

Place du Score calcique coronarien dans la prise en charge d'un malade à risque CV **asymptomatique** en 2019

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EDITORIAL COMMENT

Primary Prevention of Atherosclerosis

Time to Take a Selfie?*

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Philippe Moulin

Fédération d'endocrinologie,
Diabétologie, Maladies Métaboliques

Nutrition

Hôpital Cardiovasculaire Louis Pradel

LYON

Liens d'intérêt

- **Pas de conflit d'intérêt en lien avec cette présentation**
- **Link of interest with industry**
- 0 : none
- 1 : money paid to him
- 2 : money paid to his institution
- **Full- or part-time employment : 0**
- **Consultancies - Board:**
 - 1 Lilly, GSK, MSD,
 - 2 AKCEA, Boeringher
- **Honoraria (clinical trials, talks):**
 - 1 MSD, NovoNordisk,
 - 2 Akcea, AMGEN, MSD, Lilly, Novo Nordisk, Sanofi-Regeneron,
- **Speakers bureau : 0**
- **Stock ownership or options : 0**
- **Expert testimony : 0**
- **Grants received or pending : 0**
- **Support for Travel to scientific meetings:**
 - 1 Astra Zeneca, Boehringer, BMS, Jansen, MSD, lilly, Sanofi,
- **Patents filed, received, pending, or in preparation that represent potential future financial gain : 0**
- **Royalties :0**
- **Donation of medical equipment :0**

Preamble: 2003-(2011)-20018 !

J Nucl Cardiol. 2003 Nov-Dec;10(6):590-8.

Coronary calcium screening in asymptomatic patients as a guide to risk factor modification and stress myocardial perfusion imaging.

Moser KW¹, O'Keefe JH Jr, Bateman TM, McGhie IA.

Author information

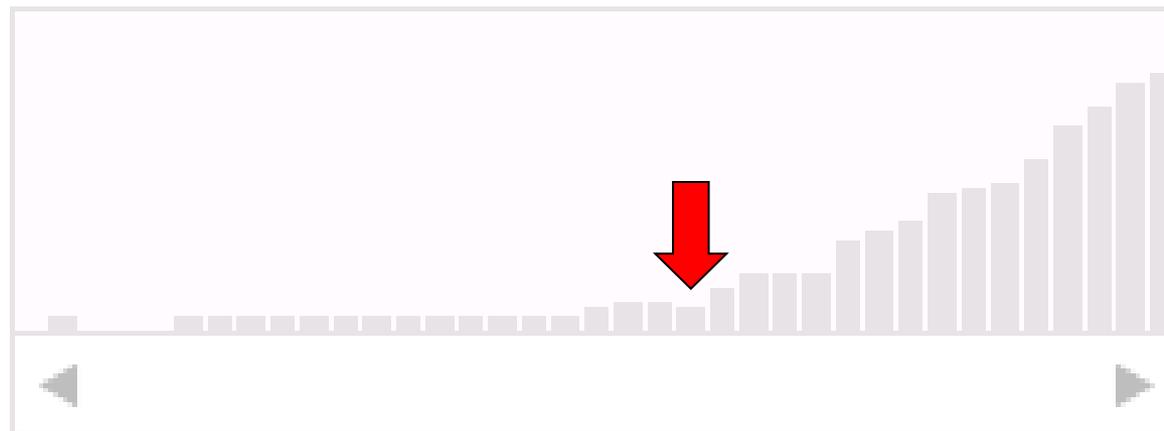
Abstract

BACKGROUND
plaque. As a re-
method of detec-
factor modificati-

METHODS AND
practice setting
period. On the t
substudy was a
422 of 794 patie
risk factors wen
100 had an abn
CAC group had

CONCLUSION:
is poor at predic
changes in CAC
threshold to initiate follow-up myocardial perfusion SPECT testing.

Results by year



) and atherosclerotic
s developing. One possible
into groups requiring risk
200/an
(MDCT) in a cardiology
ening over an 8-month
n SPECT imaging. A
es. CAC was detected in
s with 3 or more cardiac
Agatston score lower than
ility substudy the minimal

er, risk factor assessment
ICT is capable of following
e of 400 is a logical

Comment in

Coronary calcium scoring: what does it really mean? [J Nucl Cardiol. 2003]

HAROLD N. BORNSTEIN, M.D.
101 East 78th Street
New York, New York 10075-0301

September 13, 2016

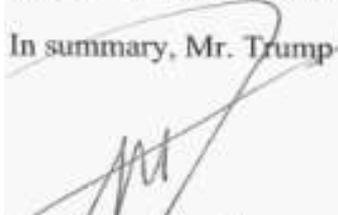
Mr. Donald J. Trump is a 70-year-old male who has been under my personal medical care since November 6, 1980. I am an internist, a Diplomate of the American Board of Internal Medicine in medicine and gastroenterology, and a graduate of Tufts University School of Medicine. I have been on the active staff of Lenox Hill Hospital, New York, New York for the past 38 years.

Mr. Trump was hospitalized only once, as a child of 11 years old for an appendectomy. He is 6'3" tall and weighs 236 pounds. Mr. Trump's laboratory results reveal the following:

Cholesterol 169, HDL cholesterol 63, LDL cholesterol 94, triglycerides 61, PSA 0.15, blood pressure 116/70, blood sugar 99 and C Reactive Protein UQ 0.7. His liver function and thyroid function tests are all within the normal range. He has had an annual physical exam in the spring of every year. His last colonoscopy was performed on July 10, 2013 which was normal and revealed no polyps. His calcium score in 2013 was 98. His EKG and chest X-ray on April 14, 2016, were normal. His cardiac evaluation included a transthoracic echocardiogram on December 16, 2014. This study was reported within the range of normal. His testosterone is 441.6. There is no family history of premature cardiac or neoplastic disease. He takes a lipid lowering agent (rosuvastatin) and a low dose aspirin. He does not use tobacco products or alcohol.

Mr. Trump's parents, Mary and Fred, lived into their late 80s and 90s.

In summary, Mr. Trump is in excellent physical health.


Harold N. Bornstein, MD

Bulletin de santé

Donald J Trump 70 ans
Sous rosuva (dose ?)
+ asp 100mg (!)

Obèse :107Kg/1,89 IMC 29
116/70 mmHg !?

HCF?

LDLc 0,94 g/l – 1,9g/l non tt
HDLc 0,63 g/l (!)

TG 0,61 g/l

Gaj 0,99 g/l

CRPus 7 g/l (!)

Testostéronémie 441 ?

Rx + ECG + ETT: RAS

score calcique 98 UA 2013

-
- nécessités/limites et enjeux de la prévention cardiovasculaire primaire
 - capacités prédictives du score calcique coronarien
 - Valeur ajoutée du score calcique coronarien
 - Limites relatives à l'utilisation du score calcique coronarien
 - Observations
 - intégration

- Prévention primaire

- Médecine prédictive personnalisée

- If were not for the great variability among individuals, medicine might as well be a science, not an art.*

- Sir William Osler, 1892

- Risque incertain

- Risque intermédiaire (score TCV 1-5%, Framingham 10-20%)

- **Risque** monofactoriel

- Athérogénicité variable

- Exemple typologie des diabète

- selon sd métabolique associé

- Exemple HFh

- famille HF

- prise en compte des atcd fam

- lp(a)

- Cholestérol burden

- Autres ???

Reco US équations de prédiction de risque CV

1. The race- and sex-specific Pooled Cohort Equations* to predict 10-year risk for a first hard ASCVD event should be used in nonHispanic African Americans and nonHispanic Whites, 40 to 79 years of age.	B (Moderate)	N/A	I	B (4-8)
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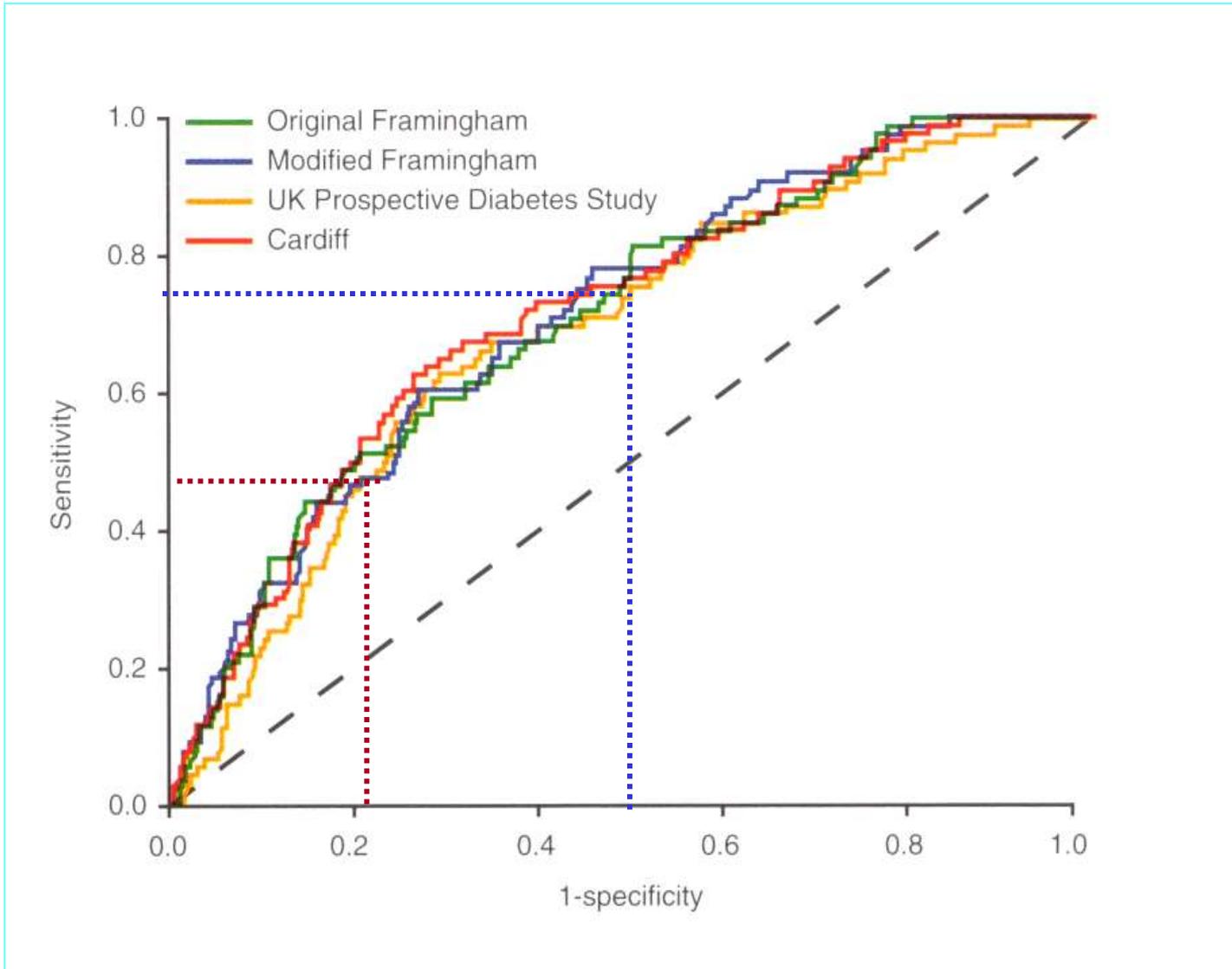
Goff DC Jr, et al.
2013 ACC/AHA Cardiovascular Risk Guideline

2013 ACC/AHA Guideline on the Assessment of Cardiovascular Risk

**A Report of the American College of Cardiology/American Heart Association
Task Force on Practice Guidelines**



Valeur prédictive de différents modèles de prédiction du risque cardiovasculaire



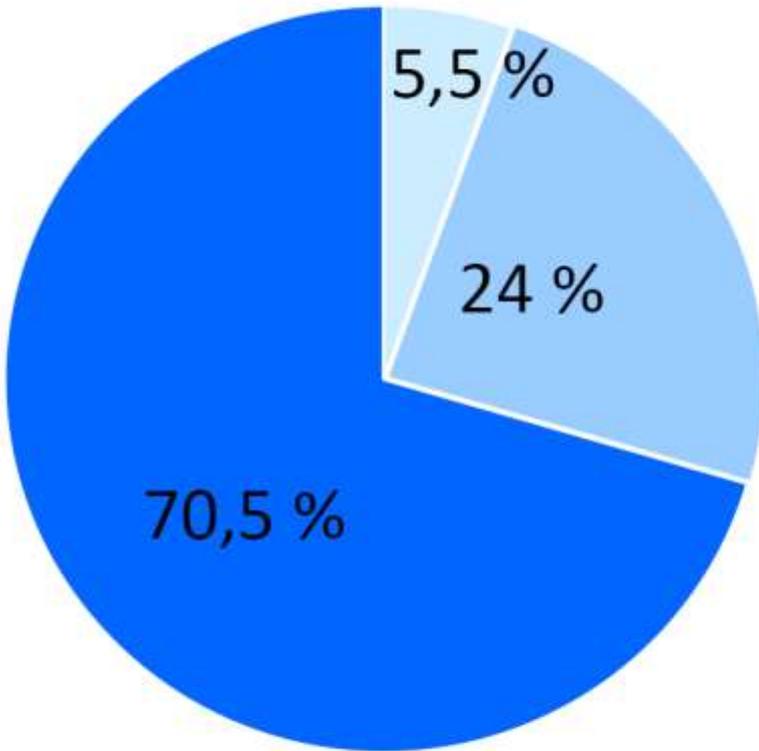
sensibilité à 75 %
spécificité à 50 %

spécificité à 80 %
sensibilité à 50 %

Comparison Q risk engine vs ADVANCE risk engine

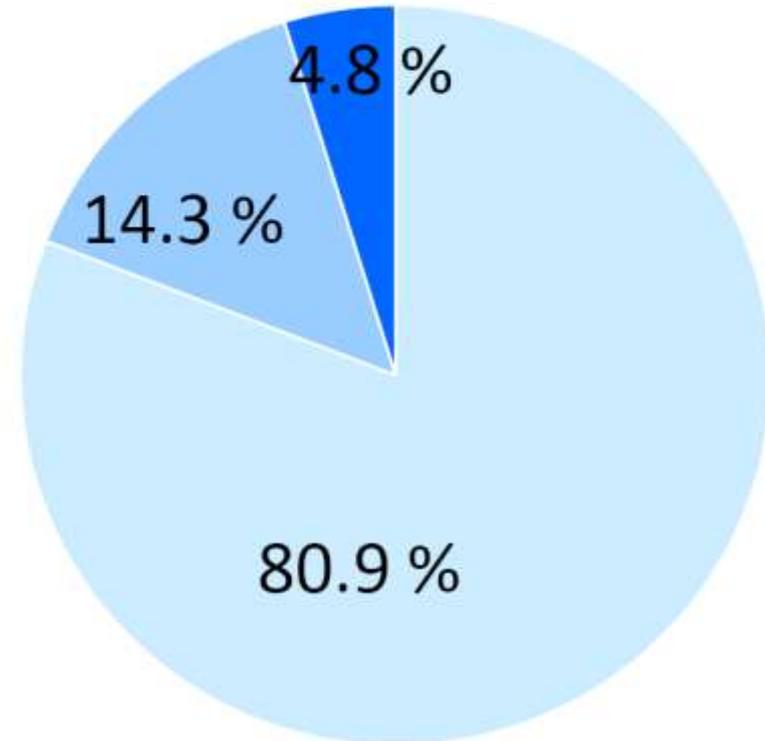
445 DT2 2015-2017

Q risk



QR vs ARE
 $p < 0.0001$

ARE

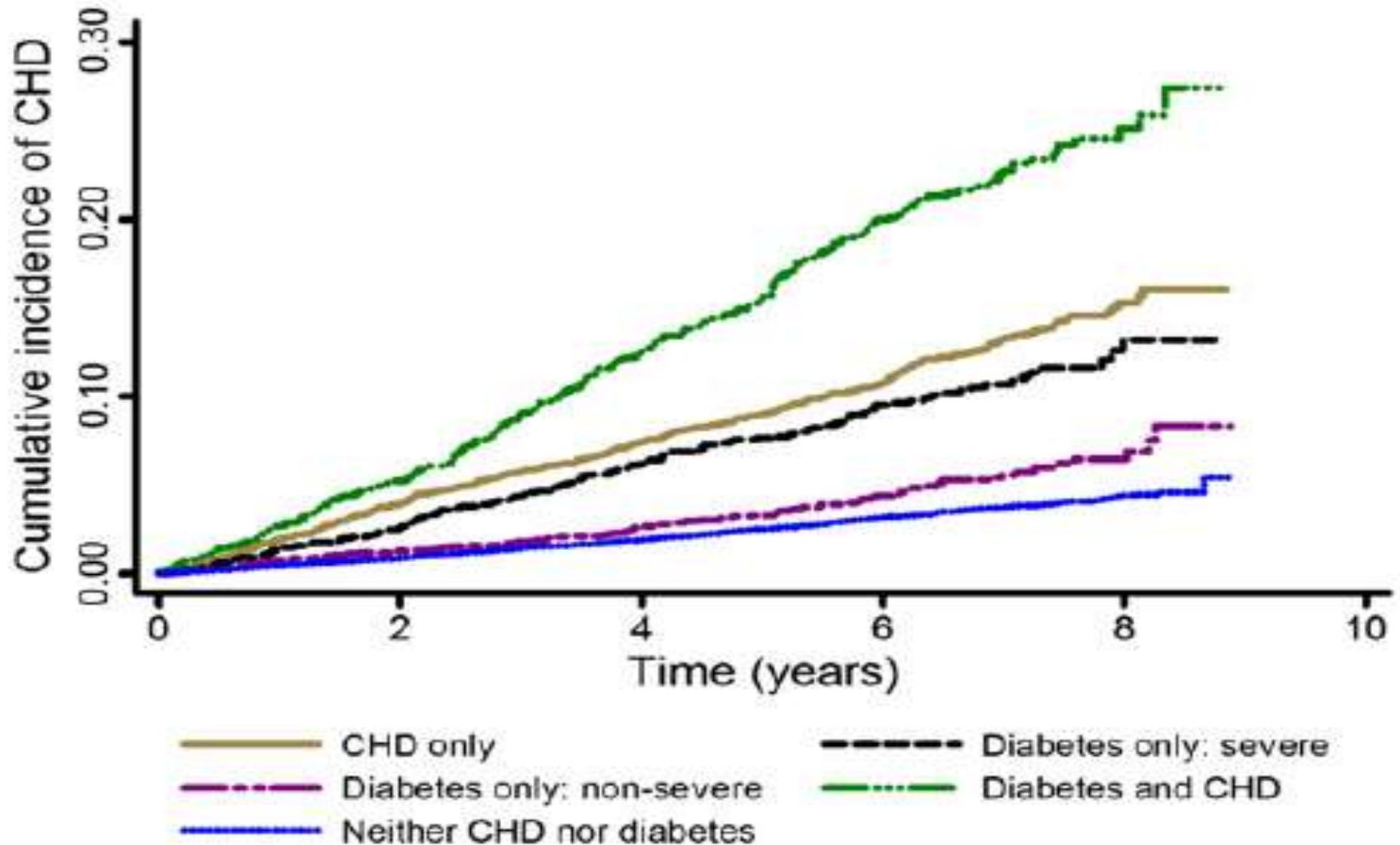


■ LR ■ IR ■ HR

Only **12,8 %** of patients are classified in the same CV risk group

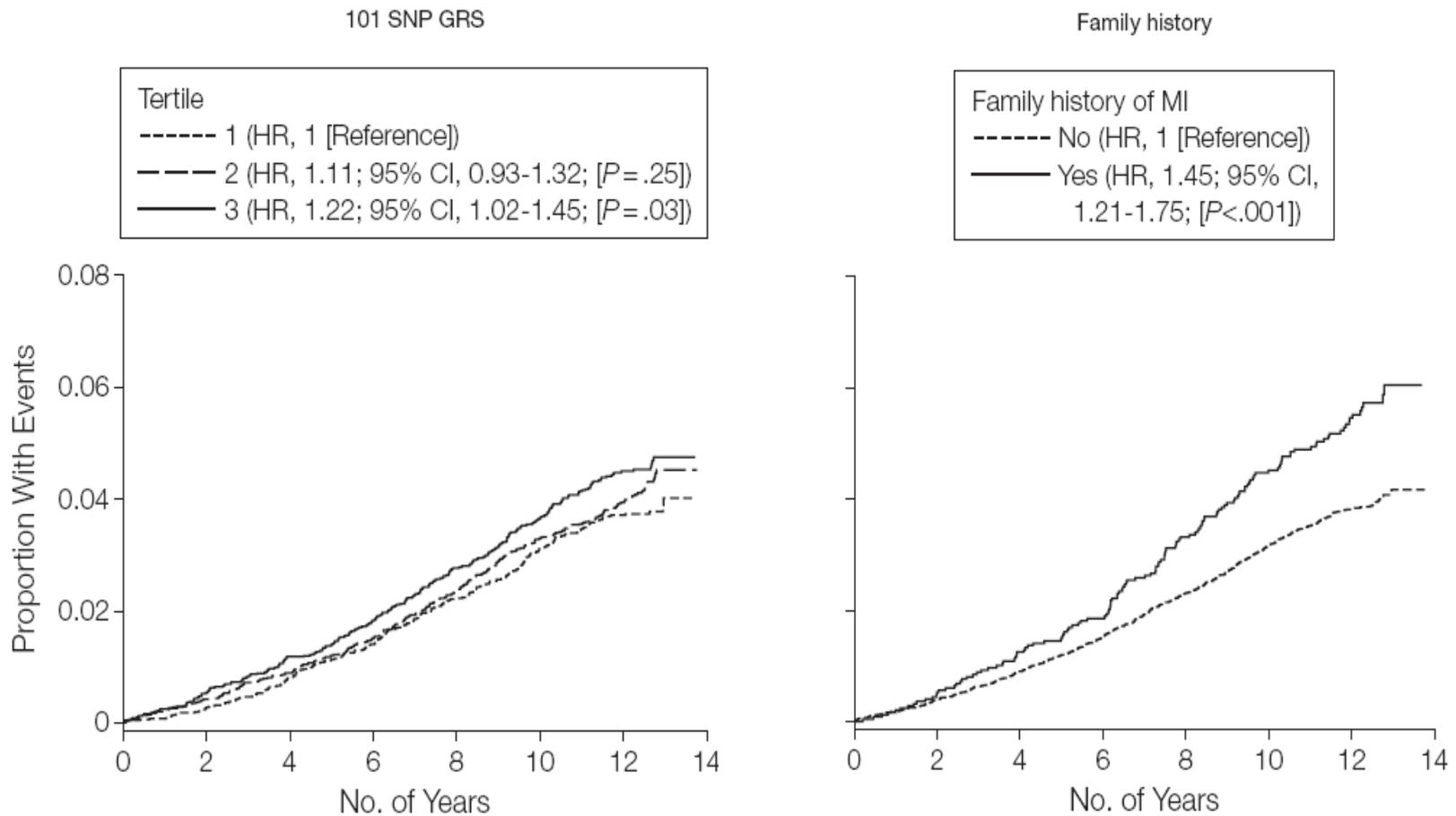
Balaire L et al EAS lisbonne 2018

Diabete et risque CV : hétérogénéité du risque



Les déboires de la génétique prédictive

Figure 1. Cumulative Incidence of Cardiovascular Events by Genetic Risk Score (GRS) Tertile and Family History of Myocardial Infarction (MI)



