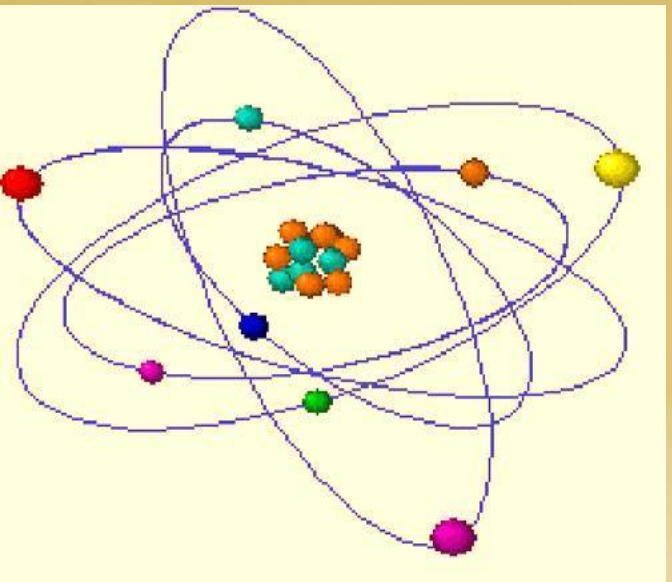
10ο Πανελλήνιο Συνέδριο Καρδιομεταβολικών Παραγόντων Κινδύνου

22 - 25 Ιουνίου 2017
HOTEL ELITE CITY RESORT
ΚΑΛΑΜΑΤΑ

Σπινθηρογράφημα καρδιάς : Πότε και σε ποιούς γίνεται; Τι πληροφορίες παρέχει;



Β.Πρασόπουλος
Δ/τής Πυρηνικής Ιατρικής- PET/CT
"ΥΓΕΙΑ"- "ΜΗΤΕΡΑ"

ΑΠΕΙΚΟΝΙΣΕΙΣ ΠΥΡΗΝΙΚΗΣ ΙΑΤΡΙΚΗΣ

ΜΟΝΟΦΩΤΟΝΙΑΚΗ (γ,x)
ΕΠΙΠΕΔΗ / ΤΟΜΟΓΡΑΦΙΚΗ
(Planar / SPECT)

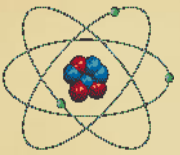
ΠΟΖΙΤΡΟΝΙΑΚΗ(e^+)
ΤΟΜΟΓΡΑΦΙΑ
(PET)

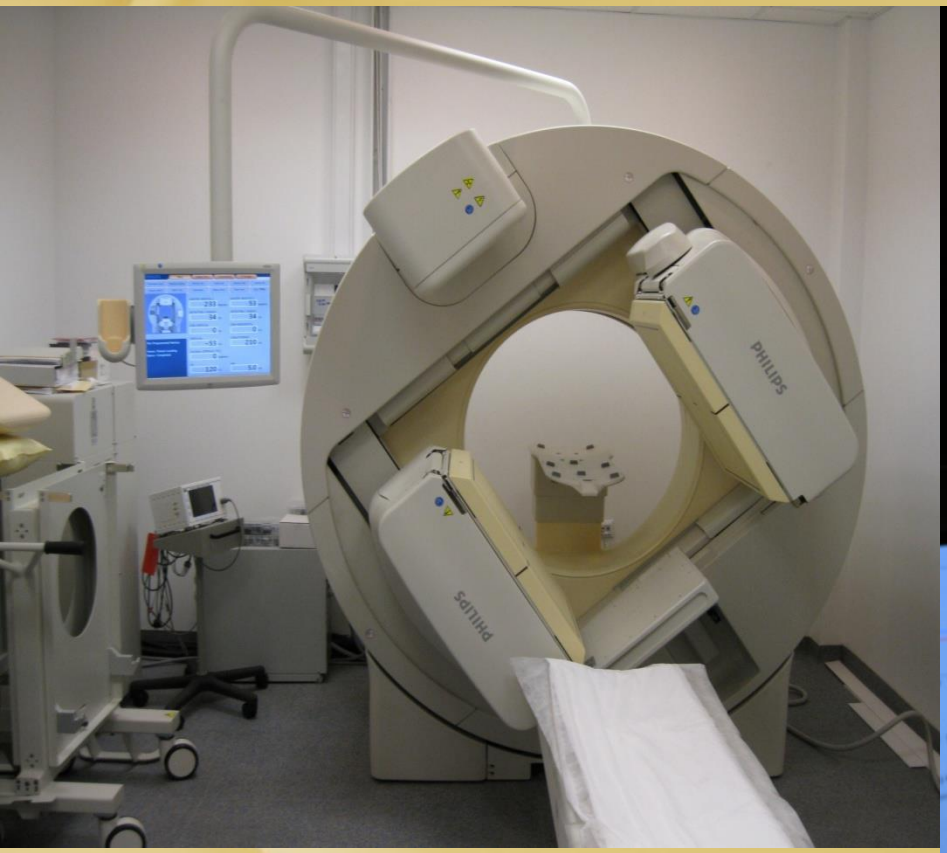
Μονοφωτονιακά Ραδιοϊσότοπα :
$^{99m}Tc, ^{201}Tl, ^{67}Ga, ^{131,123}I, ^{111}In$

Ποζιτρονιακά Ραδιοϊσότοπα
$^{18}F, ^{15}O, ^{13}N, ^{11}C, ^{82}Rb, ^{68}Ga$

Ανατομική-Λειτουργική
Απεικόνιση

Μοριακή-Χημική
Απεικόνιση




PHILIPS
PHILIPS

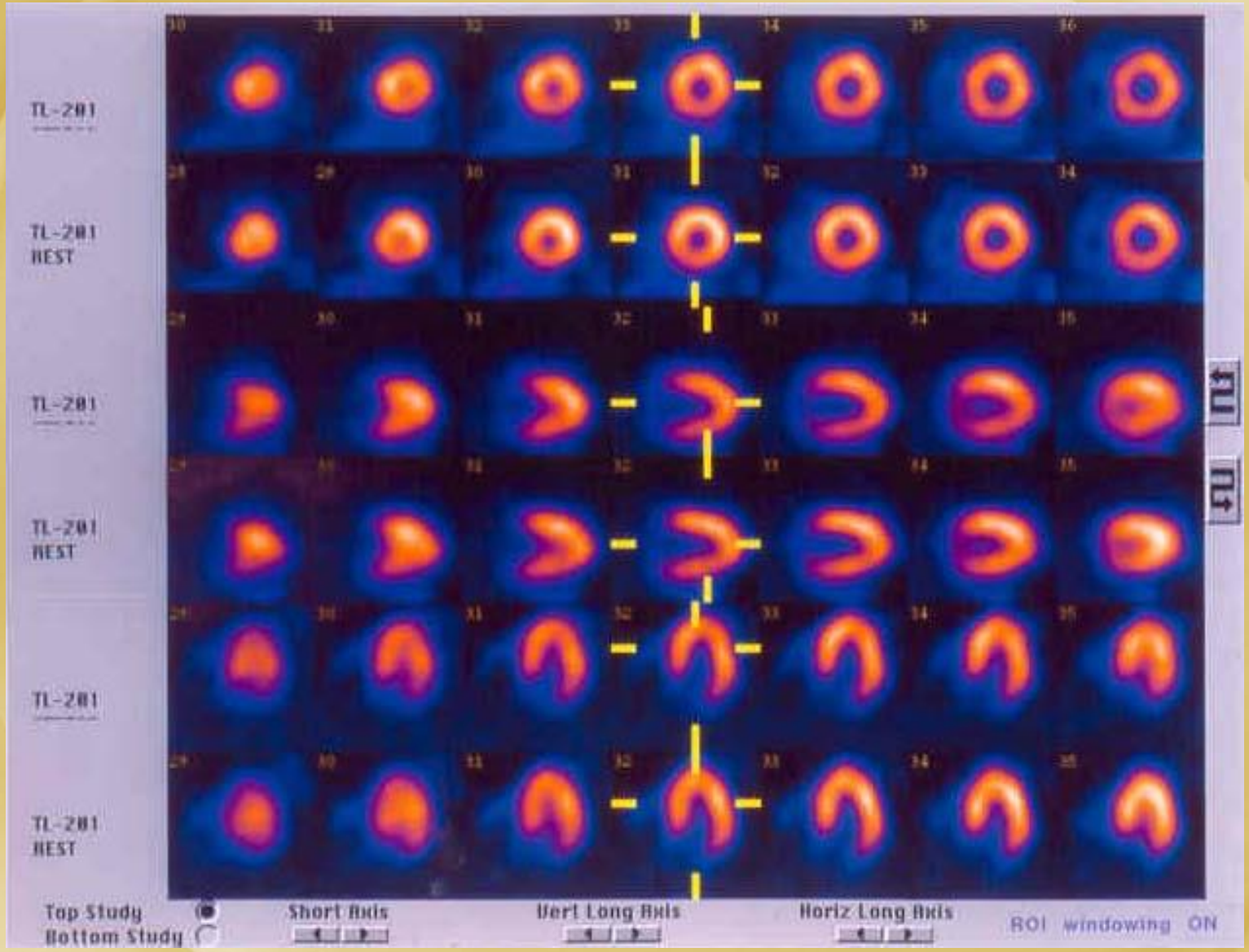

SIEMENS
biograph

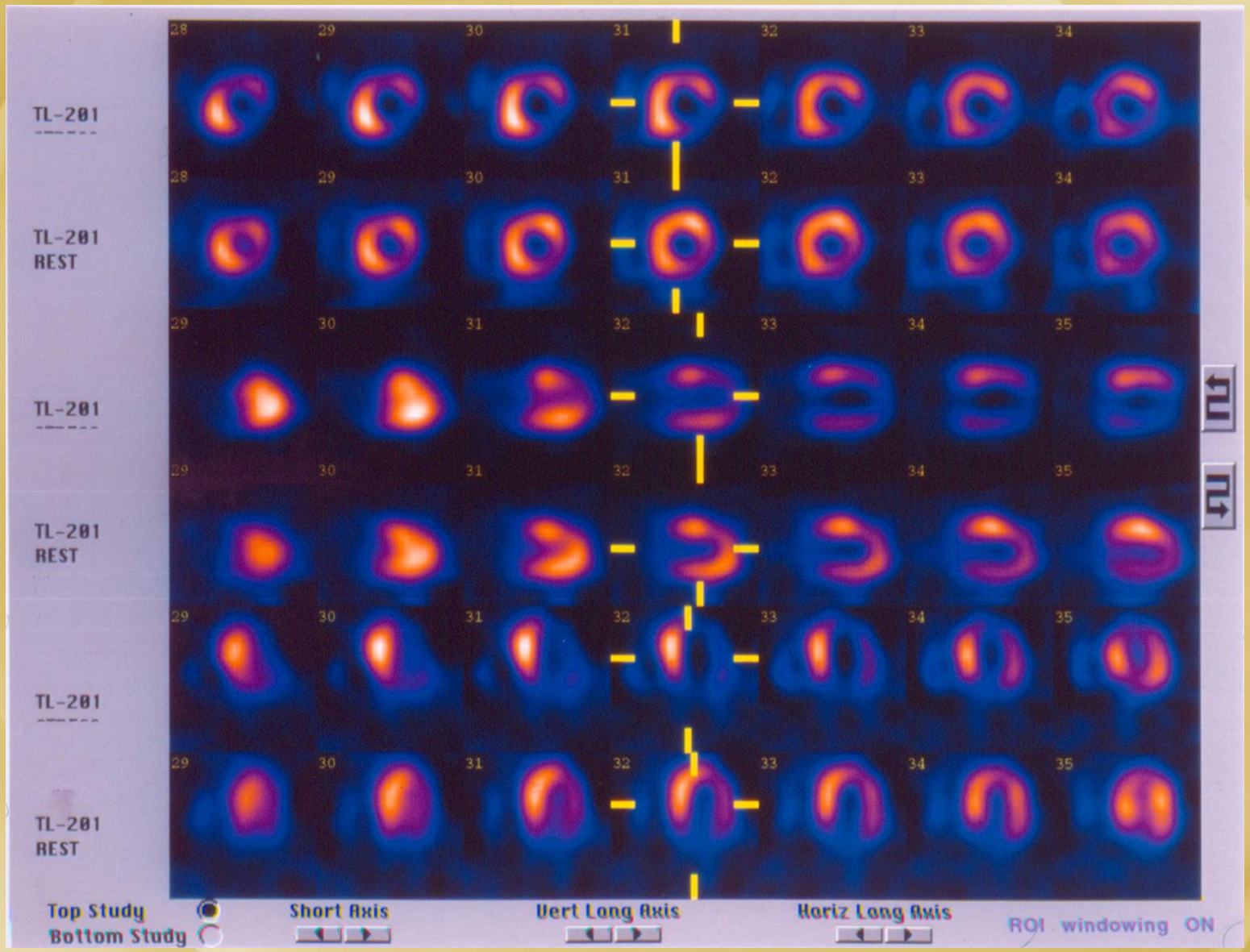
ΣΠΙΝΘΗΡΟΓΡΑΦΗΜΑ ΑΙΜΑΤΩΣΕΩΣ ΜΥΟΚΑΡΔΙΟΥ

- TL-201
- Tc99m επισημασμένες ενώσεις
  - Tc99m ισονιτρίλια (MIBI)
  - Tc99m Tetrofosmin (MYOVIEW)
  - Tc99m Teboroxime
  - Tc99m-HL-91

Τεχνικές κοπώσεως

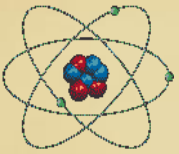
- Test κοπώσεως σε κυλιόμενο τάπητα ή εργομετρικό ποδήλατο.
- Φαρμακολογική δοκιμασία:
  - Διπυριδαμόλη
  - Αδενοσίνη
  - Δοβουταμίνη
  - Regadenoson:
- Δοκιμασία ψυχρού ύδατος (cold pressure)


TL-201
TL-201
REST
TL-201
TL-201
REST
TL-201
TL-201
REST
Top Study
Bottom Study
Short Axis
Vert Long Axis
Horiz Long Axis
ROI
Windowing
ON


TL-201
TL-201
REST
TL-201
TL-201
REST
TL-201
TL-201
REST
Top Study
Bottom Study
Short Axis
Vert Long Axis
Horiz Long Axis
ROI windowing ON

ΕΝΔΕΙΞΕΙΣ ΡΑΔΙΟΪΣΟΤΟΠΙΚΗΣ ΜΕΛΕΤΗΣ ΤΟΥ ΜΥΟΚΑΡΔΙΟΥ ΣΕ ΣΤΕΦΑΝΙΑΙΑ ΝΟΣΟ

- **Α. ΕΛΕΓΧΟΣ ΠΙΘΑΝΗΣ ΣΤΕΦΑΝΙΑΙΑΣ ΝΟΣΟΥ**
  - Ατομα με άτυπα ενοχλήματα ή μη διαγνωστικό ΗΚΓ κοπώσεως
  - Γυναίκες με ψευδώς θετική δοκιμασία κοπώσεως
  - LBBB
  - Σύνδρομο WPW
  - Διάταση αριστεράς κοιλίας
  - Εκτίμηση της στεφανιαίας νόσου για τη μελλοντική θεραπευτική αγωγή



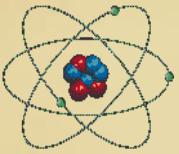
ΕΝΔΕΙΞΕΙΣ ΡΑΔΙΟΪΣΟΤΟΠΙΚΗΣ ΜΕΛΕΤΗΣ ΤΟΥ ΜΥΟΚΑΡΔΙΟΥ ΣΕ ΣΤΕΦΑΝΙΑΙΑ ΝΟΣΟ

- **Β. ΓΝΩΣΤΗ ΣΤΕΦΑΝΙΑΙΑ ΝΟΣΟΣ**

  Ισχαιμία – Εμφραγμα

  - Εκτίμηση βαρύτητας
  - Εκτίμηση εκτάσεως
  - Πρόγνωση
  - Ελεγχος βιωσιμότητας
  - Ελεγχος της εξελίξεως της στεφανιαίας νόσου

- **Γ. ΠΡΟ ΚΑΙ ΜΕΤΑ ΕΠΕΜΒΑΤΙΚΗΣ ΘΕΡΑΠΕΥΤΙΚΗΣ ΑΝΤΙΜΕΤΩΠΙΣΕΩΣ**



ΕΝΔΕΙΞΕΙΣ ΡΑΔΙΟΪΣΟΤΟΠΙΚΩΝ ΤΕΧΝΙΚΩΝ

- **Ειδικότερα οι ραδιοϊσοτοπικές μέθοδοι είναι χρήσιμες στις κάτωθι περιπτώσεις** :

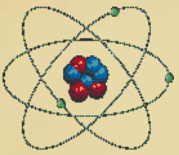
  α) Στη διάγνωση της ύπαρξης ή μη κλινικά σημαντικής ΣΝ, την εκτίμηση της θέσης, του βαθμού και της έκτασης της ισχαιμίας ή της μυοκαρδιακής ουλής.

  β) Στην εκτίμηση της αιμοδυναμικής σημαντικότητας γνωστών από τη στεφανιογραφία αλλοιώσεων

  γ) Στον καθορισμό του κινδύνου (risk stratification) και της πρόγνωσης του στεφανιαίου ασθενούς γενικά. Οσον αφορά τον καθορισμό του κινδύνου, ιδιαίτερη κατηγορία αποτελούν : i) ασθενείς μετά από οξύ έμφραγμα του μυοκαρδίου και ii) ασθενείς με γνωστή ή ύποπτη ΣΝ πριν από μείζονα (μη καρδιοχειρουργική) χειρουργική επέμβαση.

  δ) Επί εμφράγματος, στην εκτίμηση της βιωσιμότητας του μυοκαρδίου. Η μέθοδος είναι χρήσιμη για την διάκριση ουλής – ισχαιμίας και την πρόβλεψη της λειτουργικής αποκατάστασης του μυοκαρδίου μετά από επαναγγείωση.

  ε) Στη διάκριση στεφανιαίων ή μη αιτίων σε ασθενείς που προσέρχονται στα επείγοντα εξωτερικά Ιατρεία με σύνδρομο πρόσθιου θωρακικού άλγους.



JACC Vol. 53, No. 23, 2009
June 9, 2009:2201–29

Table A. Pretest Probability of CAD by Age, Gender, and Symptoms*

Age (Years)	Gender	Typical/Definite Angina Pectoris	Atypical/Probable Angina Pectoris	Nonanginal Chest Pain	Asymptomatic
<39	Men	Intermediate	Intermediate	Low	Very low
	Women	Intermediate	Very low	Very low	Very low
40–49	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Low	Very low	Very low
50–59	Men	High	Intermediate	Intermediate	Low
	Women	Intermediate	Intermediate	Low	Very low
>60	Men	High	Intermediate	Intermediate	Low
	Women	High	Intermediate	Intermediate	Low

High: Greater than 90% pretest probability. **Intermediate:** Between 10% and 90% pretest probability. **Low:** Between 5% and 10% pretest probability. **Very low:** Less than 5% pretest probability. *Modified from the ACC/AHA Exercise Testing Guidelines to reflect all age ranges (14).

