冠脉CTA
与
syntax评分

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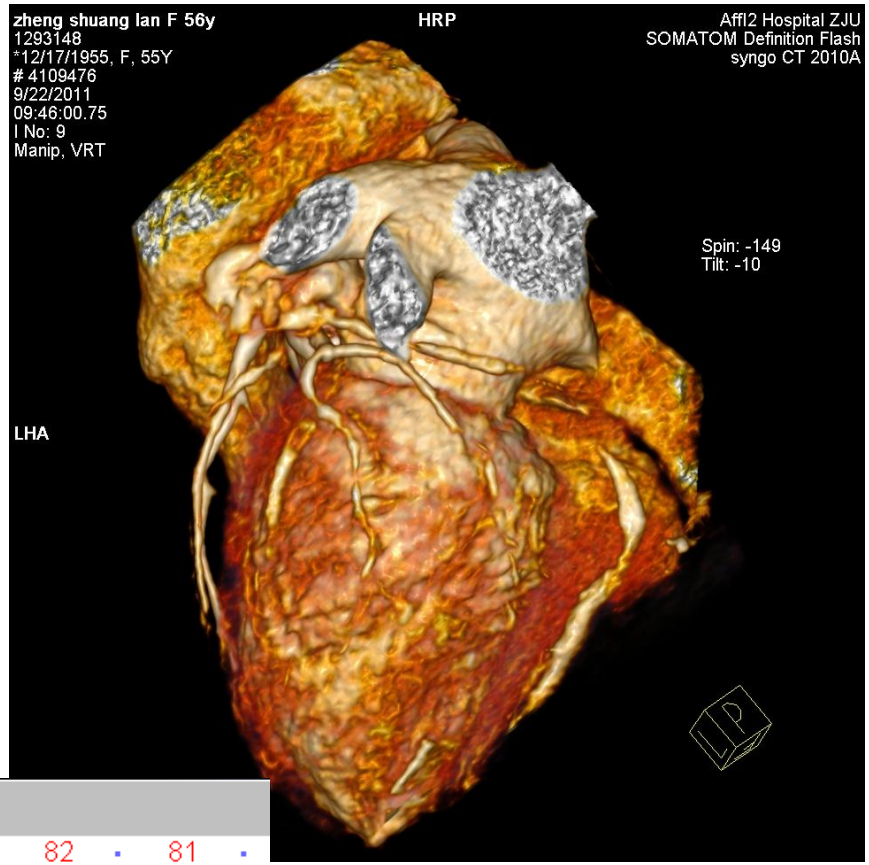
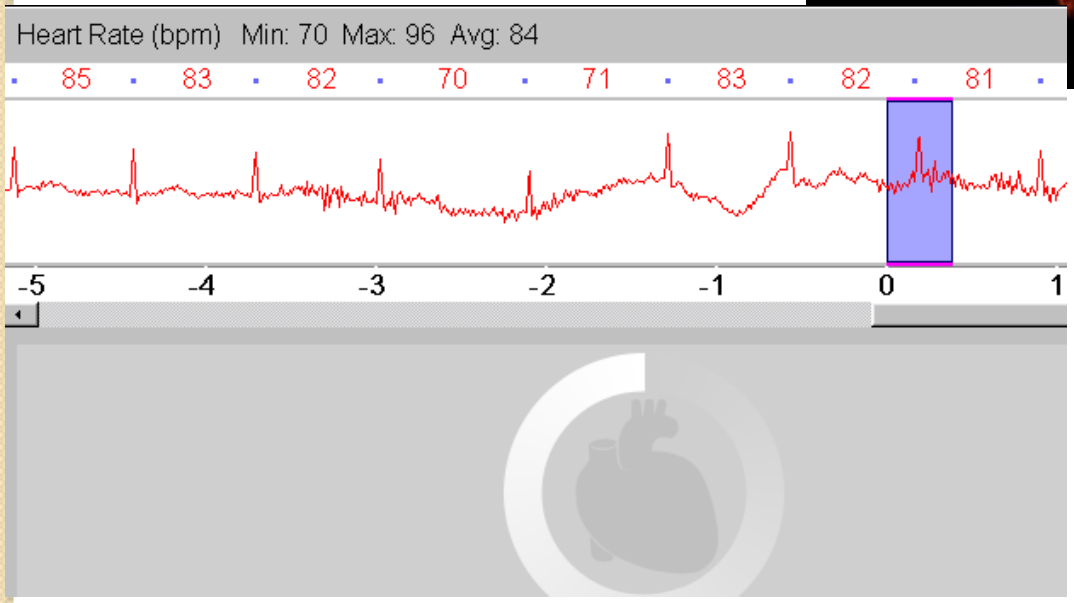
- 1、扫描方式与诊断
- 2、冠脉分段与Syntax评分

扫描与诊断

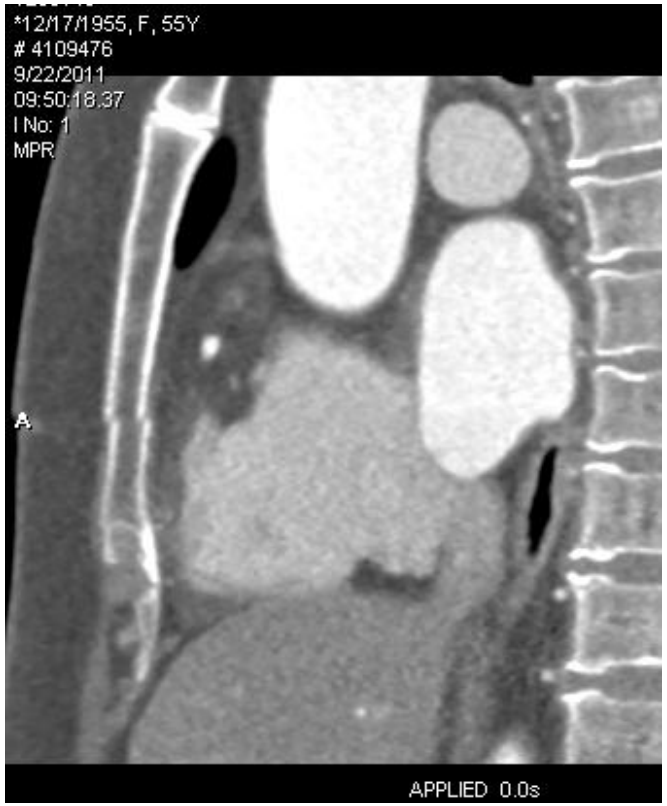
- **Flash mode**
- 1、high-pitch scan
- 2、HR< 65 beats/min
- 3、scan time about 0.3s
- 4、radiation dose about
- **5、artifacts：**

