Debulking Of Chronic Total Occlusion with Rotational or Directional Atherectomy before Stenting Trial (DOCTORS Trial)

DOCTORS Investigators

Background

PCI of CTO is associated with

- an acceptable success rate
- a favorable long-term patency by primary stenting
- a high revascularization rate due to restenosis

Hypothesis

Plaque debulking of CTO facilitates subsequent dilatation by balloon angioplasty and stenting and provides a better long-term angiographic outcome compared with primary stenting.

Study Aim

This study aimed to examine the impact of pre-stent plaque debulking of CTO by rotational or directional atherectomy (RA or DCA) on restenosis reduction in a multi-center randomized study.

Study Design

- Prospective
- Multi-center
- Randomized
- Any stent(s)

Debulking arm	vs	Non-debulking arm
RA or DCA before stenting		Stenting alone

(Decision making by operator)

Inclusion Criteria

- Definition of CTO
  1. TIMI flow grade = 0 or 1
  2. Estimated occluded duration > 1 month or unknown
- Occlusion length < 20 mm
- Suitable morphology for rotational or directional atherectomy
- Suitable morphology for stenting

Exclusion Criteria

- Reference diameter < 2.0 mm
- ACS culprit lesion
- Wire passed through the false lumen
- Bypass graft
- Occluded vessel supplied from intact bypass graft
- Instent occlusion
- Unsuitable morphology for atherectomy devices
- Unsuitable morphology for stenting

Procedural Sequence

- Successful crossing of CTO with conventional guide wire
- Judgement of RA or DCA application (by IVUS guidance)

↓

Enrollment

↓

- Randomization

Debulking arm	Non-debulking arm
RA or DCA	POBA
POBA, if necessary	Stenting
Stenting	Adjunctive POBA, if necessary
Adjunctive POBA, if necessary	

Endpoints

Primary endpoint

- Angiographic restenosis at 6 months

Secondary endpoint

- MACE, TLR, TVR by 1 year

Study Organization

- *Principle Investigators*

  Etsuo Tsuchikane, MD — *Toyohashi Heart Center*
  Yung-Sheng Hsu, MD — *Shiga Medical Center for Adults*
  Kinzo Ueda, MD — *Takeda Hospital*

