

# Dépistage de l'ischémie myocardique

**Pascal Lim**

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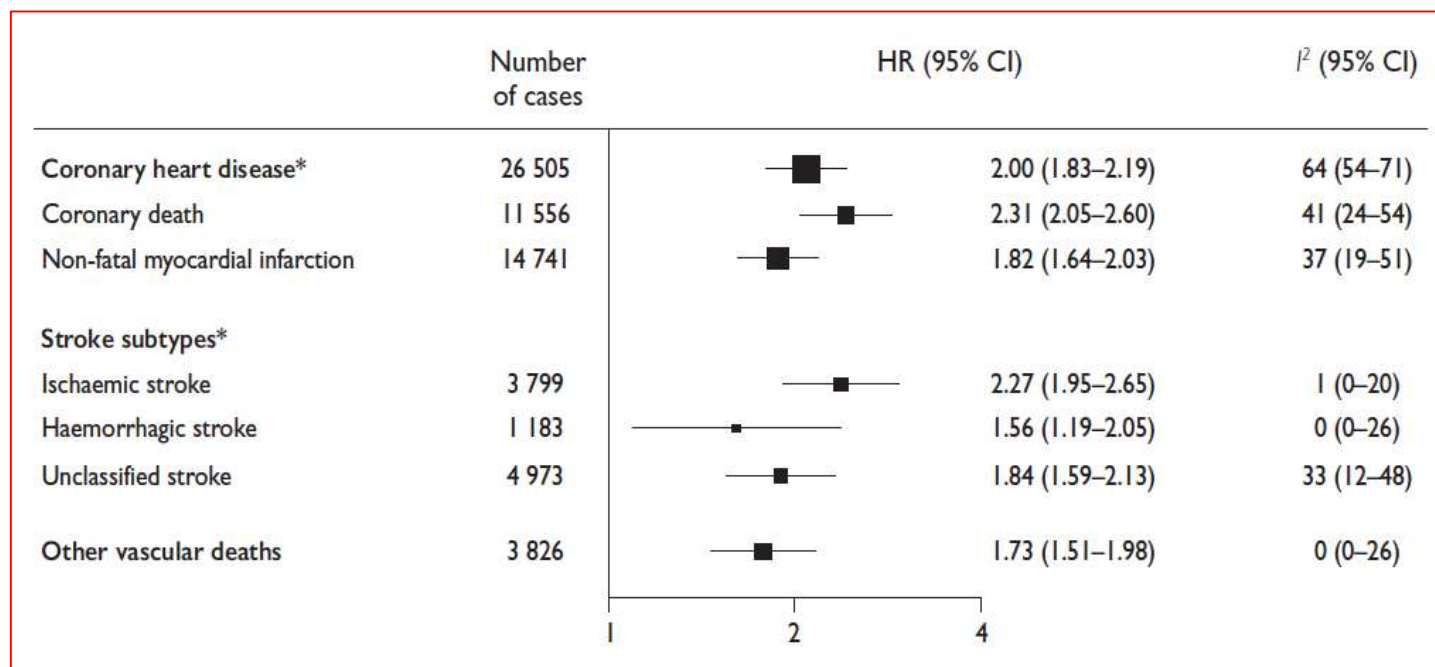
# 1

## DEPISTAGE DE LA CARDIOPATHIE ISCHEMIQUE CHEZ LE PATIENT DIABETIQUE



# Epidémiologie

- Diabétiques en France: 5.1 millions de patients (9% )
- Un risque X2 de décès cardiovasculaire
- Ischémie silencieuse fréquente liée à une dysfonction endothéliale et dysfonction du système nerveux autonome



# Stratifier le niveau de risque CV

<b>Very high CV risk</b>	Patients with T2DM with: <ul style="list-style-type: none"> <li>• Clinically established ASCVD or</li> <li>• Severe TOD or</li> <li>• 10-year CVD risk <math>\geq 20\%</math> using SCORE2-Diabetes</li> </ul>
<b>High CV risk</b>	Patients with T2DM not fulfilling the very high-risk criteria and a: <ul style="list-style-type: none"> <li>• 10-year CVD risk 10 to <math>&lt;20\%</math> using SCORE2-Diabetes</li> </ul>
<b>Moderate CV risk</b>	Patients with T2DM not fulfilling the very high-risk criteria and a: <ul style="list-style-type: none"> <li>• 10-year CVD risk 5 to <math>&lt;10\%</math> using SCORE2-Diabetes</li> </ul>
<b>Low CV risk</b>	Patients with T2DM not fulfilling the very high-risk criteria and a: <ul style="list-style-type: none"> <li>• 10-year CVD risk <math>&lt;5\%</math> using SCORE2-Diabetes</li> </ul>

<https://www.guideline.care/score/calculateur-score2-diabetes>

- Pays, âge, sexe,
- Ancienneté du diabète, tabac
- Hba1%, TAS, Cholestérol, DFG

## Severe TOD:

- eGFR  $<45$  mL/min/1.73 m<sup>2</sup>
- eGFR 45–59 mL/min/1.73 m<sup>2</sup> + microalbuminuria (rapport albuminurie/creatinine= 30–300 mg/g);
- Proteinuria (rapport albuminurie/creatinine=  $>300$  mg/g; stage A3),
- Microvascular disease in at least 3 different sites [e.g. microalbuminuria (stage A2) + retinopathy + neuropathy]

# Recommandations sur le dépistage du diabète

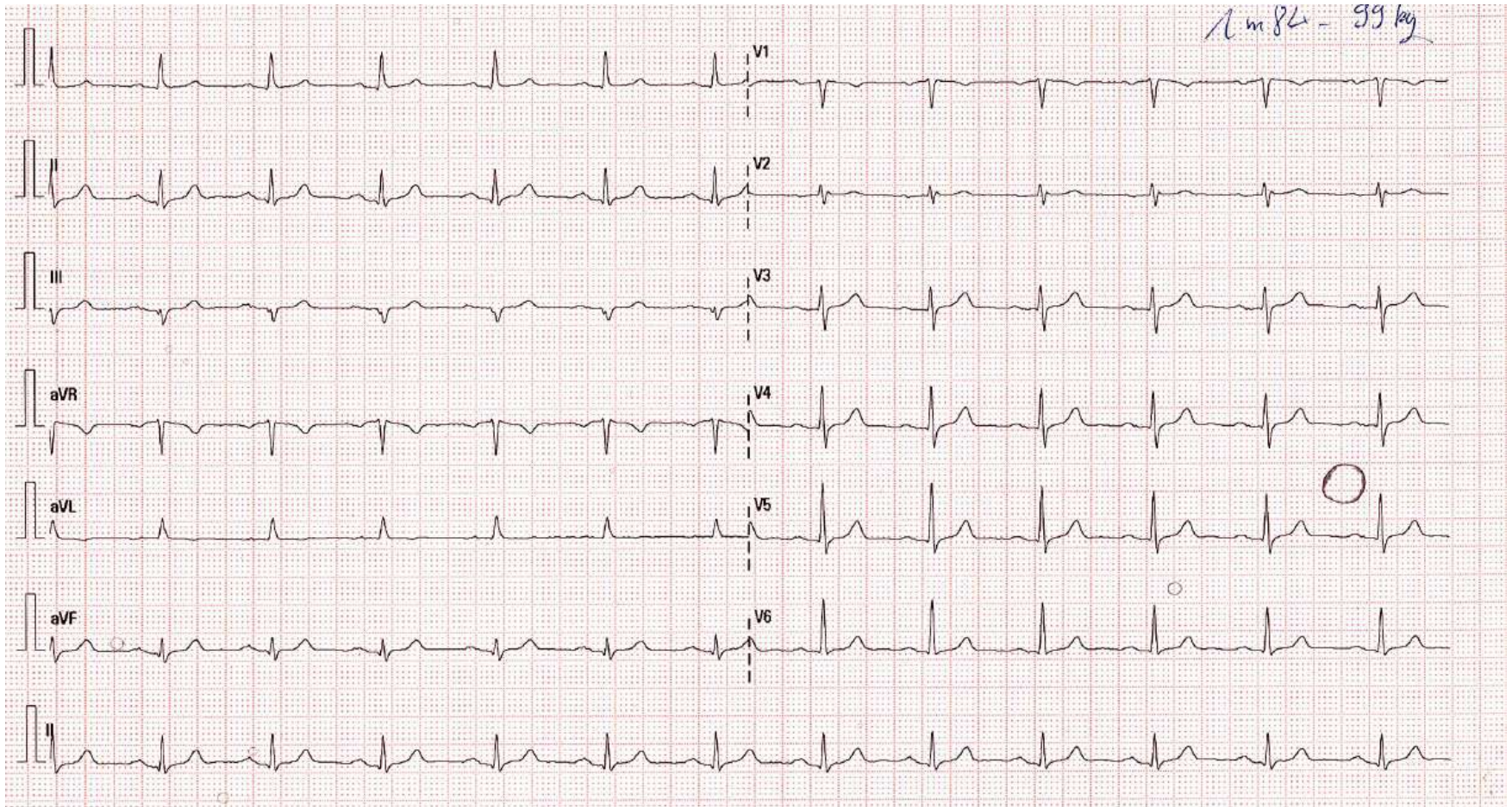
Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
Screening for diabetes is recommended in all individuals with CVD, <sup>c</sup> using fasting glucose and/or HbA1c. <sup>5-7,36,37,39</sup>	I	A
It is recommended that the diagnosis of diabetes is based on HbA1c and/or fasting plasma glucose, or on an OGTT if still in doubt. <sup>d,5-8,10,11</sup>	I	B

- **Diabète si HbA1c  $\geq 48$  mmol/mol ( $\geq 6.5\%$ )**
- **Pre-diabetes si HbA1c 42–47 mmol/ mol (6.0–6.4%)**

# Cas Clinique n°1

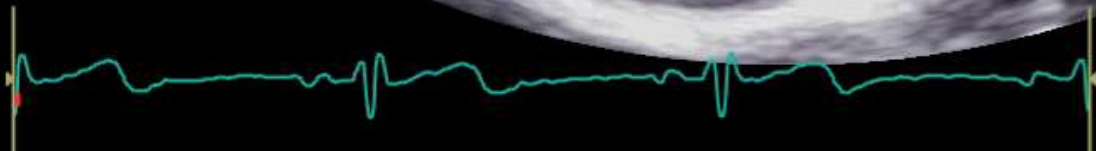
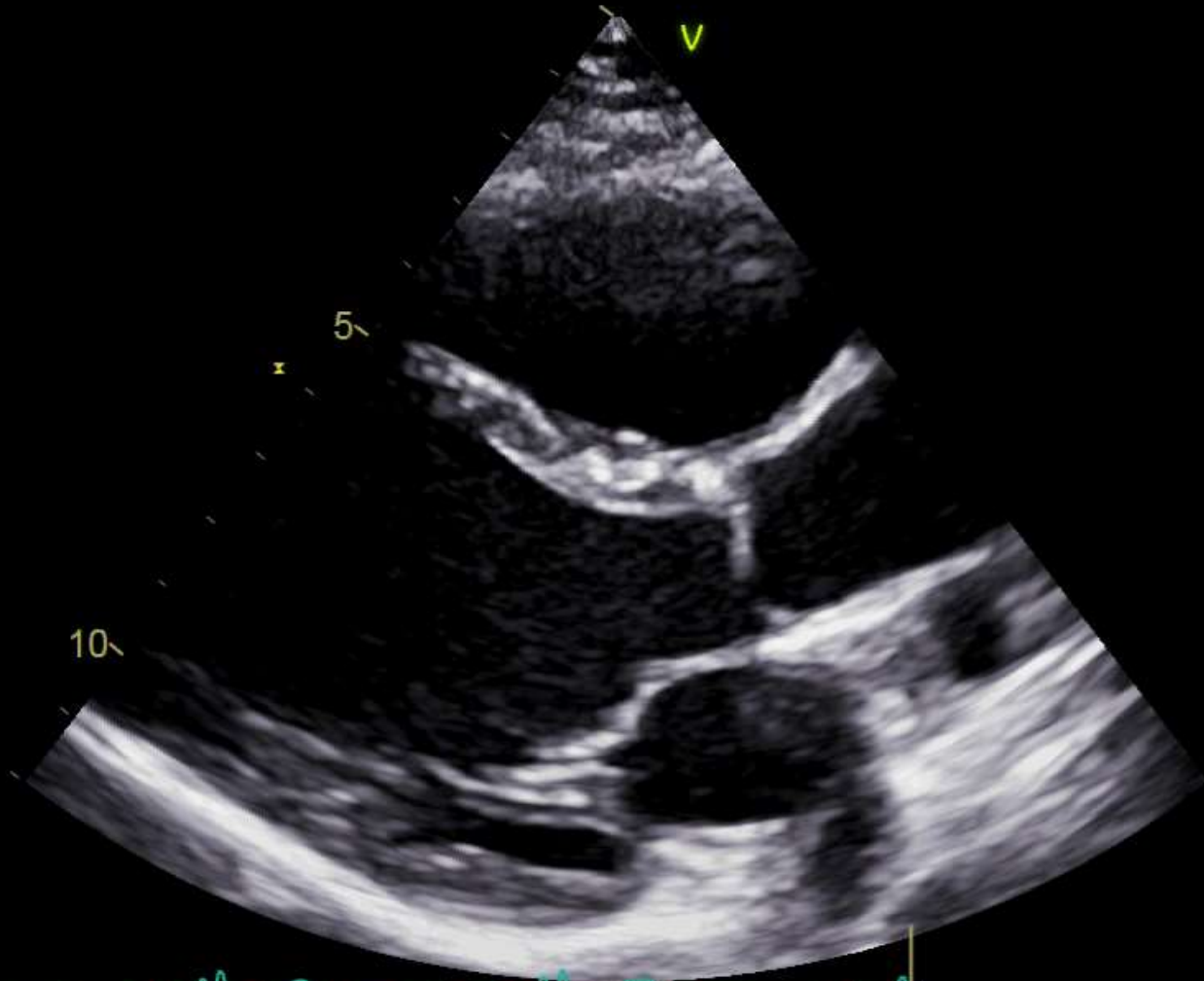
- **Un homme de 50 ans diabétique depuis 10 ans vous est adressé pour une évaluation cardiovasculaire. Il ne présente pas d'antécédent cardiovasculaire notable. A l'interrogatoire, il est asymptomatique. Sa pression artérielle systolique est à 150/90mmHg, sa FC à 85 bpm. Il pèse 99Kg pour une taille 1,84m. Son traitement comporte diamicon. Son HbA1 est à 8%, sa créatinémie est à 60microM/L et il n'y a pas de protéinurie dans les urines. Son LDL cholestérol est à 1,4g/L**

