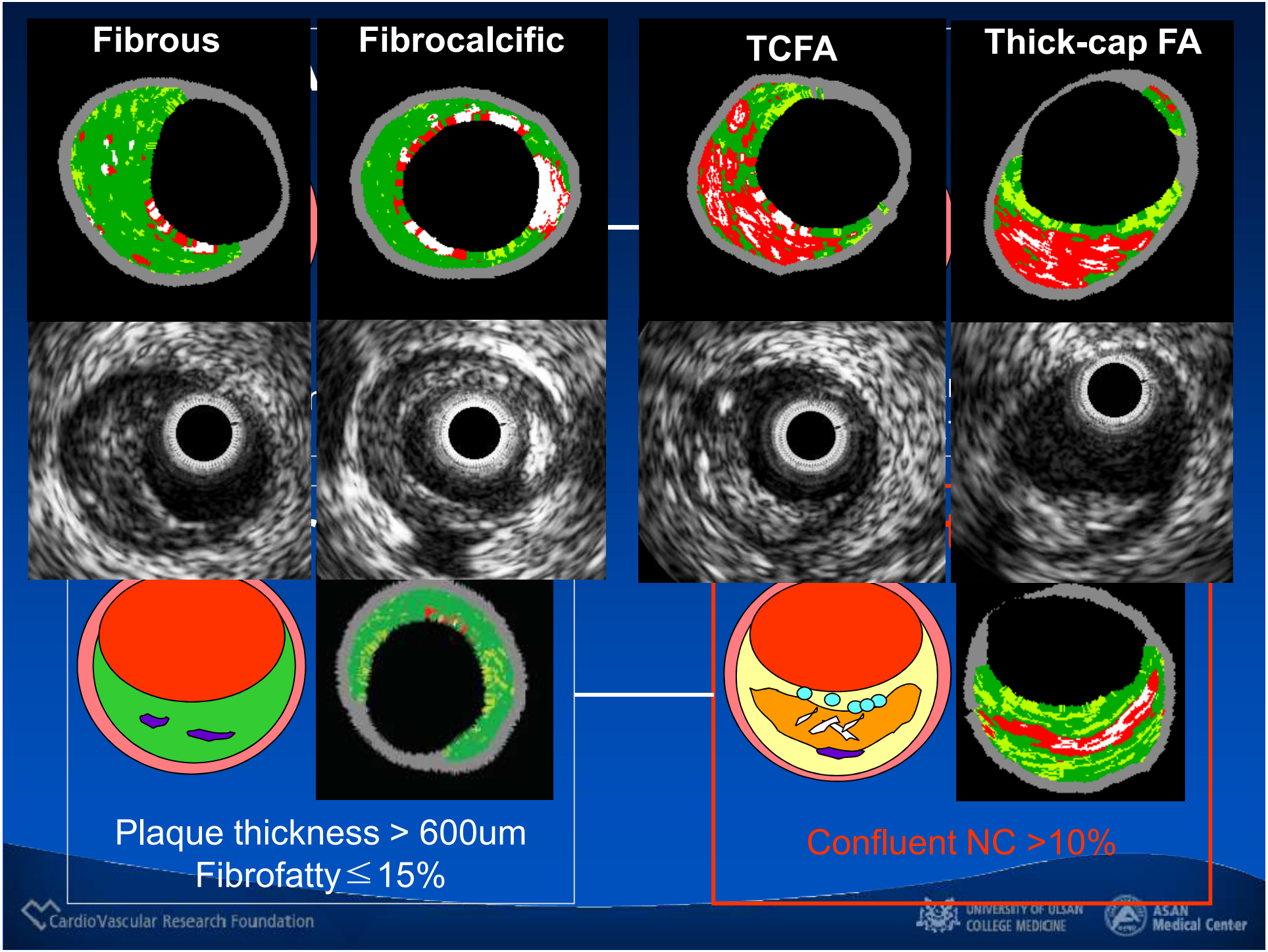


Plaque thickness > 600um
Fibrofatty ≤ 15%

Fibroatheroma



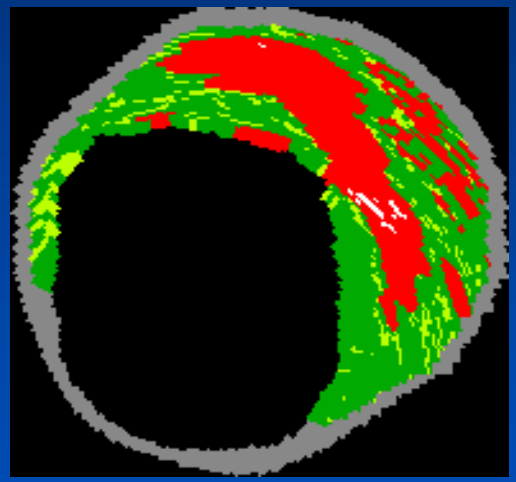
Confluent NC >10%


Fibrous
Fibrocalcific
TCFA
Thick-cap FA
Plaque thickness > 600um
Fibrofatty ≤ 15%
Confluent NC >10%
CardioVascular Research Foundation
UNIVERSITY OF ULSAN COLLEGE MEDICINE