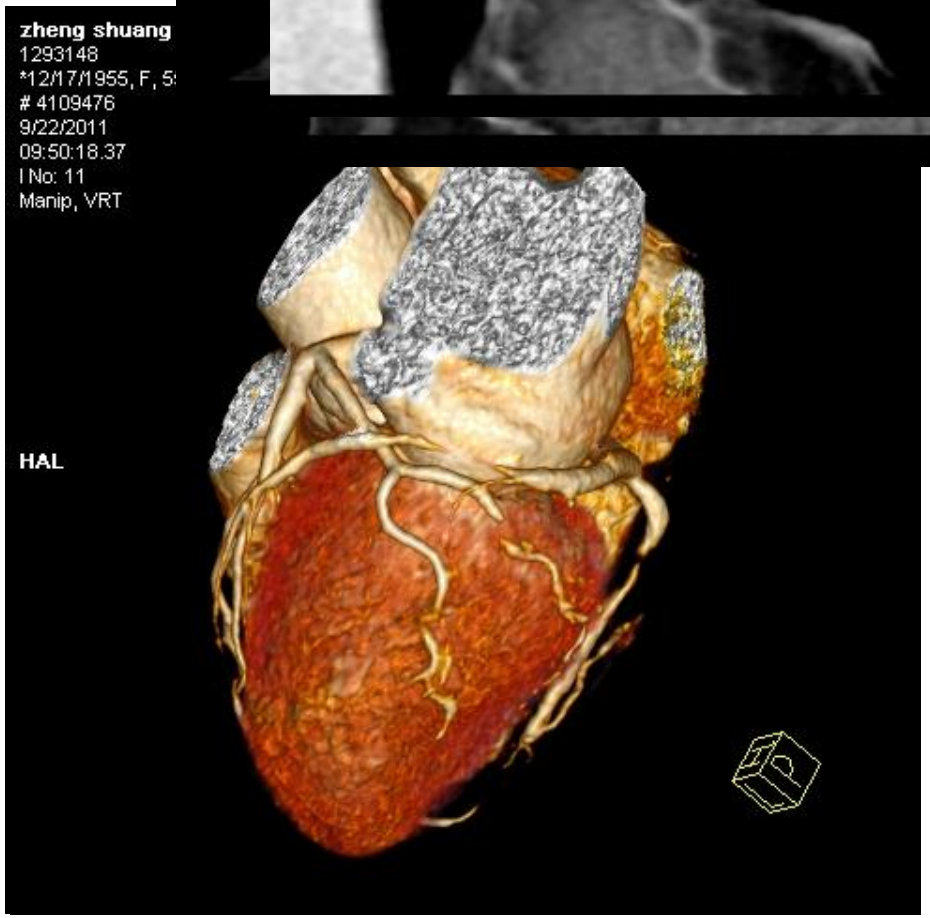




扫描与诊断

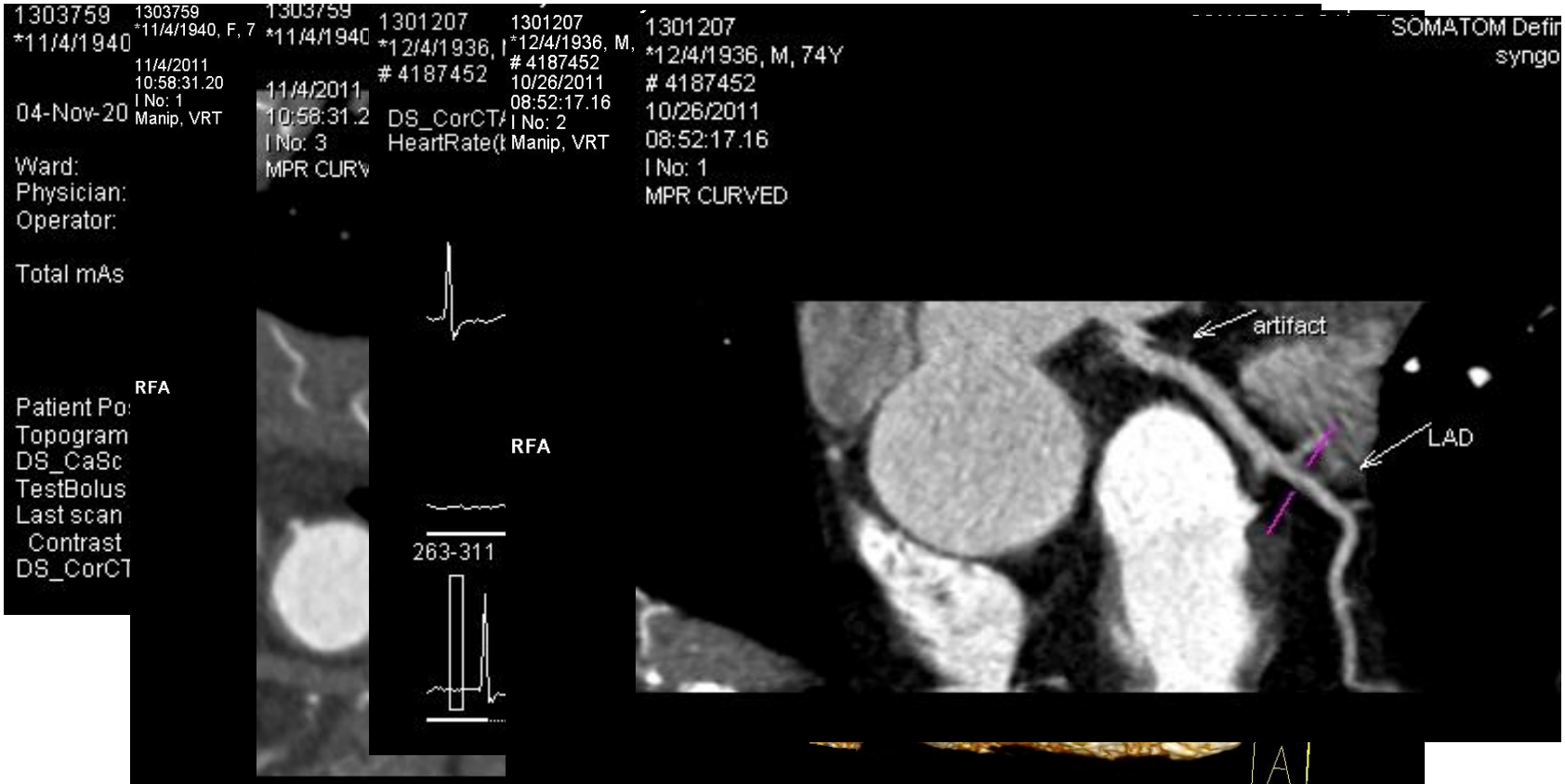
- **Sequence mode**
  - 1、prospectively ECG trigger
  - 2、adventitious premature b
  - 3、scan time about 8-10s
  - 4、radiation dose about 8m
  - **5、artifacts：**





扫描与诊断

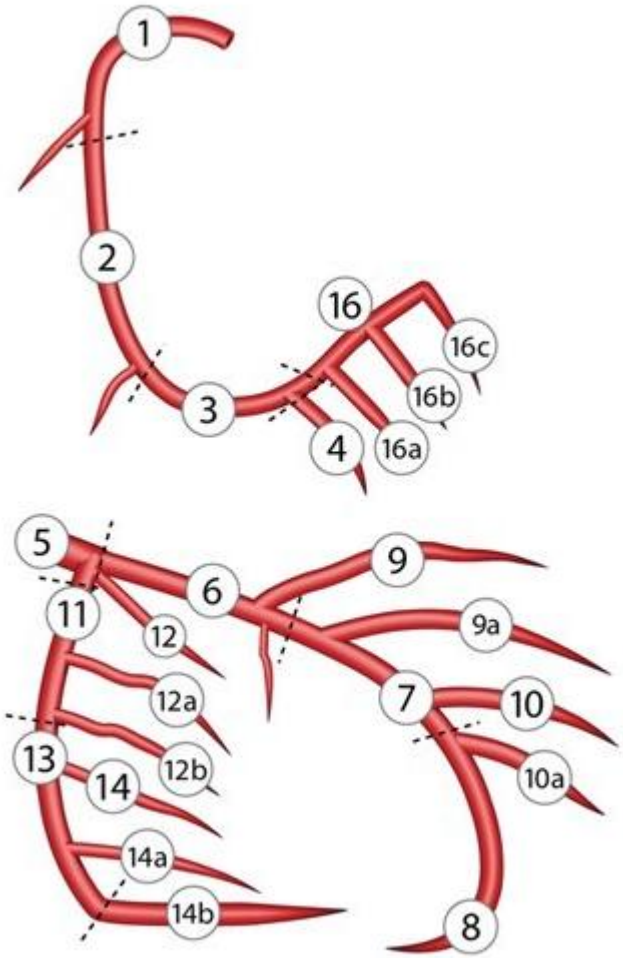
- **Spiral mode**
  - **1、 retrospectively ECG triggered scan**
  - **2、 scan time about 6-8s**
  - **4、 radiation dose > 10mSv**
  - **5、 artifacts :**



