



ГКБ ИМ. И. В. ДАВИДОВСКОГО

— 1866 —

От субклинического атеросклероза к острым коронарным событиям

Мальцева А.С., 6 курс, МШ «Медицина будущего», Сеченовский
университет
Москва, 2020

**JACC FOCUS SEMINAR: HISTORICAL AND CONCEPTUAL CHANGES OF
CORONARY ARTERY DISEASE (1980-2020)**

JACC STATE-OF-THE-ART REVIEW

From Subclinical Atherosclerosis to Plaque Progression and Acute Coronary Events



JACC State-of-the-Art Review

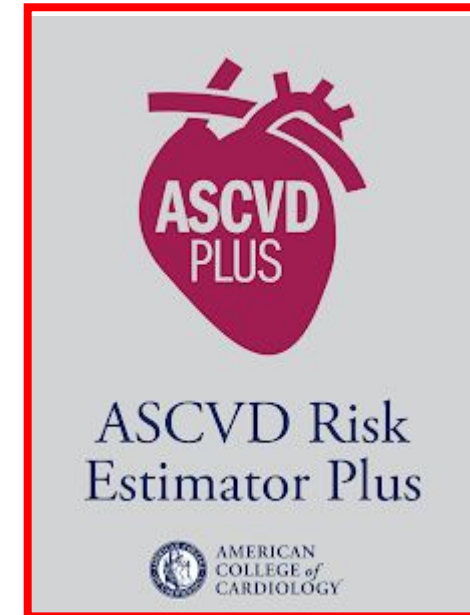
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Установленный подход к оценке сердечно-сосудистого риска

Supplementary Table 1 Total cardiovascular disease risk assessment systems

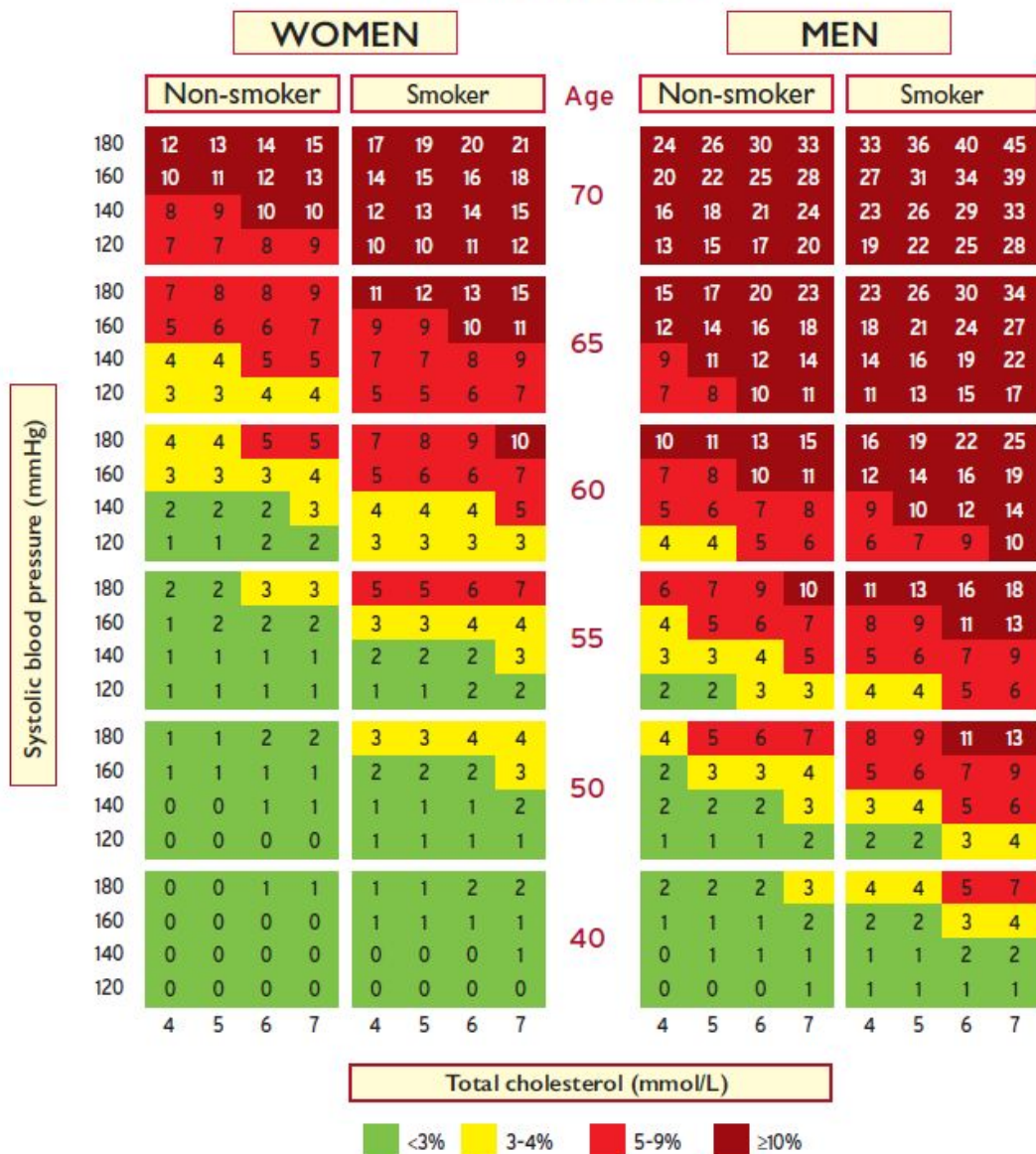
System	Risk	Variables	Reference
Framingham models	10-year risk of CHD events	Gender, age, TC, HDL-C, SBP, smoking status, diabetes, hypertensive treatment	1
Systematic Coronary Risk Estimation (SCORE)	10-year risk of CVD mortality	Gender, age, TC or TC/HDL-C ratio, SBP, smoking status	2
ASSIGN (CV risk estimation model from the Scottish Intercollegiate Guidelines Network)	10-year risk of first CVD event	Gender, age, TC, HDL-C, SBP, smoking (number of cigarettes), diabetes, area-based index of deprivation, family history	3
QRISK2	10-year risk of first CVD event	Gender, age, TC to HDL-C ratio, SBP, smoking status, diabetes, area-based index of deprivation, family history, BMI, antihypertensive treatment, ethnicity, rheumatoid arthritis, CKD stages 4–5, AF	4
Prospective Cardiovascular Munster Study (PROCAM)	Two separate scores calculate 10-year risk of major coronary events and cerebral ischaemic events	Age, gender, LDL-C, HDL-C, diabetes, smoking, SBP	5
Reynolds Risk Score	10-year risk of incident myocardial infarction, stroke, coronary revascularization, or CV death	Gender, age, SBP, smoking, high-sensitivity C-reactive protein, TC, HDL-C, family history of premature MI (parent aged <60 years), HbA1c if diabetic	6,7
CUORE	10-year risk of first CVD event	Age, gender, TC, HDL-C, diabetes, smoking, SBP, hypertensive treatment	8
Pooled Cohort equations	10-year risk of CVD event	Age, gender, TC, HDL-C, diabetes, smoking, SBP, hypertensive treatment, race	9
Globorisk	10-year risk of CVD mortality	Age, gender, smoking, SBP, diabetes, TC	10

AF = atrial fibrillation; BMI = body mass index; CHD = coronary heart disease; CKD = chronic kidney disease; CV = cardiovascular; CVD = cardiovascular disease; HbA1c = glycated haemoglobin; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol; MI = myocardial infarction, SBP = systolic blood pressure; TC = total cholesterol.



SCORE Cardiovascular Risk Chart 10-year risk of fatal CVD

High-risk regions of Europe




Box 2 Risk estimation charts for different countries


The **low-risk charts** should be considered for use in Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Netherlands, Norway, Malta, Portugal, Slovenia, Spain, Sweden, Switzerland, and the UK.

The **high-risk charts** should be considered for use in Albania, Algeria, Armenia, Bosnia and Herzegovina, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lebanon, Libya, Lithuania, Montenegro, Morocco, Poland, Romania, Serbia, Slovakia, Tunisia, and Turkey.

Some countries have a cardiovascular disease mortality rate >350/100 000, and the **high-risk chart may underestimate risk**. These are Azerbaijan, Belarus, Bulgaria, Egypt, Georgia, Kazakhstan, Kyrgyzstan, North Macedonia, Republic of Moldova, Russian Federation, Syria, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

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Добро пожаловать!