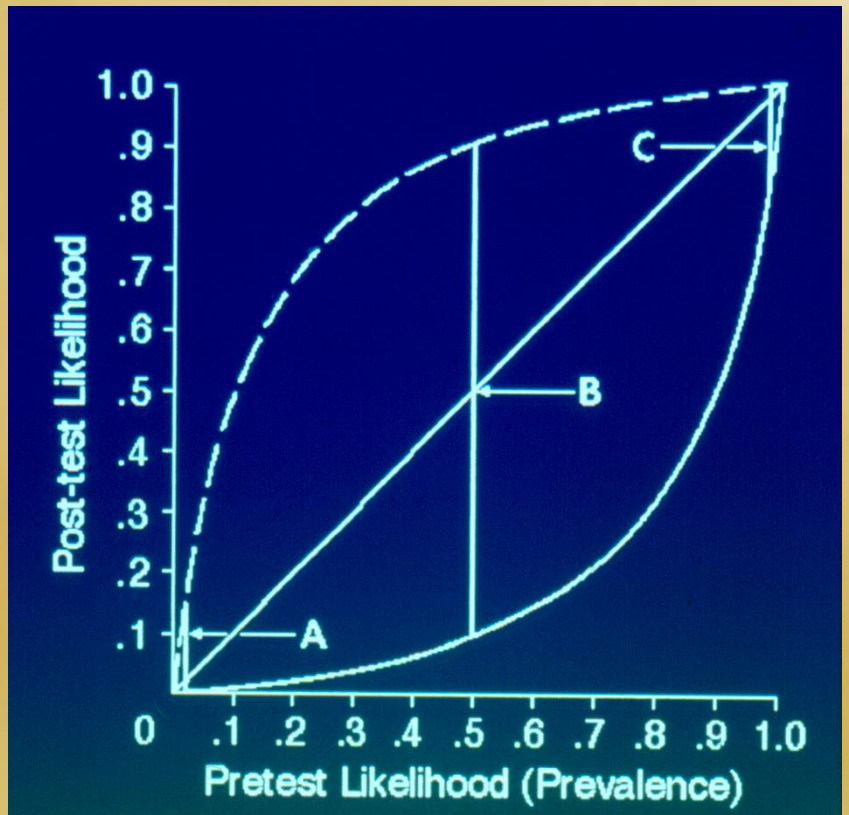
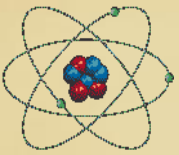


Fig 1. Relationship between pretest likelihood (X axis) and posttest likelihood (Y axis) of angiographically significant CAD for a test with 90% sensitivity and 90% specificity. The upper curve (*dashed*) depicts this relationship for the abnormal test results, and the lower curve (*solid*) for the normal test results. The center line is the line of identity. Vertical lines a, b, and c delineate three different pretest likelihoods of 0.01, 0.5, and 0.99, respectively. The length of these lines can be considered a measure of the diagnostic value of the test. Note that the longest line (greatest separation between the pretest and posttest likelihoods) is associated with the midrange of pretest likelihood. (Reprinted with permission.[15])

GATED SPECT Acquisition

- μυοκαρδιακή διάχυση
- περιοχική συστολική πάχυνση
- εκτίμηση δραστηριότητας αριστεράς κοιλίας - EF %
- προσδιορισμός όγκων αριστεράς κοιλίας
- έλεγχος κινητικότητας
- έλεγχος βιωσιμότητας
- ↑ ευαισθησίας και ειδικότητας στη διάγνωση CAD
- ↓ ψευδώς θετικών - εκτίμηση πιθανόν artifacts



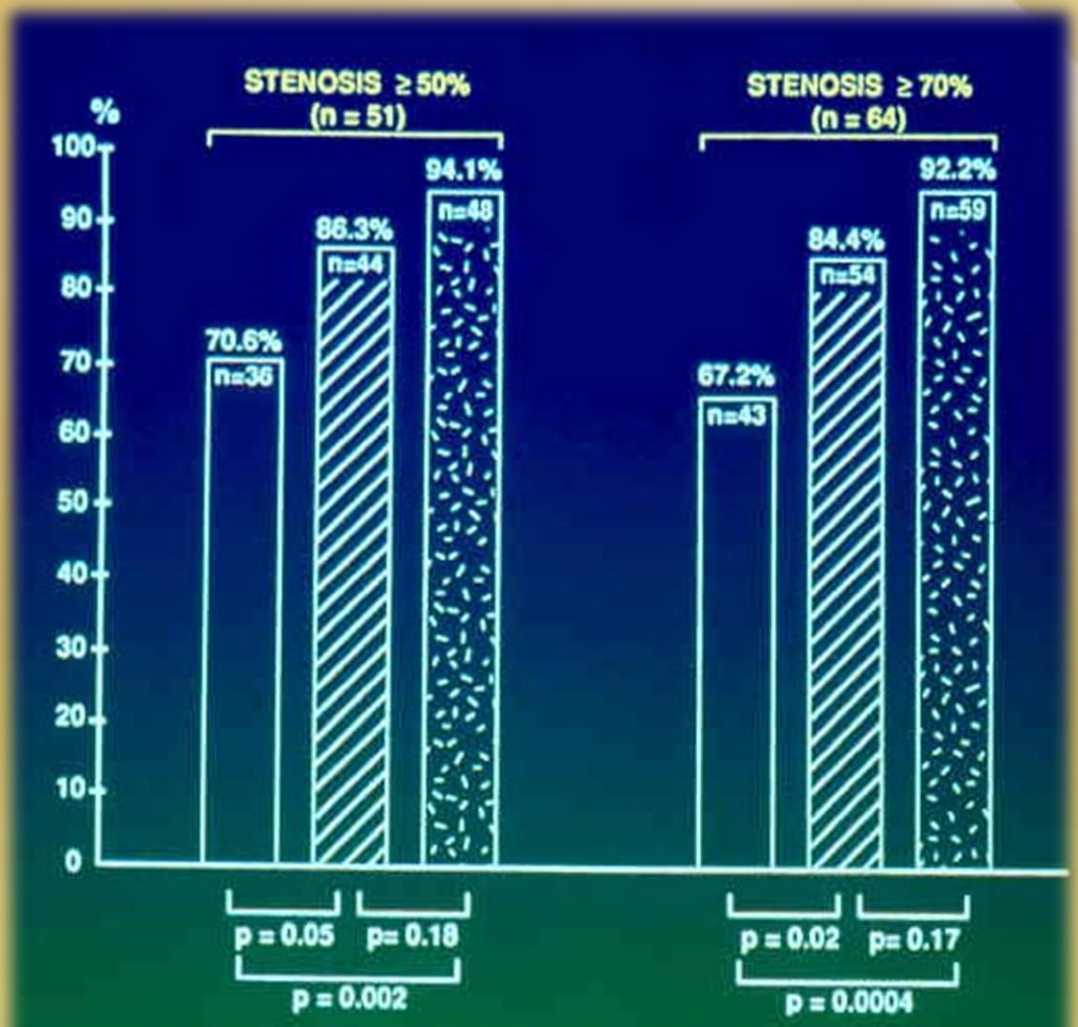
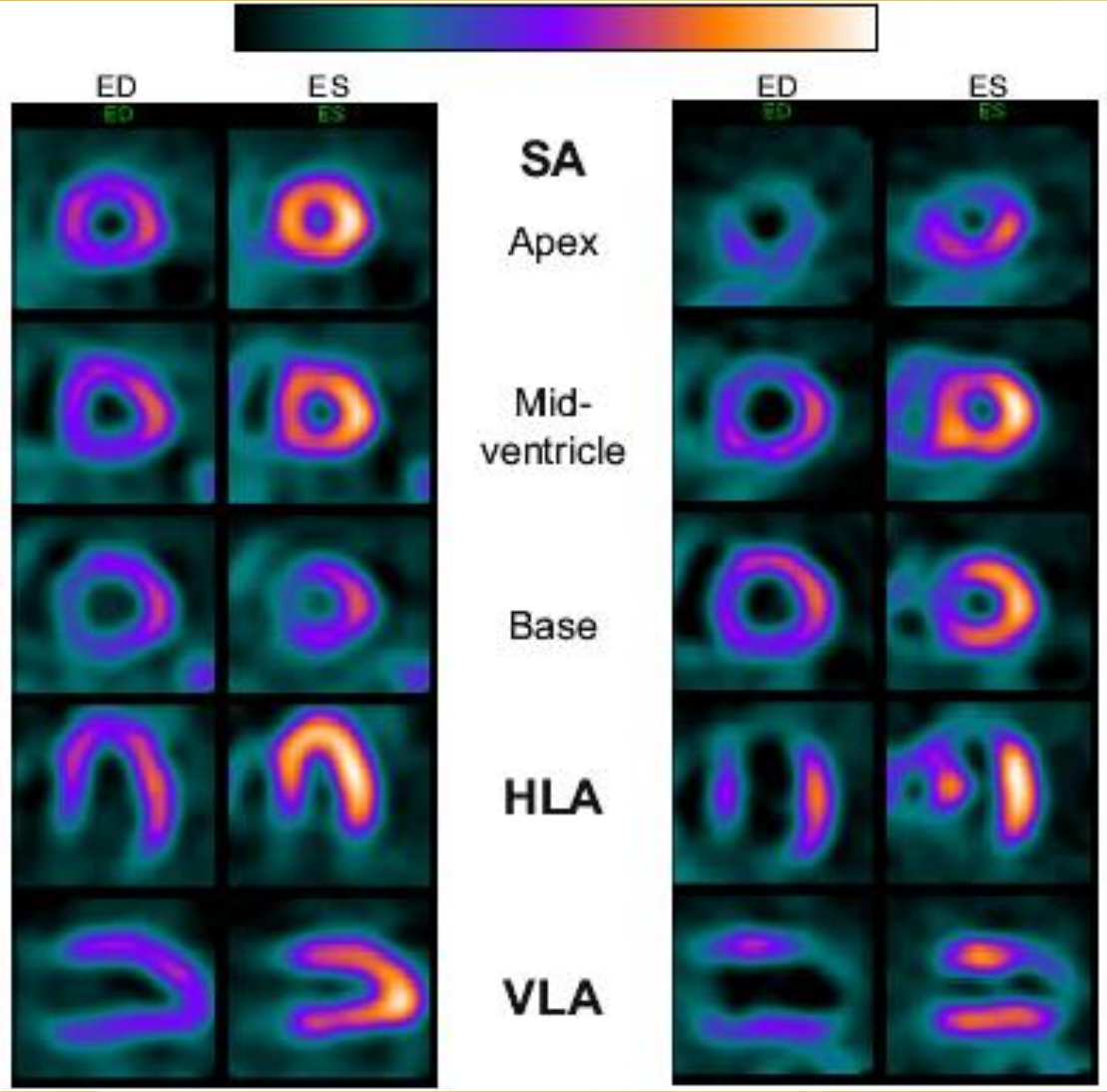
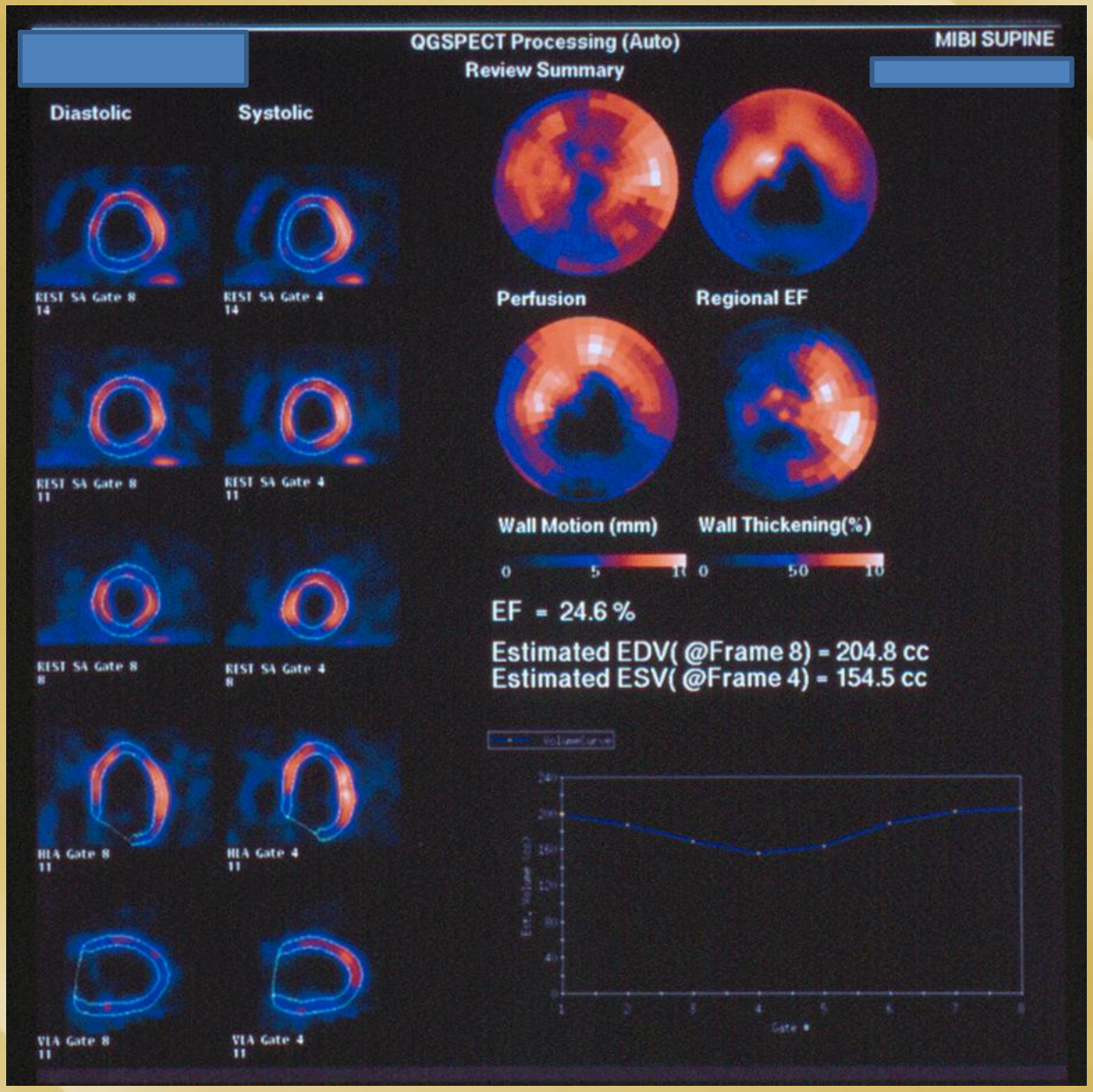


Figure 1. Specificity of ^{201}Tl (open bars), ^{99m}Tc-sestamibi perfusion (striped bars), and gated ^{99m}Tc-sestamibi SPECT (speckled bars) imaging studies for both women without CAD and normal volunteers.[7] Values are given for ≥50% and ≥70% stenosis as definition for significant CAD. Reprinted with permission from the American College of Cardiology.[7]

GATED - SPECT



EANM/ESC guidelines EJNM 32:855, 2005


QGSPECT Processing (Auto)
Review Summary
MIBI SUPINE
Diastolic
Systolic
REST SA Gate 8
14
REST SA Gate 4
14
REST SA Gate 8
11
REST SA Gate 4
11
REST SA Gate 8
8
REST SA Gate 4
8
HLA Gate 8
11
HLA Gate 4
11
VLA Gate 8
11
VLA Gate 4
11
Perfusion
Regional EF
Wall Motion (mm)
Wall Thickening(%)
0
5
0
50
EF = 24.6 %
Estimated EDV(@Frame 8) = 204.8 cc
Estimated ESV(@Frame 4) = 154.5 cc

Comparison of gated SPECT, echocardiography and cardiac magnetic resonance imaging for the assessment of left ventricular ejection fraction and volumes.

- Συσχετίσεις μεταξύ των τιμών των LVEF, EDV και ESV, που προέκυψαν από τη μελέτη με GSPECT, ECHO και CMRI.

Demir H, et al. ***Ann Saudi Med.*** *2007 Nov-Dec;27(6):415-20.*

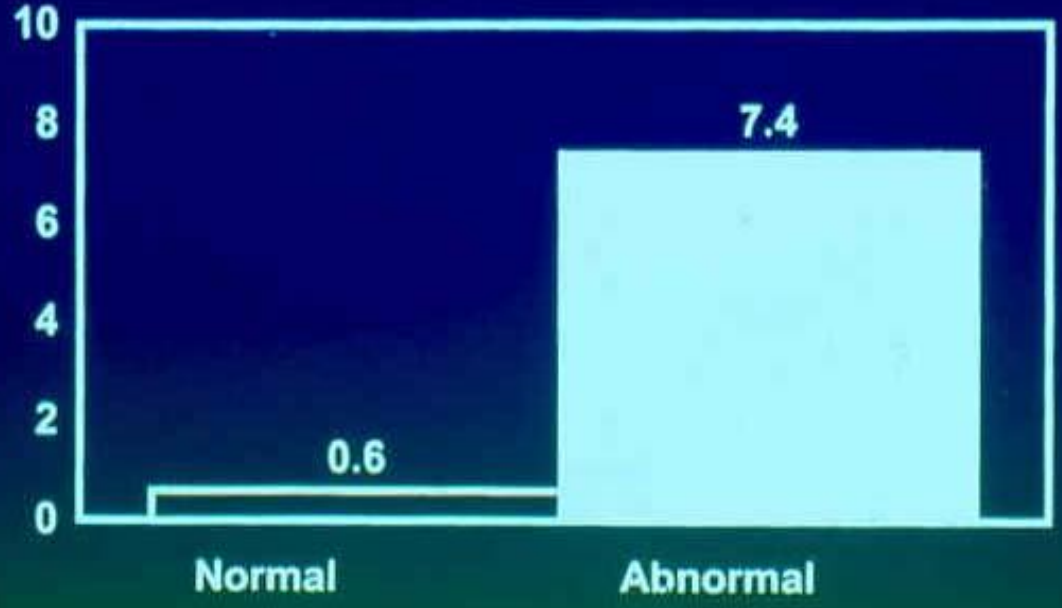
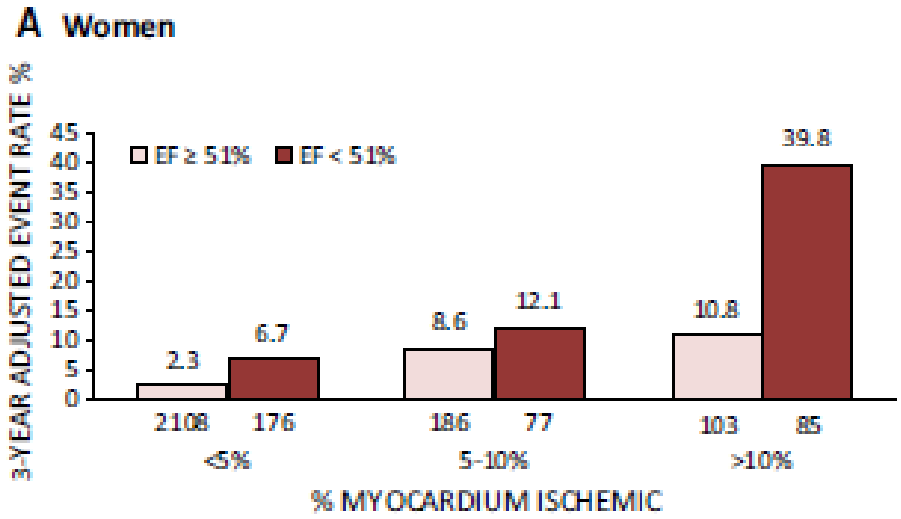


Figure 2. Rate of death or nonfatal myocardial infarction in patients with normal and abnormal stress SPECT images from 14 published reports comprising >12 000 patients. Reprinted with permission from the American College of Cardiology.[26]



