

***Relation between Neointimal Coverage
and Yellow Grade of the Segments after
Sirolimus-Eluting Stent Evaluated by
Coronary Angioscopy***

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Background

- **The efficacy of sirolimus-eluting stent (SES) have been demonstrated to reduce restenosis rate in various reports.**
- **Recently, late stent thrombosis and inhibition of plaque sealing receives considerable attention after DES implantation.**
- **Coronary angiography can visualize neointimal coverage, color of the plaque and thrombus formation.**

Objective

To evaluate the degree of neointimal coverage, existence of thrombus and plaque yellow grade on coronary angioscopy after SES implantation at follow-up.

We observed those segments after paclitaxel-eluting stent (PES) implantation at follow-up in small group of patients.

Methods

- 1. Eighty-four lesions in 64 patients who had implanted SES in our hospital.**
- 2. Angioscopic observation was performed both at the time of SES implantation and at follow-up study.**
- 3. Angioscopic system: flushing system
FT-201 (FiberTech)
Fiber catheter (AS-003, FiberTech)**
- 4. Seven lesions in 7 patients who had PES implantation were also observed.**

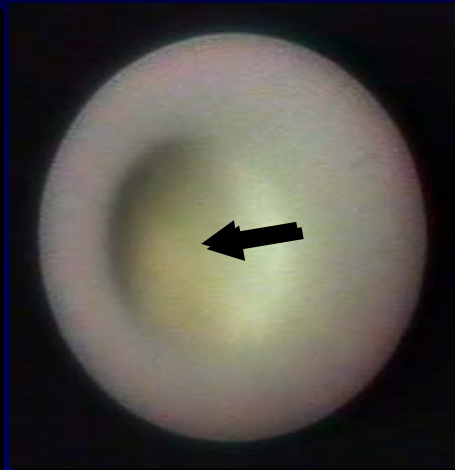
Angioscopic classification of yellow plaque

Grade0



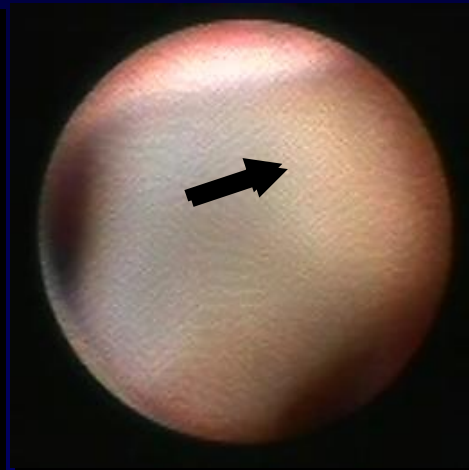
White

Grade1



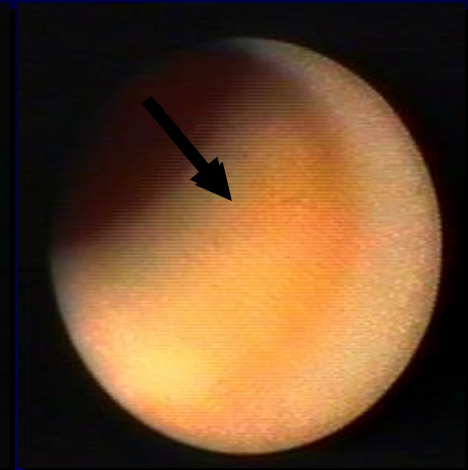
light Yellow

Grade2



Yellow

Grade3



Intensive Yellow

Angioscopic classification of neointima

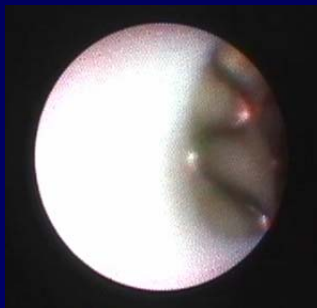
Grade 0: Stent struts that are fully visible

Grade 1: Stent struts that bulged into the lumen but covered with transparent neointima

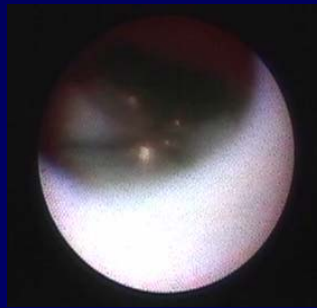
Grade 2: Stent struts that are visible but not clearly seen