冠脉分段与Syntax评分

冠脉分段与Syntax评分

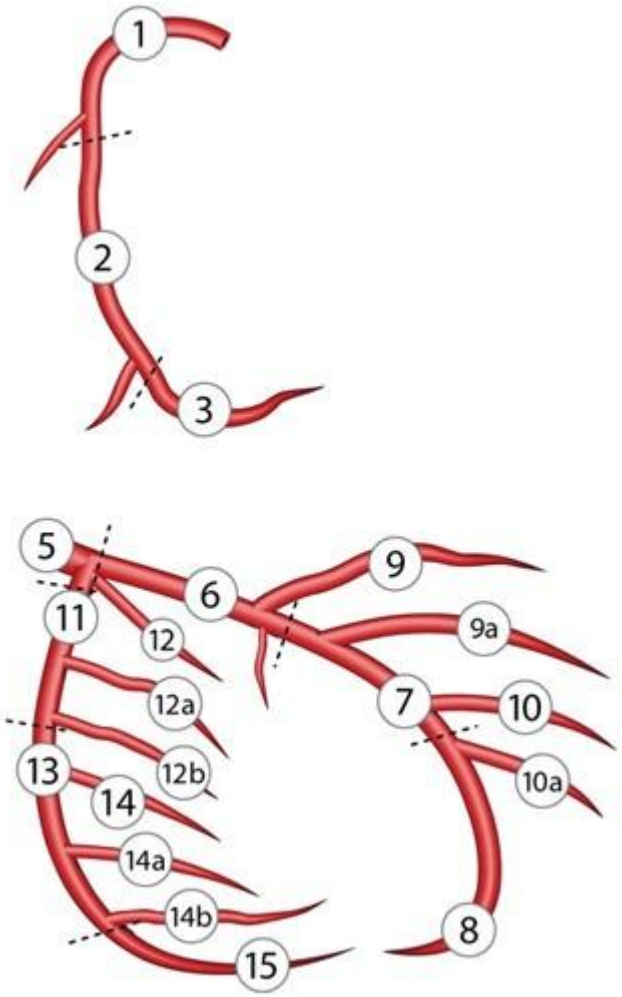
右冠状动脉优势



		Lesion:	1
	Segments:		
RCA	RCA proximal	1	☐
	RCA mid	2	☐
	RCA distal	3	☐
	Posterior descending	4	☐
	Posterolateral from RCA	16	☐
	Posterolateral from RCA	16a	☐
	Posterolateral from RCA	16b	☐
	Posterolateral from RCA	16c	☐
LM	Left main	5	☐
LAD	LAD proximal	6	☐
	LAD mid	7	☐
	LAD apical	8	☐
	First diagonal	9	☐
	Add. first diagonal	9a	☐
	Second diagonal	10	☐
	Add. second diagonal	10a	☐
LCX	Proximal circumflex	11	☐
	Intermediate/anterolateral	12	☐
	Obtuse marginal	12a	☐
	Obtuse marginal	12b	☐
	Distal circumflex	13	☐
	Left posterolateral	14	☐
	Left posterolateral	14a	☐
	Left posterolateral	14b	☐

冠脉分段与Syntax评分

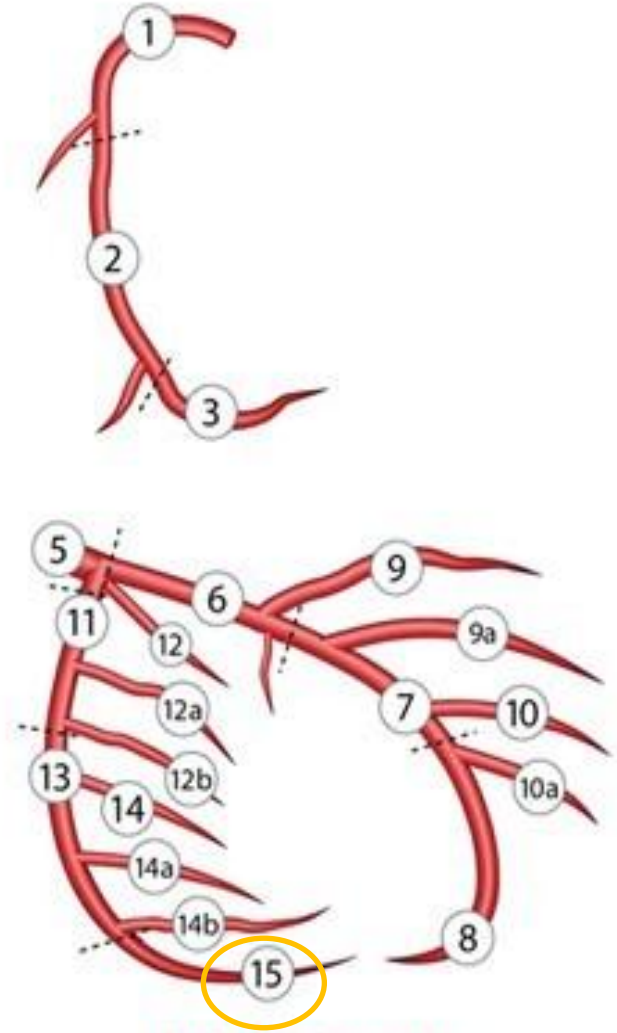
左冠状动脉优势



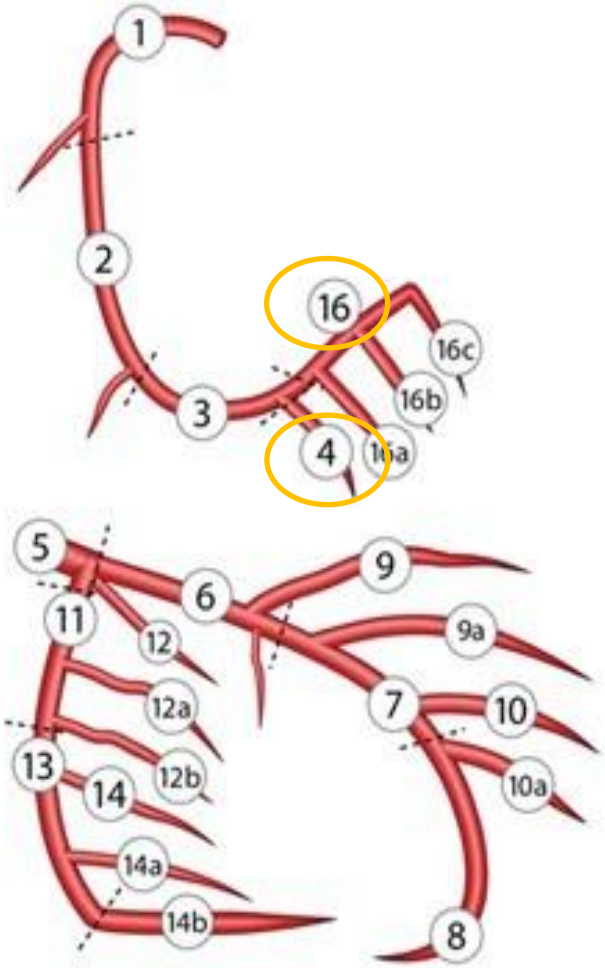
		Lesion:	1
	Segments:		
RCA	RCA proximal	1	☐
	RCA mid	2	☐
	RCA distal	3	☐
LM	Left main	5	☐
LAD	LAD proximal	6	☐
	LAD mid	7	☐
	LAD apical	8	☐
	First diagonal	9	☐
	Add. first diagonal	9a	☐
	Second diagonal	10	☐
	Add. second diagonal	10a	☐
LCX	Proximal circumflex	11	☐
	Intermediate/anterolateral	12	☐
	Obtuse marginal	12a	☐
	Obtuse marginal	12b	☐
	Distal circumflex	13	☐
	Left posterolateral	14	☐
	Left posterolateral	14a	☐
	Left posterolateral	14b	☐
	Posterior descending	15	☐

冠脉分段与Syntax评分

Select dominance coronary system



Left dominance



Right dominance

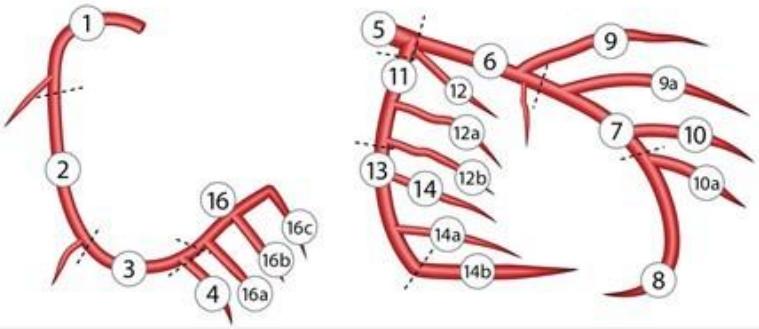
冠脉分段与Syntax评分

SYNTAX SCORE

CARDIALYSIS

Score: 9 Dominance: right Current lesion: 1/1

		Lesions:	1
	Segments:		
RCA	RCA proximal	1	
	RCA mid	2	
	RCA distal	3	
	Posterior descending	4	
	Posterolateral from RCA	16	
	Posterolateral from RCA	16a	
	Posterolateral from RCA	16b	
	Posterolateral from RCA	16c	
LM	Left main	5	
LAD	LAD proximal	6	v
	LAD mid	7	
	LAD apical	8	
	First diagonal	9	
	Add. first diagonal	9a	
	Second diagonal	10	
	Add. second diagonal	10a	
LCX	Proximal circumflex	11	
	Intermediate/anterolateral	12	
	Obtuse marginal	12a	
	Obtuse marginal	12b	
	Distal circumflex	13	
	Left posterolateral	14	
	Left posterolateral	14a	
	Left posterolateral	14b	



