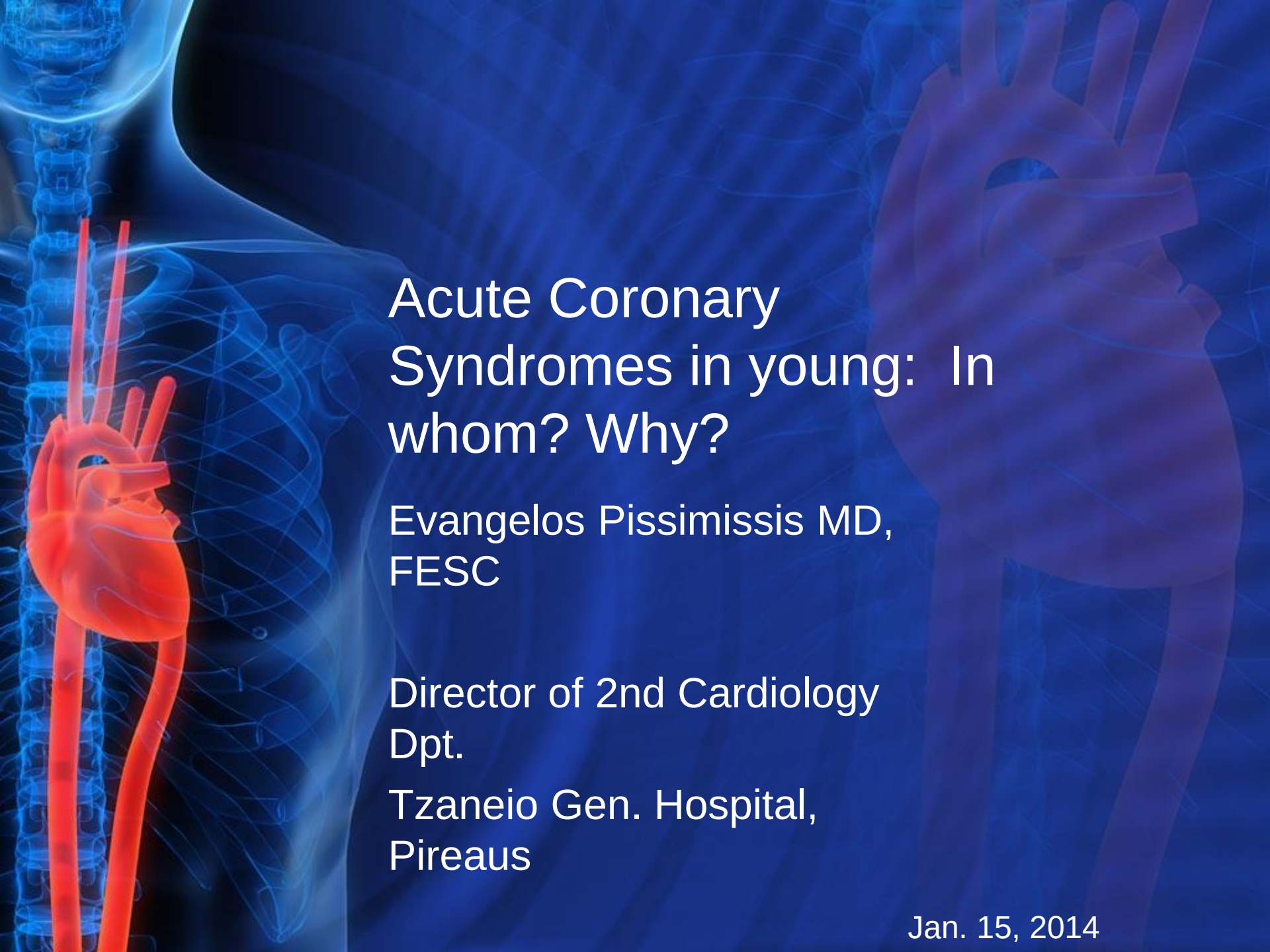


Acute Coronary Syndromes in young: In whom? Why?

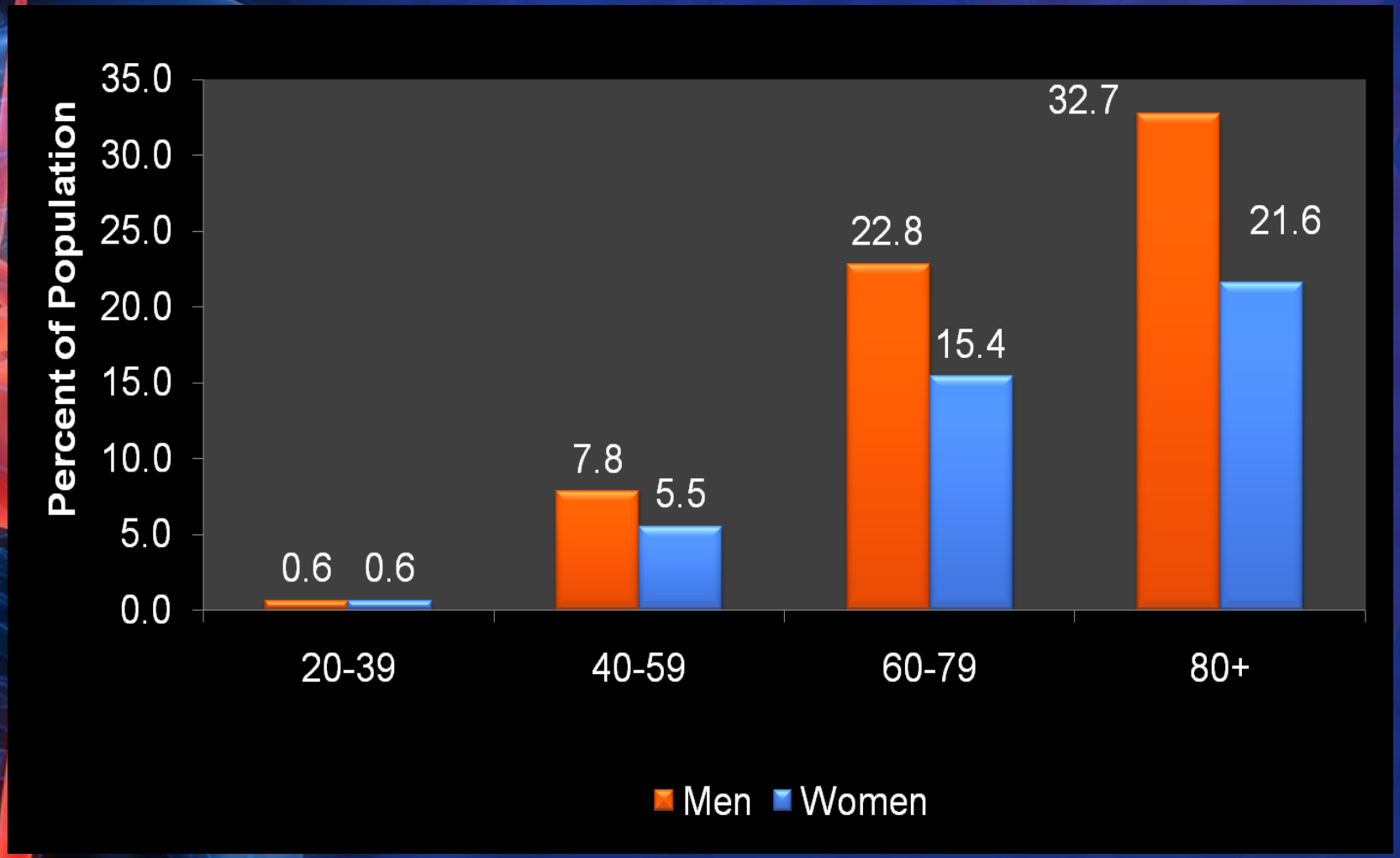
Evangelos Pissimissis MD, FESC

Director of 2nd Cardiology Dpt.

Tzaneio Gen. Hospital, Pireaus

Jan. 15, 2014

Prevalence of Coronary Heart Disease by Age and Sex in the U.S. from 1999-2004



REF: Rosamond W, et al. *Circulation 2007;115:e69-171.*

BACKGROUND

- Acute coronary syndrome (ACS) is rarely encountered in young adults and may have unusual causes [Thrombophilia,Kawasaki]

- Data on incidence, risk factors and clinical outcome of ACS in this particular subset are limited.

- On currently available evidence, young patients represent 0,4% - 19% of all ACS cases, depending on the cut-off age used (<45-35-30 years)

Coronary Risk Factors Measured in Childhood and Young Adult Life Are Associated With Coronary Artery Calcification in Young Adults: The Muscatine Study

LARRY T. MAHONEY, MD, FACC, TRUDY L. BURNS, PHD, WILLIAM STANFORD, MD, FACC, BRAD H. THOMPSON, MD, JOHN D. WITT, CATHERINE A. ROST, RONALD M. LAUER, MD, FACC

Iowa City, Iowa

JACC Vol. 27, No. 2
February 1996:277–84

- 197 men, 187 women
- coronary risk factors measured 3 times (mean age 15, 27,33.)
- Electron beam computed tomography for CAC.

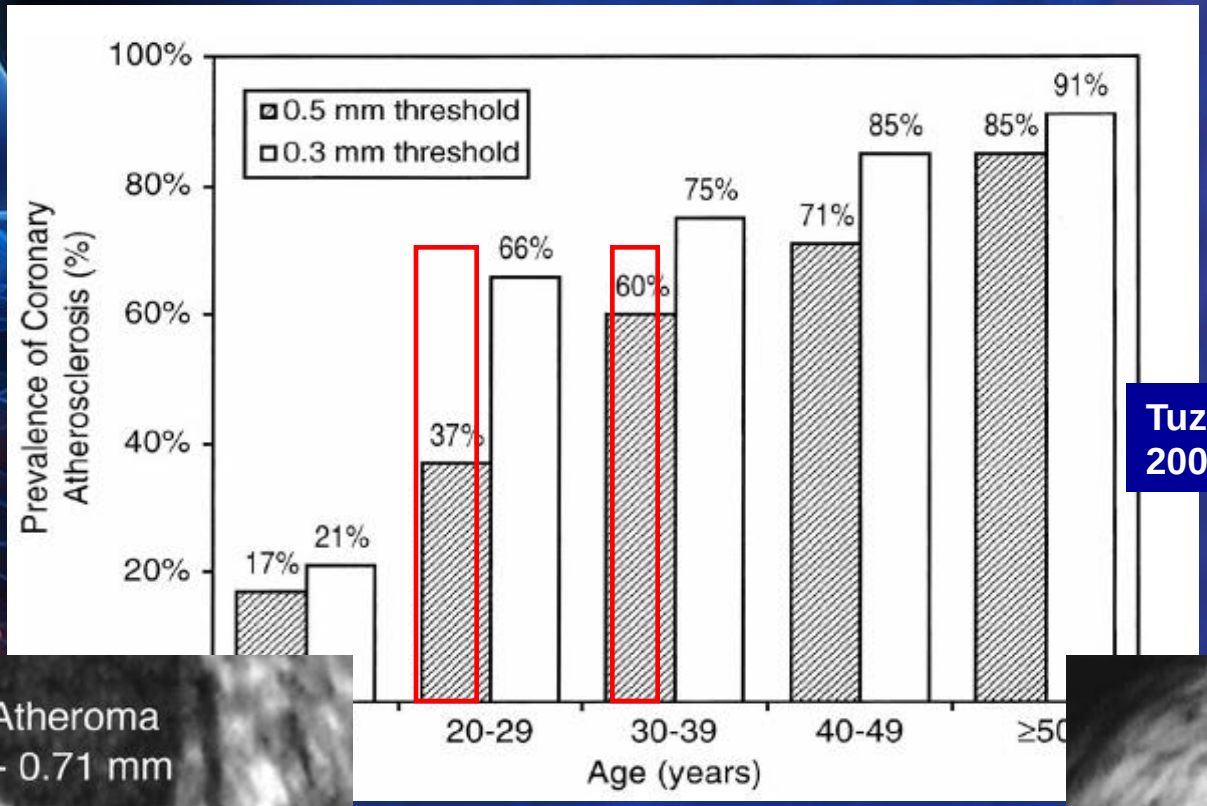
Table 4. Risk of Coronary Artery Calcification From Stepwise Multiple Logistic Regression Analysis of Coronary Risk Factors*

	Odds Ratio (95% CI)
Childhood	
Weight	3.0 (1.3–6.7)
Young adult	
DBP	4.2 (1.9–9.6)
BMI	5.3 (2.2–13.0)
Total chol/HDL ratio	4.3 (1.7–10.7)
Most recent	
SBP	6.5 (2.6–16.5)
BMI	6.1 (2.4–15.1)
LDL	3.1 (1.3–7.6)
HDL	5.5 (2.0–15.2)

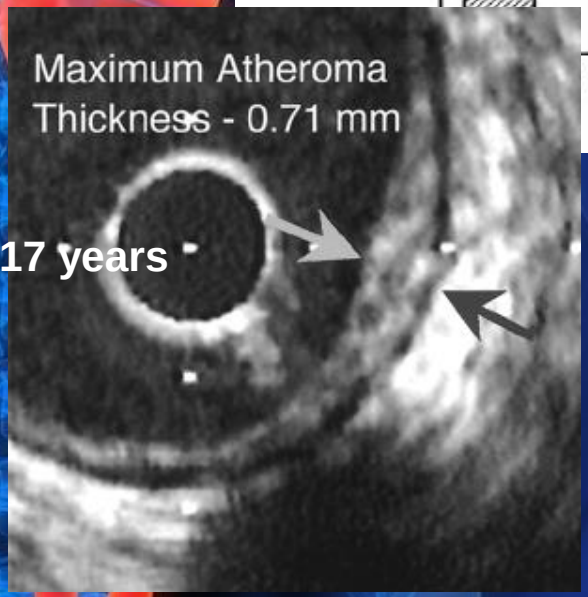
Coronary artery calcification
31% in men and 19% in women

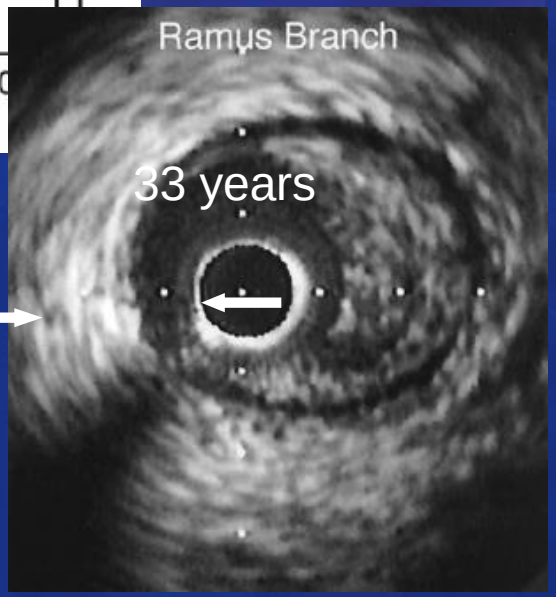
*Adjusted for age group and gender; highest decile (lowest for high density lipoprotein [HDL]) versus other nine deciles. CI = confidence interval; other abbreviations as in Table 1.