ASAN Medical Center

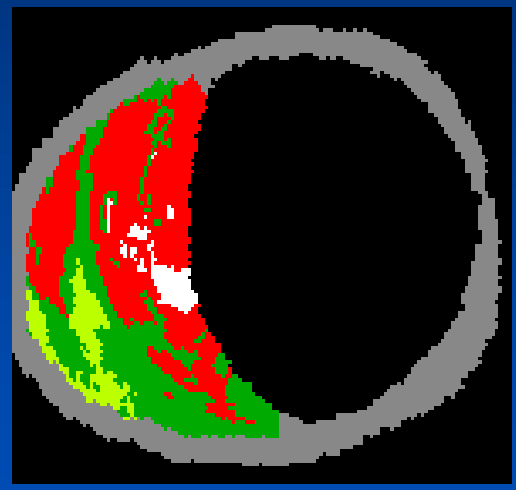
Criteria of TCFA

In at least 3 consecutive frames:

1) Percent atheroma area **≥ 40%**
2) Necrotic core **≥ 10%**
3) without evident overlying fibrous tissue



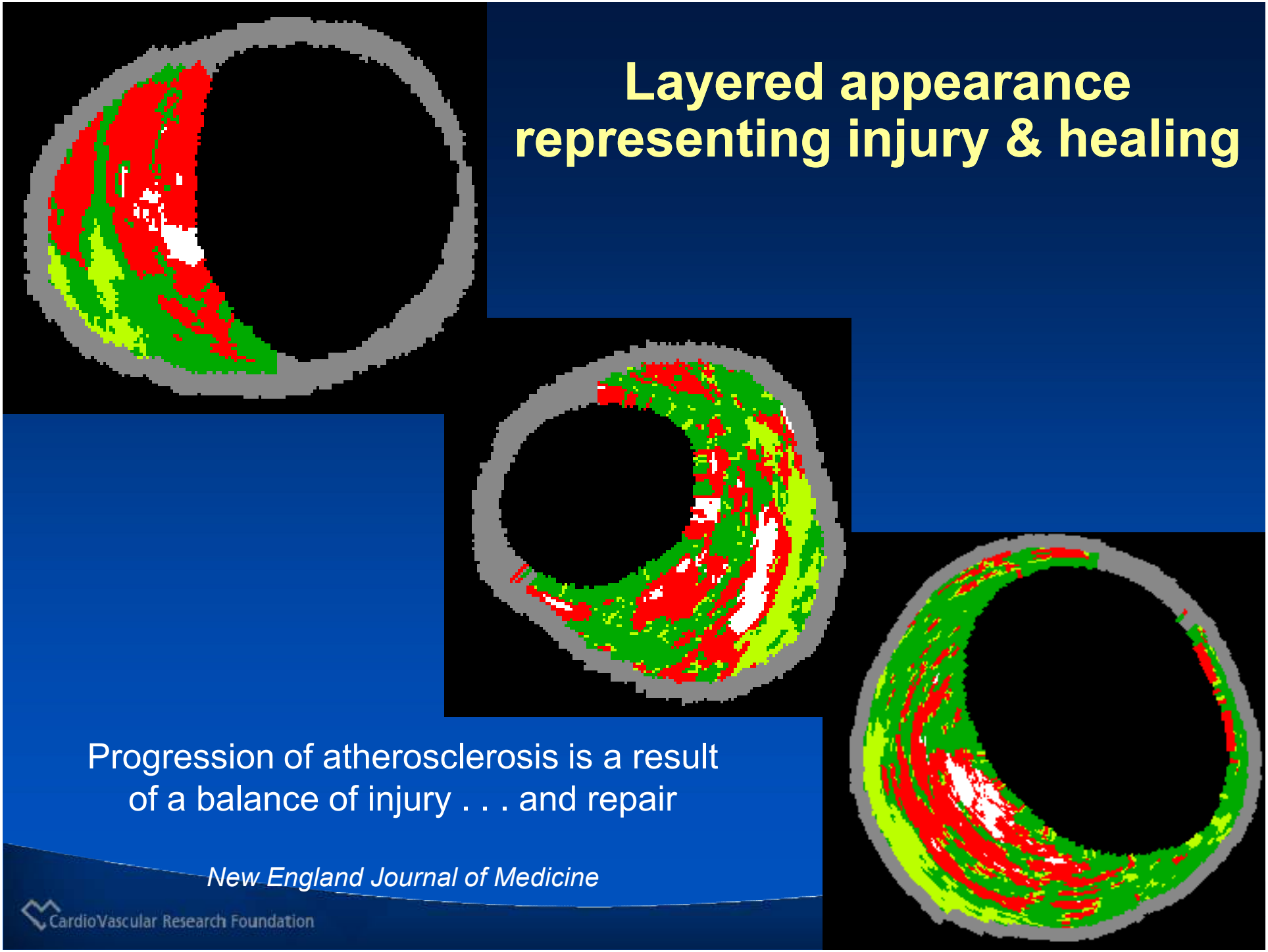
Thick fibrous cap
Low lipid conc
Low macrophage density



