

관동맥 스텐트 시술 후 혈관조영상 재협착의 예측 인자에 대한 연구 : 혈관내 초음파를 이용한 스텐트 단면적과 길이에 따른 재협착율에 대한 연구

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Predictors of Angiographic Restenosis after Intracoronary Stenting according to Stent Lumen Cross Sectional Area and Stent Length in Native Coronary Artery Lesions : An Intravascular Ultrasound Study

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ABSTRACT

Background : The adequate intravascular ultrasound (IVUS) criteria for stent optimization have not been determined in long coronary stenting. We evaluated the predictors of angiographic restenosis and compared that according to stent lumen cross-sectional area (CSA) and stent length between short (stent length <20 mm) and long (≥ 20 mm) coronary stenting. **Methods :** IVUS-guided coronary stenting was successfully performed in 285 consecutive patients with 304 native coronary lesions. Six-month follow-up angiogram was performed in 236 patients (82.8%) with 246 lesions (80.9%). Results were evaluated using conventional (clinical, angiographic, and IVUS) methodology. **Results :** The overall angiographic restenosis rate was 22.8% (56/246)(short stent 17.6% vs long stent 32.2%, $p = 0.009$). Using multivariate logistic regression analysis, the independent predictors of angiographic restenosis were the IVUS stent lumen CSA (odd ratio = 1.51, 95% CI 1.18 -1.92, $p = 0.001$) and stent length (odd ratio = 0.95, 95% CI 0.91 -1.00, $p = 0.039$). The angiographic restenosis rate was 54.8% in stent lumen CSA <5.0 mm² (short stent 37.5% vs long stent 73.3%, $p = 0.049$), 27.4% between 5.0 and 7.0 mm² (short stent 24.1% vs long stent 31.7%, $p = 0.409$), 10.5% between 7.0 and 9.0 mm² (short stent 10.0% vs long stent 12.5%, $p = 0.772$), and 11.4% in stent lumen CSA ≥ 9.0 mm² (short stent 10.4% vs long stent 13.3%, $p = 0.767$)($p = 0.001$). **Conclusions :** Compared with short coronary stenting, long coronary stenting is effective treatment modality to cover long lesions with comparable long-term clinical outcomes in cases of stent lumen CSA ≥ 7.0 mm². Regardless of the stent length,

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the most important factor determining the angiographic restenosis was the IVUS stent lumen CSA in relatively large coronary artery lesions. **(Korean Circulation J 2000;30(1):23-30)**

KEY WORDS : Stent · Coronary artery disease · Intravascular ultrasound.

서론

6 236 (82.8%)
246 (80.9%)

1)2) 49
(<20 mm) 151
3-5) 가 159 (20 mm) 85
, 87
(3) 가 70%
2 (tar -
get lesion revascularization)
6)
스텐트 시술
가 7-9)
(stent optimization)
(intravascular ultrasound, IVUS) 1)2)16)17) (acti -
vated clotting time) 300 가
GFX
10-12) 79 , CrossFlex 32 , NIR 25
, tantalum Cordis 10 , Wiktor 5
, Palmaz - Schatz 4 Multilink
(/) 4 GFX
13-15) 27 (24 mm 14 , 30 mm 8 40
1) mm 5), 25 mm CrossFlex 12 , Cr -
(quantitative coronary angiography, own 12 (22 mm 1 30 mm 11
QCA), IVUS , 2)), Wallstent(40.4 mm) 10 , Giantur -
(<20 mm) (20 mm) co - Roubin 9 (20 mm 7 40 mm
(cross sectional area, CSA) 2) 25 mm Multilink 1
. GFX 9
가 가
방법
대상 환자
IVUS 285
304
1, 3, 6
6
oss - Flex 가 Tantalum Cordis Cr -
premount
, 12 14
, 2 18)19) GFX,
tantalum Cordis CrossFlex

optimization) 16 가 (angiographic stent optimization) 16 가 . IVUS . IVUS (optimum stent expansion) CSA가 가 CSA 80% , 250 mg 3 1 가 CSA

정량적 IVUS 분석 (plaque) , (external elastic membrane, EEM), (lumen) + (plaque + media) CSA IVUS .²⁰⁾²¹⁾ EEM CSA (adventitia) leading edge (reference segment) , (lesion site) CSA IVUS CSA가 가 10 mm

정량적 혈관조영 분석

0.2 mg (ANCOR V2.0, Siemens, Germany) (percent diameter stenosis), (minimal luminal diameter, MLD), (reference vessel diameter) 가