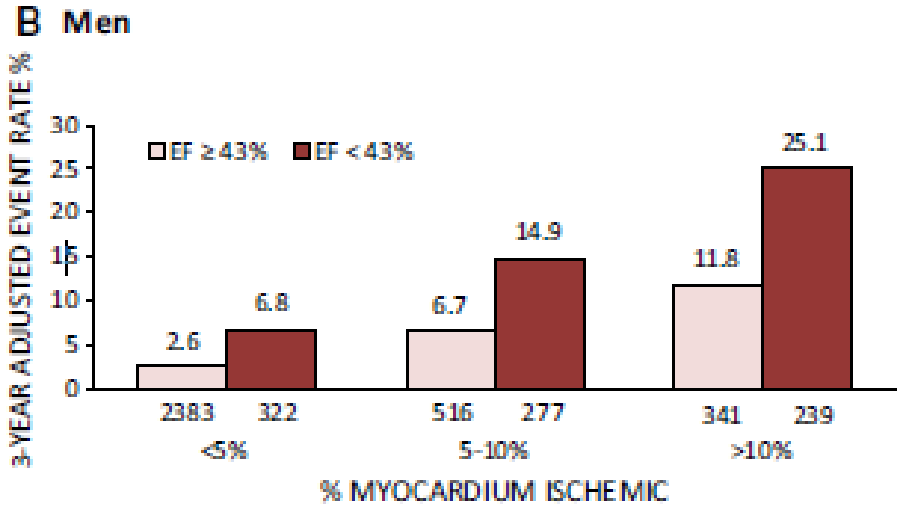
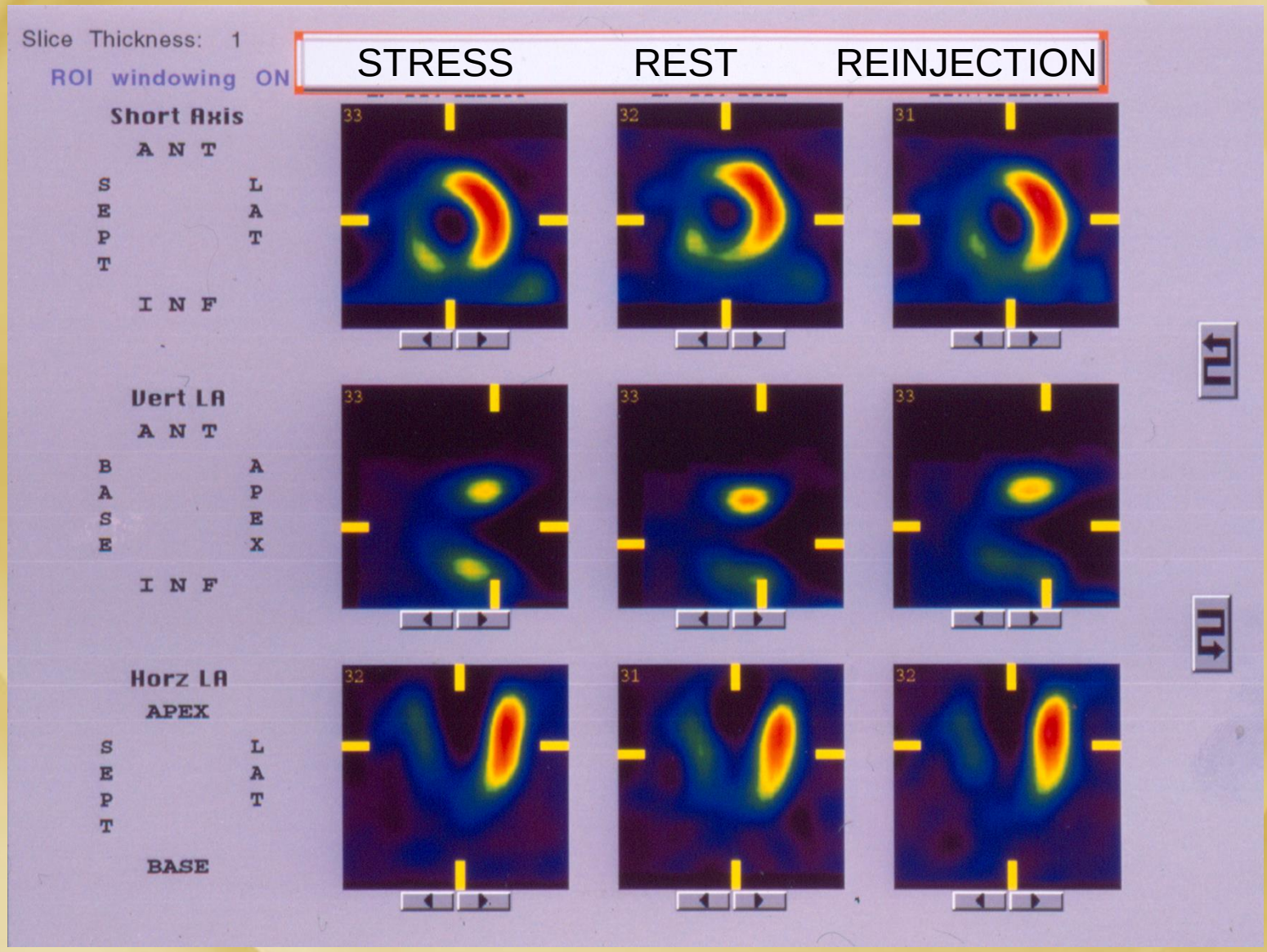
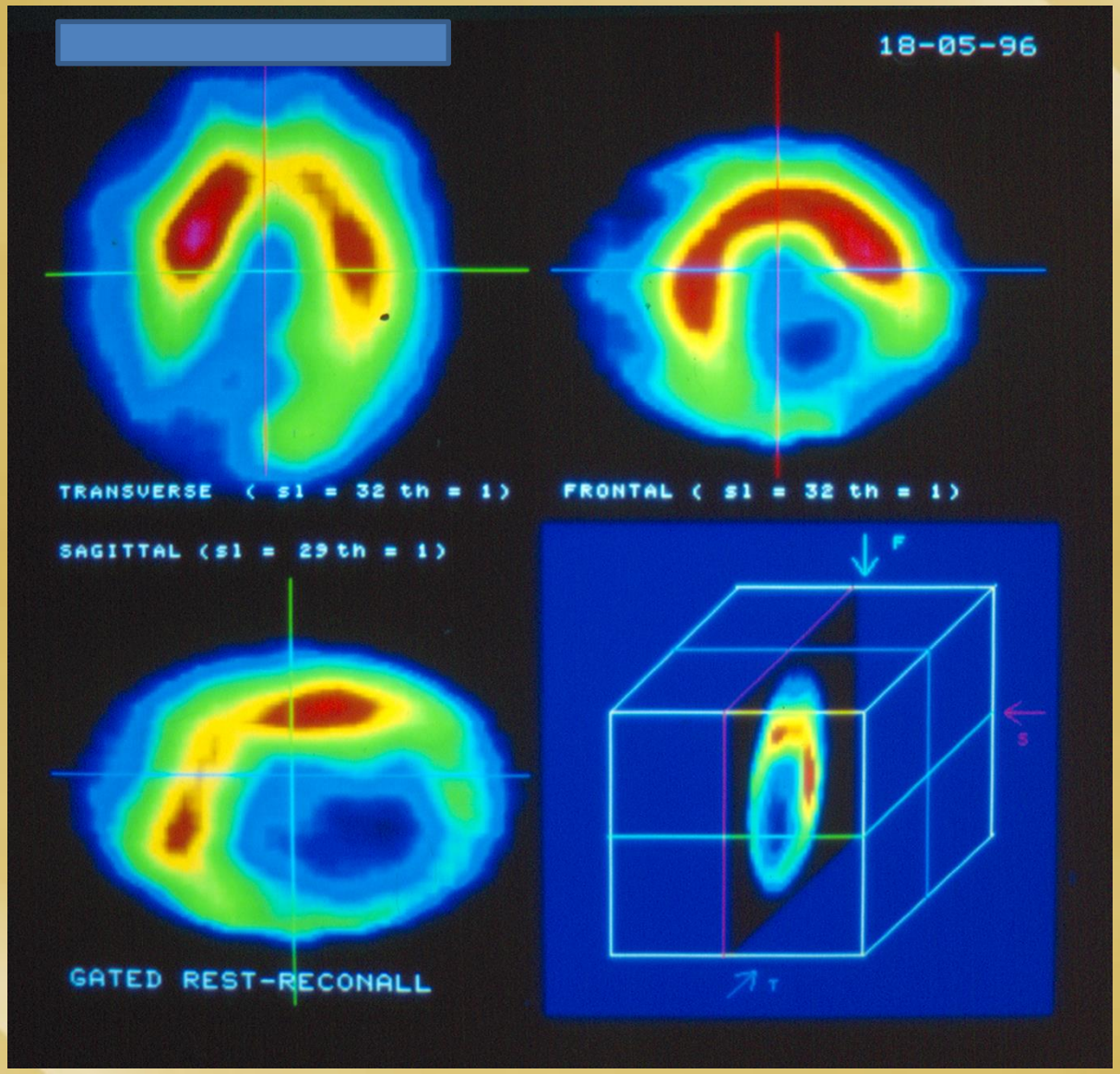


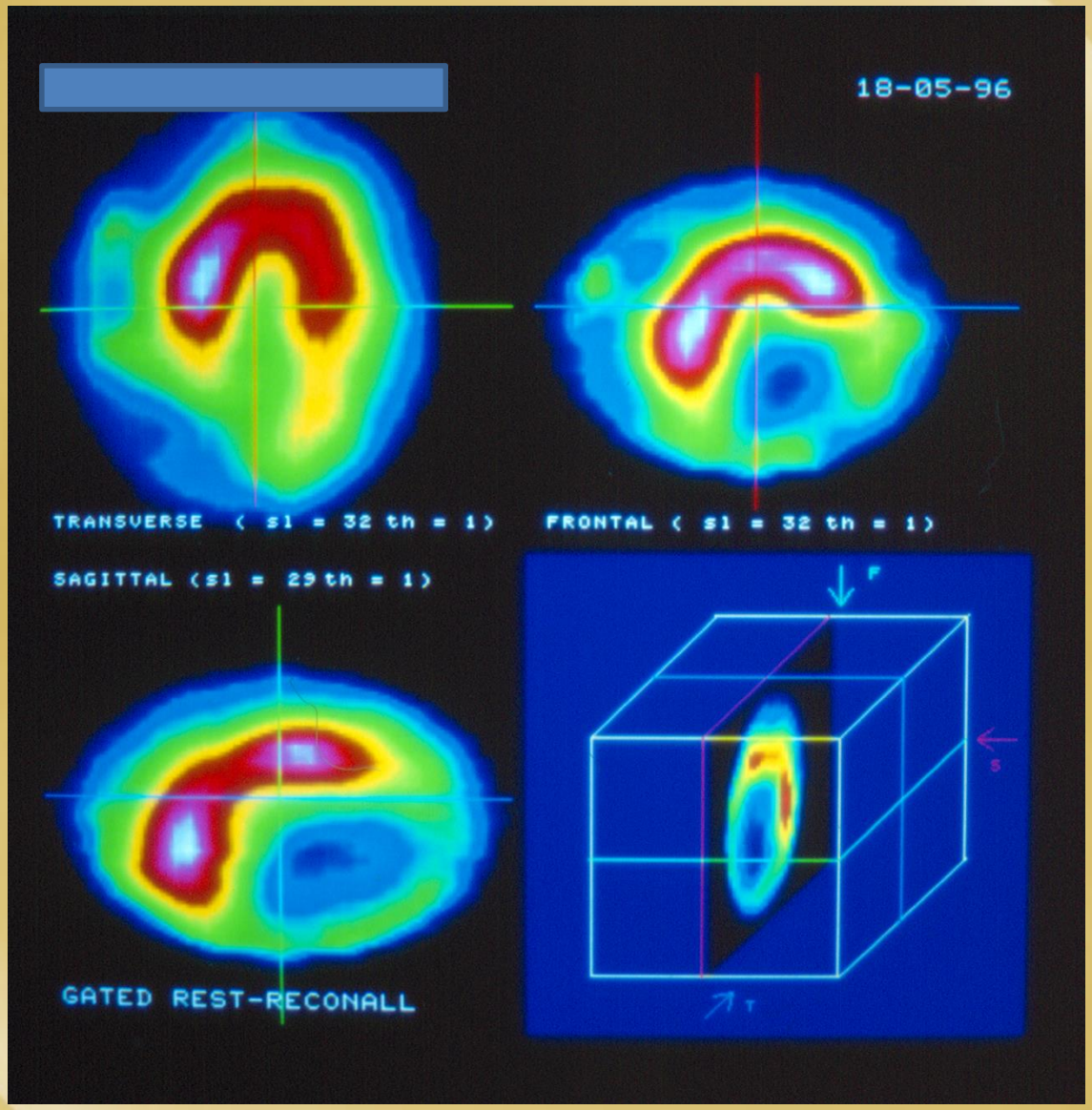
Figure 2. Three-year adjusted rate of cardiac death or myocardial infarction in women (**A**) and men (**B**) as a function of ischemia and LVEF. Normal limits of LVEF are ≥51% in women and ≥43% in men. *LVEF*, left ventricular ejection fraction. Adapted with permission.[21]

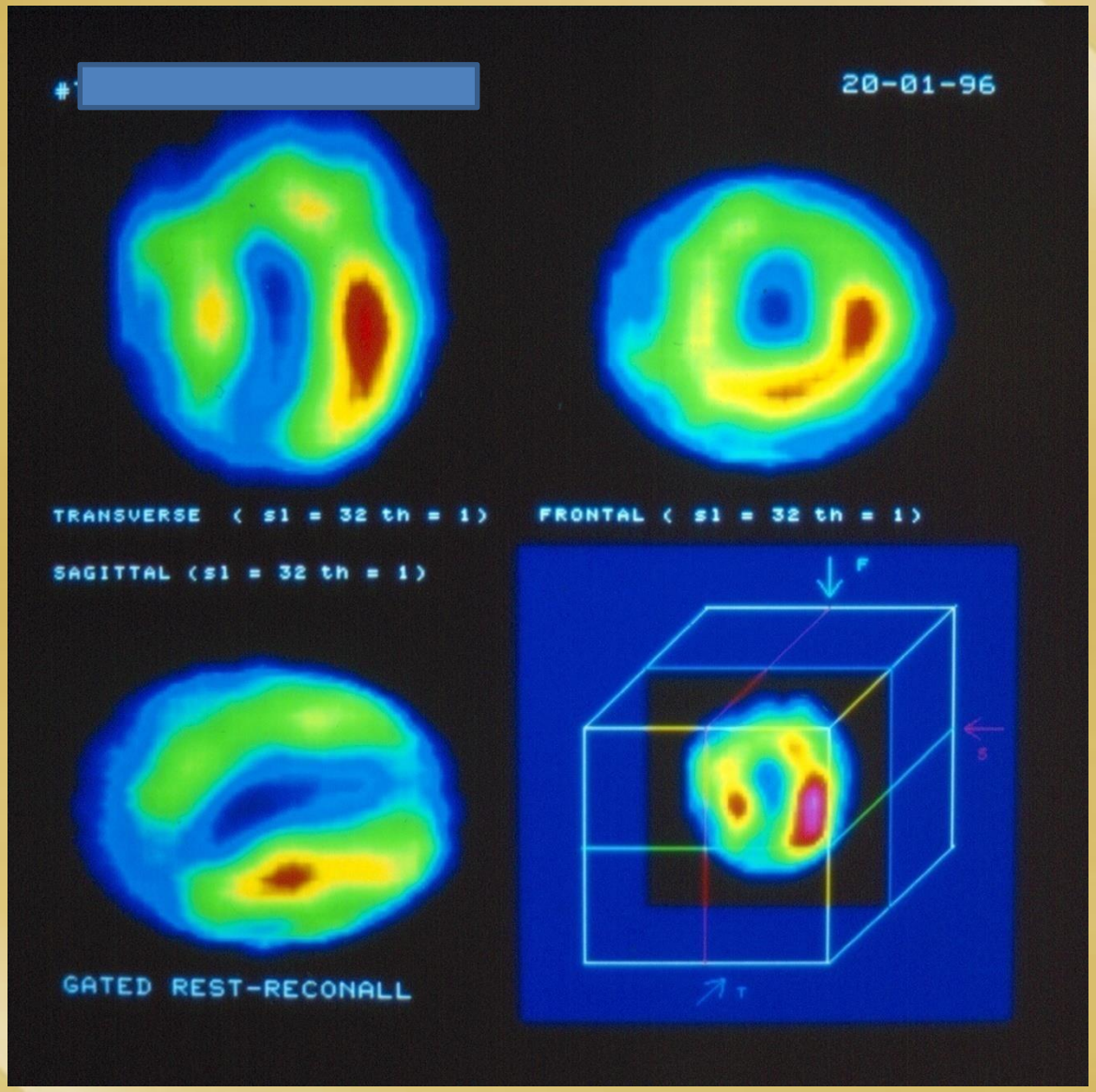
Myocardial perfusion imaging in women for the evaluation of stable ischemic heart disease— state-of-the-evidence and clinical recommendations. Taqueti et al. Journal of Nuclear Cardiology May 15, 2017