Thin fibrous cap
High lipid conc
High macrophage density

Rodriguez-Granillo et al. J Am Coll Cardiol 2005;46:2038–42

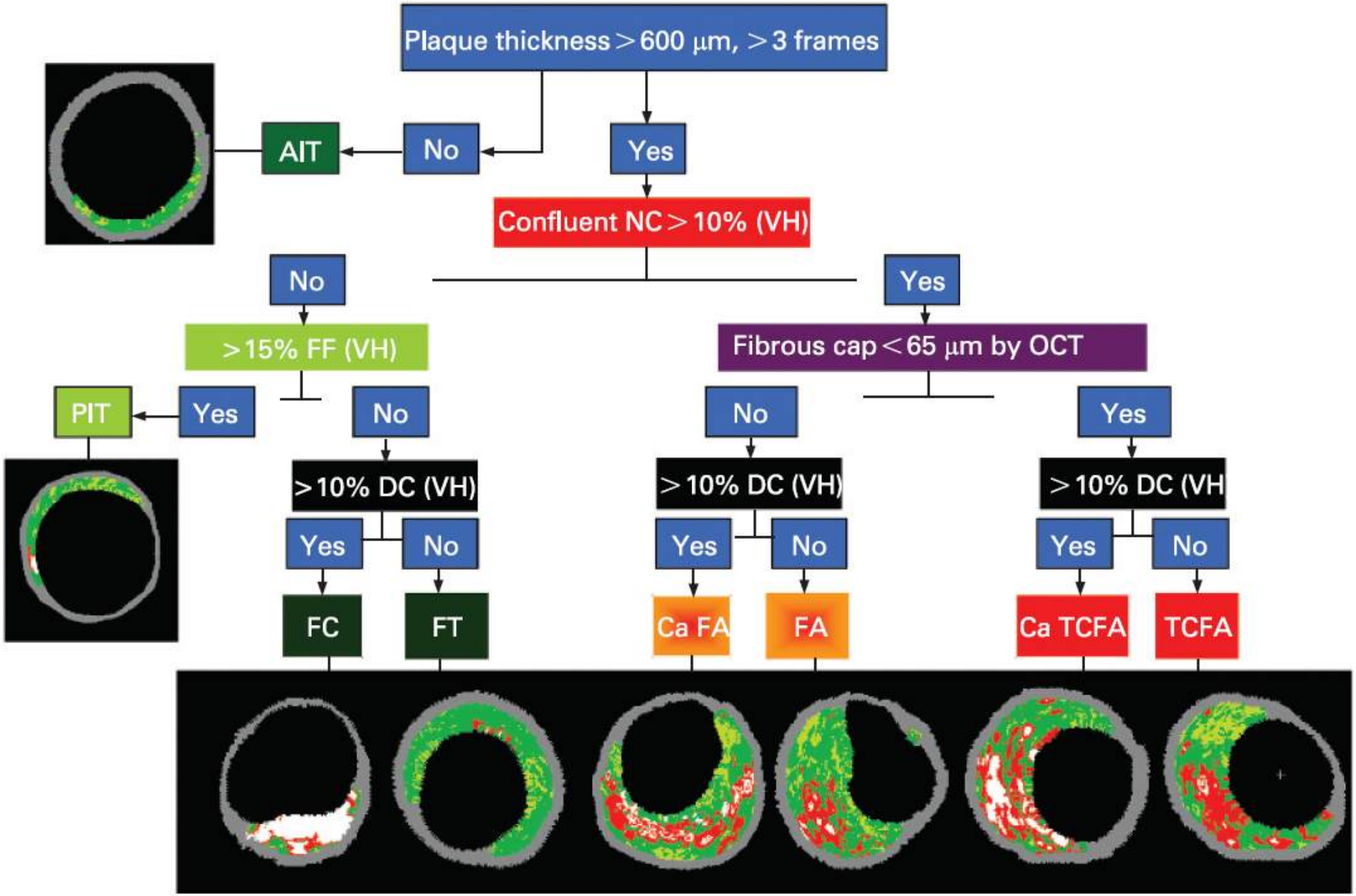
Layered appearance representing injury & healing