No. at risk

	0	2	4	6	8	10	12	14
Tertile 1	6678	6645	6581	6499	6407	6178	4949	
Tertile 2	6857	6815	6749	6660	6538	6349	4628	
Tertile 3	5778	5729	5668	5595	5496	5337	3900	

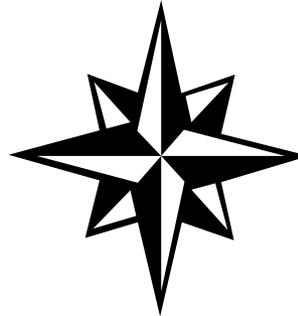
No. at risk

	0	2	4	6	8	10	12	14
Family history of MI								
No	16814	16702	16554	16325	16053	15578	11697	
Yes	2499	2480	2450	2424	2367	2284	1650	

-
- limites enjeux de la prédiction cardiovasculaire
 - capacités prédictives du score calcique coronarien
 - Valeur ajoutée du score calcique coronarien
 - Limites relatives à l'utilisation du score calcique coronarien
 - Observations
 - intégration

Besoin de prédiction cv et de recalage des estimations

Estimation du Risque CV ischémique



Age
Sexe
Tabac*
LDLc*
HDLc
Diabete sd metab*
HTA*
Atcd fam

Tour de taille*
CRPus
Lp(a)
Fibrinogene
Homocystéine

Sommation ou équation multivariée

Evt CV à 10 ans
Risque faible < 10%
Risque modéré 10-20%
Risque fort > 20%
Risque majeur >30%



ECG basal
Epreuve effort
Scinti

EIMc
dysfonction endothéliale
VOP
IPS

Score calcique coro

Reco AHA evaluation risque CV asymptomatique

- Equation de risque I B
- ATCD fam I B
 - CRP us IIa;IIb;III
 - HBA1c IIb; B
 - Microalbuminurie IIa; IIb
- ECG basal IIa; IIb;
- ECG effort IIb B
- Echo ETT: IIb;
- Scinti
 - IIb; ssi Db ou SC>400
 - **III si risque interm ou faible**
- Génétique III B
- Lipo qualitative III B
- BNP III B
- PWV III C
- Echo de stress III C
- Angio coro scan III C
- IRM plaque III C

IIa benefit > cost and risk

IIb only in sub population

III potential Harm

2013 ACC/AHA Guideline on the Assessment of Cardiovascular Risk

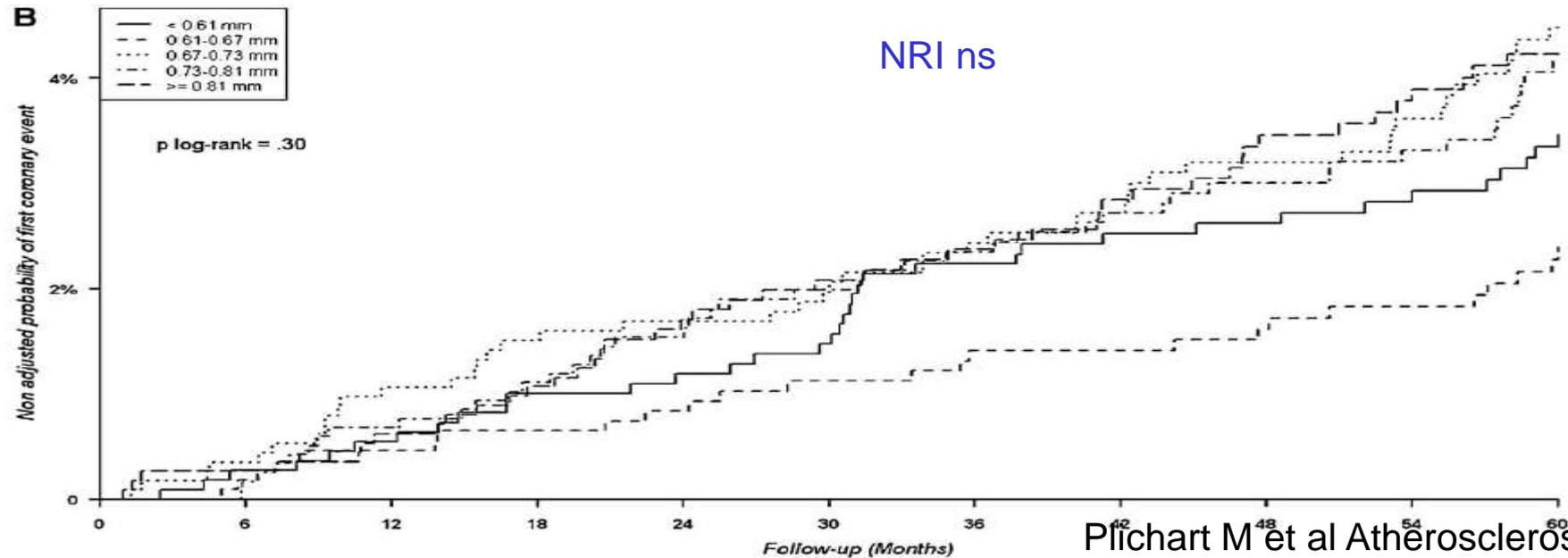
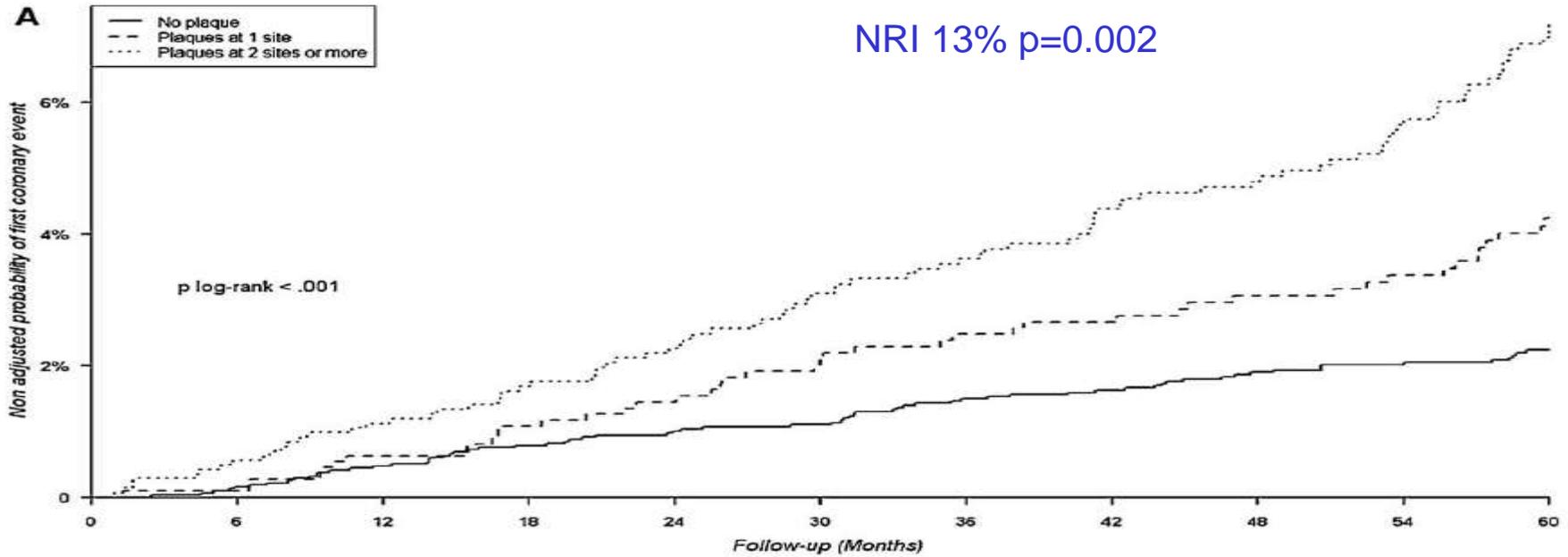
A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines

5. CIMT is not recommended for routine measurement in clinical practice for risk assessment for a first ASCVD event.	N (No Recommendation For or Against)	Appendix 1	III: No Benefit†	B (12,16,18)
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-CIMT provided no additional prognostic information over and above Framingham risk score (FRS)

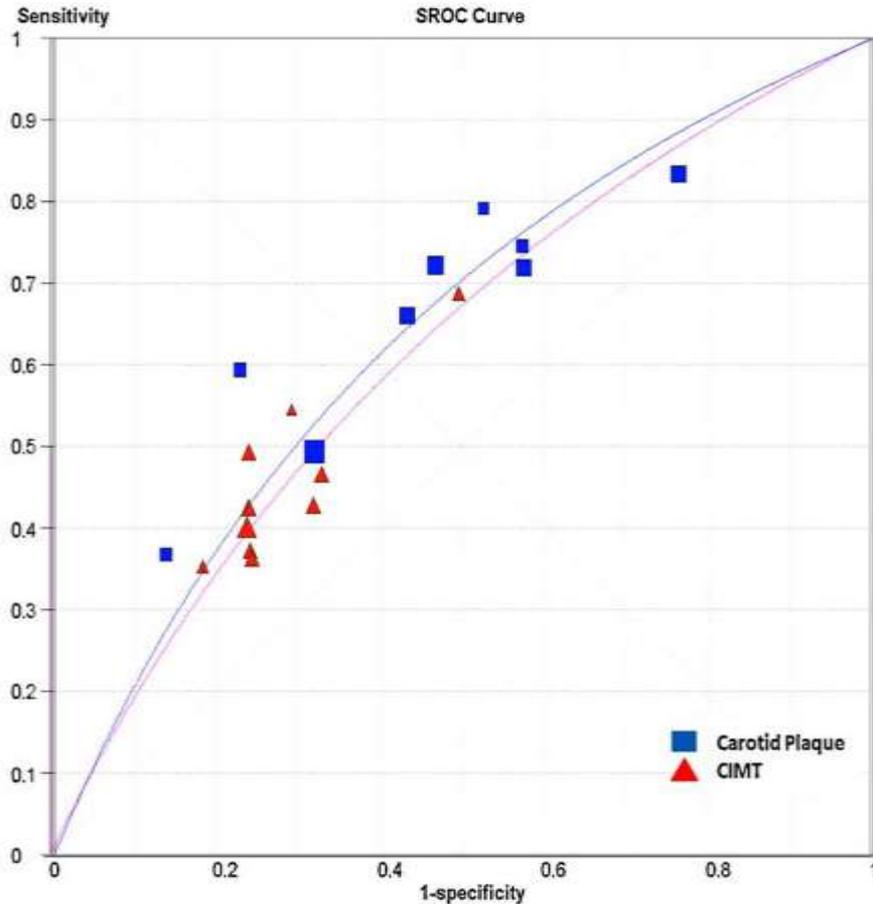
-A metaanalysis of 11 population-based studies including 54,336 patients :
carotid plaque vs CIMT has a significantly higher diagnostic accuracy for the prediction of future MI (1.35)

Carotide Plaque vs CIMT : the three city study



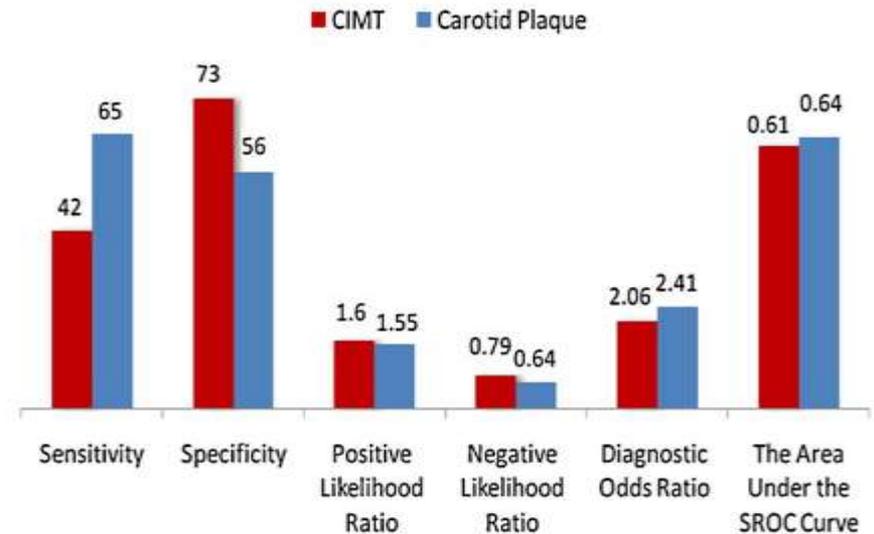
Carotide plaque vs cIMT

a) Population-based studies for the prediction of future myocardial infarction



a) Population-based studies for the prediction of future myocardial infarction

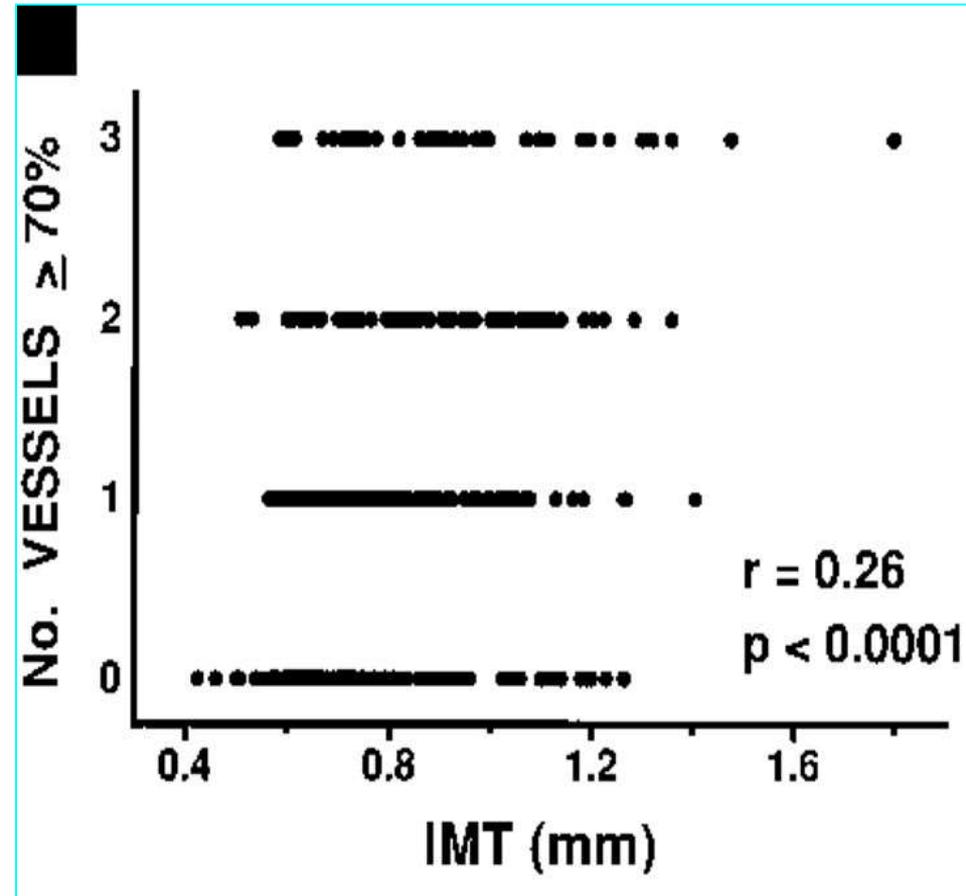
Diagnostic accuracy of carotid ultrasound for the prediction of future MI



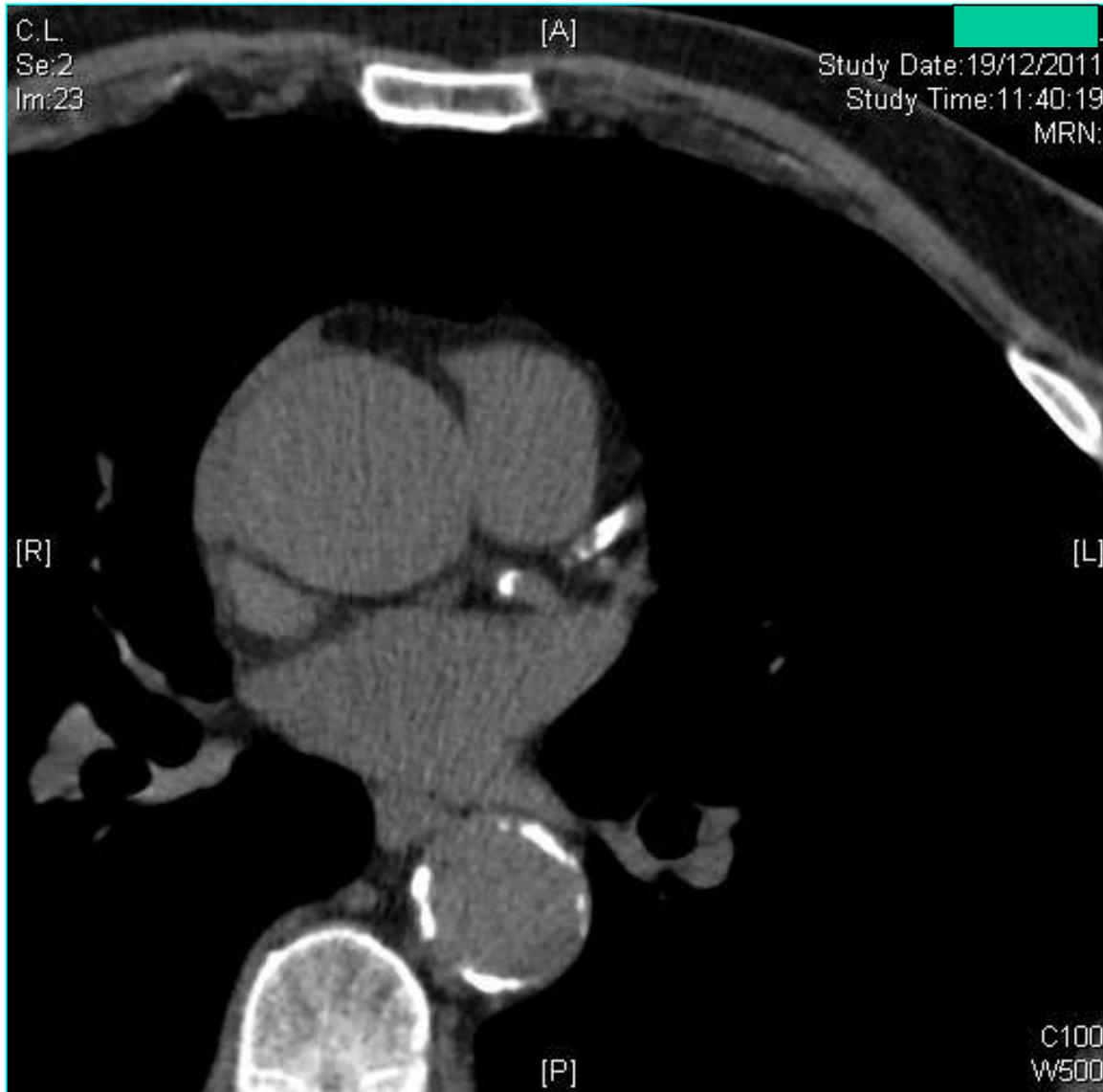
Multivariate meta-regression analyses to compare the diagnostic performance between carotid plaque and CIMT after the adjustment of other study-specific covariates.