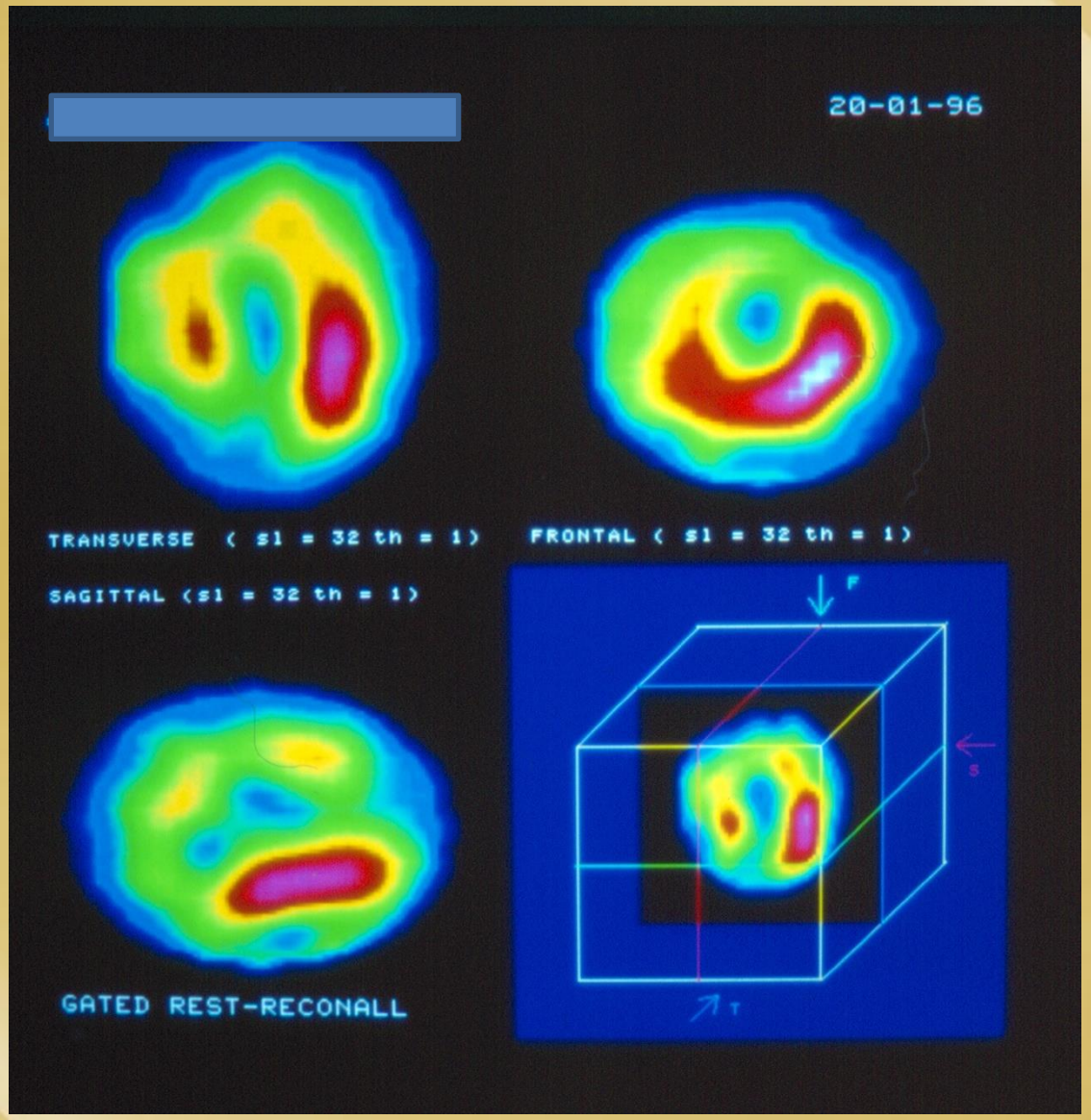
ΕΛΕΓΧΟΣ ΒΙΩΣΙΜΟΤΗΤΑΣ ΤΟΥ ΜΥΟΚΑΡΔΙΟΥ




18-05-96
TRANSVERSE (s1 = 32 th = 1)
FRONTAL (s1 = 32 th = 1)
SAGITTAL (s1 = 29 th = 1)
GATED REST-RECONALL
F
S
T


18-05-96
TRANSVERSE (s1 = 32 th = 1)
FRONTAL (s1 = 32 th = 1)
SAGITTAL (s1 = 29 th = 1)
GATED REST-RECONALL
F
S
T


#
20-01-96
TRANSVERSE (s1 = 32 th = 1)
FRONTAL (s1 = 32 th = 1)
SAGITTAL (s1 = 32 th = 1)
GATED REST-RECONALL


20-01-96
TRANSVERSE (s1 = 32 th = 1)
FRONTAL (s1 = 32 th = 1)
SAGITTAL (s1 = 32 th = 1)
GATED REST-RECONALL
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S
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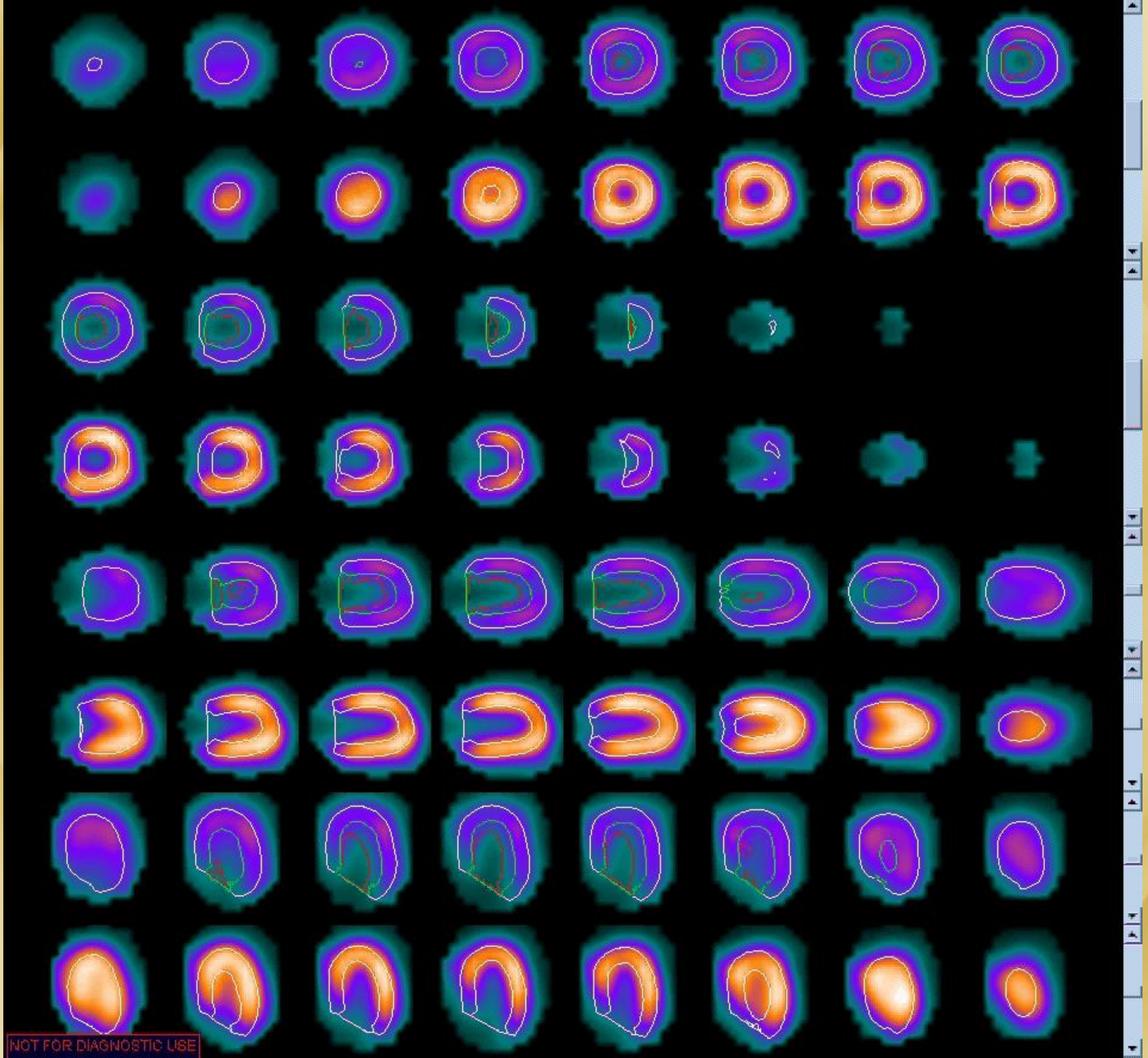
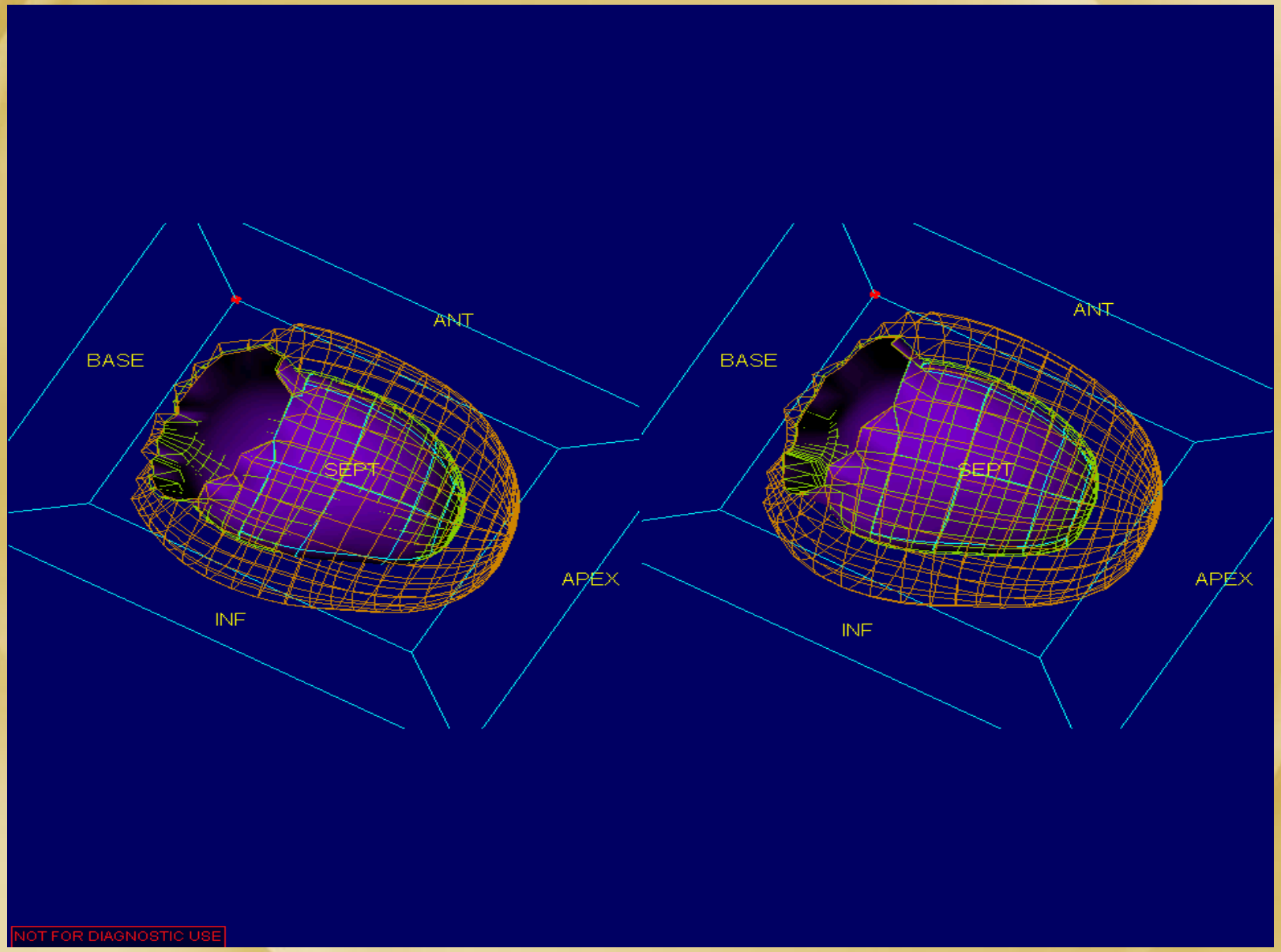

NOT FOR DIAGNOSTIC USE

stress

rest


BASE
ANT
SEPT
APEX
INF
BASE
ANT
SEPT
APEX
INF
NOT FOR DIAGNOSTIC USE

Low-Dose Dobutamine Electrocardiograph-Gated Myocardial SPECT for Identifying Viable Myocardium:Comparison with Dobutamine Stress Echocardiography and PET
K.Yoshinata et al,J Nucl Med 2001:42:838-844

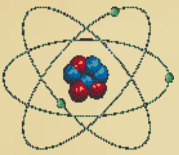
- 23 patients 294 segments
- 99mTc-Tetrofosmin gated-SPECT low-dose dobutamine(7,5 μg/kg/min)

- **DIAGNOSTIC ACCURACY of VIABILITY ASSESSMENT by EACH METHOD**

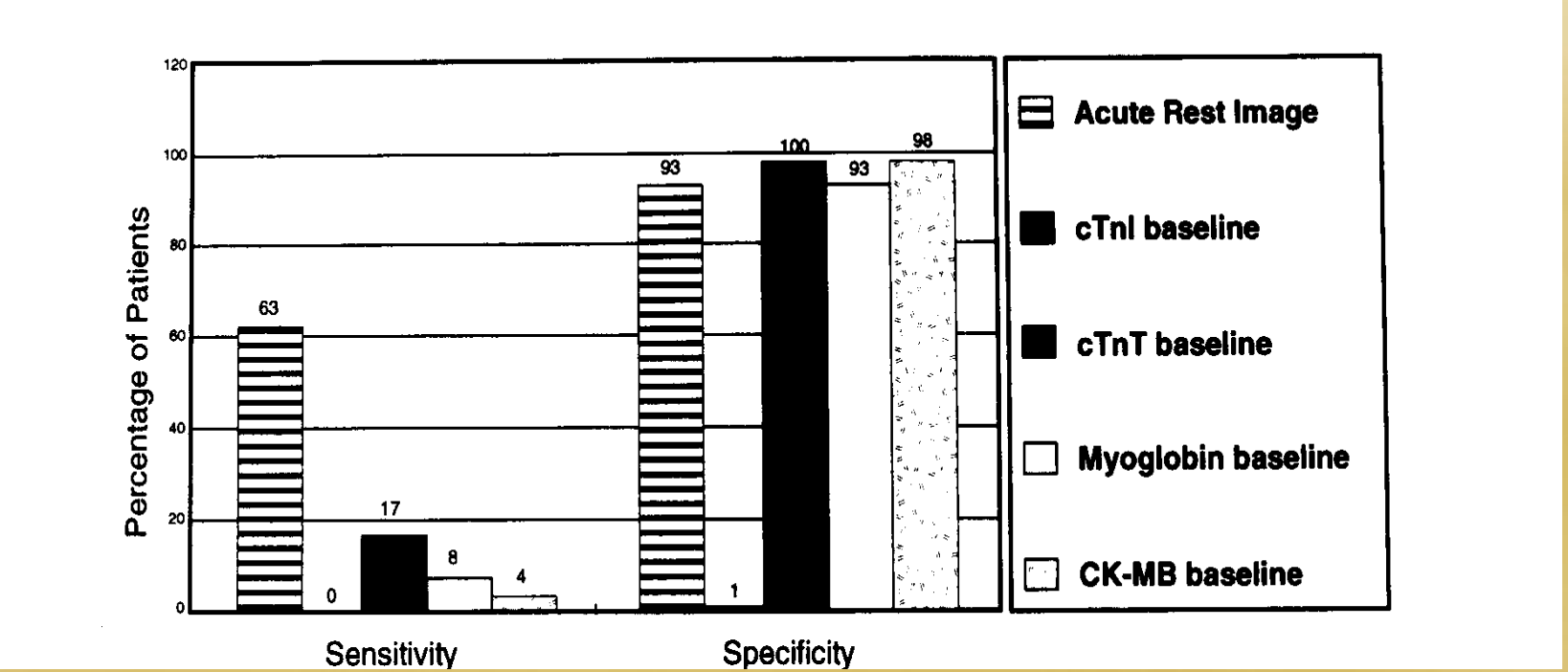
METHOD	Sensitivity	Specificity	PPV	NPV
DS SPECT	76%	100%	100%	72%
DSE	78%	94%	96%	70%
Rest SPECT	85%	52%	74%	69%

ΣΠΙΝΘΗΡΟΓΡΑΦΗΜΑ ΑΙΜΑΤΩΣΕΩΣ ΜΥΟΚΑΡΔΙΟΥ ΜΕΤΑ ΑΓΓΕΙΟΠΛΑΣΤΙΚΗ

- Θετική προγνωστική αξία (PPV) :93%
- Αρνητική προγνωστική αξία (NPV) : 93%
- Θετικό σπινθηρογράφημα 4-6 εβδομάδες μετά αγγειοπλαστική διαγιγνώσκει ή προβλέπει επαναστένωση σε 3-6 μήνες.
- Αρνητικό σπινθηρογράφημα απομονώνει ομάδα χαμηλού κινδύνου



ΕΠΕΙΓΟΥΣΑ ΠΥΡΗΝΙΚΗ ΚΑΡΔΙΟΛΟΓΙΑ



Duca, et al, Comparison of acute rest myocardial perfusion imaging and serum markers of myocardial injury in patients with chest pain syndromes. J. Nucl. Cardiol. 6:570-576, 1999

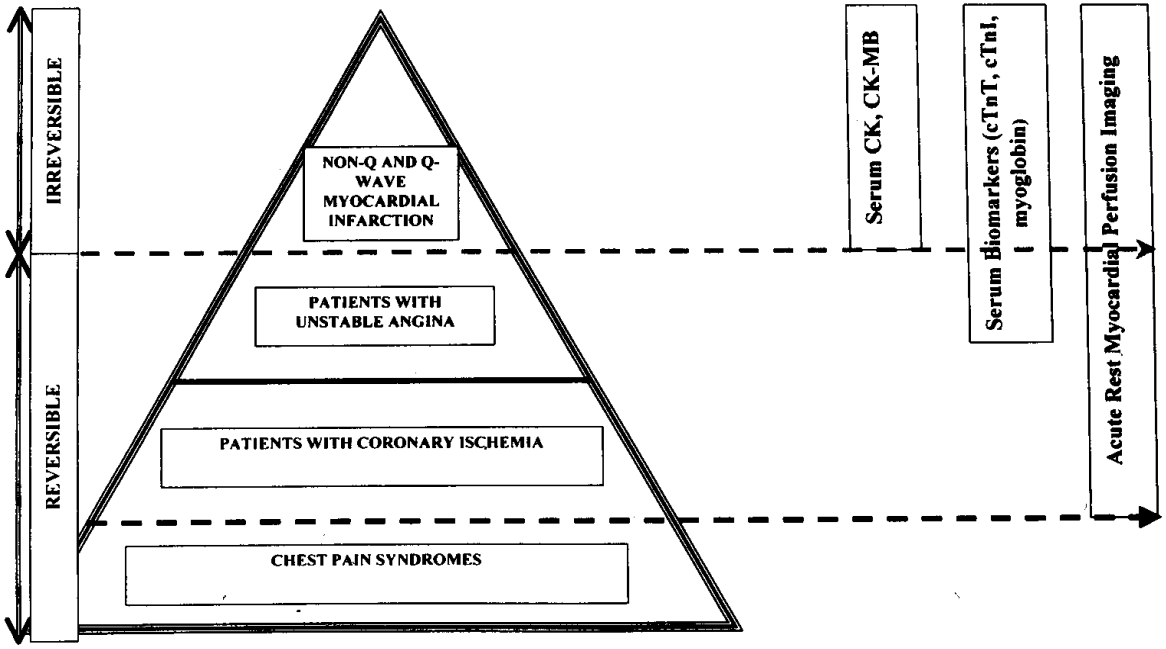
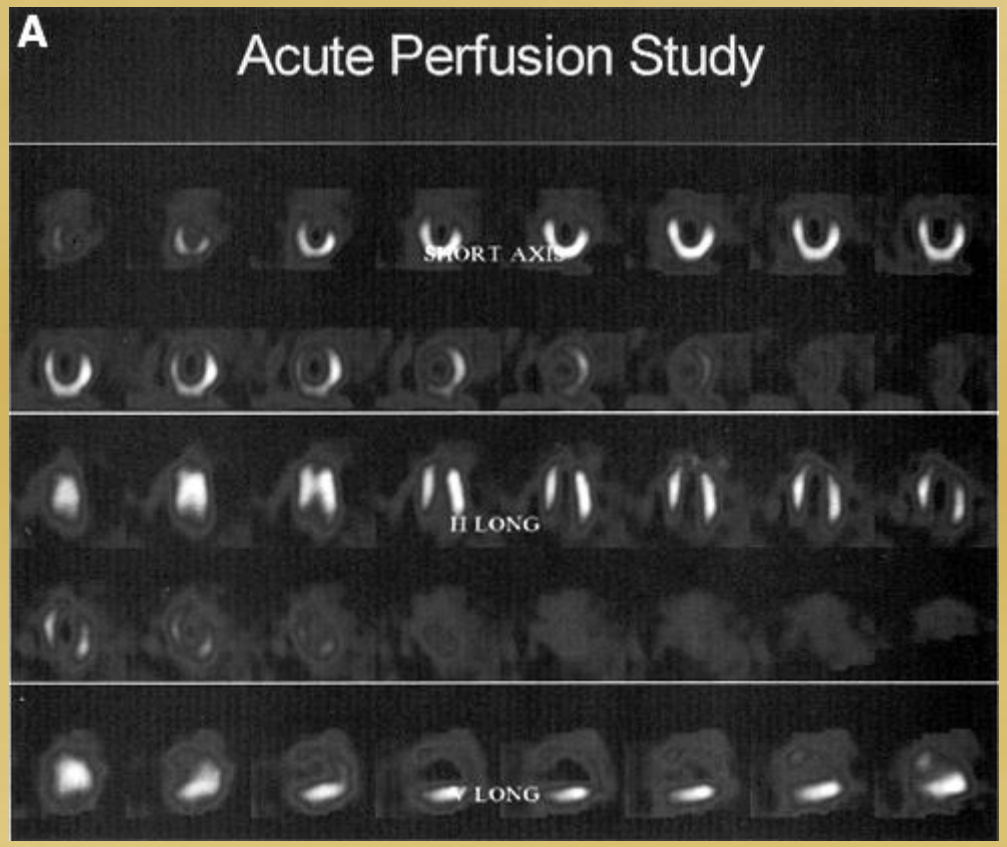
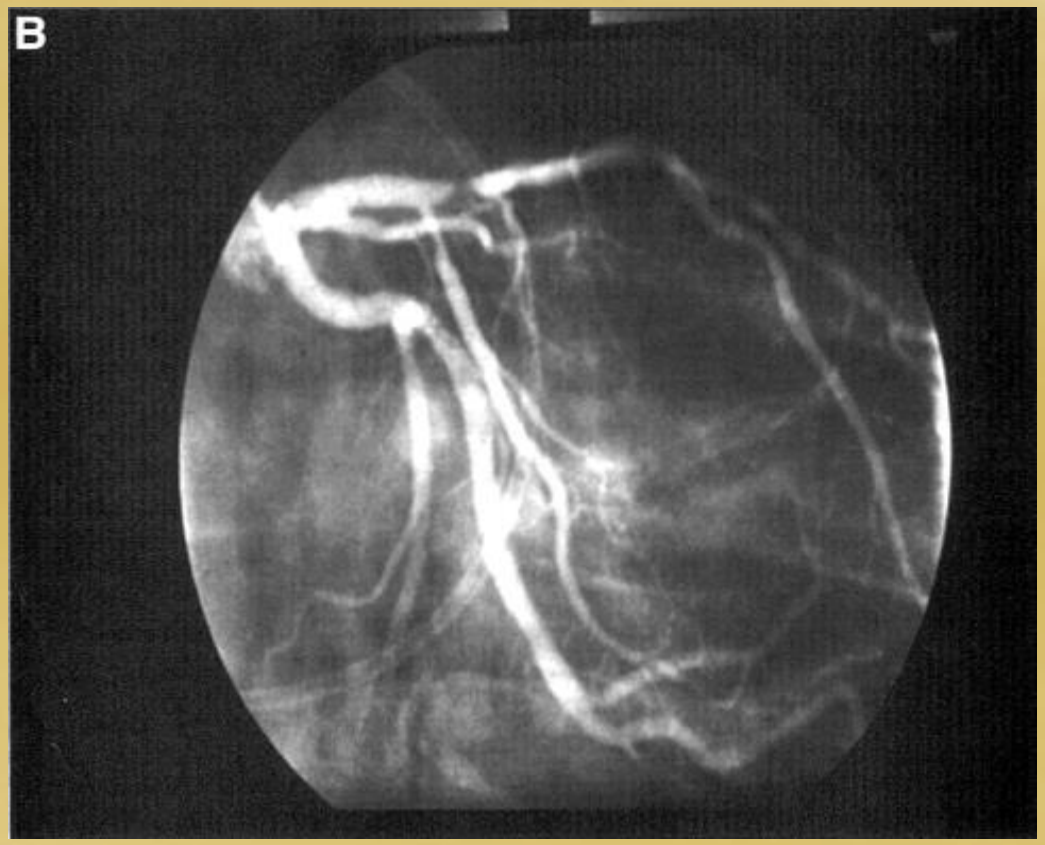


Figure 2. Conceptual model depicts role of diagnostic modalities throughout a wide spectrum of acute coronary syndromes. Spectrum varies from those patients with atypical symptoms and no ECG changes to patients with typical symptoms, ECG changes, and higher likelihood of acute MI (biochemical markers, serum enzymes, and acute rest MPI)

Duca, et al, Comparison of acute rest myocardial perfusion imaging and serum markers of myocardial injury in patients with chest pain syndromes. J. Nucl. Cardiol. 6:570-576, 1999