С помощью HeartScore вы сможете рассчитывать уровни риска пациентов и получать рекомендации по лечению на основе таблиц рисков SCORE (Systematic COronary Risk Evaluation — Систематическая оценка коронарного риска) и Европейских рекомендаций по профилактике ССЗ в клинической практике, сохранять данные пациентов и контролировать их динамику



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Table 4 Cardiovascular risk categories

Very-high-risk	<p>People with any of the following: Documented ASCVD, either clinical or unequivocal on imaging. Documented ASCVD includes previous ACS (MI or unstable angina), stable angina, coronary revascularization (PCI, CABG, and other arterial revascularization procedures), stroke and TIA, and peripheral arterial disease. Unequivocally documented ASCVD on imaging includes those findings that are known to be predictive of clinical events, such as significant plaque on coronary angiography or CT scan (multivessel coronary disease with two major epicardial arteries having >50% stenosis), or on carotid ultrasound.</p> <p>DM with target organ damage,^a or at least three major risk factors, or early onset of T1DM of long duration (>20 years).</p> <p>Severe CKD (eGFR <30 mL/min/1.73 m²).</p> <p>A calculated SCORE ≥10% for 10-year risk of fatal CVD.</p> <p>FH with ASCVD or with another major risk factor.</p>
High-risk	<p>People with: Markedly elevated single risk factors, in particular TC >8 mmol/L (>310 mg/dL), LDL-C >4.9 mmol/L (>190 mg/dL), or BP ≥180/110 mmHg.</p> <p>Patients with FH without other major risk factors.</p> <p>Patients with DM without target organ damage,^a with DM duration ≥10 years or another additional risk factor.</p> <p>Moderate CKD (eGFR 30–59 mL/min/1.73 m²).</p> <p>A calculated SCORE ≥5% and <10% for 10-year risk of fatal CVD.</p>
Moderate-risk	<p>Young patients (T1DM <35 years; T2DM <50 years) with DM duration <10 years, without other risk factors. Calculated SCORE ≥1% and <5% for 10-year risk of fatal CVD.</p>
Low-risk	<p>Calculated SCORE <1% for 10-year risk of fatal CVD.</p>

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1. Подтвержденное результатами исследований сердечно-сосудистое заболевание (ССЗ) атеросклеротического генеза (**симптомное** или четко определяющееся при визуализации). Среди них: ОКС, стабильная стенокардия, инсульт и ТИА, атеросклероз периферических артерий. Четкие признаки поражения коронарных артерий при визуализации: многососудистое поражение КА + поражение 2х крупных артерий со стенозом более 50% на КАГ и КТ/ визуализация на УЗИ сонных артерий.
2. СД + поражение органов-мишеней/ три больших факторов риска (ФР)/ СД 1 типа более 20 лет
3. Тяжелая степень ХБП (СКФ менее 30 мл/мин/1,73 м²)
4. SCORE более 10% (включая)
5. Семейная гиперхолестеринемия (СГ) + ССЗ атероск. г./ СГ+ один из больших ФР

1. Значимо повышенный ФР (ТГ более 8 ммоль/л, ЛПНП более 4,9 ммоль/л, АД более 180/110 мм рт. ст.)
2. СГ без сочетания с большим ФР
3. СД без поражения органов-мишеней, длительностью более 10 лет, без дополнительных ФР
4. ХБП средней степени тяжести (СКФ 30-59 мл/мин/1,73 м²)
5. SCORE от 5 (включая) до 10%

1. Молодые пациенты (с СД 1 типа – моложе 35 лет, с СД 2 типа – моложе 50 лет) без дополнительных ФР
2. SCORE от 1% (включая) до 5%

1. SCORE менее 1%

Table 5 Intervention strategies as a function of total cardiovascular risk and untreated low-density lipoprotein cholesterol levels

	Total CV risk (SCORE) %	Untreated LDL-C levels					
		<1.4 mmol/L (55 mg/dL)	1.4 to <1.8 mmol/L (55 to <70 mg/dL)	1.8 to <2.6 mmol/L (70 to <100 mg/dL)	2.6 to <3.0 mmol/L (100 to <116 mg/dL)	3.0 to <4.9 mmol/L (116 to <190 mg/dL)	≥4.9 mmol/L (≥190 mg/dL)
Primary prevention	<1, low-risk	Lifestyle advice	Lifestyle advice	Lifestyle advice	Lifestyle advice	Lifestyle intervention, consider adding drug if uncontrolled	Lifestyle intervention and concomitant drug intervention
	Class ^a /Level ^b	I/C	I/C	I/C	I/C	IIa/A	IIa/A
	≥1 to <5, or moderate risk (see Table 4)	Lifestyle advice	Lifestyle advice	Lifestyle advice	Lifestyle intervention, consider adding drug if uncontrolled	Lifestyle intervention, consider adding drug if uncontrolled	Lifestyle intervention and concomitant drug intervention
	Class ^a /Level ^b	I/C	I/C	IIa/A	IIa/A	IIa/A	IIa/A
	≥5 to <10, or high-risk (see Table 4)	Lifestyle advice	Lifestyle advice	Lifestyle intervention, consider adding drug if uncontrolled	Lifestyle intervention and concomitant drug intervention	Lifestyle intervention and concomitant drug intervention	Lifestyle intervention and concomitant drug intervention
	Class ^a /Level ^b	IIa/A	IIa/A	IIa/A	I/A	I/A	I/A
Secondary prevention	≥10, or at very-high risk due to a risk condition (see Table 4)	Lifestyle advice	Lifestyle intervention, consider adding drug if uncontrolled	Lifestyle intervention and concomitant drug intervention	Lifestyle intervention and concomitant drug intervention	Lifestyle intervention and concomitant drug intervention	Lifestyle intervention and concomitant drug intervention
	Class ^a /Level ^b	IIa/B	IIa/A	I/A	I/A	I/A	I/A
	Very-high-risk	Lifestyle intervention, consider adding drug if uncontrolled	Lifestyle intervention and concomitant drug intervention	Lifestyle intervention and concomitant drug intervention	Lifestyle intervention and concomitant drug intervention	Lifestyle intervention and concomitant drug intervention	Lifestyle intervention and concomitant drug intervention
	Class ^a /Level ^b	IIa/A	I/A	I/A	I/A	I/A	I/A

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Когда назначать статины?

CV = cardiovascular; LDL-C = low-density lipoprotein cholesterol; SCORE = Systematic Coronary Risk Estimation.

^aClass of recommendation.

^bLevel of evidence.

Риск считается сниженным, при достижении целевого уровня ЛПНП

Recommendations for treatment goals for low-density lipoprotein cholesterol

Recommendations	Class ^a	Level ^b
In secondary prevention for patients at very-high risk, ^c an LDL-C reduction of $\geq 50\%$ from baseline ^d and an LDL-C goal of < 1.4 mmol/L (< 55 mg/dL) are recommended. ^{33–35,119,120}	I	A
In primary prevention for individuals at very-high risk but without FH, ^c an LDL-C reduction of $\geq 50\%$ from baseline ^d and an LDL-C goal of < 1.4 mmol/L (< 55 mg/dL) are recommended. ^{34–36}	I	C
In primary prevention for individuals with FH at very-high risk, an LDL-C reduction of $\geq 50\%$ from baseline and an LDL-C goal of < 1.4 mmol/L (< 55 mg/dL) should be considered.	IIa	C
For patients with ASCVD who experience a second vascular event within 2 years (not necessarily of the same type as the first event) while taking maximally tolerated statin-based therapy, an LDL-C goal of < 1.0 mmol/L (< 40 mg/dL) may be considered. ^{119,120}	IIb	B
In patients at high risk, ^c an LDL-C reduction of $\geq 50\%$ from baseline ^d and an LDL-C goal of < 1.8 mmol/L (< 70 mg/dL) are recommended. ^{34,35}	I	A
In individuals at moderate risk, ^c an LDL-C goal of < 2.6 mmol/L (< 100 mg/dL) should be considered. ³⁴	IIa	A
In individuals at low risk, ^c an LDL-C goal < 3.0 mmol/L (< 116 mg/dL) may be considered. ³⁶	IIb	A

ASCVD = atherosclerotic cardiovascular disease; FH = familial hypercholesterolaemia; LDL-C = low-density lipoprotein cholesterol.

^aClass of recommendation.

^bLevel of evidence.

^cFor definitions see Table 4.

^dThe term 'baseline' refers to the LDL-C level in a person not taking any LDL-C-lowering medication. In people who are taking LDL-C-lowering medication(s), the projected baseline (untreated) LDL-C levels should be estimated, based on the average LDL-C-lowering efficacy of the given medication or combination of medications.

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Риск	Уровень ЛПНП (ммоль/л)
Очень высокий	Менее 1,4
2 сосудистых события за 2 года	Менее 1
Высокий	Менее 1,8
Средний	Менее 2,6
Низкий	Менее 3

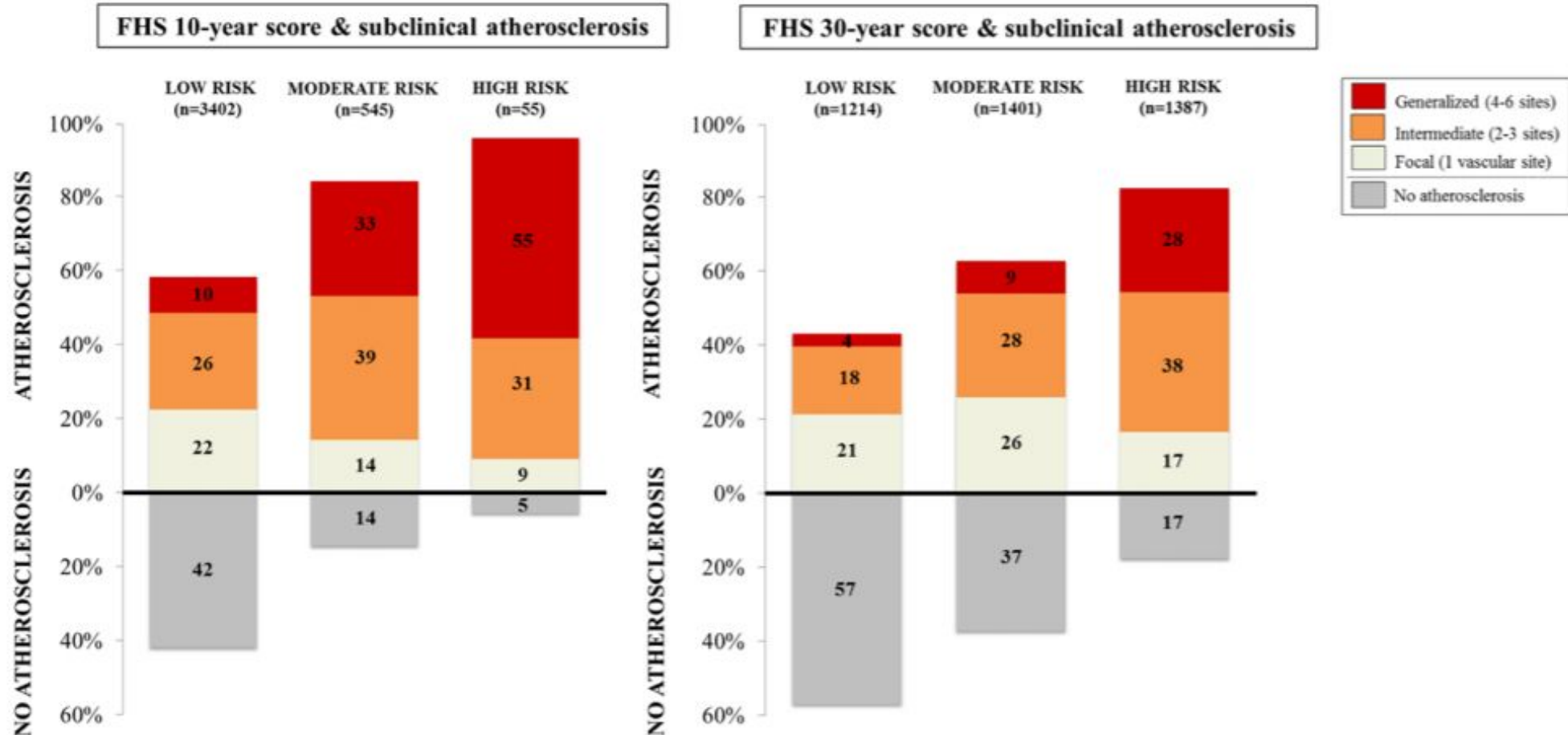
The PESA (Progression of Early Subclinical Atherosclerosis) Study