# Cas clinique



23/10/2018 11:21:52  
FPS: 57  
P: 0 dB  
D: 12.0 cm

Soft



63  
2:174HR

23/10/2018 11:22:42

FPS: 28

P: 0 dB

D: 13.0 cm

PRF: 4.0 kHz

SV: 1.0 mm

Soft

.63

-.63



70  
3:25HR

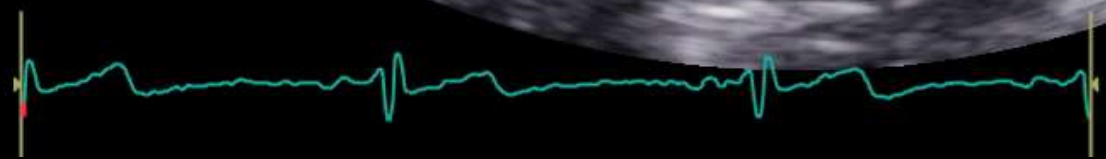
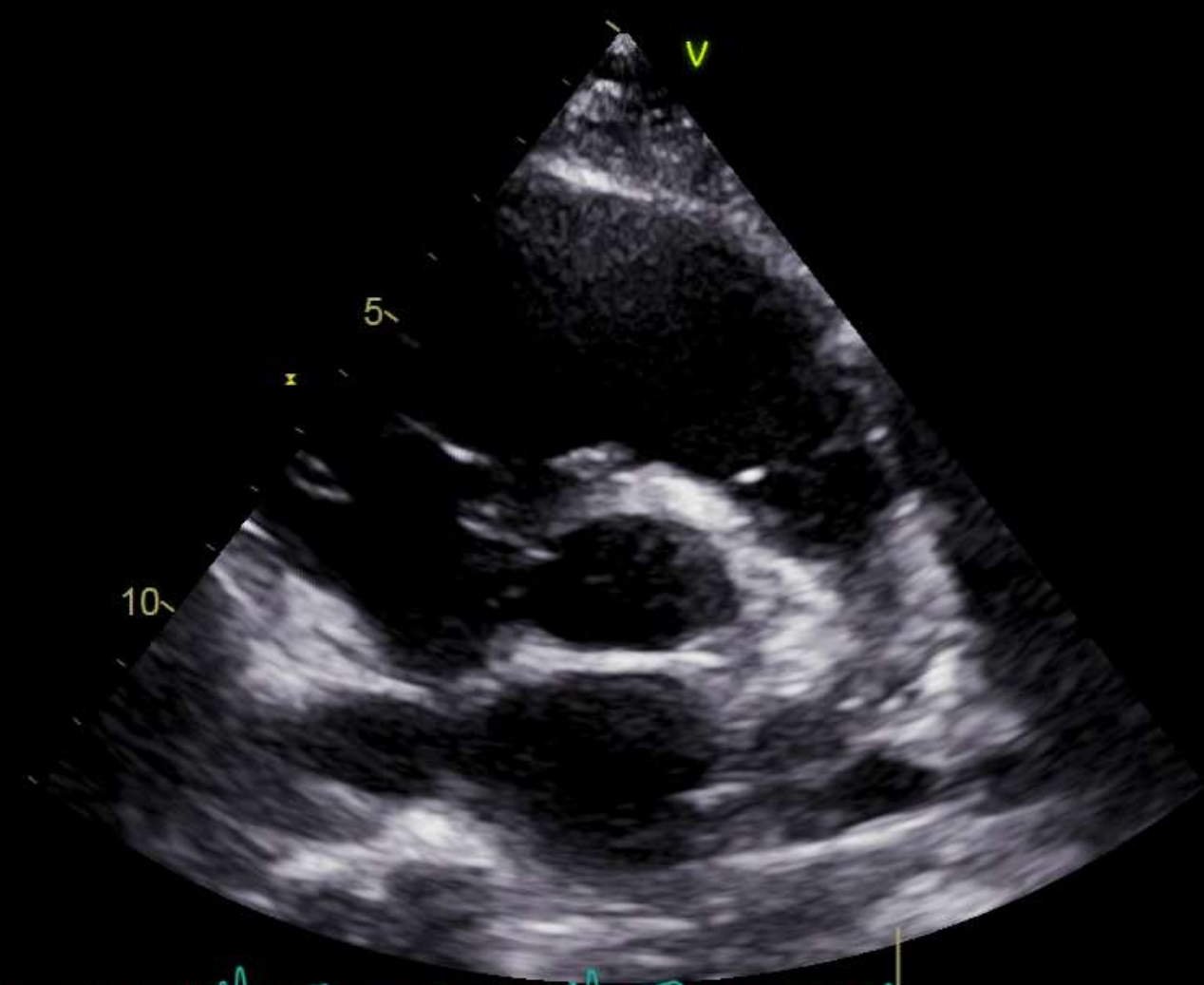
23/10/2018 11:23:18

