



**Η αξονική στεφανιογραφία στο  
τμήμα επειγόντων  
περιστατικών σε ασθενείς με  
οξύ προκάρδιο αλγος**

Πάνος Κορκονικήτας  
Καρδιολόγος  
Κωσταντοπούλειο Γ.Ν.Αθηνών

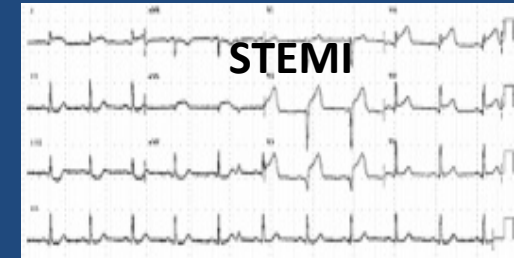
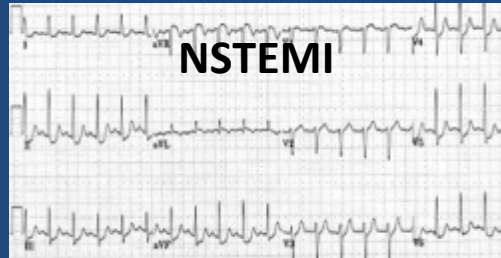


**> 6 εκ ασθενείς επισκέπτονται τα ΤΕΠ στις ΗΠΑ για ΘΠ  
~ 5% του συνόλου των περιστατικών στα ΤΕΠ**

# Δυνητικά απειλητικές για τη ζωή καρδιαγγειακές αιτίες ΘΠ

## ✓ Οξεία στεφανιαία σύνδρομα (ΟΣΣ)

Ασταθής στηθάγχη

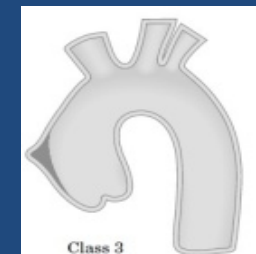
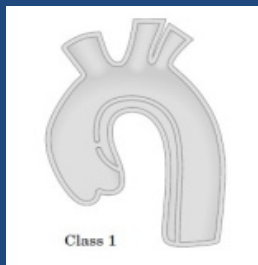


## ✓ Οξεία σύνδρομα από την αορτή (ΟΣΑ)

Οξύς διαχωρισμός

Ενδοτοιχωματικό αιμάτωμα

Τοιχωματικό έλκος



## ✓ Πνευμονική εμβολή



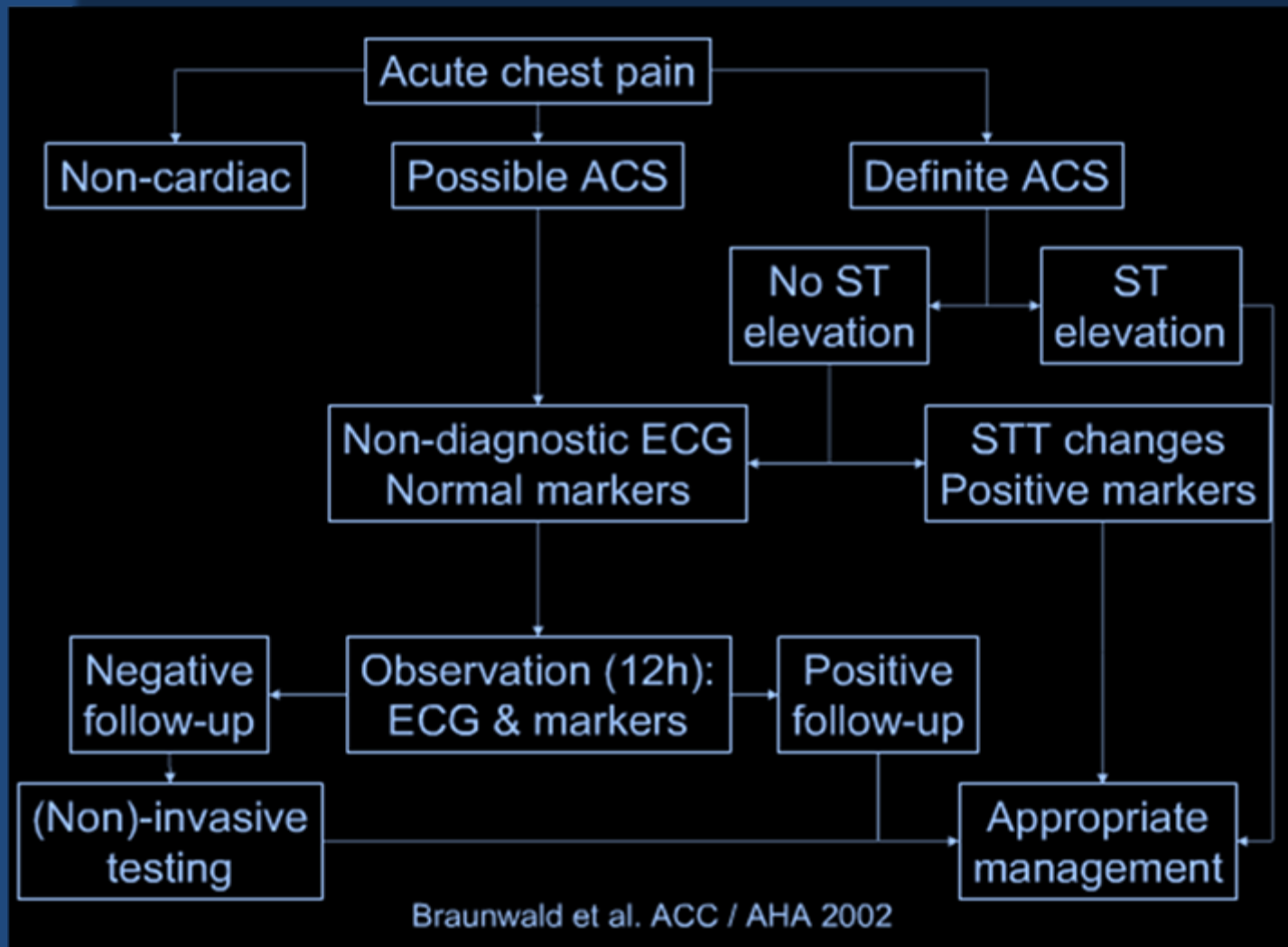
- Άλλες καρδιαγγειακές αιτίες ΘΠ

- ✓ Μυοκαρδίτις
- ✓ Περικαρδίτις
- ✓ Στένωση αορτής

- Μη καρδιαγγειακές αιτίες ΘΠ

- ✓ Πνευμονία
- ✓ Υπεζωκοτική συλλογή
- ✓ Νοσήματα του γαστρεντερικού συστήματος
- ✓ Ψυχογενή αίτια

# Καθιερωμένος αλγόριθμος που εφαρμόζεται στα ΤΕΠ για τη διαλογή των ασθενών με ΘΠ



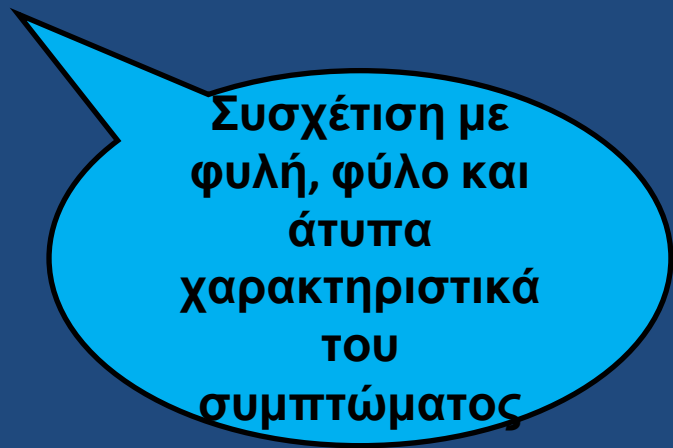
- **Από τους ασθενείς που προσέρχονται στα ΤΕΠ με ΘΠ**

- Το 50% εισάγεται για παρακολούθηση

- Από αυτούς το 2-5% χρειαζόταν εισαγωγή

- ~ 2% πηγαίνει σπίτι ενώ θα έπρεπε να νοσηλευτεί

- Αυξημένη θνητότητα
- Δραματικές συνέπειες



Συσχέτιση με  
φυλή, φύλο και  
άτυπα  
χαρακτηριστικά  
του  
συμπτώματος





|                          |                                                                 |
|--------------------------|-----------------------------------------------------------------|
| Μη απαραίτητες εισαγωγές | • 2,8εκ στις ΗΠΑ                                                |
| Αυξημένο κόστος          | • > 6δισ \$                                                     |
| Άσκοπες ημέρες νοσηλείας | • Από 65 στη Νέα Ζηλανδία έως 839 στη Γερμανία ανά 100 ασθενείς |

Μη απαραίτητες εισαγωγές

- 2,8εκ στις ΗΠΑ

Αυξημένο κόστος

- > 6δισ \$

Άσκοπες ημέρες νοσηλείας

- Από 65 στη Νέα Ζηλανδία έως 839 στη Γερμανία ανά 100 ασθενείς

- Οι αλγόριθμοι που εφαρμόζονται δεν είναι επαρκείς.
- Η διαλογή ασθενών με ΘΠ στα ΤΕΠ παραμένει μια πρόκληση για τον κλινικό ιατρό
- Ανάγκη για αξιόπιστα μη επεμβατικά εργαλεία διερεύνησης του ΘΠ



Υπερηχοκαρδιογράφημα

Μαγνητική τομογραφία  
καρδιάς

**Διάφορες  
απεικονιστικές  
τεχνικές έχουν  
προταθεί**

Σπινθηρογράφημα  
αιμάτωσης του  
μυοκαρδίου

Αξονική τομογραφία  
καρδιάς

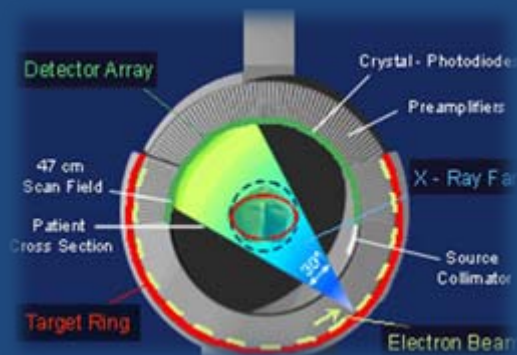
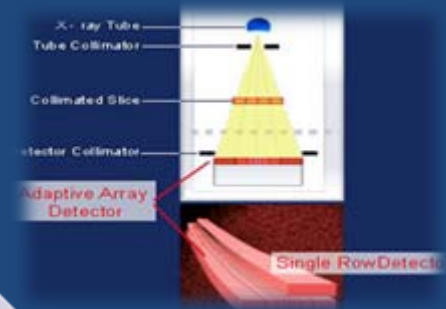
- Φορτίο ασβεστίου-Calcium Score (CS)
- Αξονική αγγειογραφία της καρδιάς (CCTA)

Η απεικόνιση της  
καρδιάς ήταν  
αδύνατη έως το  
τέλος της  
δεκαετίας του  
'80

Εμφάνιση EBCT  
το 1987 →  
Υπολογισμός του  
CS

Παρουσίαση των  
πρώτων MSCT  
(4slices) το 2000  
→ αξονική  
αγγειογραφία  
της καρδιάς

Τεχνολογικές  
εξελίξεις →  
σαρωτές dual  
source, MSCT  
320slices και όχι  
μόνο.....και  
έπεται συνέχεια



# Η εξέλιξη σε αριθμούς

**Table 1. Technical and Acquisition Parameters for Cardiac Examinations With MDCT**

| Number of detector slices                      | 4             | 16                            | 64                             | 256          | 320              |
|------------------------------------------------|---------------|-------------------------------|--------------------------------|--------------|------------------|
| Detector collimation (mm)                      | 4×1<br>4×1.25 | 16×0.5<br>16×0.625<br>16×0.75 | 64×0.5<br>64×0.65<br>2×32×0.6* | 2×128×0.625* | 320×0.5          |
| Slice width (mm)                               | 1.3           | 0.8–1.0                       | 0.5–0.8                        | 0.6          | 0.5              |
| Spatial resolution (mm)                        | 1             | 0.6                           | 0.4–0.6                        | 0.4          | 0.35             |
| Rotation time (s)                              | 0.5           | 0.375–0.420                   | 0.33–0.40                      | 0.27         | 0.35             |
| Temporal resolution (ms)                       | 250           | 188–210                       | 165–200 <sup>‡</sup>           | 135          | 175 <sup>§</sup> |
| z-axis coverage (mm)                           | 4–5           | 8–12                          | 32–40                          | 80           | 160              |
| Scan time to cover the entire heart volume (s) | 40            | 15–20                         | 6–12                           | 1–2          | >1               |

\*Double z sampling. <sup>‡</sup>Temporal resolution can be improved to 83 ms with dual source acquisitions in single energy applications. <sup>§</sup>Temporal resolution can be improved to 58 ms with multisegment acquisition and multisegment reconstruction. Abbreviation: MDCT, multidetector CT.