- *Safety Committee*

  Tetsu Yamaguchi, MD — *Toranomon Hospital*

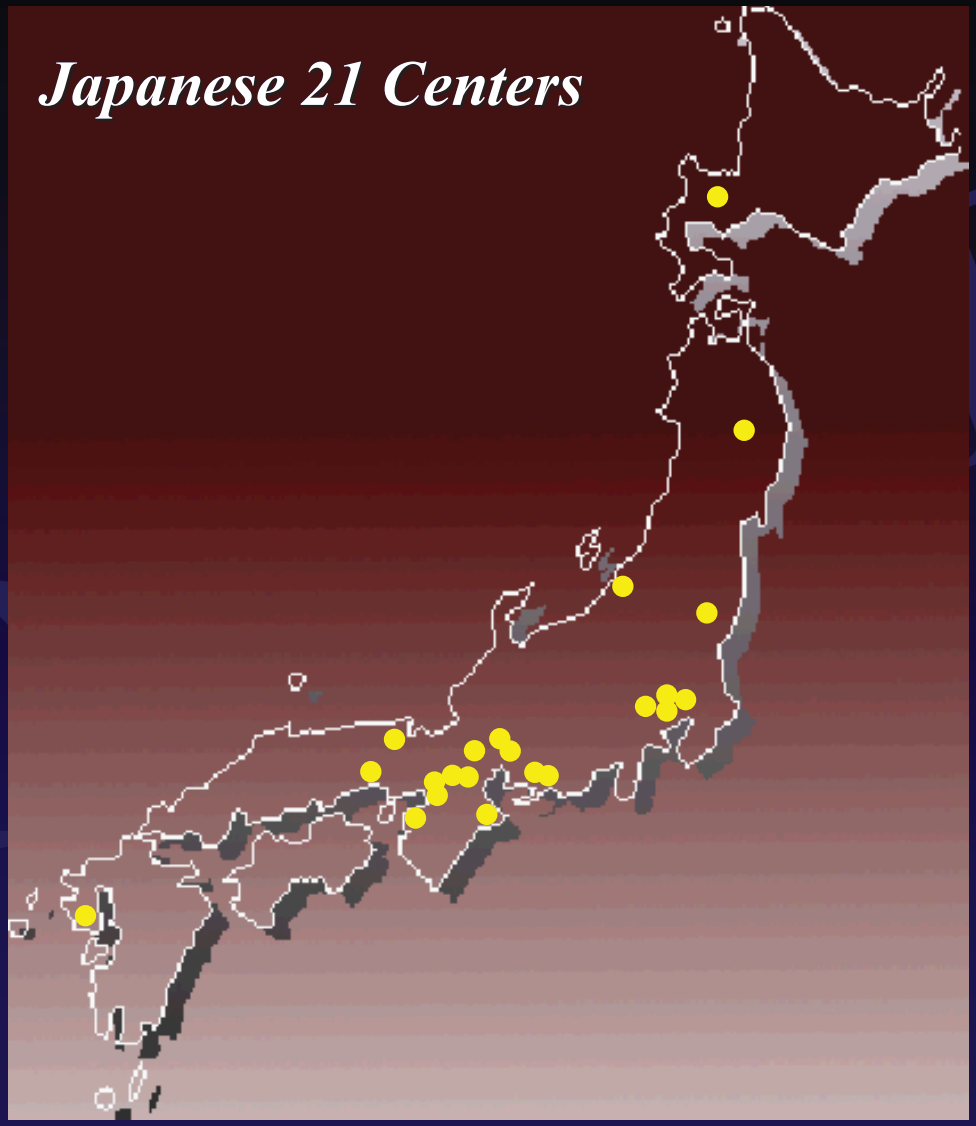
- *QCA Core Laboratory*

  Takaaki Isshiki, MD — *CARDIOCORE JAPAN* (CMS-MEDIS)

- *Clinical Data Analysis*

  MEDICAL TOKEI Co. Ltd

Study Institutions



Study Investigators

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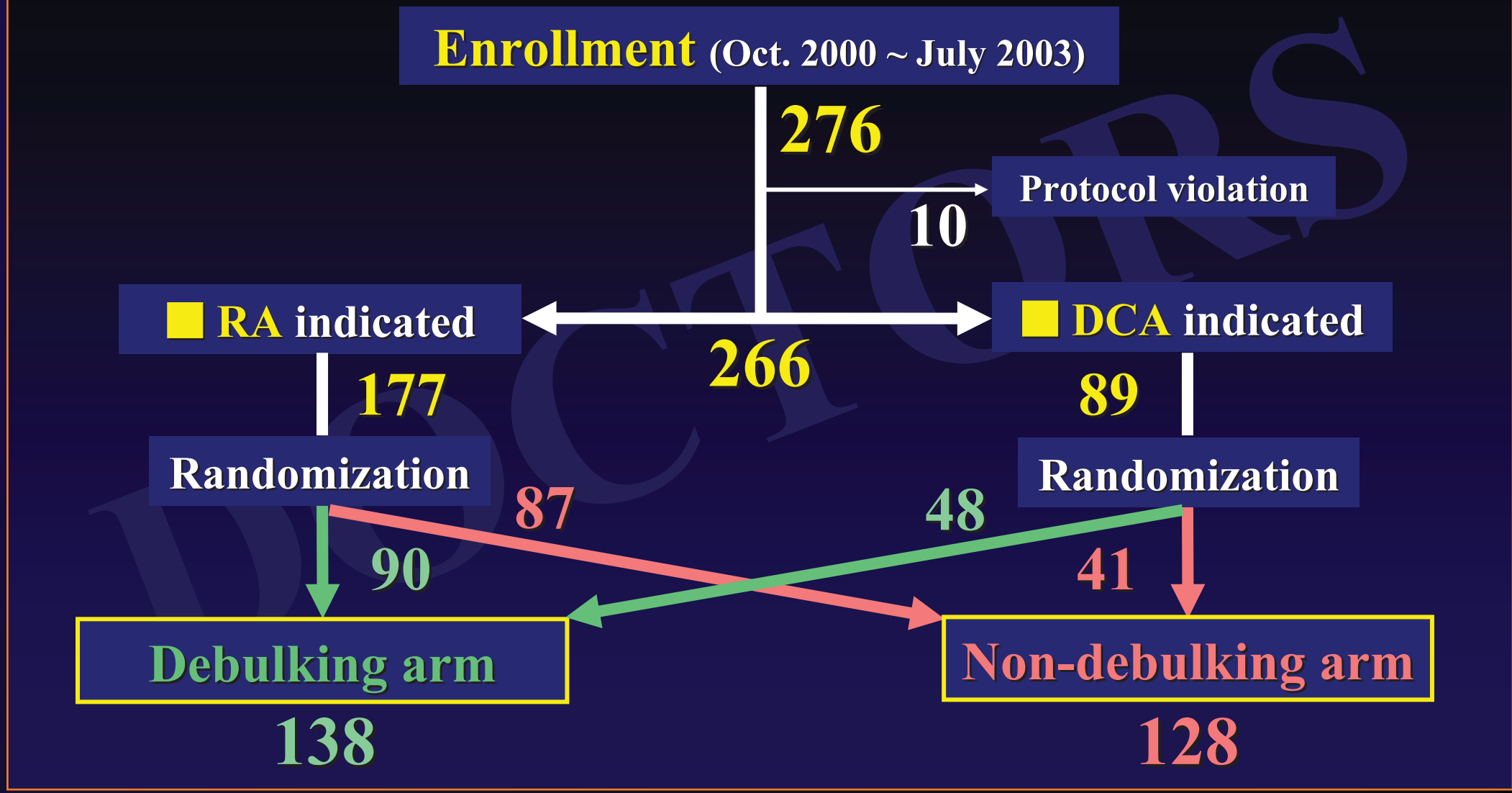
Rinku General Medical Center	Satoru Sumitsuji, MD
Teine Keijinkai Hospital	Mitsugu Hirokami, MD
National Toyohashi Higashi Hospital	Hiroaki Hosokawa, MD
Iwate Prefectural Central Hospital	Eiji Nozaki, MD; Kenji Tamaki, MD