FPS: 57

P: 0 dB

D: 13.0 cm

Soft



72  
2:172HR

23/10/2018 11:33:26

FPS: 57

P: 0 dB

D: 13.0 cm

Soft



69  
2:179HR

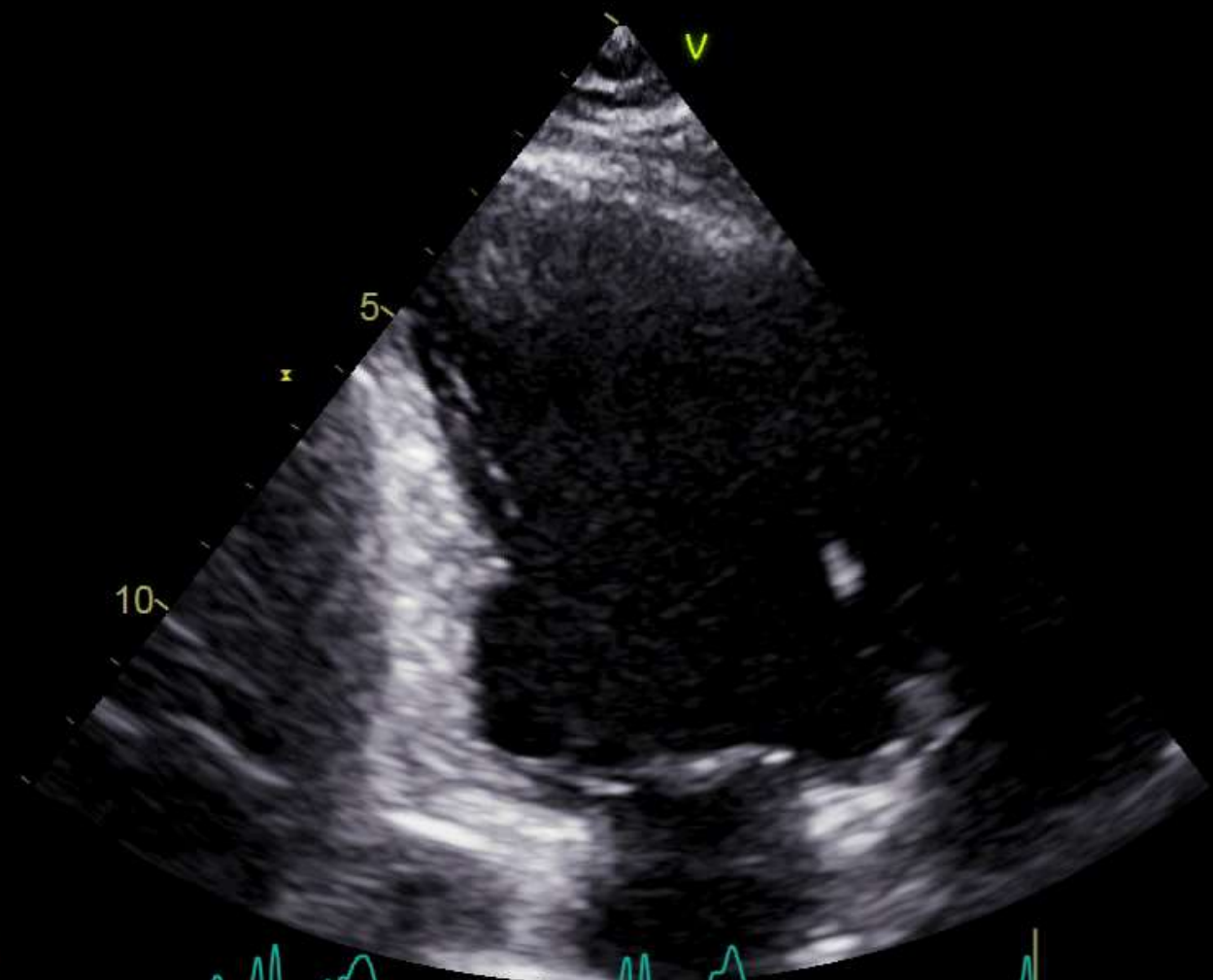
23/10/2018 11:33:35

FPS: 57

P: 0 dB

D: 13.0 cm

Soft



5  
10

57  
3:194HR

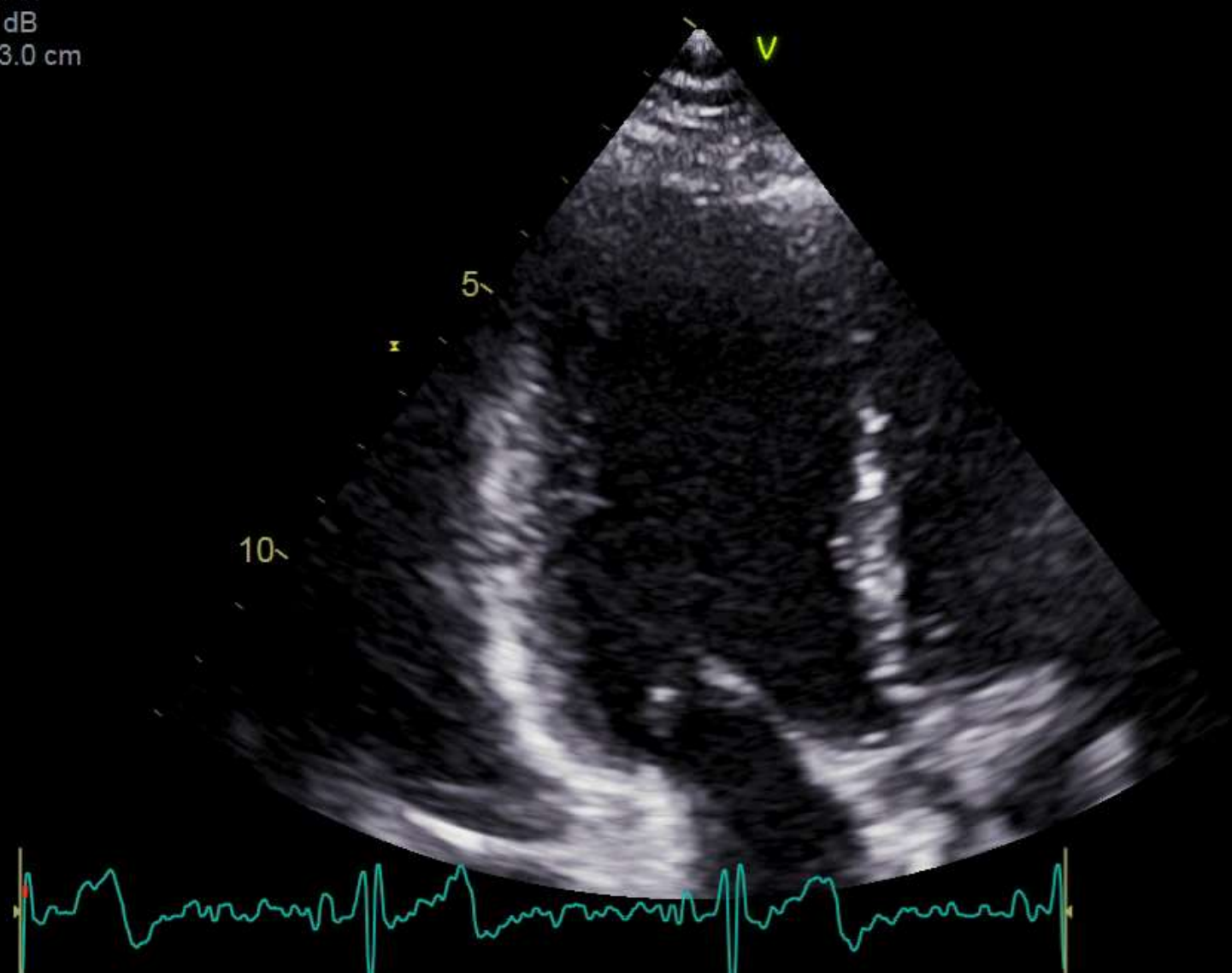
23/10/2018 11:33:43

FPS: 57

P: 0 dB

D: 13.0 cm

Soft



10~

5~

55  
2:192HR

2018/10/23-11:33:26

4CH

FR= 57 fps

HR= 57 bpm



SL

20.0



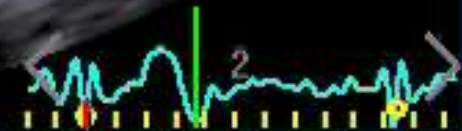
-20.0

%

5

10

GS=-20.6%



2018/10/23-11:33:35

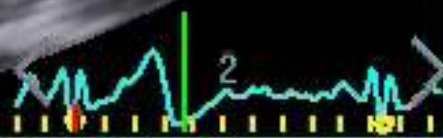
2CH

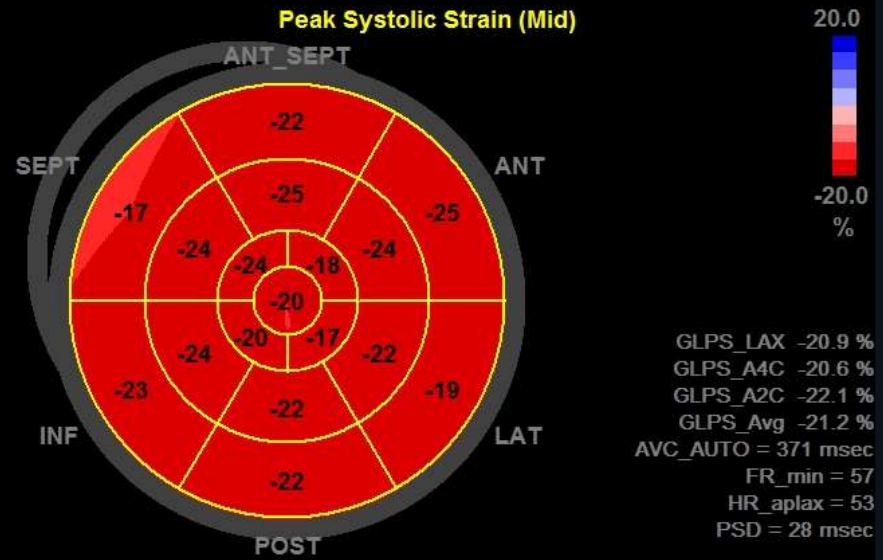
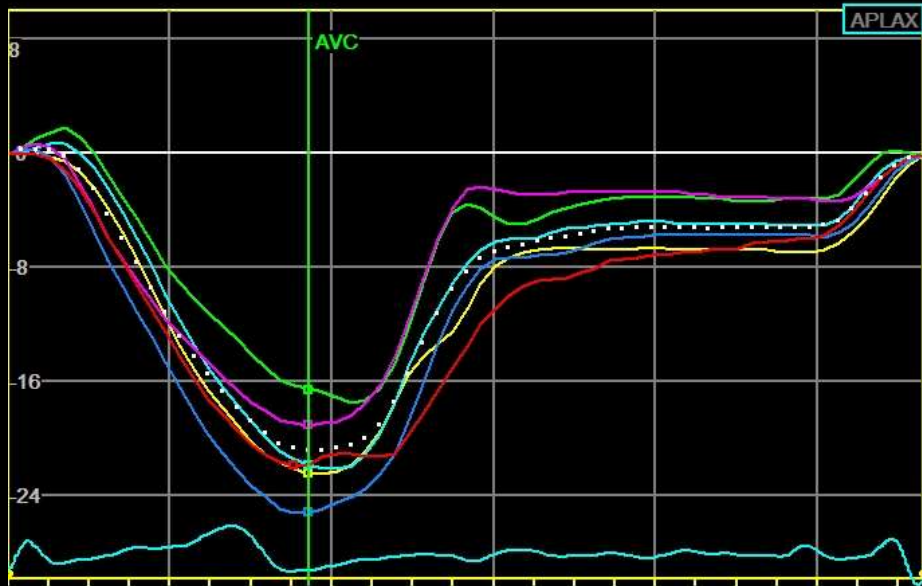
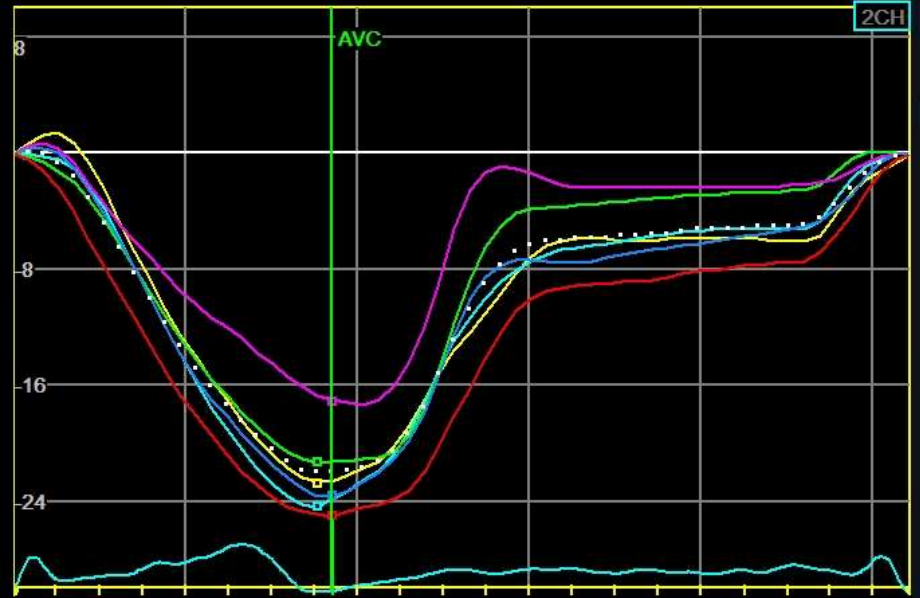
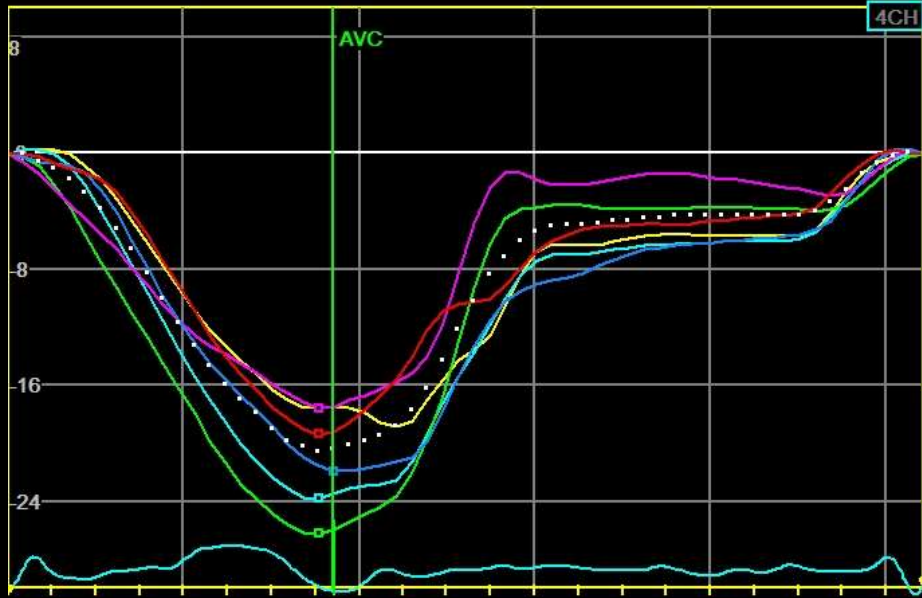
FR= 57 fps

HR= 57 bpm



GS=-22.1%





GLPS\_LAX -20.9 %  
 GLPS\_A4C -20.6 %  
 GLPS\_A2C -22.1 %  
 GLPS\_Avg -21.2 %  
 AVC\_AUTO = 371 msec  
 FR\_min = 57  
 HR\_aplax = 53  
 PSD = 28 msec

24/10/2018-11:43:55

# Question

- **Quelle exploration proposez vous à ce patient?**
  - un scanner coronaire
  - une épreuve d'effort
  - une échographie d'effort
  - Aucune

# 2

## Les grandes études



# Cardiac Outcomes After Screening for Asymptomatic Coronary Artery Disease in Patients With Type 2 Diabetes

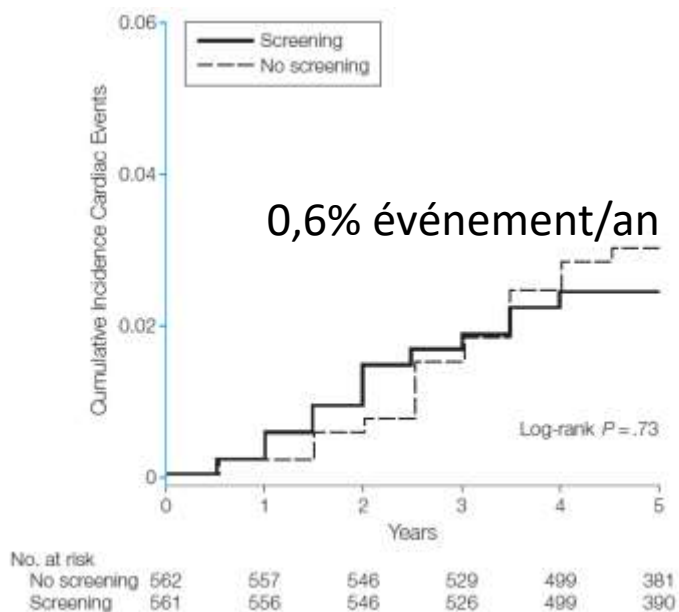
The DIAD Study: A Randomized Controlled Trial

	No Screening (n = 562)	Screening (n = 561)
	Mean (SD)	
Age, y	60.8 (6.4)	60.7 (6.7)
Diabetes duration, y	8.9 (6.9)	8.2 (7.1)
Body mass index <sup>a</sup>	31.0 (6.1)	31.1 (6.5)
Hemoglobin A <sub>1C</sub> , %	7.0 (1.5)	7.2 (1.6)

L'étude DIAD est la plus grande étude randomisée évaluant le screening de l'ischémie silencieuse par scintigraphie chez le patient diabétique asymptomatique