Progression of atherosclerosis is a result of a balance of injury . . . and repair

New England Journal of Medicine

CardioVascular Research Foundation



Garcia-Garcia. Heart 2009;95:1362–1374

Limitations

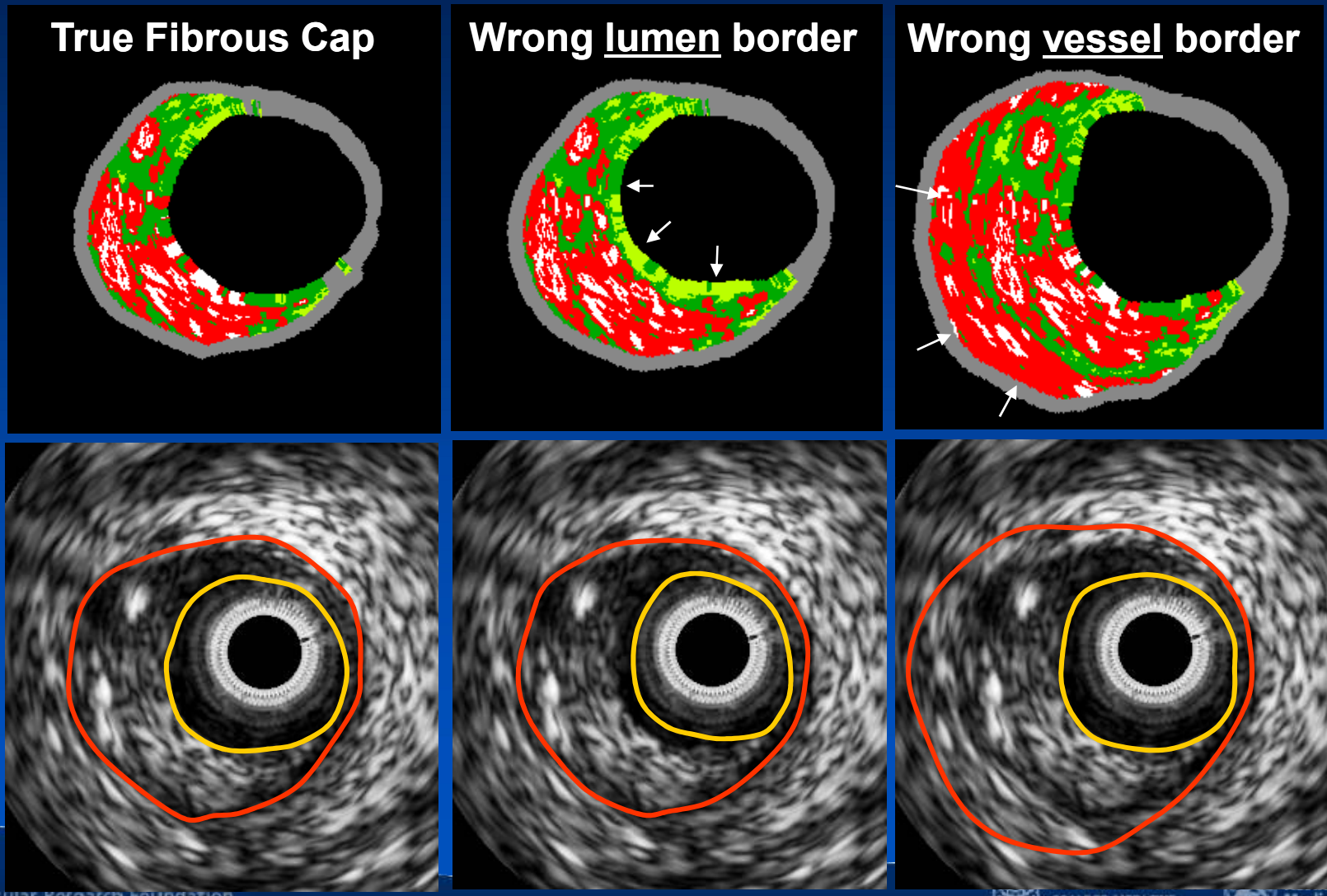
- VH is based on IVUS, but low resolution
- No classification for intraluminal blood yet
- No classification for thrombus yet