- Πόσο όμως μπορούμε να εμπιστευόμαστε την cardiac CT;

> 30 μελέτες με πάνω από 2000 ασθενείς την συγκρίνουν με την επεμβατική αγγειογραφία (gold standard)

| Author (Ref. #)          | Patient Population                                               | n     | Age (yrs) | Heart Rate (beats/min) | Percent Excluded | Scanner          | Analysis by Segment          |             |     |     | Comment                                                                                                               |
|--------------------------|------------------------------------------------------------------|-------|-----------|------------------------|------------------|------------------|------------------------------|-------------|-----|-----|-----------------------------------------------------------------------------------------------------------------------|
|                          |                                                                  |       |           |                        |                  |                  | Sensitivity for 50% Stenosis | Specificity | PPV | NPV |                                                                                                                       |
| Hamon et al. (36)        | Meta-analysis (28 studies)                                       | 1,292 | NR        | NR                     | 4%               | 16-row           | 95                           | 69          | 79  | 92  | 64-row CTA had better specificity and PPV than 16-row                                                                 |
|                          |                                                                  | 695   | NR        | NR                     | 2%               | 64-row           | 97                           | 90          | 93  | 96  |                                                                                                                       |
|                          |                                                                  | 357   | 61        | 61                     | NR               | 4-row            | 84                           | 93          | NR  | NR  |                                                                                                                       |
| Vanhoenacker et al. (37) | Meta-analysis (54 studies)                                       | 704   |           |                        | NR               | 16-row           | 83                           | 96          | NR  | NR  | 64-row CTA had better sensitivity than 16-row; 4-row CTA should not be used                                           |
|                          |                                                                  | 363   |           |                        | NR               | 64-row           | 93                           | 96          | NR  | NR  |                                                                                                                       |
| Weustink et al. (38)     | Symptomatic patients with low, intermediate, or high probability | 100   | 61 ± 11   | 68 ± 11                | 0                | DSCT             | 95                           | 95          | 75  | 99  | DSCT performs well over a wide range of patients                                                                      |
| Heuschmid et al. (39)    | Unselected population with high prevalence of disease            | 51    | 64 ± 10   | 65 ± 14                | 19%              | DSCT             | 96                           | 87          | 61  | 99  | High number of excluded segments due to large number of stented segments                                              |
| Ropers et al. (40)       | Low-Intermediate probability                                     | 100   | 61        | 64                     | 0                | DSCT             | 92                           | 97          | 68  | 99  | DSCT has high diagnostic accuracy, even at high heart rates                                                           |
| Leber et al. (41)        | Intermediate probability                                         | 90    | 58 ± 8    | 73                     | 0                | DSCT             | 90                           | 98          | 81  | 99  | DSCT has high diagnostic accuracy, even at high heart rates                                                           |
| Meijboom et al. (46)     | High, Intermediate, and low probability of CAD                   | 254   | NR        | NR                     | 0                | 64-row           | 88                           | 94          | 54  | 99  | CTA only useful in low and intermediate probability groups                                                            |
| Pundziute et al. (43)    | Intermediate-high probability                                    | 103   | 60 ± 10   | NR                     | 0                | 64-row           | 85                           | 99          | 90  | 98  | CTA is effective for both females and males                                                                           |
| Bayrak et al. (44)       | Low-Intermediate probability                                     | 100   | 58 ± 10   |                        |                  | 64-row           | 88                           | 99          |     |     | CTA can exclude CAD in patients in sinus rhythm                                                                       |
| Herzog et al. (45)       | Low probability                                                  | 55    | 67        | 64                     | 0                | 64-row           | 82                           | 97          | 69  | 99  | MDCTA adequate to exclude disease in patients with low probability                                                    |
| Meijboom et al. (46)     | ACS                                                              | 104   | 59 ± 9    | NR                     | 0                | 64-row           | 92                           | 91          | 60  | 99  | CTA can exclude CAD in patients with ACS                                                                              |
| Husmann et al. (47)      | Low, Intermediate, and high probability                          | 88    | 64 ± 9    | 63 ± 9                 | 0                | 64-row           | 81                           | 96          | 69  | 98  | Sensitivity and specificity did not vary with CAD probability; PPV higher, NPV lower in patients with high likelihood |
| Pugliese et al. (48)     | Low-Intermediate probability                                     | 204   | 56 ± 10   | 57 ± 7                 | 26%              | 4-row            | 57                           | 91          | 60  | 90  | Improvements in scanner technology permit more complete evaluation; 4-row CTA is not adequate                         |
|                          |                                                                  |       | 59 ± 12   | 56 ± 6                 | 0                | 16-row (1st gen) | 90                           | 93          | 65  | 99  |                                                                                                                       |
|                          |                                                                  |       | 59 ± 10   | 57 ± 5                 | 0                | 16-row (2nd gen) | 97                           | 98          | 87  | 100 |                                                                                                                       |
|                          |                                                                  |       | 59 ± 11   | 58 ± 7                 | 0                | 64-row           | 99                           | 96          | 80  | 100 |                                                                                                                       |
| Hausleiter et al. (49)   | Intermediate probability                                         | 129   | 62 ± 10   | 57 ± 7                 | 0                | 16-row           | 93                           | 87          | 46  | 99  | 64-row CT superior for detection of CAD                                                                               |
|                          |                                                                  |       |           |                        |                  | 64-row           | 92                           | 92          | 54  | 99  |                                                                                                                       |

ACS = acute coronary syndrome without ST elevation; CAD = coronary artery disease; CT = computed tomography; CTA = computed tomography angiography; DSCT = dual-source computed tomography; gen = generation; MDCTA = multidetector computed tomography angiography; NPV = negative predictive value; NR = not recorded; PPV = positive predictive value.

# CORE-64 (Coronary Evaluation Using Multi-detector Spiral Computed Tomography Angiography using 64 Detectors)

## CTA vs coronary angiography

|                                  |             |
|----------------------------------|-------------|
| <b>Sensitivity</b>               | <b>0.85</b> |
| <b>Specificity</b>               | <b>0.90</b> |
| <b>Positive predictive value</b> | <b>0.91</b> |
| <b>Negative predictive value</b> | <b>0.83</b> |

Miller JM. American Heart Association 2007 Scientific Sessions; November 5, 2007; Orlando, FL.



The authors concluded in those with suspected CAD and a calcium score of  $< 600$ , MDCTA is able to assess the presence of significant  $>50\%$  stenosis and identify those likely to be referred for revascularization as compared to QCA. Diagnostic performance of MDCTA on a per patient basis was better than on a per vessel basis. "ruling out" CAD in low-moderate risk patients. The results of CORE-64 provide additional support on the ability of MDCT to predict significant CAD. While the sensitivity and negative predictive values are lower than in previously published single-center studies, this is a multicenter study, with a higher prevalence of CAD. However, these findings should be taken in light that those patients with calcium scores  $>600$  ( $n=89$ , 22% of the patient population) were excluded from the study. Further studies incorporating this subgroup to the accuracy assessment of MDCT may be more representative of everyday clinical practice. The study was sponsored by TOSHIBA.



# ACCURACY (Assessment by Coronary Computed Tomographic Angiography of Individuals Undergoing Invasive Coronary Angiography)

## Per Vessel Analysis

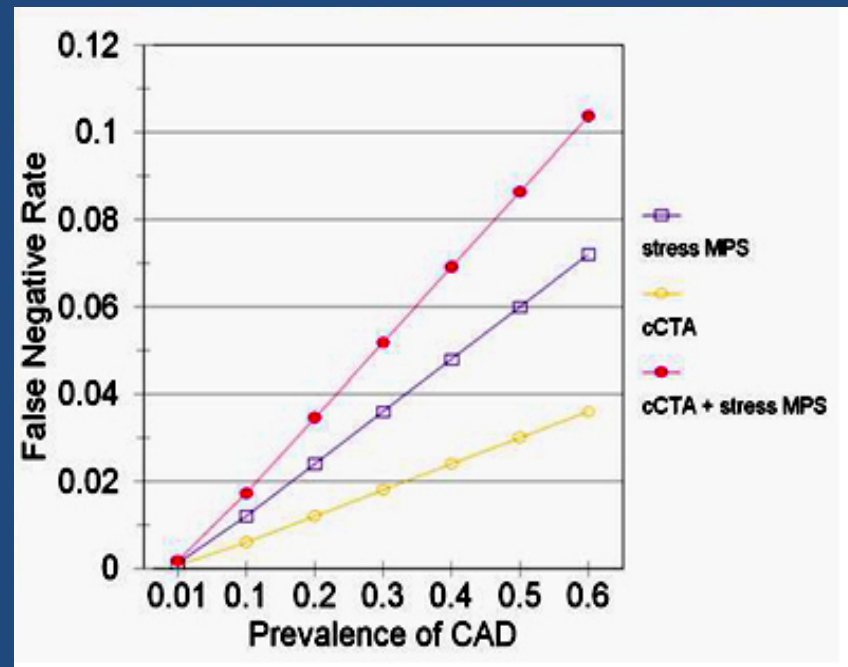
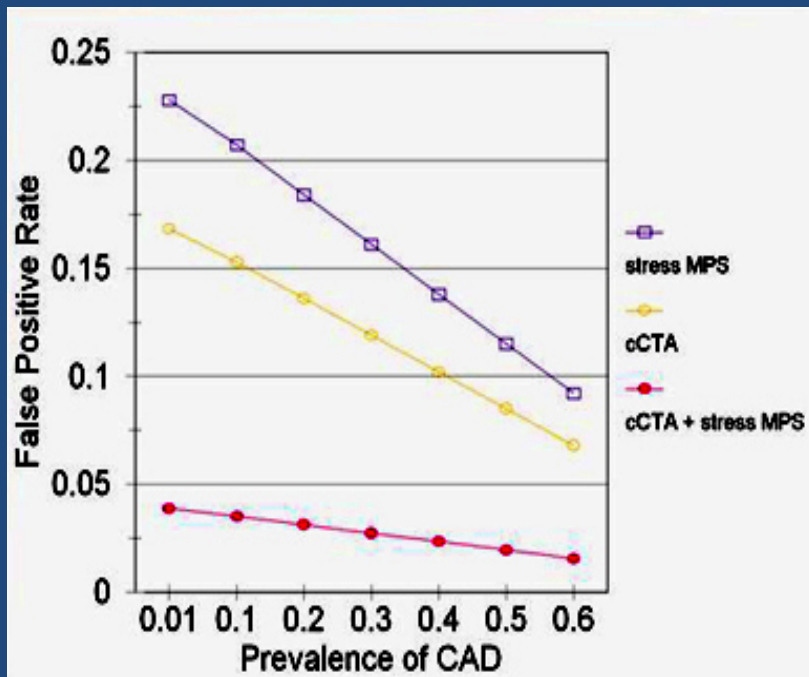
| Lesion Grade | Parameters  | %  | # vessels by ICA | # vessels by CCTA |
|--------------|-------------|----|------------------|-------------------|
| ≥50%         | Sensitivity | 84 | 88               | 74                |
|              | Specificity | 91 | 824              | 752               |
|              | PPV         | 51 | 146              | 74                |
|              | NPV         | 98 | 766              | 752               |
| ≥70%         | Sensitivity | 85 | 39               | 33                |
|              | Specificity | 92 | 873              | 805               |
|              | PPV         | 33 | 101              | 33                |
|              | NPV         | 99 | 811              | 805               |

## Per Patient Analysis

| Lesion Grade | Parameters  | %  | # of subjects by ICA | # of subjects by CCTA |
|--------------|-------------|----|----------------------|-----------------------|
| ≥50%         | Sensitivity | 93 | 55                   | 51                    |
|              | Specificity | 82 | 174                  | 143                   |
|              | PPV         | 62 | 82                   | 51                    |
|              | NPV         | 97 | 147                  | 143                   |
| ≥70%         | Sensitivity | 91 | 34                   | 31                    |
|              | Specificity | 84 | 195                  | 163                   |
|              | PPV         | 49 | 63                   | 31                    |
|              | NPV         | 98 | 166                  | 163                   |

The results show the high accuracy of current-generation 64-slice coronary CTA to detect stenosis of greater than 50% and greater than 70%, Min said, adding that these are the first prospective multicenter results to compare 64-row coronary CTA to angiography without exclusion based on calcium score or BMI.