Enrollment


Enrollment (Oct. 2000 ~ July 2003)
276
Protocol violation
10
RA indicated
DCA indicated
266
177
89
Randomization
Randomization
87
48
90
41
Debulking arm
Non-debulking arm
138
128

Patients Characteristics

	Debulking	Non-debulking	P value
Number	138	128	
Male	84.1%	81.3%	NS
Age (y.o.)	64±9	65±9	NS
Prior MI	57.2%	57.0%	NS
Prior CABG	7.2%	7.0%	NS
Prior PCI	36.2%	28.9%	NS
UA	7.2%	7.8%	NS
Multivessel	68.1%	68.0%	NS
HT	58.0%	52.3%	NS
DM	34.8%	38.3%	NS
HL	57.2%	46.9%	NS
H/O smoking	51.4%	44.5%	NS

Lesion Characteristics

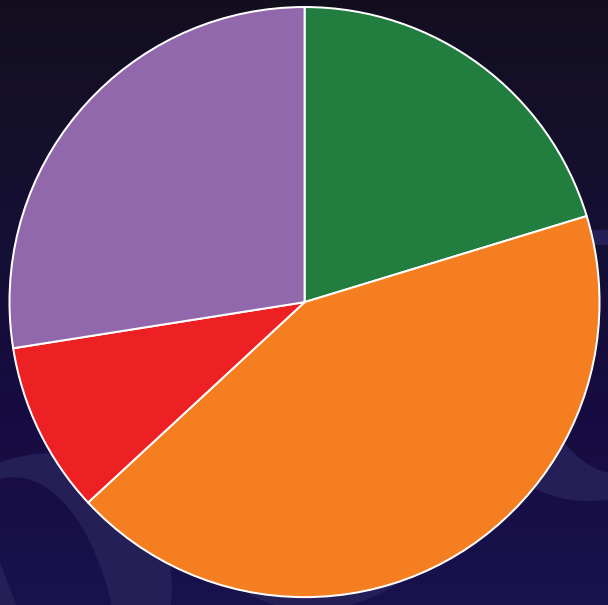
	Debulking	Non-debulking	P value
Number	138	128	
Target vessel RCA / LAD / LCx	33 / 53 / 14%	39 / 48 / 13%	NS
De novo	89.1%	89.8%	NS
OMI related	55.1%	56.3%	NS
Calcified	61.6%	62.5%	NS
Jeopardized collateral	41.3%	38.3%	NS
Proximal tortuosity	37.0%	27.3%	NS
Bending (>45 degree)	6.5%	3.1%	NS