Cardiac Transplantation[n=262]-IVUS Study

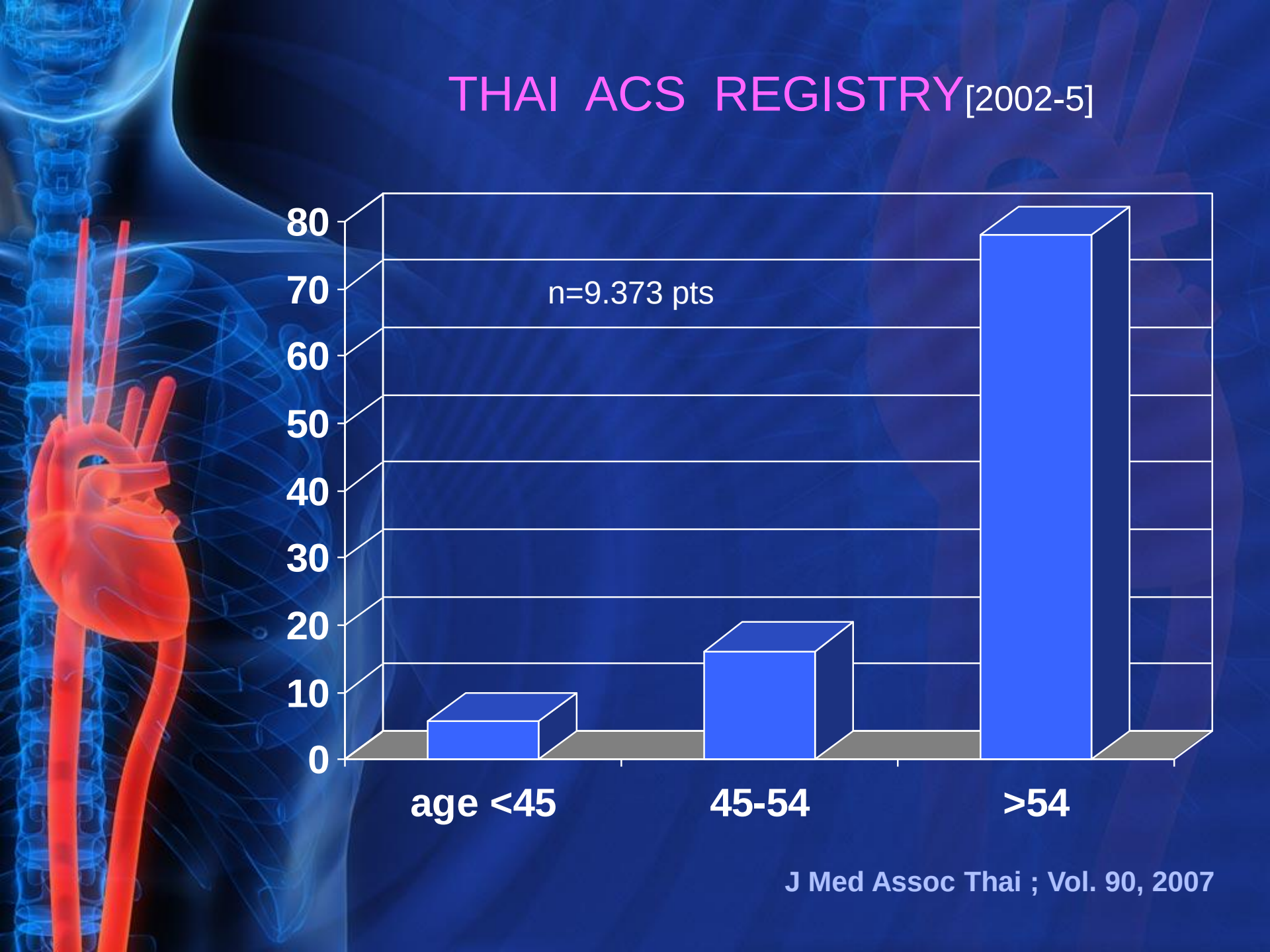


Tuzcu EM. Circulation 2001;103:2705



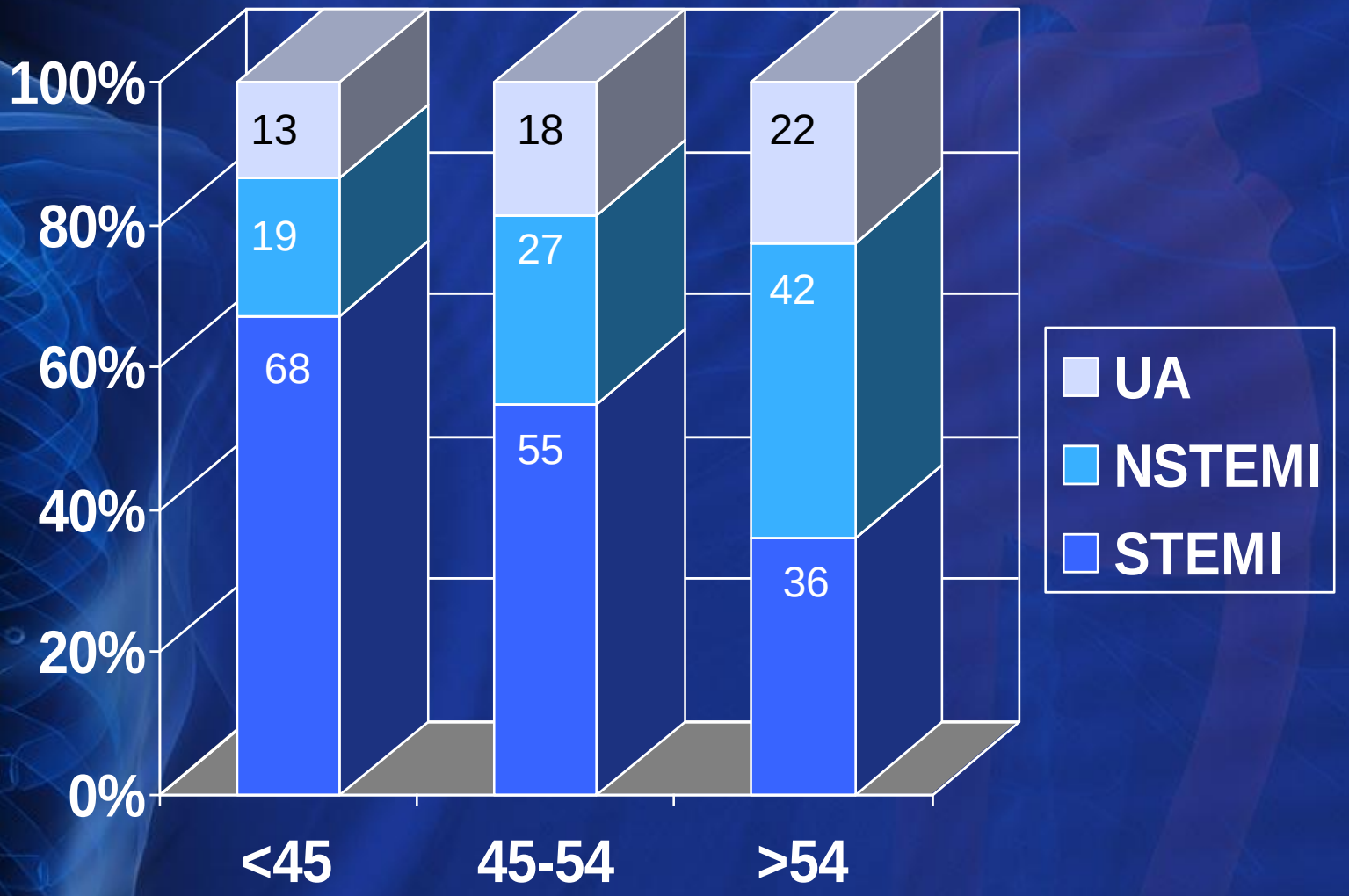


THAI ACS REGISTRY[2002-5]



J Med Assoc Thai ; Vol. 90, 2007

THAI ACS REGISTRY



J Med Assoc Thai Vol. 90, 2007

THAI ACS REGISTRY

1. RISK FACTORS ACCORDING TO AGE GROUP

	<45y n=544, n(%)	45-54y n=1,518, n(%)	> 54y n=7,311, n(%)	p
MALE	85.3	75.5	54.6	<0.001
DIAB	22.0	38.3	47.1	<0.001
HP	30.5	51.1	69.1	<0.001
DYSLIP	77.4	77.0	74.9	0.123
SMOKE	65.9	50.3	25.6	<0.001
FH	23.6	17.5	8.9	<0.001

2. PRESENTING SYMPTOMS ACCORDING TO AGE GROUP

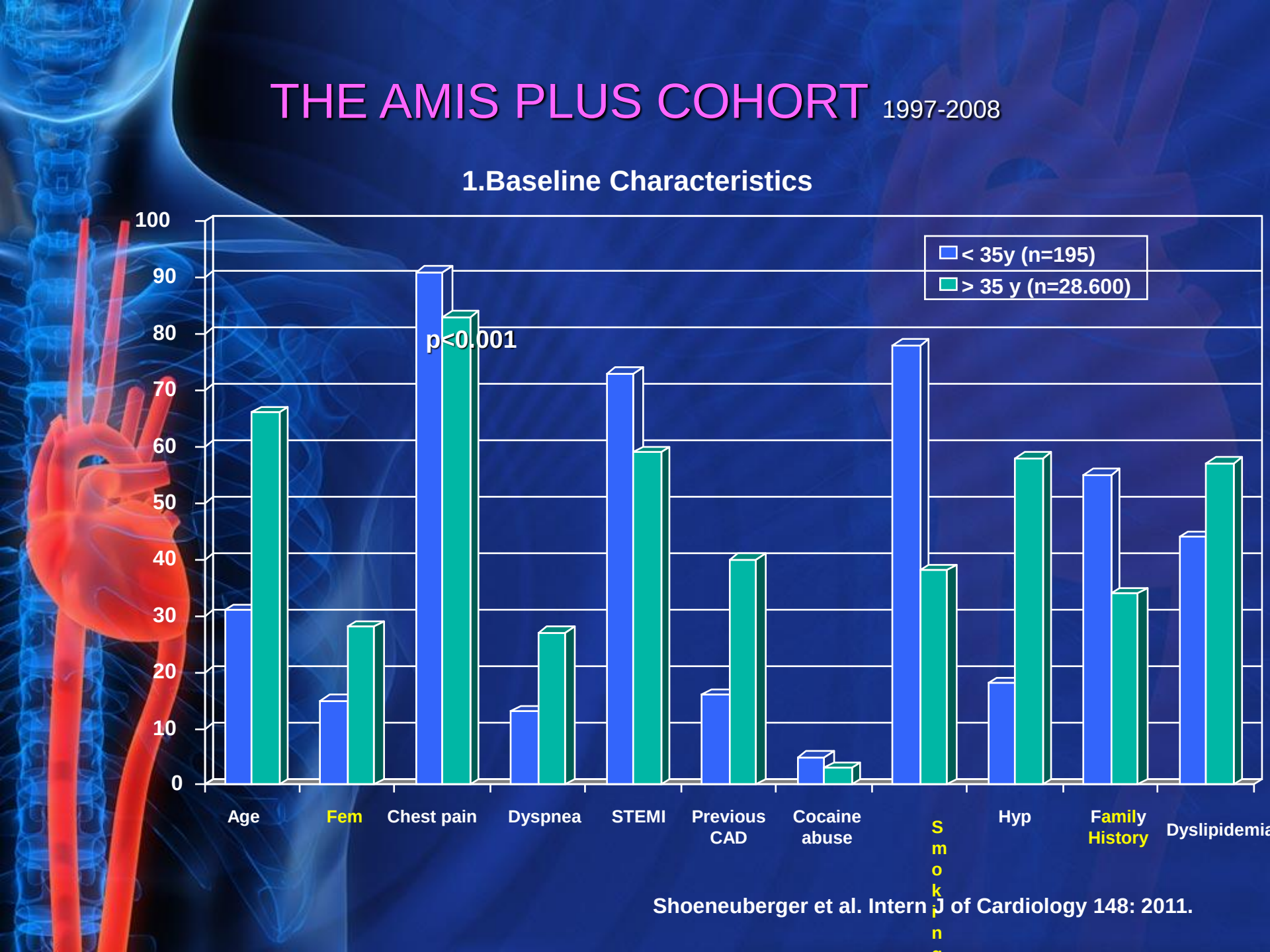
Symptoms	<45y n=544, n(%)	45-54y n=1,518, n(%)	> 54y n=7,311, n(%)	p
Typical angina	86.3	85.9	76.5	<0.001
Atypical angina	9.0	10.1	13.6	<0.001
Chest pain	95.4	95.5	89.2	<0.001
Dyspnea	14.2	18.9	34.5	<0.001
Cardiogenic shock	7.5	8.6	9.6	0.182
Cardiac arrest	6.3	5.3	3.8	0.002
Syncope	4.4	6.3	5.2	0.297

3.IN-HOSPITAL OUTCOME

Outcome	<45y n=544, n(%)	45-54y n=1,518, n(%)	> 54y n=7,311, n(%)	p
Congestive heart failure	25.6	33.0	49.1	<0.001
Cardiogenic shock (killip 4)	9.2	11.2	17.6	<0.001
Major bleeding	2.6	4.3	6.5	<0.001
Death	7.4	7.2	14.1	<0.001
Length of stay (day)	5.0	3.6:9.8	4.0:12.8	<0.001