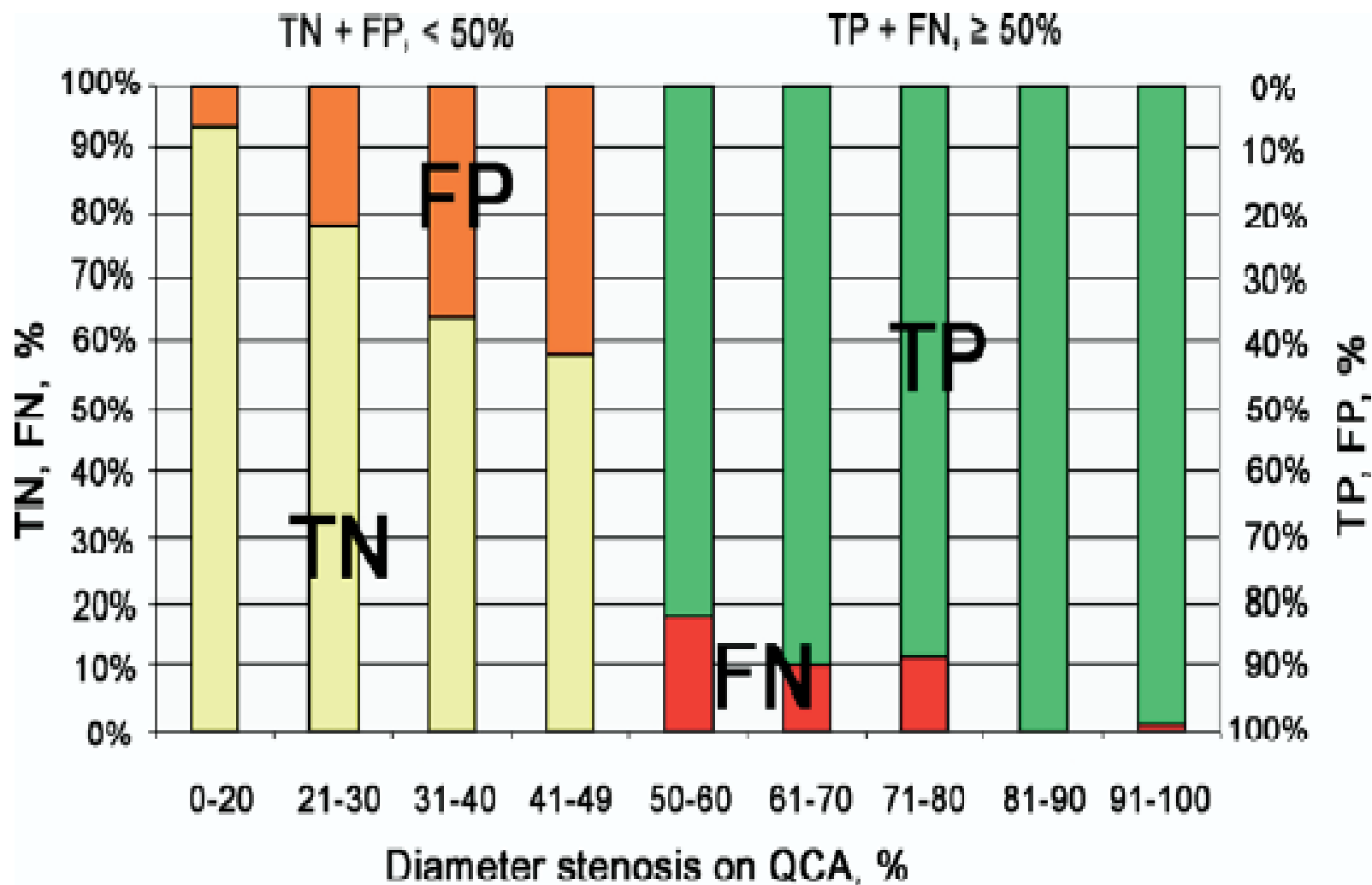
"In patients with chest pain who are electively referred for coronary invasive angiography, the high negative predictive values of 97% to 99% indicate that CTA is a highly effective noninvasive alternative to exclude coronary artery stenosis," he said. "I think the accuracy of the results in a prospective multicenter (setting) definitely establish a high diagnostic accuracy and high negative predictive value of 64-detector-row CT angiography in chest pain patients with an intermediate prevalence of coronary artery disease."



Οι επιδόσεις αυτές φυσικά  
εξαρτώνται από την επιπολασμό της νόσου  
στον πληθυσμό που μελετούμε.



- Οι αναλύσεις που αφορούν την MSCT 64 τομών αποκαλύπτουν **ευαισθησία** και **ειδικότητα** για την ανίχνευση σημαντικής στεφανιαίας νόσου (ΣΝ) με >50% στένωση του αυλού, 98% και 93% αντίστοιχα.
- Το πιο σημαντικό όμως είναι πως η ανάλυση ανά ασθενή ανέδειξε **αρνητική προγνωστική αξία** 97%



# Πόσο όμως μπορούμε να εμπιστευόμαστε την cardiac CT σε ασθενείς με ΘΠ στα ΤΕΠ;

Zero calcium score not 100% reassuring in those presenting to ER with chest pain

CAC scoring can miss soft plaques, which play an important role in ACS.



- Πόσο όμως μπορούμε να εμπιστευόμαστε την cardiac CT σε ασθενείς με ΘΠ στα ΤΕΠ;

| Author (Ref. #)          | Patient Population                                                        | n  | Age (yrs) | Scanner | Reference Standard                         | Coronary Analysis by Patient |             |     |     | Comment                                                                                                                                                                                                            |
|--------------------------|---------------------------------------------------------------------------|----|-----------|---------|--------------------------------------------|------------------------------|-------------|-----|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          |                                                                           |    |           |         |                                            | Sensitivity                  | Specificity | PPV | NPV |                                                                                                                                                                                                                    |
| Litmanovitch et al. (65) | Nonspecific chest pain with Inconclusive ECG and negative Initial enzymes | 56 | 59 ± 11   | 64-row  | Coronary angiography (n = 9)               | NR                           | NR          | NR  | NR  | Triphasic IV contrast Injection performed to opacify both right and left cardiac chambers and pulmonary arteries. Noncoronary findings included PE (n = 4), aortic aneurysm (n = 4), and aortic dissection (n = 3) |
| Rubinshtein et al. (66)  | Nonspecific chest pain with Inconclusive ECG and negative Initial enzymes | 58 | 56 ± 10   | 64-row  | Coronary angiography or clinical follow-up | 100                          | 92          | 87  | 100 | No deaths or MI in 15-month follow-up (1 patient with late PCI)                                                                                                                                                    |
| Scherdier et al. (67)    | Acute chest pain—CT to rule out PE or aortic dissection                   | 60 | 58 ± 16   | DSCT    | Visual assessment of Image quality         | NR                           | NR          | NR  | NR  | Diagnostic Image quality in all vascular beds for all patients. Findings included PE (n = 11), aortic dissection (n = 3), coronary stenosis/occlusion (n = 3), and aortic pseudoaneurysm (n = 1)                   |
| Vrachliotis et al. (68)  | Low-risk patients (atypical chest pain)                                   | 50 | 52 ± 11   | 64-row  | Visual assessment of Image quality         | NR                           | NR          | NR  | NR  | 8 patients excluded for Imaging artifacts. Diagnostic Image quality in the remaining patients                                                                                                                      |

# The Rule Out Myocardial Infarction Using Computer Assisted Tomography (ROMICAT) Trial

## Determine the prevalence

- of coronary atherosclerotic plaque and stenosis in patients with acute chest pain and low to intermediate for ACS