Table 1. Demographic Characteristics and Cardiovascular Risk Factors

	Total (n=4066)	Men (n=2573)	Women (n=1493)	P Value
Baseline characteristics				
Age, y	45.8±4.3	46.3±4.4	45±3.9	<0.001
BMI, kg/m ²	26.2±3.8	27.4±3.4	24.1±3.6	<0.001
Obesity (BMI ≥30 kg/m ²), n (%)	598 (15)	493 (19)	105 (7)	<0.001
SBP, mm Hg	116±12.5	121±11.1	109±11	<0.001
DBP, mm Hg	72.5±9.4	74.7±9.1	68.7±8.7	<0.001
Total cholesterol, mg/dL	201±33.3	203±34.2	196±31.2	<0.001
LDL-C, mg/dL	132±29.8	136±30.3	125±27.5	<0.001
HDL-C, mg/dL	49±12.2	44.8±10.2	56.3±11.9	<0.001
Triglycerides, mg/dL	95±57.2	109±64	70.6±29.9	<0.001
Fasting glucose, mg/dL	90.6±13.8	93.4±15	85.7±9.7	<0.001
Hemoglobin A _{1c} , %	5.44±0.5	5.49±0.5	5.36±0.4	<0.001

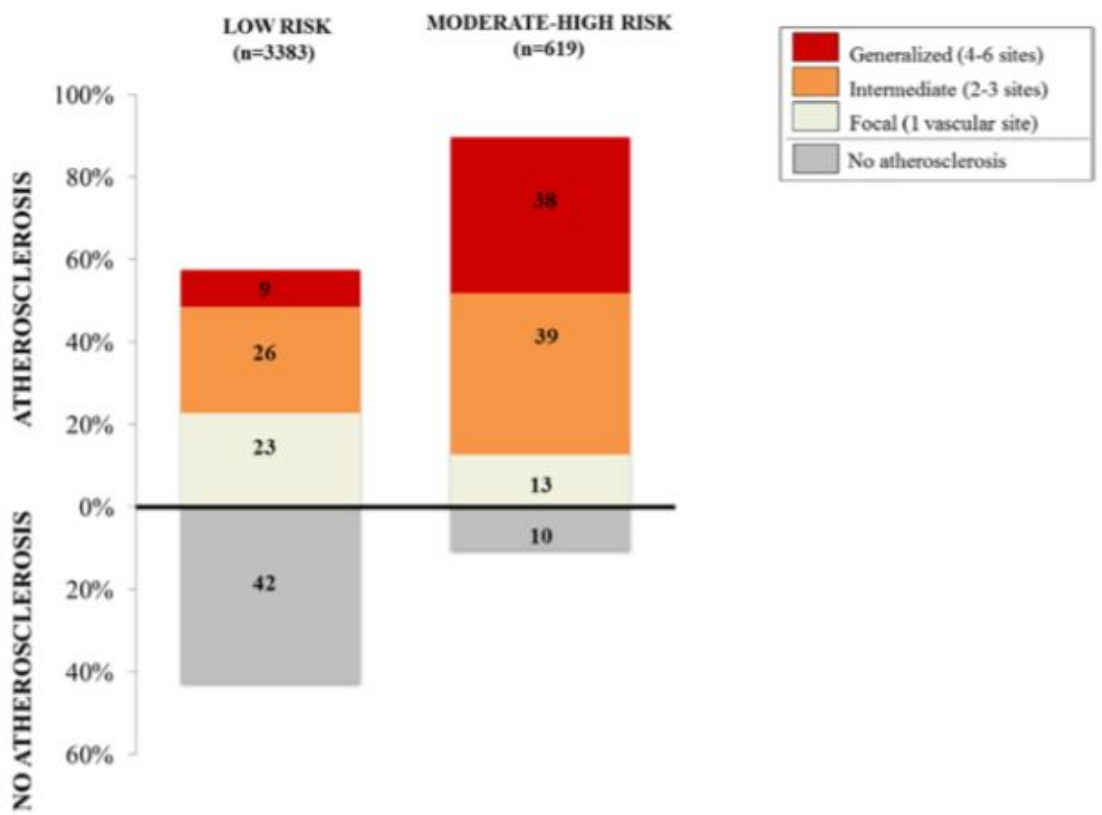
Lipid-lowering therapy, n (%)	287 (7)	242 (9)	45 (3)	<0.001
Antihypertensive therapy, n (%)	309 (8)	266 (10)	43 (3)	<0.001
Antidiabetic therapy, n (%)	64 (2)	56 (2)	8 (0.5)	<0.001
Traditional CV risk factors, n (%)				
Dyslipidemia	1691 (42)	1374 (53)	317 (21)	<0.001
Total cholesterol ≥240 mg/dL	475 (12)	345 (13)	130 (9)	<0.001
LDL-C ≥160 mg/dL	688 (17)	522 (20)	166 (11)	<0.001
HDL-C <40 mg/dL	983 (24)	880 (34)	103 (7)	<0.001
Current smoking	835 (21)	486 (19)	349 (23)	<0.001
Family history of CV disease	646 (16)	398 (16)	248 (17)	0.337
Hypertension	481 (12)	409 (16)	72 (5)	<0.001
Diabetes mellitus	81 (2)	72 (3)	9 (0.6)	<0.001
No. of CV risk factors, n (%)				
0	1535 (38)	777 (30)	758 (51)	<0.001
1	1572 (39)	1053 (41)	519 (35)	<0.001
2	746 (18)	569 (22)	177 (12)	<0.001
>2	213 (5)	174 (7)	39 (3)	<0.001

The PESA (Progression of Early Subclinical Atherosclerosis) Study

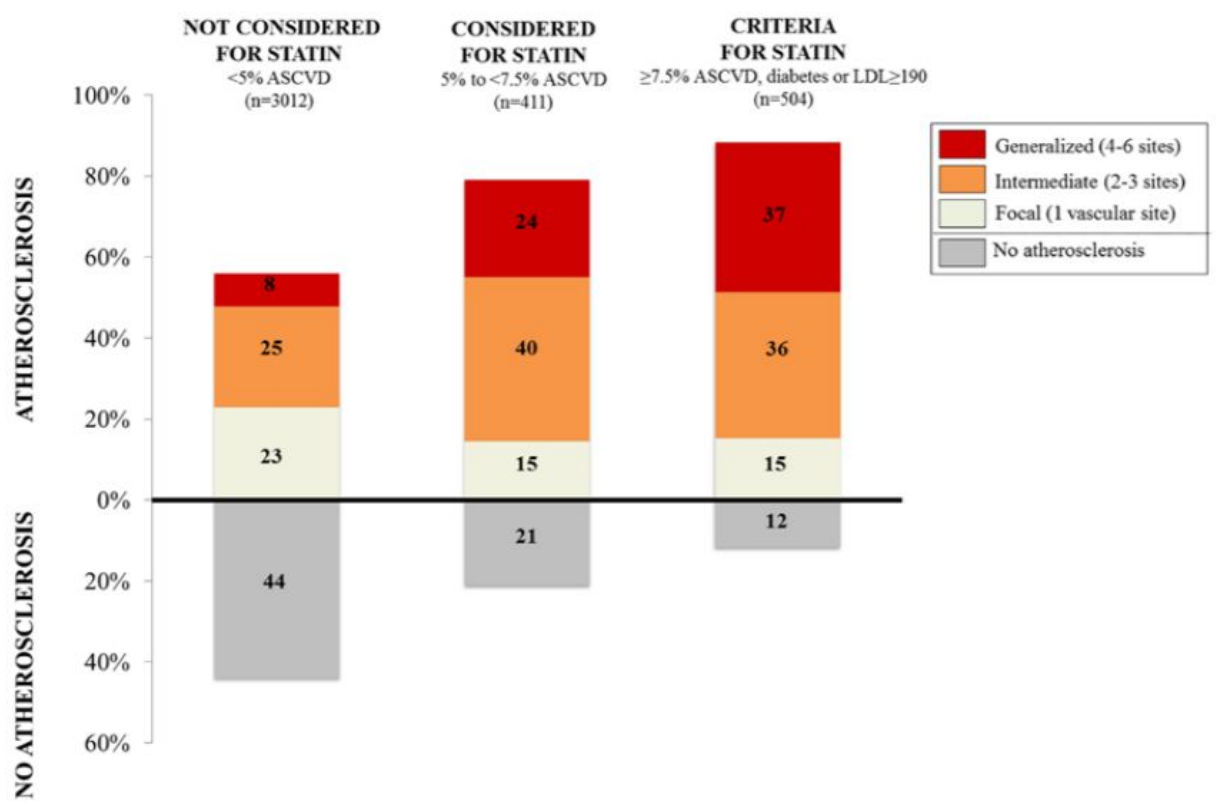


Из них статины получали лишь некоторые пациенты

10-year European SCORE & subclinical atherosclerosis



Subclinical atherosclerosis according to statin recommendations by the ASCVD risk score