Grade 3: Stent struts that are not visible

Grade 0



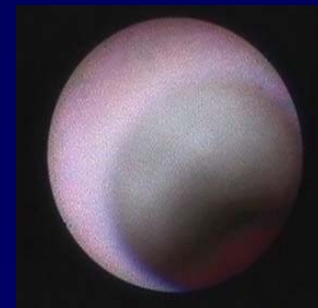
Grade 1



Grade 2



Grade 3



Patient Characteristics (n=68)

Age (mean \pm SD) 64.6 \pm 9.8

Male 51 (75.0%)

Clinical diagnosis

Stable effort angina 42 (61.8%)

Unstable angina / NSTEMI 17 (25.0%)

STEMI 0 (0.0%)

Silent myocardial ischemia / OMI 9 (13.2%)

Risk factors

Diabetes 31 (45.6%)

Hypertension 43 (64.2%)

Dyslipidemia 48 (71.5%)

LDL-C / HDL-C 104.4 \pm 26.1 / 45.7 \pm 13.0

Hyperuricemia 13 (19.1%)

Obesity 20 (29.9%)

Smoking 37 (54.4%)

Family history of IHD 10 (14.7%)

Lesion characteristics (n=84)

Distribution

LAD	43 (51.2%)
LCX	17 (20.2%)
RCA	24 (28.6%)