THE AMIS PLUS COHORT 1997-2008

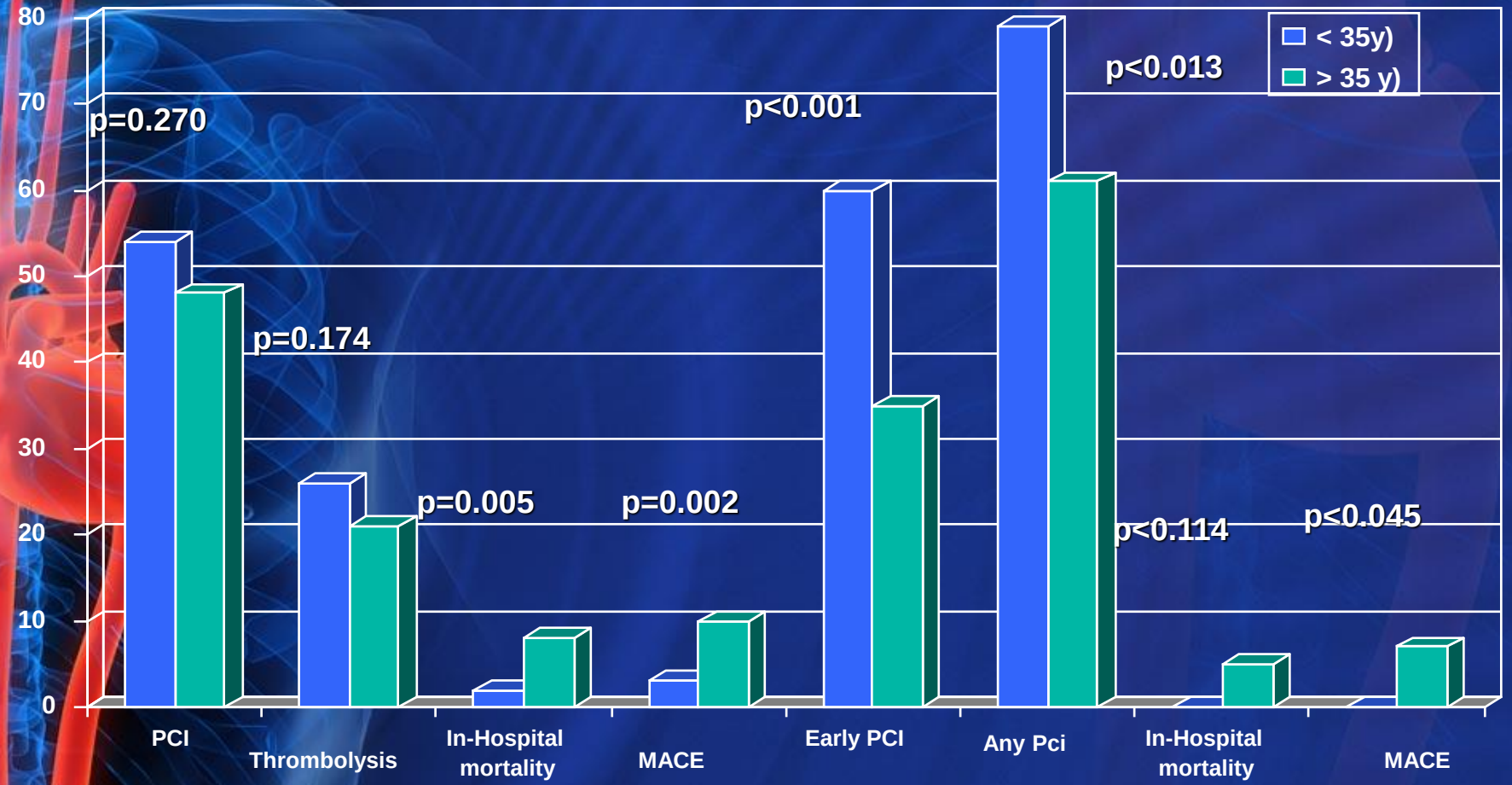
1.Baseline Characteristics



Shoeneuberger et al. Intern J of Cardiology 148: 2011.

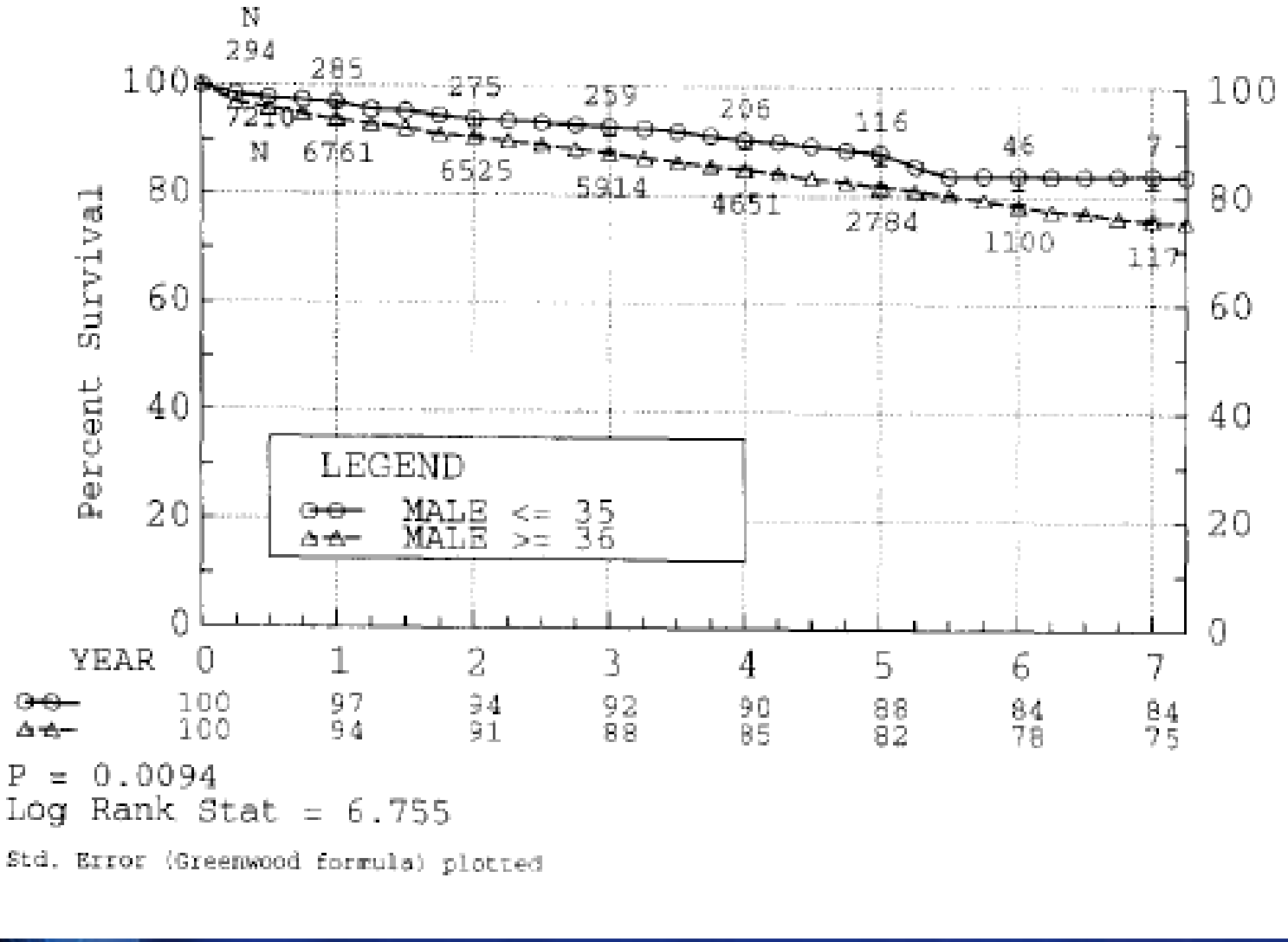
THE AMIS PLUS COHORT

2.Treatment and outcome

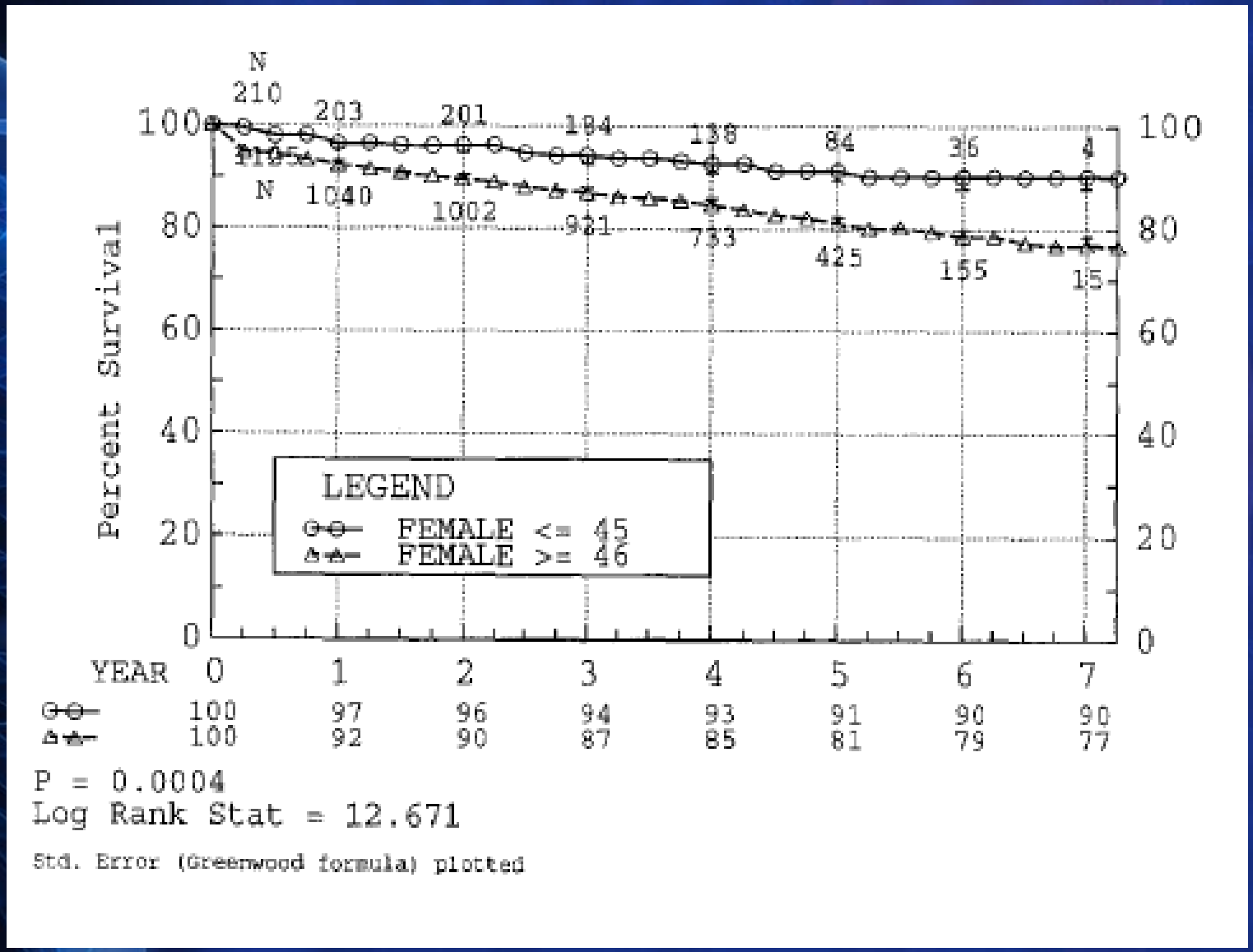


Shoeneuberger et al. Inter J of Cardiology 148: 2011.

CASS Study: Seven-year survival curve of younger versus older men after MI.[84% vs 75%]



CASS Registry: Seven-year survival curve of younger versus older women**[90% vs 77%]**

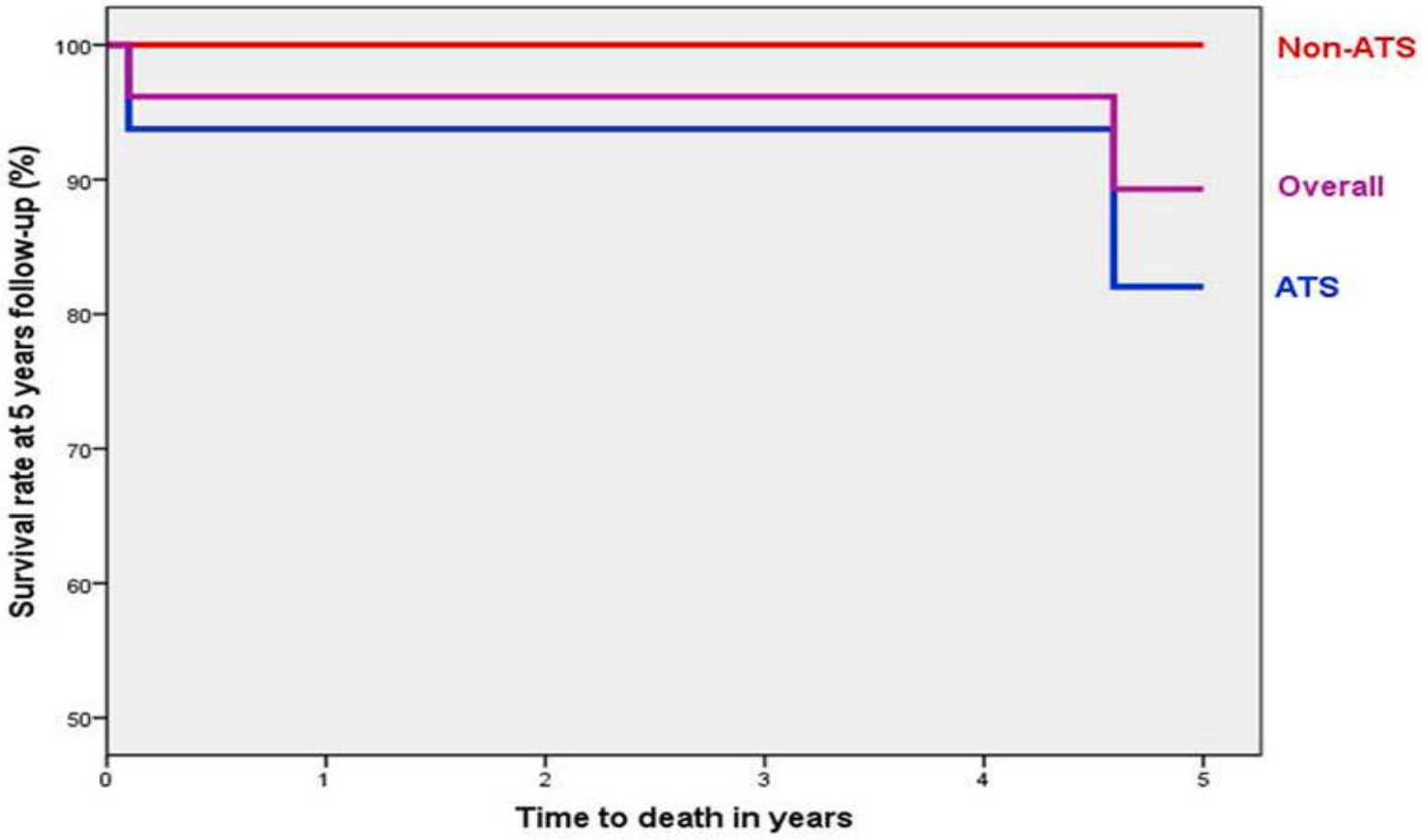


PATHOGENESIS

The causes for MI among patients aged less than 45 can be divided into four groups:

- Atheromatous CHD
- Non-atheromatous CHD
- Hypercoagulable states
- MI related to substance misuse

Survival in 100 pts< 30 years with ACS



Myocardial Infarction in Patients younger than 30 years, Puricel et al.