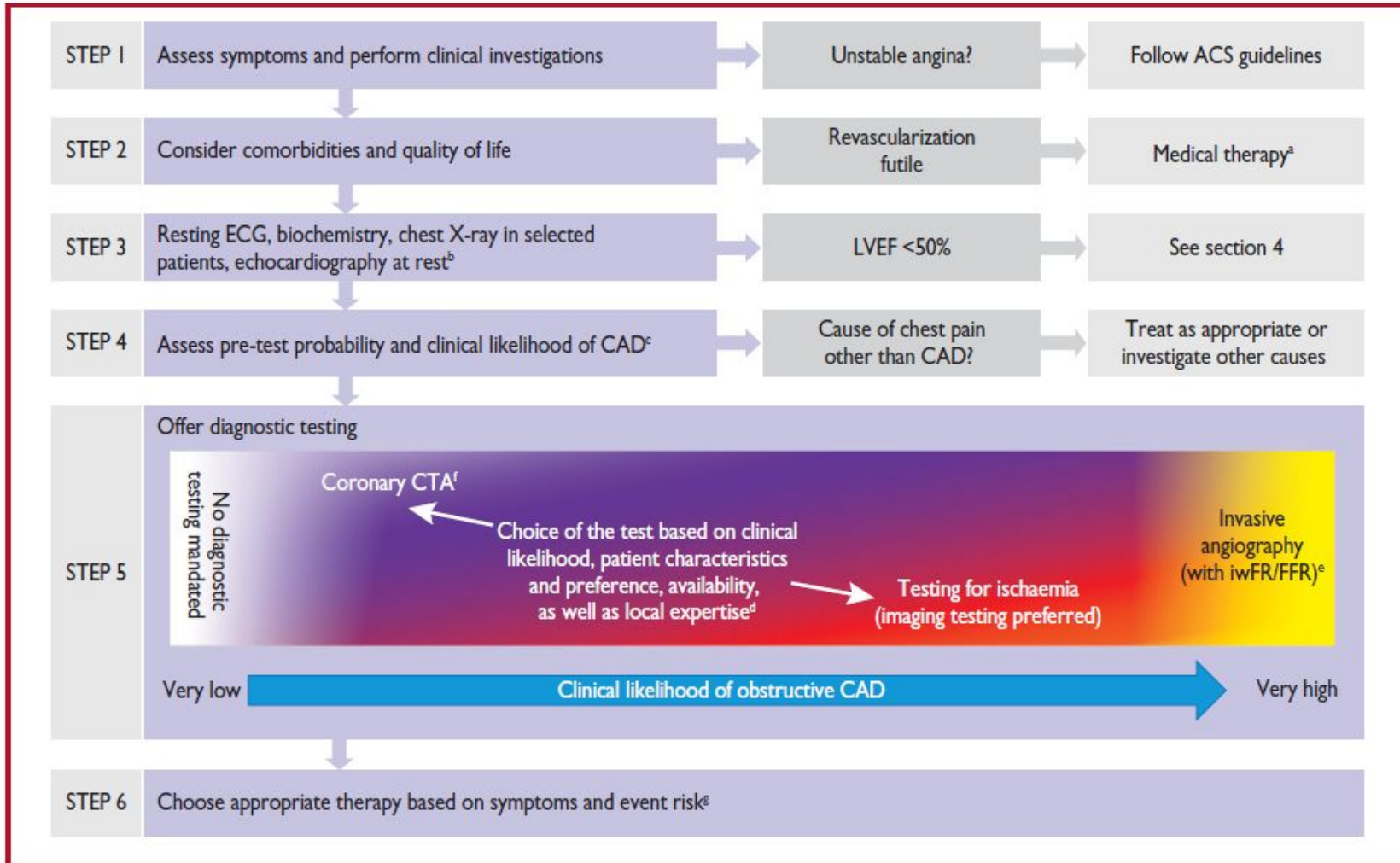


О визуализации в рекомендациях

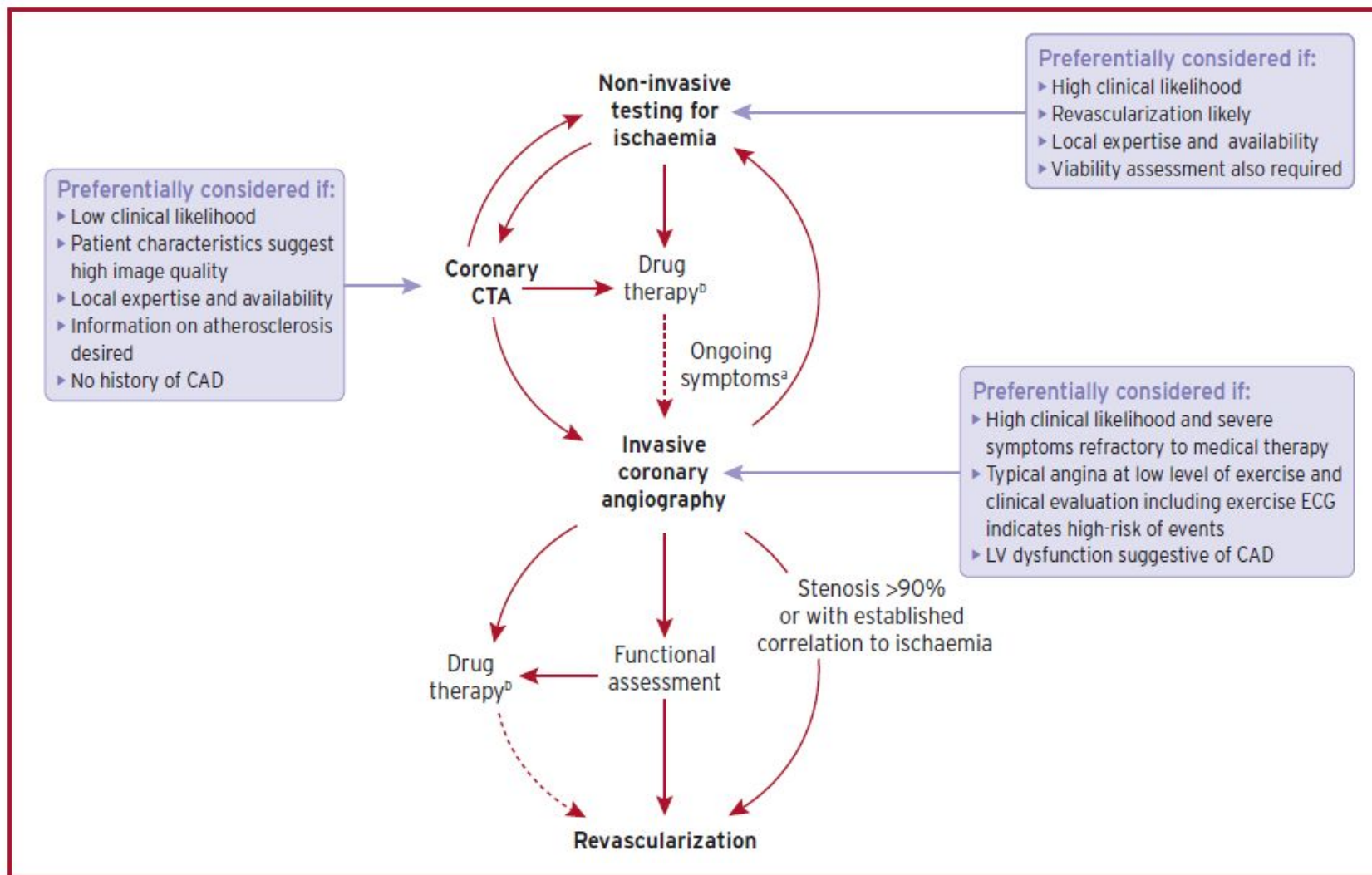
Recommendations for cardiovascular imaging for risk assessment of atherosclerotic cardiovascular disease

Recommendations	Class ^a	Level ^b
Arterial (carotid and/or femoral) plaque burden on arterial ultrasonography should be considered as a risk modifier in individuals at low or moderate risk. ^{29,30}	IIa	B
CAC score assessment with CT should be considered as a risk modifier in the CV risk assessment of asymptomatic individuals at low or moderate risk. ^{14–16,24,26}	IIa	B