	Relative DOR
(a) Population-based studies for the prediction of future myocardial infarction	
Carotid plaque vs. CIMT	1.35 (1.03–1.82), $p=0.046$
Follow up length	0.97 (0.93–1.02), $p=0.17$
Mean age	0.91 (0.72–1.14), $p=0.35$
Study quality	0.97 (0.84–1.11), $p=0.61$
Study year	1.00 (0.95–1.06), $p=0.90$
Number of participants	1.00 (0.94–1.07), $p=0.95$

EIMc et statut coronarien



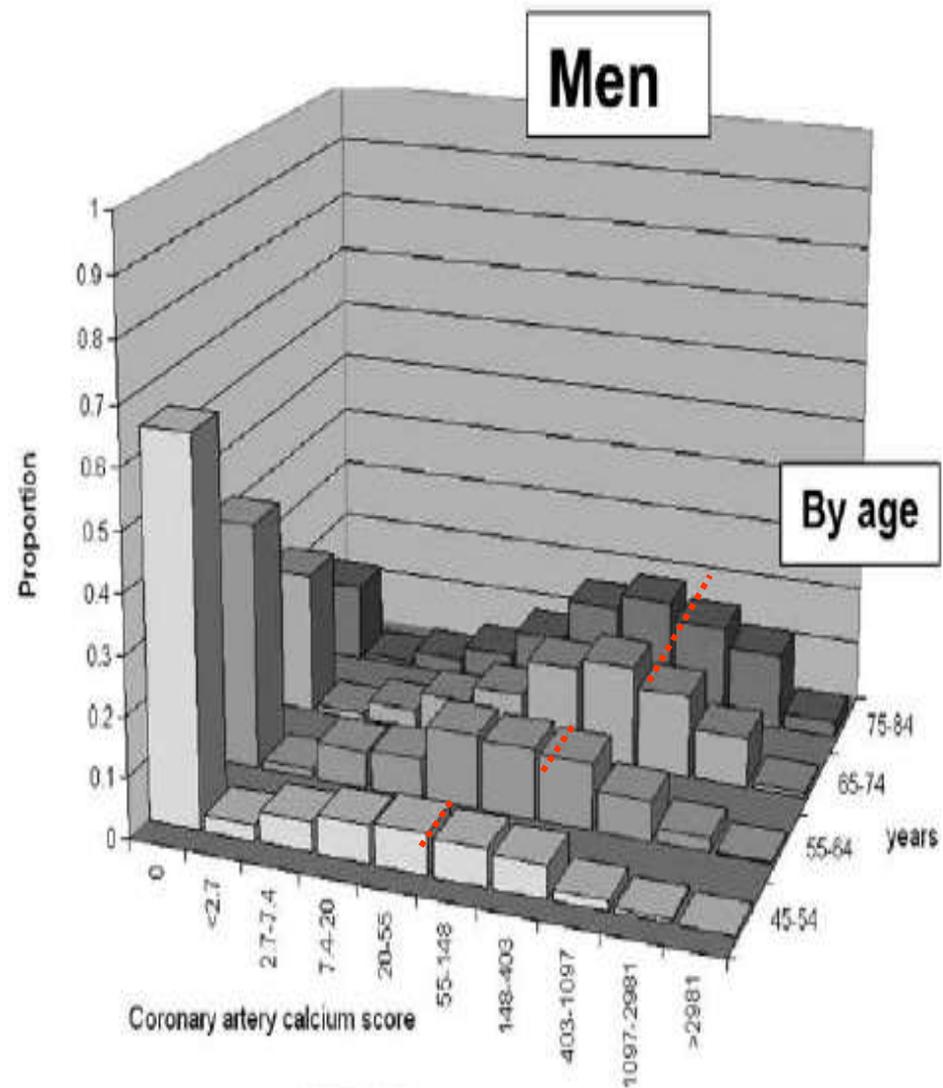
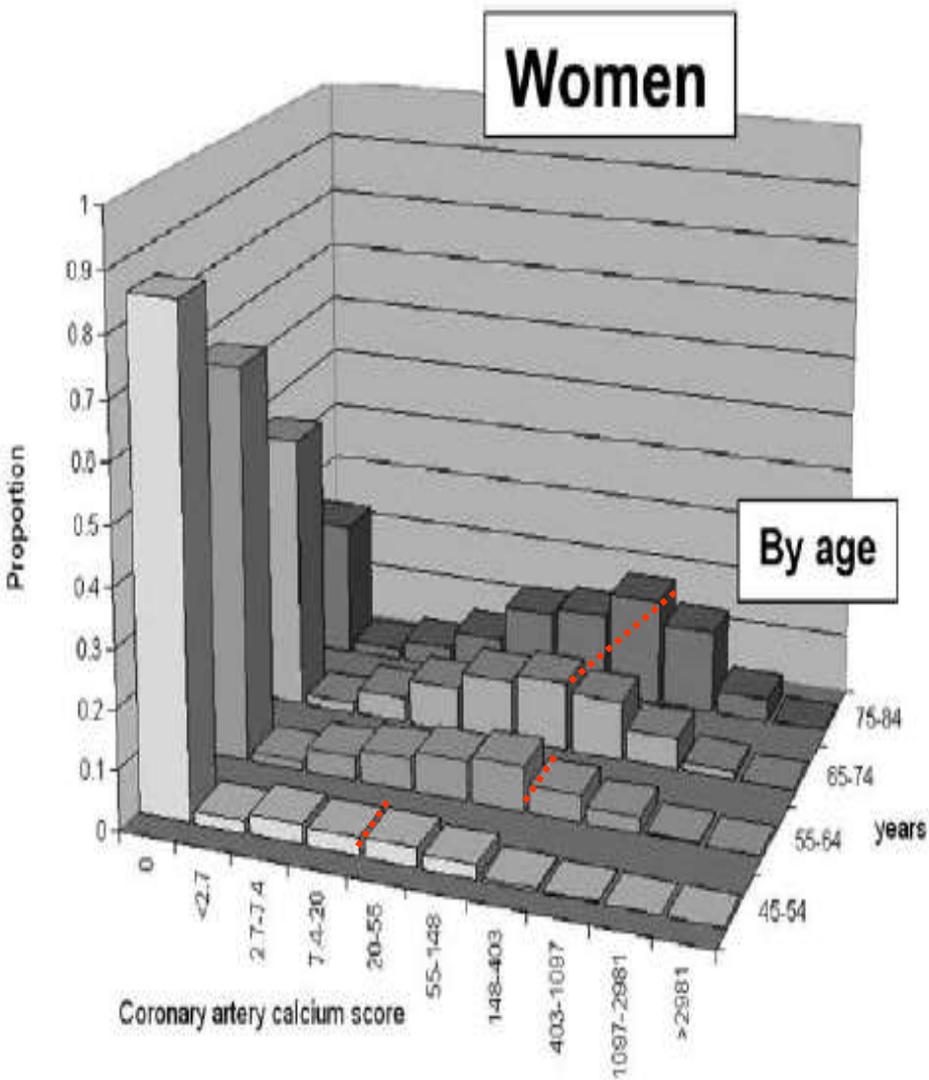
Score calcique coronarien



Score
d'Agatston= 304

Distribution du score calcique en population générale

cohorte MESA



Robustesse du CAC: reproductibilité

104 patients scores >0 on 256-slice MDCT underwent additional MDCT imaging at 2-week intervals. 0,8 mm sclices

The CAC **score** was quantified using the Agatston **score**, which was measured independently by two radiologists.

The variability between observers and [MDCT](#) scan measurements was determined by the mean value of absolute and percentage differences:

intra-scan/intra-observer (1.75 ± 5.85 , 1.26 ± 3.69 %),

intra-scan/inter-observer (3.3 ± 9.1 , 4.8 ± 21.3 %),

inter-scan/intra-observer (13.45 ± 20.7 , 10.04 ± 10.46 %).

inter-scan/inter-observer (14.45 ± 21.84 , **12.51 ± 21.84** %),

CAC < 100 var 80%

CAC > 400 var 9%

Relation CAC et sténoses coronaires

The CONFIRM registry, consisting of 27,125 patients, was screened and 10,037 symptomatic patients without known CAD who underwent both CAC scoring and CCTA were identified. The mean age of patients in the cohort was $57 \pm$

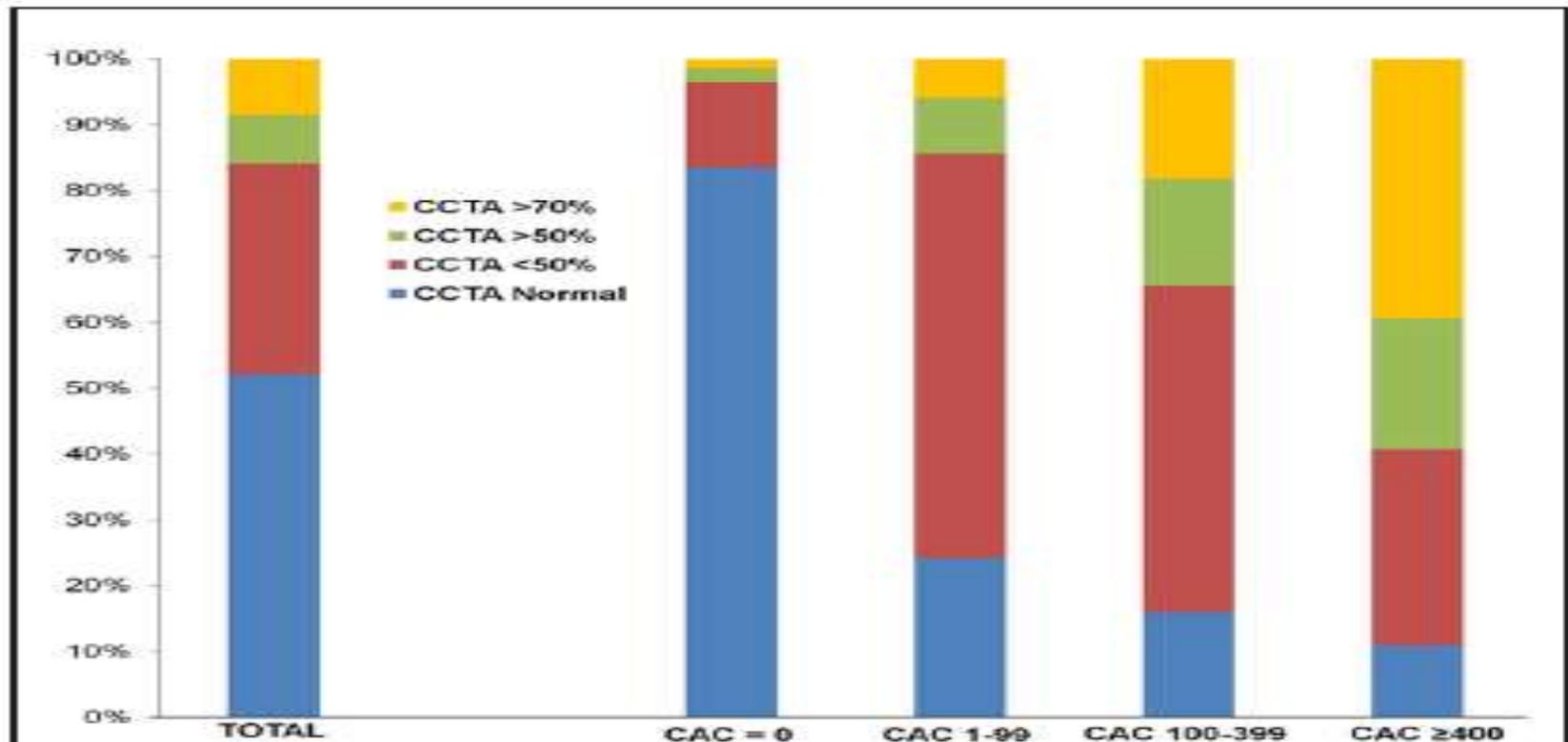
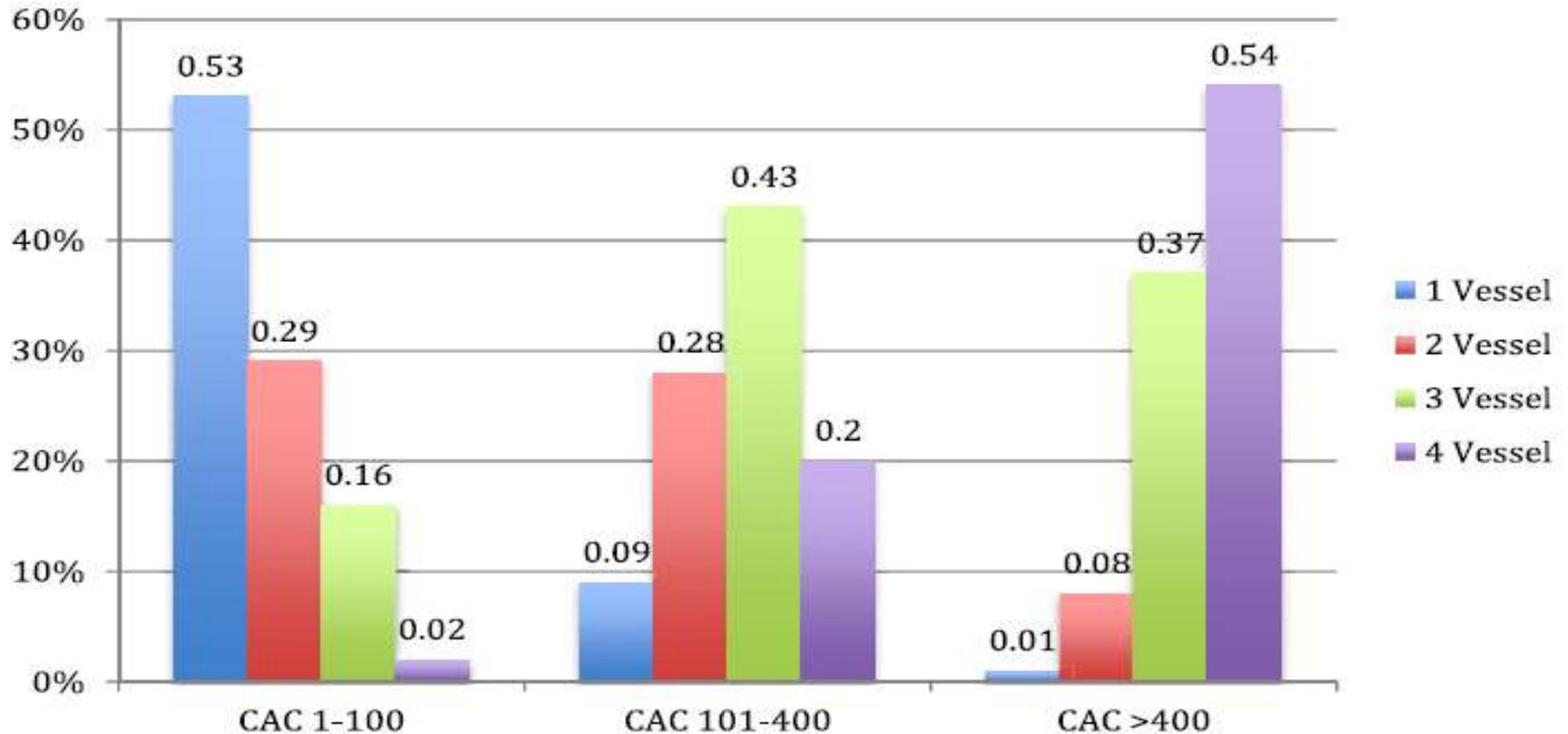


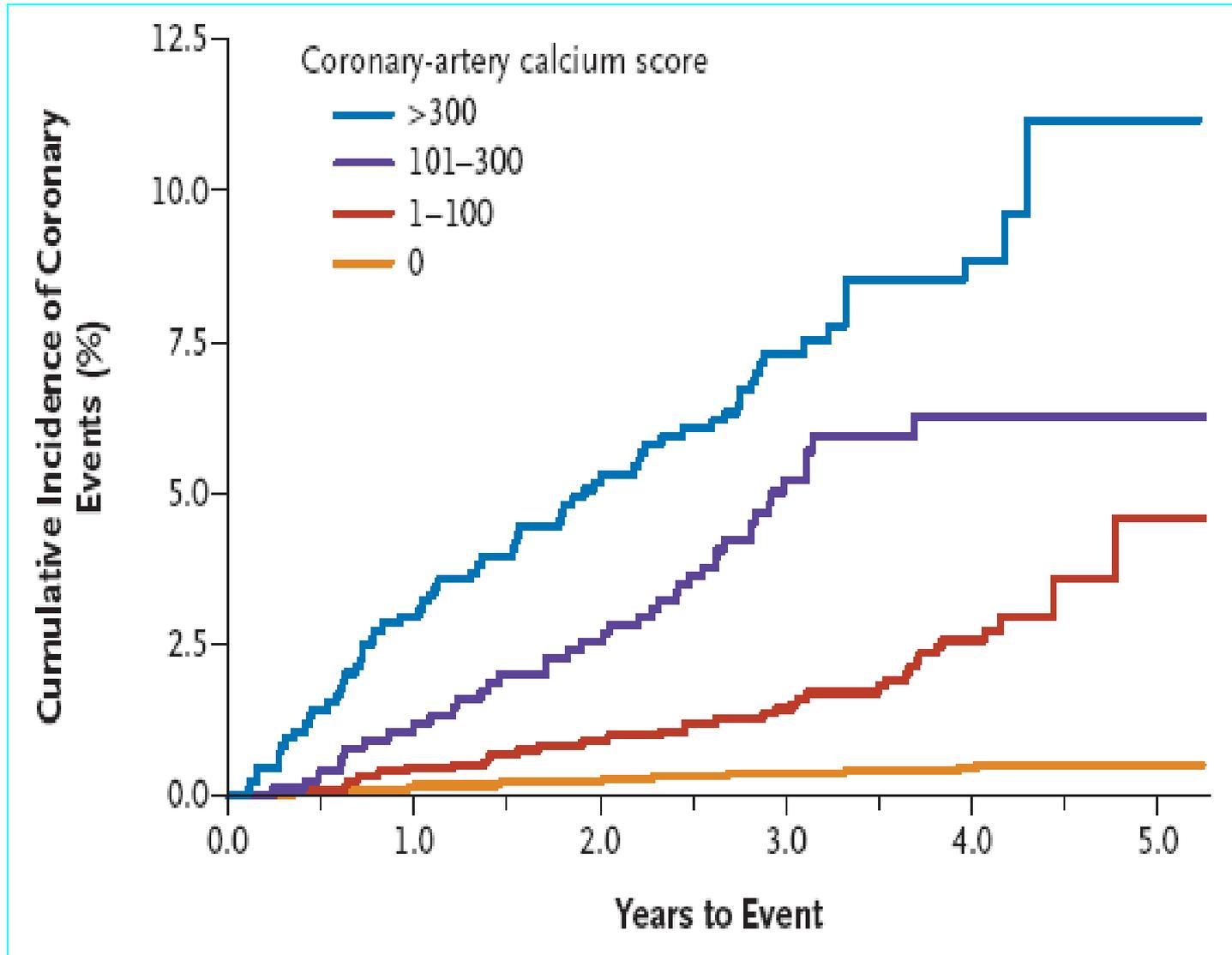
Figure 1

Coronary Artery Stenosis on CCTA

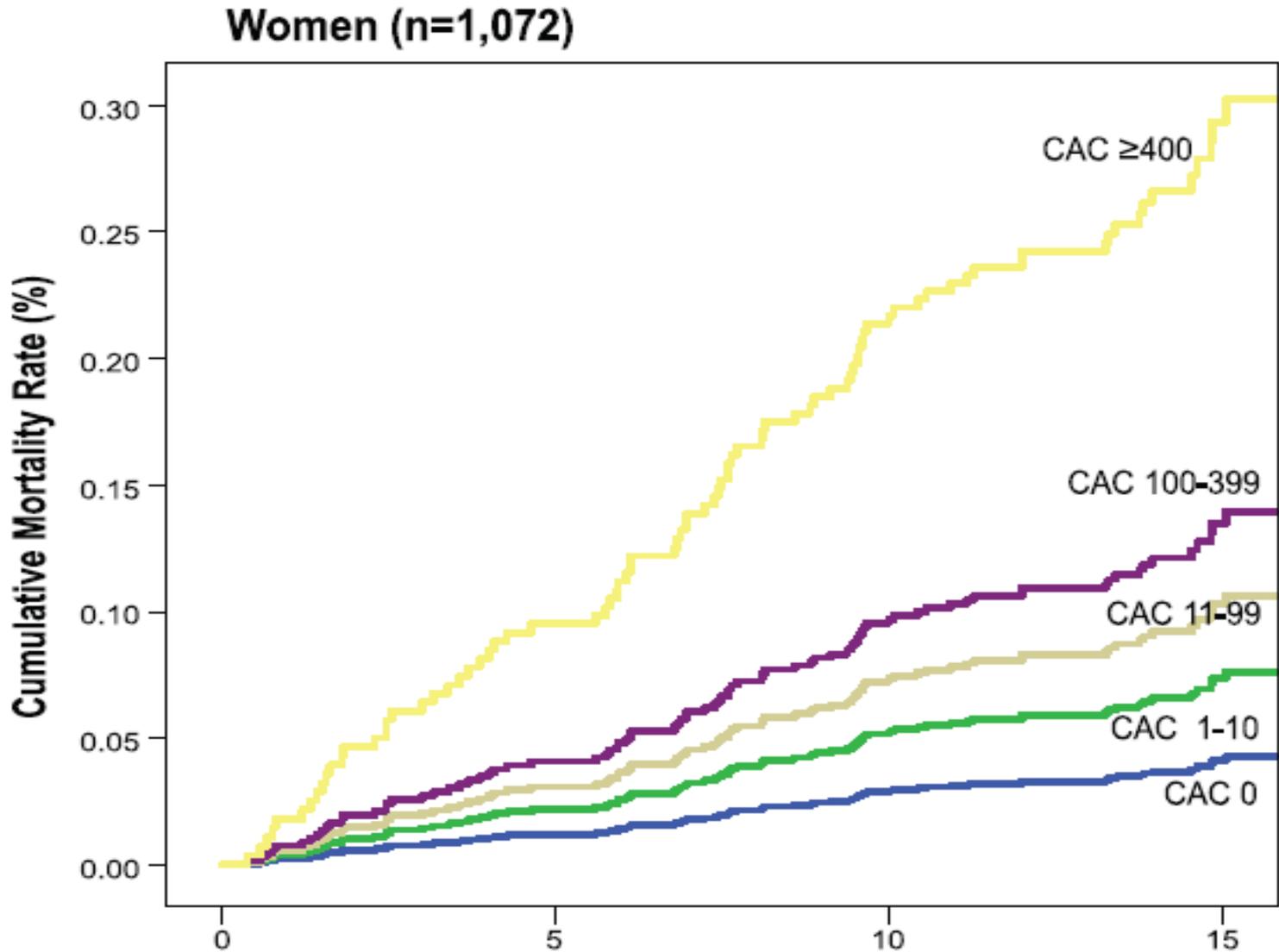
Topographie de la charge athéromateuse selon le CAC



Calcium score: suivi de cohorte n=6722 x 3.8

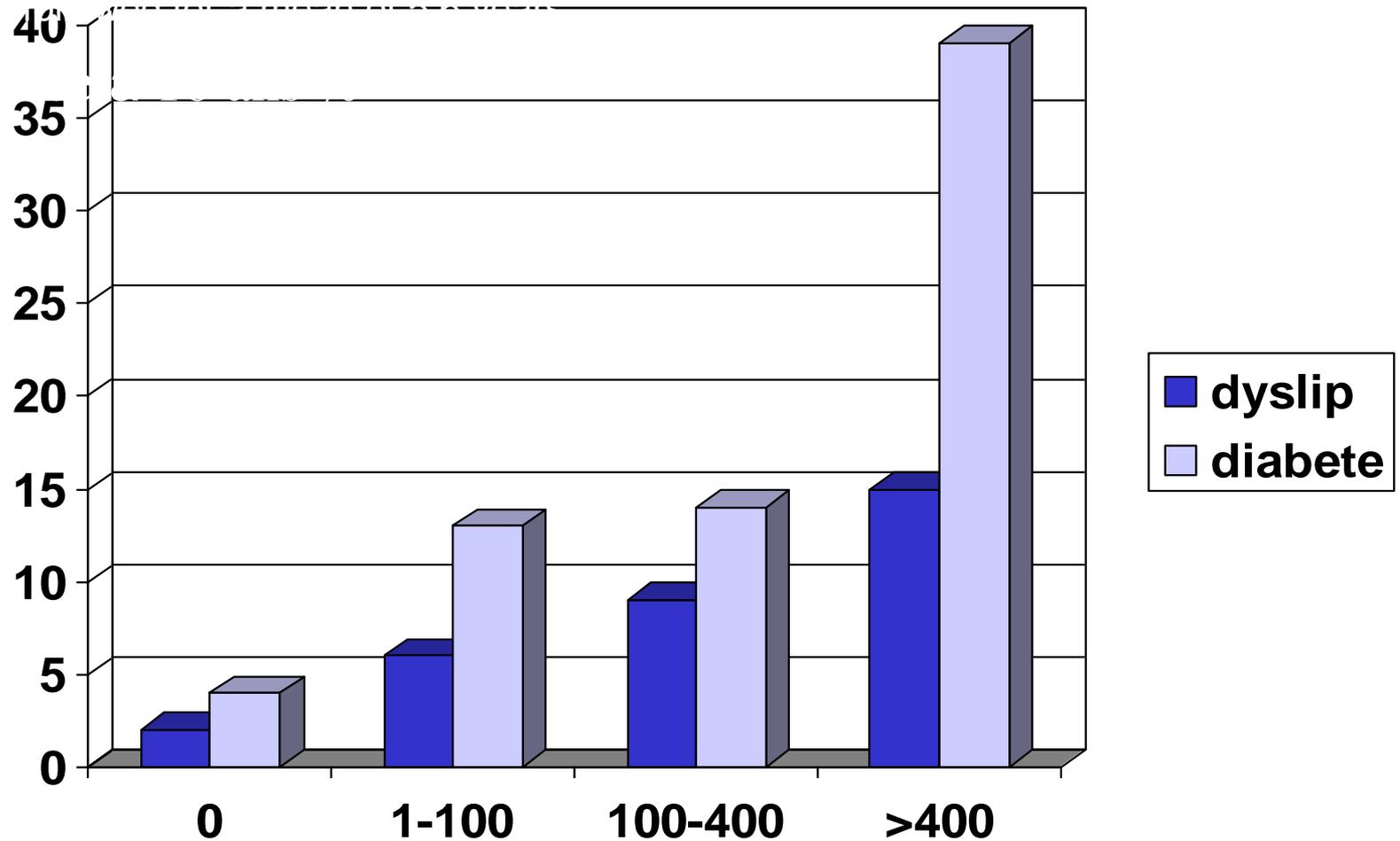


Mortalité selon CAC score si risque faible à intermédiaire selon Framingham Risk equations