Number of stents **120**

Stents / lesion **1.4 ± 0.6**

Stent size **3.1 ± 0.4mm**

Stent length **22.2 ± 4.8mm**

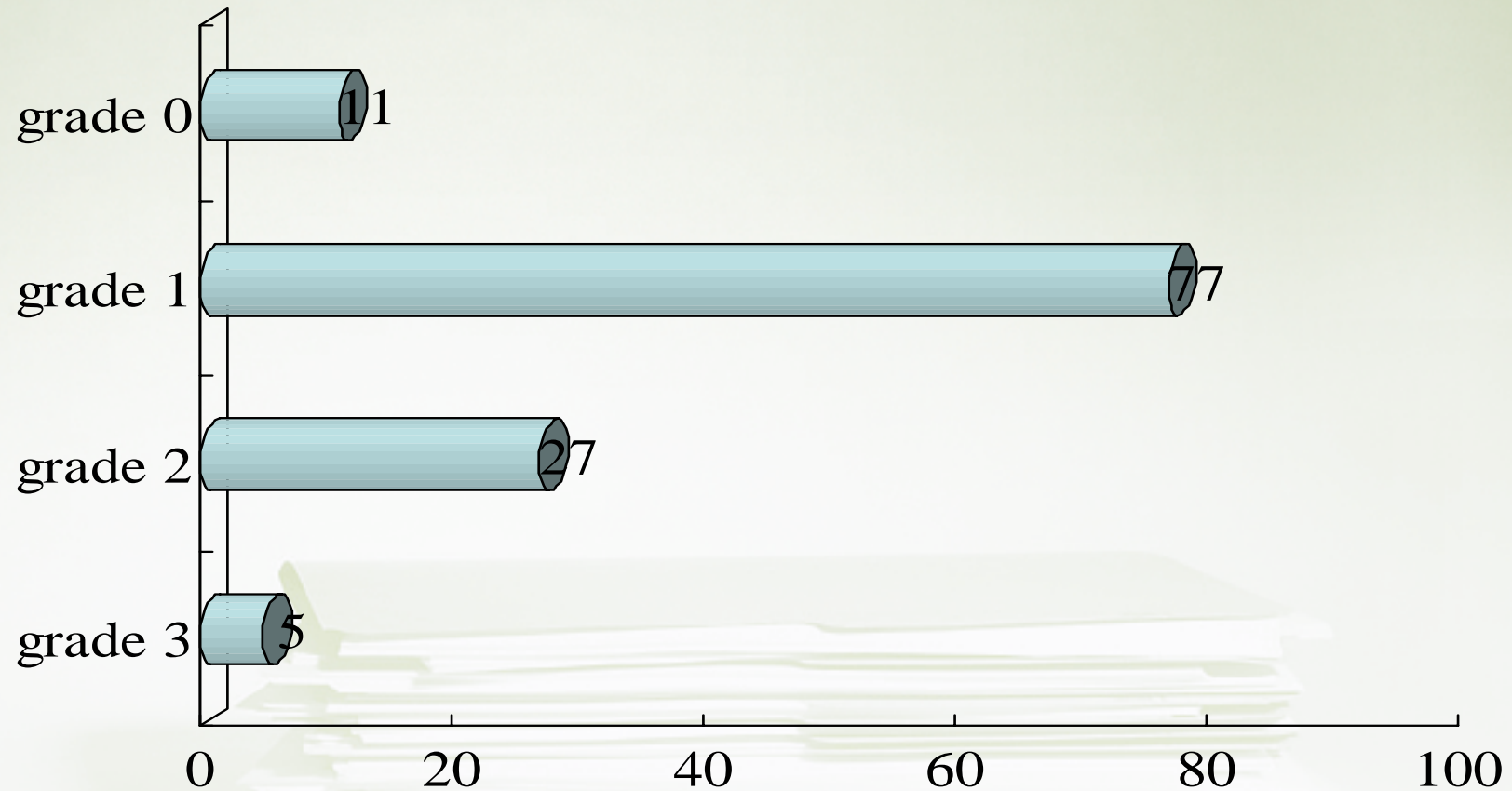