(depends on age, but often appears “green”)

- No classification for stents yet
- Accuracy behind calcium may be lower

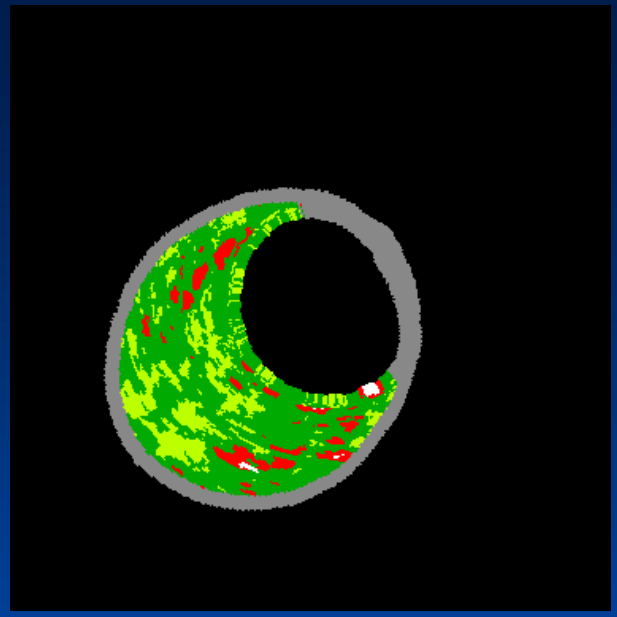
VH Artifact/Tips to read

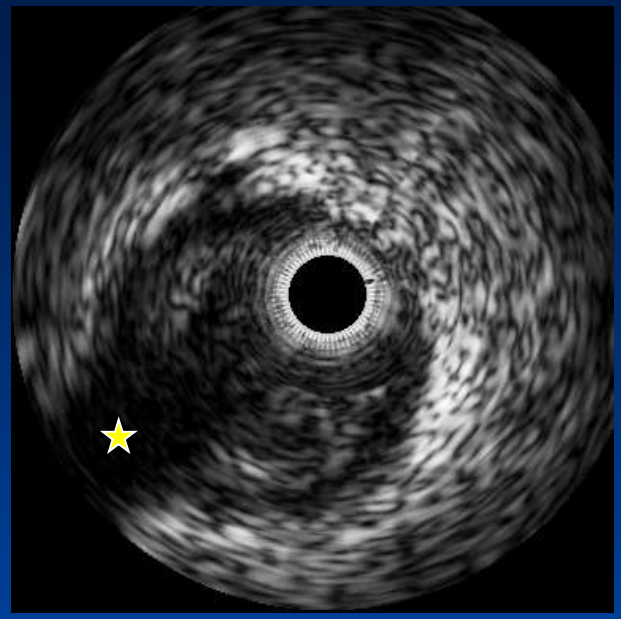
Wrong Lumen/Vessel Border



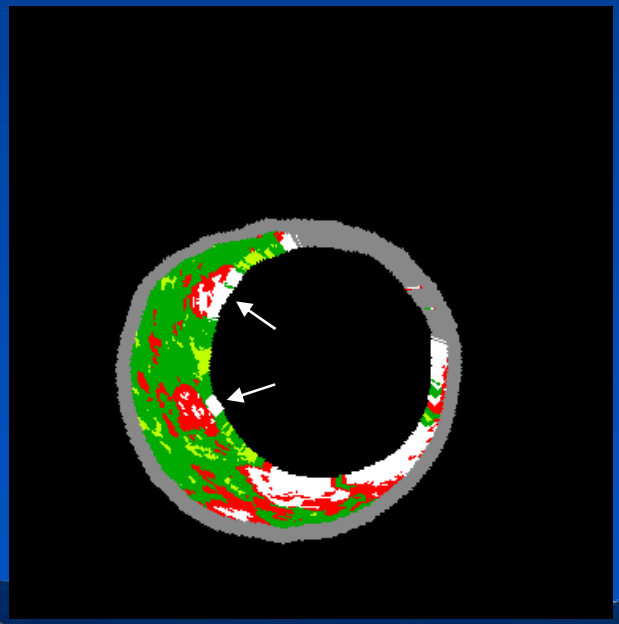
Stent Struts