A
Acute Perfusion Study
SHORT AXIS
H LONG
V LONG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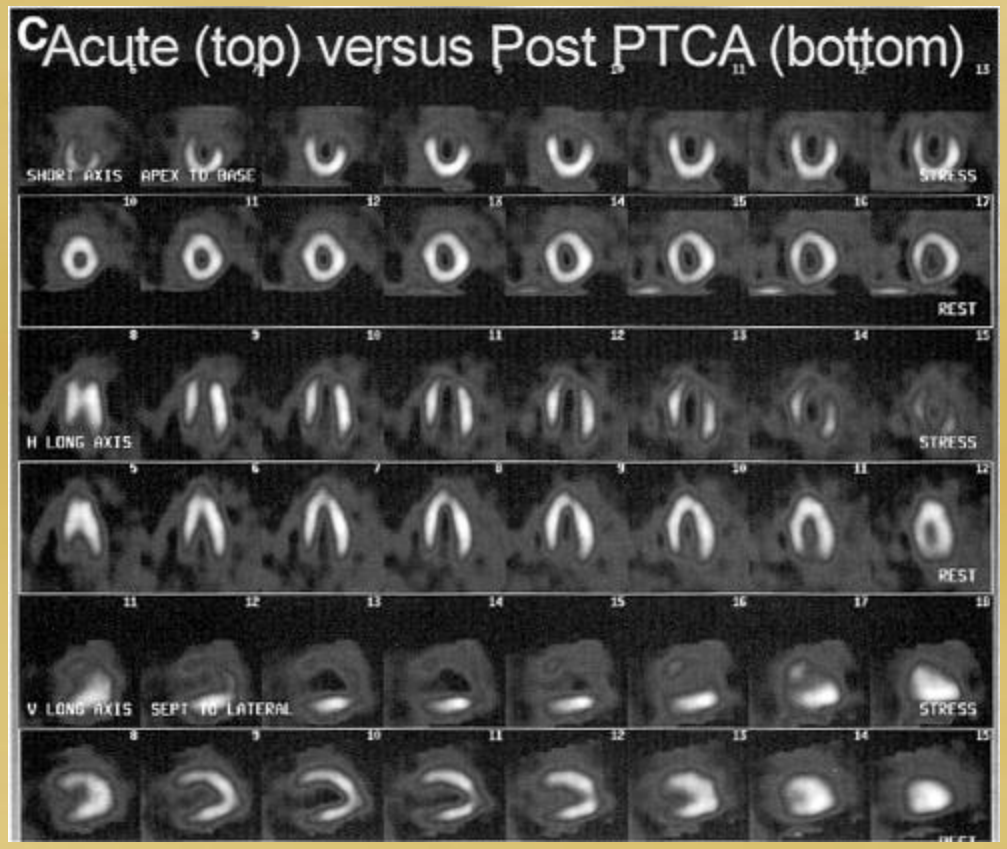
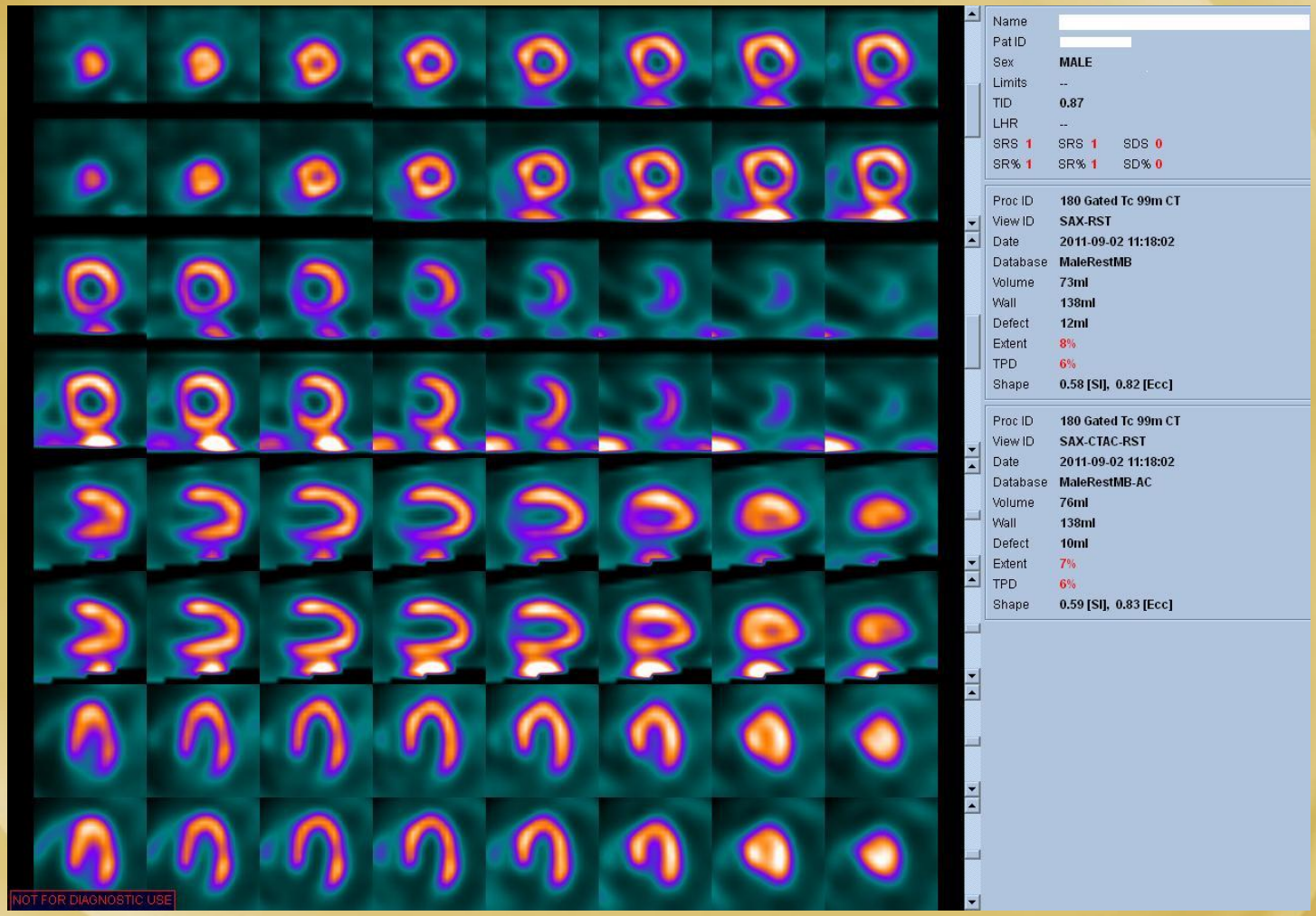

Acute (top) versus Post PTCA (bottom)
SHORT AXIS APEX TO BASE
STRESS
REST
H LONG AXIS
STRESS
REST
V LONG AXIS SEPT TO LATERAL
STRESS

ATTENUATION CORRECTION



Τυπικές Τιμές Ενεργού Δόσης

Εξετάσεις καρδιάς

Εξέταση	Ενεργή δόση (mSv)
Επεμβατική Στεφανιογραφία με αγγειογράφο	4.6 – 15.8 mSv[2]
Αγγειοπλαστική	7.5 – 57 mSv[2]
CT στεφανιογραφία	6.4 mSv (16-slice)[3] 11 mSv (64 slice)[3] 1035 ασθενείς

Σπινθηρογράφημα	Ενεργή δόση (mSv)
Tl-201	17+ mSv[6]
Tc-99m-tetrofosmin	8.5+ mSv[6]
Tc-99m-sestamibi	8.9+ mSv[5]

Εξέταση	Ενεργή δόση (mSv)
RF-ablation	15.2 (2.1-59.6) mSv[4]
Η/Φ μελέτη	3.2 (1.3-23.9) mSv[4]

2. UNSCEAR Vol 1: 2000
3. Circulation 2006;113:1305-10

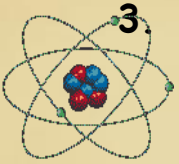


Table 3. Strategies for reducing radiation exposure in women undergoing radionuclide myocardial perfusion imaging

1. Use AUC to guide patient selection for nuclear cardiology procedures.
2. Use technetium-based tracers for SPECT MPI studies. Avoid use of thallium-based and dual-isotope SPECT protocols.
3. Consider stress-first MPI (especially with attenuation correction techniques) for select patients without evidence of prior MI or cardiomyopathy.
4. Implement iterative reconstruction algorithms for use with existing SPECT technology.
5. Use high-sensitivity solid-state CZT SPECT cameras and/or PET MPI where available.
6. Continually review nuclear laboratory practices to implement dose-reduction strategies to decrease patient radiation doses to levels that are as low as reasonably achievable (ALARA) and approaching levels of natural background radiation (3 mSV/year) whenever possible.

AUC, appropriate use criteria; *SPECT*, single-photon emission computed tomography; *MPI*, myocardial perfusion imaging; *MI*, myocardial infarction; *CZT*, cadmium zinc telluride; *PET*, positron emission tomography; *ALARA*, as low as reasonably achievable

Myocardial perfusion imaging in women for the evaluation of stable ischemic heart disease— state-of-the-evidence and clinical recommendations. Taqueti et al. Journal of Nuclear Cardiology May 15, 2017

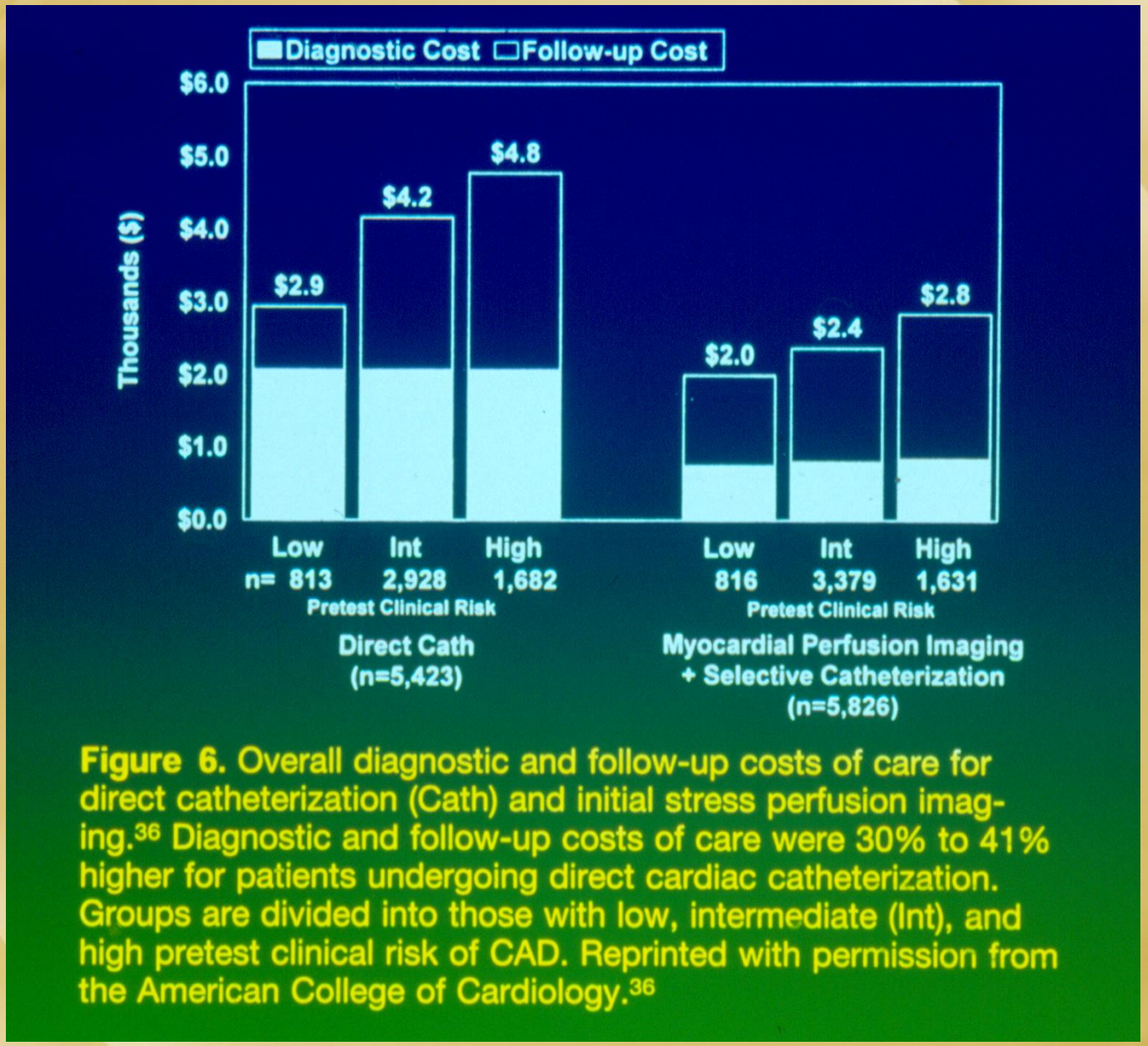


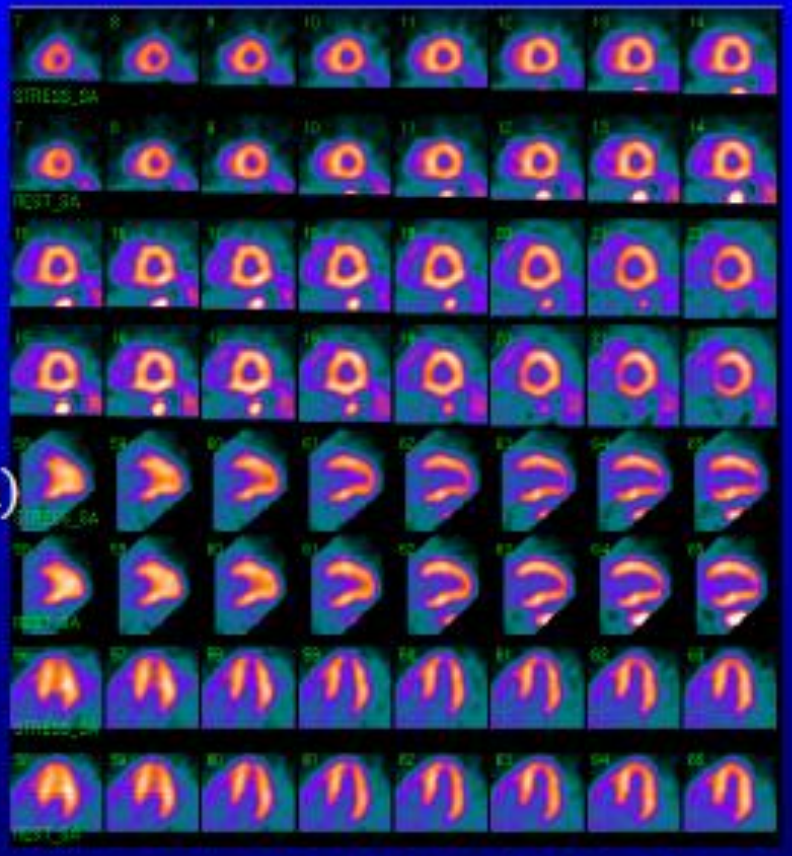
Figure 6. Overall diagnostic and follow-up costs of care for direct catheterization (Cath) and initial stress perfusion imaging.[36] Diagnostic and follow-up costs of care were 30% to 41% higher for patients undergoing direct cardiac catheterization. Groups are divided into those with low, intermediate (Int), and high pretest clinical risk of CAD. Reprinted with permission from the American College of Cardiology.[36]

ΜΕΛΕΤΕΣ ΑΙΜΑΤΩΣΗΣ ΜΥΟΚΑΡΔΙΟΥ ΜΕ PET

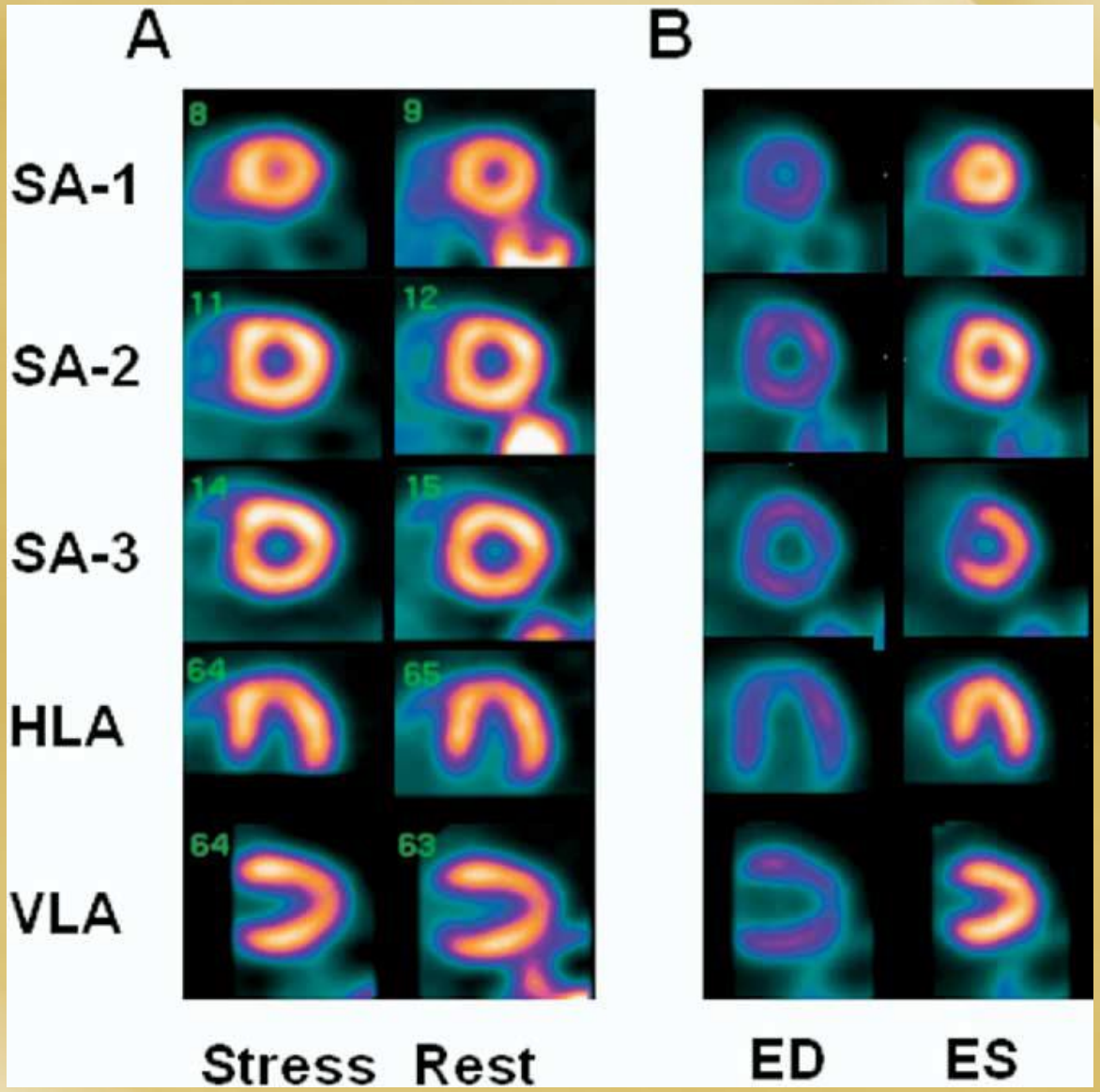
PET Perfusion for Cardiac Imaging

- Cardiac PET allows evaluation:
  - **Myocardial viability**
    - FDG (T1/2 110 min)
    - Others less available
  - **Myocardial perfusion**
    - ^{82}Rb (T1/2 90 sec)
      - ^{82}Rb-Generator
    - ^{13}N-ammonia (T1/2 10 min)
      - Cyclotron
    - Advantage:
      - Better resolution
      - Lower radiation dose
      - Attenuation correction
        - Short with CT

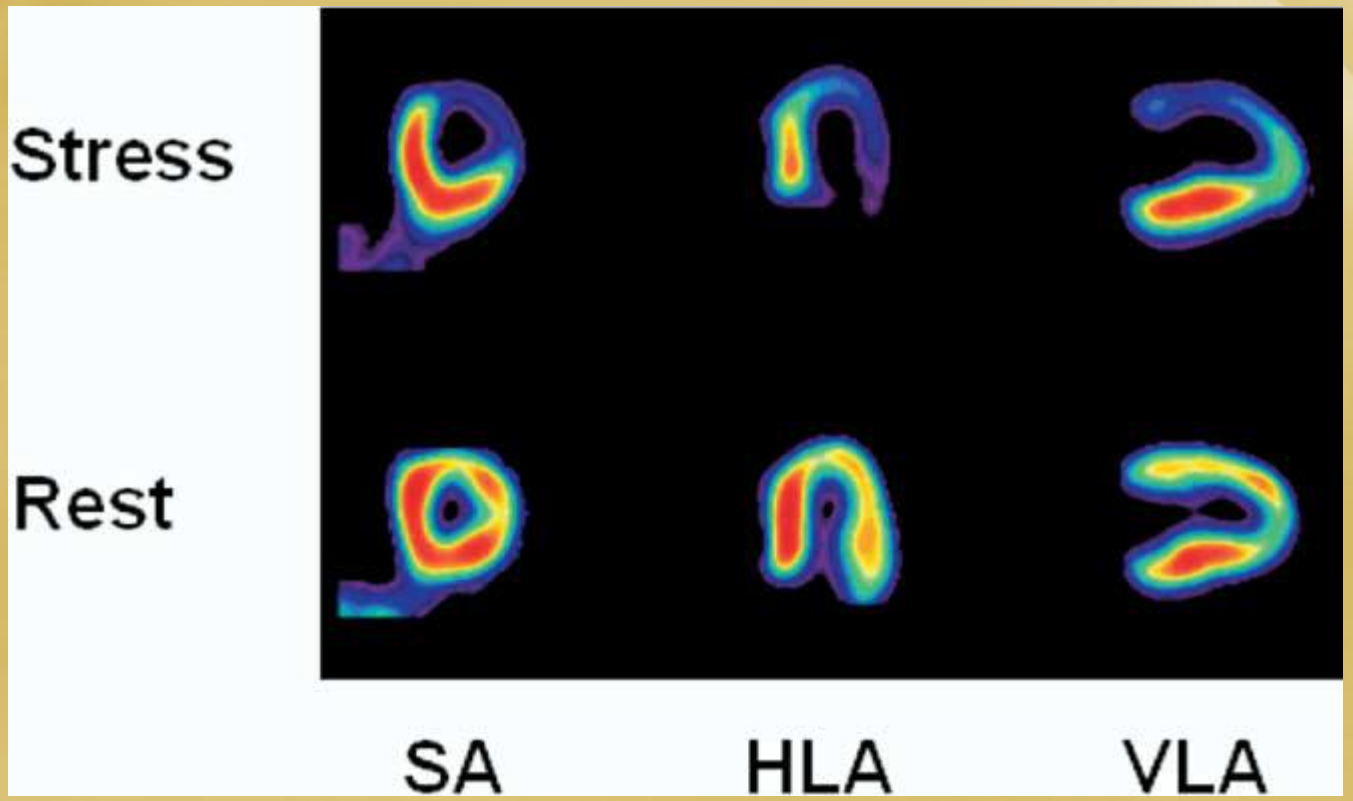
PET ^{82}Rb Stress-rest



Courtesy of J. Machac-Mt Sinai, NY



A, Normal stress and rest 82Rb PET images. B, Resting end-diastolic (ED) and end-systolic (ES) gated images, showing uniformly good contractility.