Follow-up period **12.7 ± 5.3**

Chronic total occlusion **13 (10.8%)**

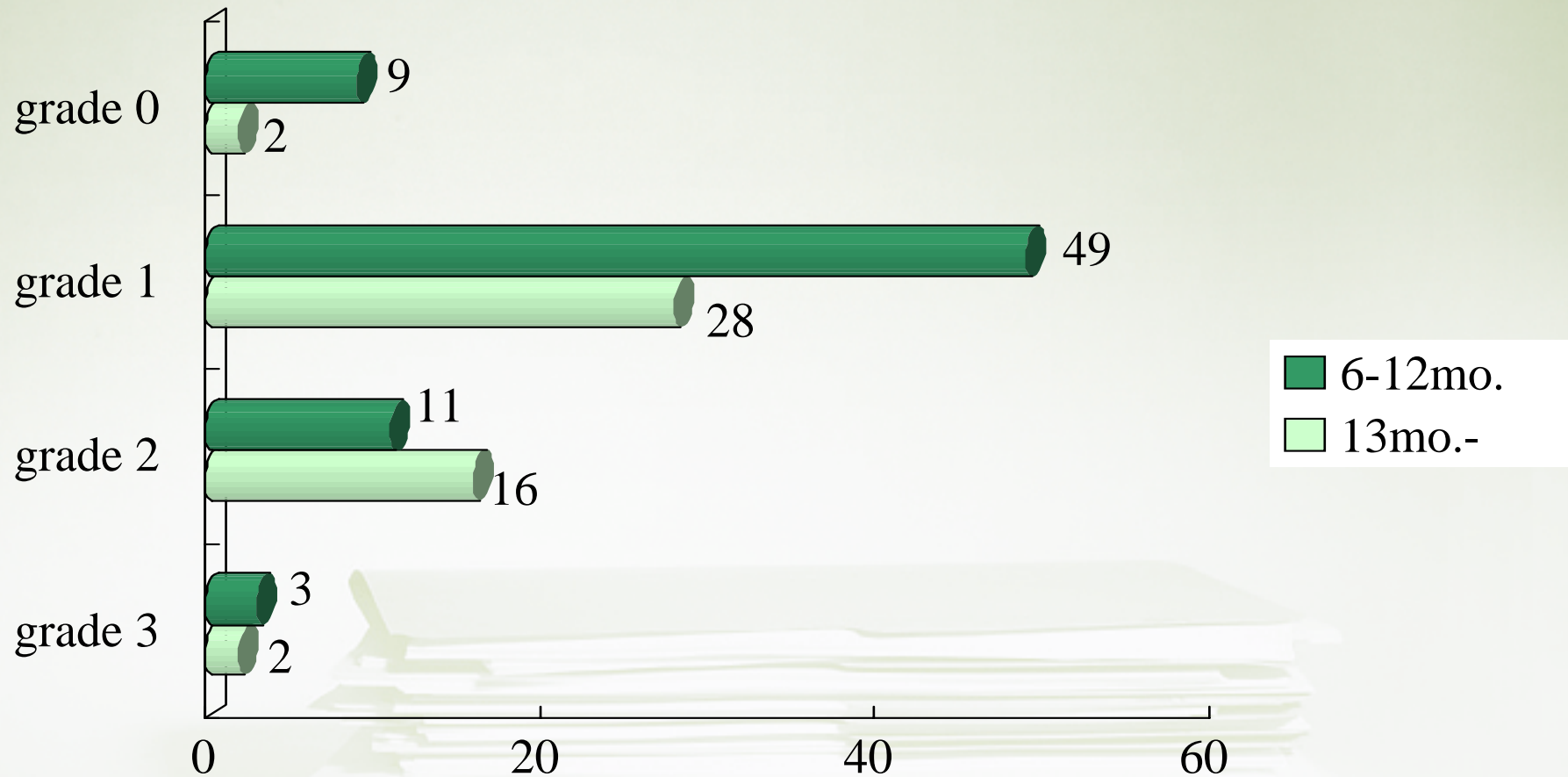
SES for in-stent restenosis **9 (7.5%)**