Mortalité CV selon score calcique (EBT) en prévention primaire

Situations particulières



CAC score et Diabète vs population générale: long terme mortalité CV

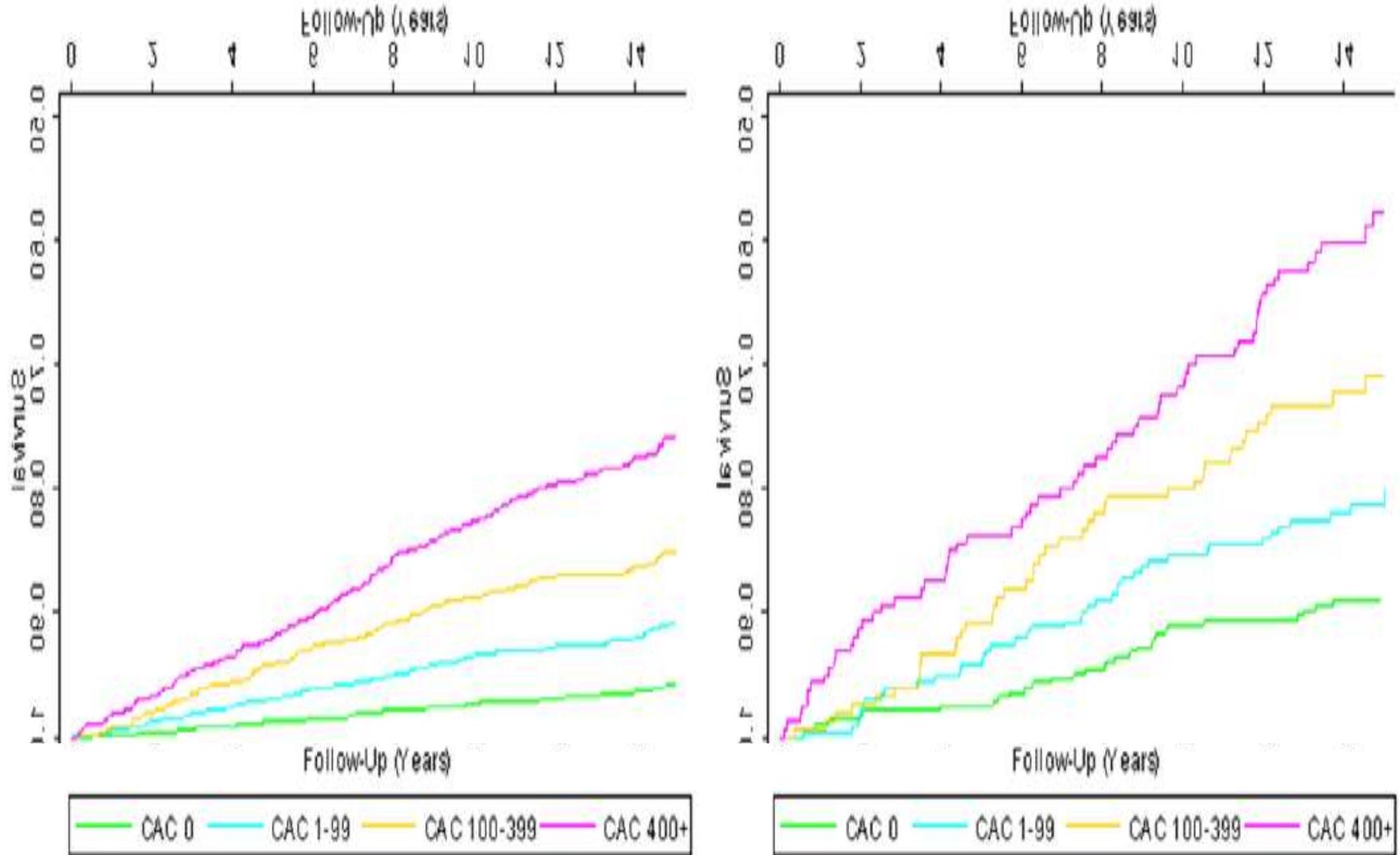
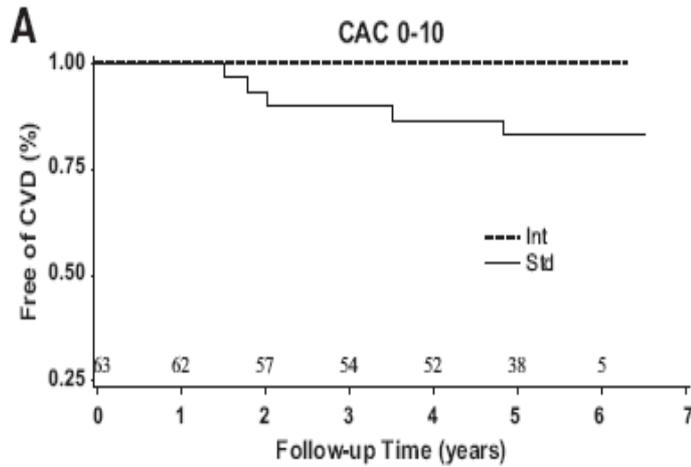


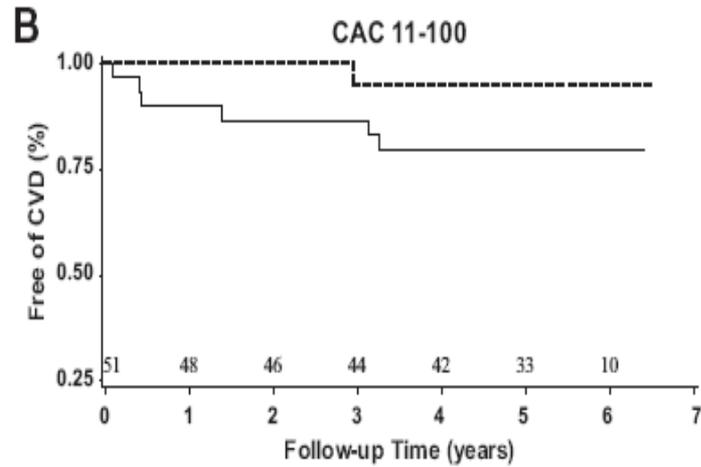
Figure 3. Kaplan-Meier survival curves in diabetic and nondiabetic individuals according to coronary artery calcium (CAC) scores.

Le score calcique reste prédictif même chez les diabétiques: Calcium score and VADT study

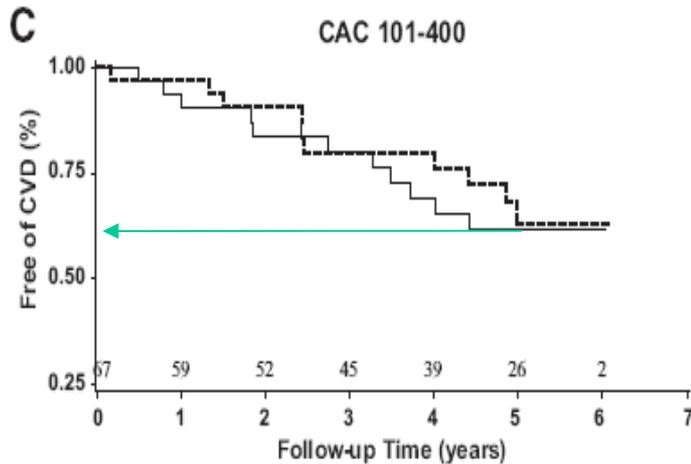
N 21%



N 17%



N 22%



N 39%

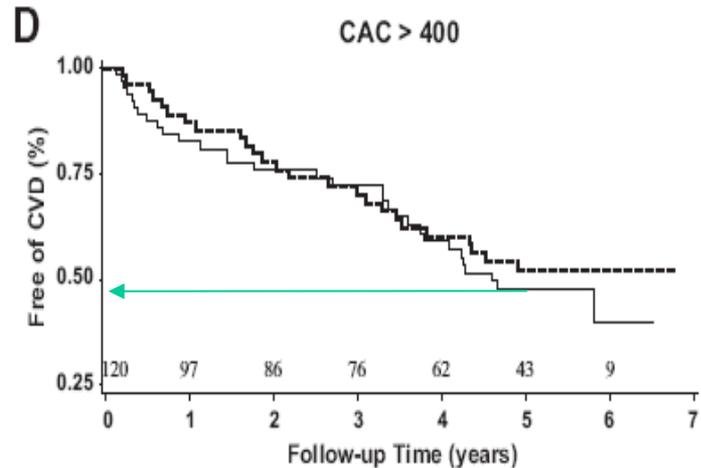
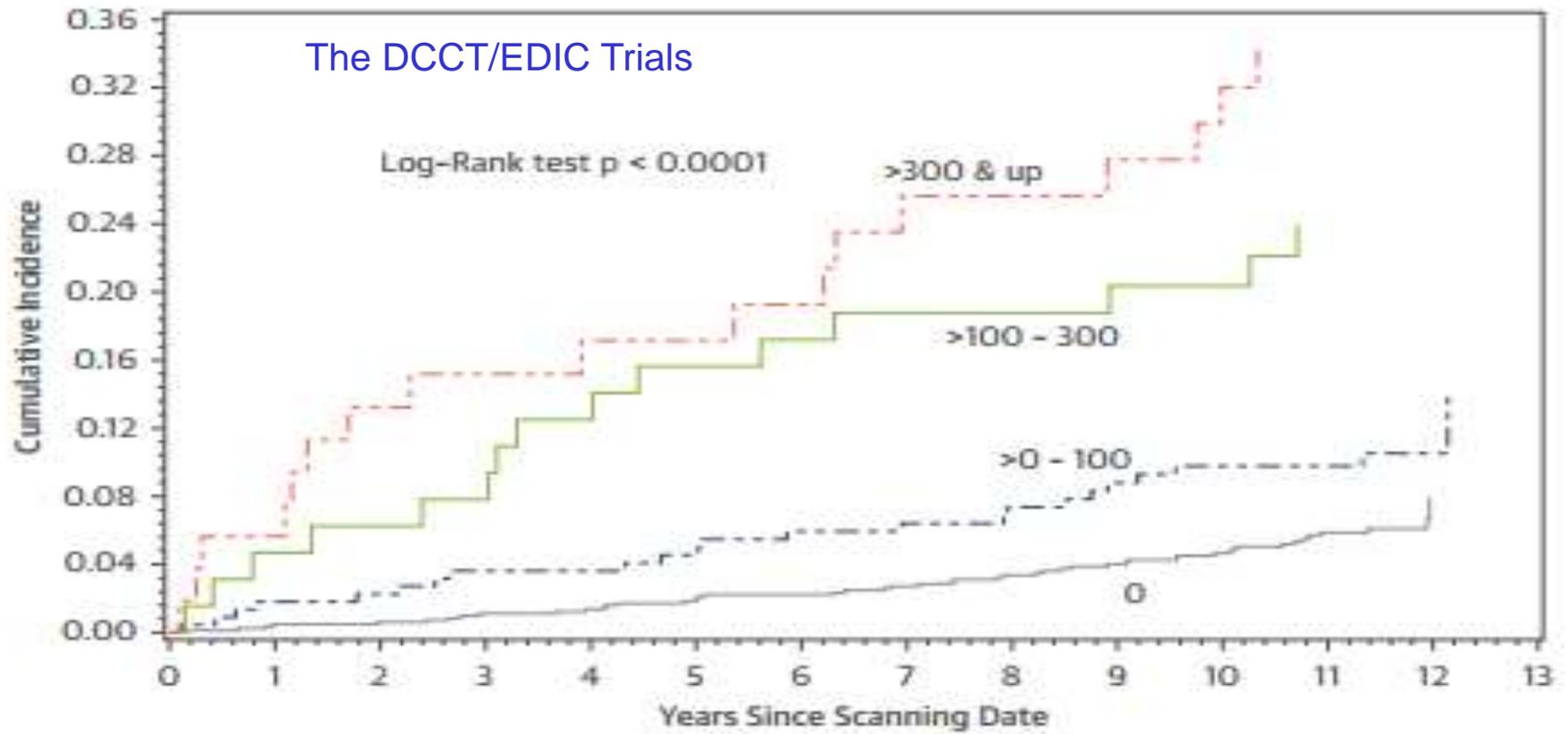


FIG. 2. Kaplan-Meier curves for time to primary macrovascular end point by clinical categories of CAC (0-10 [A], 11-100 [B], 101-400 [C], and >400[D]) in those randomized to the standard (Std) or intensive (Int) therapy arm. Differences between treatment groups were significant in A ($P = 0.03$). Shown above the x-axes are the total numbers of participants at risk at baseline and the beginning of each follow-up year through year 6.

The Association of Coronary Artery Calcification With Subsequent Incidence of Cardiovascular Disease in Type 1 Diabetes



No. at Risk

0	817
>0-100	221
>100-300	65
>300	53

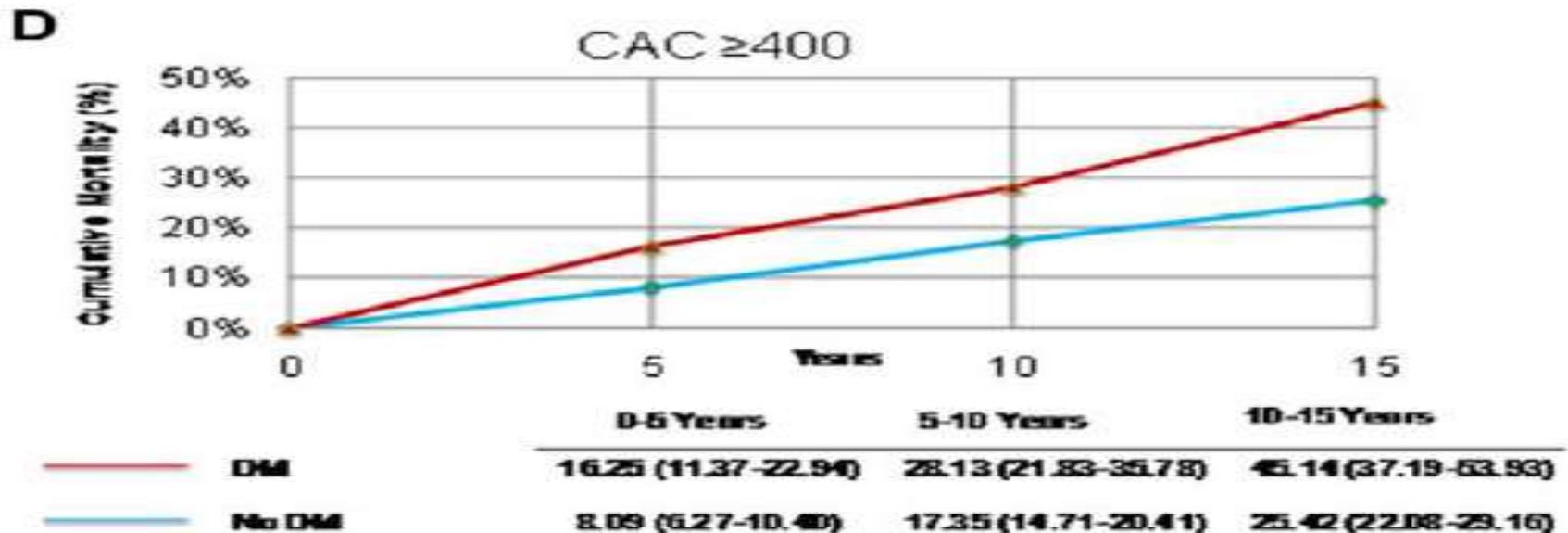
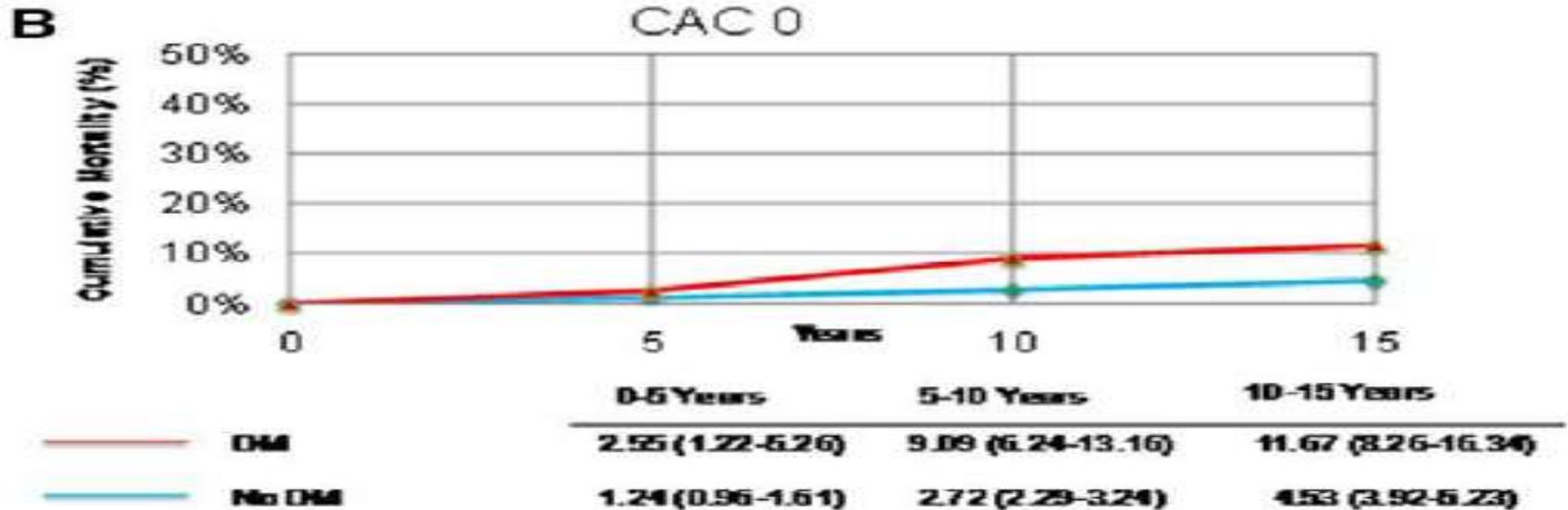
786
206
54
40

730
185
47
32

Score calcique et D2 : seuil d'exclusion 0 ou 10

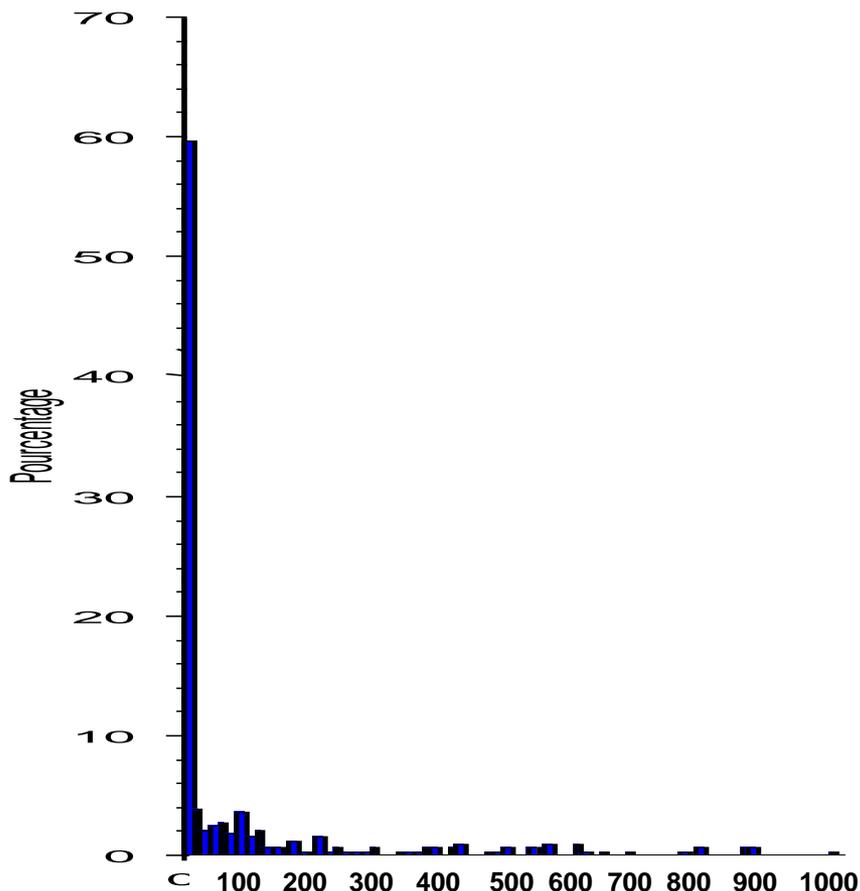
- Previous data has demonstrated a significant difference in risk between CAC = 0, versus CAC 1-10
 - Blaha et al JACC CV imaging 2009 previously demonstrated in a cohort of asymptomatic patients referred for CAC scoring that the multivariable adjusted hazard ratio for all-cause mortality among individuals with CAC 1-10 versus CAC 0 was 1.99 (1.44 – 2.75).(2)
 - Budoff et al Am Heart J 2009 demonstrated similar results from the Multi-Ethnic Study of Atherosclerosis (MESA), a cohort of asymptomatic individuals free of baseline cardiovascular disease. The multivariable adjusted hazard ratio for hard CHD events among individuals with CAC 1-10 versus CAC 0 was 3.23 (1.17 – 8.95).(3)
 - Silverman et al Diabetes care 2012 conducted a secondary analysis of our cohort of 2,384 asymptomatic individuals with diabetes referred for CAC testing. the multivariable adjusted hazard ratio for all-cause mortality among individuals with CAC 1-10 versus CAC 0 was 2.7 (1.12-6.51).
- In fact CAC=0 stands out as the most potent negative risk measure amongst all populations studied to date.
 - Blaha MJ Understanding the utility of zero coronary calcium as a prognostic test: a Bayesian approach. Circ Cardiovasc Qual Outcomes. 2011 Mar;4(2):253-6(5)