Lesion Characteristics

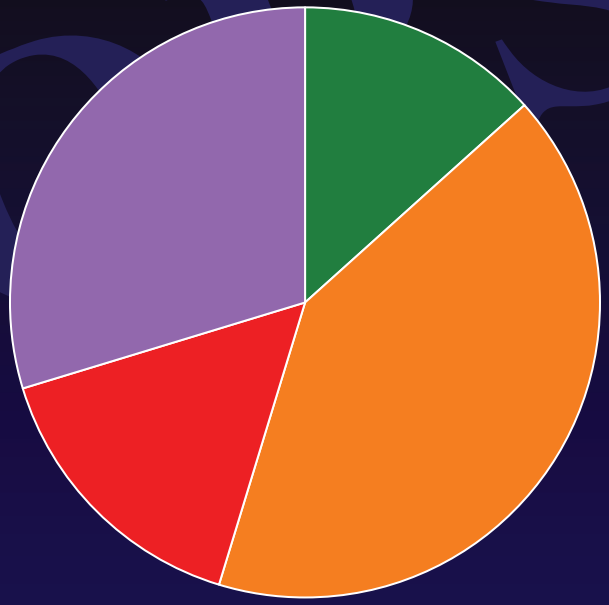
	Debulking	Non-debulking	P value
Number	138	128	
TIMI=1	18.1%	14.8%	NS
TIMI=0	81.9%	85.2%	
Occlusion length			
< 10mm	40.6%	40.6%	NS
10 ≦ , < 20mm	59.4%	59.4%	
Lesion length			
< 20mm	39.9%	35.9%	NS
≧ 20mm	60.1%	64.1%	
Occlusive duration			
< 3M	5.1%	5.5%	
≧ 3M	16.6%	16.4%	NS
Unknown	78.3%	78.1%	