## Determine the diagnostic accuracy of these findings

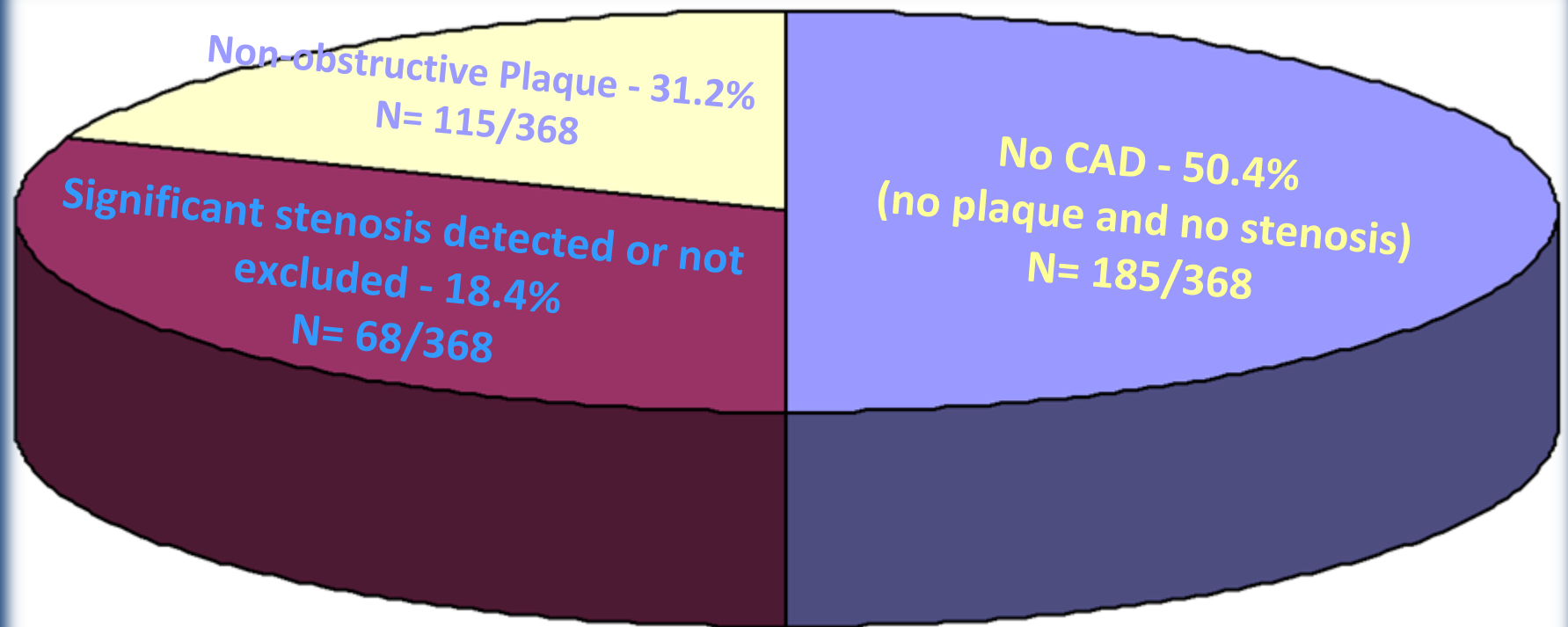
- for ACS

## Determine whether this information is incremental

- to current risk assessment



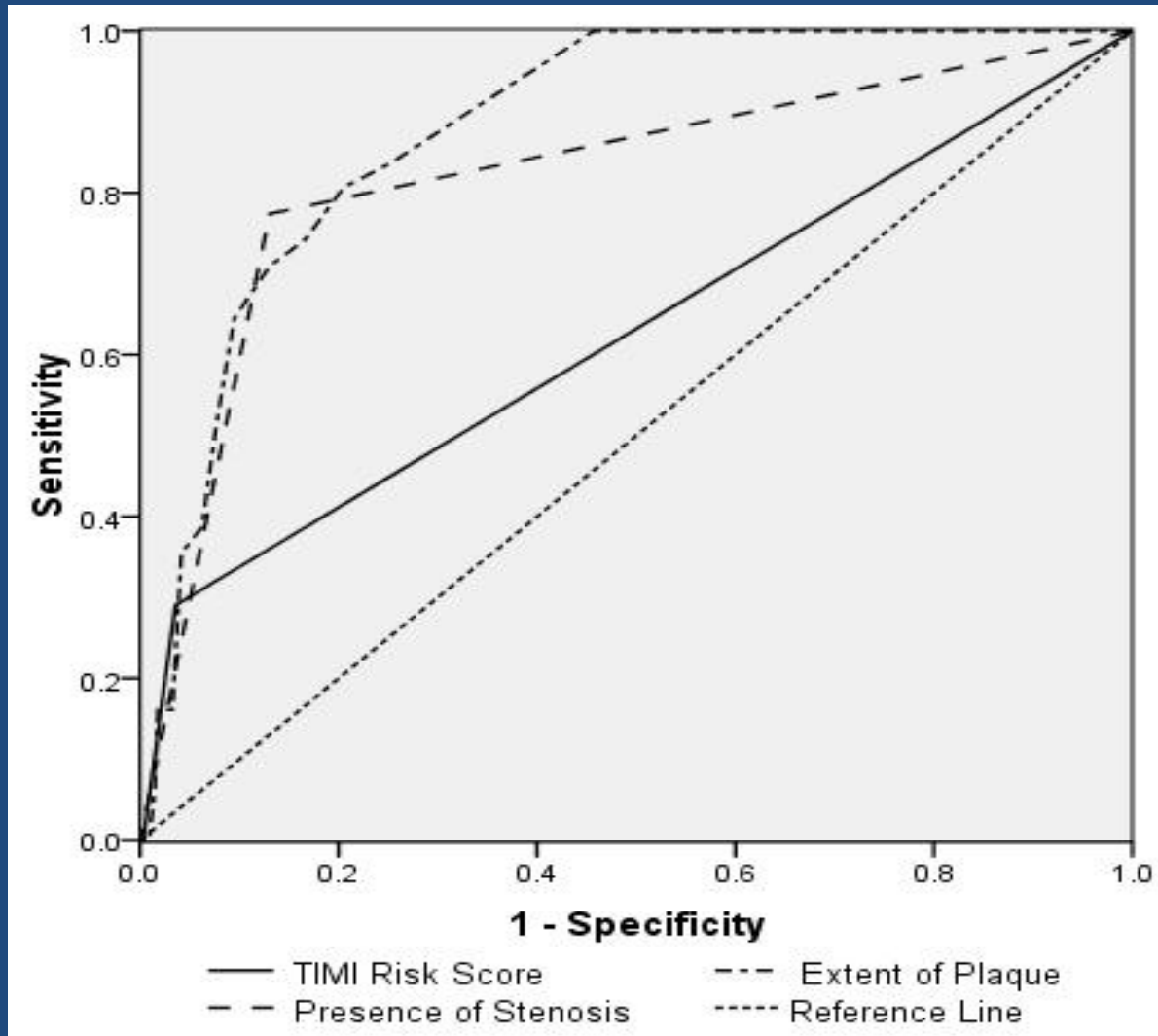
# The Rule Out Myocardial Infarction Using Computer Assisted Tomography (ROMICAT) Trial



# The Rule Out Myocardial Infarction Using Computer Assisted Tomography (ROMICAT) Trial

- Με κριτήριο την παρουσία αθηρωματικής πλάκας
  - *Sens 100%*      - *Spec 54%*
  - *PPV 17%*      - *NPV 100%*
- Με κριτήριο την παρουσία σημαντικής στένωσης του αυλού (> 50%)
  - *Sens 77%*      - *Spec 87%*
  - *PPV 35%*      - *NPV 98%*

# The Rule Out Myocardial Infarction Using Computer Assisted Tomography (ROMICAT) Trial

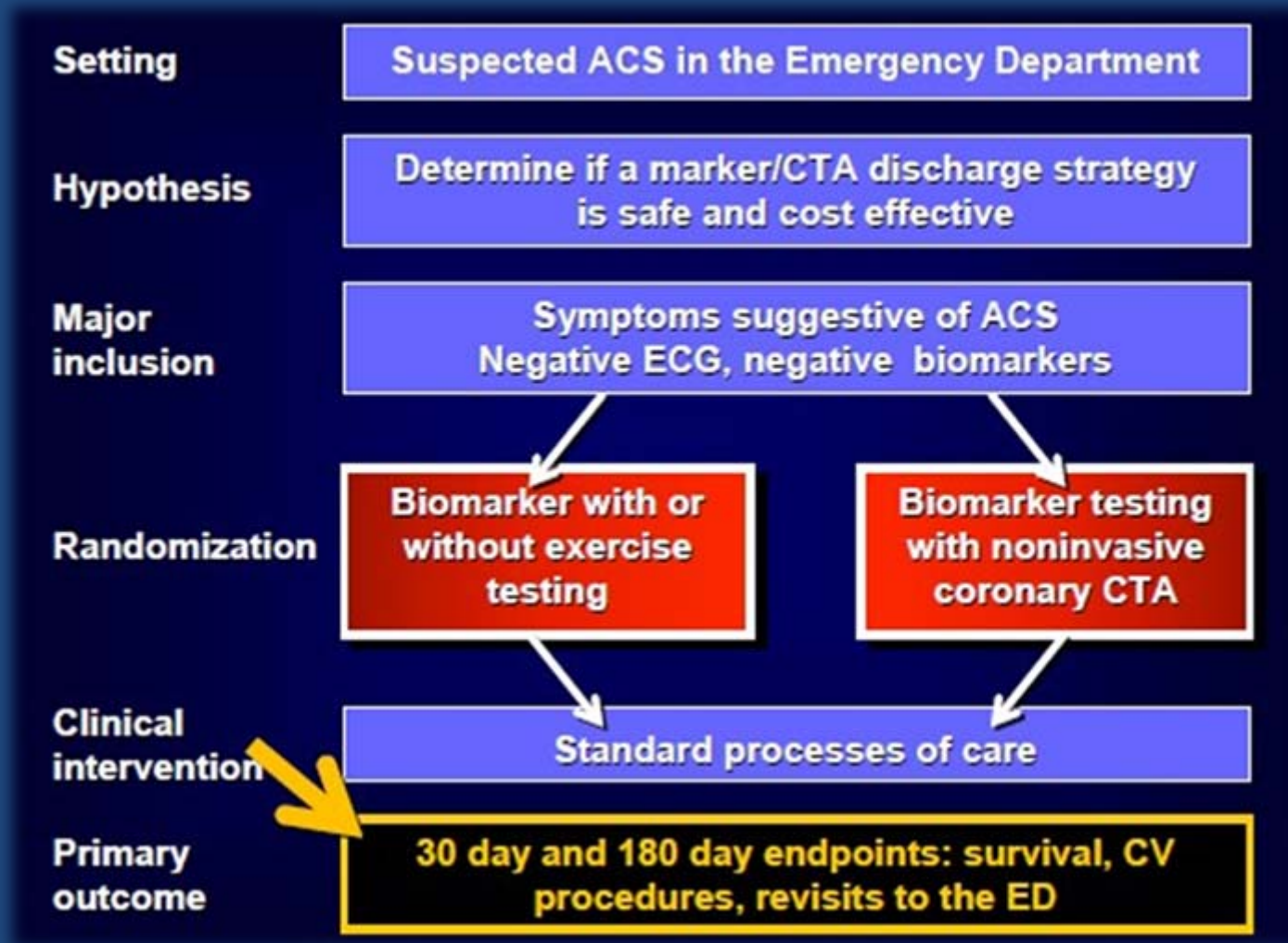


Incremental Value of coronary  
CTA to TIMI

# The Rule Out Myocardial Infarction Using Computer Assisted Tomography (ROMICAT) Trial

- ✓ Απουσία ΣΝ στο 50% των ασθενών που εξετάστηκαν
- ✓ Η NPV 100% για ΟΣΣ, επιτρέπει τη γρήγορη και ασφαλή έξοδο
- ✓ Σημαντική στένωση του αυλού ανιχνεύτηκε στο 10% των ασθενών. Από αυτούς το 40% είχε ήδη φύγει από το ΤΕΠ!!!!

# Coronary Computed Tomography for Systematic Triage of Acute Chest Pain Patients to Treatment (CT-STAT) trial





# Coronary Computed Tomography for Systematic Triage of Acute Chest Pain Patients to Treatment (CT-STAT) trial



## THE CT-STAT Trial

**BACKGROUND:** In the U.S., approximately 6 million patients present to the emergency department (ED) annually with chest pain or equivalent complaints, incurring \$8-10 billion for hospital stays to rule out acute coronary syndromes. **PURPOSE:** CTAT is a randomized, multicenter study that sought to compare the safety and efficiency of coronary computed tomographic angiography (CCTA) to standard of care (SOC) evaluation of low-intermediate risk patients with acute chest pain.

**DESIGN:** At 16 trial sites, 749 acute chest pain patients with low-to-intermediate risk (negative initial cardiac enzymes and EKGs) were randomized to a diagnostic strategy including CCTA (n=376) or SOC with myocardial perfusion imaging (MPI) (n=373) for disposition to immediate discharge, additional noninvasive testing or invasive angiography.



**Primary Endpoint:** tomographic angiography (CCTA) and standard of care (SOC)

**Secondary Endpoint:** invasive angiography during index, visit final discharge diagnosis of acute coronary, syndromes time to diagnosis and cost of care

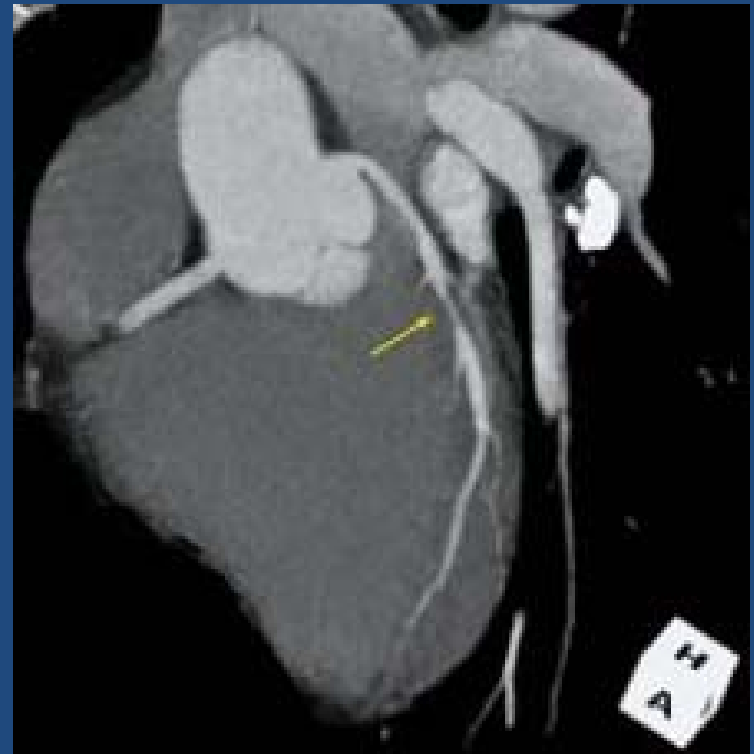
**Primary Outcomes:** safety (freedom from 6-month major adverse cardiac events - MACE) and efficiency (time to disposition and ED cost of care).