# Cardiac Outcomes After Screening for Asymptomatic Coronary Artery Disease in Patients With Type 2 Diabetes

The DIAD Study: A Randomized Controlled Trial

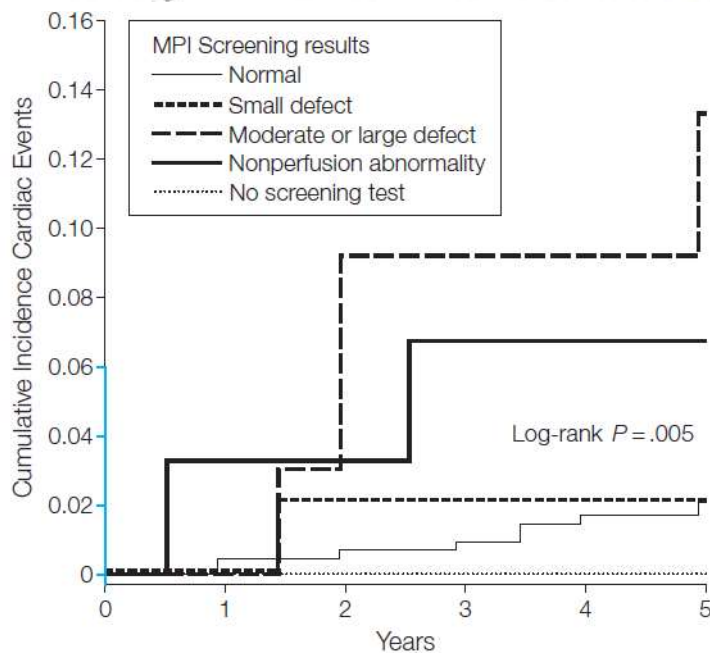


	No. (%) of Patients		Log-Rank P Value <sup>b</sup>
	No Screening (n = 562)	Screening (n = 561)	
Primary events	17 (3.0)	15 (2.7)	.73
Myocardial infarction	10 (1.7)	7 (1.3)	.66
Cardiac death	7 (1.2)	8 (1.4)	.80
Secondary events	14 (2.5) <sup>c</sup>	21 (3.7)	.23
Unstable angina	3 (0.5)	4 (0.7)	.70
Heart failure	7 (1.2)	7 (1.2)	.99
Stroke	5 (0.9)	10 (1.8)	.20
Revascularizations	44 (7.8) <sup>d</sup>	31 (5.5)	.14
PTCA	27 (4.8)	15 (2.7)	.74
CABG surgery	20 (3.6)	16 (2.9)	.76
Death			
All cause	15 (2.7)	18 (3.2)	.60
Noncardiac	8 (1.4)	10 (1.8)	.63

Elle montre que le **taux d'événement** est relativement faible  
**Pas de bénéfice à réaliser un dépistage** par scintigraphie chez le patient diabétique asymptomatique

# Cardiac Outcomes After Screening for Asymptomatic Coronary Artery Disease in Patients With Type 2 Diabetes

The DIAD Study: A Randomized Controlled Trial



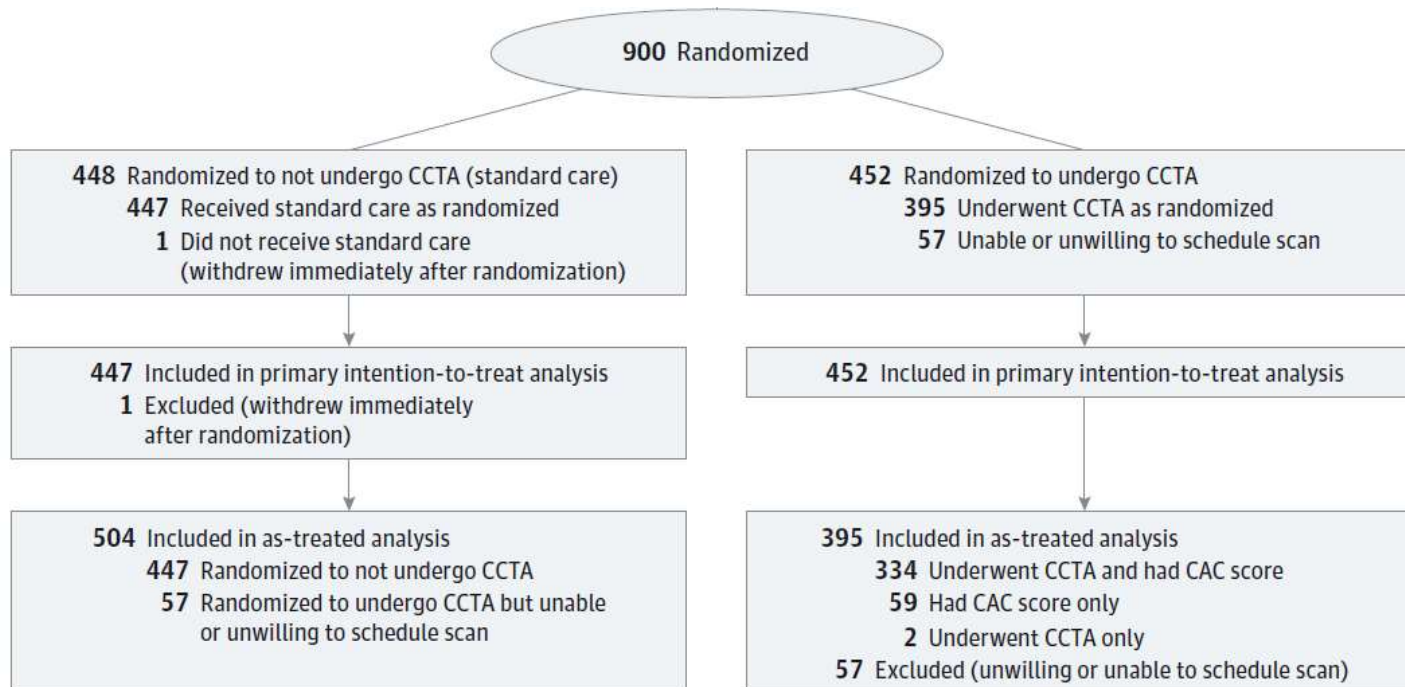
Anomalies de perfusion  
Ou défaut de perfusion  
moyenne ou large

No. at risk

MPI Screening results	0	1	2	3	4	5
Normal	409	408	402	389	370	290
Small defect	50	49	48	46	42	32
Moderate or large defect	33	33	32	30	29	22
Nonperfusion abnormality	30	29	29	27	26	20
No screening test	39	37	35	35	34	26

Néanmoins les patients ayant des défauts de perfusion semble présenter un Pronostic plus défavorable (mais seulement n=66/561)

# Effect of Screening for Coronary Artery Disease Using CT Angiography on Mortality and Cardiac Events in High-Risk Patients With Diabetes The FACTOR-64 Randomized Clinical Trial



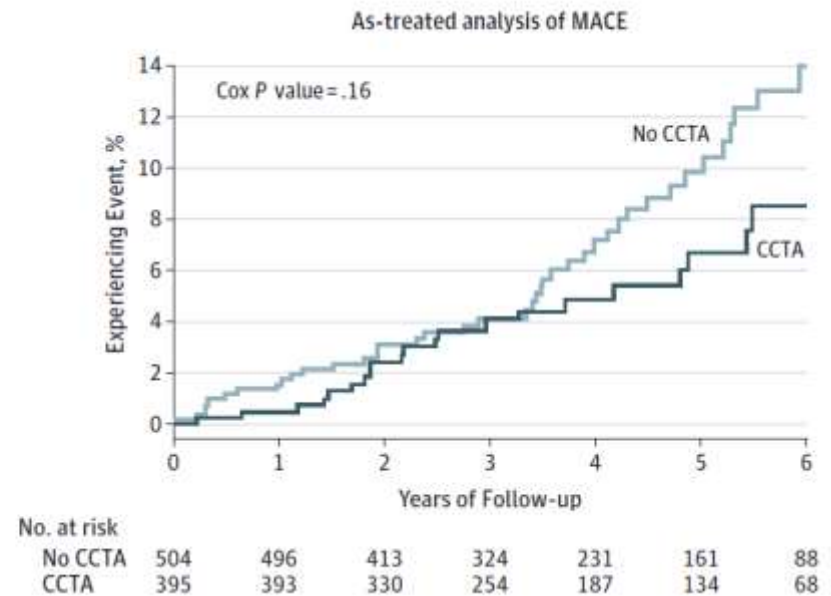
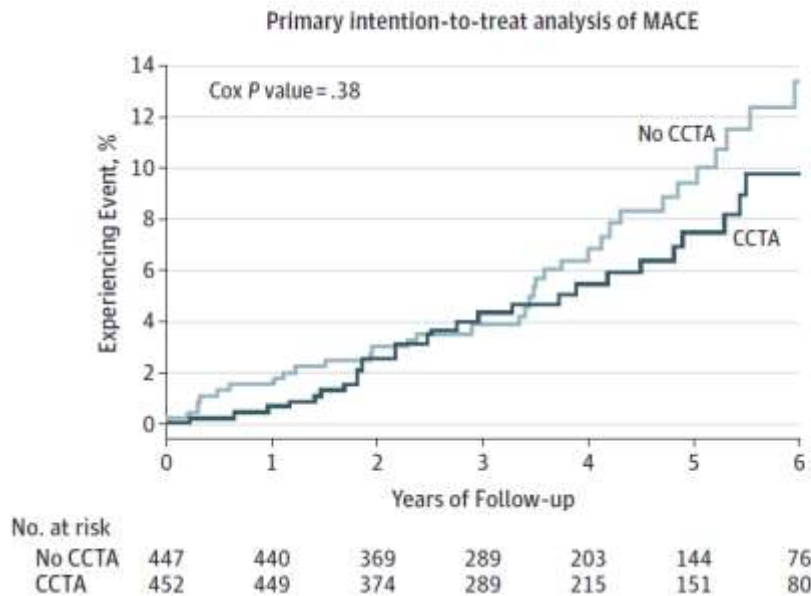
## 2<sup>e</sup> grande étude porte sur le scanner coronaire

### Scanner 64 Barrettes (Toshiba) : coronarographie recommandée

- ou sténose proximale >50%
- si score calcique >100

# Effect of Screening for Coronary Artery Disease Using CT Angiography on Mortality and Cardiac Events in High-Risk Patients With Diabetes

## The FACTOR-64 Randomized Clinical Trial



Plus d'événements mais pas de différence significative avec une tendance dans le groupe Non dépisté.

# Effect of Screening for Coronary Artery Disease Using CT Angiography on Mortality and Cardiac Events in High-Risk Patients With Diabetes The FACTOR-64 Randomized Clinical Trial



Highest degree of stenosis, No. (%)	
Normal	105 (31.3)
Mild	155 (46.1)
Moderate	40 (11.9)
Severe	36 (10.7)
Highest degree of stenosis in a proximal vessel, No. (%)	
Normal	128 (38.1)
Mild	151 (44.9)
Moderate	36 (10.7)
Severe	21 (6.3)
Vessels with severe proximal disease, No. (%)	
0	315 (93.8)
1	18 (4.6)
2	2 (0.5)
3	1 (0.3)

7% de sténose proximale (>50%), majoritairement mono-tronculaire

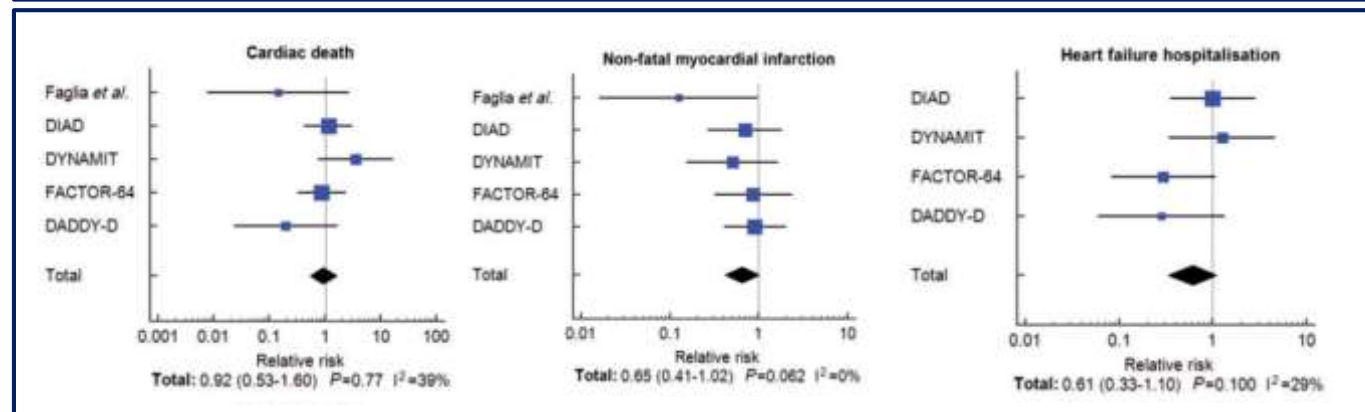
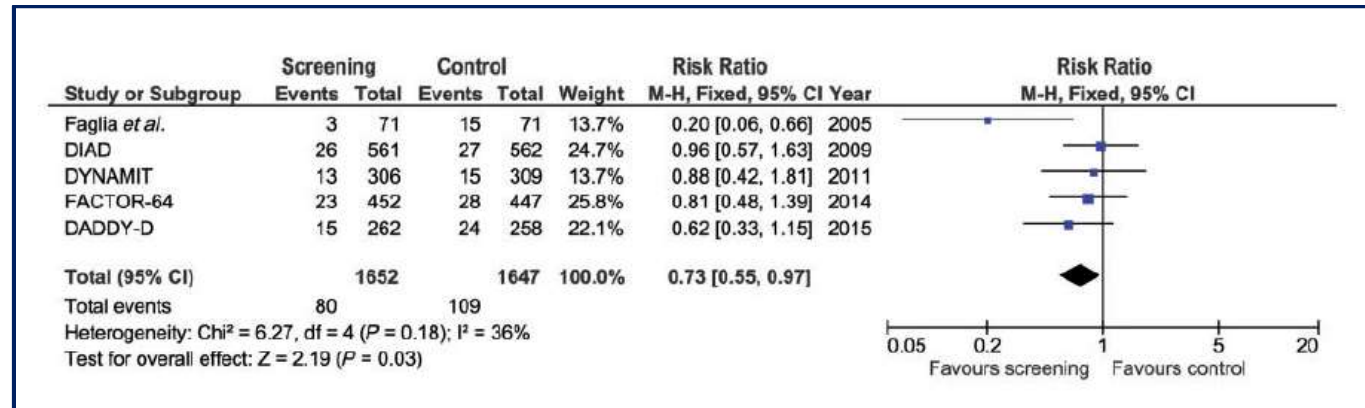
# Non-invasive screening for coronary artery disease in asymptomatic diabetic patients: a systematic review and meta-analysis of randomised controlled trials