Диагностика ИБС



Диагностика ИБС



Оценка риска у пациентов с ИБС

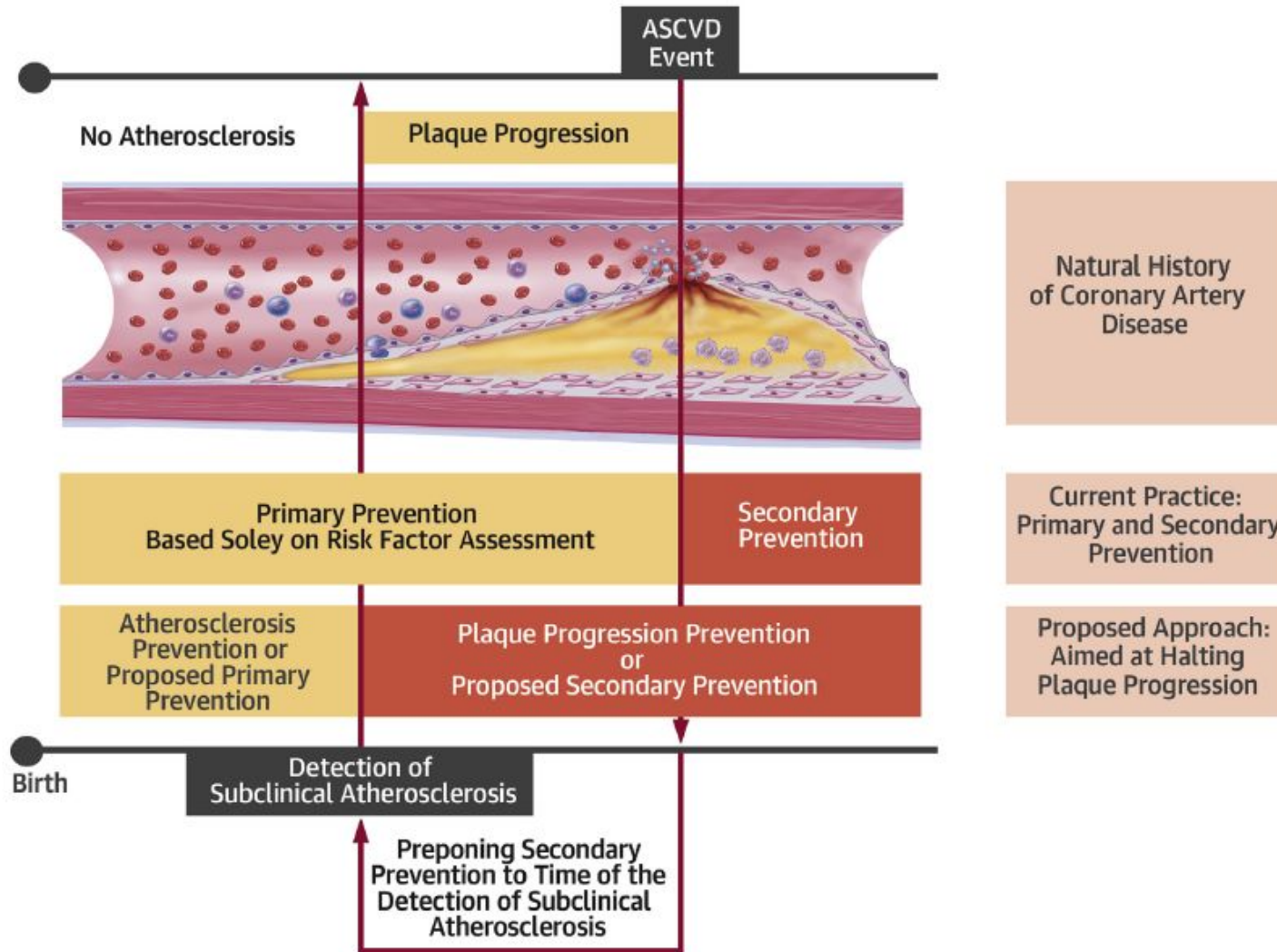
Table 6 Definitions of high event risk for different test modalities in patients with established chronic coronary syndromes^a 102–104

Exercise ECG	Cardiovascular mortality >3% per year according to Duke Treadmill Score
SPECT or PET perfusion imaging	Area of ischaemia $\geq 10\%$ of the left ventricle myocardium
Stress echocardiography	≥ 3 of 16 segments with stress-induced hypokinesia or akinesia
CMR	≥ 2 of 16 segments with stress perfusion defects or ≥ 3 dobutamine-induced dysfunctional segments
Coronary CTA or ICA	Three-vessel disease with proximal stenoses, LM disease, or proximal anterior descending disease
Invasive functional testing	FFR ≤ 0.8 , iwFR ≤ 0.89

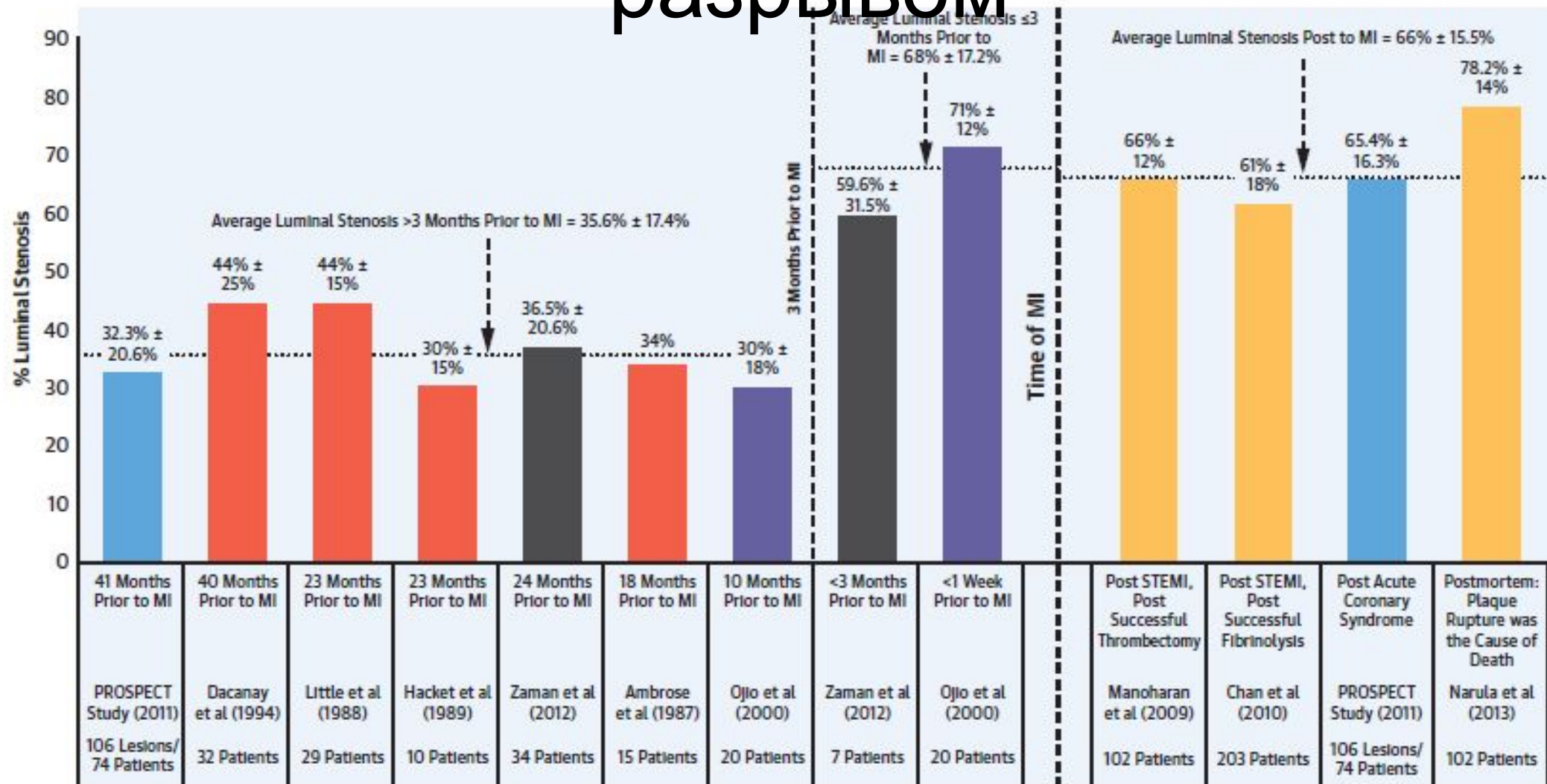
CTA = computed tomography angiography; CMR = cardiac magnetic resonance; ECG = electrocardiogram; FFR = fractional flow reserve; ICA = invasive coronary angiography; iwFR = instantaneous wave-free ration (instant flow reserve); LM = left main; PET = positron emission tomography; SPECT; single-photon emission computed tomography.

^aFor detailed explanations, refer to the Supplementary Data.