13N Ammonia PET images demonstrating anterior and lateral defects during pharmacological stress and significant improvement at rest, consistent with ischemia. SA, short axis; HLA, horizontal long axis; VLA, vertical long axis (courtesy of Dr. H Schelbert, UCLA School of Medicine, CA).

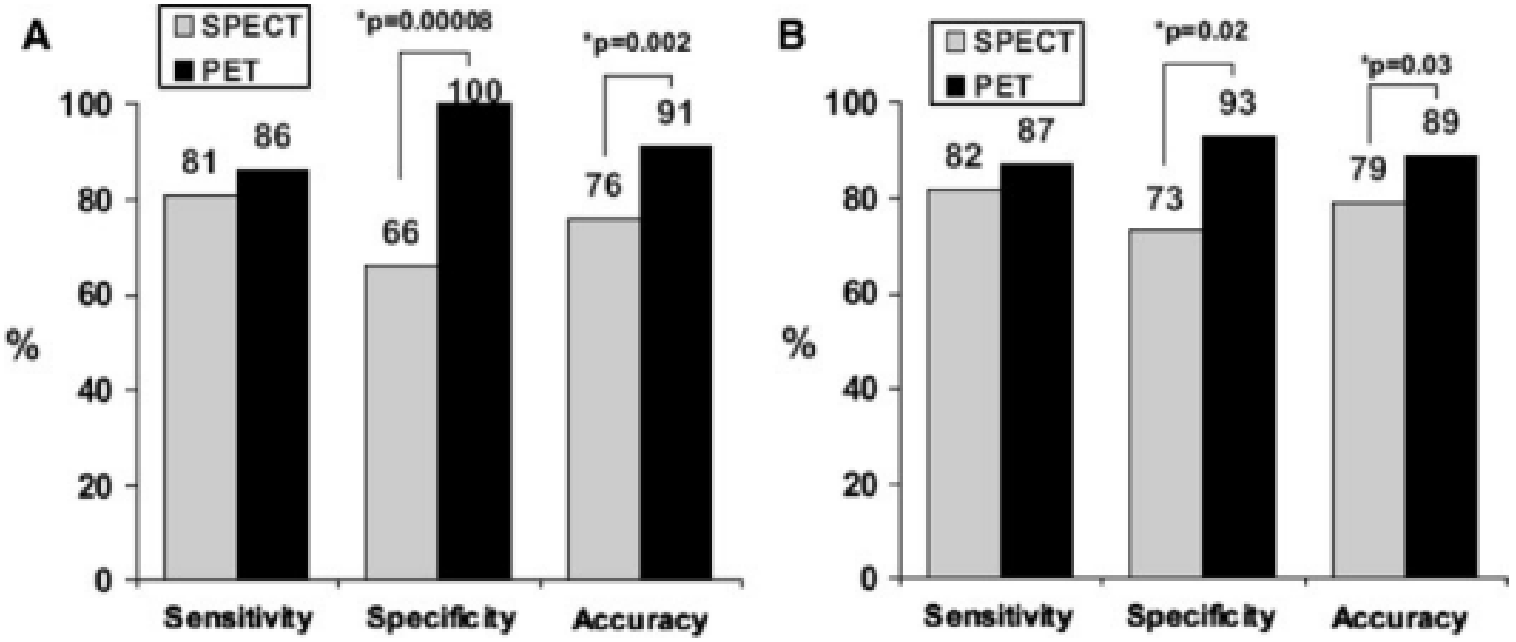


Figure 3. Overall diagnostic accuracy for PET and SPECT: 50% coronary stenosis threshold (**A**) and 70% stenosis threshold (**B**). Adapted from Bateman et al[19] (with permission).

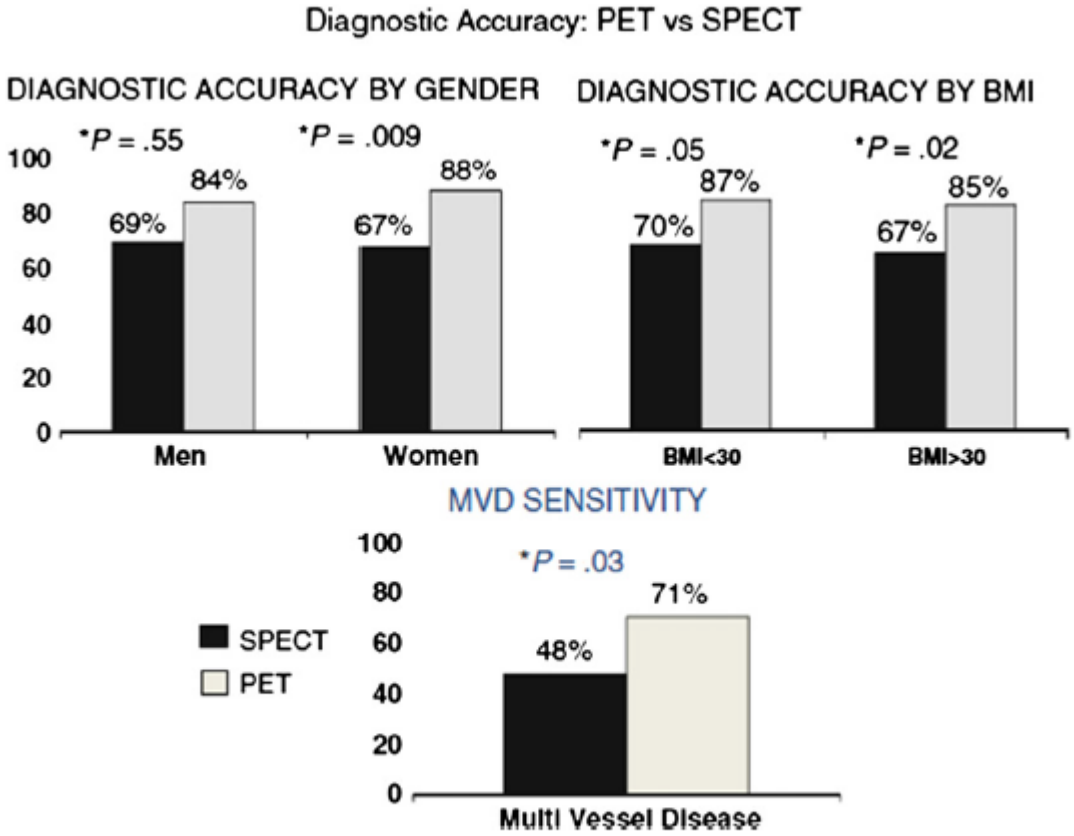
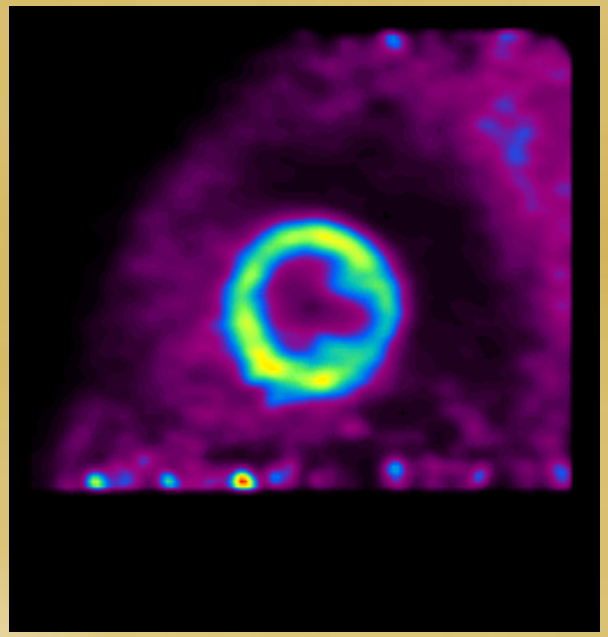
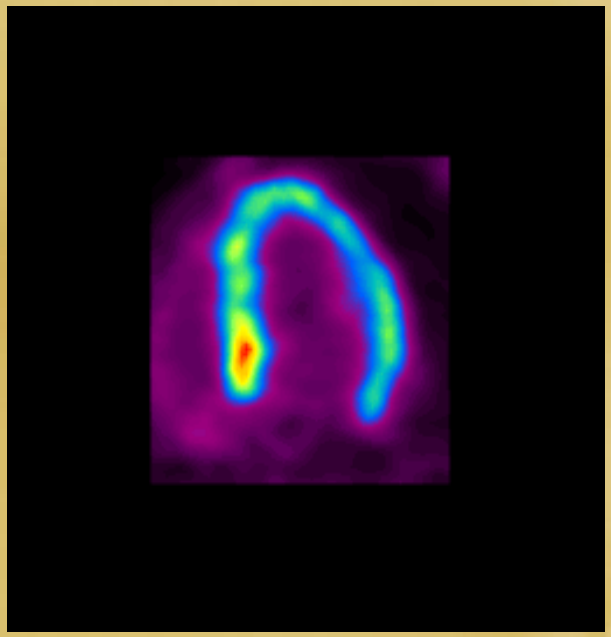


Fig. 2. Diagnostic accuracy: body mass index (BMI), gender influence, comparison of SPECT/PET disease severity. (*Data from* Bateman TM, Heller GV, McGhie AI, et al. Diagnostic accuracy of rest/stress ECG-gated Rb-82 myocardial perfusion PET: comparison with ECG-gated Tc-99m sestamibi SPECT. J Nucl Cardiol 2006;13:24–33.)

FDG





^{18}F-fluoride positron emission tomography for identification of ruptured and high-risk coronary atherosclerotic plaques: a prospective clinical trial

Nikhil V Joshi, Alex T Vesey, Michelle C Williams, Anoop S V Shah, Patrick A Calvert, Felicity H M Craighead, Su Ern Yeoh, William Wallace, Donald Salter, Alison M Fletcher, Edwin J R van Beek, Andrew D Flapan, Neal G Uren, Miles W H Behan, Nicholas L M Cruden, Nicholas L Mills, Keith A A Fox, James H F Rudd, Marc R Dweck, David E Newby**

www.thelancet.com **Published online November 11, 2013 http://dx.doi.org/10.1016/S0140-6736(13)61754-7**

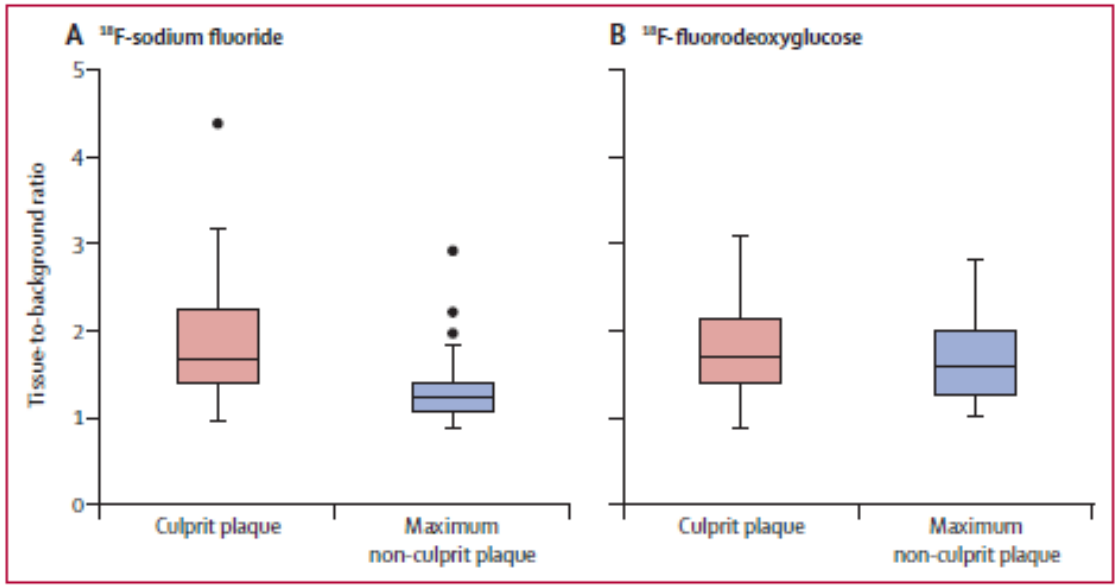


***Figure 2:* ^{18}F-fluoride and ^{18}F-fluorodeoxyglucose uptake in patients with myocardial infarction**
^{18}F-fluoride activity (maximum tissue-to-background ratio) was increased in the culprit plaque (red) compared with the maximum uptake in any of the non-culprit plaques (blue). By contrast, there was no difference in the activity of ^{18}F-fluorodeoxyglucose between these regions.

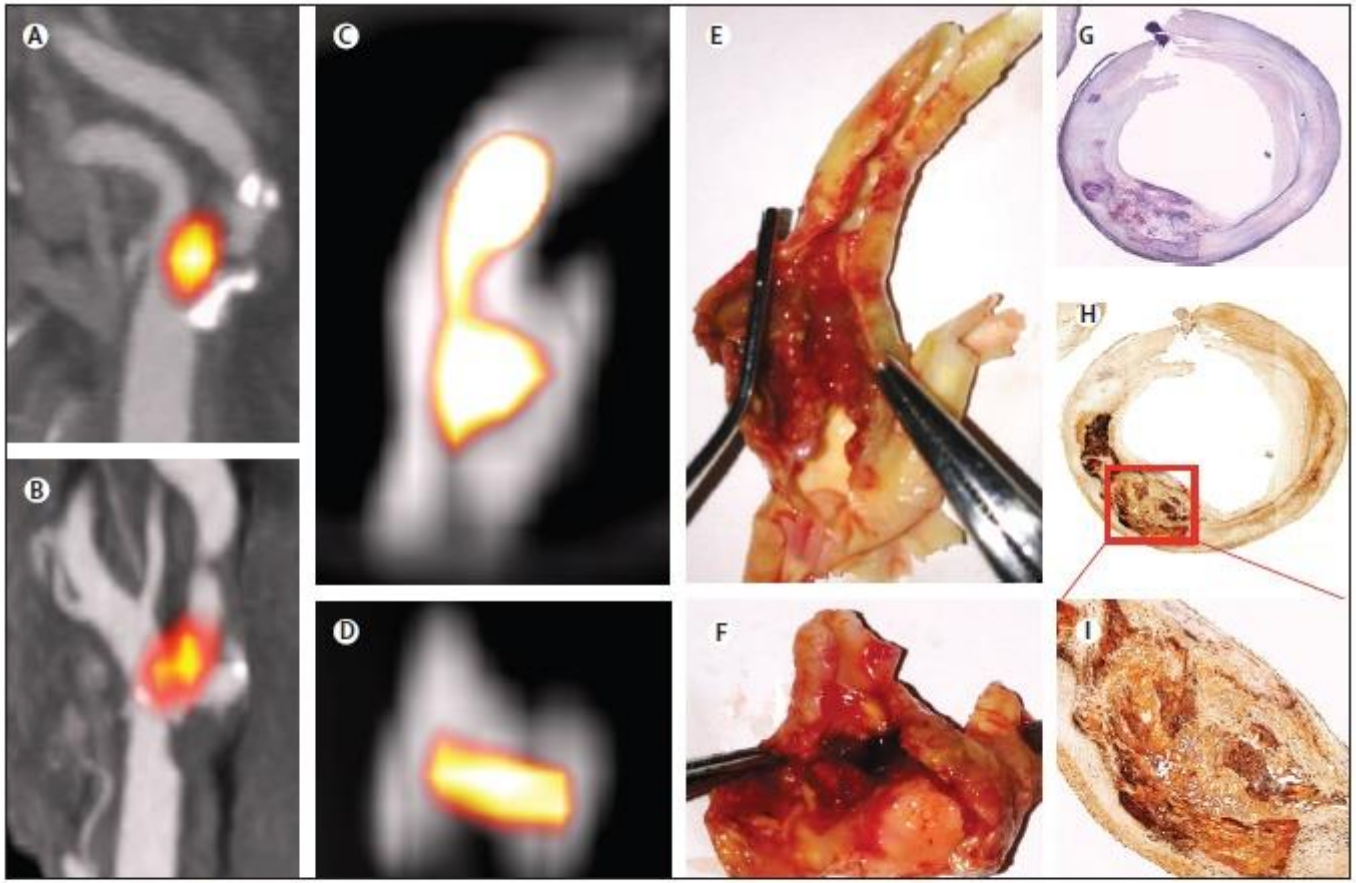
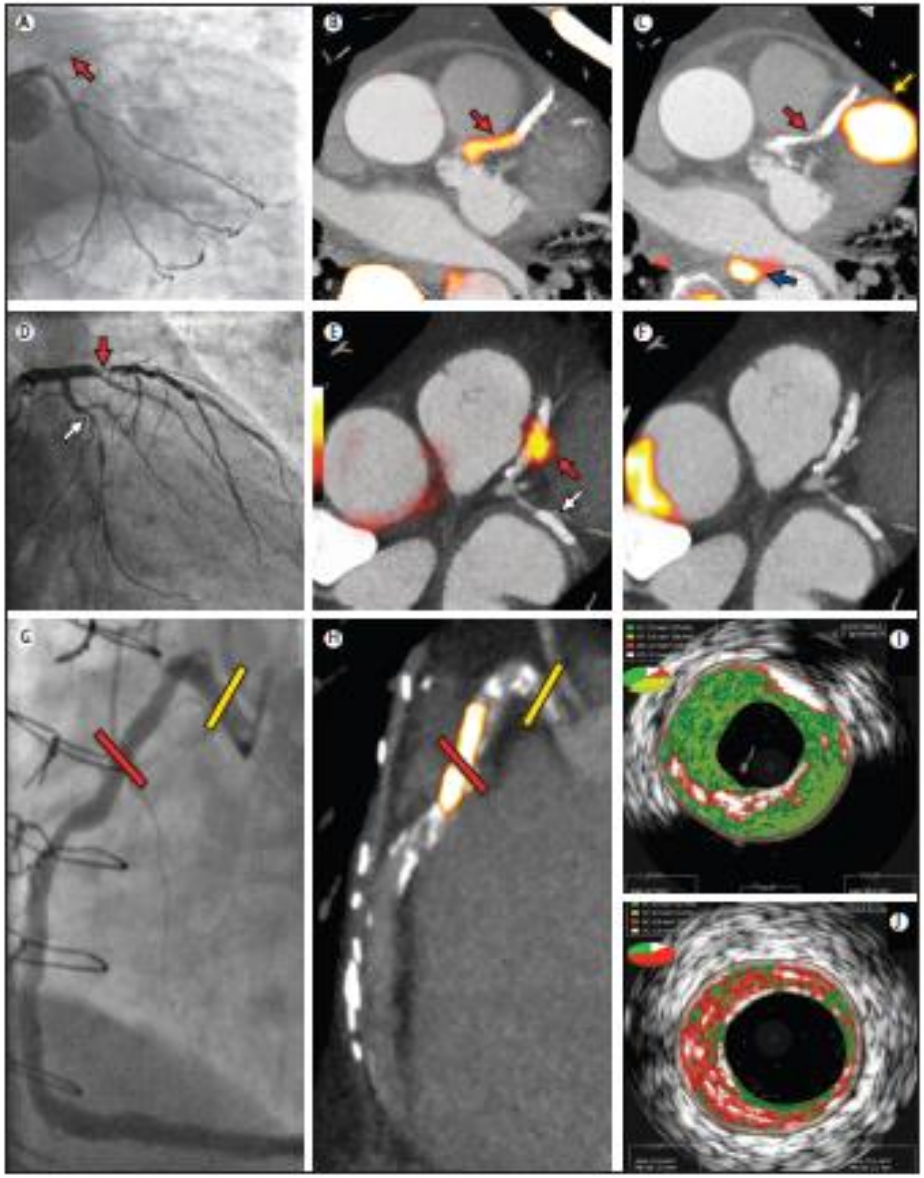