**Table 1** Overview of the randomised controlled trials included in the meta-analysis

Study/author	Faglia et al. <sup>24</sup>	DIAD <sup>22</sup>	DYNAMIT <sup>35</sup>	FACTOR-64 <sup>23</sup>	DADDY-D <sup>36</sup>
Publication year	2005	2009	2011	2014	2015
Patients (n)	141 (+1) <sup>a</sup>	1123	615	899	520
Inclusion criteria	<ul style="list-style-type: none"> <li>Type 2 DM</li> <li>45–76 years old</li> <li>≥2 other CVRF</li> </ul>	<ul style="list-style-type: none"> <li>Type 2 DM</li> <li>50–75 years old</li> </ul>	<ul style="list-style-type: none"> <li>Type 2 DM</li> <li>50–75 years old</li> <li>≥2 other CVRF</li> </ul>	<ul style="list-style-type: none"> <li>Type 1 or 2 DM</li> <li>♂ ≥50/♀ ≥55, DM for ≥3 years</li> <li>♂ ≥40/♀ ≥45, DM for ≥5 years</li> </ul>	<ul style="list-style-type: none"> <li>Type 2 DM</li> <li>50–75 years old</li> <li>CV risk ≥10%</li> <li>Sinus rhythm</li> <li>Able to do EET</li> </ul>
Mean age (years)	60.1	60.8	63.9	61.5	61.9
Male gender (%)	55.6	53.5	54.5	52.2	80.0
Screening test	EET and SE	MPI	EET or MPI	CTCA and CACS	EET
Positive screening test	21.1%	5.9% moderate or large defects	21.5% positive or uncertain	11.9% moderate 10.7% severe	7.6%
Treatment strategy	ICA and cardiac follow-up if any test was positive	At the referring physician's discretion	According to the cardiologist's decision	Recommendation based on stenosis severity and CACS	ICA if EET positive
ICA performed after positive test (%)	93.3	15.2	55.9	47.3	85.0
Mean follow-up (years)	4.5	4.8	3.5	4.0	3.6
Annual rate of major CE (%)	1.9	0.6	1.0	0.8	1.4
Main results of screening	Significant ↘ of major and all CE	Non-significant ↘ of major CE	Non-significant ↘ of MI, no effect on combined CE	Non-significant ↘ of combined CE	Non-significant ↘ of major CE, but significant ↘ in >60 years old

Lorsque regarde l'ensemble des études, cette faible prévalence d'événement est caractéristique  
Des patients asymptomatiques

# Non-invasive screening for coronary artery disease in asymptomatic diabetic patients: a systematic review and meta-analysis of randomised controlled trials



Cette faible incidence explique que ce n'est qu'en groupant l'ensemble des études que l'on retrouve **une différence significatif, principalement sur le risque d'IDM non fatal**. La rentabilité est relativement faible car il faut dépister 50 patients pour éviter un MACE.

# 3

## Recommendations



## **2023 ESC Guidelines for the management of cardiovascular disease in patients with diabetes**

**Developed by the task force on the management of cardiovascular disease in patients with diabetes of the European Society of Cardiology (ESC)**

- **Non-invasive, routine screening for CAD in asymptomatic patients is not recommended**

### **Bilan chez tous les diabétiques :**

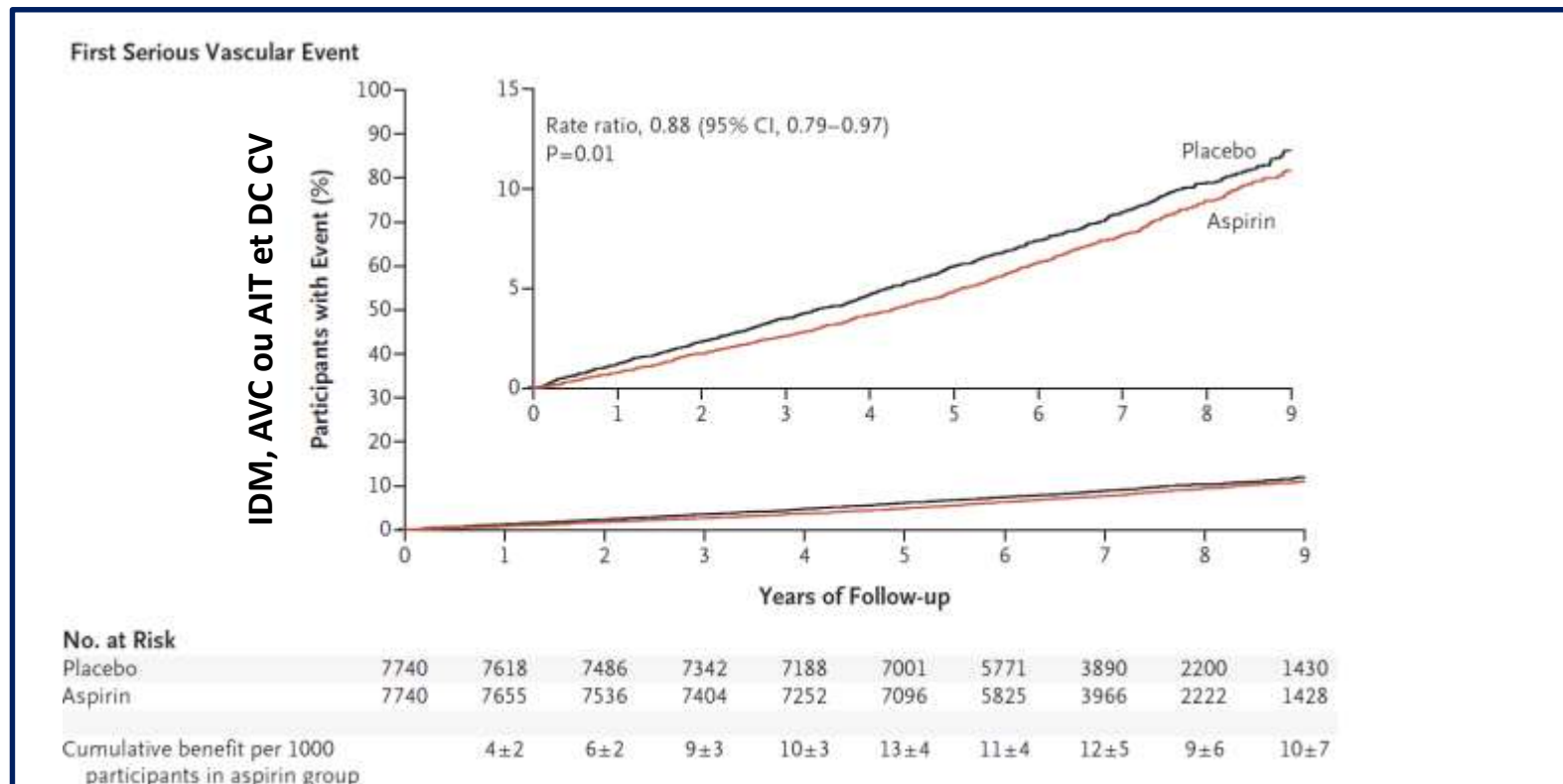
- Créat, bilan lipidique, microalbuminurie, HbA1c
- ECG

4

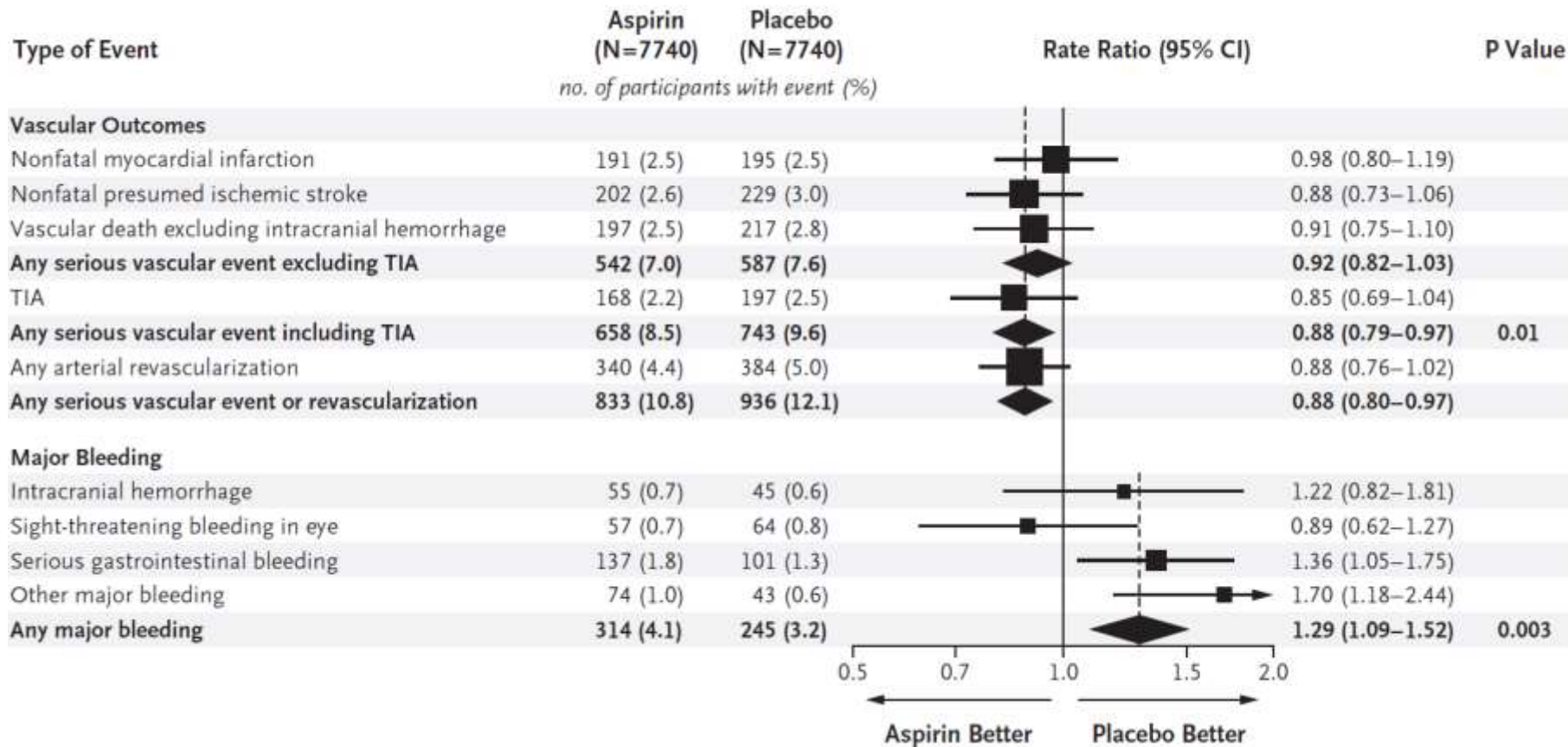
Enfin, le patient bénéficie d'un coronoscanner qui trouve une sténose de 30% sur l'IVA moyenne.  
Faut-il mettre sous aspirine?