TLR **3 (2.5%)**

Angioscopic classification of neointima



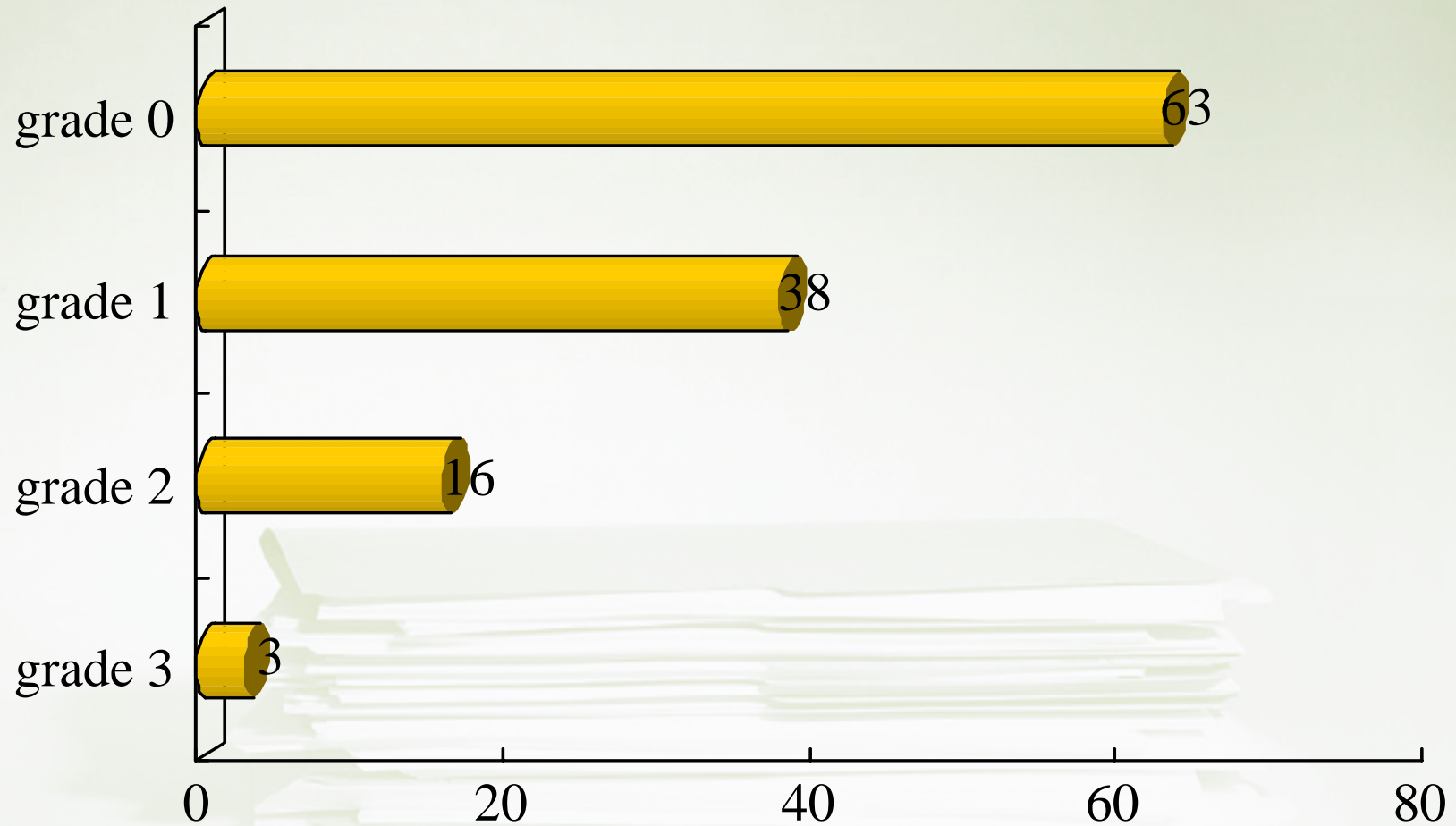
Angioscopic classification of neointima



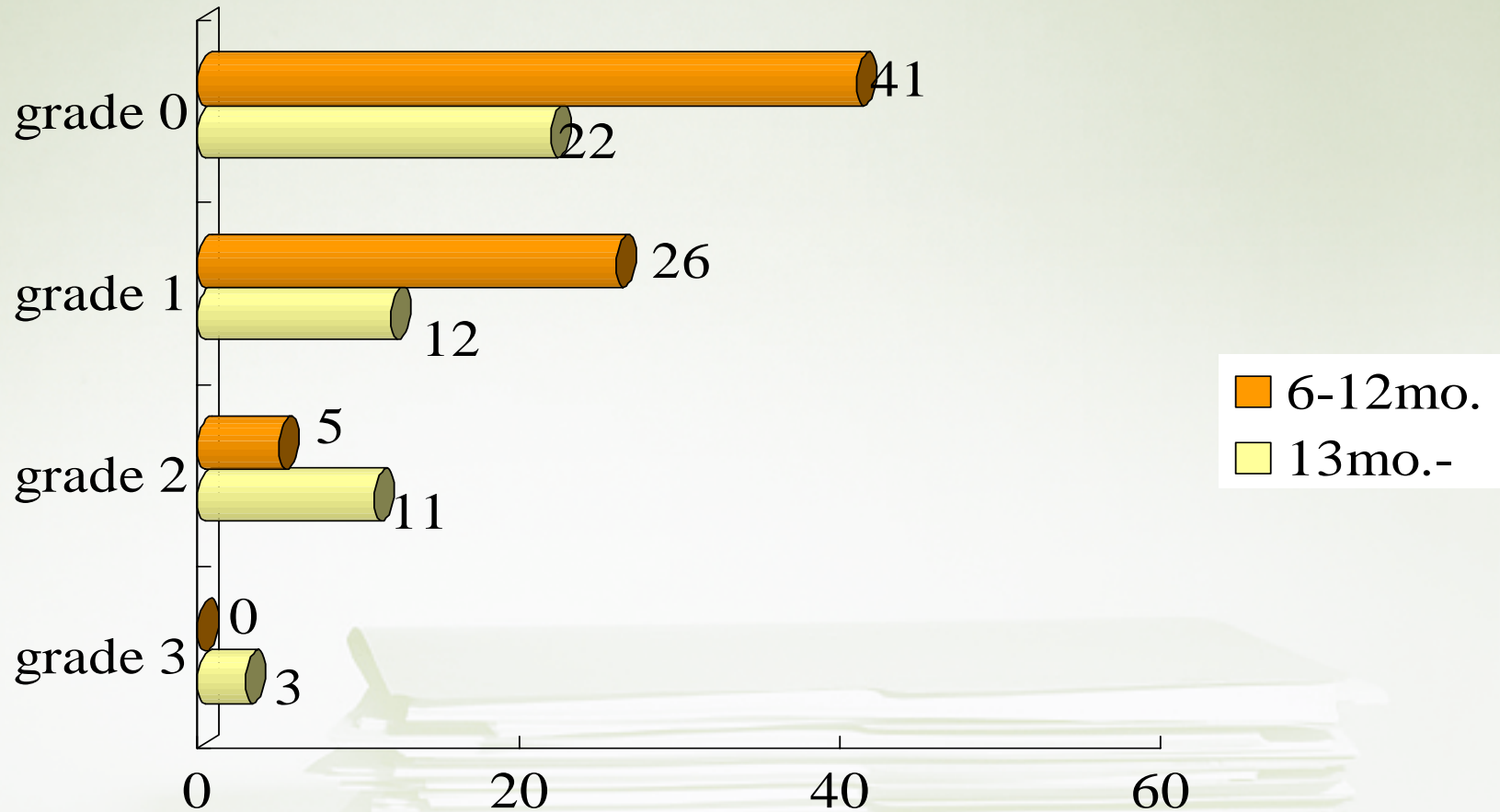
Less than 12 months: 1.1 ± 0.42

More than 12 months: 1.5 ± 0.42 (**p = 0.014**)