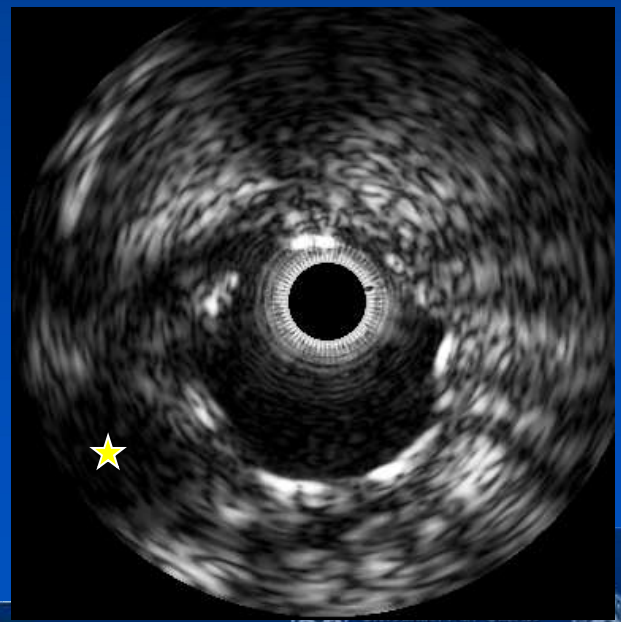
Before-Stent





Post-Stent





Clinical application

- Plaque vulnerability
- PCI outcome
- Systemic therapy

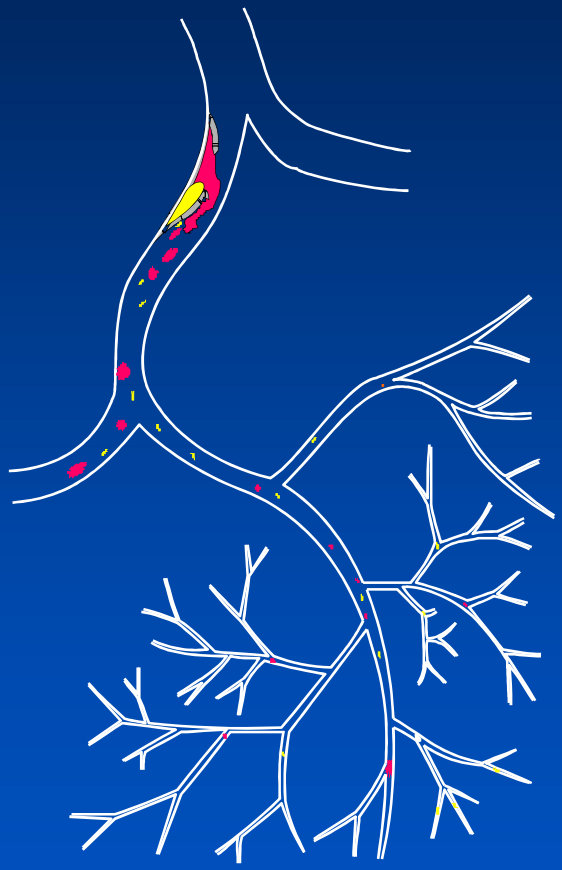
- Vulnerable plaques(TCFAs) occur more often in patients with ACS than SA
(Rodriguez-Granillo GA *et al.* 2005)