Figure 3: **Carotid ^{18}F-fluoride uptake and carotid plaque rupture**
In-vivo (A and B) and ex-vivo (C and D) positron emission and computed tomograms showing colocalisation of ^{18}F-fluoride (^{18}F-NaF) uptake (yellow-orange) to the site of plaque rupture with adherent thrombus on excised carotid endarterectomy tissue (E and F). Histology of the ^{18}F-NaF-positive region shows a large necrotic core (Movat's pentachrome, magnification 4x, G), within which increased staining for tissue non-specific alkaline phosphatase can be seen as a marker of calcification activity on immunohistochemistry (magnification 4x, H; magnification 10x, I).

www.thelancet.com **Published online November 11, 2013 http://dx.doi.org/10.1016/S0140-6736(13)61754-7**



www.thelancet.com Published online November 11, 2013 http://dx.doi.org/10.1016/S0140-6736(13)61754-7

Figure 1: **Focal ^{18}F-fluoride and ^{18}F-fluorodeoxyglucose uptake in patients with myocardial infarction and stable angina**

Patient with acute ST-segment elevation myocardial infarction with (A) proximal occlusion (red arrow) of the left anterior descending artery on invasive coronary angiography and (B) intense focal ^{18}F-fluoride (^{18}F-NaF, tissue-to-background ratios, culprit 2·27 versus reference segment 1·09 [108% increase]) uptake (yellow-red) at the site of the culprit plaque (red arrow) on the combined positron emission and computed tomogram (PET-CT). Corresponding ^{18}F-fluorodeoxyglucose PET-CT image (C) showing no uptake at the site of the culprit plaque (^{18}F-FDG, tissue-to-background ratios, 1·63 versus reference segment 1·91 [15% decrease]). Note the significant myocardial uptake overlapping with the coronary artery (yellow arrow) and uptake within the oesophagus (blue arrow). Patient with anterior non-ST-segment elevation myocardial infarction with (D) culprit (red arrow; left anterior descending artery) and bystander non-culprit (white arrow; circumflex artery) lesions on invasive coronary angiography that were both stented during the index admission. Only the culprit lesion had increased ^{18}F-NaF uptake (^{18}F-NaF, tissue-to-background ratios, culprit 2·03 versus reference segment 1·08 [88% increase]) on PET-CT (E) after percutaneous coronary intervention. Corresponding ^{18}F-fluorodeoxyglucose PET-CT showing no uptake either at the culprit (^{18}F-FDG, tissue-to-background ratios, culprit 1·62 versus reference segment 1·49 [9% increase]) or the bystander stented lesion. Note intense uptake within the ascending aorta. In a patient with stable angina with previous coronary artery bypass grafting, invasive coronary angiography (G) showed non-obstructive disease in the right coronary artery. Corresponding PET-CT scan (H) showed a region of increased ^{18}F-NaF activity (positive lesion, red line) in the mid-right coronary artery (tissue-to-background ratio, 3·13) and a region without increased uptake in the proximal vessel (negative lesion, yellow line). Radiofrequency intravascular ultrasound shows that the ^{18}F-NaF negative plaque (I) is principally composed of fibrous and fibrofatty tissue (green) with confluent calcium (white with acoustic shadow) but little evidence of necrosis. On the contrary, the ^{18}F-NaF positive plaque (J) shows high-risk features such as a large necrotic core (red) and microcalcification (white).

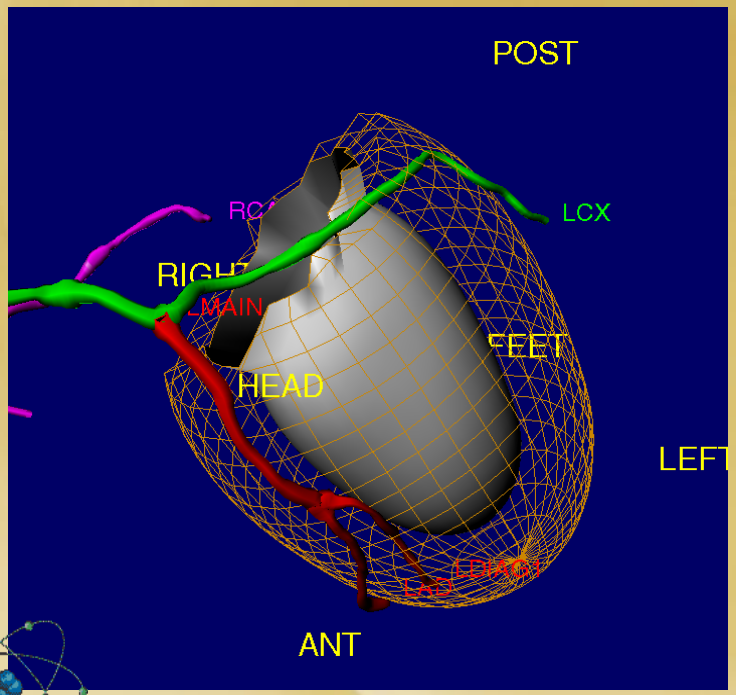
ΤΟ ΜΕΛΛΟΝ;

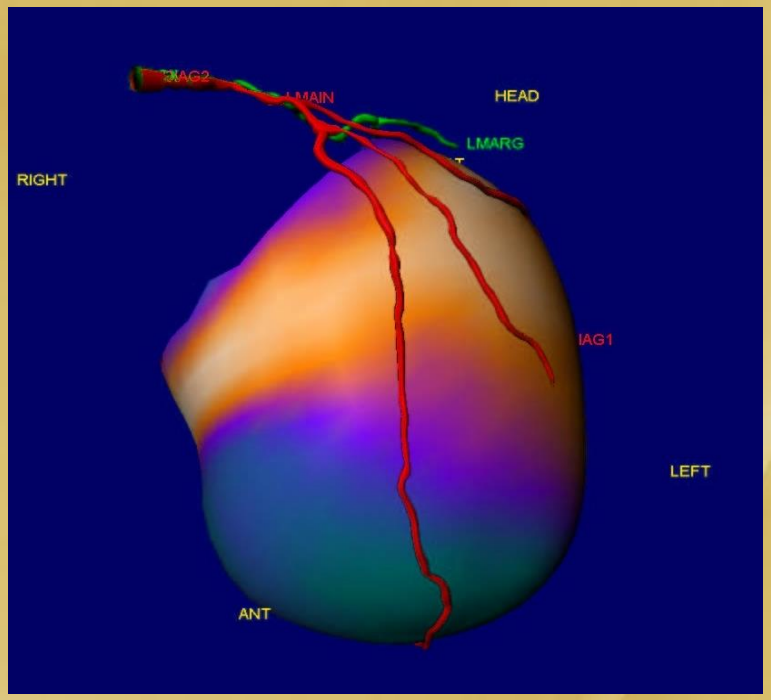
- Υβριδική απεικόνιση !!!

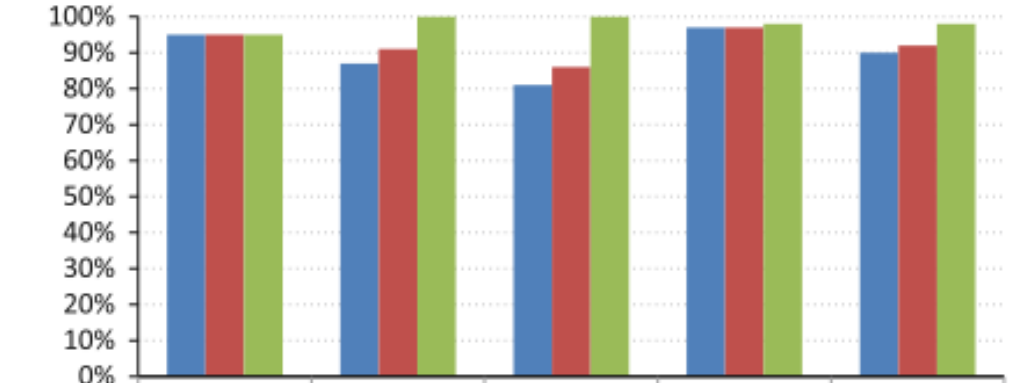
ΜΕΧΡΙ ΣΗΜΕΡΑ:

Εμπορικά διαθέσιμα σύστημα SPECT/CT προσφέρονται με επιλογή έως και 64 τομών ανά περιστροφή και κλινικές εφαρμογές οι οποίες ξεπερνάνε κατά πολύ την διόρθωση της απορρόφησης, και τον εντοπισμό της βλάβης. Χαρακτηριστικά αναφέρονται:

1. Calcium Scoring
2. Απεικόνιση των στεφανιαίων αγγείων
3. Αγγειογραφίες

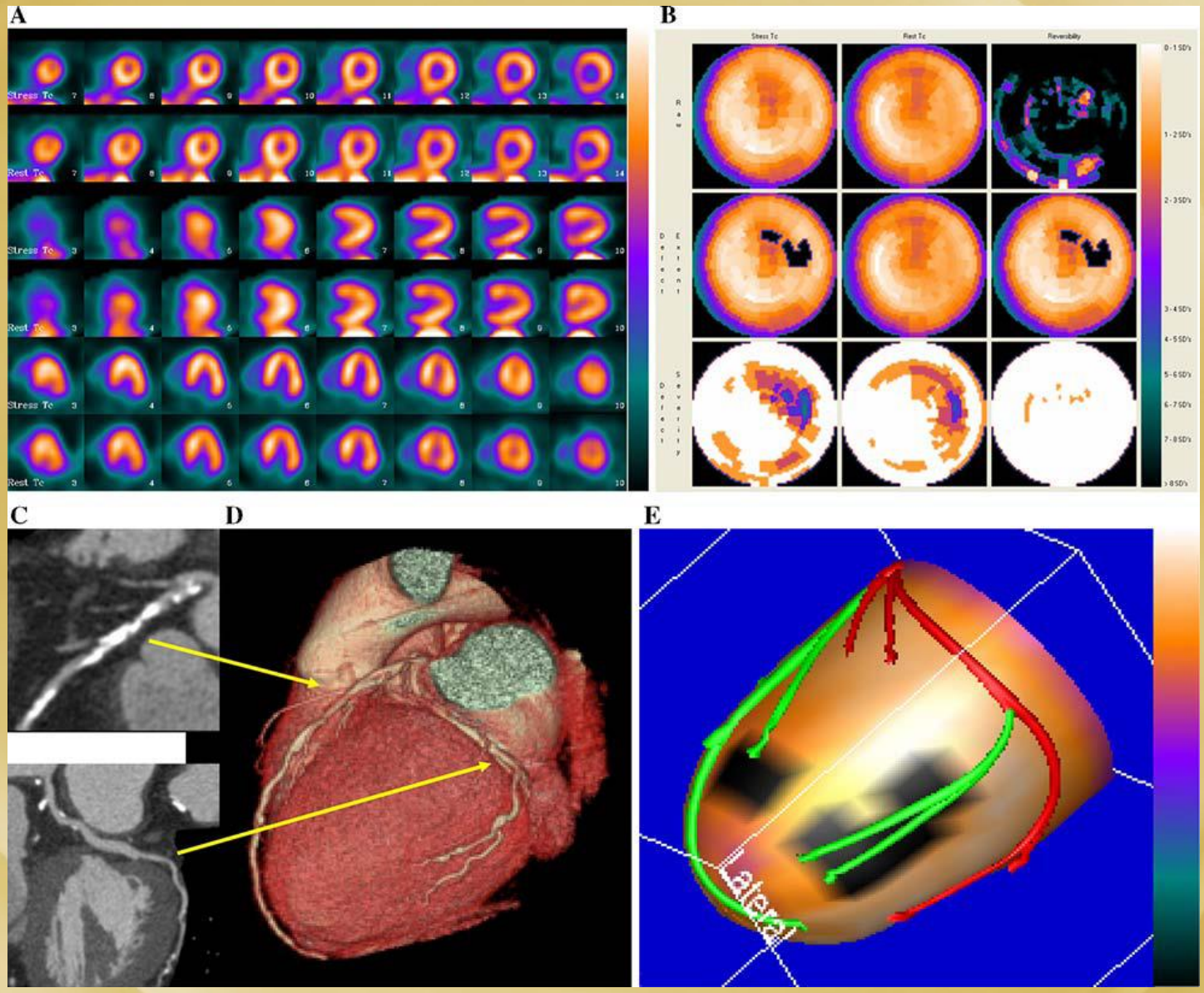






	Sensitivity	Specificity	PPV	NPV	Accuracy
CTA	95%	87%	81%	97%	90%
PET	95%	91%	86%	97%	92%
PET-CTA	95%	100%	100%	98%	98%

Figure 4. Addition of CTA to quantitative PET improves diagnostic accuracy sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and overall diagnostic accuracy for coronary CT angiography (CTA), quantitative ^{15}O water PET stress perfusion or both among 107 prospective patients compared to quantitative invasive coronary angiography and fractional flow reserve assessments. Addition of CTA to PET significantly improved overall diagnostic accuracy compared to CTA alone ($P = .004$) or PET alone ($P = .01$). Adapted with permission from Kajander et al[79].


A
B
C
D
E
Stress Tc
Rest Tc
Reversibility
Lateral

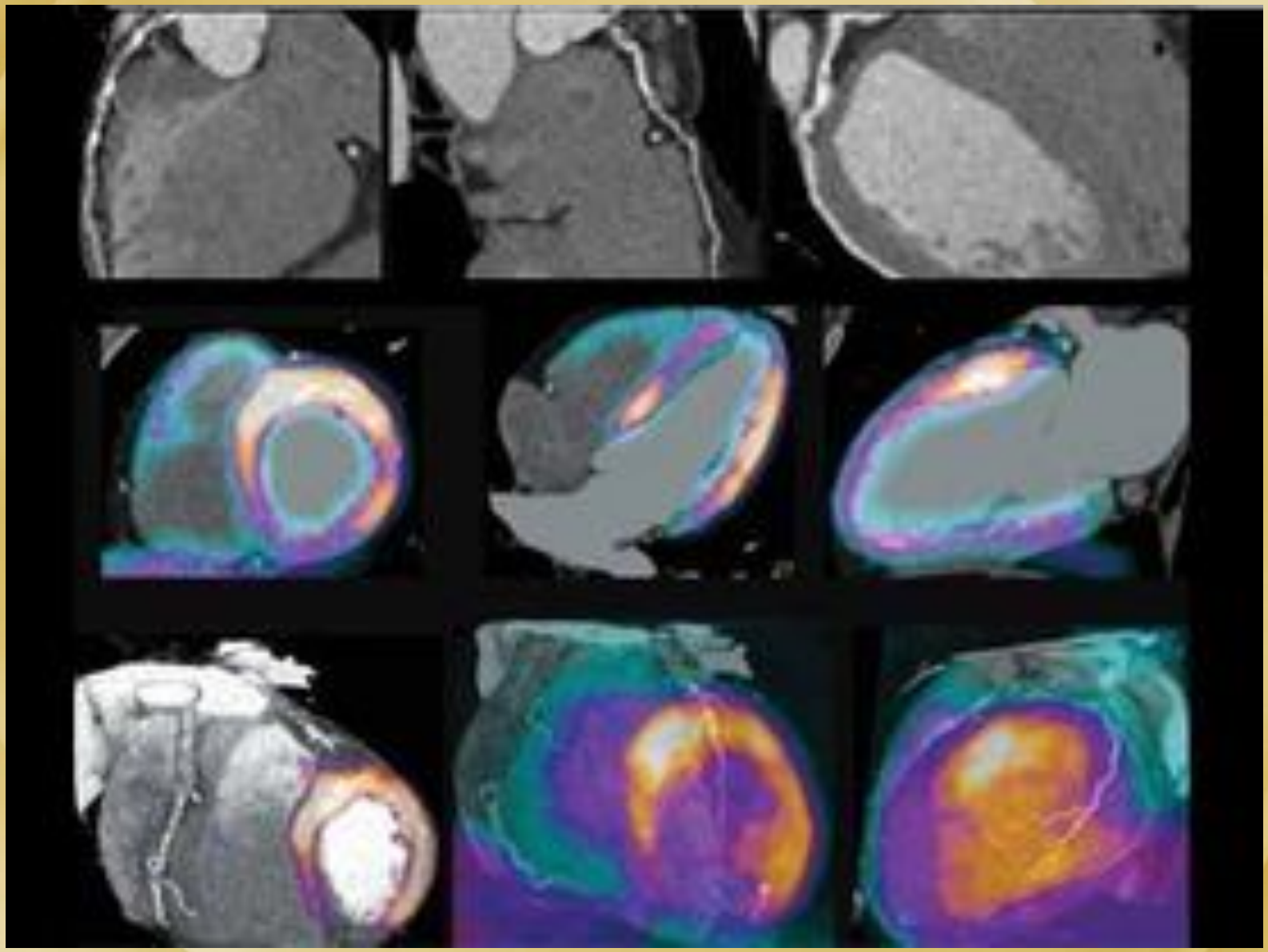
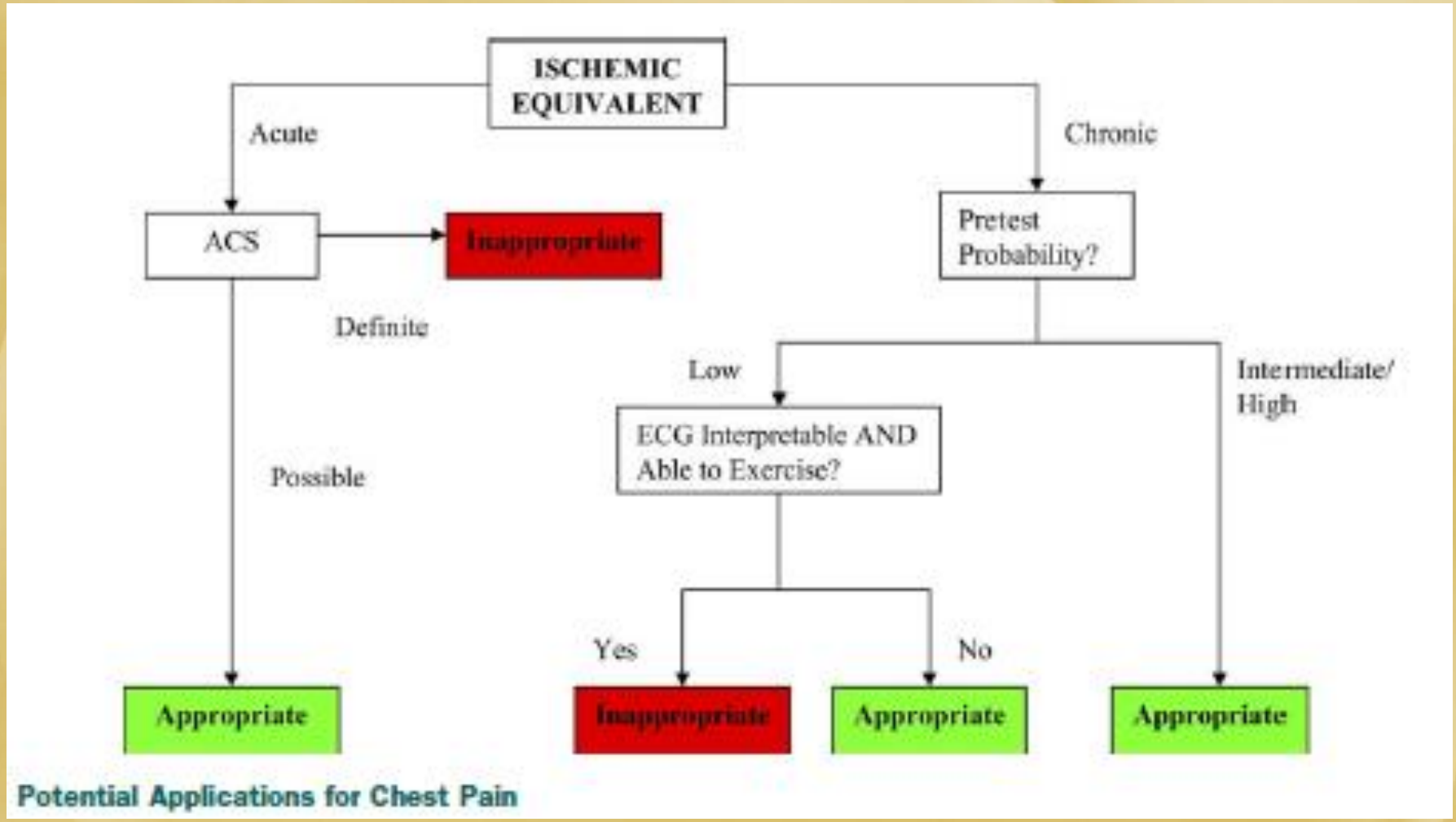