**Results:** Time-to-diagnosis decreased by half, due to more rapid facilitation in testing. Cost-to-diagnosis decreased by one-third, primarily due to expedited time-to-diagnosis and reduced length of stay

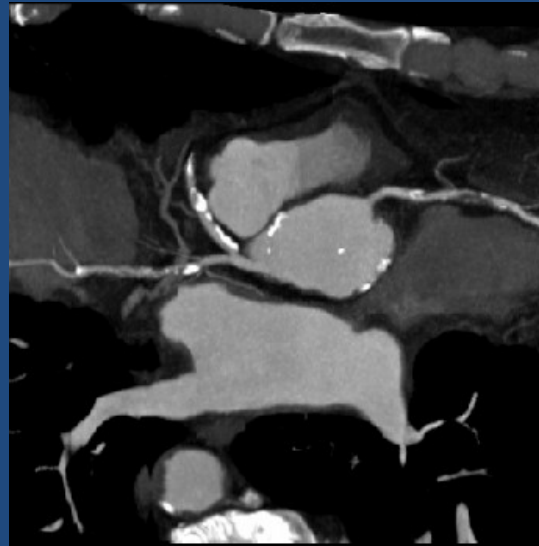
**Conclusion:** Compared to SOC, CCTA is faster, cheaper, and safe



# Μικρή στένωση του προσθίου κατιόντα



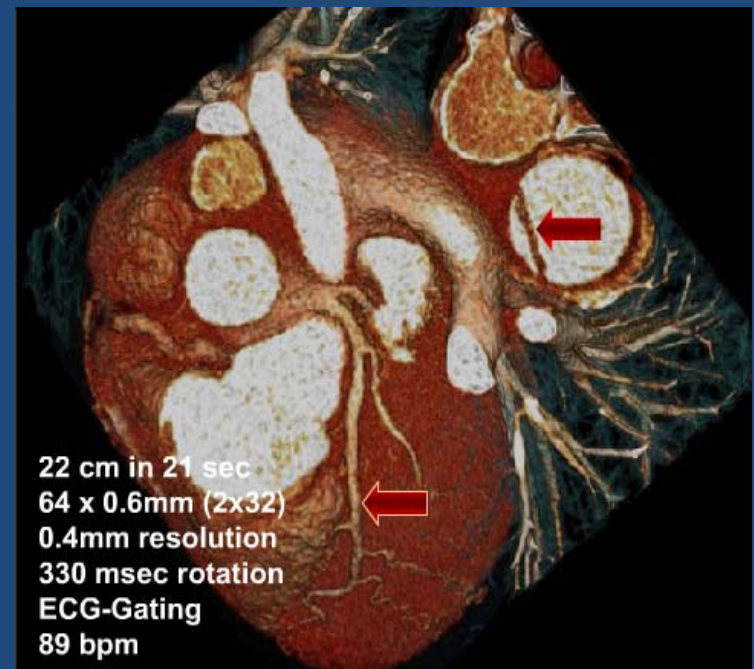
# Σημαντική στένωση της δεξιάς στεφανιαίας



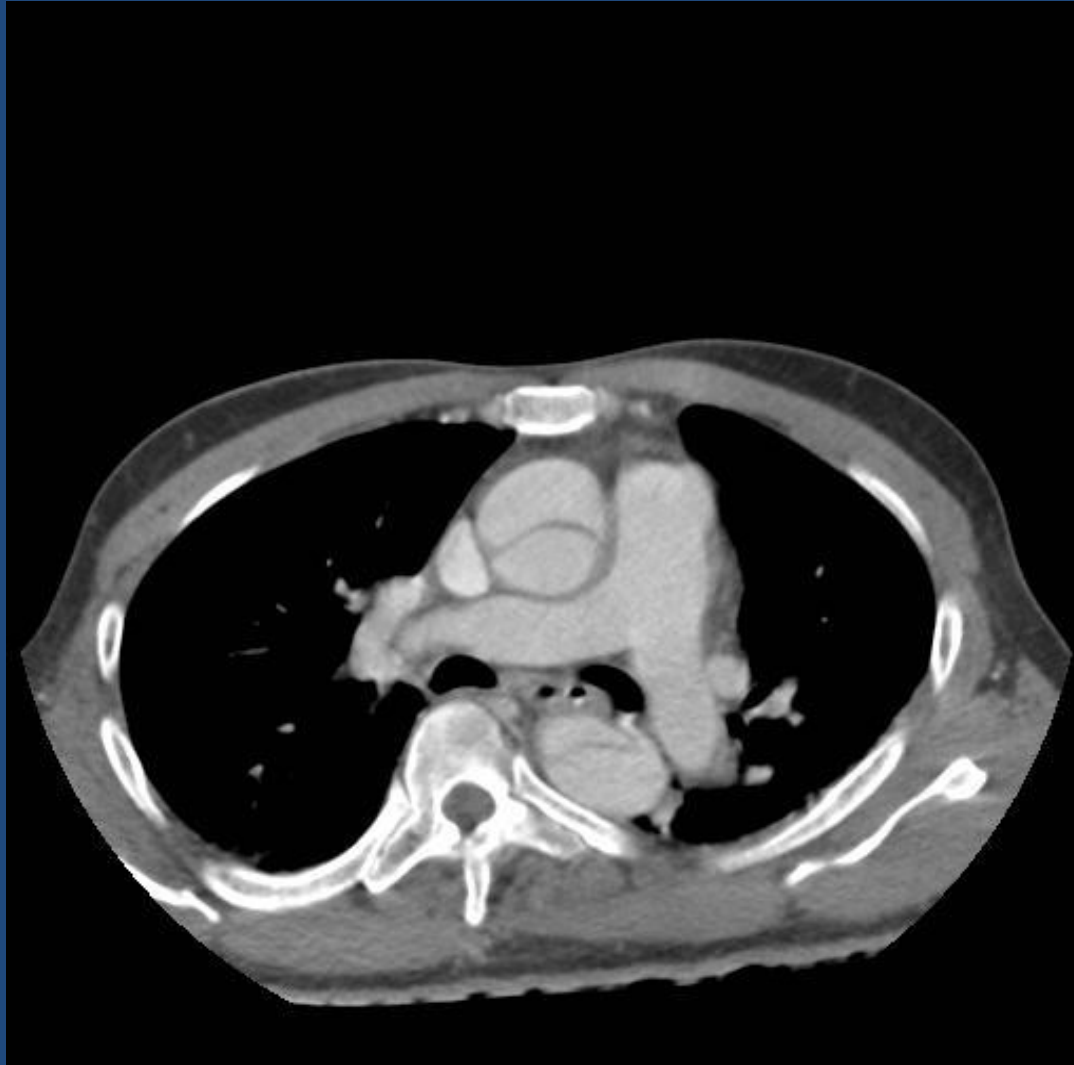
# Οξύς διαχωρισμός της αορτής

CT is the technique used most often in patients with suspected aortic dissection.

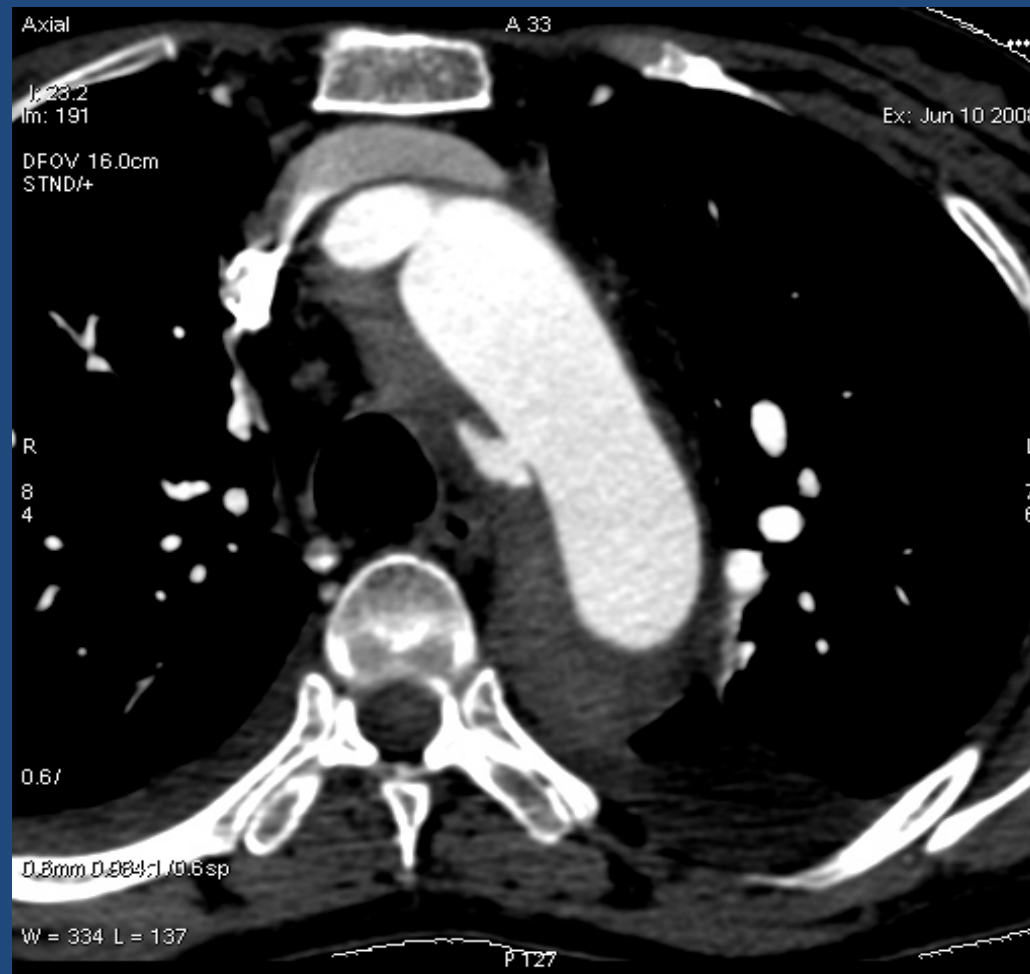
The sensitivity is greater than 90%, specificity greater than 85%. The extent, localization and side branch involvement of aortic dissection can be assessed, signs of emergency detected. Limitations are related to diagnosis of aortic regurgitation, tear localization as well as detection of intimal tears and subtle /discrete aortic dissection (class 3).



# Οξύς διαχωρισμός της αορτής

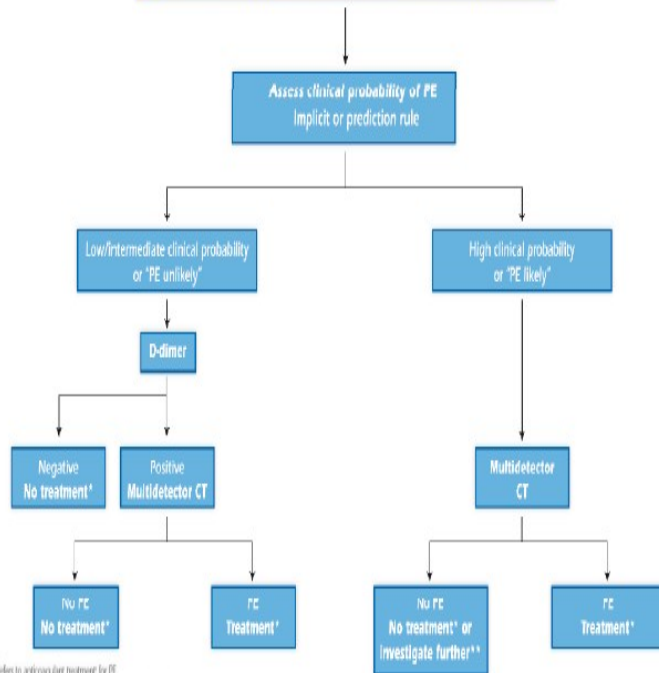


# Αιμάτωμα ή έλκος



# Πνευμονική Εμβολή

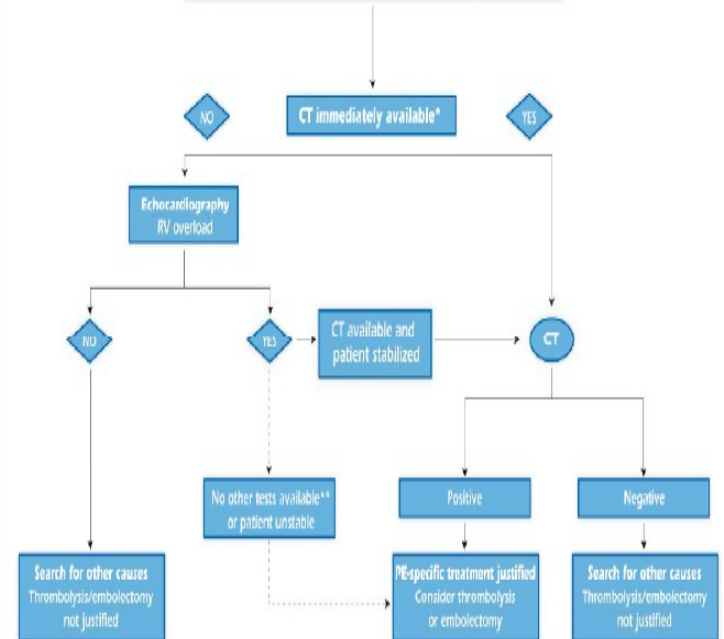
Suspected non-high-risk PE i.e. without shock or hypotension



\* Treatment refers to anticoagulant treatment for PE  
 \*\* In case of a negative multidetector CT in patients with high clinical probability  
 further investigation may be considered before withholding PE-specific treatment.