PROSPECT…

: The relationship between coronary events and VH derived plaque composition and type.

The potential value of current vulnerability by VH-findings in prediction of adverse coronary events

VH-IVUS predict distal embolization



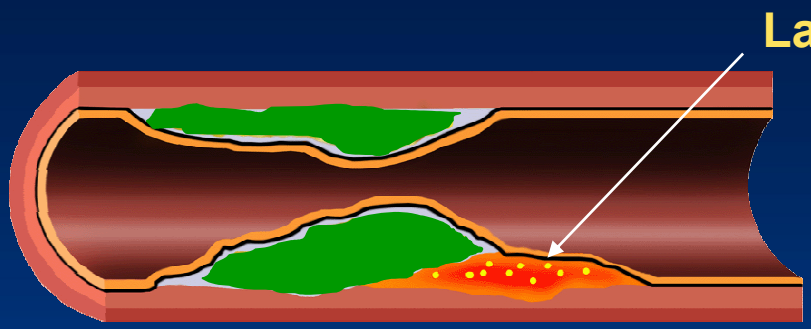
VH parameters & STR after Primary Stenting for STEMI

STR (ST-segment Re-elevation) represents distal embolization

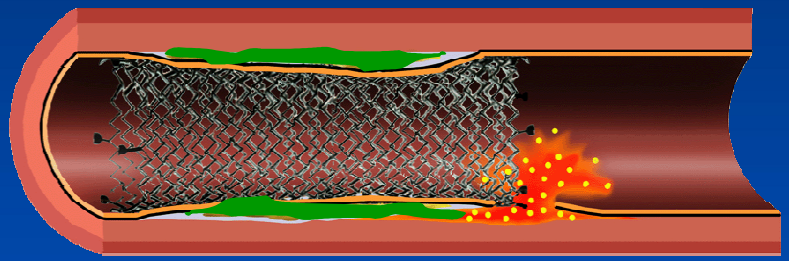
Among plaque components, only necrotic core volume are associated with STR.

(Kawaguchi, et al. JACC. 2007;50:1641-6)

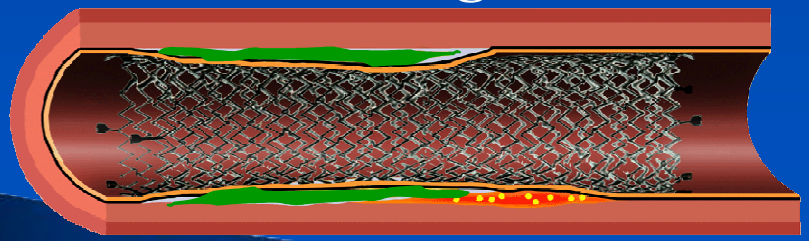
What is optimal complete lesion coverage?



Angiography or IVUS-guided



VH-IVUS-guided



Lack of clinical data comparing VH-IVUS guided vs. angiography/conventional IVUS guided PCI

Impact on:

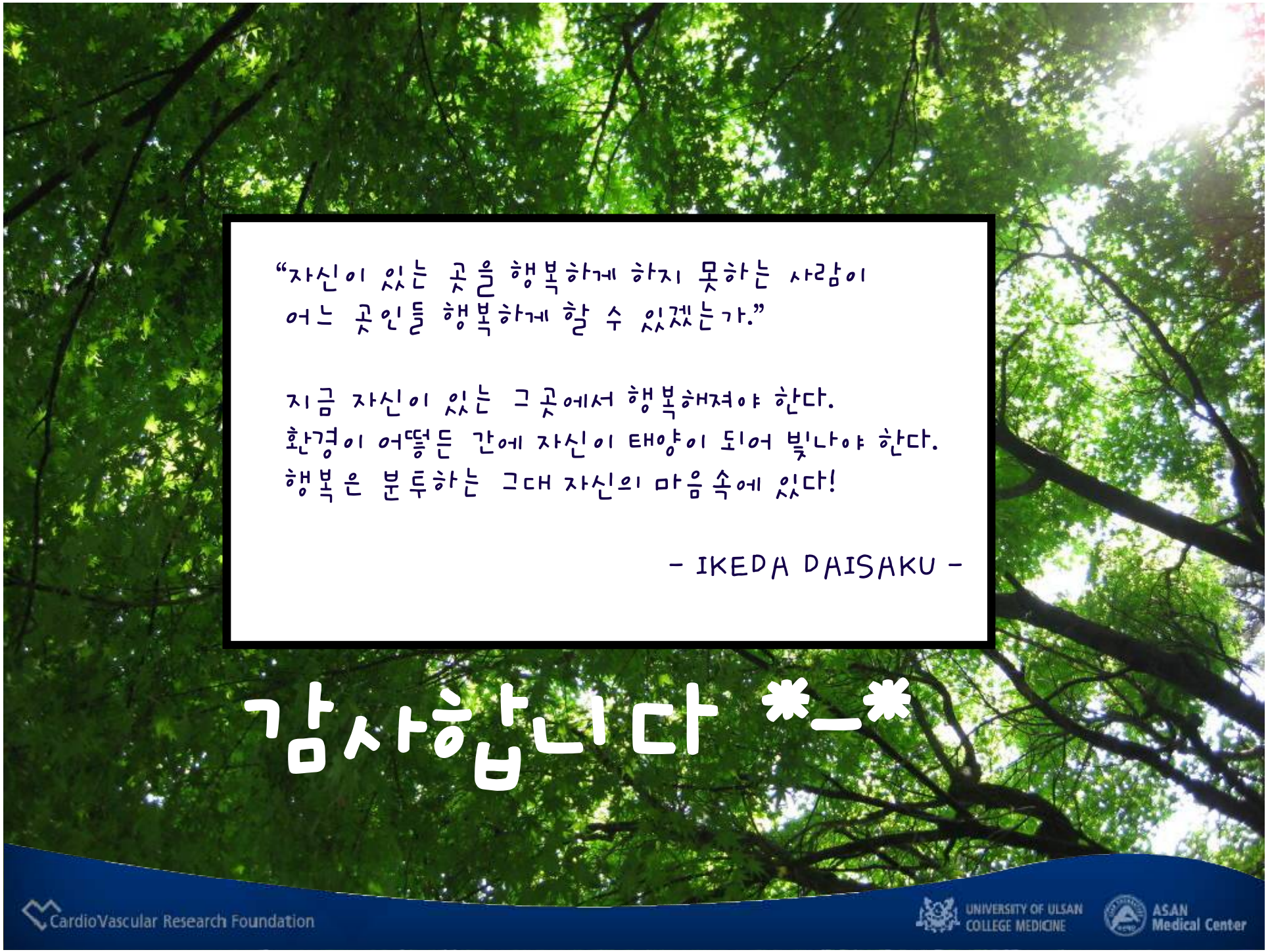
- Distal embolization
- Stent thrombosis
- Restenosis
- Plaque progression

- Fluvastatin may halt the progression of coronary atherosclerosis by the reduction of fibro-fatty

  (Kenya Nasu, M.D., Toyohashi Heart Center, AHA 2007)

- The inhibition of Lp-PLA2 halted necrotic core progression (IBIS 2)

  (Serruys PW et al. Circulation 2008; 118: 1172–82)


"자신이 있는 곳을 행복하게 하지 못하는 사람이
어느 곳인들 행복하게 할 수 있겠는가."
지금 자신이 있는 그곳에서 행복해져야 한다.
환경이 어떻든 간에 자신이 태양이 되어 빛나야 한다.
행복은 분투하는 그대 자신의 마음속에 있다!
- IKEDA DAISAKU -
감사합니다 *_*
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