Répétition des scores calciques et mortalité CV

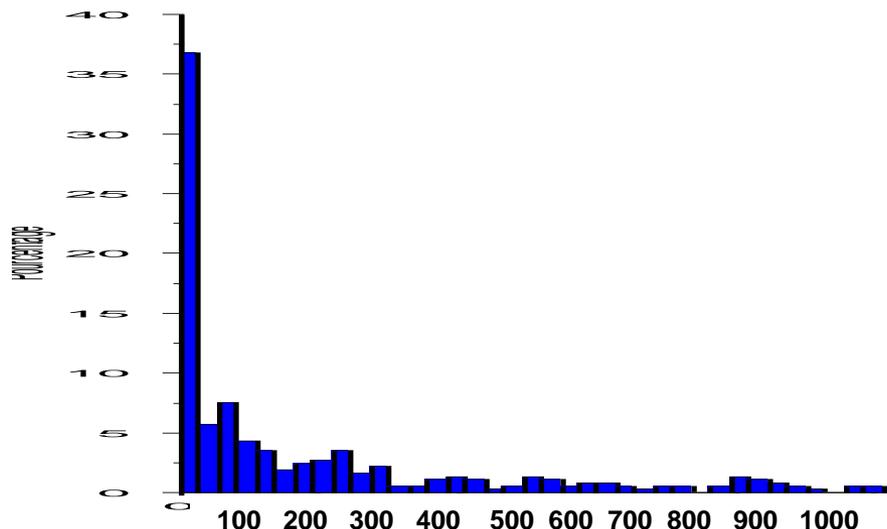


Distribution des Scores Calciques Coronariens:

Fédération d'endocrinologie 2015-2016

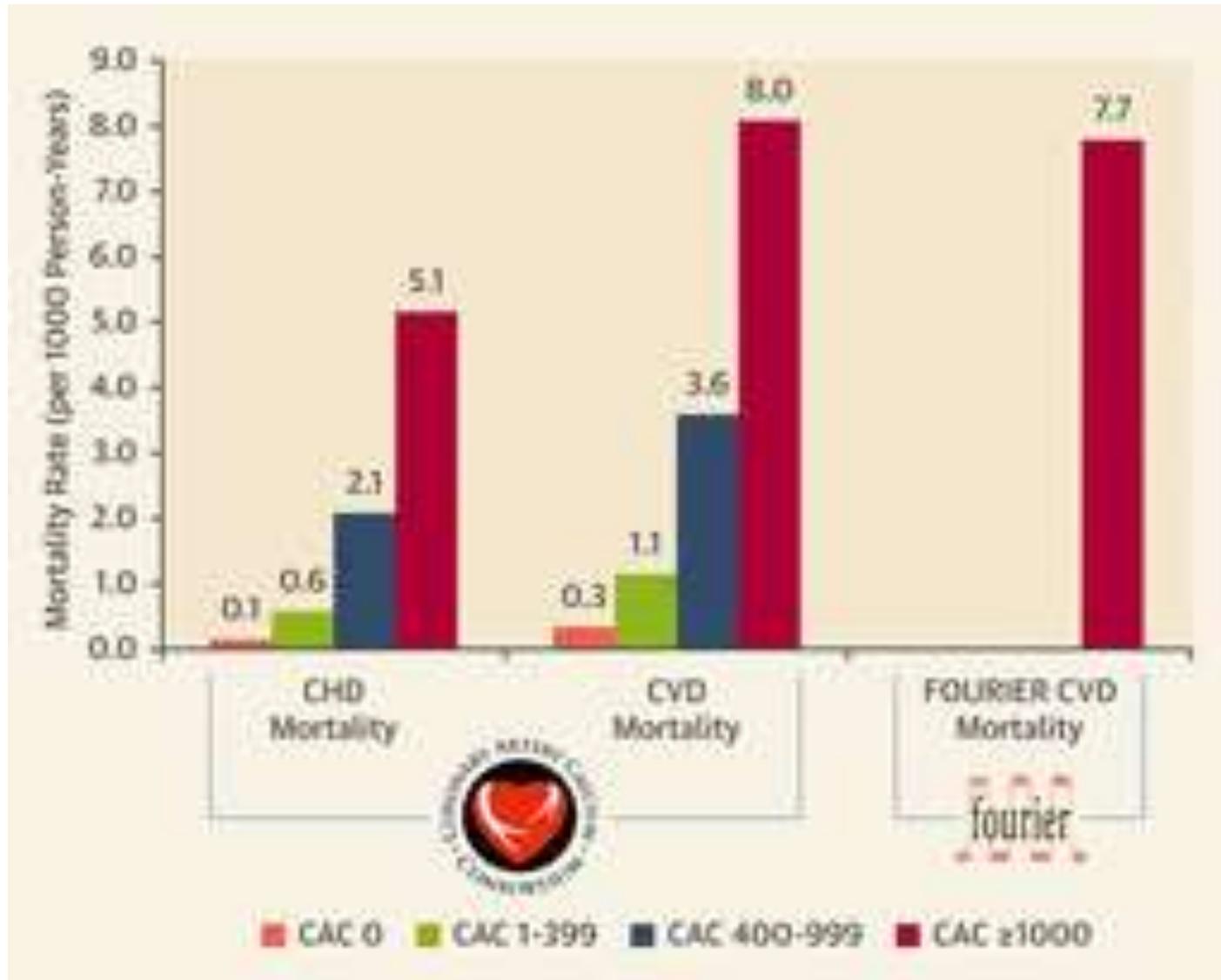


Distribution du CAC au sein de 338 diabétiques d'âge ≤ 60 ans (9 malades (3%) CAC >1000)



Distribution du CAC au sein de 369 diabétiques d'âge > 60 ans (38 malades (10%) CAC >1000)

Risque des super CAC



Evolutivité du CAC et prédiction cv: MESA study

Validité en l'absence de statine ?

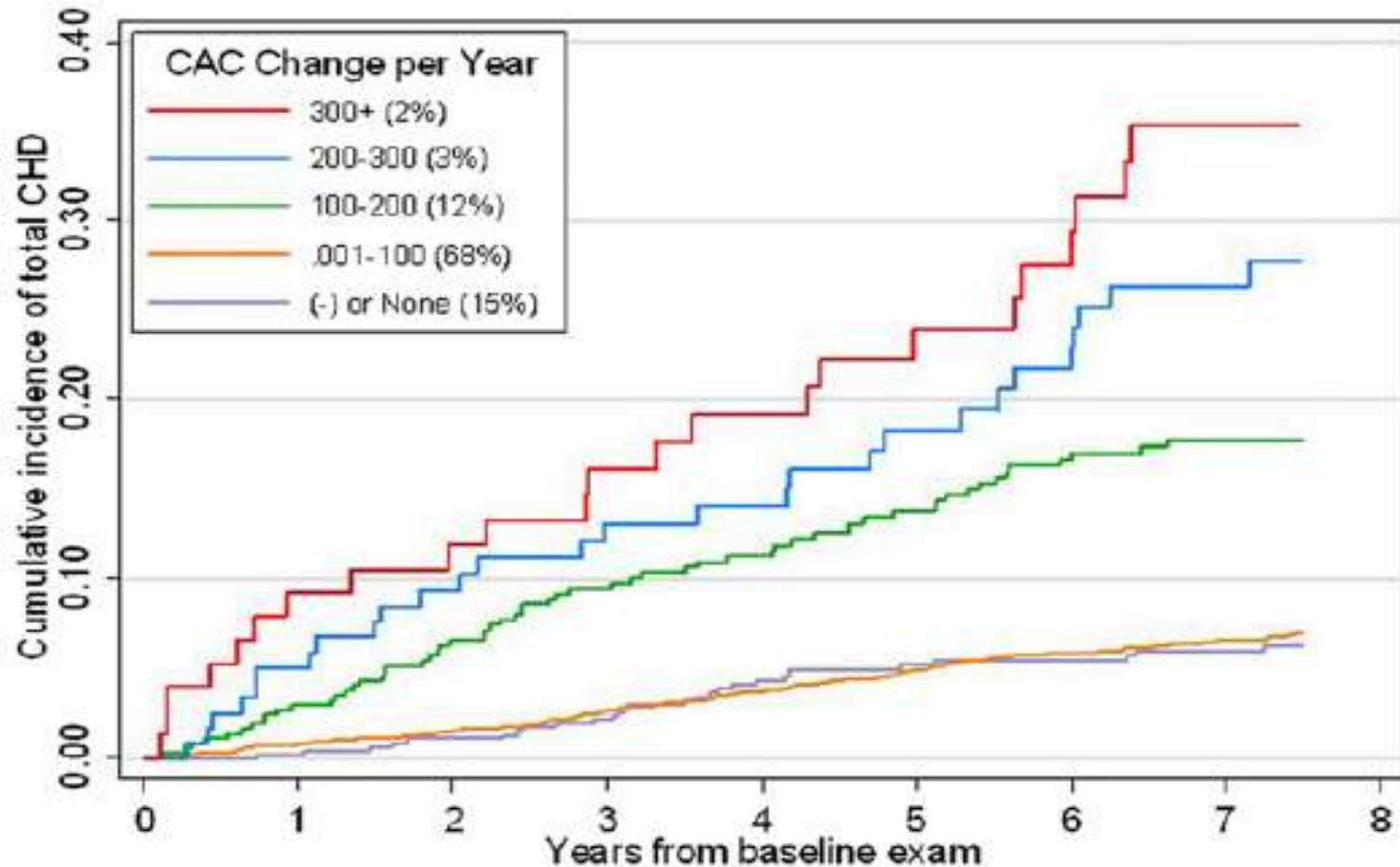


Figure 2

Kaplan-Meier Plot of Cumulative Incidence of Total CHD Among Persons with CAC > 0 at Baseline

Score Calcique: valeur ajoutée de la topographie ?

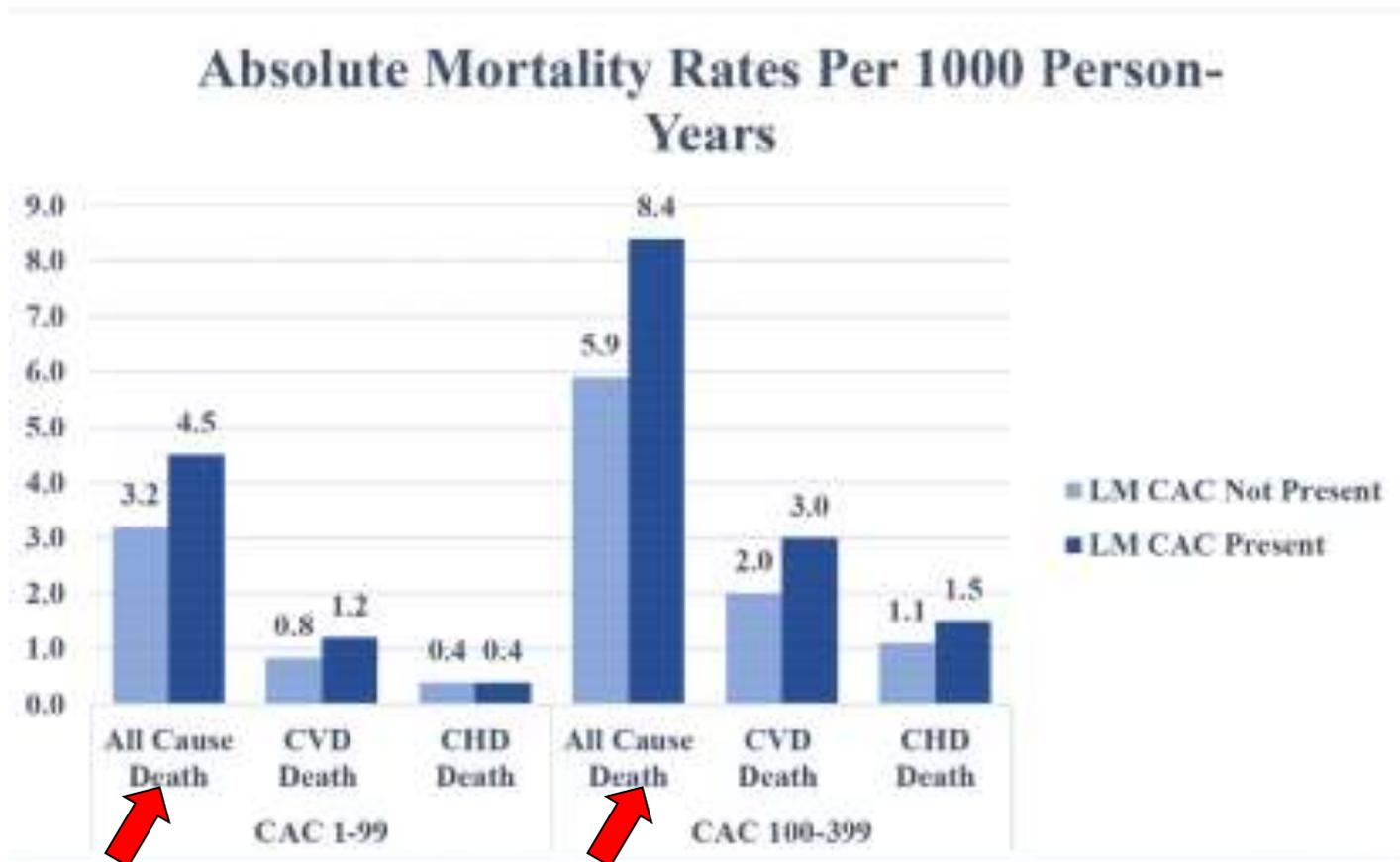
Table 3. Annualized Risk-Adjusted Mortality by Scores in the Left Anterior Descending and Left Main Coronary Arteries

	Annualized Mortality Rate (%)	95% Confidence Interval		Annualized Mortality Rate (%)	95% Confidence Interval
Total score			Left main		
0-10 (n = 14,613)	0.06	0.05-0.07	0-10 (n = 13,724)	0.33	0.32-0.34
11-100 (n = 5,033)	0.29	0.28-0.30	11-100 (n = 834)	0.81	0.74-0.89
101-399 (n = 3,177)	0.61	0.60-0.62	101-399 (n = 226)	1.73	1.44-2.01
400-999 (n = 1,469)	1.26	1.25-1.27	400-999 (n = 15)	7.71	3.13-12.30
≥1,000 (n = 965)	2.50	2.48-2.52	≥1,000 (n = 4)	100.0	100.0-100.0

The association between left main coronary artery calcium and cardiovascular-specific and total mortality: The Coronary Artery Calcium Consortium

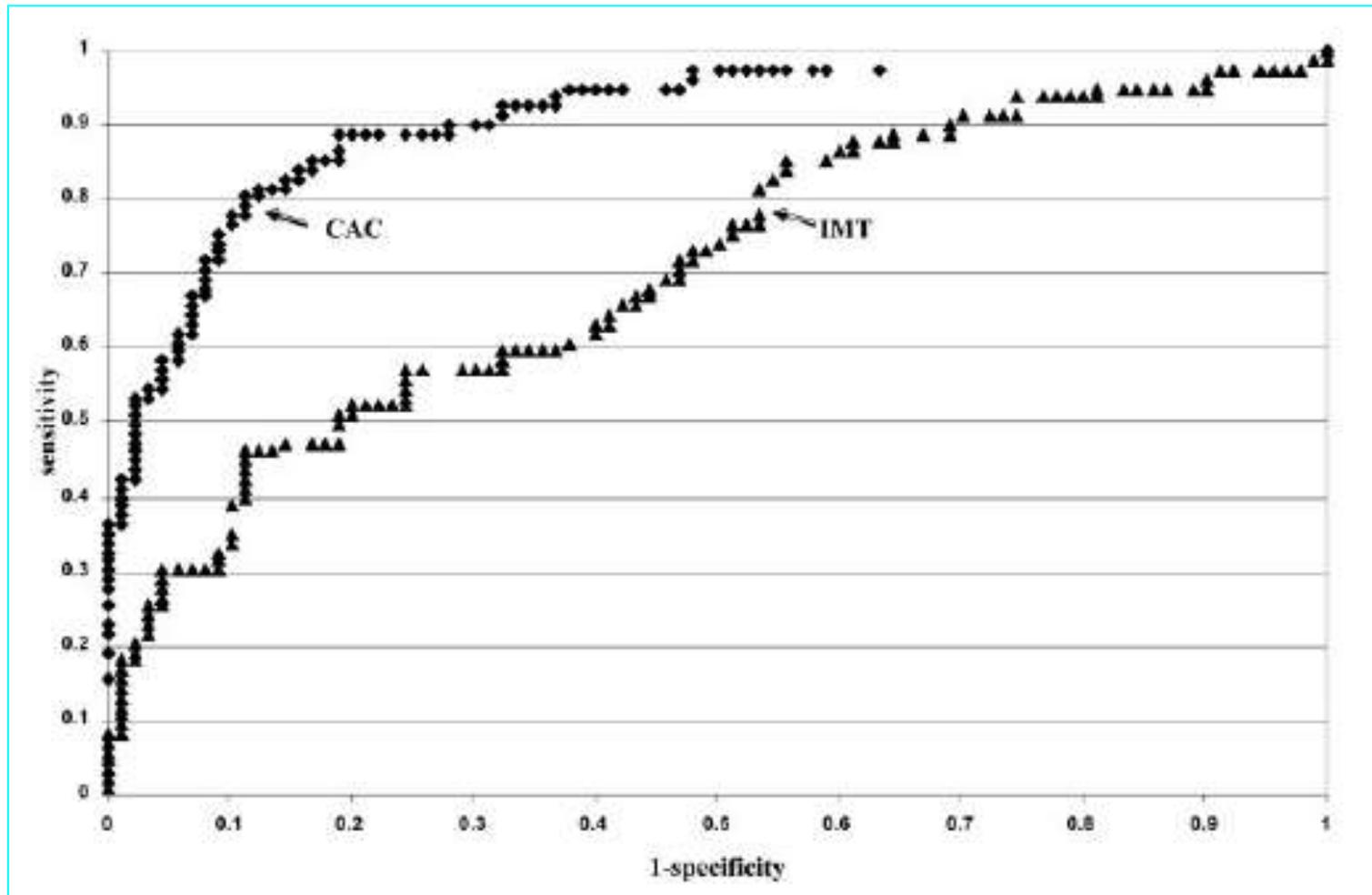
LM CAC not present n = 22,028

LM CAC present n = 6,119



-
- Intérêt / limites de la prédiction cardiovasculaire primaire
 - capacités prédictives du score calcique coronarien
 - Valeur ajoutée du score calcique coronarien
 - Limites relatives à l'utilisation du score calcique coronarien

Comparaison des valeurs diagnostic de l'IMTc vs Score calcique pour identifier une sténose coro > 50 %



Coronary Artery Calcium Outperforms Carotid Artery Intima-Media Thickness as a Noninvasive Index of Prevalent Coronary Artery Stenosis

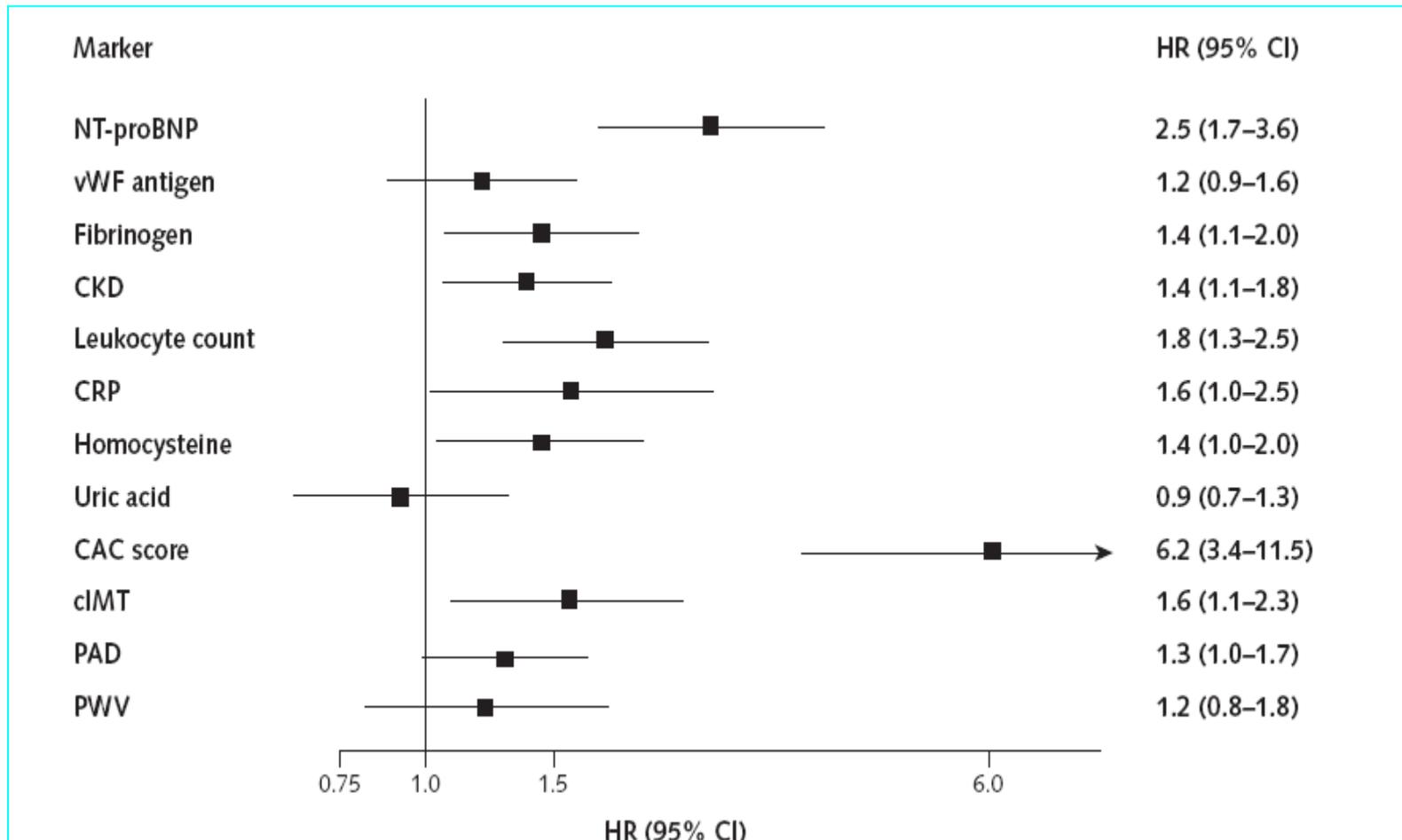
Terry JG et al *ATVB* 2005;25:1723-1728

Evaluation of Newer Risk Markers for Coronary Heart Disease Risk Classification

A Cohort Study

Multivariable-adjusted HR for incident coronary heart disease.