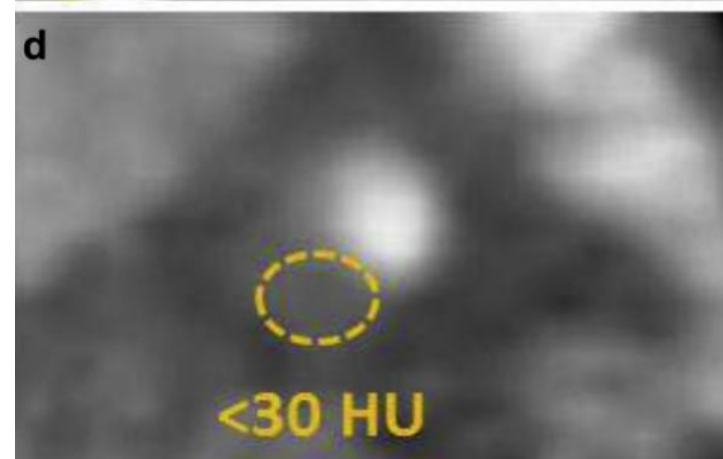
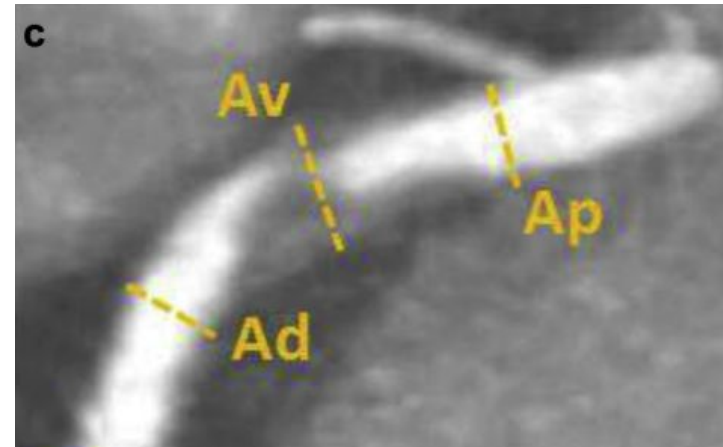
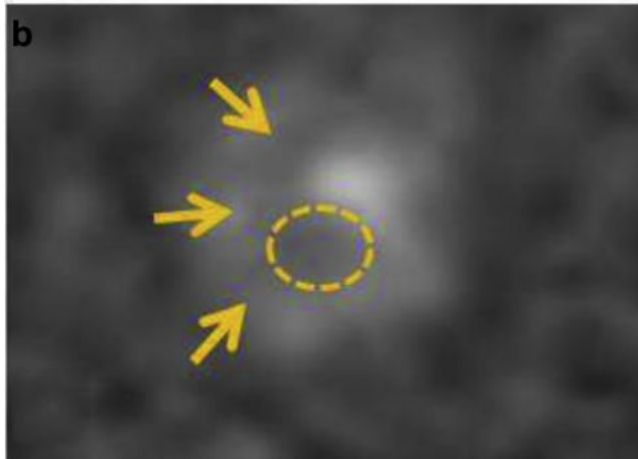
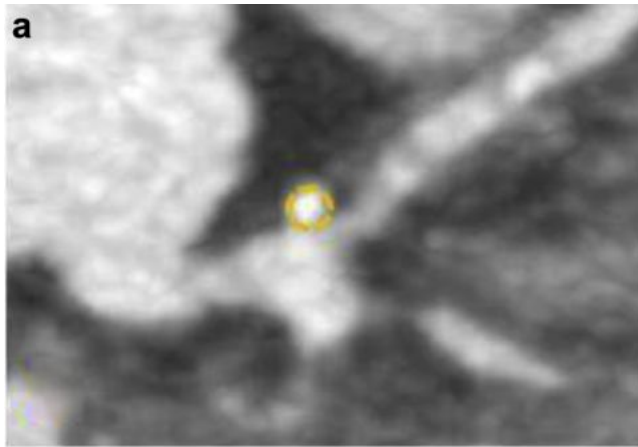
Другой подход, основанный на визуализации бляшки



Динамика роста бляшки перед разрывом



Характеристика бляшки высокого риска на КТ...



Признаки:

- 1) Точечные кальцинаты
- 2) «napkin ring sign» (кольцевидное усиление)
- 3) Позитивное ремоделирование (отношение диаметра сосуда на уровне бляшки к среднему от диаметров проксимальнее и дистальнее $Av/((Ap+Ad)/2)$)
- 4) Низкая интенсивность некальцинированной бляшки (менее 30 HU)

НЕОБХОДИМО 2 И БОЛЕЕ ПРИЗНАКА

Кальциевый индекс более

100

... и на IVUS (ВСУЗИ)

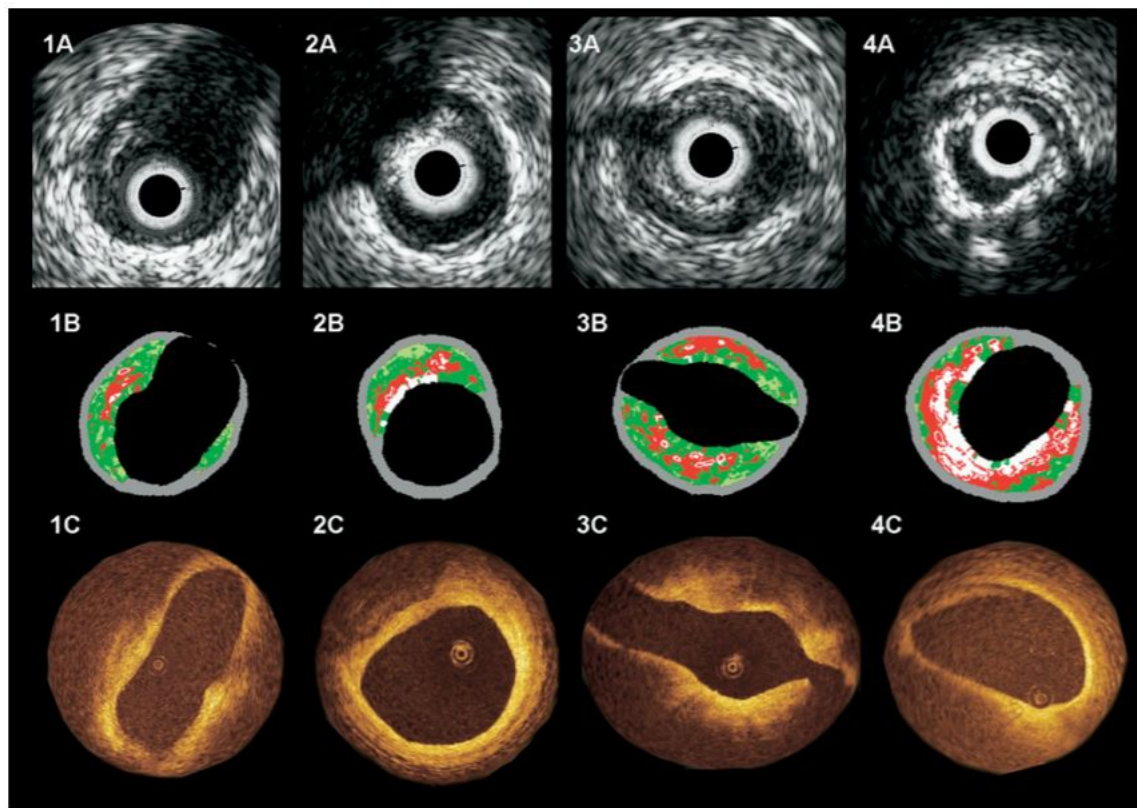


Figure 5. High-Risk Plaques

Matched images of grayscale IVUS (A), virtual histology (B), and OCT (C) for the 4 types of plaques considered at high risk of rupture. 1: fibroatheroma, 2: calcified fibroatheroma, 3: thin-cap fibroatheroma, 4: calcified thin-cap fibroatheroma. Abbreviations as in Figure 1.

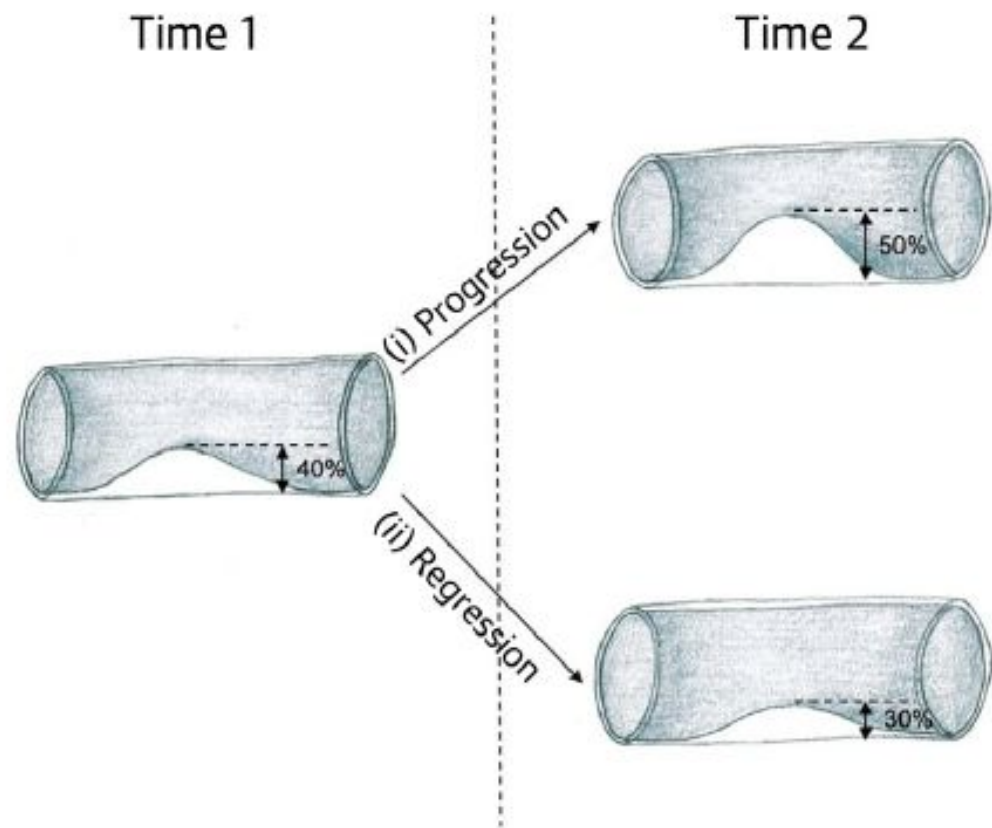
Признаки:

1. Большой объем бляшки (большое липидное ядро)
2. Тонкая фиброзная капсула

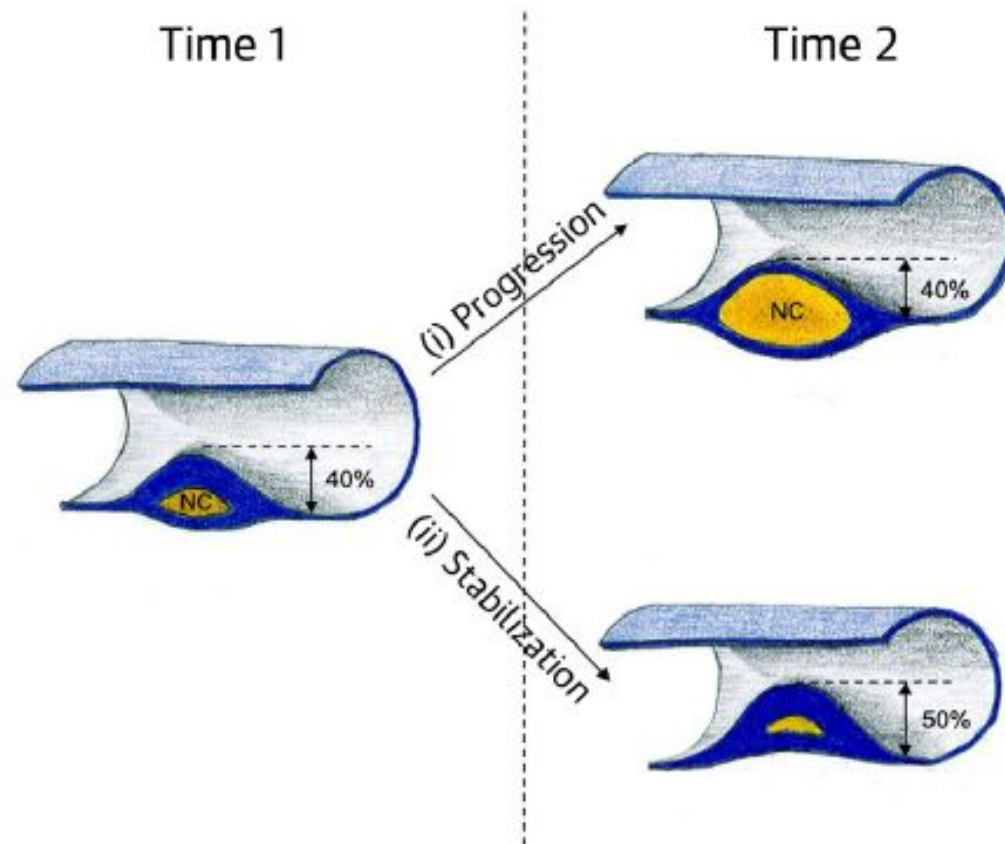
Gonzalo N. et al. In vivo assessment of high-risk coronary plaques at bifurcations with combined intravascular ultrasound and optical coherence tomography //JACC: Cardiovascular Imaging. – 2009. – Т. 2. – №. 4. – С. 473-482.

Cheng J. M. et al. In vivo detection of high-risk coronary plaques by radiofrequency intravascular ultrasound and cardiovascular outcome: results of the ATHEROREMO-IVUS study //European heart journal. – 2013. – Т. 35. – №. 10. – С. 639-647.

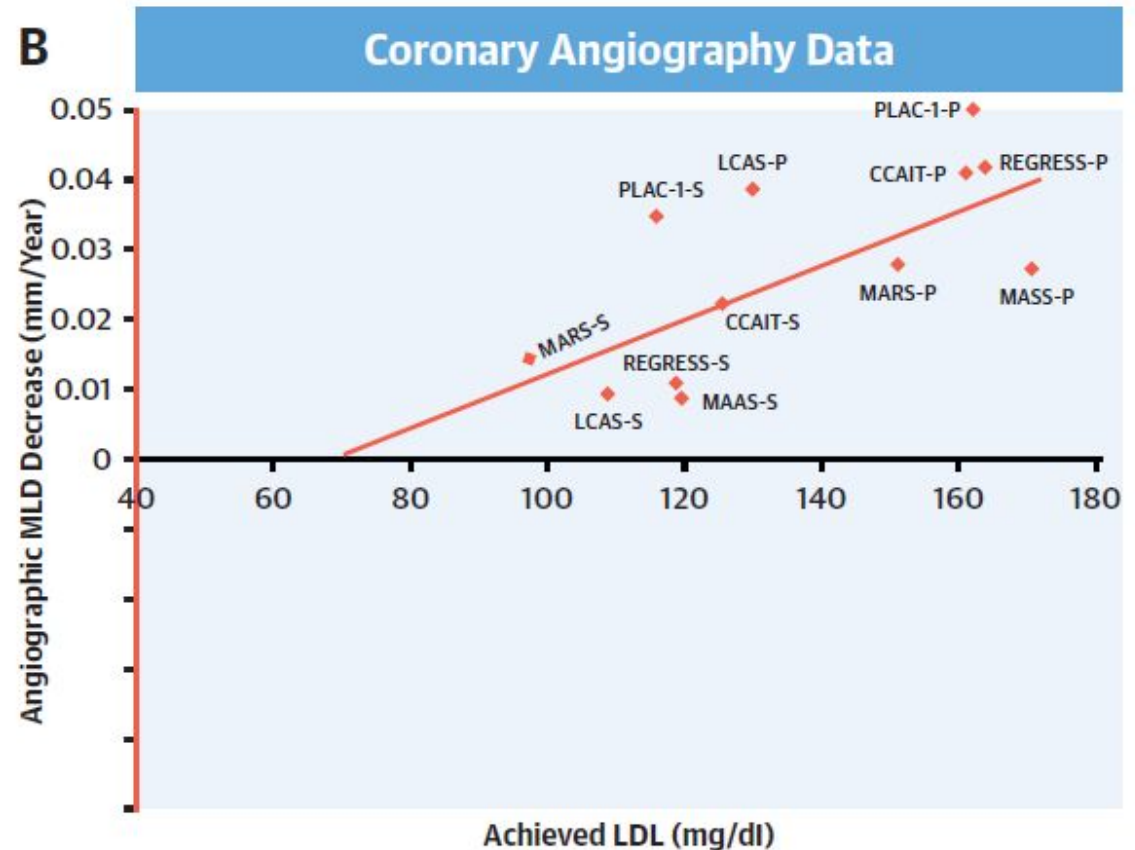
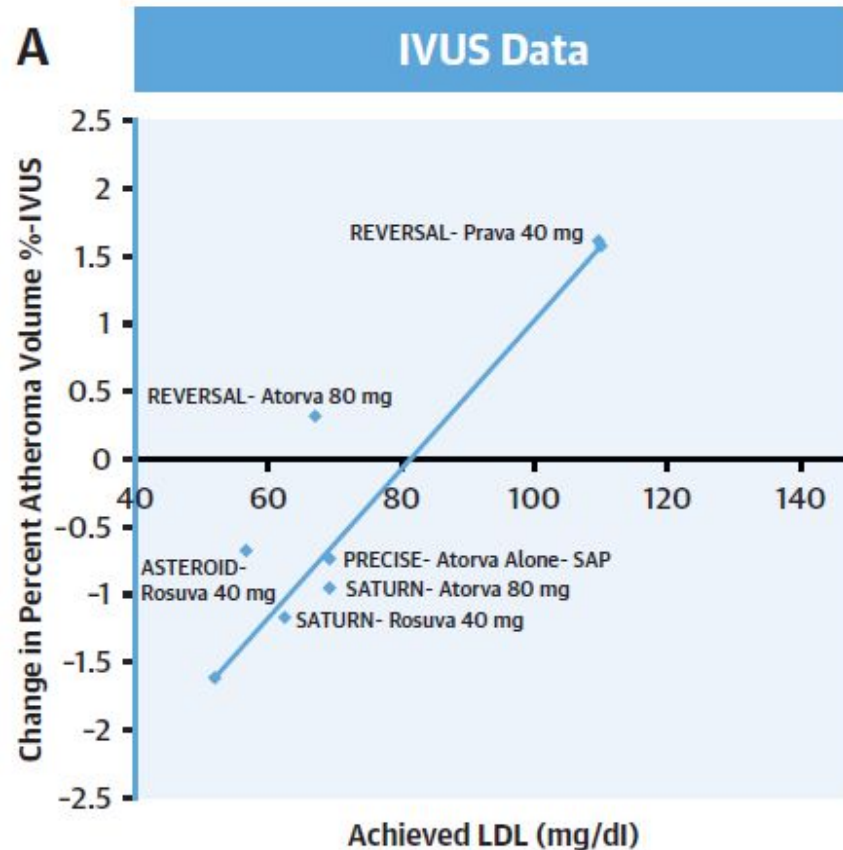
A Angiography-based Definition



B Plaque-based Definition



Можно ли повлиять на рост бляшки?



мг/дл разделить на 38,6 →
ммоль/л

PARADIGM study

TABLE 1 Baseline Clinical Characteristics and Lipid Profiles

	Total (N = 1,255)	Statin-Naive Patients (n = 474)	Statin-Taking Patients (n = 781)	p Value Between Groups
Age, yrs	60.4 ± 9.2	59.2 ± 9.6	61.1 ± 8.8	<0.001
Men	712 (56.7)	260 (54.9)	452 (57.9)	0.295
Coronary CTA interscan interval, yrs	3.8 ± 1.6	3.7 ± 1.6	3.9 ± 1.6	0.016
Body mass index, kg/m ²	25.2 ± 3.2	25.3 ± 3.4	25.1 ± 3.2	0.334
Systolic blood pressure, mm Hg	130 ± 18	128 ± 17	131 ± 18	0.005
Diastolic blood pressure, mm Hg	78 ± 11	77 ± 11	79 ± 11	0.663
Hypertension	654 (52.2)	217 (45.8)	437 (56.2)	<0.001
Diabetes mellitus	261 (20.8)	70 (14.8)	191 (24.5)	<0.001
Family history of CAD	337 (26.9)	117 (24.7)	220 (28.2)	0.177
Smoking history	467 (37.3)	178 (37.7)	289 (37.1)	0.828
Antiplatelets	507 (40.4)	125 (26.4)	382 (48.9)	<0.001
Beta-blockers	349 (27.9)	102 (21.6)	247 (31.7)	<0.001
Framingham risk score				
Low (<10%)	682 (54.6)	287 (60.8)	395 (50.8)	0.002
Intermediate (10% to 20%)	419 (33.4)	145 (30.6)	274 (35.1)	
High (>20%)	149 (11.9)	40 (8.5)	109 (14.0)	
Baseline lipid profile				
Total cholesterol, mg/dl	188 (162 to 215)	186 (165 to 210)	190 (161 to 222)	0.040
Low density lipoprotein, mg/dl	115 (91 to 138)	114 (95 to 132)	116 (88 to 142)	0.321
High density lipoprotein, mg/dl	49 (41 to 58)	49 (41 to 60)	49 (41 to 58)	0.532
Triglycerides, mg/dl	124 (89 to 179)	114 (83 to 176)	130 (92 to 183)	0.008
Change in lipid profile between index and follow-up coronary CTA				
Total cholesterol, mg/dl	-12 (-45 to 12)	1 (-16 to 19)	-27 (-60 to 2)	<0.001
Low-density lipoprotein, mg/dl	-8 (-40 to 7)	0 (-15.4 to 13)	-21 (-55.8 to 1.4)	<0.001
High-density lipoprotein, mg/dl	0 (-6 to 4)	0 (-6 to 4)	0 (-5 to 4)	0.646
Triglycerides, mg/dl	-4 (-44 to 17)	0 (-35 to 22)	-9 (-50 to 13)	0.001

Values are mean ± SD, n (%), or median (interquartile range).
CAD = coronary artery disease; CTA = computed tomography angiography.