Puricel S. Swess Med Weekly: 29 July 2013;143

I. ATHEROMATOUS CAD

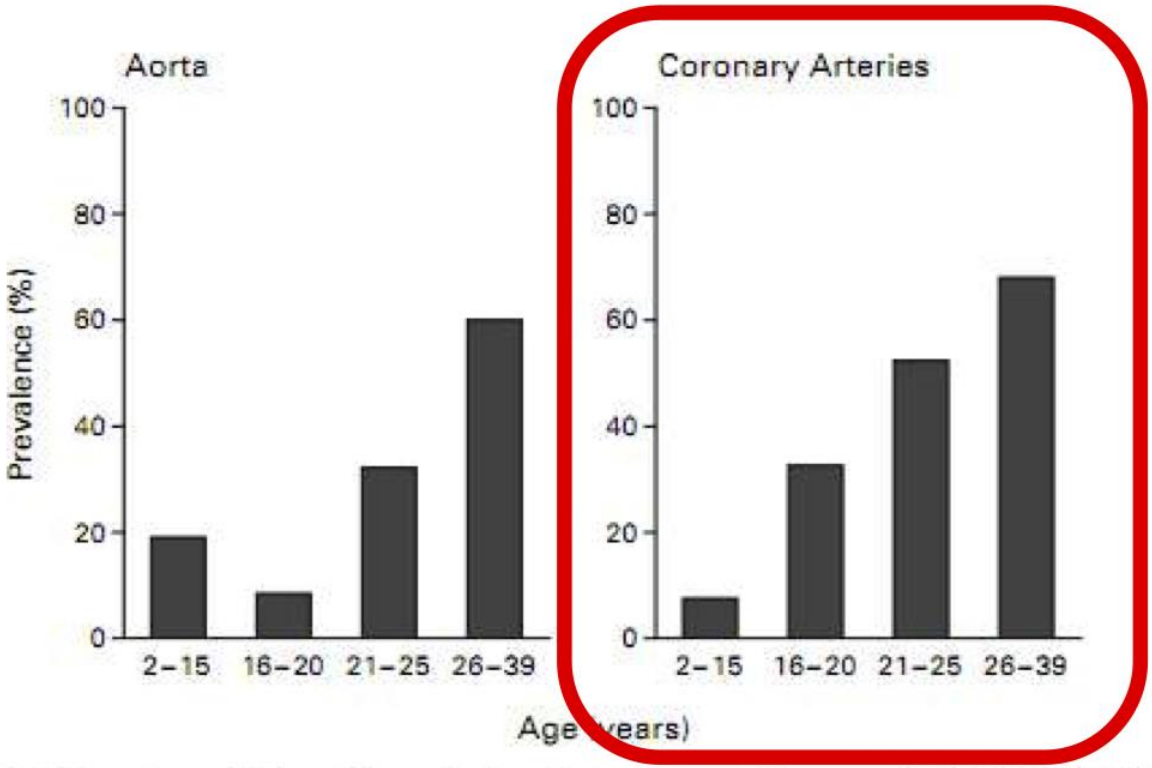
- The atheromatous process starts in early childhood. In a necropsy study of 760 young adult patients who died of various causes, advanced CHD was found in **20% of men and 8% of women aged 30- 34 yrs** .

- The pathological determinants of atherosclerosis in youth (PDAY) study and Bogalusa heart study also reflect similar trends.

ASSOCIATION BETWEEN MULTIPLE CARDIOVASCULAR RISK FACTORS AND ATHEROSCLEROSIS IN CHILDREN AND YOUNG ADULTS

for the Bogalusa Heart Study

The NEW ENGLAND JOURNAL of MEDICINE



Autopsies on 204 young persons 2 to 39 years of age, who had died from various causes, principally trauma

Figure 1. The Prevalence of Fibrous-Plaque Lesions in the Aorta and Coronary Arteries in 204 Children and Young Adults, According to Age.

There is a consistent trend toward a greater prevalence of coronary-artery lesions with increasing age ($P=0.001$).

Gerald S. Berenson et al. N Engl J Med 1998; 338:1650-1656J

ASSOCIATION BETWEEN MULTIPLE CARDIOVASCULAR RISK FACTORS AND ATHEROSCLEROSIS IN CHILDREN AND YOUNG ADULTS

for the Bogalusa Heart Study

The NEW ENGLAND JOURNAL of MEDICINE

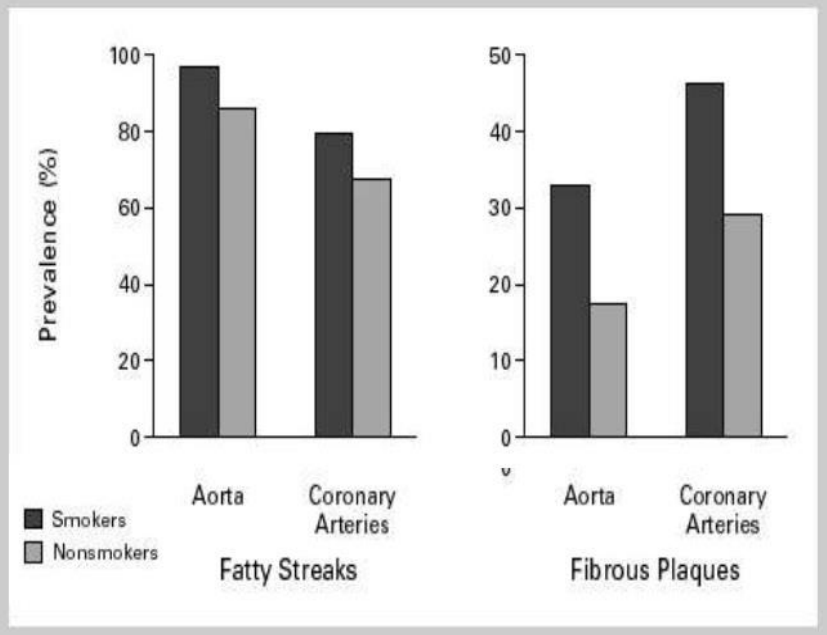
Autopsies on 204 young persons 2 to 39 years of age, who had died from various causes, principally trauma

TABLE 1. CORRELATION BETWEEN THE EXTENT OF LESIONS IN THE AORTA AND CORONARY ARTERIES AND ANTEMORTEM RISK-FACTOR VARIABLES.*

RISK-FACTOR VARIABLE	AORTA		CORONARY ARTERIES	
	FATTY STREAKS	FIBROUS PLAQUES	FATTY STREAKS	FIBROUS PLAQUES
Body-mass index	0.33†	0.24‡	0.41§	0.29†
Systolic blood pressure	0.31†	0.17	0.47§	0.41§
Diastolic blood pressure	0.14	0.10	0.18	0.24‡
Total cholesterol	0.54§	0.15	0.26‡	0.23
LDL cholesterol	0.54§	0.16	0.29‡	0.32†
HDL cholesterol	−0.03	0.05	−0.14	−0.12
Triglycerides	0.23	0.26‡	0.32†	0.37†

*Values shown are Spearman correlation coefficients. In this analysis, we used average z scores for risk factors in subgroups, defined by age, race, and sex, of all participants in the cross-sectional surveys. Although there was a total of 93 participants, because of missing data, the numbers used varied from 65 to 86, depending on the variables.

†P<0.01.
‡P<0.05.
§P<0.001.

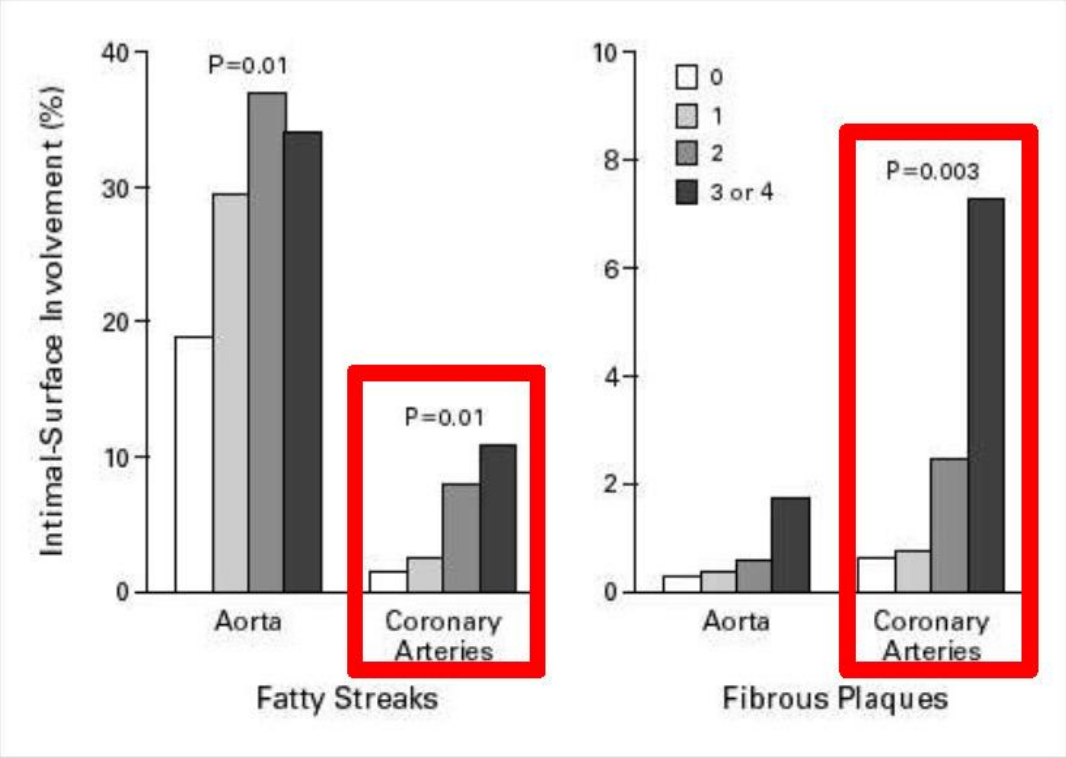


Gerald S. Berenson et al. N Engl J Med 1998; 338:1650-1656J

ASSOCIATION BETWEEN MULTIPLE CARDIOVASCULAR RISK FACTORS AND ATHEROSCLEROSIS IN CHILDREN AND YOUNG ADULTS

for the Bogalusa Heart Study

The NEW ENGLAND JOURNAL of MEDICINE



Gerald S. Berenson et al. N Engl J Med 1998; 338:1650-1656J

Figure 3. The Effect of Multiple Risk Factors on the Extent of Atherosclerosis in the Aorta and Coronary Arteries in Children and Young Adults.

Values shown are the percentages of the intimal surface covered with lesions in subjects with 0, 1, 2, and 3 or 4 risk factors. Risk factors were elevated values for body-mass index, systolic blood pressure, and serum triglyceride and LDL cholesterol concentrations, defined as values above the 75th percentile for the study group (specific for study period, race, sex, and age). There were 52 subjects with no risk factors, 20 with one, 14 with two, and 7 with three or four. The P value is based on the analysis of trend. A marked increase in the percentage of the intimal surface covered by fibrous plaques is evident in the coronary vessels of subjects with multiple risk factors.

Autopsies on 204 young persons 2 to 39 years of age, who had died from various causes, principally trauma

Association of Coronary Heart Disease Risk Factors With Microscopic Qualities of Coronary Atherosclerosis in Youth–PDAY study

Table 1. Risk Factors, Samples, Analyses, Classification, and Prevalence in the PDAY Study

Risk Factor	Sample	Analysis	Classification	Prevalence, %
High non-HDL cholesterol	Serum	Total cholesterol minus HDL cholesterol	≥4.14 mmol/L (≥160 mg/dL)	28.0
Low HDL cholesterol	Serum	Cholesterol after precipitation of apo B lipoproteins	<0.91 mmol/L (<35 mg/dL)	18.7
Smoking	Serum	Thiocyanate	≥90 μg/L	44.0
Hypertension	Renal arteries	Intimal thickness and algorithm to estimate mean arterial pressure	≥110 mm Hg	15.5
Obesity	Measured at autopsy	BMI=weight (kg)/height $(m)^2$	≥30 kg/m^2	14.3
Impaired glucose tolerance	Red blood cells	% Glycohemoglobin	≥8%	4.3

BMI indicates body mass index.

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION
American Heart Association. Learn and Live.

Henry C. McGill et al. for the Pathobiological Determinants of Atherosclerosis in Youth (PDAY) Research Group
Circulation. 2000;102:374-379

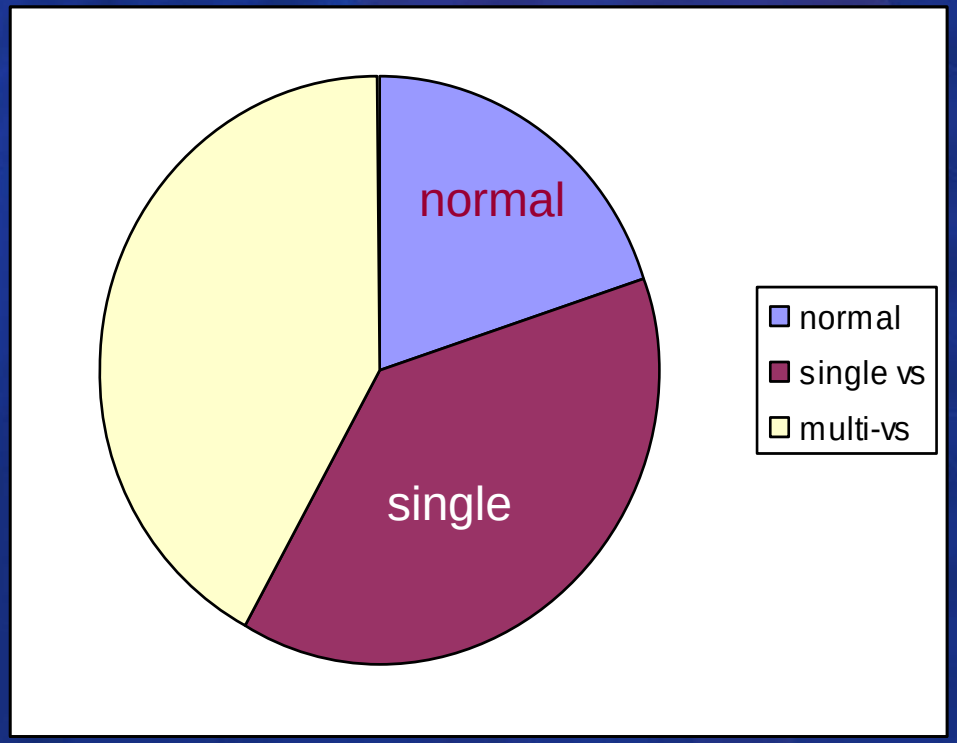
Pathobiological Determinants of Atherosclerosis in Youth (PDAY study)

Table 2. Multivariable-Adjusted Odds Ratios for Associations Between Risk Factors and Target Lesions