# Effects of Aspirin for Primary Prevention in Persons with Diabetes Mellitus

Characteristic	Aspirin Group (N=7740)	Placebo Group (N=7740)
<b>Age</b>		
Mean — yr	63.2±9.2	63.3±9.2
<b>Vascular risk score — no. (%)¶</b>		
Low	3128 (40.4)	3136 (40.5)
Moderate	3294 (42.6)	3254 (42.0)
High	1318 (17.0)	1350 (17.4)

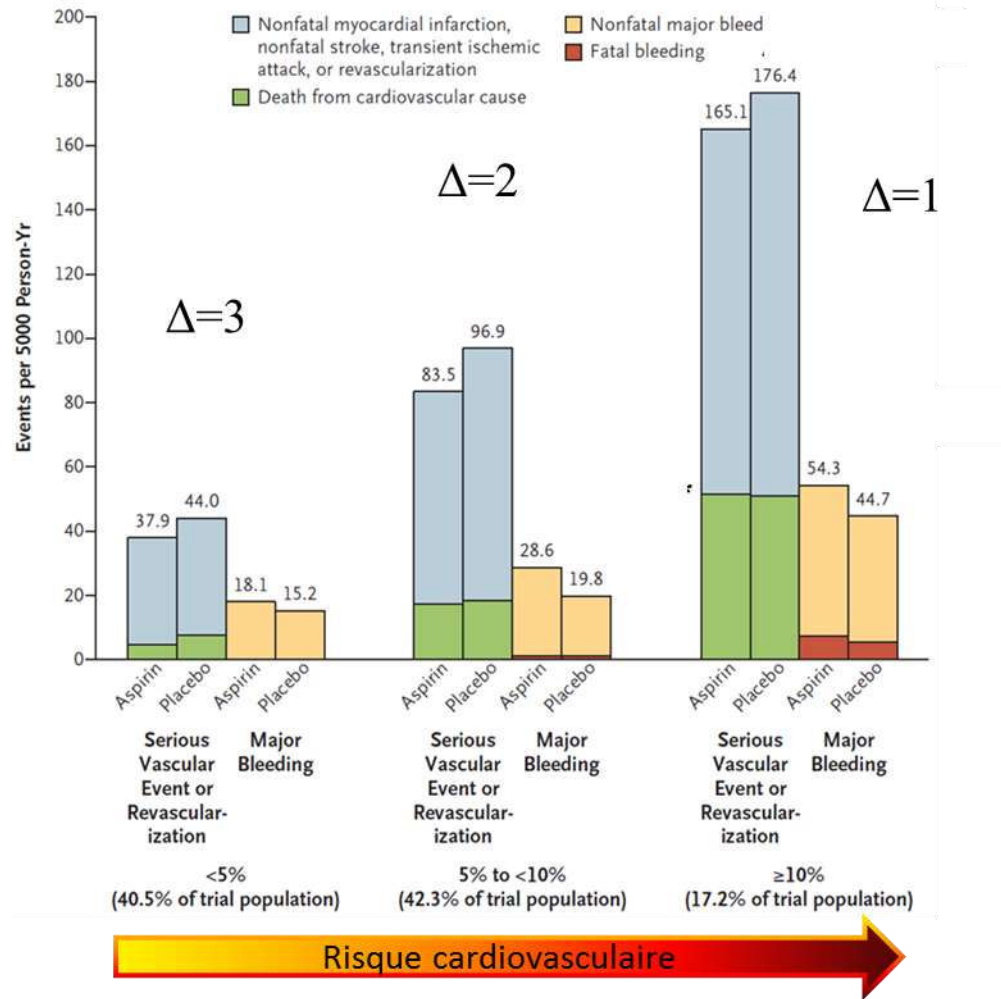


# Effects of Aspirin for Primary Prevention in Persons with Diabetes Mellitus



**-12% événements CV vs. +29% risque hémorragique**

# Effects of Aspirin for Primary Prevention in Persons with Diabetes Mellitus



- \*Nombre évènements évités/5000 patients

# Aspirine en prévention primaire

- In summary, in patients with diabetes and no history of symptomatic ASCVD or revascularization, ASA (75–100 mg o.d.) may be considered to prevent the first severe vascular event.
- In patients with diabetes with asymptomatic ASCVD (**including documented CAD confirmed by imaging**) and a higher CV risk, the net benefit of platelet inhibition by ASA may be higher and thus, therapy needs to be individualized.

Recommendation	Class <sup>a</sup>	Level <sup>b</sup>
In adults with T2DM without a history of symptomatic ASCVD or revascularization, ASA (75–100 mg o.d.) may be considered to prevent the first severe vascular event, in the absence of clear contraindications. <sup>c,292,293</sup>	<b>IIb</b>	<b>A</b>

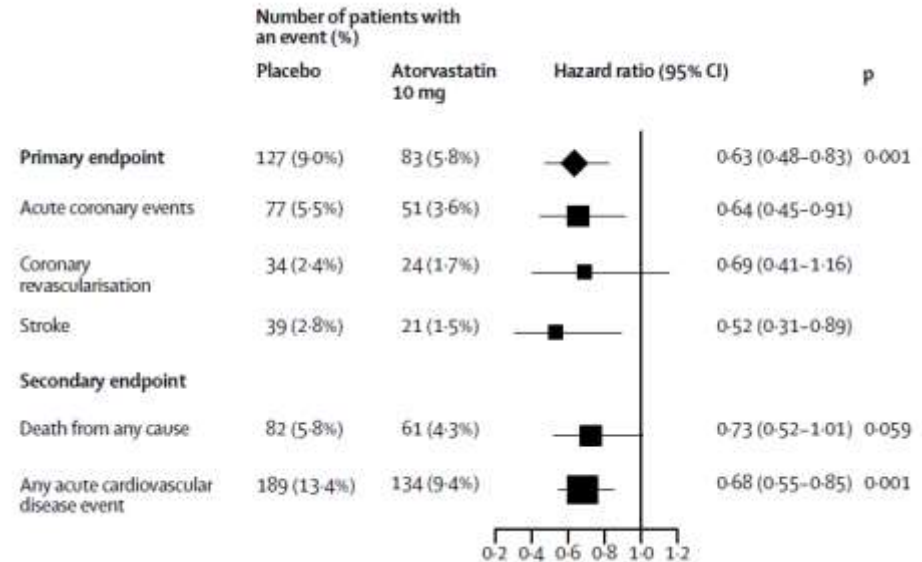
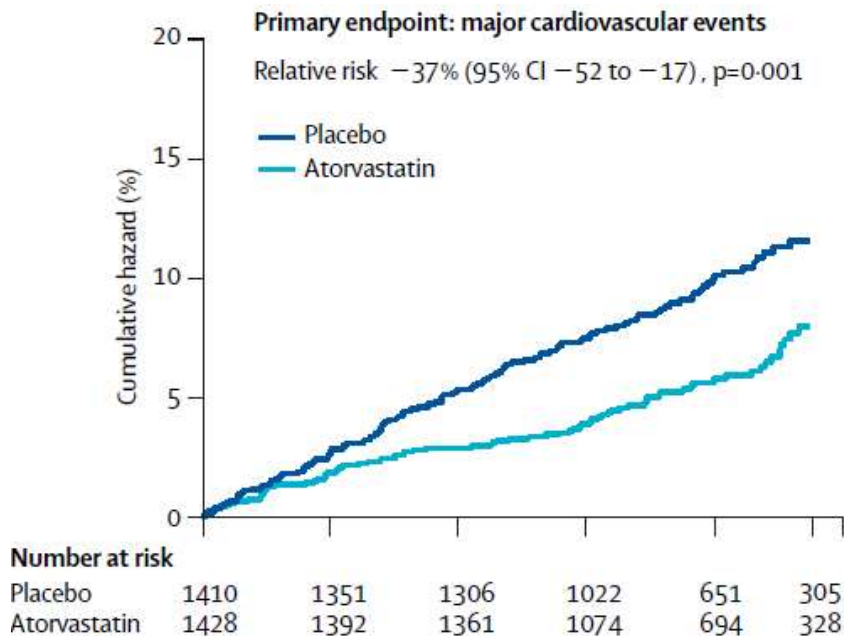
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Faut-il mettre sous  
statine?



# Primary prevention of cardiovascular disease with atorvastatin in type 2 diabetes in the Collaborative Atorvastatin Diabetes Study (CARDS): multicentre randomised placebo-controlled trial

- **Population: Diabétique (n=2838) sans antécédents CV.**
- **Design: Tahor 10 vs. Placébo (LDL moyen=1,2±0,2 g/L)**



**Réduction de 37% des MACE (IDM, Angor instable, AVC, ATL, DC CV)**

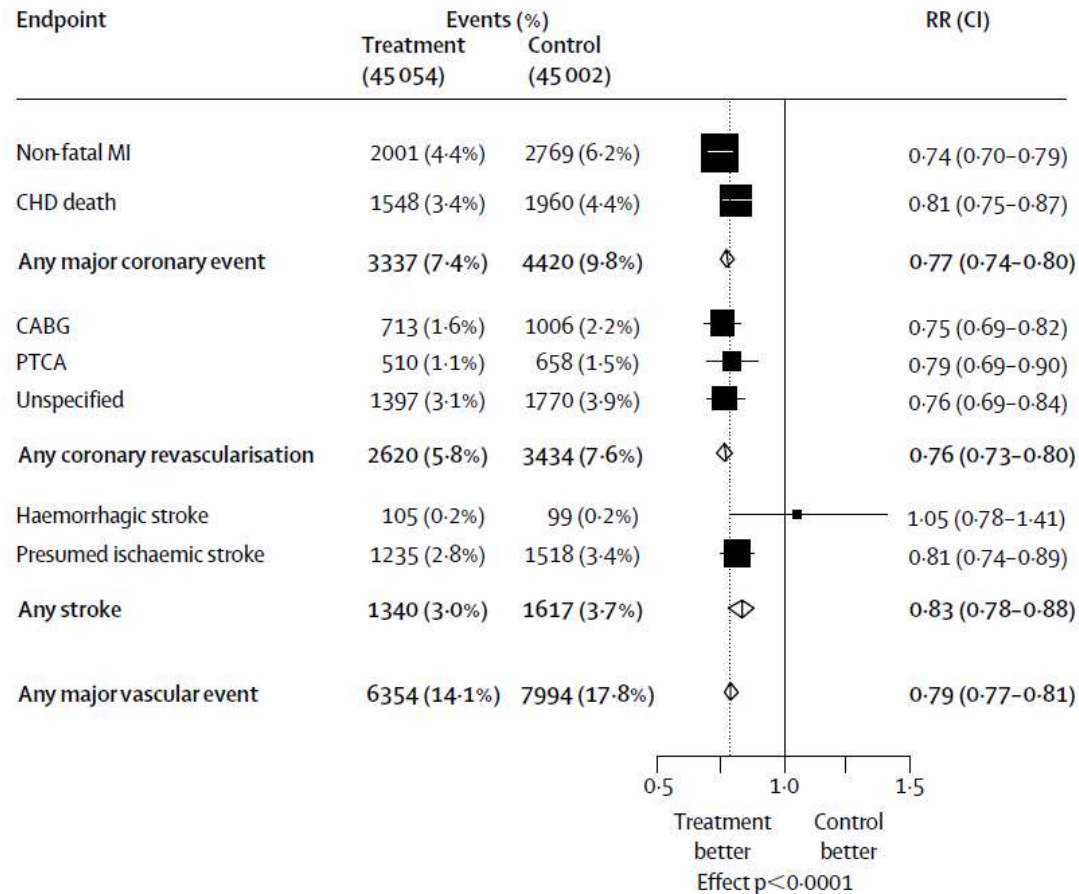
*Helen M Colhoun, Lancet 2004*

# Efficacy and safety of cholesterol-lowering treatment: prospective meta-analysis of data from 90 056 participants in 14 randomised trials of statins