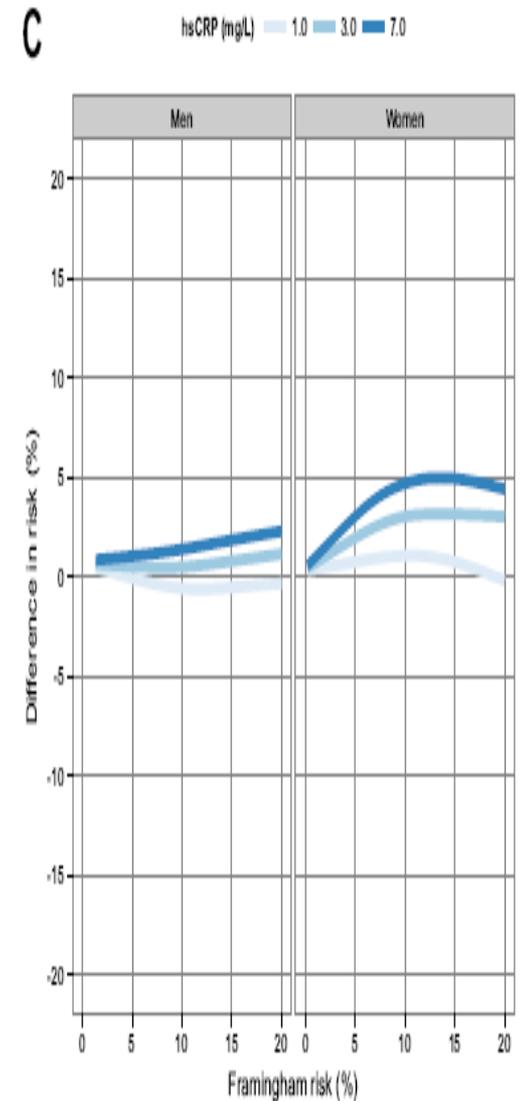
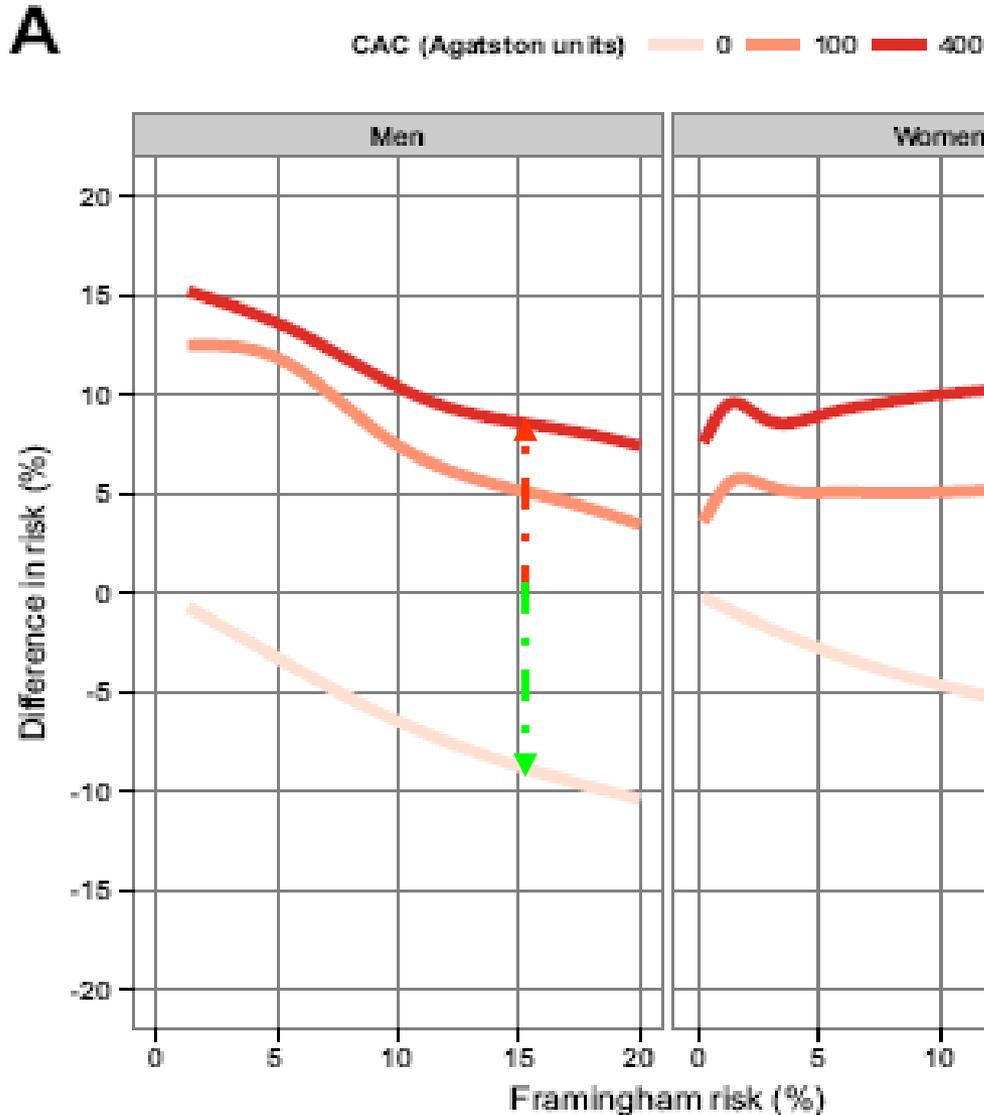
Rotterdam 6.8 ans
20 perdus de vue!



NRI: taux (%) de reclassification dans la catégorie à risque intermédiaire du score de framingham

Extended Model	NRI (95% CI), %†
FRS + NT-proBNP	33.0 (23.4 to 42.6)
FRS + vWF antigen	4.0 (−0.2 to 8.1)
FRS + fibrinogen	10.2 (4.5 to 15.9)
FRS + CKD	9.8 (4.4 to 15.1)
FRS + leukocyte count	9.3 (3.2 to 15.4)
FRS + CRP‡	9.2 (0.2 to 18.0)
FRS + homocysteine	4.7 (−0.9 to 10.3)
FRS + uric acid	2.6 (1.0 to 4.2)
FRS + CAC score‡	39.3 (26.8 to 51.7)
FRS + cIMT	4.6 (−0.1 to 9.3)
FRS + PAD	7.3 (2.9 to 11.7)
FRS + PWV	3.2 (−0.6 to 7.1)

Réévaluation de l'estimation du risque CV



IMTc vs CAC: mesa study

Table 3. Hazard Ratios (HRs) for an Incident CVD, CHD, or Stroke Event in Relation to Quartiles of Maximal Carotid IMT or CAC Score (MESA, 2000-2004)

Measure ^a	HR (95% CI)			χ^2 Statistic	P Value
	<50th Percentile	Quartile 3	Quartile 4		
CVD (n = 222)					
Age-, race-, and sex-adjusted					
z Score max IMT	1 [Reference]	1.4 (0.9-2.0)	2.2 (1.5-3.2)	20.1	<.001
CAC score	1 [Reference]	2.6 (1.6-4.1)	5.3 (3.4-8.2)	58.4	<.001
Multivariable-adjusted ^b					
z Score max IMT	1 [Reference]	1.3 (0.9-2.0)	1.7 (1.2-2.5) 	8.7	.01
CAC score	1 [Reference]	2.3 (1.5-3.7)	4.4 (2.8-6.8)	44.7	<.001
CHD (n = 159)					
Age-, race-, and sex-adjusted					
z Score max IMT	1 [Reference]	1.5 (1.0-2.4)	2.1 (1.4-3.3)	11.5	<.01
CAC score	1 [Reference]	4.1 (2.2-7.7)	10.3 (5.6-18.9)	63.8	<.001
Multivariable-adjusted ^b					
z Score max IMT	1 [Reference]	1.5 (0.9-2.3)	1.7 (1.1-2.7) 	5.4	.07
CAC score	1 [Reference]	3.5 (1.9-6.6)	8.2 (4.5-15.1)	51.5	<.001
Stroke (n = 59)					
Age-, race-, and sex-adjusted					
z Score max IMT	1 [Reference]	0.9 (0.4-2.0)	2.4 (1.2-4.7)	9.9	<.01
CAC score	1 [Reference]	1.4 (0.8-2.7)	1.2 (0.6-2.4)	0.7	.70
Multivariable-adjusted ^b					
z Score max IMT	1 [Reference]	0.9 (0.4-2.0)	1.8 (0.9-3.6) 	4.7	.10
CAC score	1 [Reference]	1.3 (0.6-2.6)	1.0 (0.5-2.1)	0.6	.73

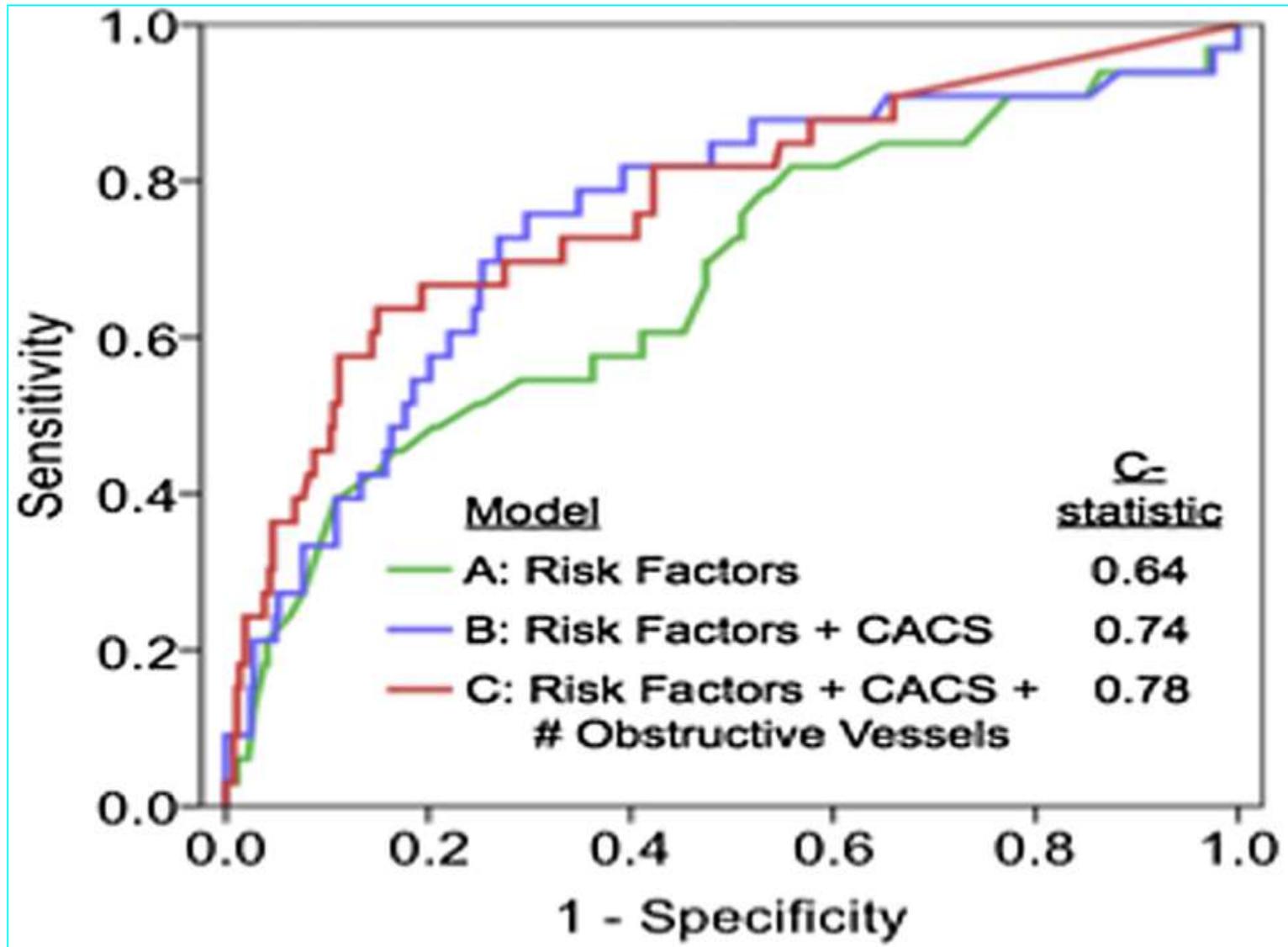
Les enjeux du CAC lors de la prévention CV primaire:

- 3 enjeux
 - perte de chance hypothétique liée à une stratégie ne comportant pas d'évaluation fonctionnelle coronarienne ni de coronarographie...
 - l'ajustement de traitements éventuellement iatrogènes : intensification/désescalade
 - Les surcoûts
 - Individuels
 - collectifs

Courbes ROC comparatives : evt CV lors du diabete

FRCV vs CAC vs angio scanner coro

confirm registry n=400 suiv 2,7 années MACE + revasc

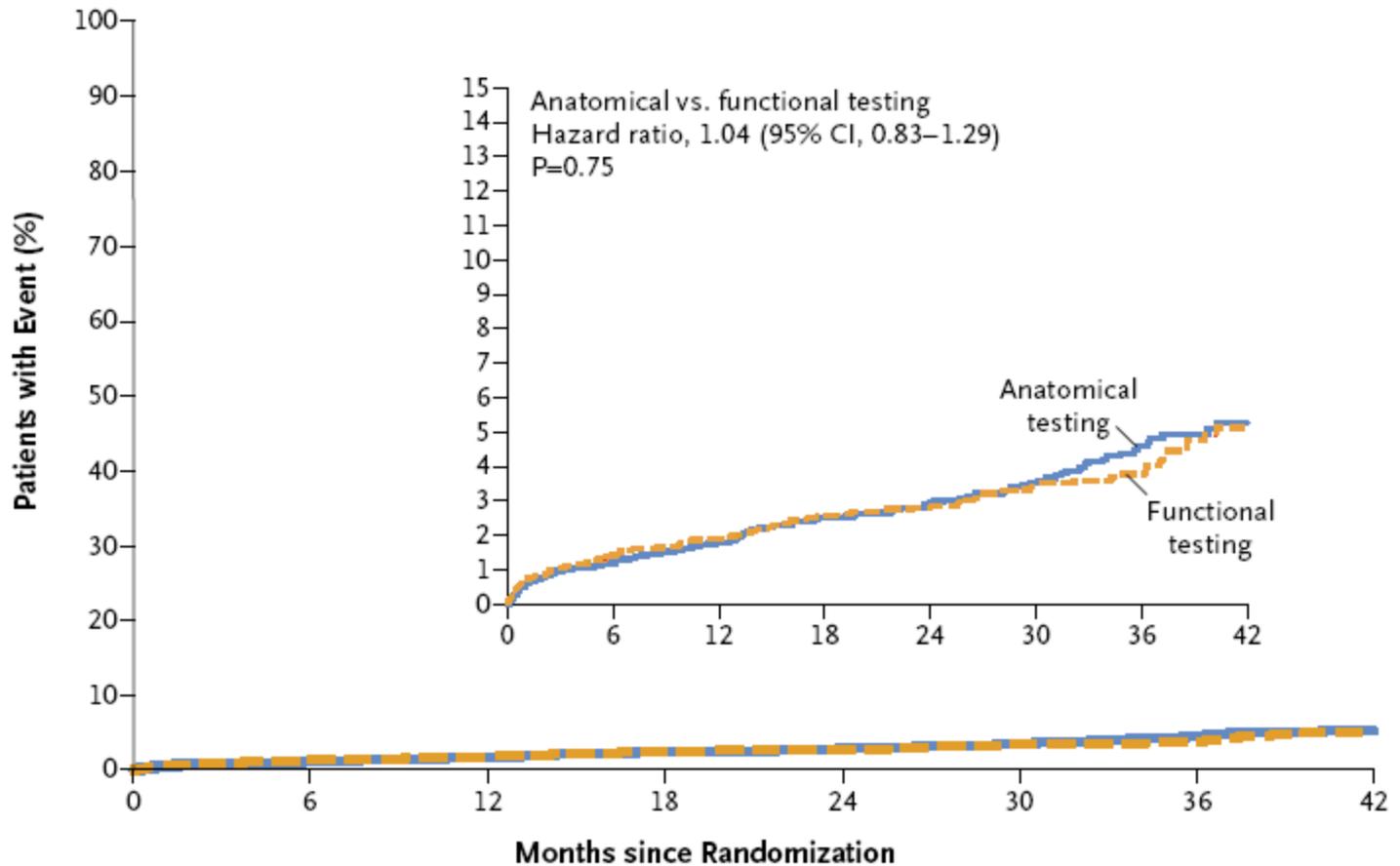


Impact pharmaco économique

Table 4 Comparison of No-Scan Subjects and Scan Subjects With a CAC Score of 0

Parameters	Study Group at Baseline	No-Scan Group	CAC Score 0	p Value
Medical costs (in U.S. \$)				
Procedure costs	All subjects	712 (523, 901)	447 (351, 543)	0.001
Meds costs	All subjects	2,937 (2,620, 3,254)	2,176 (1,922, 2,429)	0.005
Lipid-lowering meds	All subjects	721 (625, 817)	581 (491, 671)	0.02
BP meds	All subjects	761 (659, 863)	722 (623, 820)	0.78
Diabetic meds	All subjects	545 (415, 675)	367 (259, 476)	0.02
Aspirin	All subjects	26 (20, 33)	16 (11, 21)	0.02
All costs	All subjects	3,649 (3,263, 4,035)	2,623 (2,343, 2,903)	0.001

Promise study: comparaison CAC vs epreuves fonctionnelles chez un malade angineux



No. at Risk

Anatomical testing	4996	4703	4362	3551	2652	1705	902	269
Functional testing	5007	4536	4115	3331	2388	1518	832	258

-
- limites de la prédiction cardiovasculaire
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 - Observation
 - intégration

St Francis study Atorva 20 vs placebo si CAC > 80° p

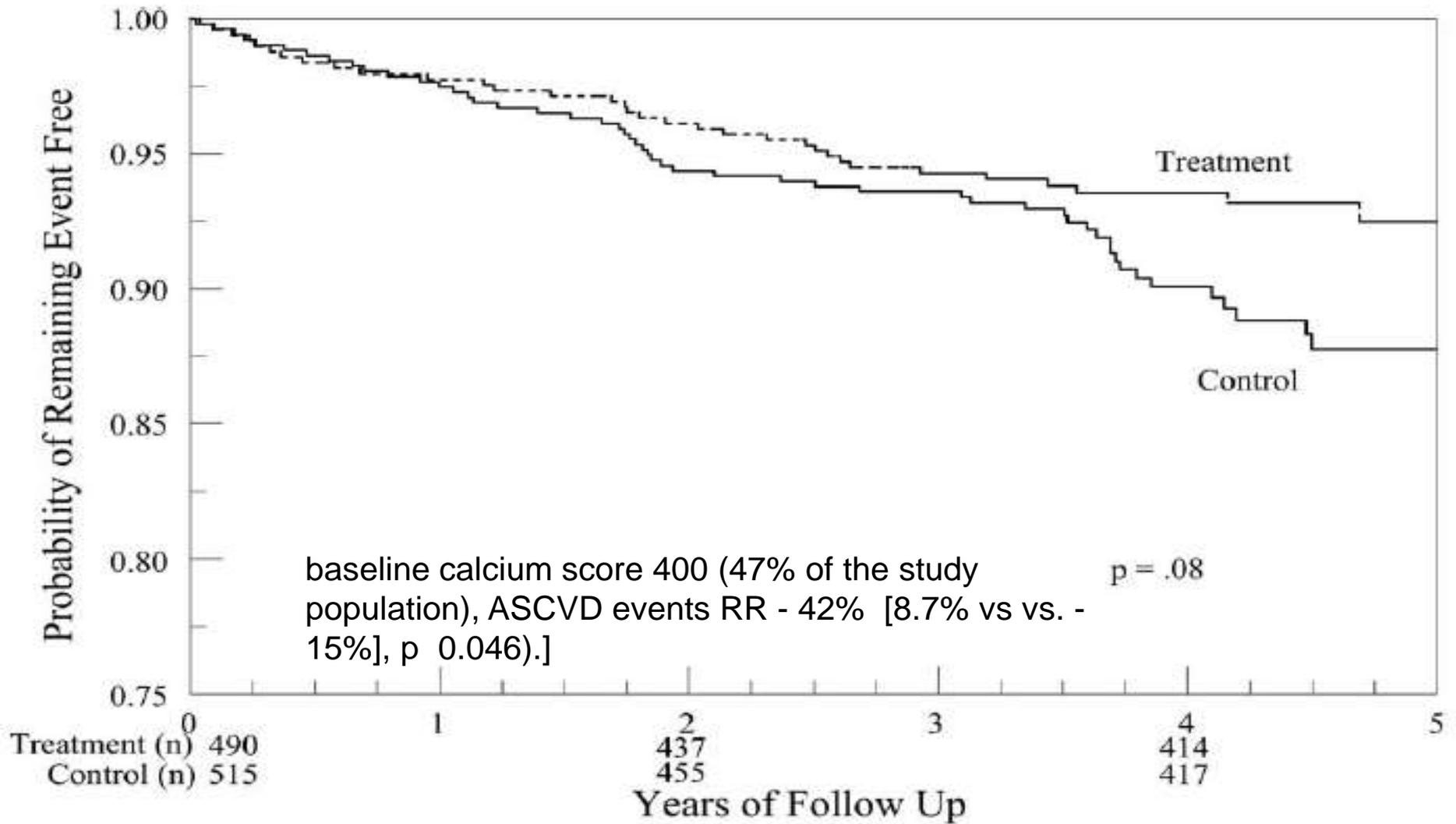


Figure 1. Kaplan-Meier survival curves for all atherosclerotic disease events.