Conventional Wires Used

Debulking arm

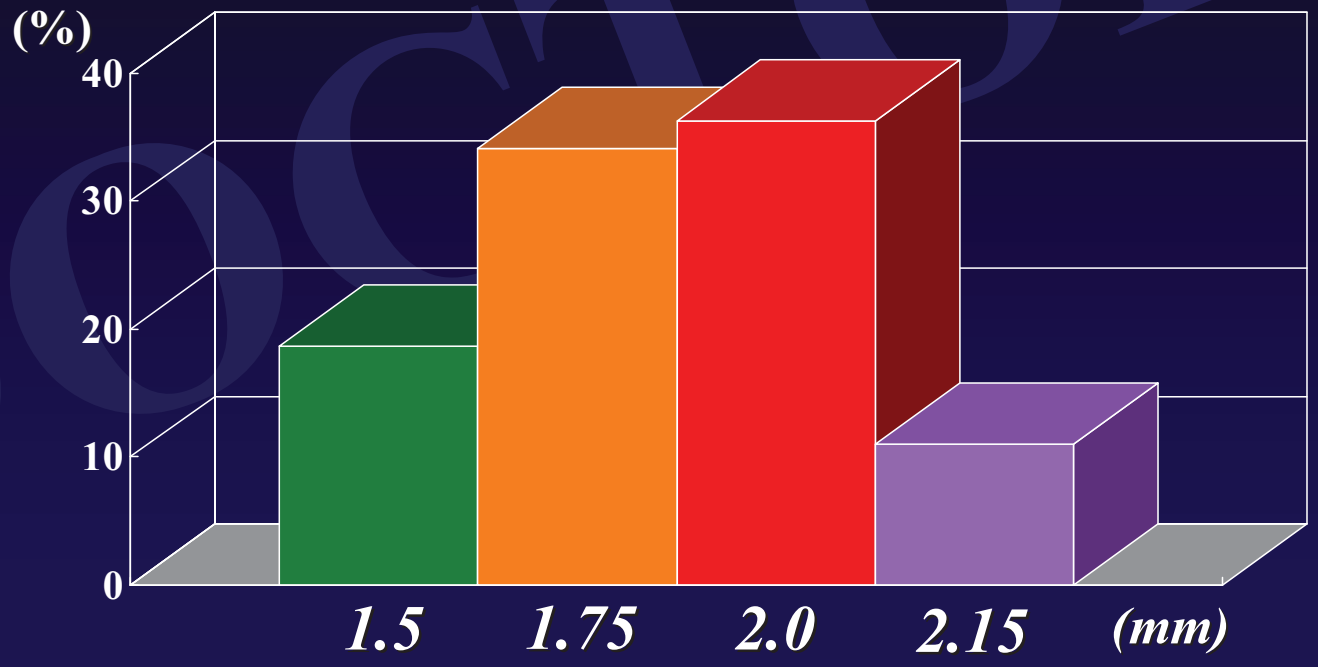


Non-debulking arm



RA Procedural Results

1. Pre-dilatation: 69.2%
2. Wire exchange success: 100%
3. Max. burr size: 1.84±0.21mm



RA Procedural Results (cont'd)

4. Multiple burrs: 51.6%
   Number of used burrs: 1.51±0.50

5. Total ablation time: 102.5±85.3 sec.

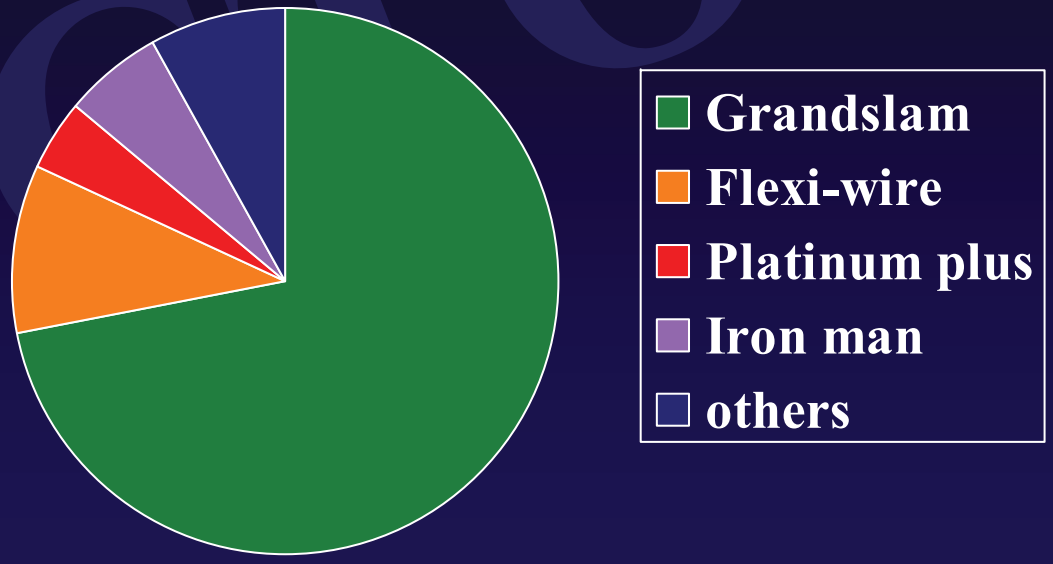
6. Max. drop in RPM: 6800±4000 rpm

7. Complications during RA

1) pacing	7.7% (6)
2) spasm	6.6% (6)
3) side branch occlusion	1.1% (1)
4) no flow	0%
5) perforation	0%

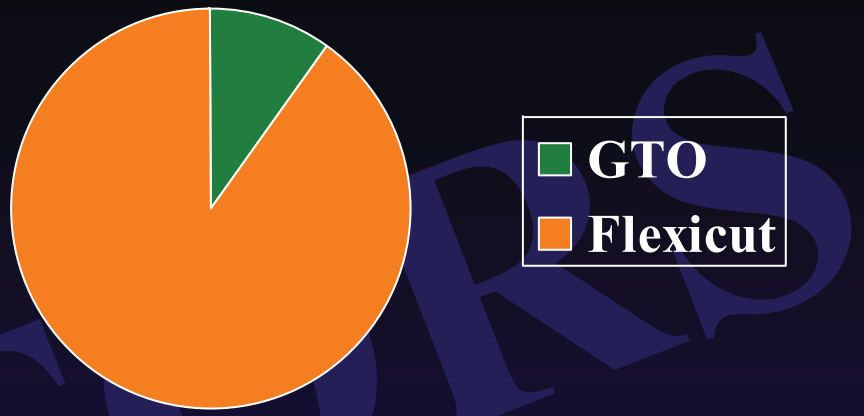
DCA Procedural Results

1. Pre-dilatation: 82%
2. Pre-dilatation balloon: 1.73±0.41 mm
3. Wire used



DCA Procedural Results (cont'd)