Please fill in the following variables :

4. Total occlusion (T.O.)

a. (•) No
b. ( ) Yes:

5. Trifurcation

a. (•) No
b. ( ) Yes

6. Bifurcation

a. ( ) No
b. (•) Yes

( ) Medina 1,0,0
( ) Medina 0,1,0
(•) Medina 1,1,0
( ) Medina 1,1,1
( ) Medina 0,0,1

冠脉分段与Syntax评分

 Medina 1,0,0

 Medina 0,1,0

 Medina 1,1,0

 Medina 1,1,1

 Medina 0,0,1

 Medina 1,0,1

 Medina 0,1,1

Bifurcation angulation (between distal main vessel and side branch) < 70°

a. No
b. Yes

7. Aorto Ostial lesion

a. No
b. Yes

7. Aorto Ostial lesion

a. No
b. Yes

8. Severe Tortuosity

a. No
b. Yes

Information

Definition: defined as one or more bends of 90° or more, or three or more bends of 45° to 90° proximal of the diseased segment.

9. Length >20 mm

a. No
b. Yes

10. Heavy calcification

a. No
b. Yes

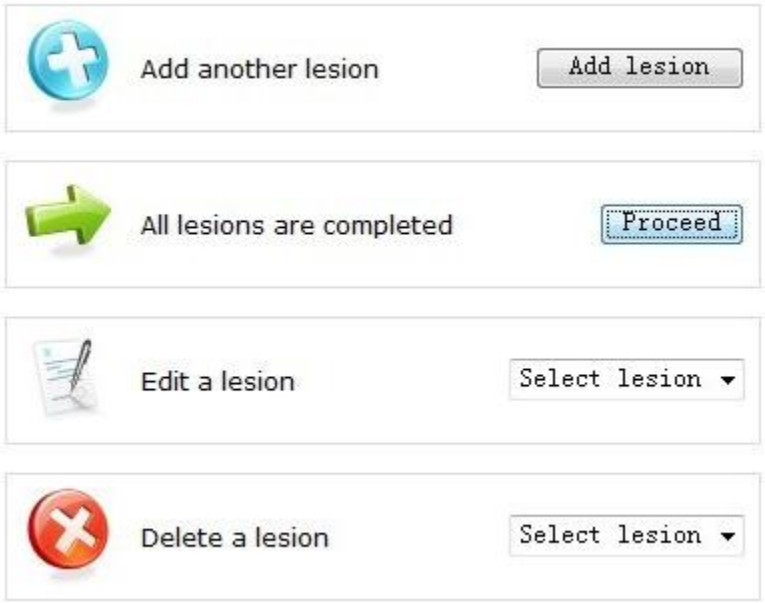
11. Thrombus

a. No
b. Yes

Comment

continue

冠脉分段与Syntax评分



12. Diffusely diseased and narrowed segment (Yes/No)?

- (•) No
- ( ) Yes

Calculate Score

Summary

Lesion 1	
(segment 6): 3.5x2=	7
Bifurcation Type: Medina 1,1,0:	1
Angulation <70	1
Aorto Ostial lesion	1
Sub total lesion 1	*10*
TOTAL:	*10*

冠脉分段与Syntax评分

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FASTTRACK CLINICAL

Comparison of coronary bypass surgery with drug-eluting stenting for the treatment of left main and/or three-vessel disease: 3-year follow-up of the SYNTAX trial

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Comparison of coronary bypass surgery with drug-eluting stenting for the treatment of left main and/or three-vessel disease: 3-year follow-up of the SYNTAX trial

Aims Long-term randomized comparisons of percutaneous coronary intervention (PCI) to coronary artery bypass grafting (CABG) in left main coronary (LM) disease and/or three-vessel disease (3VD) patients have been limited. This analysis compares 3-year outcomes in LM and/or 3VD patients treated with CABG or PCI with TAXUS Express stents.

Methods and results SYNTAX is an 85-centre randomized clinical trial ($n = 1800$). Prospectively screened, consecutive LM and/or 3VD patients were randomized if amenable to equivalent revascularization using either technique; if not, they were entered into a registry. Patients in the randomized cohort will continue to be followed for 5 years. At 3 years, major adverse cardiac and cerebrovascular events [MACCE: death, stroke, myocardial infarction (MI), and repeat revascularization; CABG 20.2% vs. PCI 28.0%, $P < 0.001$], repeat revascularization (10.7 vs. 19.7%, $P < 0.001$), and MI (3.6 vs. 7.1%, $P = 0.002$) were elevated in the PCI arm. Rates of the composite safety endpoint (death/stroke/MI 12.0 vs. 14.1%, $P = 0.21$) and stroke alone (3.4 vs. 2.0%, $P = 0.07$) were not significantly different between treatment groups. Major adverse cardiac and cerebrovascular event rates were not significantly different between arms in the LM subgroup (22.3 vs. 26.8%, $P = 0.20$) but were higher with PCI in the 3VD subgroup (18.8 vs. 28.8%, $P < 0.001$).

Conclusions At 3 years, MACCE was significantly higher in PCI- compared with CABG-treated patients. In patients with less complex disease (low SYNTAX scores for 3VD or low/intermediate terciles for LM patients), PCI is an acceptable revascularization, although longer follow-up is needed to evaluate these two revascularization strategies.

Keywords SYNTAX • Left main • Multivessel disease • PCI • CABG • Stent thrombosis

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Methods

Study design, subject selection, and follow-up

The SYNergy between PCI with TAXUS and Cardiac Surgery (SYNTAX) trial is a multinational, randomized (1:1) study comparing clinical outcomes after drug-eluting PCI using the TAXUS Express stent (Boston Scientific, Natick, MA, USA) or CABG in patients with 3VD and/or LM disease. Patients in whom equivalent and comparable revascularization could be achieved by either CABG or PCI (as determined by the cardiothoracic surgeon and interventional cardiologist of the 'Heart Team') were randomized ($n = 1800$; CABG $n = 897$ and PCI $n = 903$). In the LM group, patients could have isolated LM disease or LM plus 1, 2, or 3VD. Patients considered unsuitable for one of the treatment options were enrolled in parallel, nested registries (the PCI registry for CABG-ineligible patients, $n = 198$; CABG registry for PCI-ineligible patients, $n = 1077$). Three-year post-allocation follow-up was assessed by clinic visit; further follow-up will be conducted at 4 (telephone call or clinic visit) and 5 years (clinic visit) post-treatment allocation.

The study protocol was reviewed and approved by an Institutional Review Board/Ethics Committee at each participating site. Before enrolment in the study, each patient provided written informed consent. SYNTAX is registered on the National Institute of Health website (www.clinicaltrials.gov) as NCT00114972. The study design, including details on sample size determination, randomization scheme, and primary endpoint results have previously been described in detail.[6,13]

1、Compare clinical outcomes after PCI and CABG in patients with 3VD and/or LM disease.

2、Multinational, randomized study.

3、n=1800, CABG n=897, PCI n=903.