	Dates of recruitment	Year of publication of primary results	Mean duration of follow-up (years)*	Treatment comparison (mg/day)†	Number of patients	Age range (years)	Women (%)	Diabetes (%)	Baseline history of vascular disease (%)			
									MI	Other CHD‡	Other vascular§	None¶
4S	5/1988–8/1989	1994	5.2	S20–40 vs placebo	4444	35–70	827 (19%)	202 (5%)	3530 (79%)	914 (21%)	126 (3%)	0
WOSCOPS	2/1989–9/1991	1995	4.8	P40 vs placebo	6595	45–64	0	76 (1%)	0	338 (5%)	193 (3%)	6096 (92%)
CARE	12/1989–12/1991	1996	4.8	P40 vs placebo	4159	21–75	576 (14%)	586 (14%)	4159 (100%)	0	0	0
Post-CABG	3/1989–8/1991	1997	4.2	L40–80 vs L2.5–5	1351	21–74	102 (8%)	116 (9%)	662 (49%)	689 (51%)	37 (3%)	0
AFCAPS/ TexCAPS	5/1990–2/1993	1998	5.3	L20–40 vs placebo	6605	45–73 (men) 55–73 (women)	997 (15%)	155 (2%)	0	10 (<1%)	9 (<1%)	6431 (97%)
LIPID	6/1990–12/1992	1998	5.6	P40 vs placebo	9014	31–75	1516 (17%)	782 (9%)	5754 (64%)	3248 (36%)	905 (10%)	10 (<1%)
GISSI Prevention	1/1994–5/1996	2000	1.9	P20 vs no treatment	4271	19–90	587 (14%)	582 (14%)	4271 (100%)	0	179 (4%)	0
LIPS	4/1996–10/1998	2002	3.1	F80 vs placebo	1677	18–80	271 (16%)	202 (12%)	744 (44%)	933 (56%)	142 (8%)	0
HPS	7/1994–5/1997	2002	5.0	S40 vs placebo	20 536	40–80	5082 (25%)	5963 (29%)	8510 (41%)	4876 (24%)	8865 (43%)	3161 (15%)
PROSPER	12/1997–5/1999	2002	3.2	P40 vs placebo	5804	70–82	3000 (52%)	623 (11%)	776 (13%)	1105 (19%)	1026 (18%)	3254 (56%)
ALLHAT–LLT	3/1994–5/1998	2002	4.8	P40 vs usual care	10 355	≥55	5051 (49%)	3638 (35%)	0	1188 (11%)	0	9167 (89%)
ASCOT–LLA	2/1998–5/2000	2003	3.2	A10 vs placebo	10 305	40–79	1942 (19%)	2527 (25%)	0	15 (<1%)	1435 (14%)	8860 (86%)
ALERT	6/1996–10/1997	2003	5.1	F40 vs placebo	2102	30–75	715 (34%)	396 (19%)	319 (15%)	81 (4%)	241 (11%)	1702 (81%)
CARDS	11/1997–6/2001	2004	3.9	A10 vs placebo	2838	40–75	909 (32%)	2838 (100%)	0	9 (<1%)	97 (3%)	2738 (96%)
Total	..	..	4.7	..	90 056	..	21 575 (24%)	18 686 (21%)	28 725 (32%)	13 406 (15%)	13 255 (15%)	41 354 (46%)

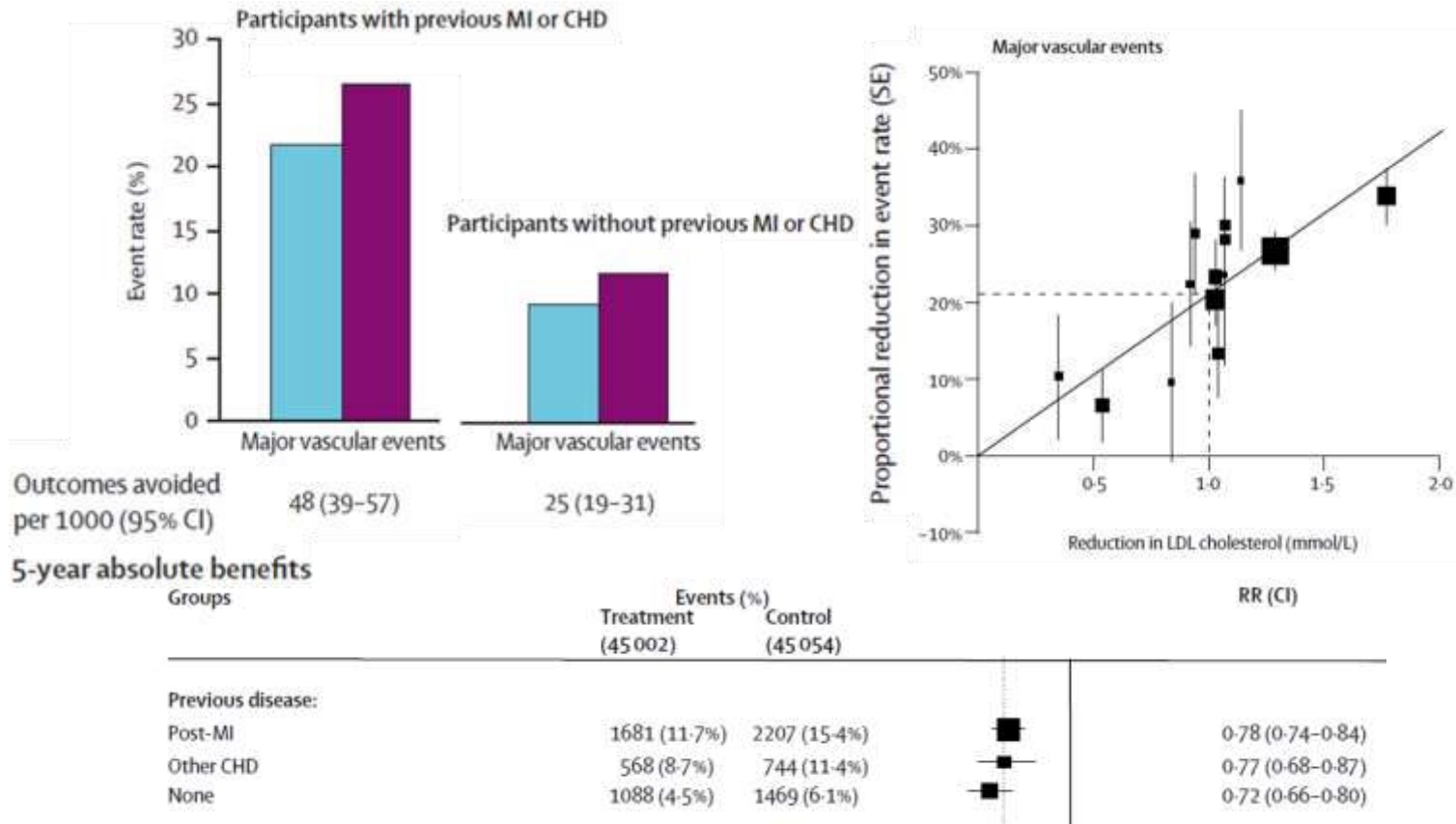
META ANALYSE en prévention primaire et secondaire chez le diabétique

# Efficacy and safety of cholesterol-lowering treatment: prospective meta-analysis of data from 90 056 participants in 14 randomised trials of statins



REDUCTION DE 20% DES DECES D'ORIGINE CARDIAQUE+++

# Efficacy and safety of cholesterol-lowering treatment: prospective meta-analysis of data from 90 056 participants in 14 randomised trials of statins



Réduction linéaire / réduction du LDL cholestérol avec un bénéfice en prévention primaire et secondaire

# Objectifs des facteurs de risques

CV risk categorization in patients with T2DM based on ASCVD, severe TOD, or SCORE2-Diabetes

**Very high risk**

LDL-C <1.4 mmol/L  
(<55 mg/dL)  
(Class I)

**High risk**

LDL-C <1.8 mmol/L  
(<70 mg/dL)  
(Class I)

**Moderate risk**

LDL-C <2.6 mmol/L  
(<100 mg/dL)  
(Class I)

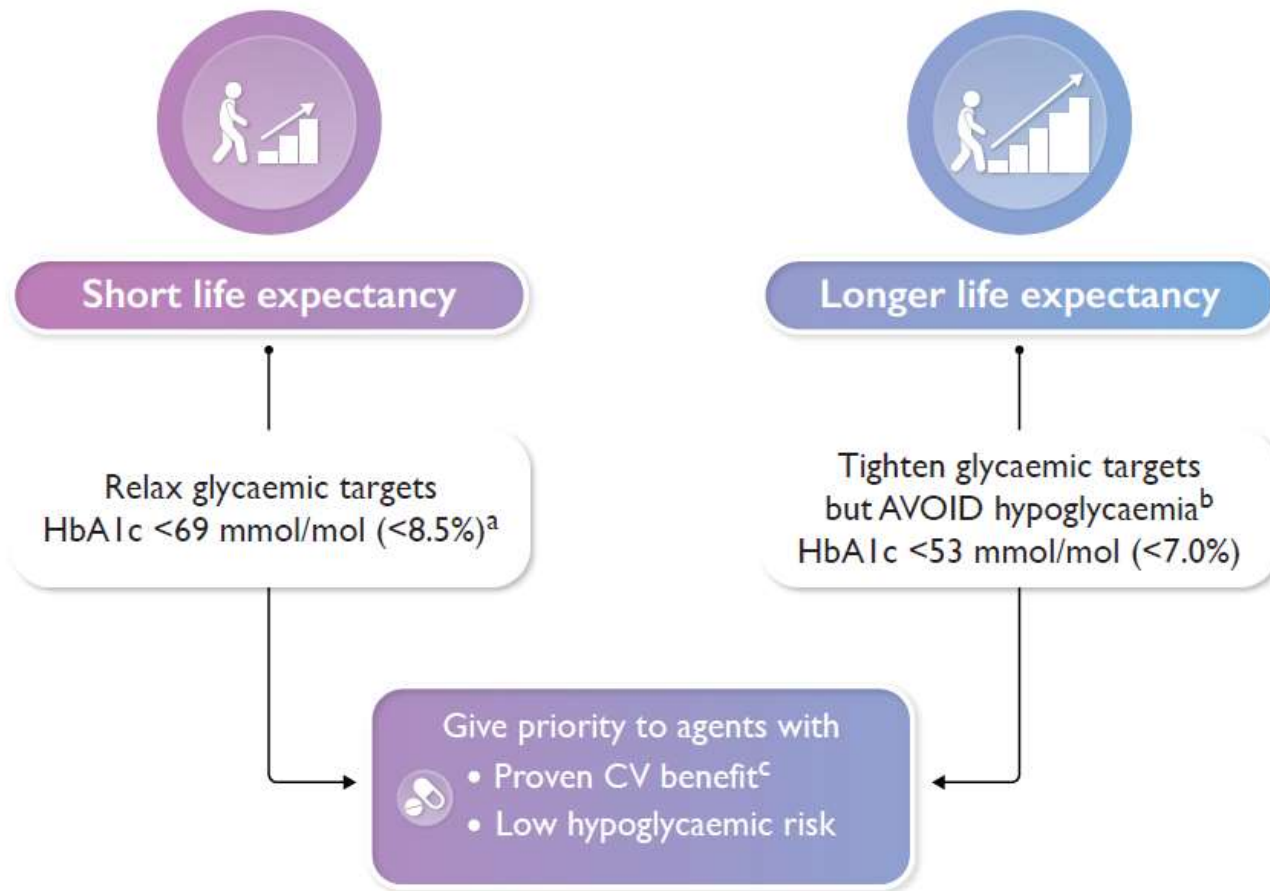
Anti-hypertensive drug treatment is recommended for people with diabetes when office BP is  $\geq 140/90$  mmHg. Target SBP around 130mmHg.

