

# Impact of intermediate coronary lesion number on long-term clinical outcomes

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**Background/Aims:** Atherosclerosis causes plaque accumulation in coronary lumen for decades and results various clinical symptoms and features in advanced stage. Long-term prognostic implications of early- or mid-stage coronary atherosclerosis on cardiovascular outcomes are unknown. We performed study to evaluate the long-term prognostic implications of non-significant coronary stenosis on cardiovascular outcomes and compare the predictive value of minimal and intermediate coronary stenosis

**Methods:** Patients who had only non-significant stenosis in coronary angiography(CAG), less or equal to 70% diameter stenosis, were eligible for study. Lesions were classified into minimal lesion (ML, less than 40% diameter stenosis including normal) or intermediate lesion (IL, diameter stenosis between 40% and 70%) according to the degree of percent diameter stenosis on angiographic findings. Primary outcomes were occurrence of major cardiac and cerebrovascular events (MACCE), composite of death, non-fatal myocardial infarction, stroke, and re-vascularization.

**Results:** Among 353 enrolled patients, 115 patients (32.6%) were classified as IL group (with at least one IL regardless of ML) and 238 patients as ML group (with no lesion or ML only). IL group was older ( $74.6 \pm 10.3$  vs.  $70.8 \pm 10.1$ ,  $p=0.001$ ), had more frequent male ( $57.4\%$  vs.  $46.2\%$ ,  $p=0.049$ ), had higher prevalence of diabetes ( $28.7\%$  vs.  $15.1\%$ ,  $p=0.003$ ), dyslipidemia ( $25.2\%$  vs.  $13.4\%$ ,  $p=0.006$ ), and smoking ( $43.9\%$  vs.  $24.4\%$ ,  $p<0.001$ ) compared with ML group. Total 54 MACCE were occurred during mean 116 months of follow-up duration, and incidence of MACCE in IL group was approximately double in compared with those of ML group ( $22.6\%$  vs.  $11.8\%$ ). Patients with MACCE had higher prevalence of IL than those without MACCE ( $48.1\%$  vs.  $29.8\%$ ,  $p=0.008$ ) and hazard had increased along with the number of IL (HR 1.45, 95% CI 1.11 – 1.89,  $p=0.007$ ).

**Conclusions:** In this study, patients with non-significant coronary obstruction were at low risk for adverse cardiovascular events for 12 years. Lesion stratification with angiography showed that both presence and increase of number of IL were associated with poor prognosis.

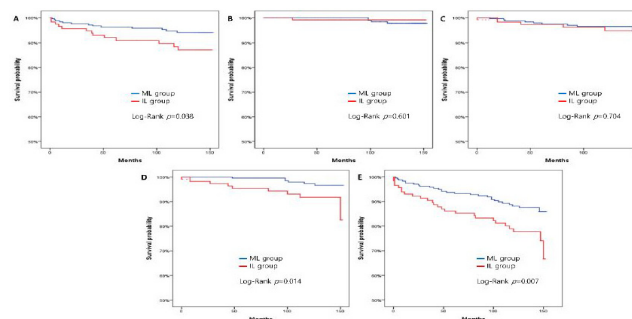


Figure 1. Kaplan-Meier survival analysis of individual and total MACCE in both groups: (A) Death; (B) Non-fatal myocardial infarction; (C) Stroke; (D) Revascularization; (E) Total MACCE.

ML, minimal lesion; IL, intermediate lesion; MACCE, major adverse cardiac and cardiovascular event

Table 1. Baseline clinical, laboratory, and lesion characteristics

Variables	ML group (n=238)	IL group (n=115)	p-value
Age, y	70.8 (10.1)	74.6 (10.3)	<0.001
Male, n (%)	110 (46.2)	66 (57.4)	0.049
Body mass index	23.3 (3.2)	24.8 (3.2)	0.377
Hypertension, n (%)	129 (54.2)	63 (54.8)	0.882
Diabetes mellitus, n (%)	36 (15.1)	33 (28.7)	0.003
Dyslipidemia, n (%)	32 (13.4)	29 (25.2)	0.006
Smoking, n (%)	58 (24.4)	50 (43.5)	<0.001
Stroke, n (%)	8 (3.4)	7 (6.1)	0.264
Chronic kidney disease stage 3-5, n (%)	29 (12.2)	19 (16.5)	0.365
Ejection fraction, %	67.5 (10.1)	68.3 (9.4)	0.440
Indications for coronary angiography, n (%)			
Stable angina	189 (79.4)	86 (74.8)	
Unstable angina	4 (1.7)	5 (4.3)	
NO2/3/4	3 (1.3)	3 (2.6)	
STEMI	4 (1.7)	1 (0.9)	
Vascular region	5 (2.1)	6 (5.2)	
Silent ischemia	19 (8.0)	17 (14.8)	
Heart failure	15 (6.3)	2 (1.7)	
Spontaneous arrest	1 (0.4)	1 (0.9)	
Oxygenated hemoglobin, %	6.1 (1.2)	6.3 (1.4)	0.403
Urea acid, mg/dL	5.1 (1.9)	5.2 (1.5)	0.899
Estimated glomerular filtration rate, mL/min/1.73m <sup>2</sup>	77.3 (16.3)	82.0 (17.7)	0.392
Total cholesterol, mg/dL	188.7 (38.2)	193.8 (49.4)	0.148
Triglyceride, mg/dL	168.6 (61.0)	188.1 (61.0)	0.153
HDL cholesterol, mg/dL	46.3 (10.4)	46.4 (12.3)	0.883
LDL cholesterol, mg/dL	120.3 (27.9)	143.0 (36.0)	0.183
High sensitivity C-reactive protein, mg/L	0.4 (1.1)	0.5 (1.1)	0.378
Downward vessel number, n	0.9 (0.8)	1.9 (1.7)	<0.001
Minimal percent diameter stenosis, %	17.6 (12.7)	49.1 (10.0)	<0.001
Presence of lesion in LAD, n (%)	9 (3.8)	9 (7.8)	0.105
Presence of lesion in LAD, n (%)	99 (41.6)	91 (79.1)	<0.001
Presence of lesion in RCA, n (%)	26 (10.9)	39 (33.9)	<0.001
Presence of lesion in RCA, n (%)	71 (29.8)	79 (68.7)	<0.001