Suspected high-risk PE i.e. with shock or hypotension



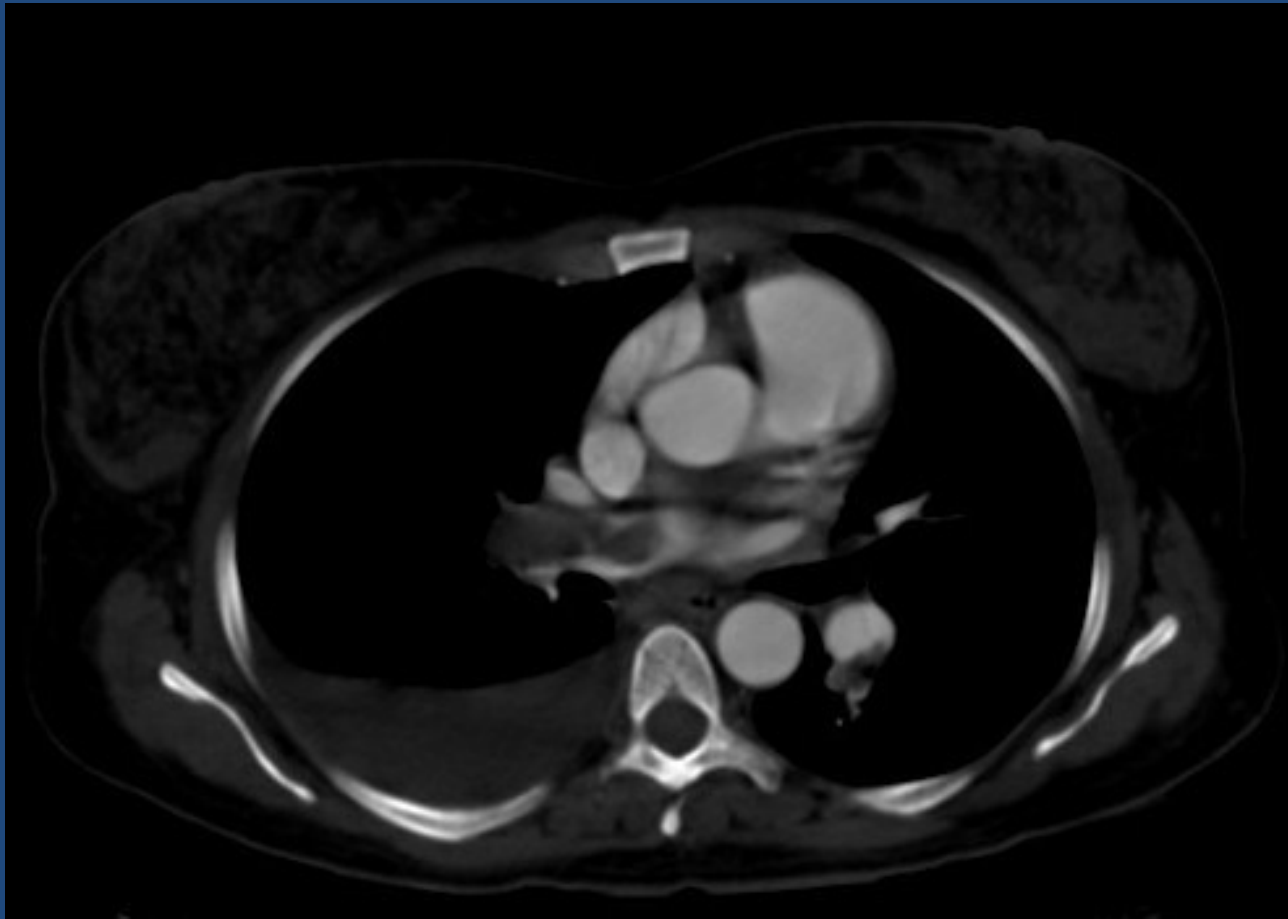
\* CT is considered not immediately available also if critical condition of a patient allows only bedside diagnostic tests.

\*\* Note that transesophageal echocardiography may detect thrombi in the pulmonary arteries in a significant proportion of patients with RV overload and PE ultimately confirmed at spiral CT and that confirmation of DVT with bedside CUS might also help in decision making.

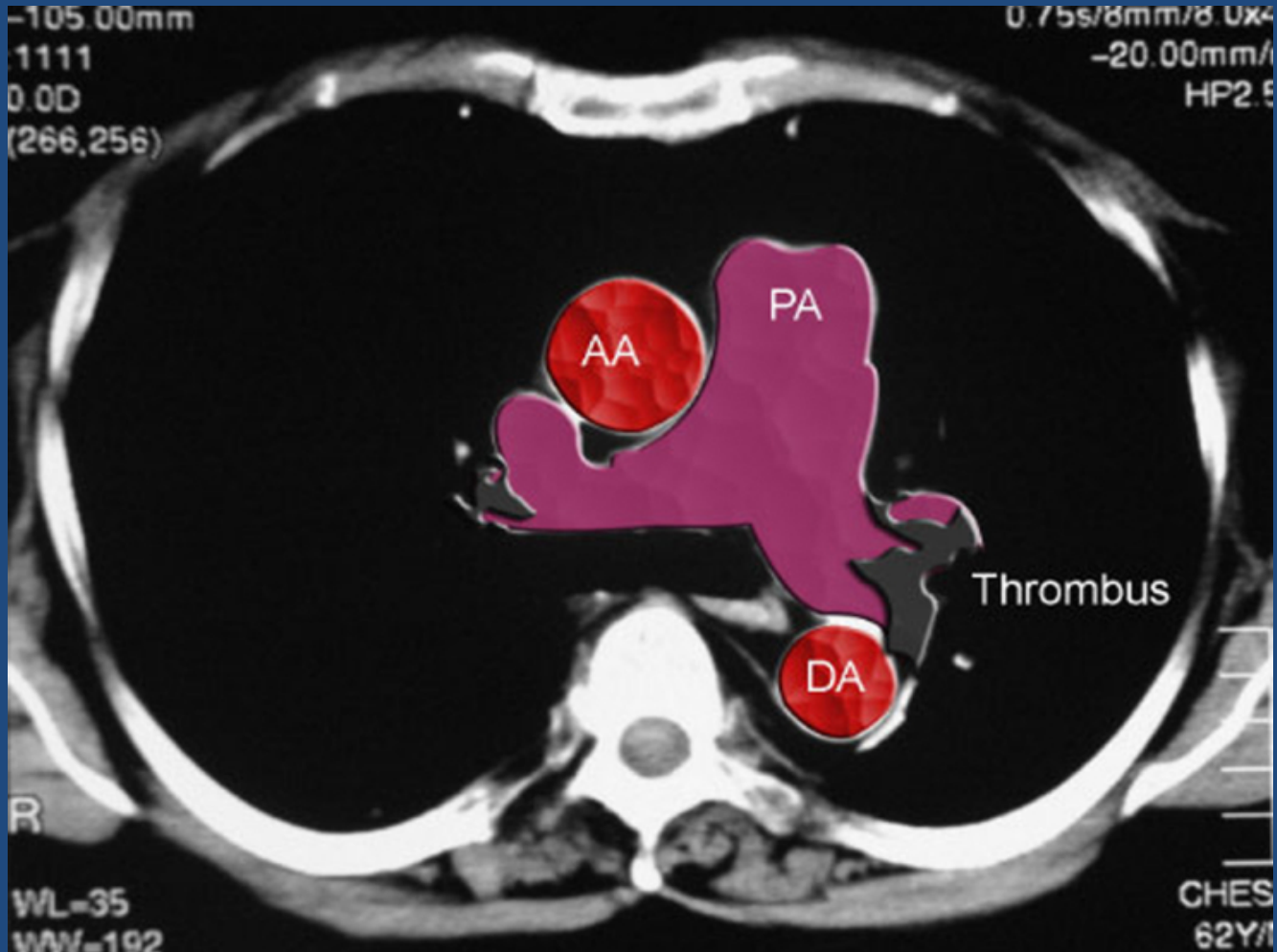




# Πνευμονική Εμβολή



# Πνευμονική Εμβολή



# Cardiac CT πέρα από τη ΣΝ

- Πνευμονική Εμβολή
- Οξύς διαχωρισμός της αορτής

Triple rule out

*αλλά και*

- καρδιακοί όγκοι
- συγγενείς ανωμαλίες των στεφανιαίων αγγείων
- περικαρδίτιδα
- πνευμοθώρακας
- πνευμονία

Multiple rule out

# Triple Rule Out CT: The Requisites

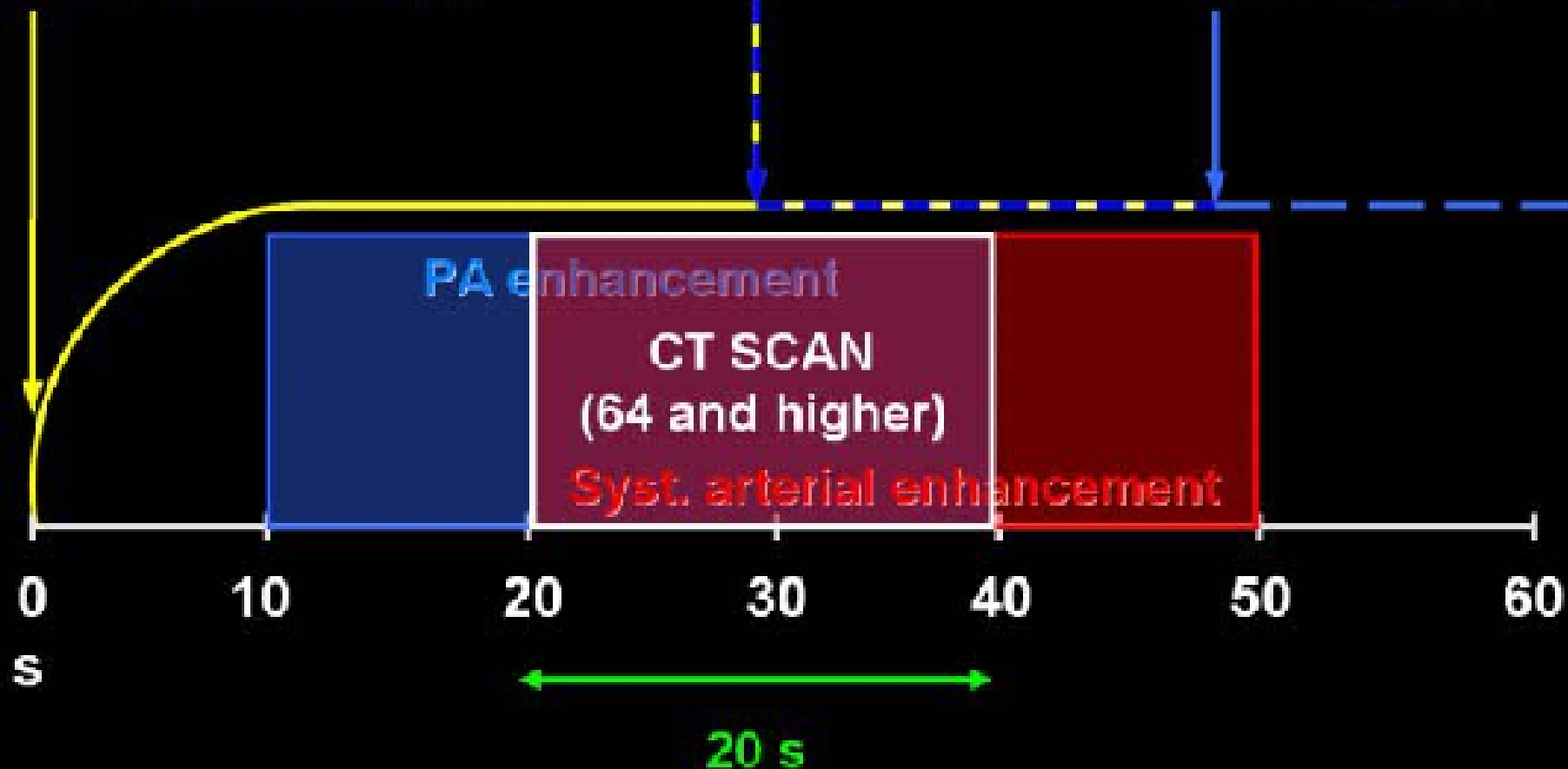
- Cover entire thorax
- Within reasonable breath-hold
- During systemic and pulmonary enhancement
- With reasonable amount of CM
- With retrospective ECG-gating
- With sub-millimeter collimation