# 5

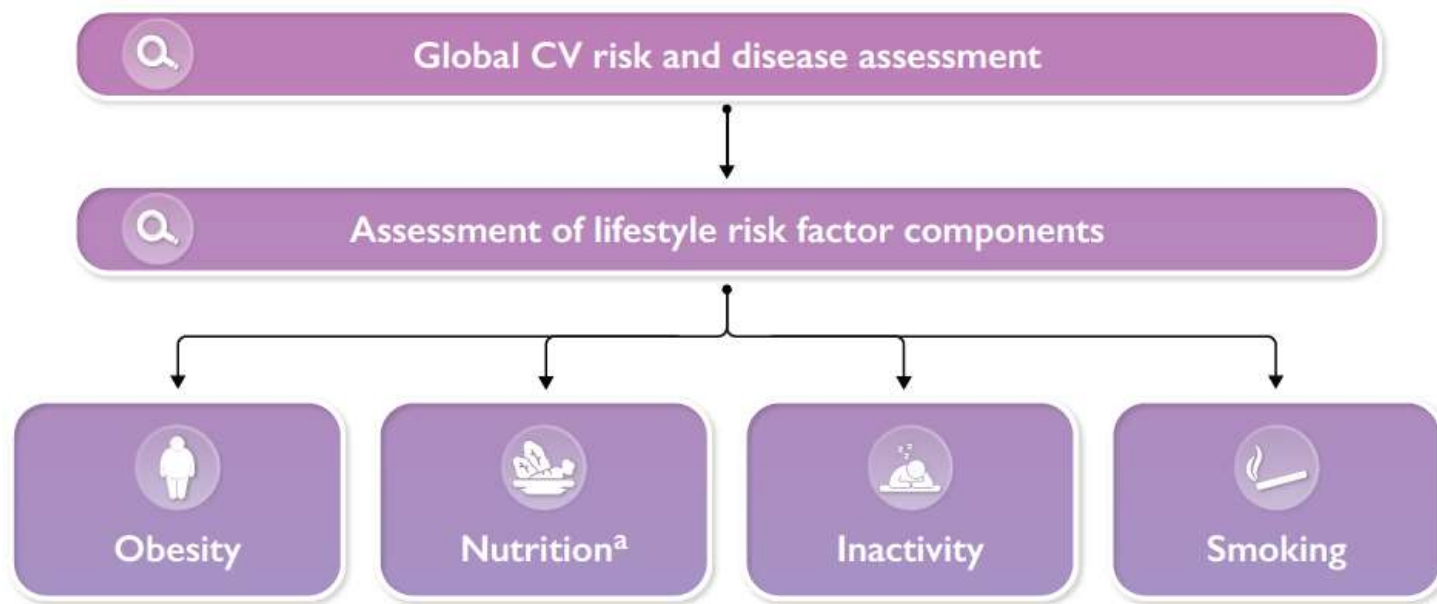
## Quel objectif de contrôle du diabète



# Objectifs équilibre du diabète



# Objectifs des facteurs de risque



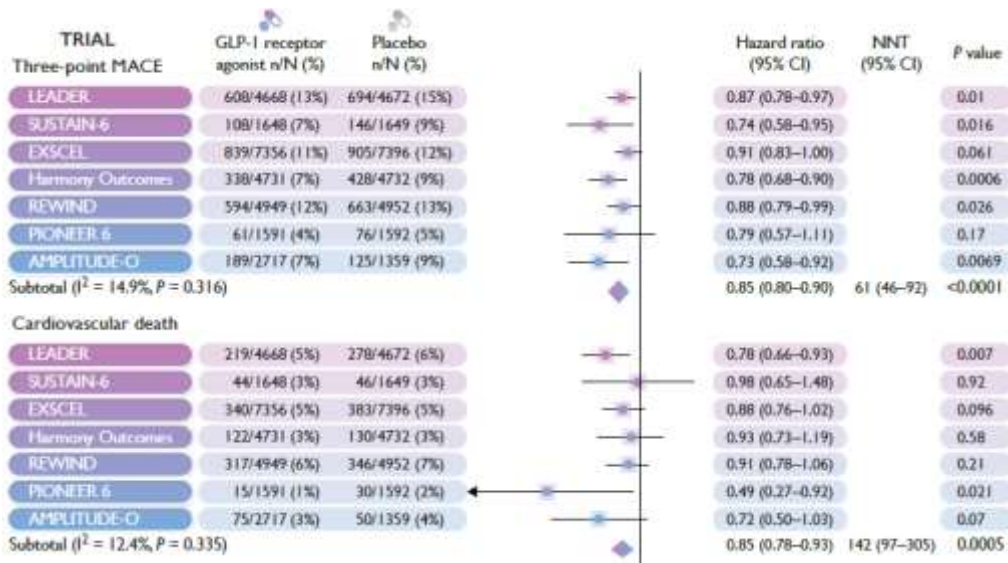
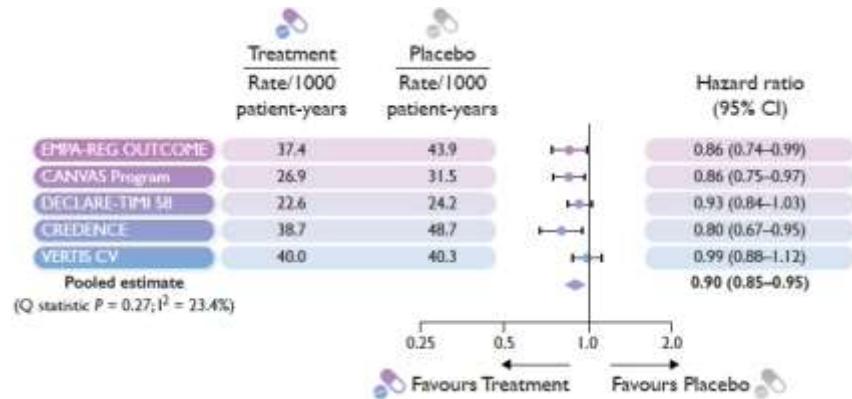
**Etude Look AHEAD (n=5145 DNID)** montre une réduction de la mortalité (HR 0.79; 95% CI, 0.67–0.94; P = 0.007) chez les patients ayant une perte de poids un an  $\geq 10\%$  un an après le début de l'intervention (encadrement 1/semaine pendant 10 ans)

## En pratique:

30min marche par jour (150 min marche par semaine ou 75 min de courses)

Régime méditerranéen – arrêt cigarette

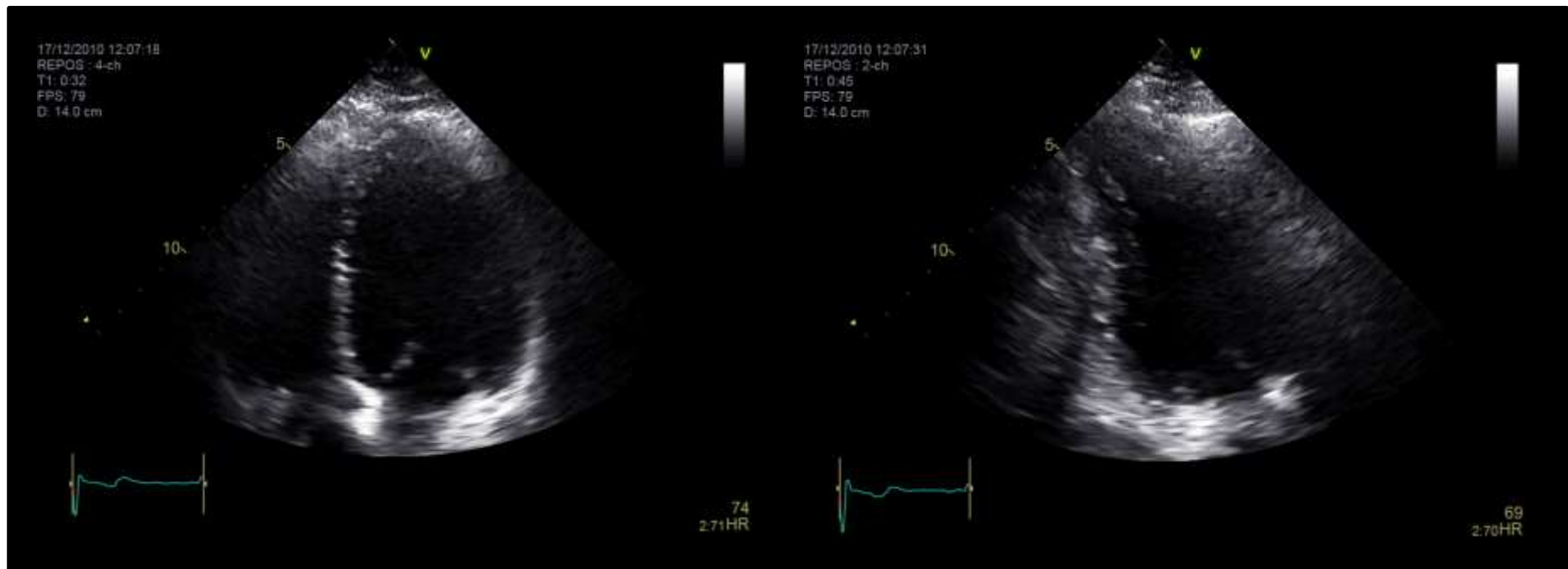
# Objectifs équilibre du diabète



La priorité est donnée aux médicaments permettant de réduire le risque CV +++

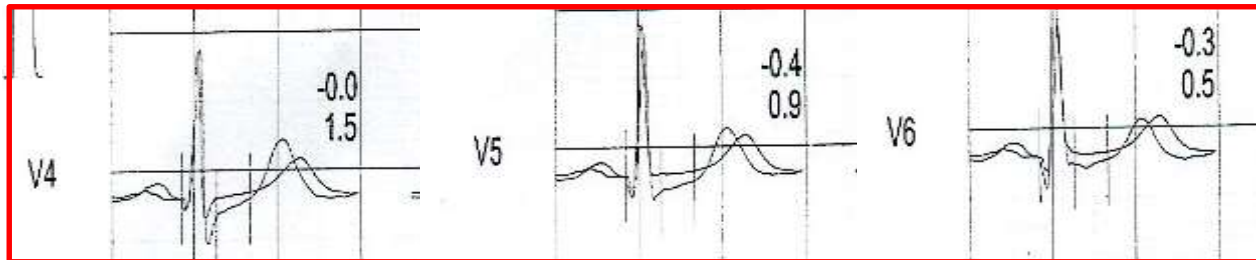
# Question

- Vous revoyez le patient 10 ans plus tard, il vous rapporte une dyspnée à l'effort. La RX de thorax est normale. L'ECG est inchangé et la troponine négative.



# Question

- Le patient réalise une échographie d'effort qui est menée à 120 watts (88% de la FMT) qui électriquement négative et cliniquement arrêtée pour dyspnée.



17/12/2010 12:07:18

T1: 0:32

Freq.: 1.7 MHz/3.4 MHz

FPS: 79.4



17/12/2010 12:08:49

FAIBLE DOSE : 4-ch

T1: 2:03

Freq.: 1.7 MHz/3.4 MHz

FPS: 79.4



2:71 74 HR

5:62 90 HR

17/12/2010 12:16:38

RECUP. : 4-ch

T1: 9:53

Freq.: 1.7 MHz/3.4 MHz

FPS: 79.4



1:40 142 HR

17/12/2010 12:18:58

: 4-ch

T1: 12:12

Freq.: 1.7 MHz/3.4 MHz

FPS: 79.4



1:53 98 HR

17/12/2010 12:07:31  
T1: 0:45  
Freq.: 1.7 MHz/3.4 MHz  
FPS: 79.4



17/12/2010 12:09:18  
FAIBLE DOSE : 2-ch  
T1: 2:32  
Freq.: 1.7 MHz/3.4 MHz  
FPS: 79.4



17/12/2010 12:16:50  
RECUP.: 2-ch  
T1: 10:05  
Freq.: 1.7 MHz/3.4 MHz  
FPS: 79.4



17/12/2010 12:19:05  
: 2-ch  
T1: 12:19  
Freq.: 1.7 MHz/3.4 MHz  
FPS: 79.4



17/12/2010 12:07:40  
T1: 0:53  
Freq.: 1.7 MHz/3.4 MHz  
FPS: 79.4



2:74 70 HR

17/12/2010 12:09:28  
FAIBLE DOSE : PLAX  
T1: 2:42  
Freq.: 1.7 MHz/3.4 MHz  
FPS: 79.4



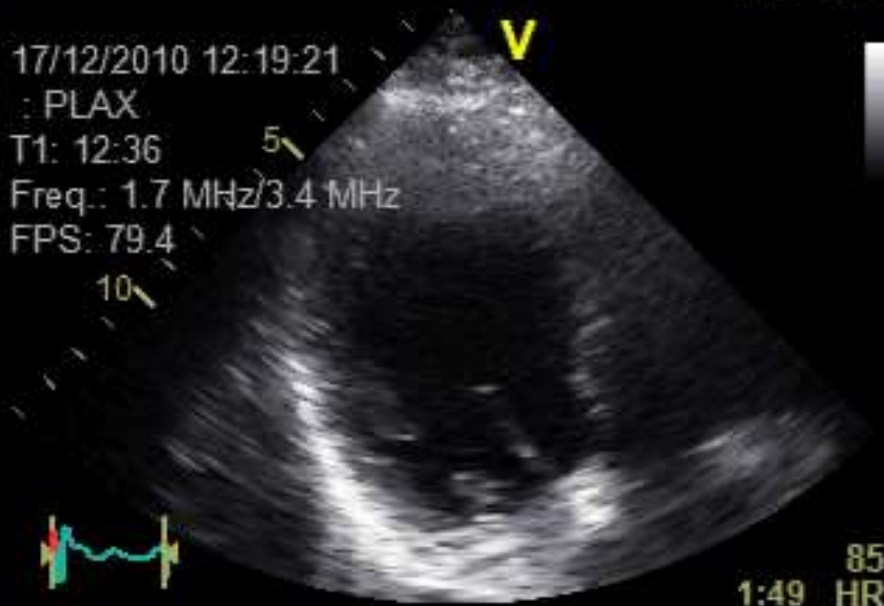
1:54 90 HR

17/12/2010 12:17:06  
RECUP. : PLAX  
T1: 10:20  
Freq.: 1.7 MHz/3.4 MHz  
FPS: 79.4



2:42 122 HR

17/12/2010 12:19:21  
: PLAX  
T1: 12:36  
Freq.: 1.7 MHz/3.4 MHz  
FPS: 79.4



1:49 85 HR