ML, minimal lesion; IL, intermediate lesion; NO2/3/4, non Q-wave myocardial infarction; STEMI, ST-segment elevation myocardial infarction; HDL, high-density lipoprotein; LDL, low-density lipoprotein; LAD, left anterior descending artery; RCA, right coronary artery

Table 2. Number and proportion of lesion location in coronary vasculature

Group	Lesion	LAD, n (%)	LAD, n (%)	RCA, n (%)	RCA, n (%)	Total, n (%)
ML group (n=238)	Minimal	9 (3.8%)	100 (42.0%)	26 (11.4%)	75 (31.7%)	210
	Intermediate	0 (0.0%)	14 (5.9%)	10 (4.3%)	39 (16.6%)	63
IL group (n=115)	Minimal	5 (7.4%)	14 (12.2%)	31 (27.0%)	46 (28.7%)	145
	Intermediate	4 (3.5%)	82 (71.3%)	27 (23.5%)	109 (94.2%)	141
Total (n=353)		14 (3.7%)	124 (35.0%)	57 (16.1%)	160 (45.4%)	255

LAD, left anterior descending artery; RCA, right coronary artery; IL, intermediate lesion; ML, minimal lesion

Table 3. Cumulative incidence of MACCE at 12 years

Events, n (%)	ML group (n=238)	IL group (n=115)	p-value
Death	13 (5.5)	13 (11.3)	0.049
Cardiovascular death	1 (0.4)	2 (1.7)	0.249
Non-cardiovascular death	12 (5.0)	6 (5.2)	0.944
Intermediate	0 (0.0)	5 (4.3)	0.003
Non-fatal myocardial infarction	4 (1.7)	1 (0.9)	0.899
Stroke	9 (3.8)	5 (4.3)	0.777
Revascularization	6 (2.5)	9 (7.8)	0.026
TLC	4 (1.7)	8 (7.0)	0.025
ACS	2	4	0.999
De novo PCI	2 (0.8)	1 (0.9)	0.999
ACS	3	0	0.508
Total	28 (11.8)	34 (29.6)	0.008

MACCE, major adverse cardiac and cerebrovascular event; ML, minimal lesion; IL, intermediate lesion; TLC, total lesion revascularization; PCI, percutaneous coronary intervention

Table 4. Association of lesion characteristics and MACCE

Variables	No MACCE group (n=239)	MACCE group (n=24)	p-value
Minimal percent diameter stenosis, %	26.3 (18.5)	26.3 (20.9)	<0.001
Total lesion number, n	1.2 (0.9)	1.7 (1.2)	0.003
Minimal lesion number, n	0.8 (0.8)	0.8 (0.8)	0.675
Intermediate lesion number, n	0.4 (0.4)	0.9 (1.1)	0.001
Intermediate lesion number ≥ 2, n (%)	22 (7.4)	13 (24.1)	<0.001
Presence of any lesion, n (%)	221 (71.9)	46 (85.2)	0.076
Presence of minimal lesion, n (%)	177 (57.5)	32 (60.4)	0.993
Presence of intermediate lesion, n (%)	89 (29.8)	26 (48.1)	0.008
Intermediate lesion in LAD, n (%)	3 (1.0)	1 (1.9)	0.487
Intermediate lesion in LAD, n (%)	40 (13.1)	19 (35.2)	0.014
Intermediate lesion in RCA, n (%)	20 (6.7)	10 (18.5)	0.013
Intermediate lesion in RCA, n (%)	29 (9.7)	13 (27.1)	0.002
Multivessel disease, n (%)	98 (32.8)	29 (54.3)	0.003

MACCE, major adverse cardiac and cerebrovascular event; LAD, left anterior descending artery; RCA, right coronary artery