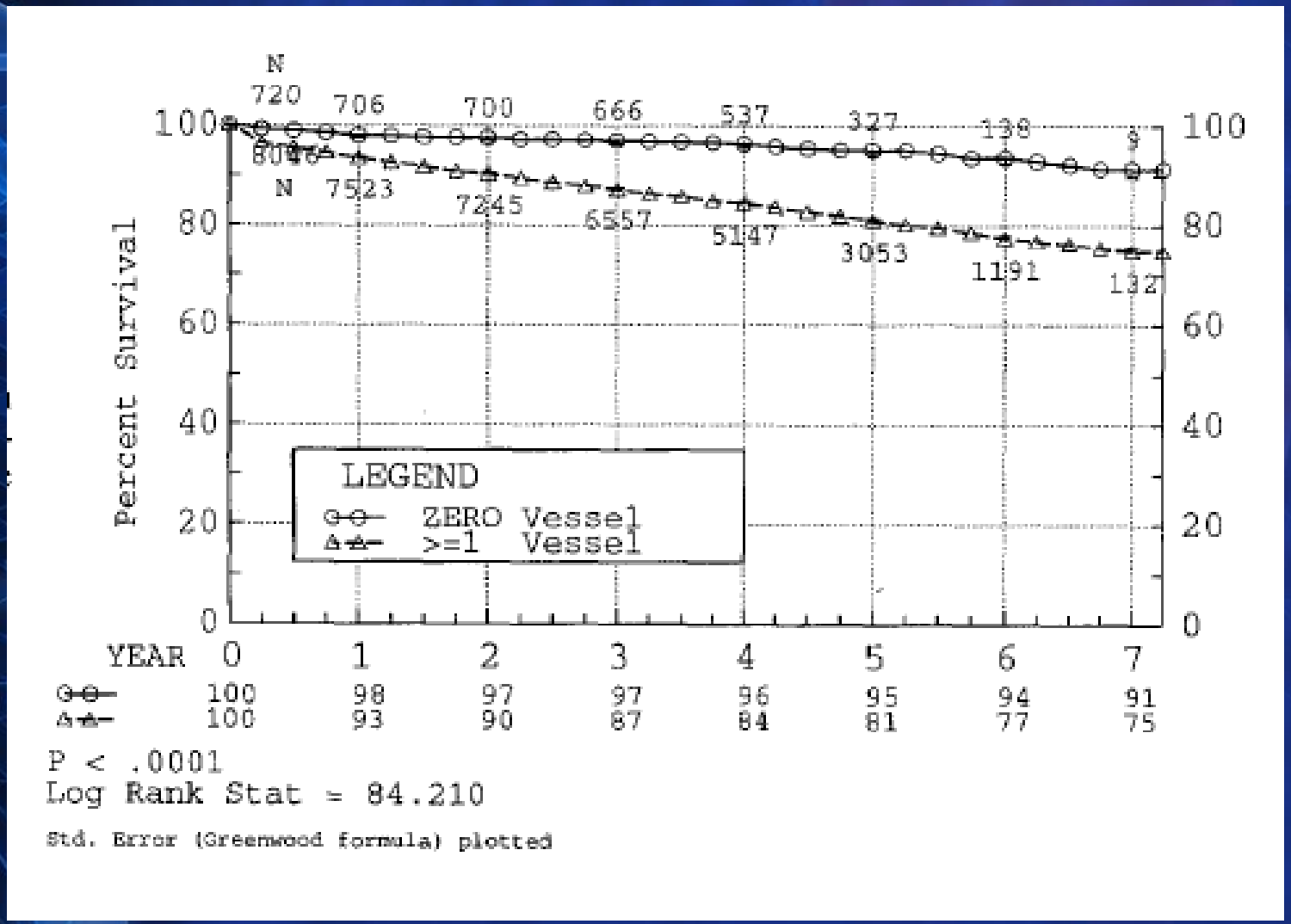
Risk Factor	Odds Ratio (95% CI)	
	Coronary Arteries	Abdominal Aorta
Age (5 y)	2.25 (1.76-2.86)	3.63 (2.58-5.12)
Female sex	0.80 (0.44-1.45)	1.61 (0.99-2.64)
Non-HDL cholesterol	1.41 (1.21-1.65)	1.23 (1.04-1.45)
HDL cholesterol	0.80 (0.61-1.05)	1.05 (0.77-1.41)
Smoking	1.26 (0.81-1.95)	2.93 (1.74-4.96)
Hypertension	1.91 (1.11-3.26)	1.93 (1.13-3.28)
Obesity		
Men	2.36 (1.31-4.24)	0.89 (0.41-1.92)
Women	0.91 (0.28-2.98)	0.89 (0.41-1.92)
Hyperglycemia	2.57 (1.10-6.00)	2.28 (0.91-5.70)

I. ATHEROMATOUS CAD
Angiographic findings

- Significantly differed in patients <45 years.
- Increased prevalence of normal coronary arteries (up to 18%) and minor coronary abnormalities in the CASS study.
- Single vessel disease was found in 38% of subjects.



CASS Registry: Seven-year survival curve of patients with zero-vessel disease (normal coronary arteries and nonobstructive narrowing) versus those with obstructive coronary disease.



I. ATHEROMATOUS CAD Smoking

- The aetiology of atheromatous CHD was linked to the conventional risk factors as in adults. Among young patients with reported atheromatous process, cigarette smoking was found in up to 92%.
- In a study of patients who had PCI, the prevalence of smoking was found to be higher in patients < 40 years as compared with patients over 60 years (58.7% and 43%, p<0.01).

Why Target Youth?

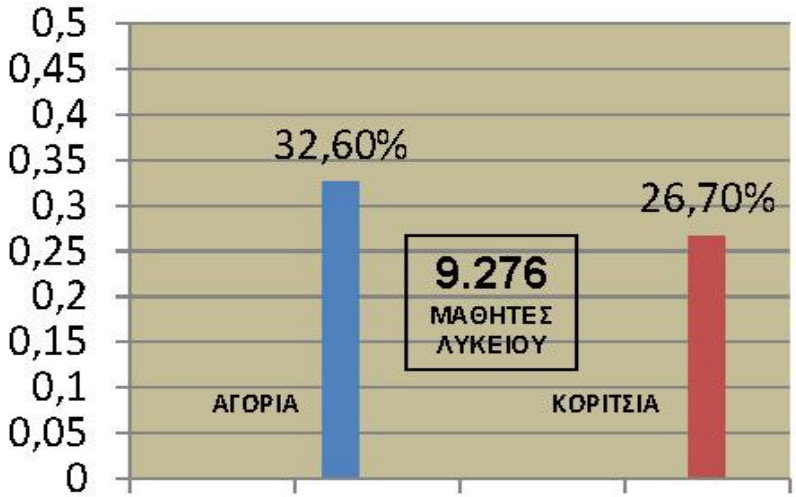
80% of adult smokers started smoking before they finished high school

Source: U.S. DHHS. Surgeon General's Report: Preventing Tobacco Use Among Young People, 1994

Prevalence and Risk Factors for Initiation of Smoking in Greek High-School Students

Lazaros T. Sichletidis *, Diamantis A. Chloros, Anastasios I. Tsiotsios and Dionisios G. Spyratos

Int. J. Environ. Res. Public Health **2009**, *6*, 971-979;



Abstract: The smoking habits of 9,276 high-school students (15-18 years old) in six cities of Northern Greece were studied using a questionnaire in order to determine the prevalence and possible risk factors for initiation of smoking. We observed that 29.6% of high-school students (32.6% of boys and 26.7% of girls) were current smokers. A percentage of 43.3% had started smoking before the age of 14. Reactive behaviour towards parents' and teachers' advice (40.2%) and the existence of smoking friends (40.1%) were the main reasons of initiation. A well-planned integrated anti-smoking campaign is urgently required, especially among students and teachers.

I. ATHEROMATOUS CAD
Family History of CAD

- In a study done in London among young patients with MI, positive family history of premature CHD was found in 39%.
- The children born of parents with premature CHD have more lipid abnormalities, insulin resistance, and obesity strengthening the belief of a common genetic linkage.
-
- These people tend to have more arterial abnormalities than the rest of the patients who had MI < 45 years .

European Journal of
Cardiovascular Prevention
& Rehabilitation

Parental history of stroke and myocardial infarction predicts coronary artery calcification: The Coronary Artery Risk Development in Young Adults (CARDIA) study

M. Fornage, D Lopez et al.

Abstract

Background Few studies have examined the relationship between parental history of stroke and myocardial infarction (MI) and subclinical atherosclerosis, especially among young, asymptomatic individuals. This study investigates the association between coronary artery calcification (CAC) and parental history of stroke and MI in African-Americans and Caucasians from the CARDIA study.

Methods Parental history of stroke and MI was determined by self-administered family history questionnaire at baseline and Year 5 examinations. Presence of coronary calcification was determined by computed tomography on 3041 individuals, age 32 to 47, including 1375 African-Americans and 1666 Caucasians. Analyses were restricted

Parental history of MI is associated with a two-fold greater risk of CAC in Caucasians (95% CI = 1.38–2.92).

AC in
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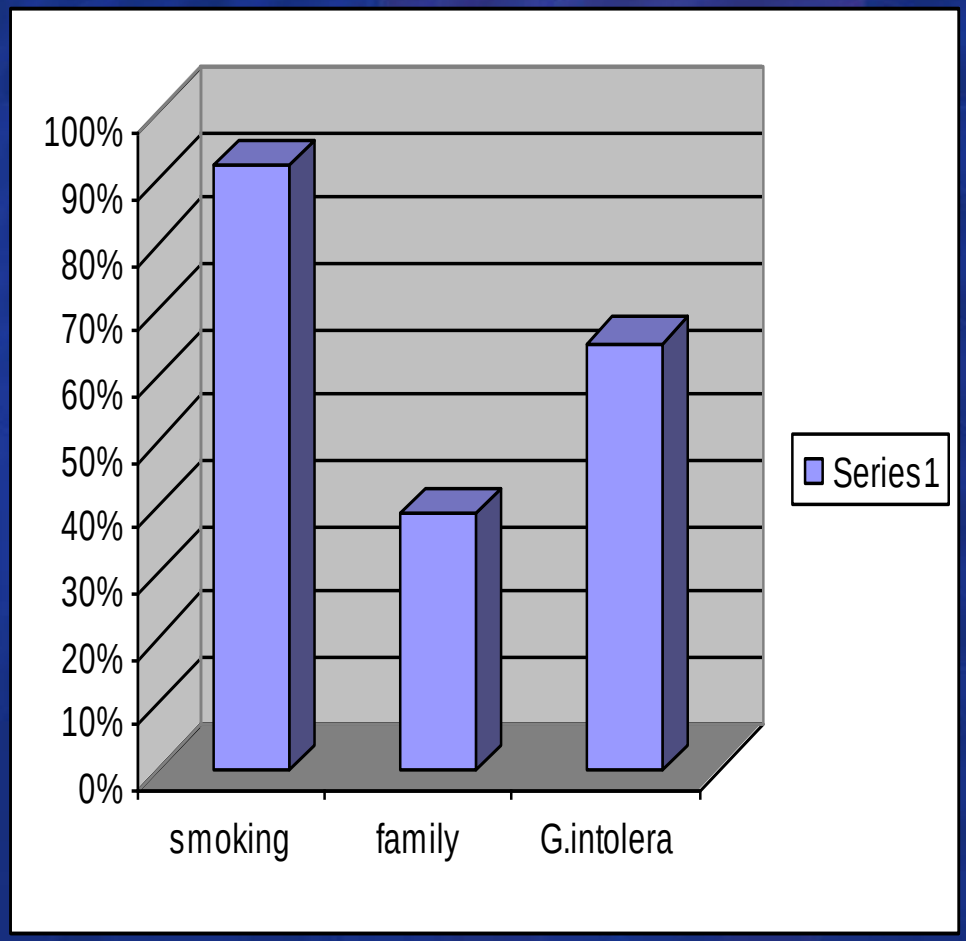
longer statistically significant after adjusting for known CHD risk factors.

Conclusions The identification of individuals with a parental history of stroke and MI provides important information for clinicians by which to target primary prevention efforts. Further characterization of familial factors, especially genetic factors, contributing to increased risk of CAC will shed light on the basis of the observed associations.

I. ATHEROMATOUS CAD
Lipid abnormalities

- Especially hyper-triglyceridaemia and low HDL were found to be more common in patients who had their MI <45 years. Apart from overt diabetes, impaired glucose tolerance was found in 65% of young survivors after MI



Annals of Internal Medicine 2010; 153:137-146

ARTICLE

Nonoptimal Lipids Commonly Present in Young Adults and Coronary Calcium Later in Life: The CARDIA (Coronary Artery Risk Development in Young Adults) Study

Mark J. Pletcher, MD, MPH; Kirsten Bibbins-Domingo, PhD, MD; Kiang Liu, PhD; Steve Sidney, MD, MPH; Feng Lin, MS; Eric Vittinghoff, PhD; and Stephen B. Hulley, MD, MPH

Background: Dyslipidemia causes coronary heart disease in middle-aged and elderly adults, but the consequences of lipid exposure during young adulthood are unclear.

Objective: To assess whether nonoptimal lipid levels during young adulthood cause atherosclerotic changes that persist into middle age.

Design: Prospective cohort study.

Setting: 4 cities in the United States.

Participants: 3258 participants from the 5115 black and white men and women recruited at age 18 to 30 years in 1985 to 1986 for the CARDIA (Coronary Artery Risk Development in Young Adults) study.

Measurements: Low-density lipoprotein (LDL) and high-density lipoprotein (HDL) cholesterol, triglycerides, and coronary calcium. Time-averaged cumulative exposures to lipids between age 20 and 35 years were estimated by using repeated serum lipid measurements over 20 years in the CARDIA study; these measurements were then related to coronary calcium scores assessed later in life (45 years [SD, 4]).

Results: 2824 participants (87%) had nonoptimal levels of LDL cholesterol (≥2.59 mmol/L [≥100 mg/dL]), HDL cholesterol (<1.55 mmol/L [<60 mg/dL]), or triglycerides (≥1.70 mmol/L [≥150 mg/dL]) during young adulthood. Coronary calcium prevalence 2 decades later was 8% in participants who maintained optimal LDL levels (<1.81 mmol/L [<70 mg/dL]), and 44% in participants with LDL cholesterol levels of 4.14 mmol/L (160 mg/dL) or greater ($P < 0.001$). The association was similar across race and sex and strongly graded, with odds ratios for coronary calcium of 1.5 (95% CI, 0.7 to 3.3) for LDL cholesterol levels of 1.81 to 2.56 mmol/L (70 to 99 mg/dL), 2.4 (CI, 1.1 to 5.3) for levels of 2.59 to 3.34 mmol/L (100 to 129 mg/dL), 3.3 (CI, 1.3 to 7.8) for levels of 3.37 to 4.12 mmol/L (130 to 159 mg/dL), and 5.6 (CI, 2.0 to 16) for levels of 4.14 mmol/L (160 mg/dL) or greater, compared with levels less than 1.81 mmol/L (<70 mg/dL), after adjustment for lipid exposure after age 35 years and other coronary risk factors. Both LDL and HDL cholesterol levels were independently associated with coronary calcium after participants who were receiving lipid-lowering medications or had clinically abnormal lipid levels were excluded.

Limitation: Coronary calcium, although a strong predictor of future coronary heart disease, is not a clinical outcome.