Les enjeux du dépistage du risque coronarien ischémique

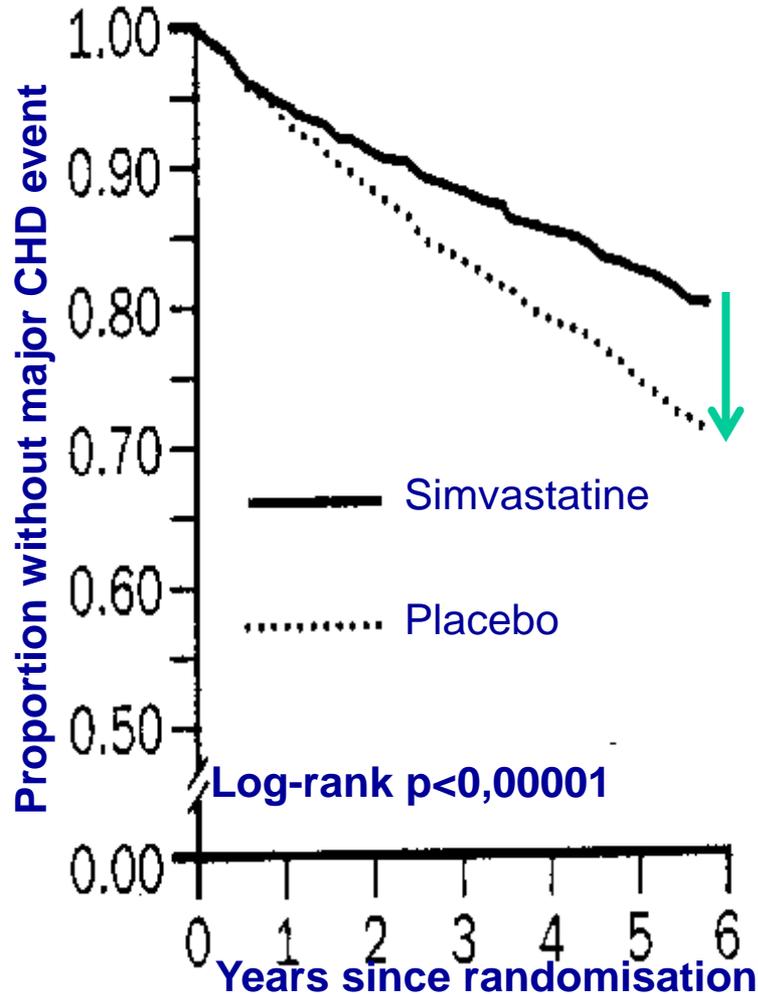
- Pathologie fréquente et grave : souvent
- Non repérable avec méthodes cliniques usuelles
- Détection sensible et spécifique dans la population ciblée ???
- Détection économique et non iatrogène: ??
- Détection éthique: certitude d'un bénéfice pour le malade: FFR!

Une médecine prédictive personnalisée en prévention CV

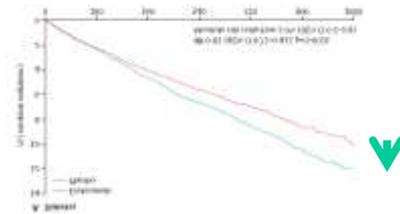


Identification de population cible: GAIN COMPARE EN RISQUE ABSOLU

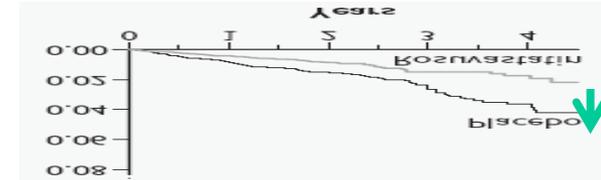
ESSAI 4S
prev secondaire LDLc 1.9 g/l



ESSAI Fourier DT2
prev I/II LDLc 0.9 g/l



ESSAI JUPITER
prev primaire LDLc 1.1 g/l

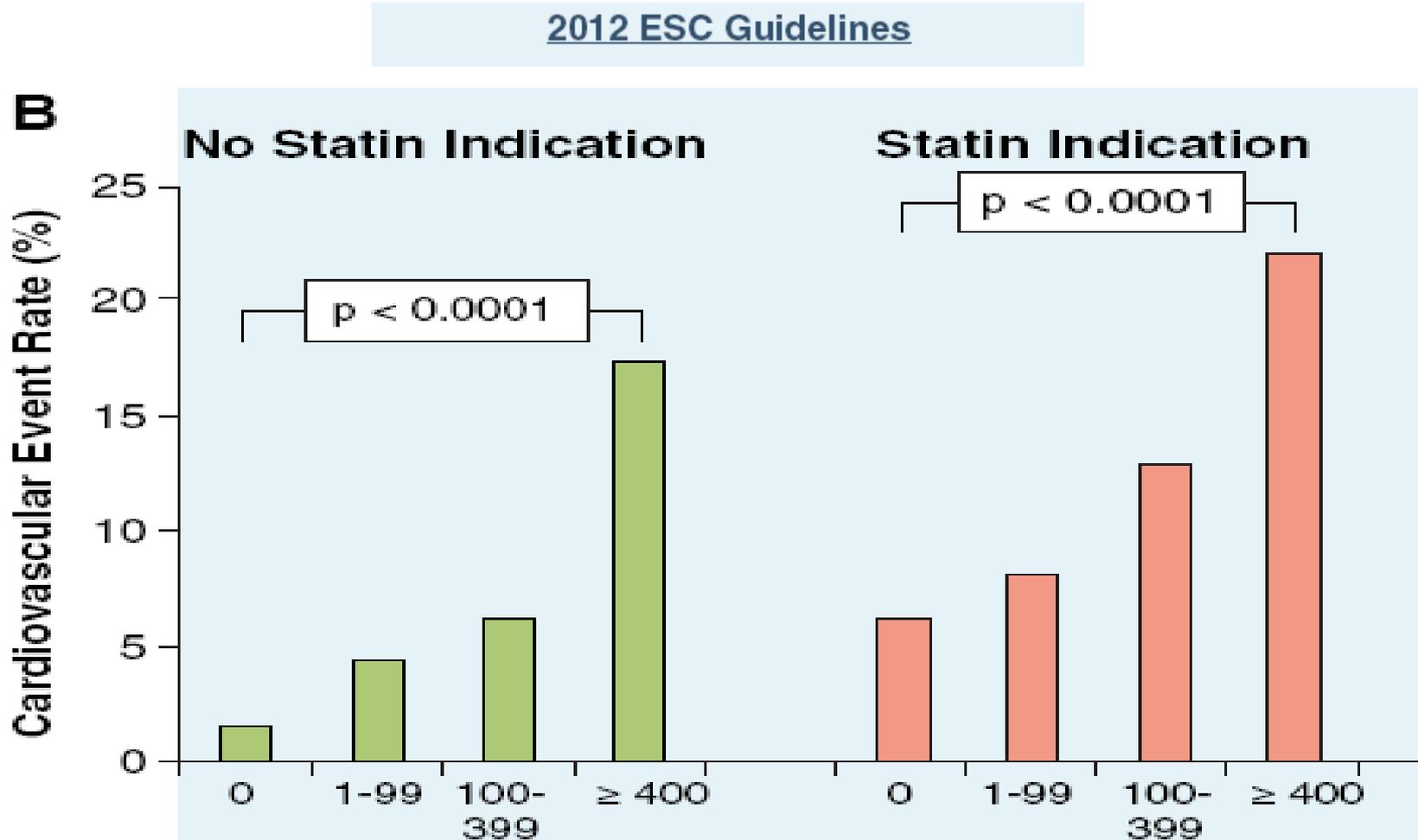


0,5 €/j vs 21 €/J

- Jupiter: NNT 5y 549 patients without CAC
 - if CAC score >100 UA: NNT 5y 24
- M.J. Blaha et al Lancet 2011;378:684e692.

Pedersen et al 4S Trial Lancet 1994
Ridker P et al Jupiter Trial NEJM 2008
Sabatine et al Fourier trial NEJM 2017

Valeur ajoutée du CAC vs reco basée du profil de risque CV

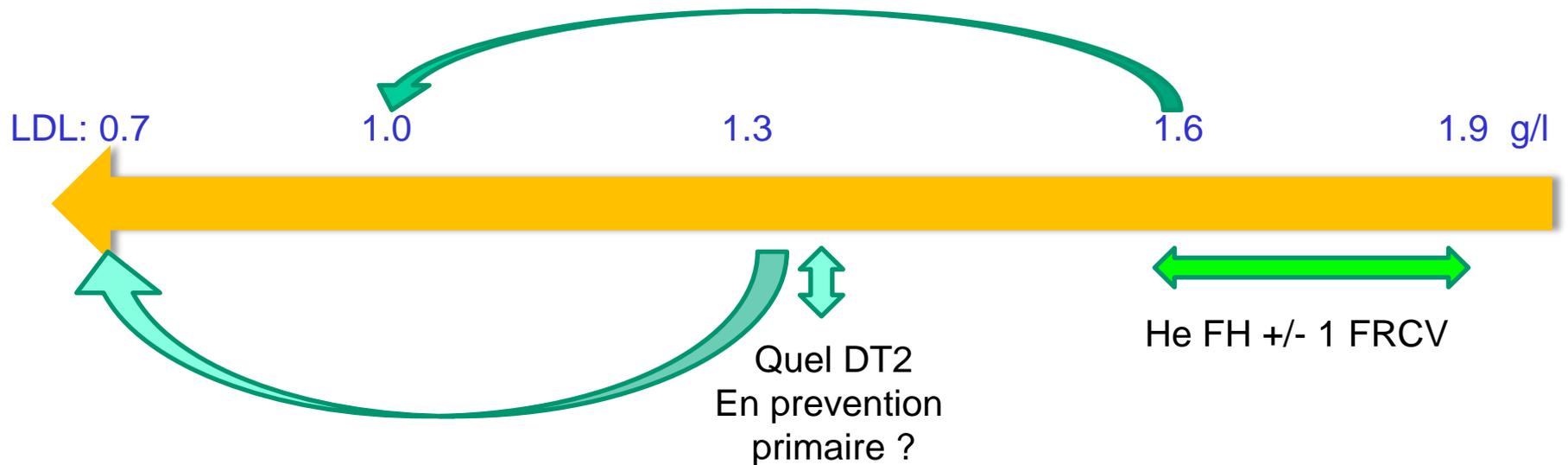


In 3,745 subjects (59 ± 8 years of age, 47% men) from the population based longitudinal Heinz Nixdorf Recall cohort study without cardiovascular disease or lipid-lowering therapy at baseline CAC score was assessed between 2000 and 2003. Subjects remained unaware of their initial CAC score. Statin indication was determined according to 2012 ESC and 2013 AHA/ACC guidelines

RECO ESC EAS anti PCSK9

Indication mab anti PCSK9 en europe

Prévention primaire



Préfiltrage par athérome infraclinique?

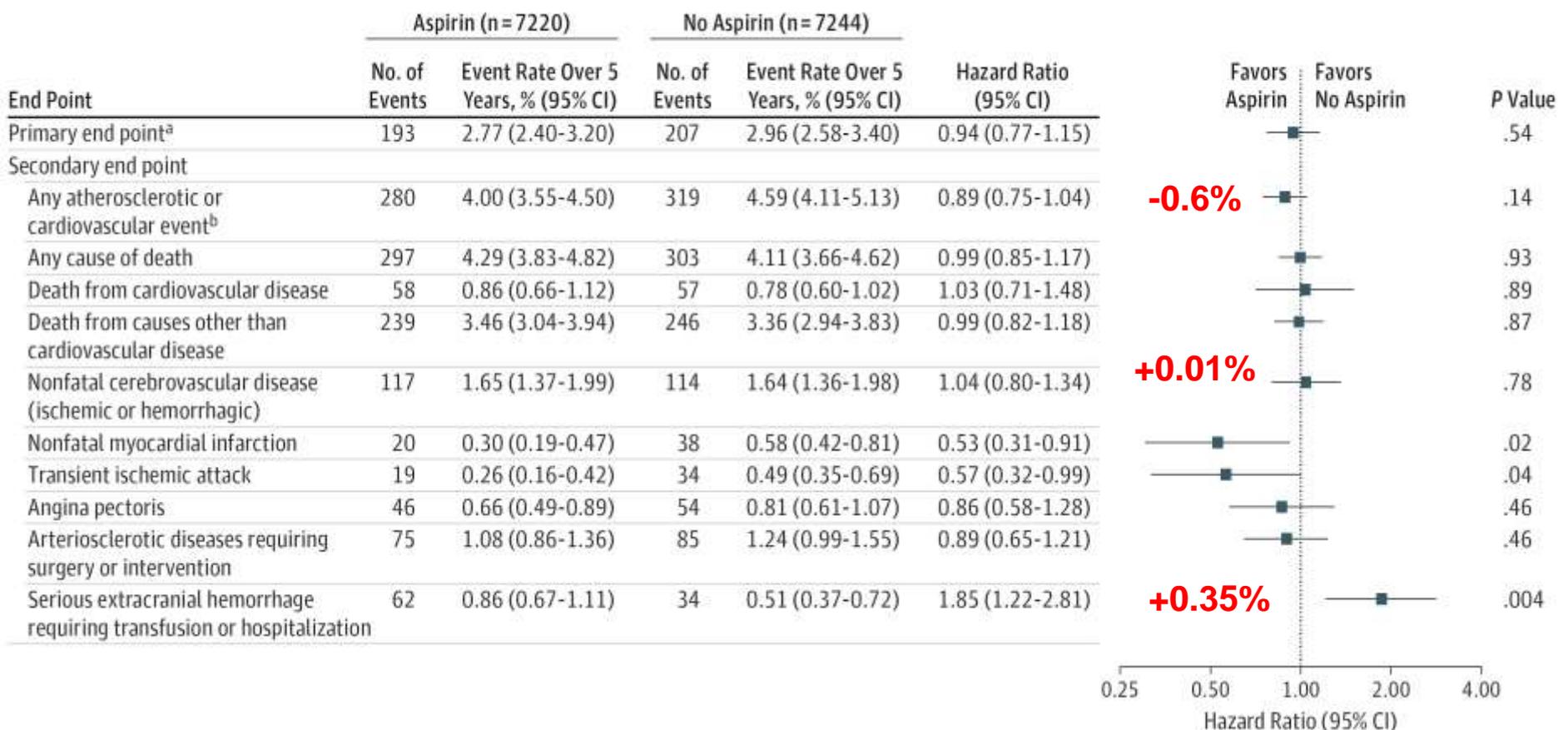
Iatrogénèse potentielle de l'aspirine en prévention primaire

Original Investigation

Low-Dose Aspirin for Primary Prevention of Cardiovascular Events in Japanese Patients 60 Years or Older With Atherosclerotic Risk Factors A Randomized Clinical Trial

Yasuo Ikeda, MD; Kazuyuki Shimada, MD; Tamio Teramoto, MD; Shinichiro Uchiyama, MD; Tsutomu Yamazaki, MD; Shinichi Oikawa, MD; Masahiro Sugawara, MD; Katsuyuki Ando, MD; Mitsuru Murata, MD; Kenji Yokoyama, MD; Naoki Ishizuka, PhD

Figure 4. Hazard Ratios for Aspirin vs No Aspirin and Event Rates for Secondary End Points Among Older Japanese Patients With Multiple Atherosclerotic Risk Factors (Modified Intention-to-Treat Population)



39 evt isch et 1 décès isch évités / 28 hgies induites

Ikeda Y et al JAMA 2014

Potential Implications of Coronary Artery Calcium Testing for Guiding Aspirin Use Among Asymptomatic Individuals With Diabetes

MICHAEL GORDON SILVERMAN, MD¹
MICHAEL J. BLAHA, MD, MPH¹
MATTHEW J. BUDOFF, MD²
JUAN J. RIVERA, MD, MPH¹
PAOLO RAGGI, MD³
LESLEE J. SHAW, PHD³

DANIEL BERMAN, MD⁴
TRACY CALLISTER, MD⁵
JOHN A. RUMBERGER, MD, PHD⁶
JAMAL S. RANA, MD, PHD⁴
ROGER S. BLUMENTHAL, MD¹
KHURRAM NASIR, MD, MPH^{1,7}

a mean of 5.6 ± 2.6 years (median 5 years, range 1 to 13 years) for the primary end point of all-cause mortality verified using the Social Security Death Index. Annualized all-cause mortality rates were estimated by dividing number of deaths by number of person-years at risk

Les conséquences

whether to include any newer test in a risk prediction algorithm requires full consideration of the financial costs (health system).

Coût direct:

Coût indirect:

Majoration dépenses de santé:

intensification inefficace,
découverte d'incidentalomes

Retour sur investissement:

intensification ciblée ;

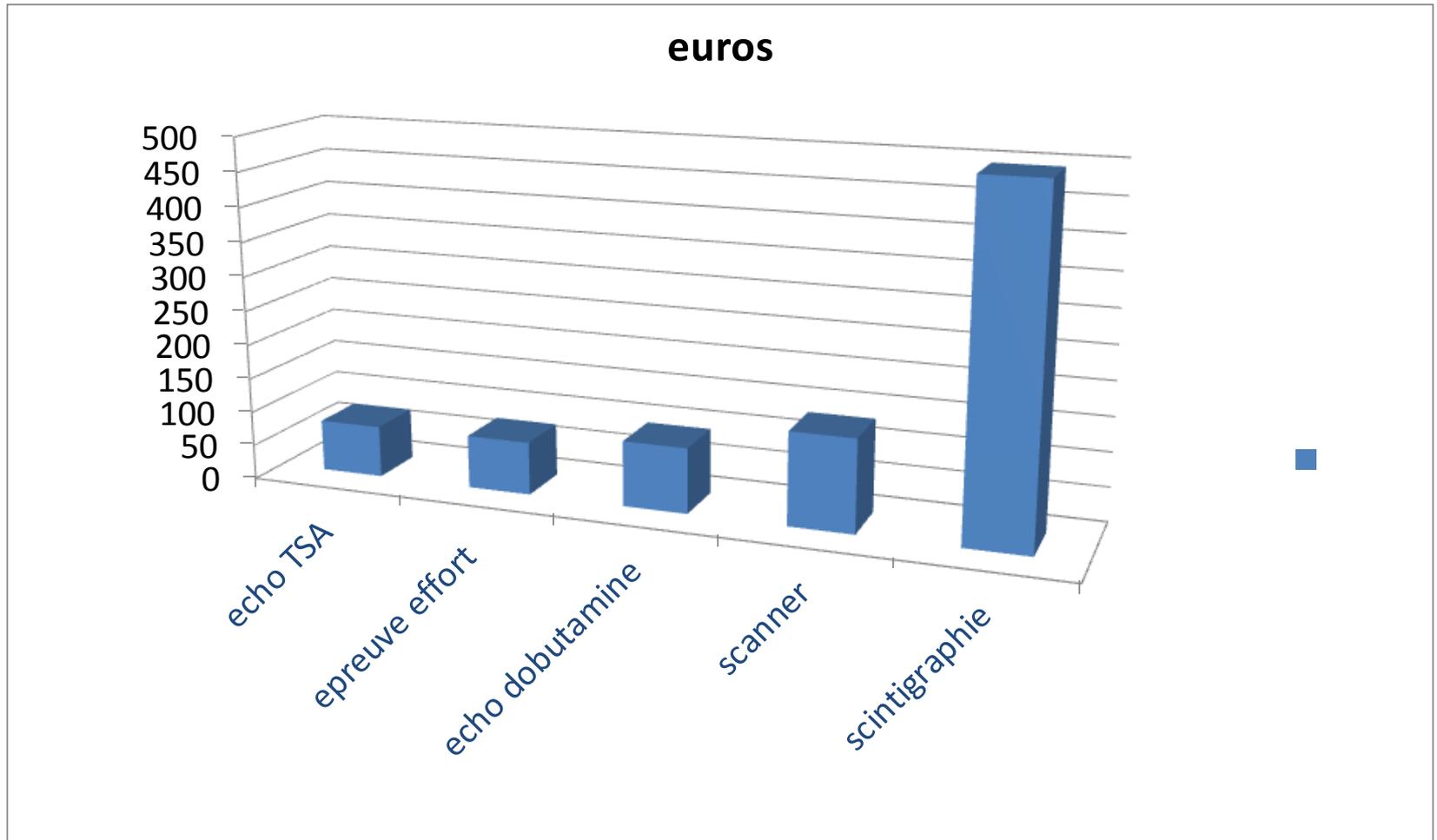
Depistage cancer poumon, ectasie aortique,

Admettre de traiter moins certains malades = la désescalade ?

clinical cost (individual people) exposing potentially healthy populations to radiation in a screening program requires careful considerations of the balance of risks and benefits.

Dosimétrie équivalente RP, répétition triennale / Quinquennale ?

Coût direct



Comparaison score calcique EIMc

	Score calcique	EIMc
	morphologique	morphologique
Localisation coro	+++	-
repérage	Tronc IVA	Sténose carotide/ nodules thy
Prédiction	++/ quantitative	+/quantitative
Validité	Ila	IIb
durée	120 secondes	10 minutes
reproductibilité	++	+/- Inter obs dep +++
cout	++ radio	+ radio ou cardio ou angiologue
	$100,51 + 40,38 + 1,5 = 142,39 \text{ €}$	75,6€
interprétation	Interprétation relative Selon age +++	Interprétation relative selon l'age +++

Comparaison score calcique, epreuve effort, scinti myocardique

	Score calcique	ECG effort	Scinti myoc
	morphologique	fonctionnel	fonctionnel
localisation	+	+/-	+
Prédiction	++	VPP, VPN ?	++
Validité	IIa/IIb	IIb	IIb-III
durée	120 secondes	20-30 minutes	1-3 heures
reproductibilité	+++	++?	+/- !!!
cout	++ radio	++ cardio	+++ med nucl
irradiation	+	-	+++
En pratique	Interprétation relative	Faussement rassurant ? Info fonctionnelle	Litigieuse ! Info fonctionnelle

-
- limites de la prédiction cardiovasculaire
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 - Valeur ajoutée du score calcique coronarien
 - Limites relatives à l'utilisation du score calcique coronarien
 - Observation
 - intégration

Les limites de l'exploitation du score calcique

- → outil de prédiction CV
 - et non pas de description anatomique de l'athérome coronarien
- → Ne prédit pas efficacement le risque AVC
 - l'EIMc prédit le risque coronaire indirectement
 - Le CAC prédit le risque AVC indirectement
- **Pb: Les sujets jeunes: MESA age > 45 ans**
 - pas le temps de calcifier ? Valeur ssi positif
 - Interpréter selon l'age +++
 - Neutralité du compte rendu
 - **Expression du CAC en absolue (n UA) et en percentile pour age et sexe**
- **Nécessité d'essai de stratégie de Non escalade/désescalade**
Oser ne pas escalader (voire désescalader) devant un score calcique nul ???

Calcium calculator: <http://www.mesa-nhlbi.org/Calcium/input.aspx>

[Back to MESA CAC](#)

Input your age, select your gender and race/ethnicity, input (optionally) your observed calcium score and click "Calculate".