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Definitions

The primary clinical endpoint of SYNTAX was the composite of MACCE [all-cause death, cerebrovascular accident (CVA/stroke), MI, and repeat revascularization] through 12-month post-allocation. Patients were treated with the intention of complete revascularization of all vessels/lesions (reference diameter >1.5 mm, stenosis ≥50%) identified at the Heart Team conference. Completeness of revascularization was assessed post-procedure by the investigator. All deaths were considered cardiac unless an unequivocal, non-cardiac cause could be established. Cerebrovascular events, or stroke, were defined as focal neurological deficits of central origin lasting >72 h resulting in permanent brain damage or body impairment. The definition of MI was based on previous studies.[14–16] Briefly, MI was defined in relation to intervention status as follows: (i) after allocation but before treatment: Q-wave [new pathological Q-waves in ≥2 leads lasting ≥0.04 s with creatine kinase-MB (CK-MB) levels elevated above normal] and non-Q-wave MI [elevation of CK levels >2× the upper limit of normal (ULN) with positive CK-MB or elevation of CK levels to >2× ULN without new Q-waves if no baseline CK-MB was available]; (ii) <7 days after intervention: new Q-waves and either peak CK-MB/total CK >10% or plasma level of CK-MB 5× ULN; and (iii) ≥7 days after intervention: new Q-waves or peak CK-MB/total CK >10% or plasma level of CK-MB 5× ULN or plasma level of CK 5× ULN. The CK/CK-MB enzyme levels were obtained and measured by a core laboratory for all randomized patients. Per protocol (symptomatic) graft occlusion (GO) and ST were defined as an acute coronary syndrome with confirmed occlusion within or adjacent to a previously treated graft (GO) or lesion (ST) and/or Q-wave MI in the treated vessel territory within 30 days of the index procedure. Additionally, ST was adjudicated according to the Academic Research Consortium (ARC) definitions as definite or probable and by tin the event: acute (≤1 day post-procedure), subacute (2 to ≤30 days), late (>30 to ≤365 days), and very late (>365 days).[17] All MACCE, GO, and ST events were adjudicated by an independent, Clinical Events Committee which included a neurologist.

1、MACCE（major adverse cardiac and cerebrovascular events）

2、Revascularization

3、Death

4、Cerebrovascular

5、MI

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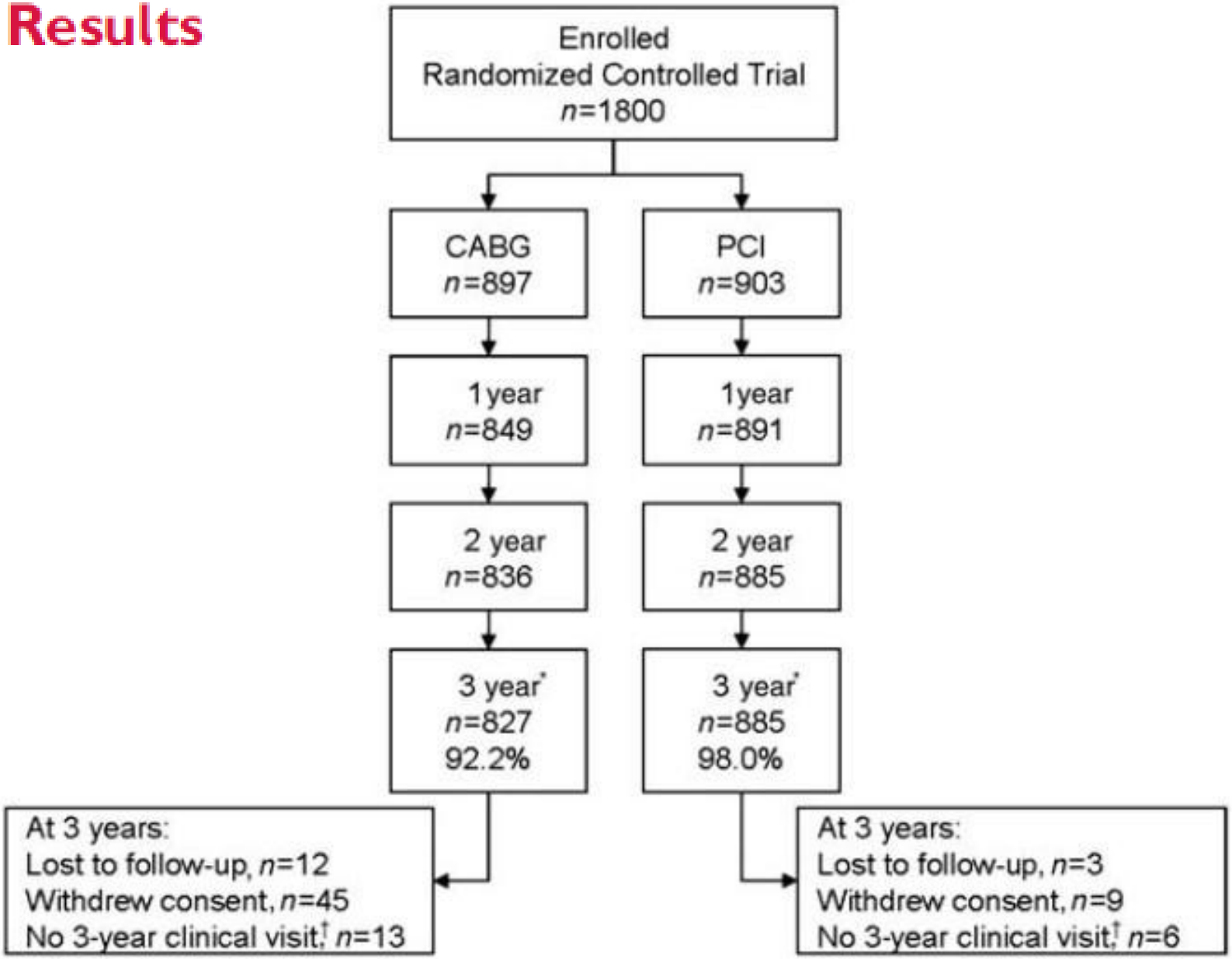
SYNTAX score

Angiograms were scored according to the SYNTAX score algorithm (www.syntaxscore.com)[12] by the Angiographic Core Laboratory (Cardialysis BV, Rotterdam, The Netherlands).

Statistical methods

Analyses were conducted using SAS System Software, Version 8.0 or higher (SAS Institute, Cary, NC, USA). Analyses of the randomized cohort were based on the intent-to-treat principle and in the registries were performed in an as-treated manner. Time-to-event rates are presented for overall 3-year data. Discrete variables are presented as counts and percentages. Differences in the time-to-event curves between the treatment groups were evaluated by a two-sided log-rank test. All tests of interaction were from a χ^2 test from a logistic regression model including the factors of interest and the interaction term. A χ^2 or Fisher's exact test was used, as appropriate, for discrete variables.