Angioscopic yellow grade of the plaque



Angioscopic yellow grade of the plaque



Less than 12 months: 0.52 ± 0.40

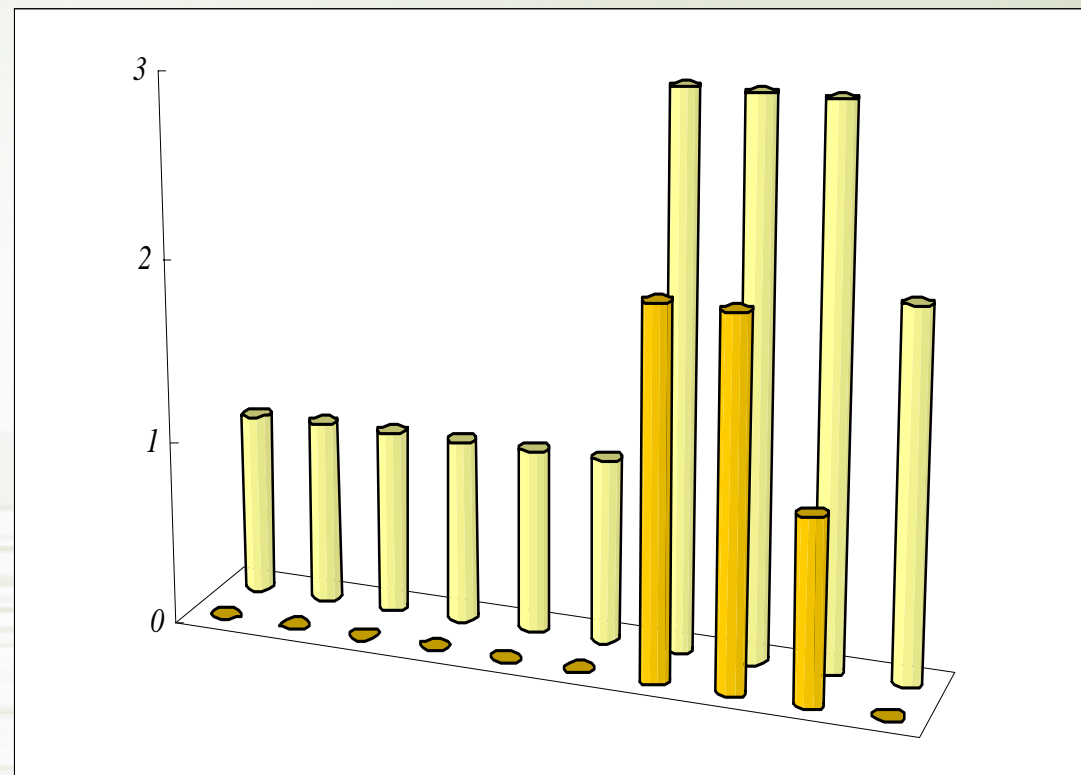
More than 12 months: 0.82 ± 0.86 (p = 0.06)

Changes in yellow grade after SES implantation

(n=46 stents)

Decreased: 21 (46%)
No change: 15 (33%)
Increased: 10 (22%)

Increased yellow grade of the plaque after SES implantation



Relationship between neointimal coverage and yellow grading

Grade of Neointima	Yellow grading			
	Grade 0	Grade 1	Grade 2	Grade 3
Grade 0/1	43 (49%)	38 (44%)	6 (7%)	0 (0%)
Grade 2/3	20 (61%)	3 (9%)	9 (27%)	1 (3%)

The higher neointimal grade, the higher yellow grade?

Grade 2 / 3 neointima (n=10)