# The Triple Rule Out CT Protocol

**Volume =  
Scan Time x 5 (6)**

**50 cc Dual Flow  
30% / 70% Mix**

**30 cc NaCl**

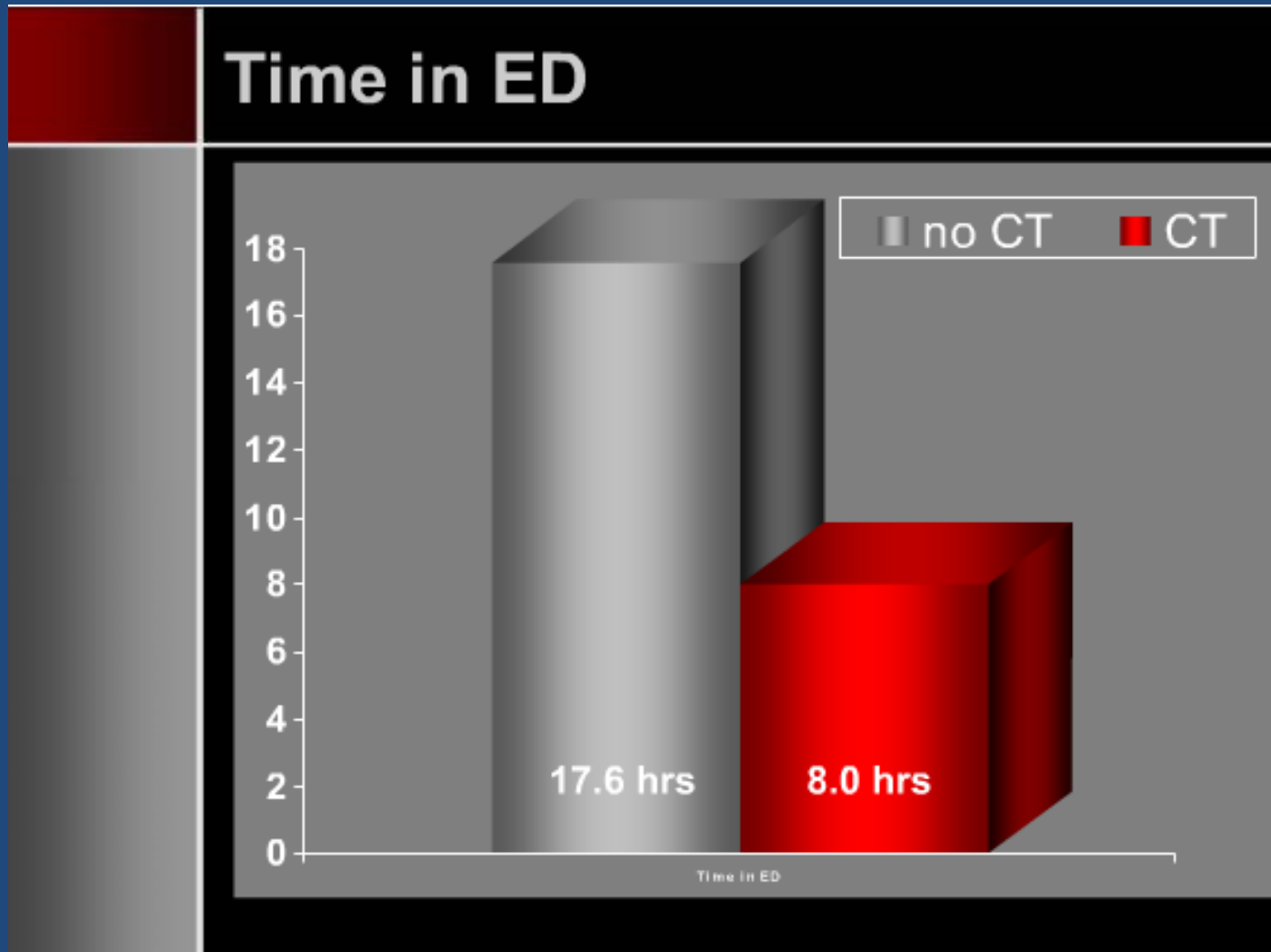


# Stenosis Grading at MUSC

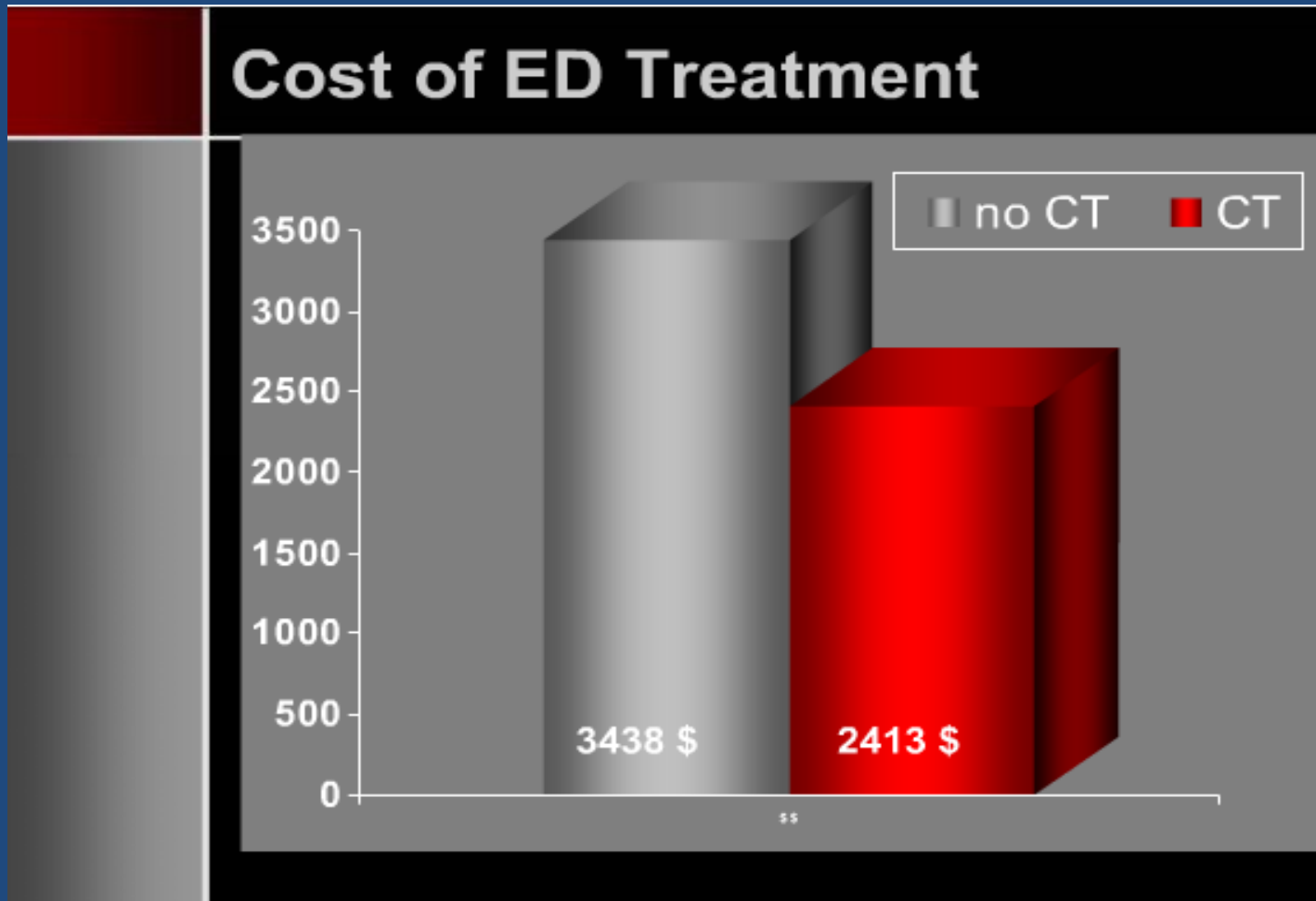
- — < 30% ( $\approx$  40% of cases)
  - Diffuse, non-obstructive disease
  - No conventional catheter confirmation
  - Medical therapy – Aspirin, statins
- — 30% - 70% Greyzone ( $\approx$  30% of cases)
  - Decision for catheter and / or specific treatment depend on other tests
- — >70% ( $\approx$  30% of cases)
  - Almost always conventional catheter confirmation / intervention



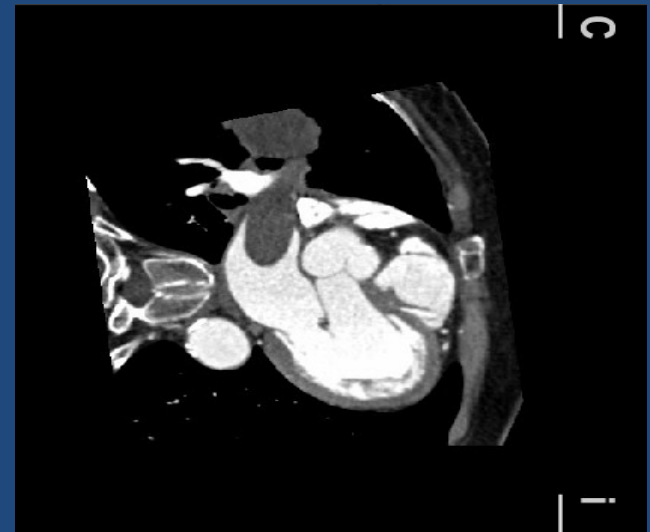
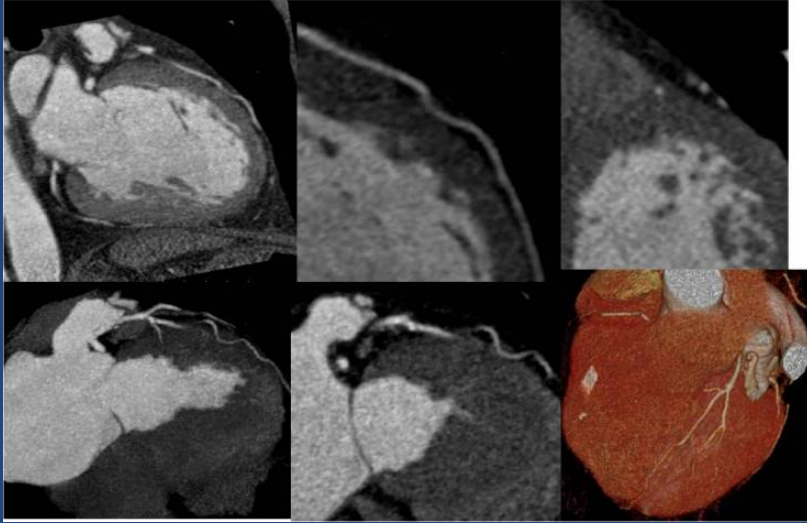
# Μείωση του χρόνου



# Μείωση του κόστους



# Άλλες αιτίες θωρακικού πόνου



# Ας ακούσουμε τους ίδιους τους ασθενείς!

## Patients experience from CT coronary angiography versus conventional coronary angiography

A Diederichsen<sup>1</sup>, H Petersen<sup>1</sup>, A Johansen<sup>1</sup>, N Sandgaard<sup>1</sup>, PF Høiland-Carlson<sup>1</sup>, Hans Frederik HF Mikkelsen<sup>2</sup>

<sup>1</sup>Odense, Denmark; <sup>2</sup>Odense M, Denmark

**Introduction:** With the development of 64-slice CT scanners the technical quality of CT coronary angiography (CT-angio) has substantially improved. The exact clinical role of CT-angio compared with conventional coronary angiography (KAG) remains to be settled. In this study we set out to evaluate the patients personal attitude towards the two diagnostic procedures.