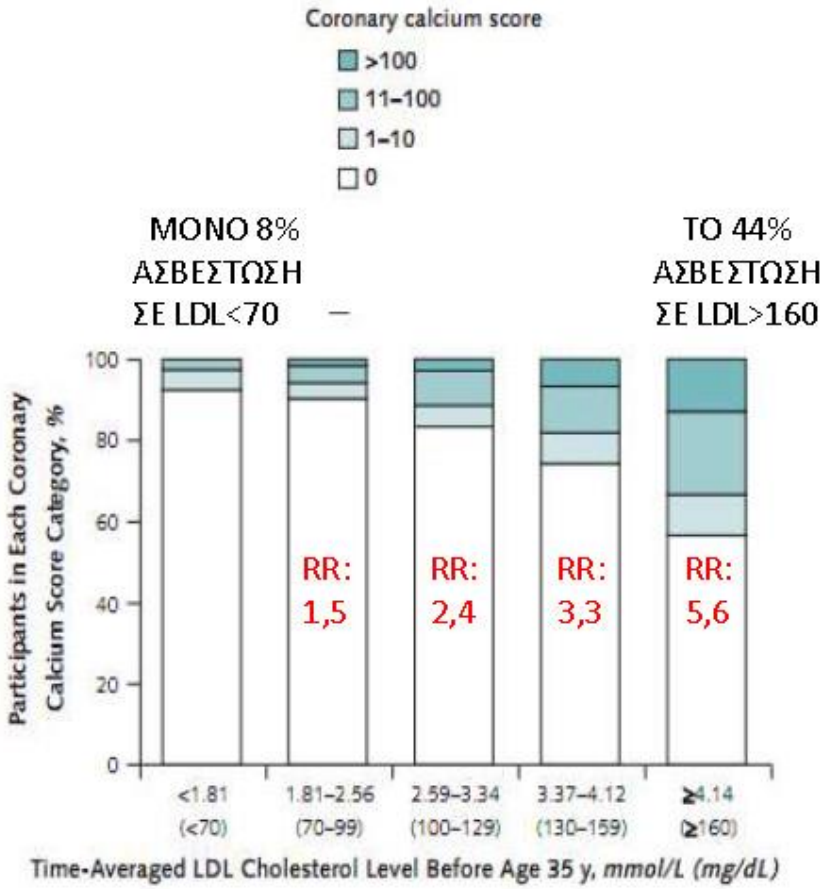
Conclusion: Nonoptimal levels of LDL and HDL cholesterol during young adulthood are independently associated with coronary atherosclerosis 2 decades later.

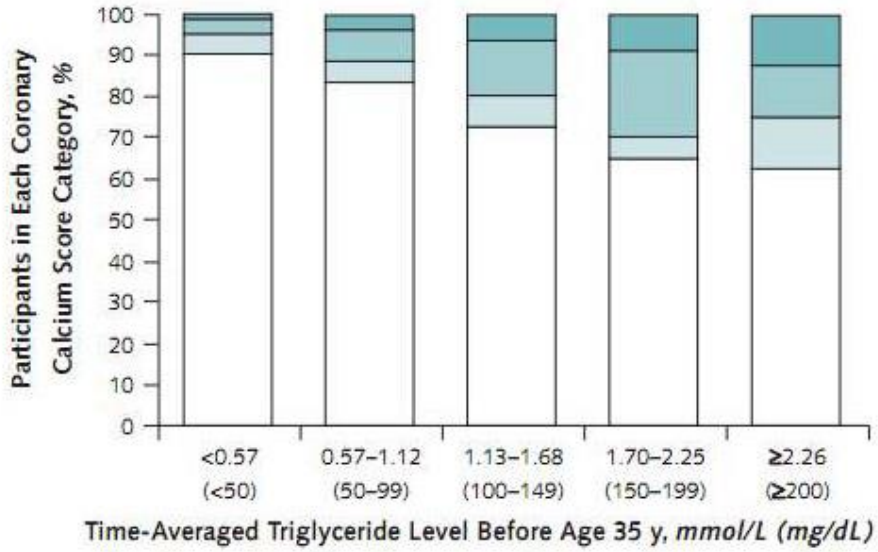
Primary Funding Source: National Heart, Lung, and Blood Institute.

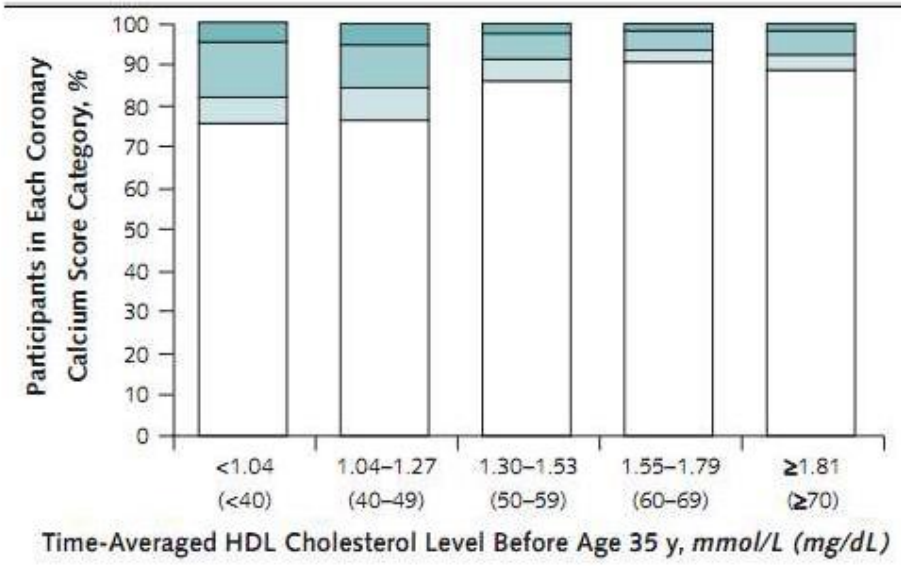
For author affiliations, see end of text.

Nonoptimal levels of LDL chol. (≥100mg/dL), HDL chol. (<60 mg/dL), or triglycerides ≥150mg/dL were found in **87%** of young adults in the study

Figure 1. Coronary calcium score distribution in middle age with increasing exposure to lipids before age 35 years.







Υπερχοληστερολαιμία απαντάται σε ποσοστό 74%

Table 1. Prevalence of major cardiovascular risk factors in young survivors of myocardial infarction and control subjects.

	Patients ($n=201$)	Controls ($n=140$)	p-Value
Age (years), mean ± SD	32.2±3.4	31.8±3.5	0.27
Males	176 (87.6%)	123 (87.9%)	0.94
Current smokers	188 (93.5%)	71 (50.8%)	<0.001
Hypercholesterolaemia	148 (73.6%)	60 (42.8%)	<0.001
Hypertension	24 (12%)	0 (0%)	<0.001
Diabetes mellitus	6 (3%)	0 (0%)	0.25

Χαμηλή HDLχολ (<40 mg/dl) απαντάται σε ποσοστό 52%

Rallidis L, et al. Biomarkers 2009;14:401-5.

I. ATHEROMATOUS CAD
Novel risk factors

- Conventional risk factors play a larger part in younger patients who had MI.
- Emergence of **novel risk factors** for CHD like hyperhomocysteinaemia and lipoprotein (a) among adults of different age group may have the same clinical implications in younger people.
- Premature CHD is a rapidly progressive form of atheromatous process.
- Entirely unexplored areas like anger and psychosocial stress can add a significant morbidity and were associated with MI and coronary artery calcification in young adults.

Ομοκυστεΐνη

Σχέση ομοκυστεΐνης και αθηροθρομβωτικής διεργασίας

- Φυσιολογικά κυμαίνονται από 5-15 μmol/l
- Ανεπαρκή δεδομένα για την εμπλοκή στην πρόκληση πρώιμης ΣΝ

(Ogawa M. Thromb Res 2003;109:253-8, Nikfardjam M. Thomb Res 2001;103:S35-9)

1) Δυσλειτουργία ενδοθηλίου μέσω ελάττωσης της παραγωγής του NO
2) Ευόδωση θρόμβωσης ενεργοποιώντας τα αιμοπετάλια και επίσης επάγοντας την παραγωγή του ιστικού παράγοντα
3) Επιτάχυνση οξείδωσης της LDL
4) Αύξηση οξειδωτικού stress

22% νεαρών εμφραγματιών έχει επίπεδα ομοκυστεΐνης >15 μmol/l [Ραλλιδης 2009]

II. NON-ATHEROMATOUS CAD
Congenital Coronary Abnormailties

- Can present for the first time as MI in young adults. rare and may be a surprise to the cardiologist
- **Myocardial bridging**, been reported in young people presenting with MI. can result in significant ischaemia during systolic contraction and can result in MI.
- PCI and surgical splitting were found to be more useful than medical management in this group of patients.

II. NON-ATHEROMATOUS CORONARY ABNORMALITIES

- **Coronary artery dissection** can occur spontaneously in young adults. The chest pain is often atypical and women are at a higher risk during their peripartum period.
-
- LAD was found to be the culprit artery in most of the cases.
- Unfortunately the diagnosis is often made at necropsy. Successful treatment with stenting or surgery has been reported.

II. NON-ATHEROMATOUS CORONARY ABNORMALITIES

- **Septic vegetation** from infected aortic valve was reported to have caused MI in younger people. Intravenous drug misusers are at a higher risk.

- MI has been reported to occur as a result of bacteraemia in the absence of vegetations in young people.Management entails treatment of the underlying source of sepsis as well.

- coronary artery aneurysms: rare cause of MI in younger adults the mechanism either attributable to embolisation from the aneurysmal sac or extra luminal compression.

- Paradoxical embolisation from right to left, through a patent foramen ovale, leading to MI has also been reported.

III. RECREATIONAL DRUG USE

- The diagnostic challenge in confirming MI is complicated by the increased prevalence of false positive creatinine kinase rise. Serious arrhythmias including ventricular tachycardia can occur in cocaine users in the absence of MI.Apart from MI, cocaine use has been associated with cardiomyopathy, tachyarrhythmias, and endocarditis.

- Amphetamine and marihuana use can result in MI but the data are limited. Binge drinking of alcohol has also been reported to be associated with developing MI in a young person, although the mechanism is not entirely clear.

III. RECREATIONAL DRUG USE

- **Cocaine** use is associated with various cardiac complications including MI. Among young patients admitted with non-traumatic chest pain in the ER, cocaine use was found to associate with the clinical presentation in 48%.
-
  - A detailed history is vital as cocaine effects can present **up to 76 hours after its use.** Most of the patients who misuse cocaine are also found to be smokers and this makes them more vulnerable for MI.

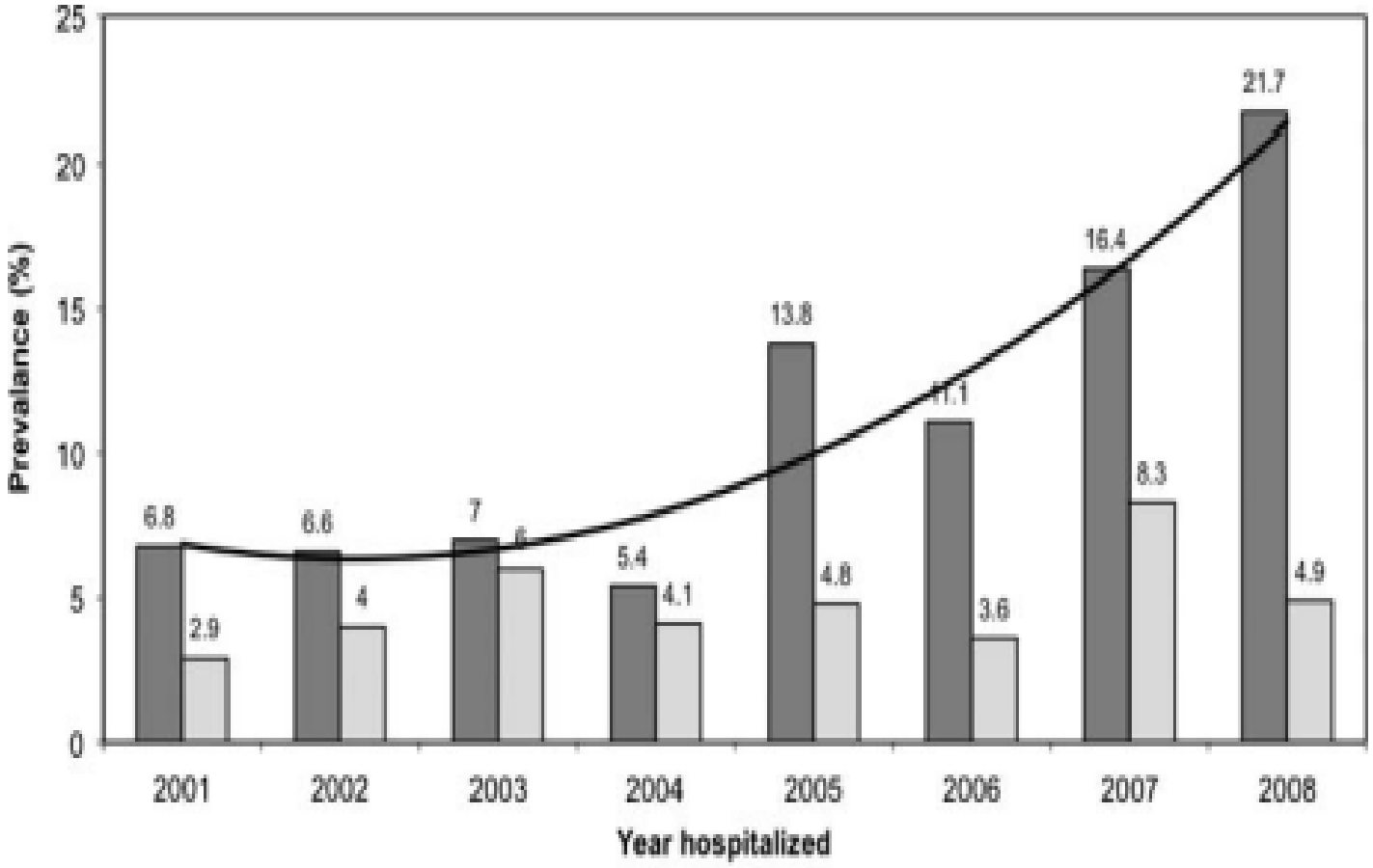
III. RECREATIONAL DRUG USE

- MI was diagnosed, based on an increase in cardiac troponins, in 6% of the people admitted to the emergency department after various complications after cocaine use.

- Cocaine use results in acute MI by various mechanisms including coronary vasospasm and hypercoagulability in the background of heightened sympathetic activity.Long term cocaine use also results in hastened atherosclerosis.