통계 분석

SPSS ± 1 Student t , ² Fisher's exact p 0.05

50%

결 과

IVUS 시술

0.2 mg IVUS (CVIS system, SCIMED life system INC, Boston Scientific Corporation, USA) 10 mm (automatic pullback device) 0.5 mm/sec 3.2 F 1,800 rpm 가 s - VHS

($p=0.007$) (Table 1). Table 2 B2 C ($p=0.01$). 15.8 mm 29.7 mm ($p=0.001$). QCA MLD (p=0.001), (p=0.190). IVUS Table 3 EEM, CSA MLD (lesion segm -

Table 1. Baseline clinical characteristics (%)

Stent length, mm	< 20	20	p
Number of patients	151	85	
Age (years)	57 ± 9	59 ± 8	0.073
Males	112 (74.2)	68 (80.0)	0.198
Prior myocardial infarction	11 (7.3)	11 (12.9)	0.116
Hypertension	60 (39.7)	20 (23.5)	0.007
Diabetes mellitus	25 (16.6)	17 (20.0)	0.319
Hypercholesterolemia	18 (11.9)	9 (10.6)	0.468
Cigarette smoking	73 (48.3)	44 (51.8)	0.356
Clinical presentation			
Stable angina	41 (27.2)	25 (29.4)	0.411
Unstable angina	84 (55.6)	46 (54.1)	0.465
Acute myocardial infarction	26 (17.2)	14 (16.5)	0.518
Number of disease vessel			
One	85 (56.3)	44 (51.8)	0.296
Two	42 (27.8)	25 (29.4)	0.454
Three	24 (15.9)	16 (18.8)	0.343

Table 2. Baseline angiographic characteristics and procedural results (%)

Stent length, mm	< 20	20	p
Number of lesions	159	87	
Coronary artery dilated			
Left anterior descending	89 (56.0)	52 (59.8)	0.330
Left circumflex	22 (13.8)	8 (9.2)	0.196
Right coronary	48 (30.2)	27 (31.0)	0.501
Restenotic lesions	4 (2.5)	1 (1.2)	0.420
Infarct-related artery	19 (11.9)	11 (12.6)	0.512
Debulking before stenting	12 (7.5)	10 (11.5)	0.209
Lesion morphology			0.001
A	7 (4.4)		
B1	45 (28.3)		
B2	82 (51.6)	11 (12.6)	
C	25 (15.7)	76 (87.4)	
Mean stent length (mm)	15.8 ± 2.3	29.7 ± 7.5	0.001
Reference vessel diameter (mm)	3.3 ± 0.7	3.3 ± 0.4	0.715
Minimal lumen diameter (mm)			
Pre-intervention	0.8 ± 0.5	0.7 ± 0.4	0.370
Post-intervention	3.3 ± 0.7	3.2 ± 0.4	0.139
Follow-up	2.1 ± 0.8	1.8 ± 0.8	0.048
Last balloon size (mm)	3.8 ± 0.5	3.7 ± 0.5	0.190
Pressure (atm)	12.4 ± 3.3	14.0 ± 3.1	0.001

Table 3. Post-intervention IVUS findings

Stent length, mm	< 20	20	p
Proximal reference segment			
EEM CSA (mm ²)	16.0 ± 4.0	17.1 ± 4.4	0.078
Lumen CSA (mm ²)	9.5 ± 2.9	9.5 ± 3.3	0.861
Lumen MLD (mm)	3.2 ± 0.5	3.2 ± 0.6	0.918
Lesion segment			
Lumen CSA (mm ²)	7.5 ± 2.3	6.7 ± 2.0	0.009
Lumen MLD (mm)	2.8 ± 0.5	2.7 ± 0.4	0.023
Distal reference segment			
EEM CSA (mm ²)	14.5 ± 4.6	12.7 ± 3.9	0.003
Lumen CSA (mm ²)	8.8 ± 2.9	7.6 ± 2.3	0.001
Lumen MLD (mm)	3.1 ± 0.5	2.9 ± 0.5	0.001

ent) CSA MLD
 .
 22.8%(56/246)
 17.6%(28/159)
 32.2%(28/87) (p=0.009). 6

, IVUS Table 4
 가
 (24.1 19.7 mm, p=0.007), QCA
 MLD (p=0.001),
 (p=0.001).
 EEM, CSA, MLD가
 CSA MLD
 p<0.2
 IVUS CSA(odd ratio=1.51, 95% CI
 =1.18 1.92, p=0.001) (odd ratio=
 0.95, 95% CI=0.91 1.00, p=0.039)가