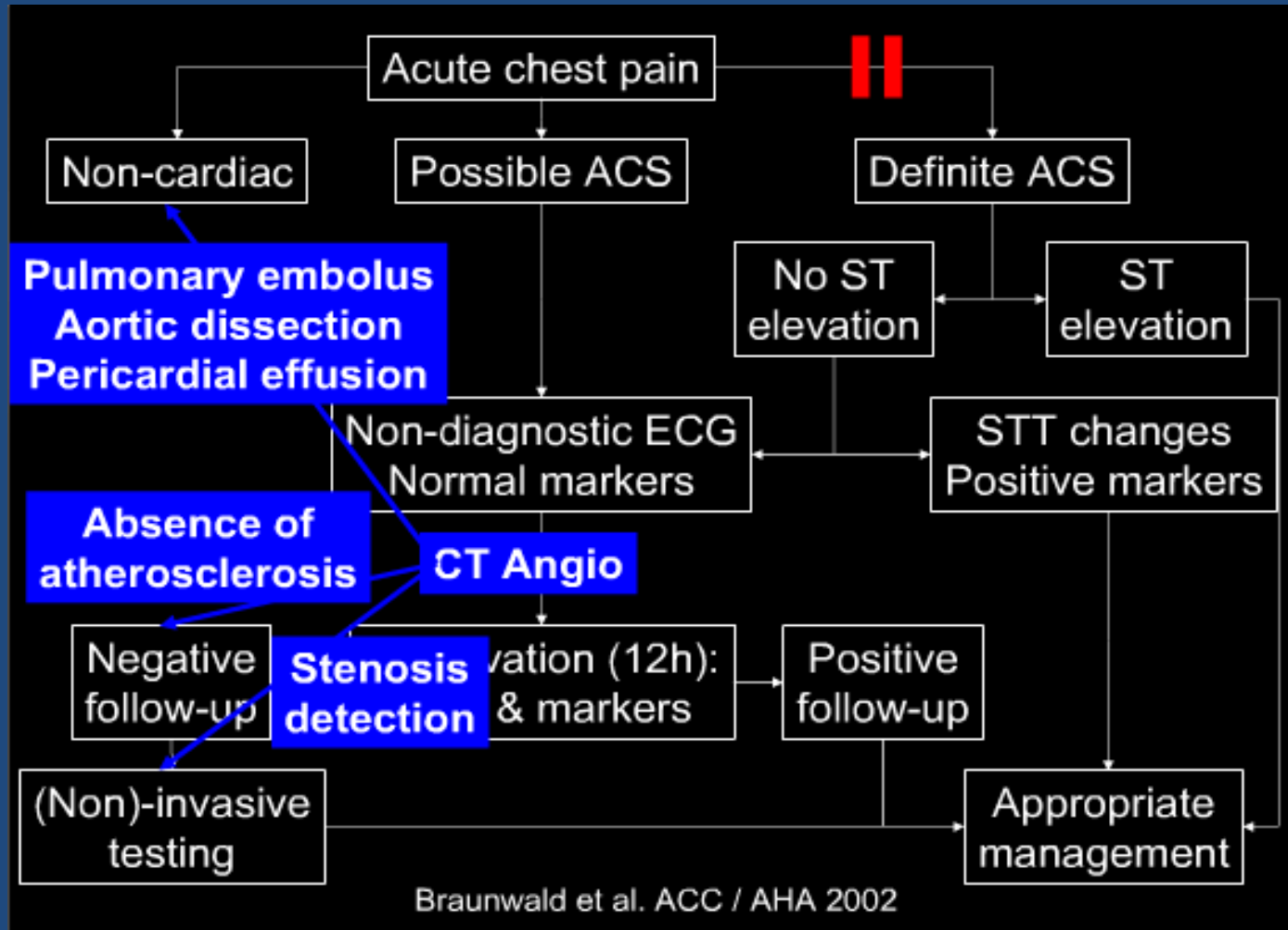
**Methods:** CT-angio and KAG were performed in 108 patients aged  $62.8 \pm 9.8$  (SD) years with suspected or definite CAD. A 64-slice scanner was used for CT-angio, and contrast was given via an antebachial vein. KAG was done through the right femoral artery. A mean of 3 months after the intervention a structured questionnaire addressing the preferences, attitude towards the two procedures, and social consequences was sent to each of the 108 patients (61 men, 47 women). A total of 8 questions were asked. Additionally, safety data including major complications and deaths were registered.

**Results:** 92 patients (85%) answered the questionnaire. In the table selected but representative findings are presented. No patients died during or after the diagnostic procedures. However, 2 patients had surgical intervention performed after KAG due to major bleeding at the site of femoral puncture. No major complications were observed in association with CT-angio.

**Conclusion:** After having undergone both kinds of diagnostic procedures 9 of 10 patients would prefer CT-angio as compared with KAG. This preference was mainly caused by significantly less discomfort and a higher level of mobilization in the early days following CT-angio versus KAG.

| (n = 108)                                   | CT-angio | KAG | P-value  |
|---------------------------------------------|----------|-----|----------|
| Back pain during or after angio             | 3%       | 13% | < 0.01   |
| Pain at the puncture site 1 day after angio | 2%       | 49% | < 0.0001 |
| Missed work for >1 day after angio          | 1%       | 40% | < 0.0001 |
| Which kind of angio would you prefer?       | 91%      | 9%  | < 0.0001 |

# Προτεινόμενος αλγόριθμος που εφαρμόζεται στα ΤΕΠ για τη διαλογή των ασθενών με ΘΠ



# Περιορισμοί

The devil is in the details

- Beta-blockers are required for coronary CTA, but may not be safe in patients with pulmonary embolism
- High radiation dose: approximately 25 to 40 mSv from a single scan; 14 to 18 mSv from separate coronary CT and chest CT scans
- Not available 24 hours a day (lack of experienced technologists, readers, and physician supervision)
- Increased contrast volume (>100 mL)
- Obesity and calcifications limit interpretation
- Patient exclusion criteria:
  - Rapid heart rate
  - Arrhythmias
  - Renal dysfunction
  - Contrast allergies



# Τι γίνεται με την ακτινοβολία;

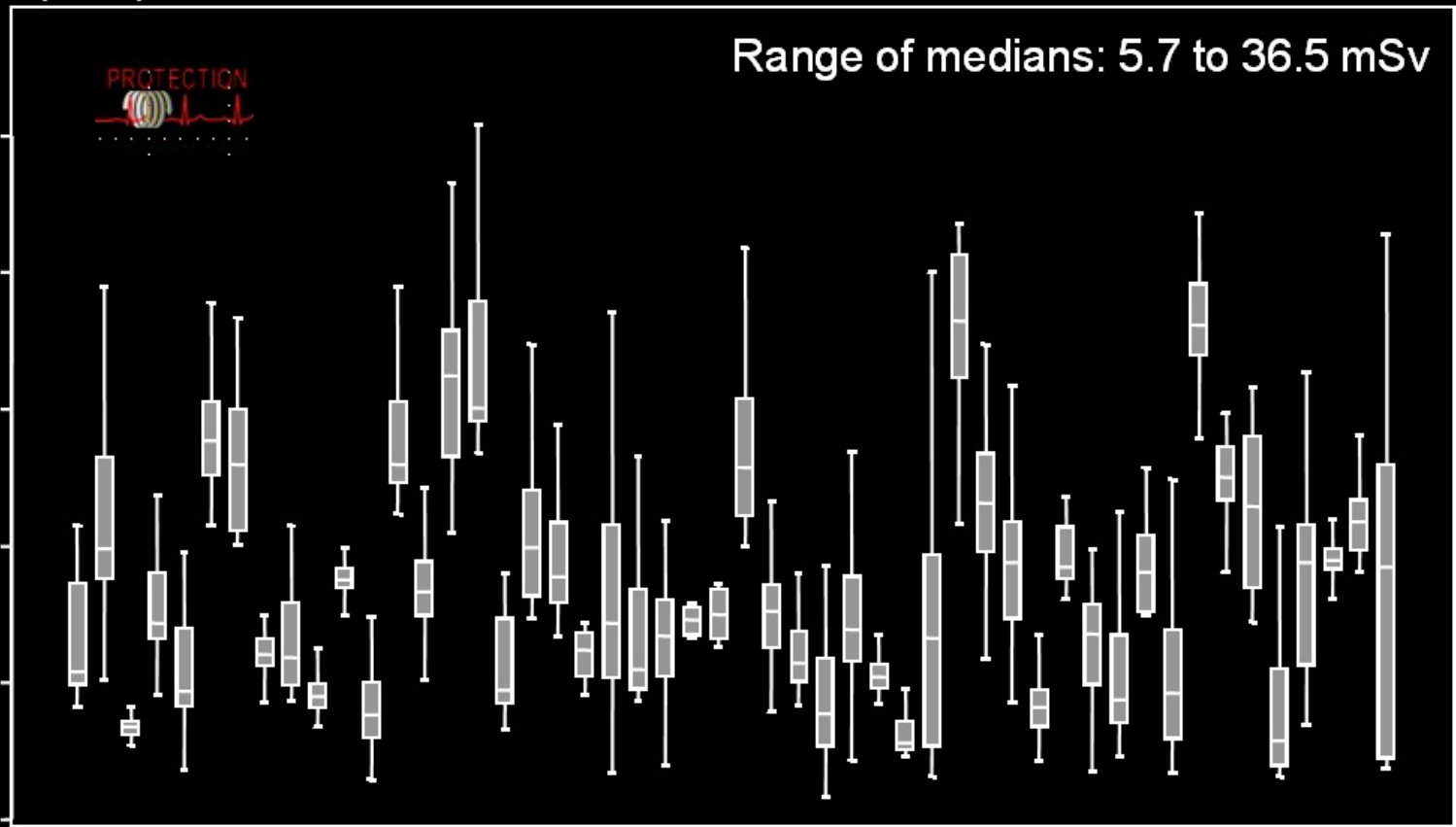
Dose (mSv)



Range of medians: 5.7 to 36.5 mSv

50  
40  
30  
20  
10  
0

Study sites



# Περιορισμοί

- Διαθεσιμότητα
- Εκπαίδευση
- Ζητήματα 'ιδιοκτησίας'

*The devil is in the details*

The final issue has nothing to do with imaging or risk, but with "ownership." Radiologists have long been the primary readers of CT studies, particularly in the ED setting. On the other hand, coronary angiography is almost universally the province of the cardiologist. Computed tomographic coronary angiography has been rapidly adopted by radiologists, cardiologists, and even nuclear medicine specialists (some of whom are nonradiologists and non-cardiologists). This overlap has created some contentious battles regarding control of this technology, particularly with respect to credentialing and billing.

# Ιδέες-Λύσεις;

**Table 1** Performance characteristics of the automated algorithm for detection of significant (50% or more) stenosis compared with conventional coronary angiography on a per-vessel and per-patient basis

|             |     | Performance characteristics of the automated algorithm |             |          |      |      |
|-------------|-----|--------------------------------------------------------|-------------|----------|------|------|
|             |     | Sensitivity                                            | Specificity | Accuracy | PPV  | NPV  |
| Per vessel  | LM  | 0.33                                                   | 0.93        | 0.90     | 0.20 | 0.96 |
|             | LAD | 0.94                                                   | 0.90        | 0.92     | 0.81 | 0.97 |
|             | LCx | 0.43                                                   | 0.85        | 0.80     | 0.27 | 0.92 |
|             | RCA | 0.70                                                   | 0.65        | 0.66     | 0.29 | 0.91 |
| Per patient |     | 1.00                                                   | 0.65        | 0.76     | 0.58 | 1.00 |

*PPV* positive predictive value, *NPV* negative predictive value

***Automated computer-aided stenosis detection  
at coronary CT angiography: initial experience***

***Eur Radiol***

# Συμπέρασμα

- Η χρήση της MSCT στα ΤΕΠ βοηθά στην έγκαιρη και αποτελεσματική διερεύνηση του ΘΠ σε ασθενείς χαμηλού και μέσου κινδύνου , με ακρίβεια και μικρότερο κόστος σε σύγκριση με την συμβατική προσέγγιση
- Χρειάζονται περαιτέρω μελέτες που να επιβεβαιώνουν το όφελος και κυρίως προσπάθειες για δραστική μείωση της έκθεσης σε ακτινοβολία

Σας ευχαριστώ πολύ