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TABLE 2 Coronary Computed Tomography Angiography Findings at Baseline and Follow-Up Stratified According to Statin Therapy Status

	Total (N = 3,575)		p Value Between Baseline vs. Follow-Up	Lesions in Statin-Naive Patients (n = 1,079)		p Value Between Baseline vs. Follow-Up	Lesions in Statin-Taking Patients (n = 2,496)		p Value Between Baseline vs. Follow-Up	p Value Between Groups	
	Baseline	Follow-Up		Baseline	Follow-Up		Baseline	Follow-Up		Baseline	Follow-Up
	Lesion length, mm	22.0 ± 14.5	22.2 ± 14.2	<0.001	19.9 ± 11.7	20.7 ± 12.0	<0.001	22.8 ± 15.4	22.9 ± 15.0	<0.001	<0.001
Stenosis severity											
Diameter stenosis ≥50%	52 (1.6)	99 (2.8)	<0.001	12 (1.1)	23 (2.1)	0.028	40 (1.6)	76 (3.0)	<0.001	0.261	0.127
Stenosis severity, %	13.6 ± 13.6	19.5 ± 13.0	<0.001	11.6 ± 12.7	18.2 ± 12.4	<0.001	14.4 ± 13.8	20.1 ± 13.2	<0.001	<0.001	<0.001
Annualized change in %DS, % per yr		1.6 ± 3.8			1.9 ± 3.8			1.5 ± 3.8		0.009	
High-risk plaque characteristics*											
High-risk plaque	450 (12.6)	598 (16.7)	<0.001	108 (10.0)	170 (15.8)	<0.001	342 (13.7)	428 (17.2)	<0.001	0.002	0.306
Positive arterial remodeling	1,912 (53.5)	2,700 (75.5)	<0.001	514 (47.6)	799 (74.1)	<0.001	1,398 (56.0)	1,901 (76.2)	<0.001	<0.001	0.178
Low-attenuation plaque	303 (8.5)	344 (9.6)	0.008	91 (8.4)	111 (10.3)	0.027	212 (8.5)	233 (9.3)	0.096	0.953	0.375
Spotty calcification	327 (9.2)	445 (12.5)	<0.001	73 (6.8)	113 (10.5)	<0.001	254 (10.2)	332 (13.3)	<0.0001	0.001	0.019
PAV at baseline, %											
Total PAV		13.3 ± 12.6			10.9 ± 11.2			14.4 ± 13.1		<0.001	
Calcified PAV		4.6 ± 7.0			3.2 ± 5.6			5.2 ± 7.4		<0.001	
Noncalcified PAV†		8.7 ± 9.9			7.6 ± 9.4			9.1 ± 10.0		<0.001	
Fibrous PAV		6.1 ± 6.2			5.2 ± 5.6			6.5 ± 6.4		<0.001	
Fibro-fatty PAV		2.3 ± 4.7			2.2 ± 4.5			2.4 ± 4.8		0.303	
Low-attenuation PAV		0.3 ± 1.1			0.3 ± 1.0			0.3 ± 1.2		0.458	
Annualized change in PAV, % per yr											
Total PAV		1.85 ± 2.39			2.04 ± 2.37			1.76 ± 2.40		0.002	
Calcified PAV		1.18 ± 1.47			0.98 ± 1.27			1.27 ± 1.54		<0.001	
Noncalcified PAV†		0.66 ± 2.42			1.06 ± 2.42			0.49 ± 2.39		<0.001	
Fibrous PAV		0.64 ± 1.81			0.89 ± 1.78			0.53 ± 1.81		<0.001	
Fibro-fatty PAV		0.03 ± 1.22			0.16 ± 1.28			-0.03 ± 1.18		<0.001	
Low-attenuation PAV		0.00 ± 0.34			0.01 ± 0.34			0.00 ± 0.34		0.202	

Values are mean ± SD or n (%), unless otherwise specified. *High-risk plaque is defined as a lesion with ≥2 features indicative of positive arterial remodeling, low-attenuation plaque, or spotty calcification.

†Noncalcified PAV is the summation of fibrous, fibro-fatty, and low-attenuation PAV.

%DS = percentage of diameter stenosis; PAV = percent atheroma volume.

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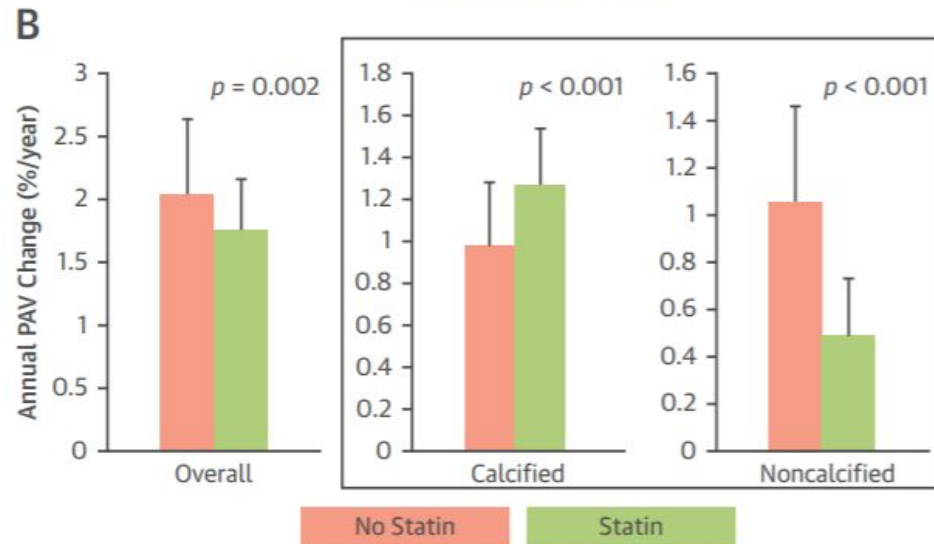
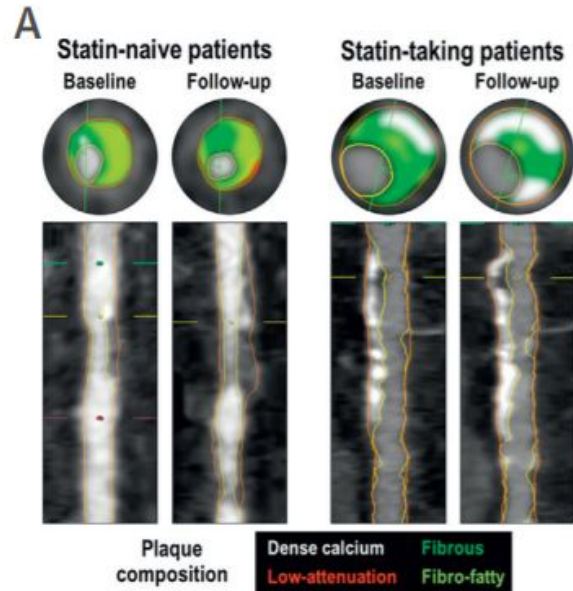


TABLE 3 Effects of Statins on Atherosclerosis

	Hazard Ratio of Statin	95% Confidence Interval	p Value
Newly developed diameter stenosis $\geq 50\%$	0.660	0.345-1.335	0.225
Annualized progression of atherosclerosis (% per yr) to above median			
Total PAV	0.796	0.687-0.925	0.003
Calcified PAV	0.940	0.822-1.076	0.365
Noncalcified PAV*	0.703	0.605-0.82	<0.001
Fibrous PAV	0.701	0.603-0.817	<0.001
Fibro-fatty PAV	0.745	0.633-0.879	<0.001
Low-attenuation PAV	0.644	0.522-0.798	<0.001
Newly developed adverse atherosclerotic features			
High-risk plaque†	0.670	0.473-0.96	0.026
Positive arterial remodeling	0.764	0.596-0.983	0.034
Low-attenuation plaque	0.718	0.413-1.291	0.252
Spotty calcification	0.849	0.561-1.314	0.451

*Noncalcified PAV is the summation of fibrous, fibro-fatty, and low-attenuation PAV. †High-risk plaque is defined as a lesion with ≥ 2 features indicative of positive arterial remodeling, low-attenuation plaque, or spotty calcification.

PAV = percent atheroma volume.

Lee S. E. et al. Effects of statins on coronary atherosclerotic plaques: the PARADIGM study // JACC: Cardiovascular Imaging. – 2018. – T. 11. – №. 10. – C. 1475-1484.

Основные выводы

- Субклинический атеросклероз можно легко диагностировать с помощью неинвазивных методов
- Обязательным, но модифицируемым фактором разрыва бляшки является ее быстрый рост
- Интенсивная терапия статинами может остановить рост бляшки и снизить риск ее разрыва

Спасибо за внимание!