Results



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Results

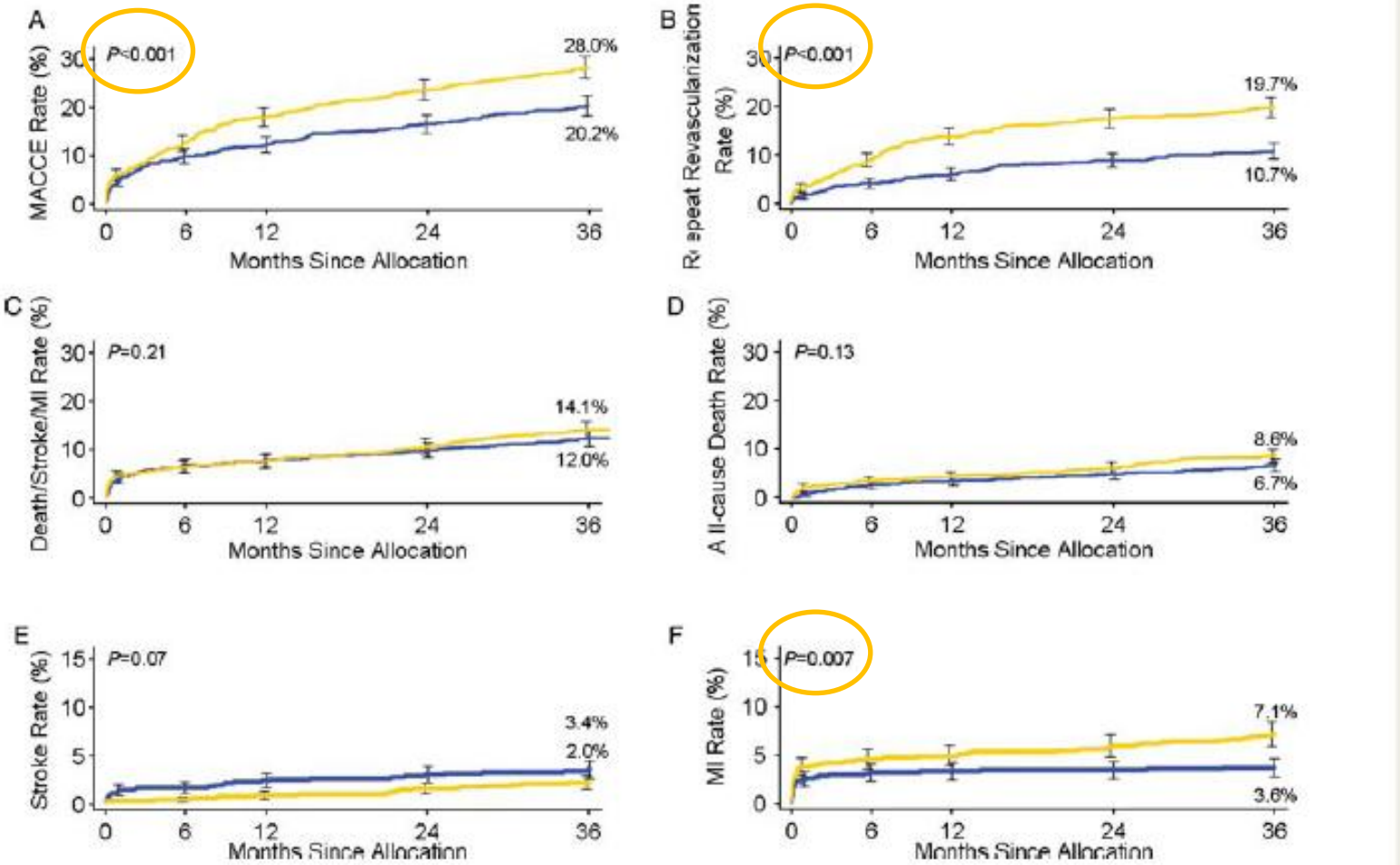

Figure 2 Rates of clinical outcomes among randomized treatment groups. Time-to-event curves in patients treated with coronary artery bypass grafting (blue line) or percutaneous coronary intervention (yellow line) for the composite of major adverse cardiac and cerebrovascular events (*A*), repeat revascularization (*B*), death/stroke/myocardial infarction (*C*), all-cause death (*D*), stroke (*E*), and myocardial infarction (*F*) to 3 years. *P*-values from log-rank test.

冠脉分段与Syntax评分

Results

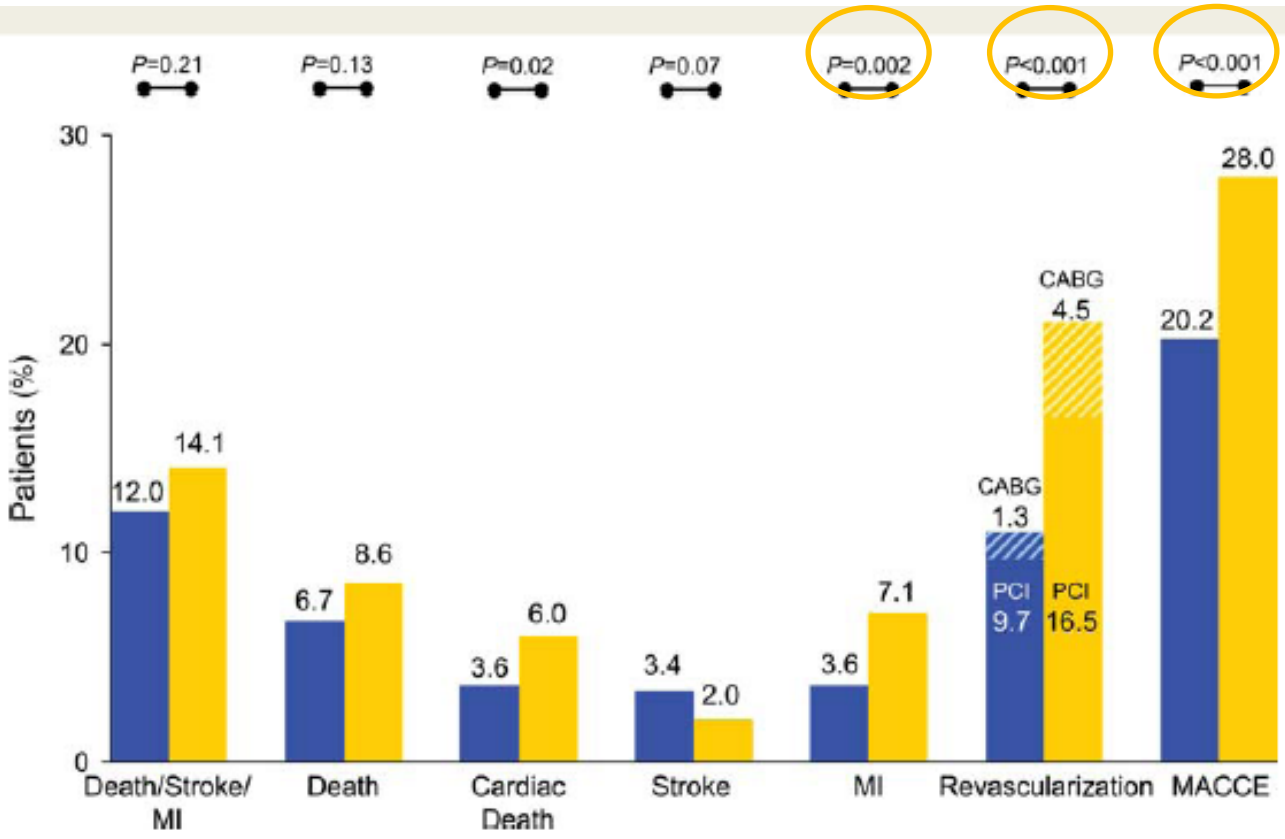

Figure 3 Rates of clinical outcomes among randomized treatment groups. Three-year clinical outcomes in coronary artery bypass grafting (blue bars) or percutaneous coronary intervention (yellow bars). Repeat revascularization is broken down into repeat percutaneous coronary intervention (yellow or blue bars) and repeat coronary artery bypass grafting (striped yellow or blue bars). The Kaplan–Meier event rates, *P*-value from log-rank test.

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Table I Cardiac-related medications at 3-year follow-up

Medication type	CABG[a]	PCI[a]	*P*-value[b]
Any cardiac-related medication (%)	99.3 (745/750)	99.6 (795/798)	0.49
Dual antiplatelet therapy (aspirin and antiplatelet) (%)	8.5 (64/750)	32.8 (262/798)	<0.001
Aspirin alone	83.3 (625/750)	87.5 (698/798)	0.02
Antiplatelet alone, any	16.3 (122/750)	41.7 (333/798)	<0.001
Thienopyridine antiplatelet alone	12.4 (93/750)	36.6 (292/798)	<0.001
Other antiplatelet medications (%)	4.0 (30/750)	5.6 (45/798)	0.13
Coumadin derivatives (%)	6.8 (51/750)	3.6 (29/798)	0.005
Statin therapy (%)	85.5 (641/750)	86.6 (691/798)	0.52
β-Blockers (%)	77.2 (579/750)	77.2 (616/798)	0.99
ACE-inhibitors (%)	52.5 (394/750)	52.4 (418/798)	0.95
Calcium channel blockers (%)	22.7 (170/750)	25.7 (205/798)	0.17
Angiotensin II receptor antagonists (%)	19.2 (144/750)	21.1 (168/798)	0.36
Anti-arrhythmics (amiodarone) (%)	2.5 (19/750)	0.8 (6/798)	0.006
H2 receptor blockers (%)	12.3 (92/750)	13.4 (107/798)	0.50

[a]Values based on an intent-to-treat analysis.
[b]Binary rates *P*-value from χ^2 test.