Age (45-84):

Gender:

Race/Ethnicity:

Observed Agatston Calcium Score (optional):

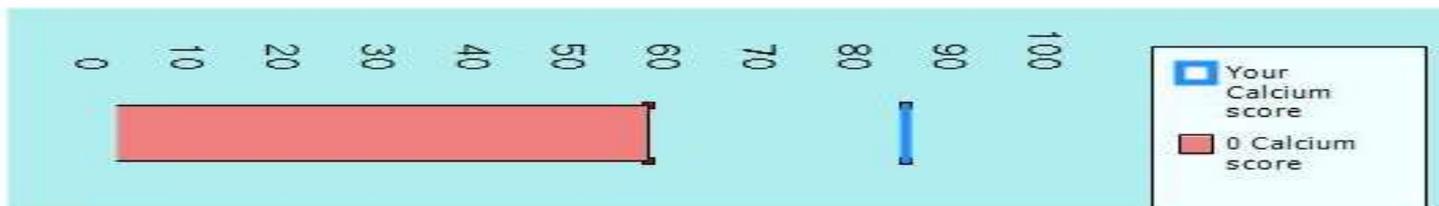
The estimated probability of a non-zero calcium score for a white male of age 51 is **44 %**.

Percentiles and Calcium Scores for: **white male of age 51**

25th	50th	75th	90th
0	0	29	132

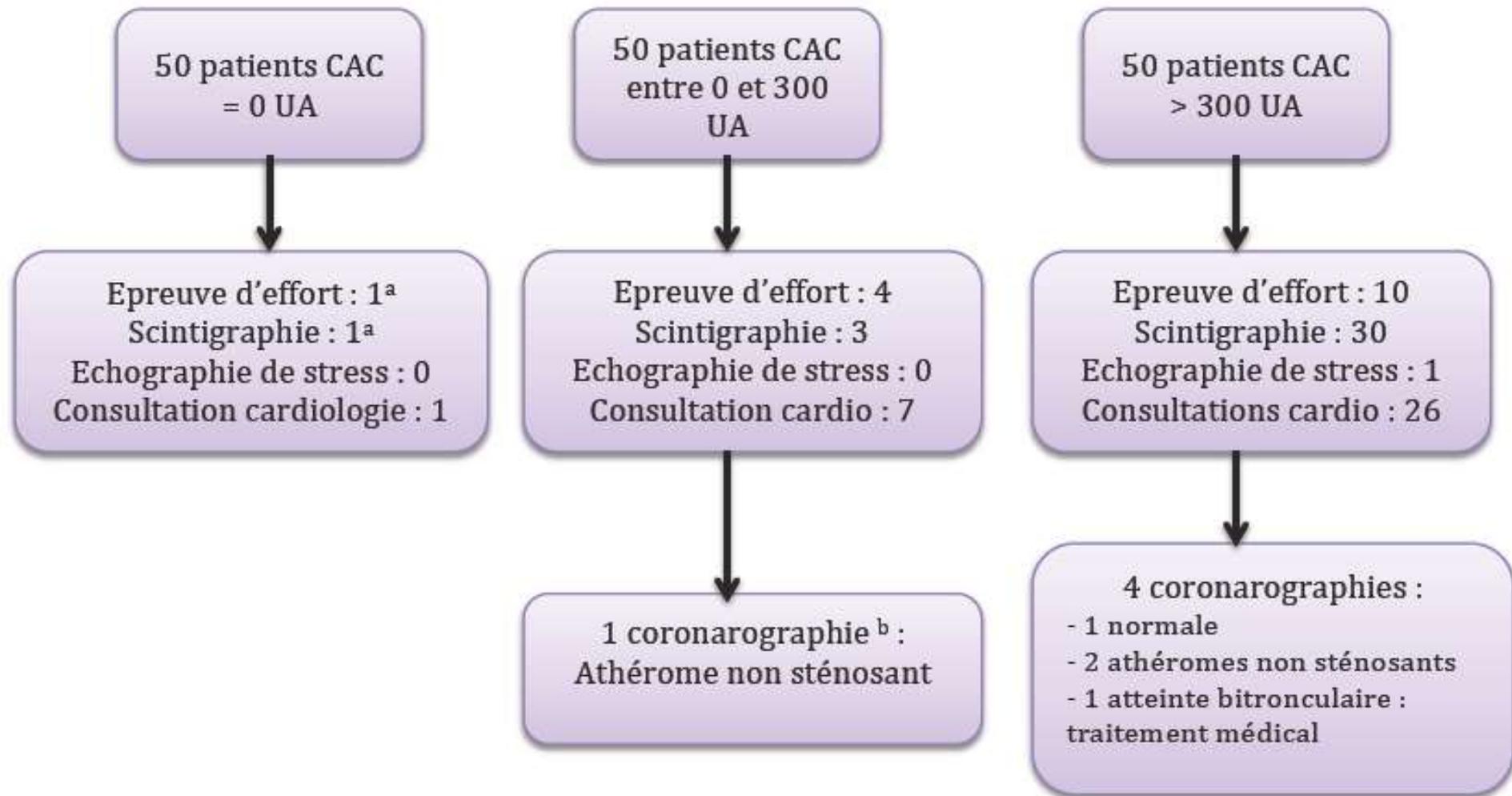
The observed calcium score of **64** is at percentile **83** for subjects of the same age, gender, and race/ethnicity who are free of clinical cardiovascular disease and treated diabetes.

Chart 1: Percentiles



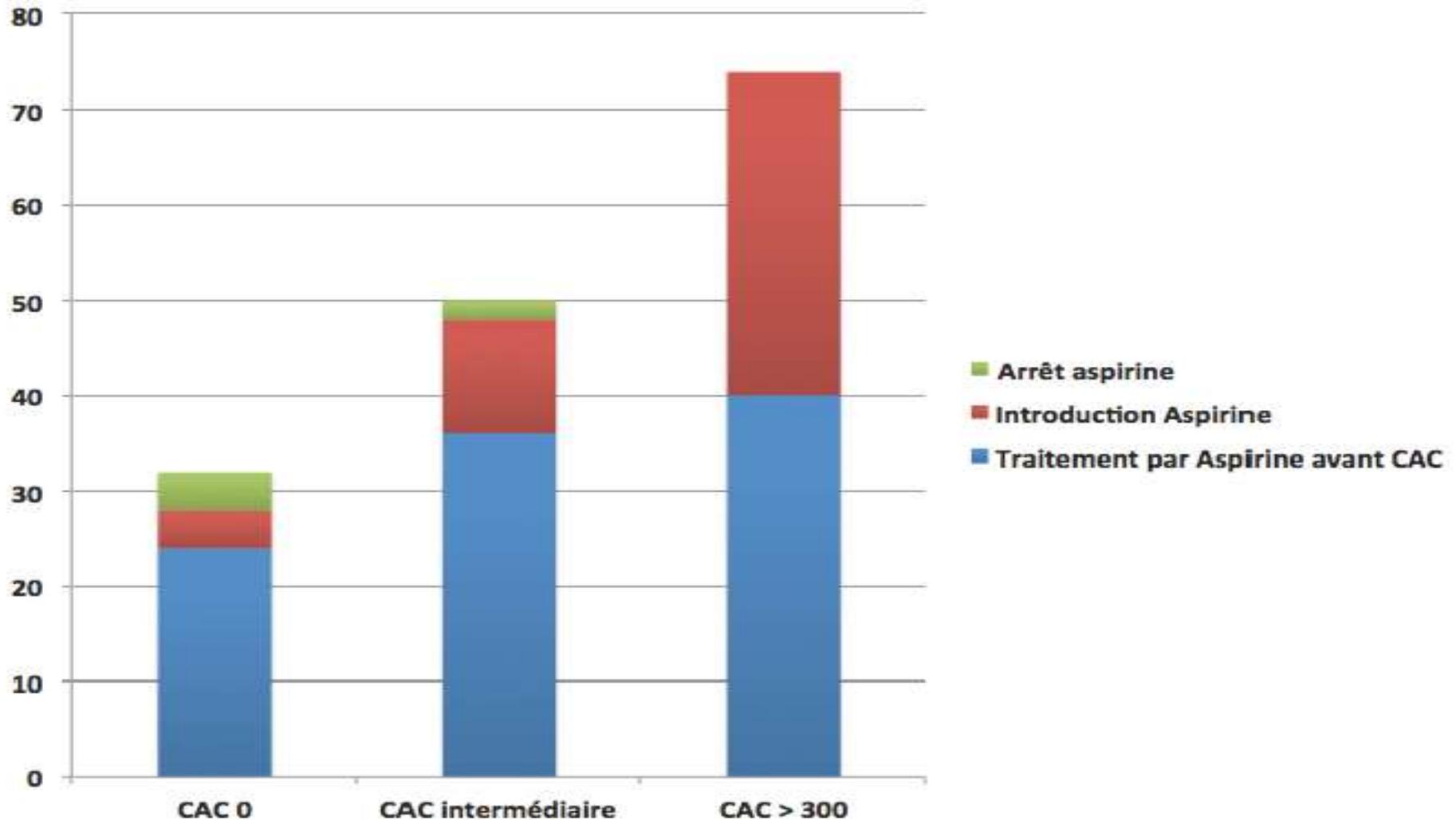
-
- limites de la prédiction cardiovasculaire
 - capacités prédictives du score calcique coronarien
 - Valeur ajoutée du score calcique coronarien
 - Limites relatives à l'utilisation du score calcique coronarien
 - **Observations**
 - intégration

D2 étude cas/contrôle nichée : Explorations post CAC



Adaptations thérapeutiques post CAC

Figure 7 : Modification de l'aspirine en fonction du CAC



Score calcique valeur ajoutée pour estimation risque CV



- Département d'Imagerie Professeur Didier REVEL Professeur Philippe
- Lyon, le 21 décembre 2011 PG 1948 Examen du 19/12/11 Appareil utilisé : C - Scanner Philips Cardio 03/12/04 CNEH 05603 scanner des artères coronaires ML
- **Indication** : Patient de 63 ans suivi pour troubles métaboliques avec, hyperlipidémie combinée familiale élévation Lp(a) et sd métabolique. evaluation d'une coronaropathie.
- Epreuve effort neg en 2008 EIMc 0,92 mm plq+ns

Score calcique valeur ajoutée pour estimation risque CV



- **Resultat :**
- - Le réseau coronarien semble être gauche dominant.
- - Mise en évidence de plusieurs plaques d'athérome calcifiées du tronc commun gauche, de l'IVA dans ses segments proximaux et moyens, de l'artère circonflexe et de la bissectrice.
- Minime plaque calcifiée du segment I de l'artère coronaire droite.
- - Le score calcique d'Agatston = 304 .
- **conséquences :**
 - Information sur niveau risque: tres élevé
 - revérification épreuve effort négative
 - Renforcement tt avec adjonction ezetrol LDL intensifié de 1,2 g/l à 0,7 g/l
 - Introduction d'aspirine en prev primaire

Score calcique valeur ajoutée pour estimation risque CV

- **Indication** : Patiente de 65 ans suivi pour HFh jamais traitée intolérance à toutes les statines et ezetrol, refus de prendre du questran !
- LDL constamment 3,5-3,8 g/l HDLc 0,45 g/l.
- (EIMc 0,80 mm plq ns)
- Quid pronostic CV ?

CAC= 0 UA

- Rassurée sur faible retentissement ?
- Introduction d'aspirine en prev primaire ??? Oui / **Non**
- Pas de LDL aphéreses
- Si CAC positif Mab anti PCSK9 ++++

Score calcique valeur ajoutée pour estimation risque CV

- Femme 43 ans HFh mut ex 4 rLDL sous Rosuvastatine 10 mg
 - LDLc 1,6-1,9 g/l HDL 0,7 g/l TG 0,6 g/l Lp(a) 0,15g/l
 - CRPus 1,4 mg/l
 - Reco EAS ESC 1 g/l !!!! Car traitement tardif
 - Score calcique Nul:
 - ??? ... statu quo, intensification apres la ménopause ?

-
- limites de la prédiction cardiovasculaire
 - capacités prédictives du score calcique coronarien
 - Valeur ajoutée du score calcique coronarien
 - Limites relatives à l'utilisation du score calcique coronarien
 - Observation
 - **intégration**

Further evidence is needed to support screening for SMI in all high-risk patients with DM.

Screening may be performed in patients at a particularly high risk, such as:

- those with evidence of peripheral artery disease (PAD)

- or high CAC score

- or with proteinuria, (*atteinte d'organe, insulinothérapie*)

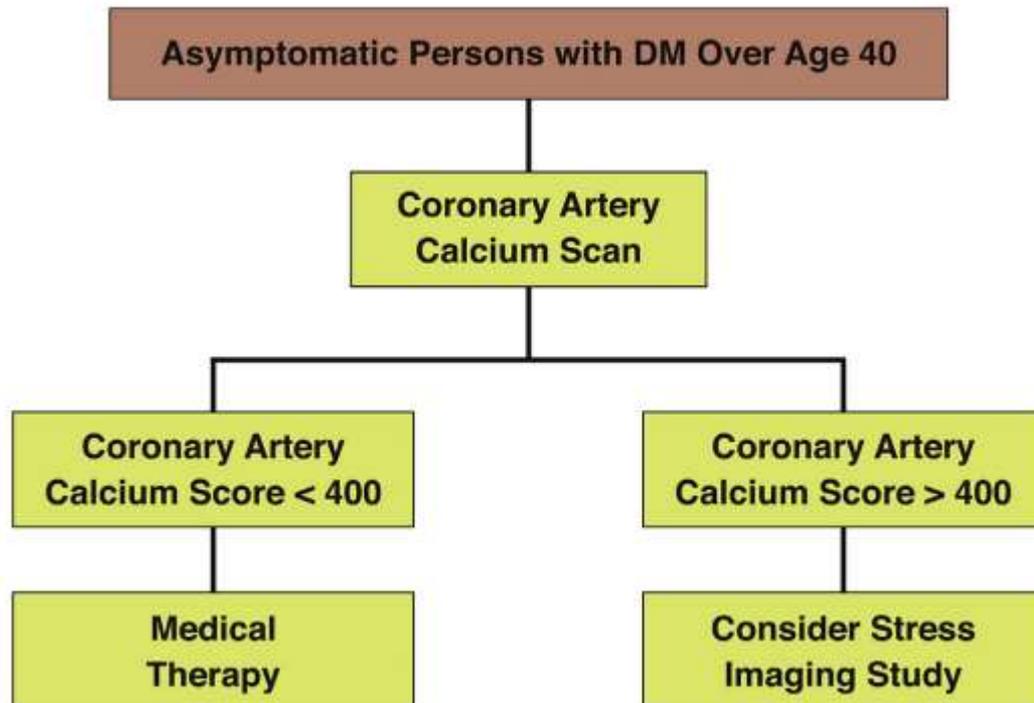
- and in people who wish to start a vigorous exercise programme.



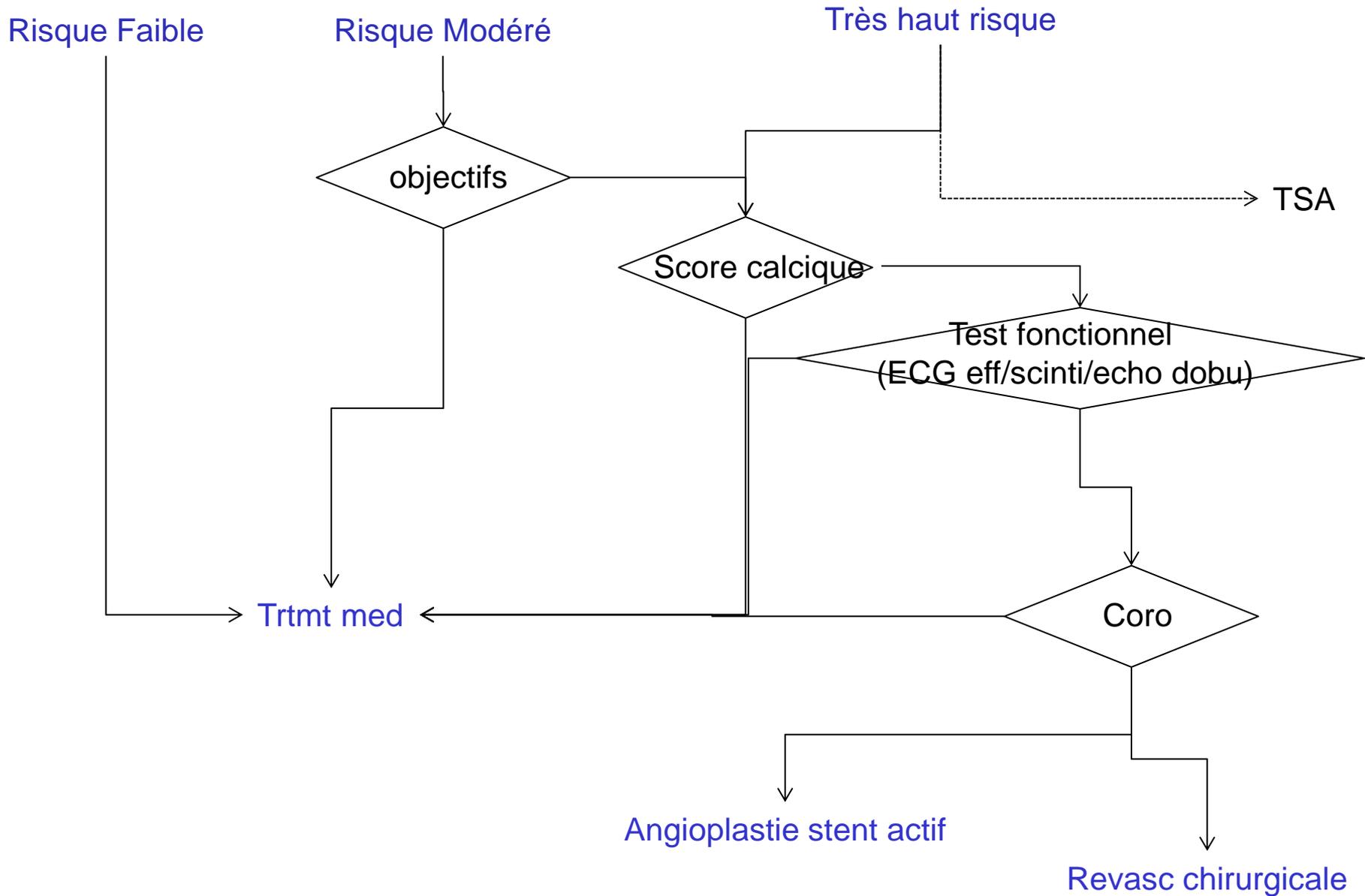
Noninvasive Cardiovascular Risk Assessment of the Asymptomatic Diabetic Patient

The Imaging Council of the American College of Cardiology

Matthew J. Budoff, MD, *Chair*,^a Paolo Raggi, MD,^b George A. Beller, MD,^c Daniel S. Berman, MD,^d Regina S. Druz, MD,^e Shaista Malik, MD, PhD,^f Vera H. Rigolin, MD,^g Wm. Guy Weigold, MD,^h Prem Soman, MD, PhD,ⁱ on behalf of the Imaging Council of the American College of Cardiology



Nouvelle stratégie alternative de dépistage chez les DT2



12) L'interprétation du score calcique est opérante

Si score calcique 0

Non escalade/Désescalade ? CI anti agrégants

Si score calcique 10-50/100: risque faible-moderé

Pas d'explo fonctionnelle

Antiagrégants ??? CI anti agrégants

Si score calcique 100-300: risque intermédiaire

Cible LDL durcie: <1 g/l

Antiagrégants ?

Explo fonctionnelle ?

Surveillance fonctionnelle espacée?

Si score calcique > 300 : risque majeur (>prev secondaire!)

Adjonction systématique antiagrégant+, intensification cible < 0,7 g /l LDLc

Explo fonctionnelle oui!: Surveillance coronaire fonctionnelle régulière: 3 ans ?

Pas d'angioscanner ici !

Vérif TSA diffusion atherome

EDITORIAL COMMENT

“De-Risking” Risk Reduction

Should Coronary Artery Calcium Scoring Be the Gatekeeper to Preventive Pharmacotherapy With the Polypill?*

William Wijns, MD, PHD, Dan Rusinaru, MD, PHD
Aalst, Belgium

Hypothèse RR – 62% avec polypill

NNT sur 5 ans si CAC 0 = 80-136

NNT sur 5 ans si CAC >100 = 20

Applying “what-if” calculations, the authors report the impact of adding CACS to the actual inclusion criteria for polypill studies. Participants of MESA (Multi-Ethnic Study of Atherosclerosis) who fulfilled the inclusion criteria of 4 published polypill trials were stratified according to baseline CAC score and CVD events during a 7.6-year median follow-up were compared. The results of this analysis are of great interest and can be briefly summarized as follows: 1) the rate of CVD events is low for patients with CAC = 0 (2.5 to 4.0 per 1,000 person-years), whereas patients with CAC >100 experience most of the CVD events (15.8 to 18.6 per 1,000 person-years); 2) assuming a 62% reduction of CVD events with preventive pharmacotherapy, the estimated 5-year number needed to treat (NNT) to prevent

Gate keeper dans les indications de traitement par mab anti PCSK9 en prévention primaire ?

Take Home message

Stratification du risque intermédiaire Ila B



Long-Term All-Cause and Cause-Specific Mortality in Asymptomatic Patients With CAC >1,000

TABLE 3 Hazard Ratios for All-Cause and Cause-Specific Mortality by CAC Score Group

CAC 0 Reference Group				
Model 1-Unadjusted HRs				
Agatston Score	Cause of Mortality, HR (95% CI)			
	CVD	CHD	Cancer	All-Cause
0	Ref.	Ref.	Ref.	Ref.
1-399	3.49 (2.85-4.27)	4.14 (3.05-5.63)	1.96 (1.70-2.26)	2.50 (2.28-2.75)
400-999	10.85 (8.63-13.64)	14.86 (10.64-20.74)	3.52 (2.88-4.30)	6.07 (5.39-6.83)
≥1,000	24.23 (19.49-30.12)	36.26 (26.44-49.73)	5.87 (4.80-7.18)	11.64 (10.38-13.05)
Model 2-Fully Adjusted HRs*				
Agatston Score	Cause of Mortality, HR (95% CI)			
	CVD	CHD	Cancer	All-Cause
0	Ref.	Ref.	Ref.	Ref.
1-399	1.77 (1.43-2.18)	1.99 (1.45-2.74)	1.09 (0.94-1.27)	1.37 (1.24-1.52)
400-999	3.09 (2.41-3.97)	3.90 (2.72-5.59)	1.19 (0.95-1.48)	1.98 (1.73-2.25)
≥1,000	5.04 (3.92-6.48)	6.79 (4.74-9.73)	1.55 (1.23-1.95)	2.89 (2.53-3.31)