ACS AND COCAINE USE :

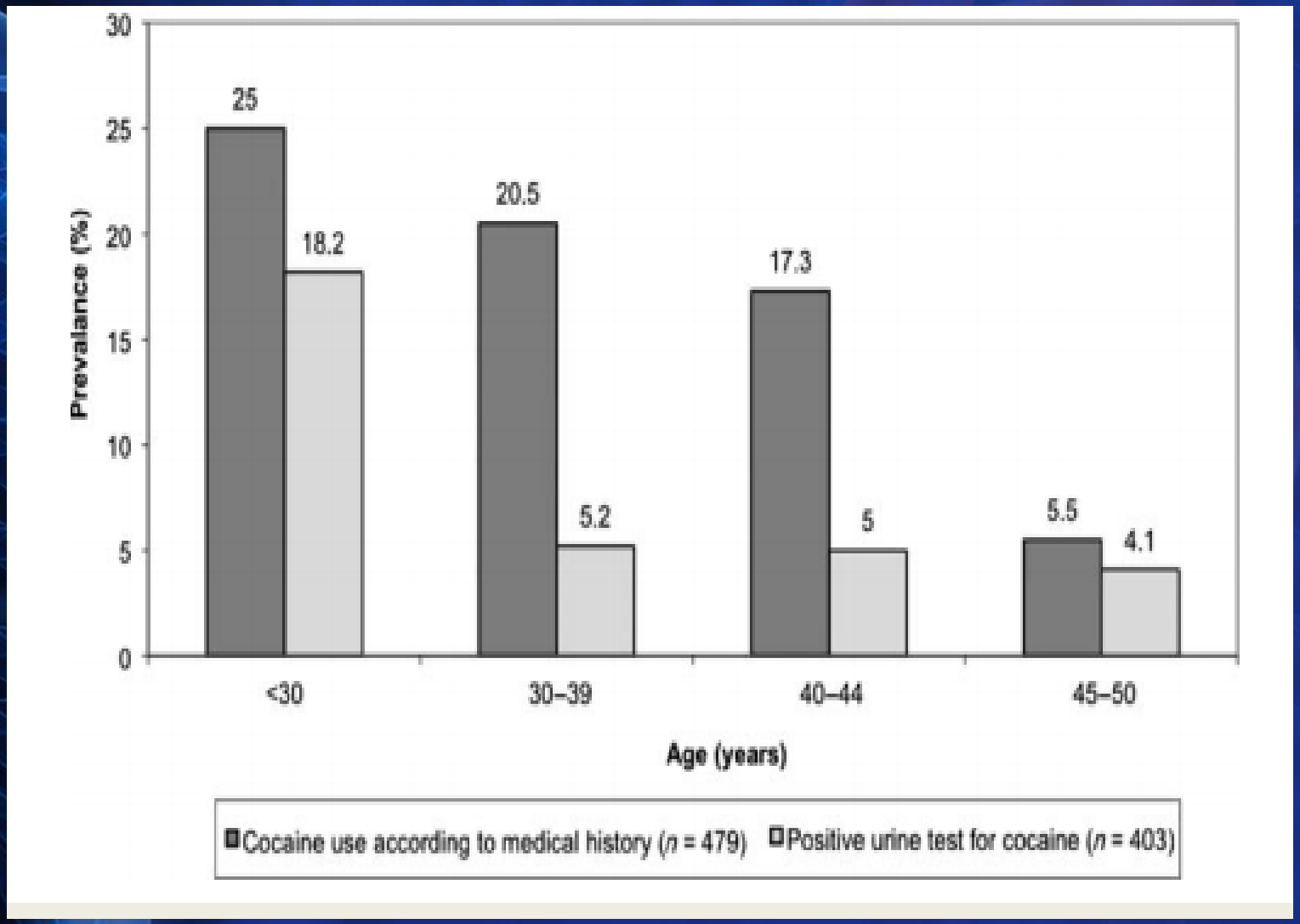
Annual Prevalence according to patient history and urine test



Carirllo X. Eur. Heart Journal; 2011,32

ACS AND COCAINE USE

Prevalence according to pt history and urine test by age group.



VI. HYPERCOAGULABLE STATES

- **Nephrotic syndrome** is associated with hypercoagulability attributable to the combination of various factors like disturbances of the fibrinolytic system, dyslipidaemia, and a decrease in anticoagulant factors. Reduction in concentration of antithrombin III, a coagulation inhibitor was particularly responsible for the thrombophilic tendency in most of the subjects.

- **Factor V Leiden** mutation is associated with a procoagulant state and has been reported to result in MI in young people; smokers are particularly at higher risk.Contraceptive pill use increases the risk of developing MI in young women because of its procoagulant activity.

Γενετικοί θρομβογόνοι πολυμορφισμοί σε νεαρούς εμφραγματίες

1) Πολυμορφισμός της μεθυλενοτετραϋδροφυλλικής αναγωγάσης 677C->T
2) Πολυμορφισμός G1691A του γονιδίου του παράγοντα V (παράγων V Leiden)
3) Πολυμορφισμός G20210A της προθρομβίνης

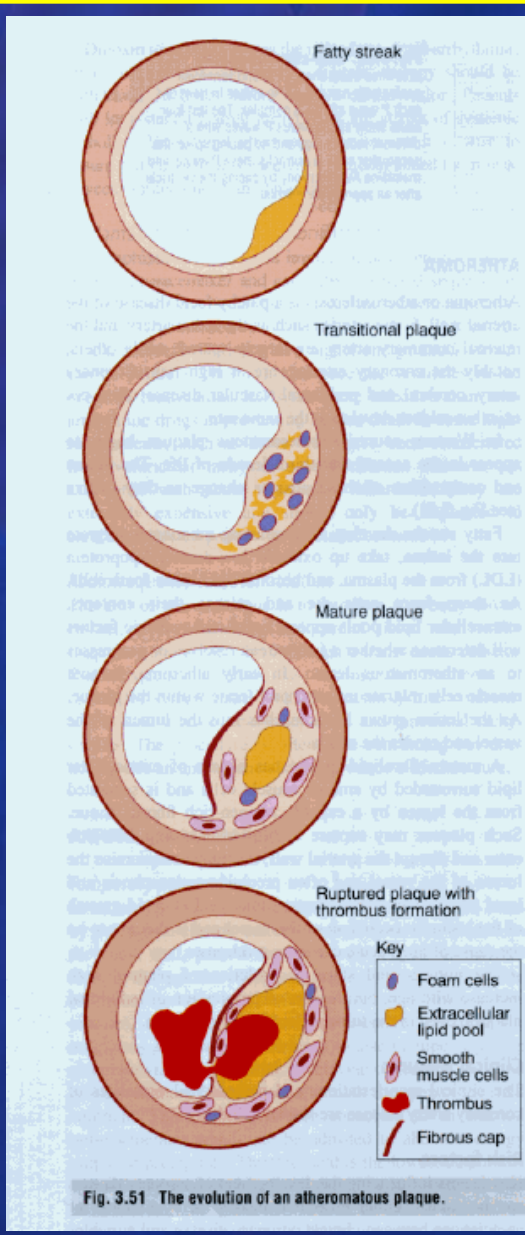


Fig. 3.51 The evolution of an atheromatous plaque.

Θρομβογόνοι πολυμορφισμοί σε 1210 άτομα με ΕΜ <45 ετών και 1210 μάρτυρες

TABLE 2. Gene Polymorphisms and the Risk of Developing Myocardial Infarction: Genotype Frequencies in Cases and Controls, Unadjusted and Adjusted ORs

Polymorphism	Cases, % (n=1210)	Controls, % (n=1210)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
G-455A β-fibrinogen gene				
0/0	60.5	61.5		
0/1	35.1	32.9	1.0 (0.9–1.1)	1.0 (0.8–1.2)
1/1	4.4	5.6		
G1691A factor V gene				
0/0	96.9	96.4	0.9 (0.5–1.3)	1.1 (0.6–2.1)
0/1	3.1	3.6		
G20210A prothrombin gene				
0/0	96.7	96.8		
0/1	3.3	3.1	1.0 (0.6–1.5)	1.0 (0.5–1.9)
1/1		0.1		
G10976A factor VII gene				
0/0	71.8	71.3		
0/1	26.5	26.9	1.0 (0.8–1.1)	1.0 (0.8–1.3)
1/1	1.7	1.8		

Circulation 2003;107:1117-22

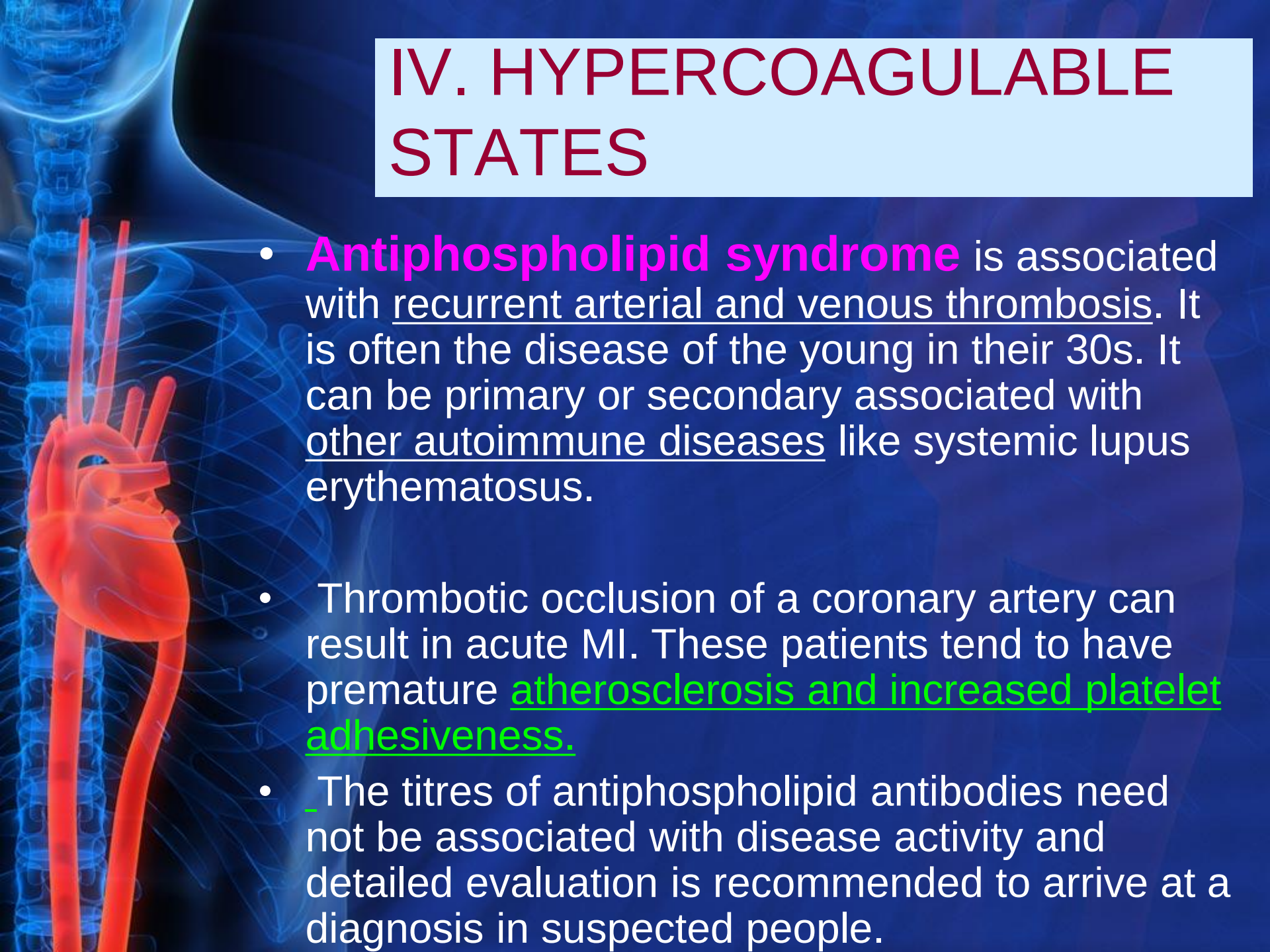
Θρομβογόνοι πολυμορφισμοί σε 70 άτομα με ΕΜ ≤35 ετών και 260 μάρτυρες

	patients n (%)	controls n (%)	OR	95% CI
Prothrombin gene 20210 genotype				
Normal GG	62 (88.6)	252 (96.9)		
Heterozygous GA	8 (11.4)	8 (3.1)	4	1.5-11.3
Homozygous AA	0	0		
Factor V gene 1691 genotype				
Normal GG	66 (94.3)	242 (93.1)		
Heterozygous GA	4 (5.7)	18 (6.9)	0.87	0.26-2.5
Homozygous AA	0	0		

Παράγων V Leiden δεν συνδέεται πρώιμο ΕΜ

Πολυμορφισμός G20210A της προθρομβίνης;

Rallidis L, et al. Thromb Haemost 2003;90:272-8



IV. HYPERCOAGULABLE STATES

- **Antiphospholipid syndrome** is associated with recurrent arterial and venous thrombosis. It is often the disease of the young in their 30s. It can be primary or secondary associated with other autoimmune diseases like systemic lupus erythematosus.

- Thrombotic occlusion of a coronary artery can result in acute MI. These patients tend to have premature atherosclerosis and increased platelet adhesiveness.
- The titres of antiphospholipid antibodies need not be associated with disease activity and detailed evaluation is recommended to arrive at a diagnosis in suspected people.