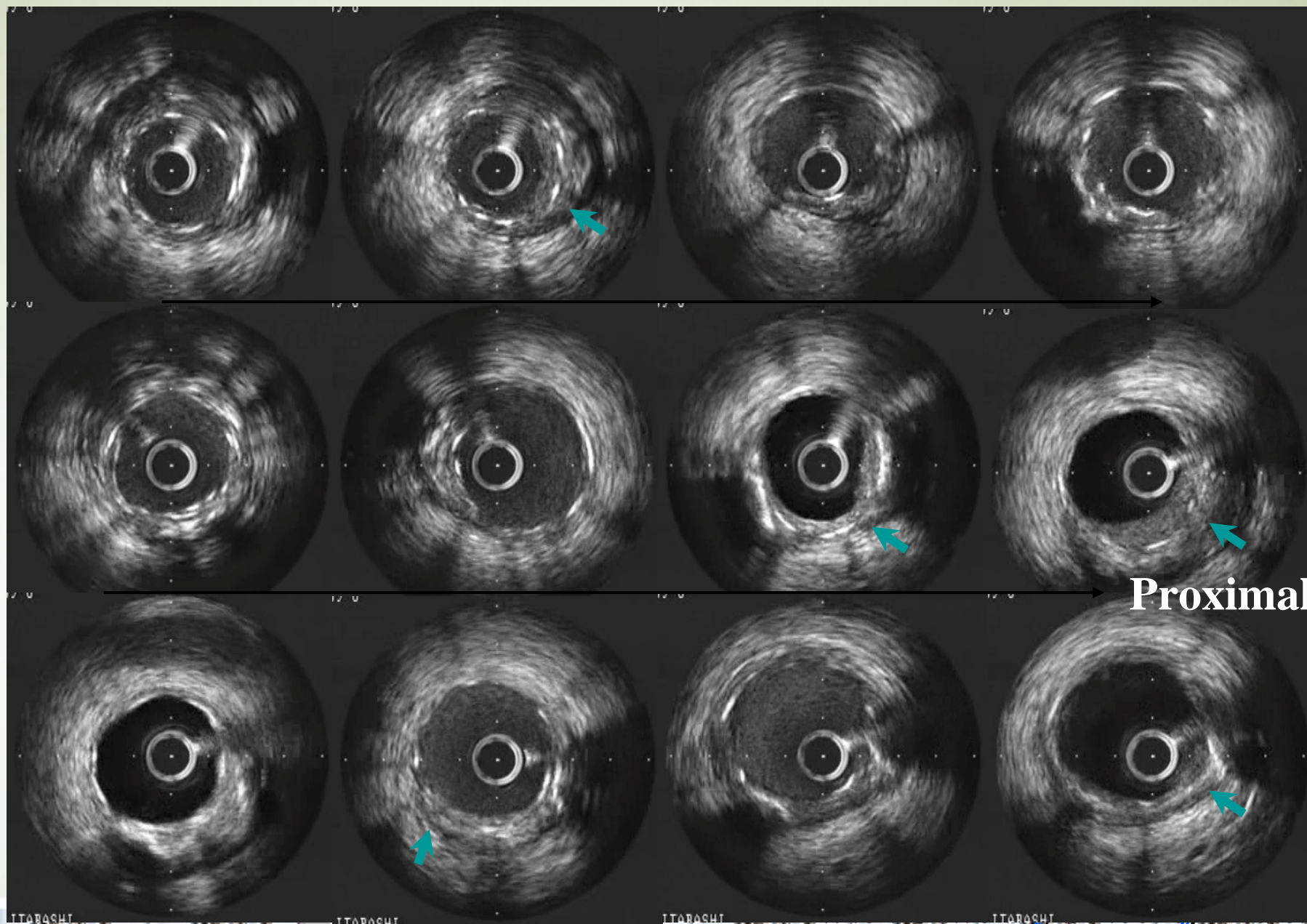
- 6 lesions: Acute coronary syndrome and thrombus formation at the time of SES implantation.
- 9 lesions had white thrombus
- 6 lesions: SES was implanted the plaques with yellow grade III
- Are these conditions precursor of late stent thrombosis?

How about Taxus stent?

Coronary angioscopic observation was performed at the site of Taxus stent implantation in 7 patients at follow-up. This is still on-going study.