Table 1. Multimodality appropriate use criteria for the detection and risk assessment of ischemic heart disease in symptomatic women and men. Reproduced with permission[9]

	Indication Text	Exercise ECG	Stress RNI	Stress Echo	Stress CMR	Calcium Scoring	CCTA	Invasive Coronary Angiography
1.	• Low pre-test probability of CAD • ECG interpretable AND able to exercise	A	R	M	R	R	R	R
2.	• Low pre-test probability of CAD • ECG uninterpretable OR unable to exercise		A	A	M	R	M	R
3.	• Intermediate pre-test probability of CAD • ECG interpretable AND able to exercise	A	A	A	M	R	M	R
4.	• Intermediate pre-test probability of CAD • ECG uninterpretable OR unable to exercise		A	A	A	R	A	M
5.	• High pre-test probability of CAD ECG interpretable AND able to exercise	M	A	A	A	R	M	A
6.	• High pre-test probability of CAD • ECG uninterpretable OR unable to exercise		A	A	A	R	M	A

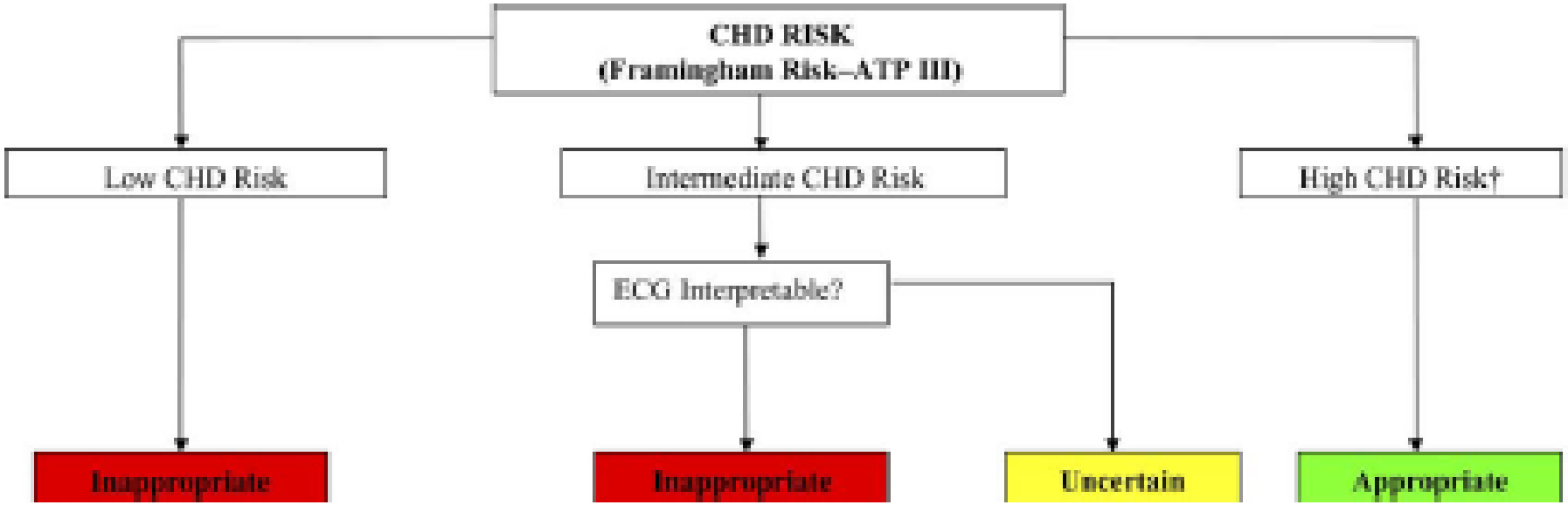
Appropriate use key: *A*, Appropriate; *M*, May be appropriate; *R*, Rarely appropriate; *CAD*, Coronary artery disease; *CCTA*, coronary computed tomography angiography; *CMR*, cardiac magnetic resonance; *ECG*, electrocardiography; *Echo*, echocardiography; *RNI*, radionuclide imaging

Myocardial perfusion imaging in women for the evaluation of stable ischemic heart disease— state-of-the-evidence and clinical recommendations. Taqueti et al. Journal of Nuclear Cardiology May 15, 2017



Patients with an ischemic equivalent, consisting of symptoms associated with CAD or ECG findings, were divided based on the likelihood of CAD. If patients had an intermediate or high likelihood for CAD, RNI was appropriate. RNI was also appropriate for patients at low likelihood if they were unable to exercise or had an uninterpretable ECG. For patients with a suspected ACS, RNI was appropriate irrespective of the TIMI score or whether or not their troponin levels were elevated.

ACCF/ASNC/ACR/AHA/ASE/SCCT/SCMR/SNM 2009
Appropriate Use Criteria for Cardiac Radionuclide Imag



Potential Applications for Asymptomatic* Patients

Only in high CHD risk patients was RNI felt to be appropriate, although those with intermediate CHD risk with an uninterpretable ECG were uncertain. The presence of syncope did not alter the appropriateness of patients separate from their CHD risk, with low-risk patients being inappropriate and high-risk patients being appropriate. *Asymptomatic patients exhibiting the following clinical indications are appropriate (or uncertain) for RNI and do not require risk assessment by either step: 1) new-onset or newly
diagnosed heart failure with LV systolic dysfunction without ischemic equivalent who have not had a prior CAD evaluation AND have no planned coronary angiography (Appropriate); 2) ventricular tachycardia (Appropriate); 3) elevated troponin without additional evidence of acute coronary syndrome (Appropriate); 4) new-onset atrial fibrillation (Uncertain). †Includes diabetes mellitus or the presence of other clinical atherosclerotic disease, including peripheral arterial disease, abdominal aortic aneurysm, carotid
artery disease, and other likely forms of clinical disease (e.g., renal artery disease).

ACCF/ASNC/ACR/AHA/ASE/SCCT/SCMR/SNM 2009
Appropriate Use Criteria for Cardiac Radionuclide Imaging

Table 2. Detection of CAD/Risk Assessment Without Ischemic Equivalent

Indication		Appropriate Use Score (1–9)
Asymptomatic		
12.	• Low CHD risk (ATP III risk criteria)	I (1)
13.	• Intermediate CHD risk (ATP III risk criteria) • ECG interpretable	I (3)
14.	• Intermediate CHD risk (ATP III risk criteria) • ECG uninterpretable	U (5)
15.	• High CHD risk (ATP III risk criteria)	A (7)
New-Onset or Newly Diagnosed Heart Failure With LV Systolic Dysfunction Without Ischemic Equivalent		
16.	• No prior CAD evaluation AND no planned coronary angiography	A (8)
New-Onset Atrial Fibrillation		
17.	• Part of evaluation when etiology unclear	U (6)
Ventricular Tachycardia		
18.	• Low CHD risk (ATP III risk criteria)	A (7)
19.	• Intermediate or high CHD risk (ATP III risk criteria)	A (8)
Syncope		
20.	• Low CHD risk (ATP III risk criteria)	I (3)
21.	• Intermediate or high CHD risk (ATP III risk criteria)	A (7)
Elevated Troponin		
22.	• Troponin elevation without additional evidence of acute coronary syndrome	A (7)

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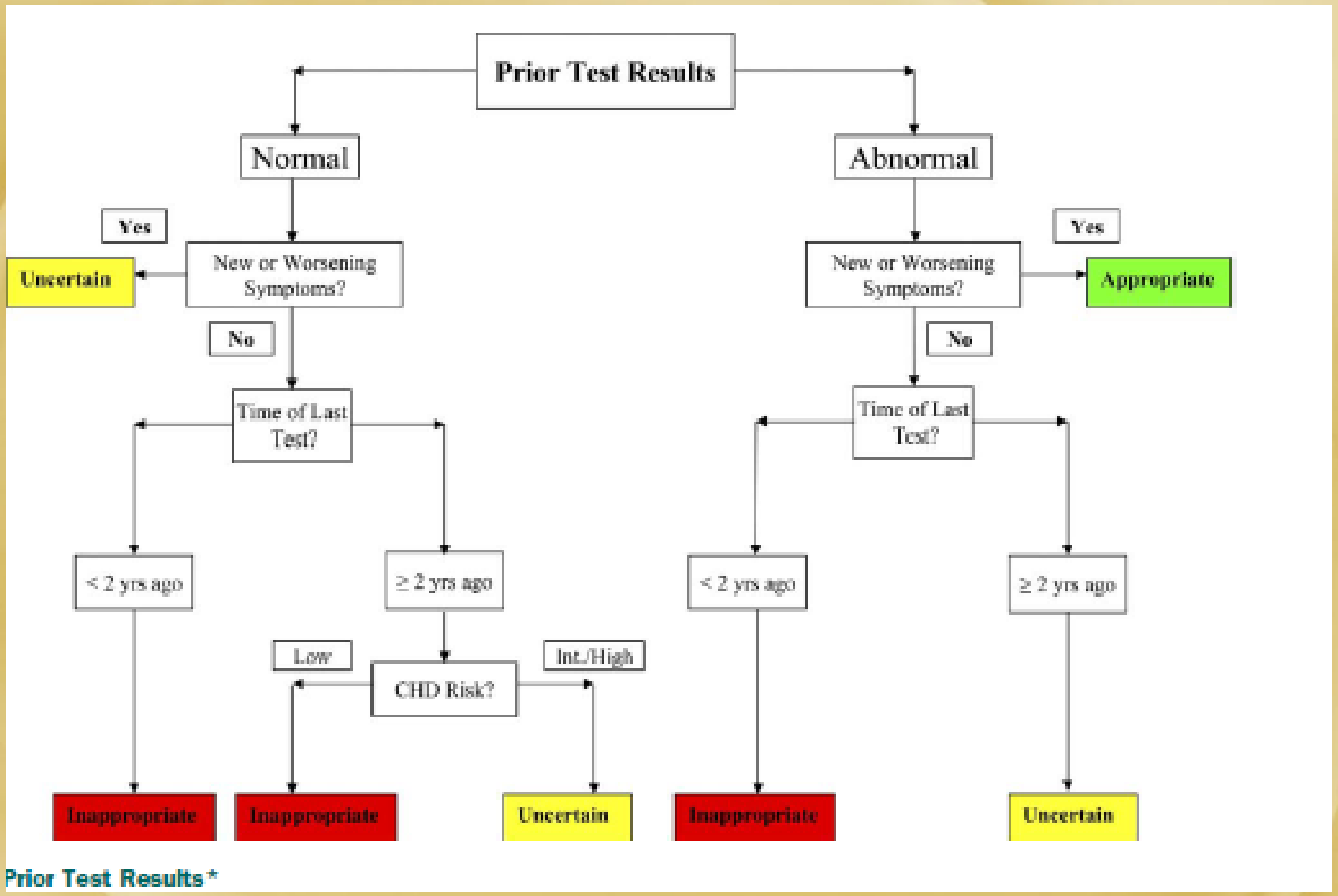
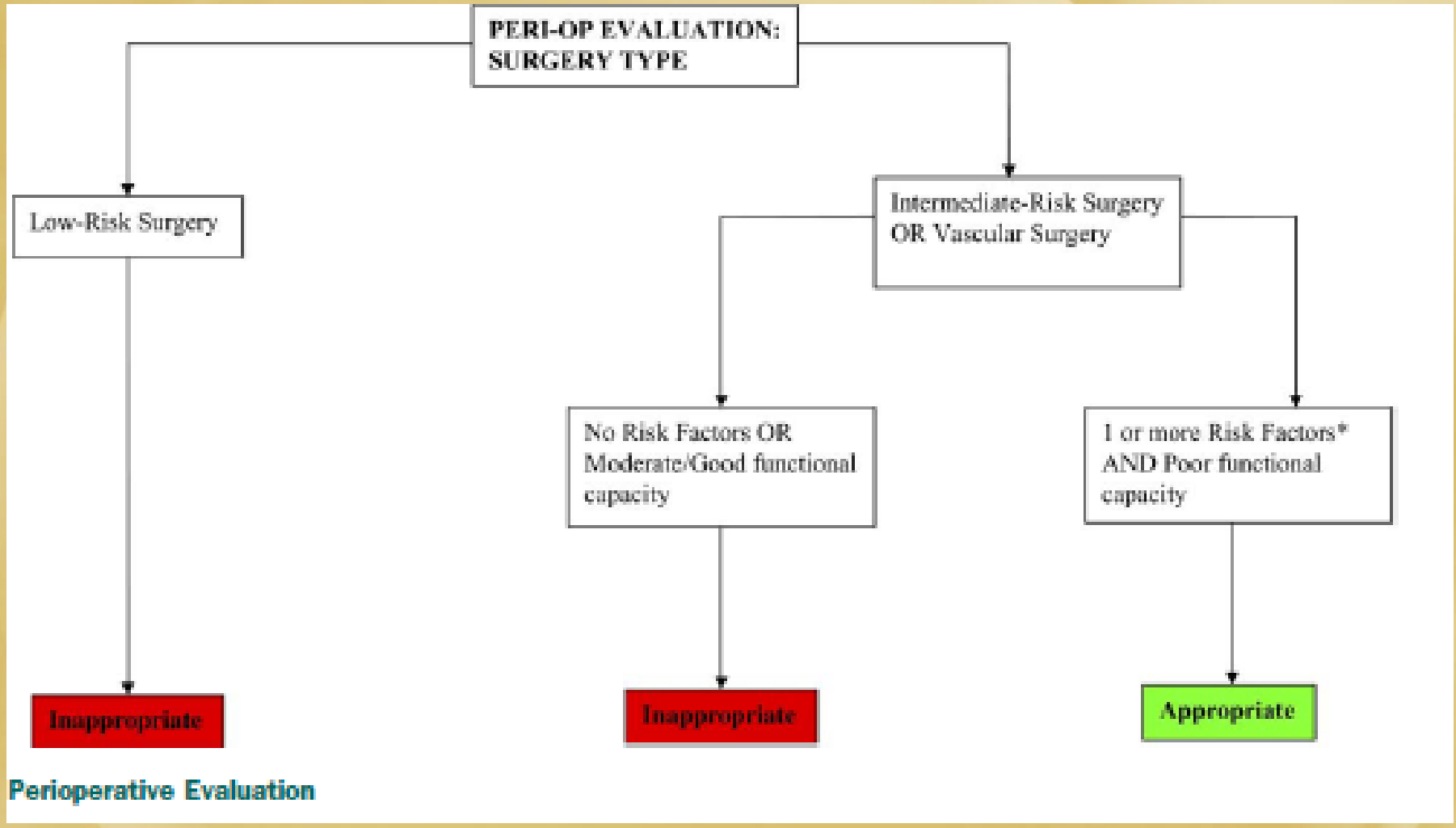
Appropriate Use Criteria for Cardiac Radionuclide Imaging



Prior Test Results*

When new or worsening symptoms were present, RNI was appropriate if prior abnormal results were present, but was uncertain if the prior study was normal. RNI was inappropriate when no or stable symptoms were present if prior test results were known, except when performed more than 2 years later, and only if an abnormal study was previously present or if the patient was at intermediate or greater CHD risk. In those circumstances, RNI use was “uncertain.” *RNI is appropriate if prior test results were uncertain in the following 2 scenarios: 1) Coronary Angiography: coronary stenosis or anatomic abnormality of uncertain significance; OR 2) Prior Noninvasive Evaluation: equivocal, borderline, or discordant stress testing where obstructive CAD remains a concern.



Perioperative Evaluation

RNI was felt to be inappropriate for preoperative risk assessment except in the setting of intermediate risk or vascular surgery when at least 1 risk factor is present and the patient has poor or unknown functional capacity. Additionally, patients who are asymptomatic up to 1 year postnormal catheterization, noninvasive test, or previous revascularization ın the setting of intermediate risk or vascular surgery were also rated as inappropriate for RNI. *History of ischemic heart disease, compensated or prior heart failure, cerebrovascular disease, diabetes mellitus (requiring insulin), or renal insufficiency (creatinine 2.0).

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Appropriate Use Criteria for Cardiac Radionuclide Imaging

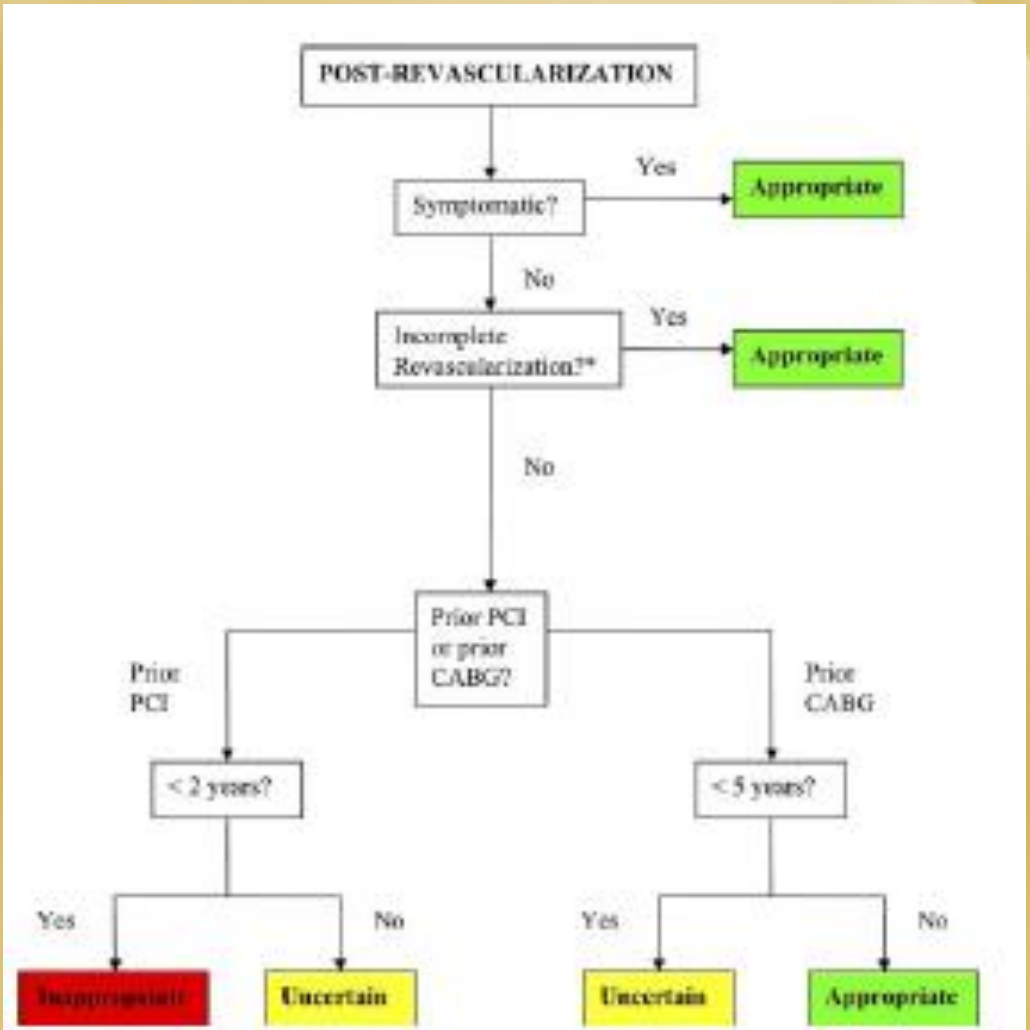

Figure 6. Postrevascularization

Following revascularization with PCI or CABG in a more chronic (3 months) setting, recurrence of symptoms or the presence of suspected incomplete revascularization were felt to be appropriate indications for RNI. For asymptomatic patients less than 2 years after a PCI, RNI was rated inappropriate. For asymptomatic patients at less than 5 years after CABG or those at greater than or equal to 2 years after PCI, RNI was rated uncertain. If CABG was performed more than 5 years ago, RNI is appropriate. *Assumes that additional revascularization is feasible.

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Appropriate Use Criteria for Cardiac Radionuclide Imagin


Ευχαριστώ πολύ, καλό καλοκαίρι