Subgroup analyses

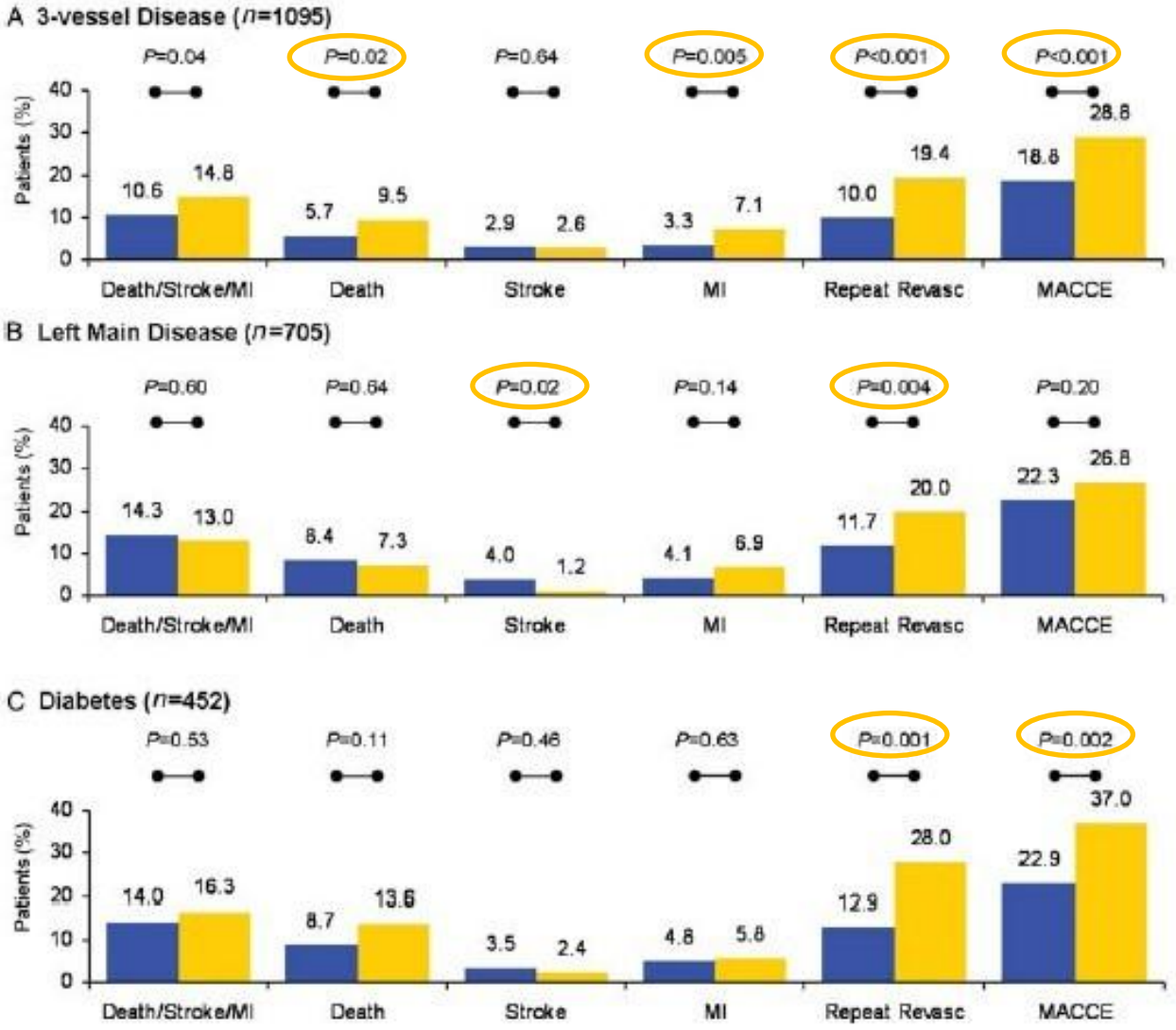

Figure 4 Three-year clinical outcomes according to the treatment group in patients with three-vessel disease, left main disease, or diabetes—death/stroke/myocardial infarction, all-cause death, stroke, myocardial infarction, repeat revascularization (repeat revasc), and major adverse cardiac and cerebrovascular event rates at 3 years in coronary artery bypass grafting (blue bars) or percutaneous coronary intervention-treated (yellow bars) patients with three-vessel (*A*) or left main (*B*) disease or diabetes (*C*). *P*-value from log-rank test.

冠脉分段与Syntax评分

Impact of lesion complexity on clinical outcomes

The impact of lesion complexity on clinical outcomes was assessed by examining 3-year patient outcomes relative to their SYNTAX score (Figure 5).

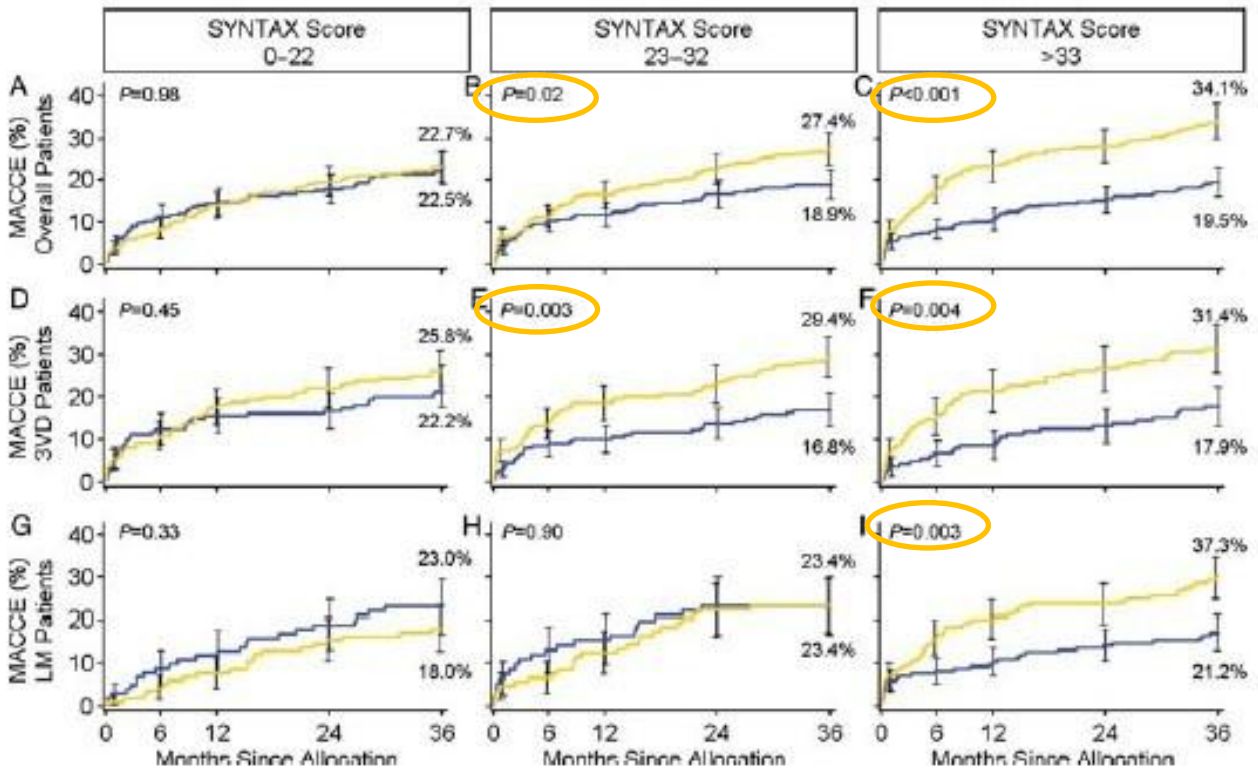

Figure 5 Major adverse cardiac and cerebrovascular event rates according to the subset, treatment group, and SYNTAX score category. Time-to-event curves in the coronary artery bypass grafting (blue line) or percutaneous coronary intervention (yellow line) overall cohorts to 3 years according to the low (0–22, *A*), intermediate (23–32, *B*), or high (≥33, *C*) SYNTAX scores. (*D–F*) Major adverse cardiac and cerebrovascular events in three-vessel disease patients with low, intermediate, or high SYNTAX scores, respectively. (*G–I*) Major adverse cardiac and cerebrovascular events in patients with left main disease with low, intermediate, or high SYNTAX scores. *P*-value from log-rank test.

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Discussion

Similar to 1-year outcomes in SYNTAX, 3-year MACCE rates were significantly higher in the PCI arm compared with CABG-treated patients. At 3 years, the rate of MI in the PCI arm was significantly increased compared with CABG patients and the difference in stroke rate between treatment arms was not significantly different unlike the outcomes after 1 year of follow-up. SYNTAX patients in the randomized cohort will continue to be followed for 5 years.