TAXUS case

Distal



Proximal

ITABASHI

ITABASHI

ITABASHI

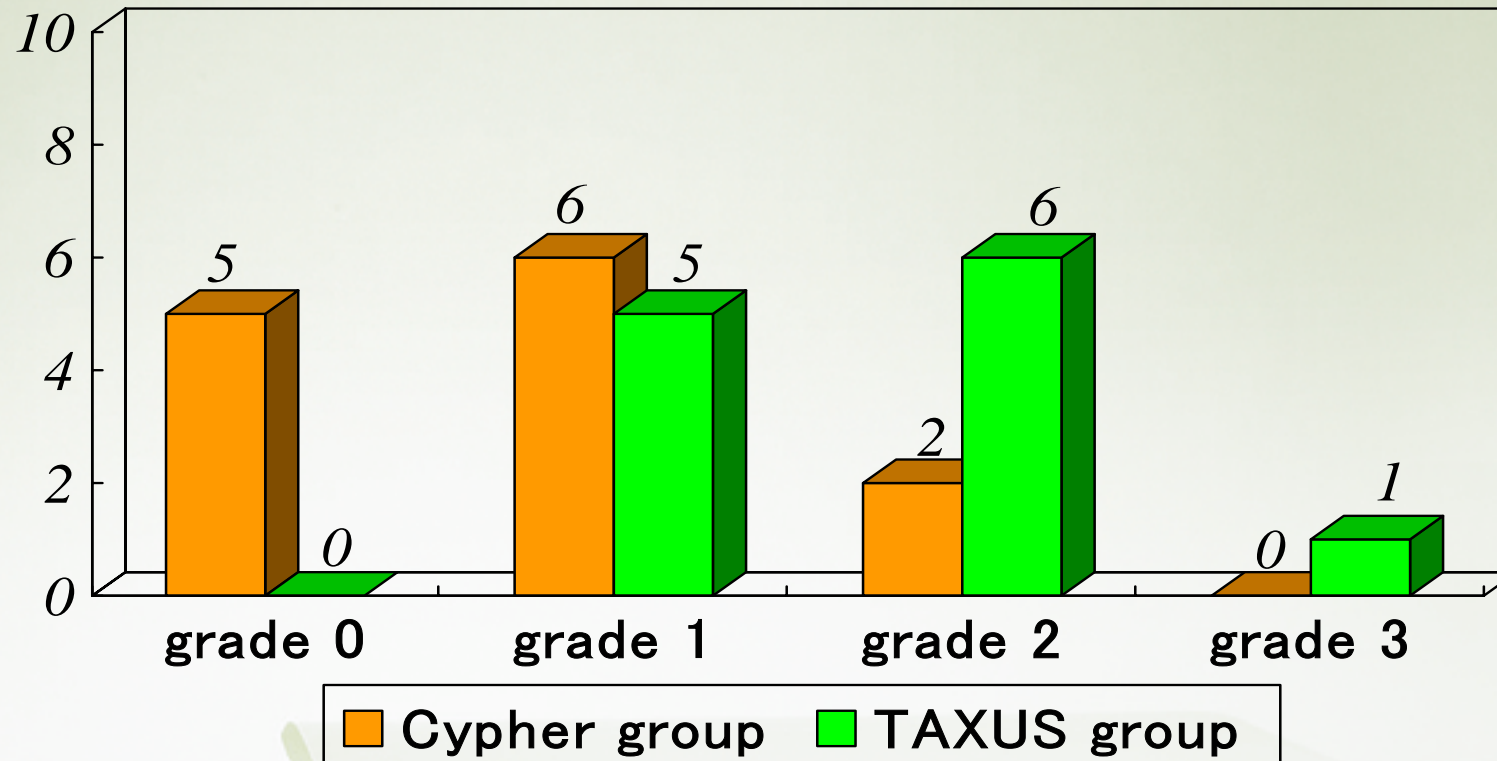
ITABASHI

IVUS findings at 8-9 months follow up

	<i>Cypher group (n=13)</i>	<i>TAXUS group (n=12)</i>
<i>Neointima (+)</i>	<i>0 (0%)</i>	<i>8 (67%)</i>
<i>Neointima (-)</i>	<i>13 (100%)</i>	<i>4 (33%)</i>

	<i>Stent proximal</i>	<i>Stent body</i>	<i>Stent distal</i>
<i>Position of neointima in TAXUS (n=8)</i>	<i>1 (13%)</i>	<i>4 (50%)</i>	<i>3 (37%)</i>

Angioscopic findings at follow-up



Cypher group 0.83 ± 0.52
 TAXUS group 1.73 ± 0.42] p<0.05

	<i>Cypher group</i> (n=13)	<i>TAXUS group</i> (n=12)
<i>Thrombus (+)</i>	2 (15%)	1 (8%)
<i>Thrombus (-)</i>	11 (85%)	11 (92%)

Summary

- 1. Incomplete neointimal coverage was observed at 1 year follow-up at the site of SES implantation by angioscopy.**
- 2. Significant increase in yellow grade with presence of thrombus was observed in lesions with higher grade of neointimal coverage.**
- 3. Higher neointimal grade was observed at 8 to 9 months follow-up after PES stent implantation compared to SES.**
- 4. Red thrombi were observed adjacent to stent struts in 10 to 15% after SES and PES.**

Conclusion

- 1. Sirolimus-eluting stent implantation may induce plaque to be vulnerable in selected group of lesions and that might be one of the cause of late stent thrombosis after SES.**
- 2. Neointimal coverage started earlier in PES stent compare to SES stent.**