CSA
 Table 5

고 안

Table 4. Angiographic and IVUS findings between restenosis and non-restenosis (%)

	Non-restenosis	Restenosis	p
Number of lesions	190	56	
Mean stent length (mm)	19.7 ± 6.9	24.1 ± 11.1	0.007
Reference vessel diameter (mm)	3.4 ± 0.7	3.2 ± 0.4	0.148
Minimal lumen diameter (mm)			
Pre-intervention	0.8 ± 0.5	0.8 ± 0.5	0.853
Post-intervention	3.3 ± 0.7	3.1 ± 0.4	0.018
Follow-up	2.3 ± 0.7	1.1 ± 0.8	0.001
Last balloon size (mm)	3.8 ± 0.5	3.5 ± 0.4	0.001
Pressure (atm)	13.1 ± 3.4	12.6 ± 2.8	0.347
IVUS findings			
Proximal reference segment			
EEM CSA (mm ²)	16.8 ± 4.3	15.0 ± 3.3	0.012
Lumen CSA (mm ²)	9.9 ± 3.0	8.0 ± 2.5	0.001
Lumen MLD (mm)	3.3 ± 0.5	2.9 ± 0.5	0.001
Lesion segment			
Lumen CSA (mm ²)	7.6 ± 2.2	6.0 ± 1.8	0.001
Lumen MLD (mm)	2.9 ± 0.4	2.5 ± 0.4	0.001
Distal reference segment			
EEM CSA (mm ²)	14.4 ± 4.4	11.9 ± 4.0	0.001
Lumen CSA (mm ²)	8.8 ± 2.8	7.1 ± 2.1	0.001
Lumen MLD (mm)	3.1 ± 0.5	2.7 ± 0.5	0.001

Table 5. Angiographic restenosis rate (%) according to postintervention lumen CSA and stent length

Lumen CSA, mm ²	Stent length, mm			p
	Total	< 20	20	
< 5.0	17/31 (54.8)	6/16 (37.5)	11/15 (73.3)	0.049
5.0 < 7.0	26/95 (27.4)	13/54 (24.1)	13/41 (31.7)	0.409
7.0 < 9.0	8/76 (10.5)	6/60 (10.0)	2/16 (12.5)	0.772
9.0	5/44 (11.4)	3/29 (10.4)	2/15 (13.3)	0.767
P	0.001	0.025	0.001	

가 가 가 가 .

22 - 24)

20 mm

63%

가

24)

(ablative device)

25 - 27)

IVUS

CSA가 가

CSA가

가

10 - 15)

CSA

CSA가 5.0

mm² 37.5% , 5.0 mm² 7.0

mm² 24.1%, 7.0 mm² 9.0 mm²

10.0%, 9.0 mm² 10.4%

(p=0.025).

CSA

3-5) , IVUS 가

CSA가 가

10-12) , IVUS 가

13-15) IVUS

13-15) IVUS

IVUS

가 (absolute lumen dimension)

CSA

CSA가 5.0 mm² 73.3%, 5.0 mm² 31.7%, 7.0 mm² 12.5%, 9.0 mm² 13.3% (p=0.001).

30 mm 40 mm

(debulking procedure) 가

가

가

요 약

가

CSA MLD 연구배경 : (stent optimization) (IVUS) (<20 mm) (CSA)

(CSA <5.0 mm²)

가

27) 방 법 : IVUS

285 304

6 236 (82.8%) 246

(80.9%) IVUS

결 과 : 22.8%(56/246)

CSA가 7.0 mm²

(17.6%) (32.2%)
(p=0.009).
IVUS CSA
(odd ratio = 1.51, 95% CI = 1.18 1.92, p=0.001)
(odd ratio = 0.95, 95% CI = 0.91 1.00,
p=0.039) CSA (
:) CSA <5.0 mm² 54.8%
(37.5% : 73.3%, p=0.049), 5.0 mm² CSA <7.0
mm² 27.4%(24.1% : 31.7%, p=0.409), 7.0
mm² CSA <9.0 mm² 10.5%(10.0% : 12.5%,
p=0.772) CSA 9.0 mm² 가 11.4% (10.4% :
13.3%, p=0.767) (p=0.001).

결 론 :

CSA가 7.0 mm²
가

IVUS
CSA가 가

중심 단어 :

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