The trends in MACCE, death/stroke/MI, all-cause death, and repeat revascularization rates in the overall patient population seen in the first year of follow-up continued through the second and third year, although fewer total events occurred during each additional year of follow-up. Compared with outcomes after 1 year of follow-up, cardiac death was found to be significantly increased in the overall PCI-treated patient population, chiefly in those patients with higher SYNTAX scores at 3 years. The majority of cardiac deaths occurred within the first year of follow-up in both arms; ~40% occurred during the second and third year of follow-up. This difference was cumulative as the interval rates of cardiac death were not significant. Although stroke was significantly increased at 1 year of follow-up for CABG, no difference in stroke was seen during the interval of 1- and 3-year follow-up.

A difference in the MI rate between the two treatment groups was also noted after the report of the first year of follow-up. Two-thirds and one-half of all MIs were periprocedural (occurring within 7 days of the index procedure) in the surgical and PCI cohorts, respectively. The likely cause of the increased MIs in the PCI arm was due to restenosis/further revascularization in these patients with advanced diffuse disease or ST. When compared with CABG patients, MI rates were higher in the 3VD PCI group and not significantly different in the LM PCI cohort.

1、MACCE rates were significantly higher from lst year to 3rd year in PCI compared with CABG.

2、MI rate significantly increased in PCI compared with CABG at 3 years.

3、stroke rate between treatment arms was not significantly different, unlike after 1 year follow-up.

4、randomized cohort patients will continue to be followed for 5 years.

5、MACCE, death/stroke/MI, all-cause death, and repeat revascularization rates continued, although fewer total events occurred during each additional year.

6、Cardiac death increased in PCI, chiefly in higher SYNTAX scores patients at 3 years.

7、MI rates were noted different, 2/3 in CABG & ½ in PCI periprocedural in the surgical.

8、compared with CABG, MI rates were higher in the 3VD PCI group and not significantly different in the LM PCI cohort.

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Overall MACCE rates were not significantly different in the pre-specified LM subgroup at 3 years. More PCI patients required reintervention compared with CABG-treated patients between these groups. The current US and European revascularization guidelines assign CABG a IA indication in most patients with 1, 2, or 3VD with low, intermediate, or high SYNTAX scores.[4,20] However, due to positive outcomes from other recent studies of LM patients, these guidelines have upgraded the indication for PCI in the LM artery from a Class III to a Class IIb (ACC/AHA)[4,20] and a Class IIb C to IIa B (ESC-EACTS)[3] indication in patients with isolated LM (ostial or trunk) and with associated 1VD. Additionally, the ESC-EACTS guidelines have also included the treatment of patients with 3VD and low SYNTAX scores as a Class IIa B indication.[3]

Both the presence of multivessel disease and diabetes are known to increase the risks associated with cardiovascular disease. In both of these subgroups, similar to the outcomes after 1 year of follow-up, the increase in MACCE and revascularization rates was maintained in PCI-treated patients.[6,8,21] Results from the FREEDOM (Future Revascularization Evaluation in Patients with Diabetes Mellitus: Optimal Management of Multivessel Disease)[22] and EXCEL (Evaluation of Xience Prime vs. Coronary Artery Bypass Surgery for Effectiveness of Left Main Revascularization) trials may provide further insight into the optimal treatment for multivessel, diabetic, and LM patients. Particularly, the impact of newer generation stents or stent platforms and the continued improvements in stenting technique will be seen in these trials.

9、MACCE rates were not significantly different in LM subgroup.

10、more PCI patients required re-intervention.

11、The current US and European revascularization guidelines assign CABG a IA indication in most patients with 1,2, or 3VD with low, intermediate, or high SYNTAX scores.

12、PCI in the LM from a Class III to a Class IIb, 3VD and low SYNTAX scores.

13、multi-vessel disease and diabetes MACCE and revascularization rates increased maintained in PCI-treated patients in both of these subgroups(LM & 3VD)

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Stratification of the randomized patient population into terciles derived from the baseline anatomical SYNTAX score confirmed the trends in MACCE rates that were found after 1 year of follow-up. Specifically, an intermediate (23–32) or high SYNTAX score (>33) was correlated with an increase in 3-year MACCE rates after percutaneous revascularization compared with surgery. Repeat revascularization, MI, and mortality were significantly higher in 3VD patients with the highest SYNTAX score. Thus, CABG remains the standard for more complex anatomy, whereas PCI in this trial demonstrated similar outcomes to CABG in patients with less complex disease, measured by lower SYNTAX score for 3VD and lower and intermediate scores for LM disease. The SYNTAX score has been successfully applied to other patient groups retrospectively and has shown value in predicting or correlating high anatomical complexity with increased adverse cardiac events making it an effective risk assessment tool.[23–27]

In the SYNTAX trial at 1 year, a significant difference in secondary prevention medical therapy was observed; patients in the surgical cohort were less likely to receive aspirin, thienopyridines, or statins compared with PCI patients. At 3 years, antiplatelet treatment was significantly different between the two treatment arms; patients in the CABG arm were significantly undertreated with single or DAPT than patients in the PCI arm.

14、SYNTAX score confirmed the trends in MACCE rates that were found after 1 year of follow-up. Specifically, an intermediate (23–32) or high SYNTAX score (.33) was correlated with an increase in 3-year MACCE rates after PCI compared with CABG.

15、Repeat revascularization, MI, and mortality were significantly higher in 3VD patients with the highest SYNTAX score.

16、In the SYNTAX trial at 1 year, a significant difference in secondary prevention medical therapy was observed.

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Study limitations

The SYNTAX trial was designed to overcome many limitations of previous comparisons of PCI and CABG. In spite of this, there is inadequate statistical power to detect differences in low-frequency events (e.g. stroke, MI) between arms. Additionally, analyses of the LM and 3VD subgroups, although sufficiently powered, can only be considered hypothesis-generating as SYNTAX did not meet its primary endpoint. The analyses of LM or 3VD patients by SYNTAX score were not pre-specified and should be considered exploratory and hypothesis-generating only. A larger number of patients withdrew from the CABG arm post-allocation ($n = 45$) than the PCI arm ($n = 9$), suggesting greater concern on the part of some patients to submit to the more invasive procedure. Sensitivity analyses suggest that the outcomes could have been influenced by non-evaluable patients if they all died. This is unlikely as a total of 57/827 CABG and 77/885 PCI patients who were evaluable died within 3 years of follow-up. The effect of this imbalance was minimized by including all data available up to the point of withdrawal (or lost to follow-up) were included in the analysis set and outcomes were analysed in an intent-to-treat manner. Details related to medical therapy were collected only at 1 and 3 years. Data regarding medical therapy at other intervals is lacking. Finally, the intermediate short (3-year) follow-up time may not provide an accurate estimate of long-term differences in outcomes between the two revascularization methods.

1、inadequate statistical power to detect differences in low-frequency events (e.g. stroke, MI) between arms.

2、analyses of the LM and 3VD subgroups, although sufficiently powered, can only be considered hypothesis-generating as SYNTAX did not meet its primary endpoint.

3、suggesting greater concern on the part of some patients to submit to the more invasive procedure.

4、Sensitivity analyses suggest that the outcomes could have been influenced by non-evaluable patients if they all died.

5、Details related to medical therapy were collected only at 1 and 3 years.

6、the intermediate short (3-year) follow-up time may not provide an accurate estimate of long-term differences in outcomes between the two revascularization methods.

Conclusions

At 3 years, MACCE was increased in PCI patients compared with CABG; no difference was observed in the combined safety endpoint of death, MI, and stroke. Analysis of pre-specified subgroups suggests that for 3VD patients, MACCE, mortality, and the combined safety endpoint of death, MI, and stroke were increased with PCI, whereas for patients with LM disease, there were no significant differences in these outcomes with PCI. In relation to anatomical complexity, patients with less complex coronary anatomy (low SYNTAX scores in 3VD patients or low/intermediate SYNTAX scores in LM patients), PCI can be an acceptable alternative treatment option to CABG. Patients with more complex disease (3VD patients with intermediate/high SYNTAX scores and LM patients with high scores) have an increased risk of an MACCE event with PCI and CABG is the preferred treatment option.

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