Αντιφωσφολιπιδικό σύνδρομο

1) Αυτοάνοσο νόσημα που συνδέεται με αγγειακές θρομβώσεις και αυξημένη νοσηρότητα κατά την εγκυμοσύνη
2) Θέσεις αρτηριακών θρομβώσεων (εγκεφαλικές >στεφανιαίες αρτ)

Διαγνωστικά κριτήρια (οριστική ≥1 κλινικό + ≥1 εργαστηριακό)

Κλινικά:

- Αγγειακές θρομβώσεις: αρτηριακές, φλεβικές ή μικρών αγγείων
- Αυξημένη νοσηρότητα κατά την εγκυμοσύνη: απώλεια ≥1 εμβρύων < ή >10η εβδομάδα, πρόωρος τοκετός <34η εβδομάδα συνεπεία εκλαμψίας ή σοβαρής προεκλαμψίας, ≥3 αυτόματες αποβολές <10η εβδομάδα εγκυμοσύνης

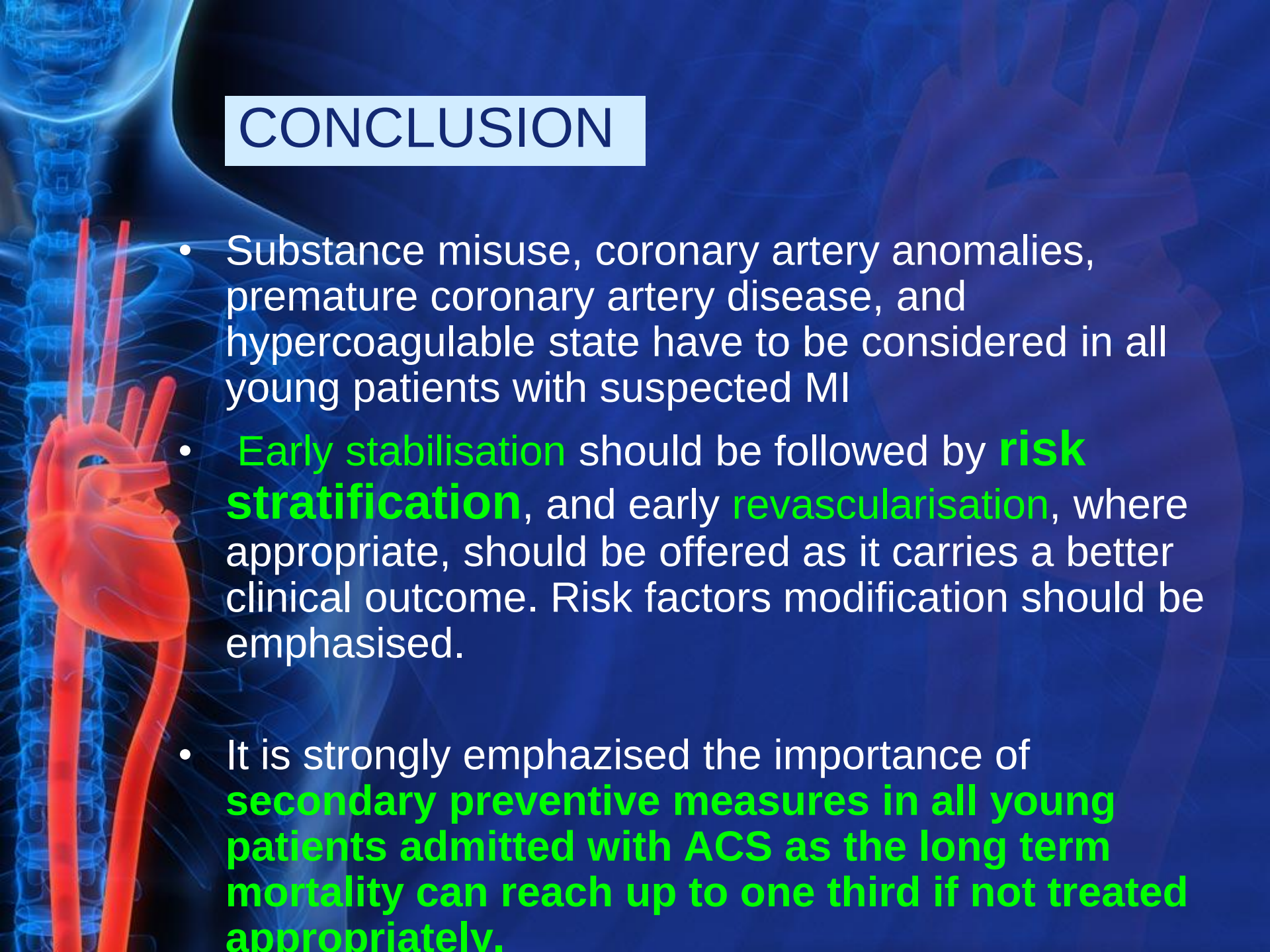
Εργαστηριακά (τουλάχιστον 2 προσδιορισμοί, απόσταση ≥3 μηνών):

- Αντιπηκτικό του λύκου
- Αντισώματα κατά καρδιολιπίνης (IgG και/ή IgM) [>40 U]
- Αντισώματα κατά αντι-β_2-γλυκοπρωτεΐνης I (IgG και IgM)

George D. Progr Cardiovasc Dis 2009;52:115-25.

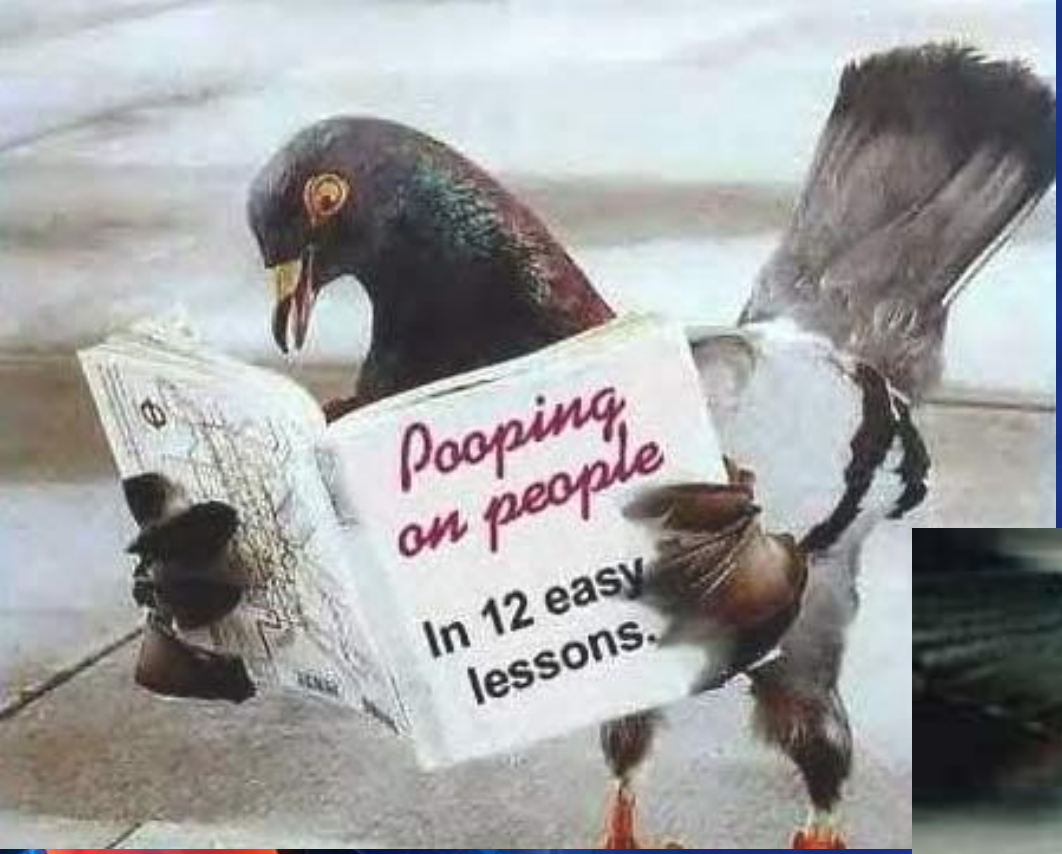
CONCLUSION

- Although MI, fortunately, is an uncommon entity in young adults , it constitutes an important problem for both the patient and the treating physician.
-
- It has a devastating effect on the more active lifestyle of young patients.
-
- These young patients also have a **different risk factor** profile, clinical presentation, and prognosis in comparison with older patients, which has to be taken into consideration when treating these young adults presenting with MI. The increased prevalence of risk factors for CHD may set up an alarming trend.



CONCLUSION

- Substance misuse, coronary artery anomalies, premature coronary artery disease, and hypercoagulable state have to be considered in all young patients with suspected MI
- Early stabilisation should be followed by **risk stratification**, and early revascularisation, where appropriate, should be offered as it carries a better clinical outcome. Risk factors modification should be emphasised.
- It is strongly emphazised the importance of **secondary preventive measures in all young patients admitted with ACS as the long term mortality can reach up to one third if not treated appropriately.**


Pooping on people
In 12 easy lessons.


THANK YOU

CLINICAL PRESENTATION OF MI IN THE YOUNG PATIENT, Clues

- In every young with MI, use of recreational drugs in the recent times should be recorded. Family history of premature CHD, risk factor profile such as smoking, obesity, diabetes, and dyslipidaemia would give better clues as to the likelihood of atheromatous coronary artery disease.
- History of recurrent venous and arterial thrombosis should also be reported.

ΣΥΓΚΡΙΣΗ PDAY SCORE ΚΑΙ FRS

- Στην Framingham Heart Study στον πληθυσμό μελέτης δεν υπήρχαν < 30 ετών.
- Στο Framingham risk score υπάρχουν αρνητικές τιμές για ηλικίες <30 ετών.
- Το PDAY risk score προβλέπει αθηρογένεση.
- Το Framingham risk score προβλέπει κίνδυνο για κλινικά συμβάματα από στεφανιαία νόσο.

Am Heart J. 2007 July ; 154(1): 80–86.

FRAMINGHAM RISK SCORE AND PREDICTION OF CORONARY HEART DISEASE DEATH IN YOUNG MEN

Jarett D. Berry, MD, Donald M. Lloyd-Jones, MD, ScM, Daniel B. Garside, BS, and Philip Greenland, MD

We included 10,551 male participants of the CHA in Chicago Heart Association Study who were aged 18 to 39 years and free of baseline CHD and diabetes at enrollment from 1967 to 1973. Risk of CHD was estimated using both FRS and ATP III online risk estimator for each individual.

In conclusion, both the FRS and the ATP III online risk estimator were able to order risk. The FRS was unable to classify the young adults in this cohort as anything other than low risk even in the face of a substantial risk factor burden estimates accurately among young adult men. However, neither strategy was able to identify high risk individuals (i.e. >20% absolute risk in 10 years) younger than 30 years despite substantial risk factor burden.

Future clinical guidelines should consider alternative strategies to estimate and communicate CVD risk to the young adult population.

Prediction of Coronary Artery Calcium in Young Adults Using PDAY Risk Score. The CARDIA Study.

Samuel S. Gidding, MD; C. Alex McMahan, PhD; Henry C. McGill, MD et al.

PDAY SCORE Arch Intern Med. 2006;166:2341-2347

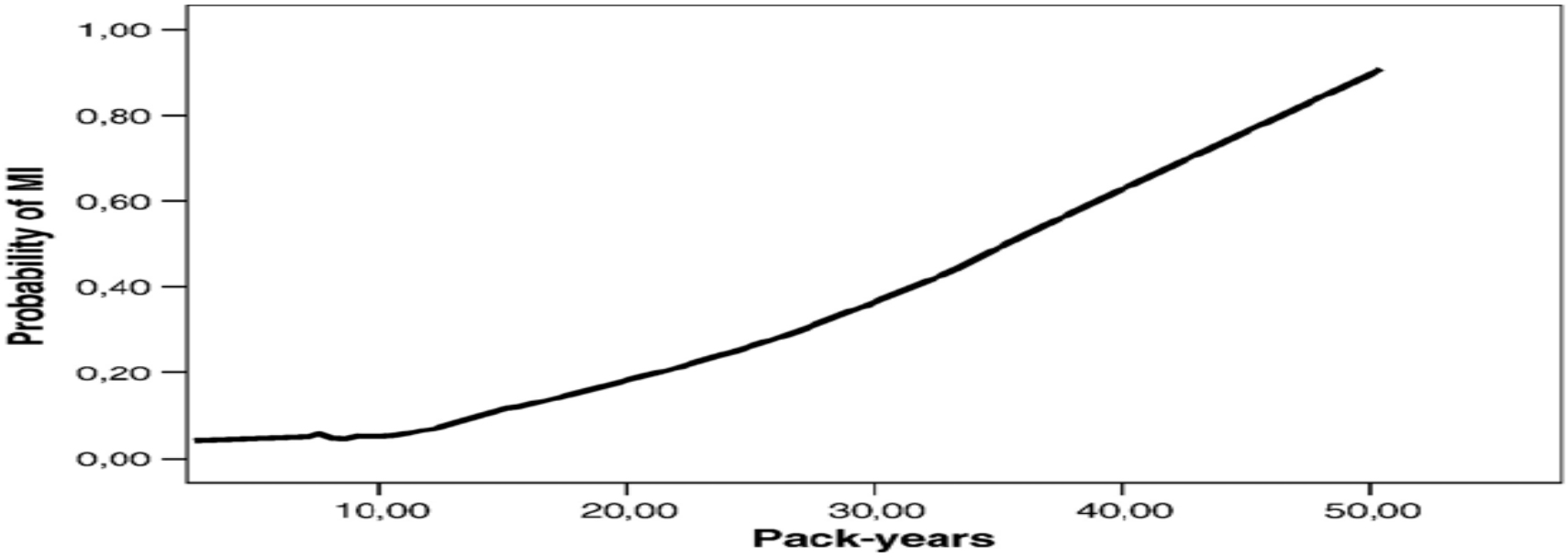
The risk score computed from risk factors measured 10 to 15 years before the assessment of CAC performed better than the risk score computed

from risk factors at the time of CAC assessment. If the risk score increased between year 0 and year 15, the likelihood of developing CAC increased; if the risk score decreased, the likelihood of developing CAC decreased. The PDAY risk score and a revised PDAY

risk score that included family history of cardiovascular disease and a greater differential between the sexes performed better than the Framingham risk score.

Results from stepwise conditional logistic regression analysis that evaluated participants' characteristics on the odds of having acute myocardial infarction

	Odds ratio	95% confidence interval	
Initial model			
Current smoking	6.25	1.04	37.63
Physical activity	1.18	0.22	6.01
Body mass index (kg/m^2)	0.92	0.80	1.12
Presence of hypertension	0.77	0.14	3.51
Presence of diabetes	0.70	0.09	13.90
Family history of CHD	0.59	0.11	3.14
Total cholesterol (mg/dl)	1.01	0.99	1.02
Final model			
Current smoking	4.9	1.01	25.1



Panagiotakos D, Rallidis L, Pitsavos C, Stefanadis C, Kremastinos D. Int J Cardiol 2007;116:371-5

Role of methylenetetrahydrofolate reductase 677C->T polymorphism in the development of premature myocardial infarction

	Young MI pts (n=144)	Controls (n=103)	p
Heterozygotes (CT)	42.4%	41.7%	NS
Homozygotes (TT)	27.1%	14.6%	0.02

	Young MI pts + CHD (n=110)	Young MI pts – CHD (n=34)	Controls (n=103)
Homocysteine (mmol/l)	12.7 ± 6.6	17.6 ± 12.2	11.8 ± 4.9
Homozygotes (TT)	21.8%	44.1%	14.6%

Η παρουσία του γονότυπου TT συνδεόταν με 3,4 φορές μεγαλύτερο κίνδυνο (p=0,03) για ανάπτυξη πρώιμου ΕΜ με «φυσιολογικά» στεφανιαία αγγεία

Συμπερασματικά
Η ομοζυγωτία του πολυμορφισμού της MTHFR 677C->T φαίνεται να ευνοεί την ανάπτυξη ΕΜ σε άτομα που έχουν μικρό αθηρωματικό φορτίο

Rallidis L, et al. Atherosclerosis 2008;200:115-20

II. NON-ATHEROMATOUS CORONARY ABNORMALITIES

- **Coronary artery dissection** can occur spontaneously in young adults. The chest pain is often atypical and women are at a higher risk during their peripartum period.

- LAD was found to be the culprit artery in most of the cases. Unfortunately the diagnosis is often made at necropsy. Successful treatment with stenting or surgery has been reported.

EPIDEMIOLOGY

- The incidence of CHD is declining in all age groups. The actual prevalence is 0.5% in men and 0.18% in women aged 35 - 44 years, 20.5% in men, and 17.1% in women > 60 years.
- In fact, the figures in young patients may be lower than actual because of atypical presentation and reluctance to submit themselves for further investigations.
- However, CHD in younger population <40 years represents only 3% of all patients with CHD.