4. Atherocatheter used



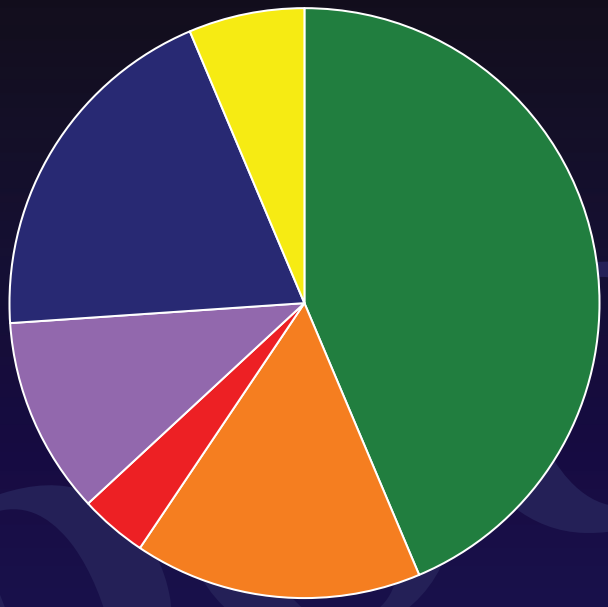
5. Max. cutting pressure: 54.9±31.1 psi

6. Complications during DCA

1) spasm	2% (1)
3) side branch occlusion	2% (1)
4) no flow	4% (2)
5) perforation	0%

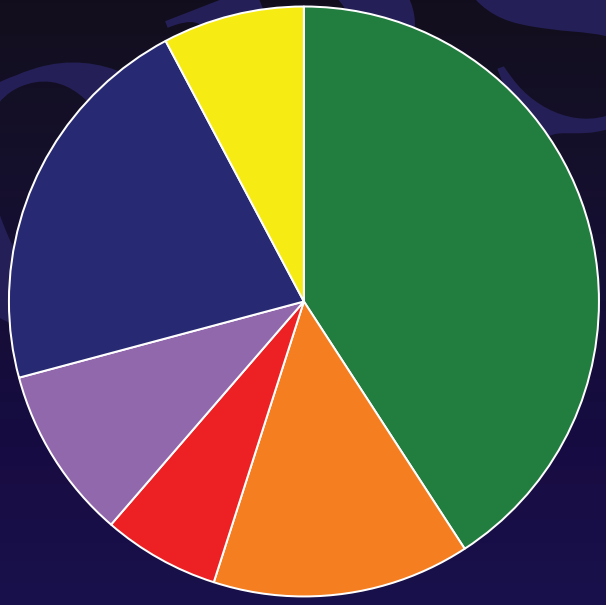
Stents Used

Debulking arm



- NIR
- Velocity
- Radius
- S series
- Multilink series
- Mixed

Non-debulking arm



- NIR
- Velocity
- Radius
- S series
- Multilink series
- Mixed

Stenting Procedural Results

	Debulking	Non-debulking	P value
Number	138	128	
Delivery success	100%	99.2% (Balloon not crossed: 1pt)	
Multiple stents	21.7%	27.5%	0.27
Number of stents	1.23±0.46	1.31±0.54	0.18
Stent size (mm)	3.46±0.47	3.39±0.42	0.14
Total length of stents (mm)	25.7±11.0	28.2±11.7	0.076
Stenting pressure (atm)	11.7±3.4	11.9±3.9	0.65
Post dilatation	63.8%	65.4%	0.79
Post dilatation balloon (mm)	3.45±0.45	3.42±0.44	0.62
Post dilatation pressure (atm)	12.9±4.3	13.6±4.5	0.32

Final Procedural Results

	Debulking	Non-debulking	P value
Number	138	128	
Lesion unsuccess	1.4% (2)	1.6% (2)	NS
Flow disturbance	1.4% (2)	0.8% (1)	0.49
Residual stenosis	0	1.6% (2)	NS
MACE	0.7% (1)	0	NS

In-Hospital Outcomes

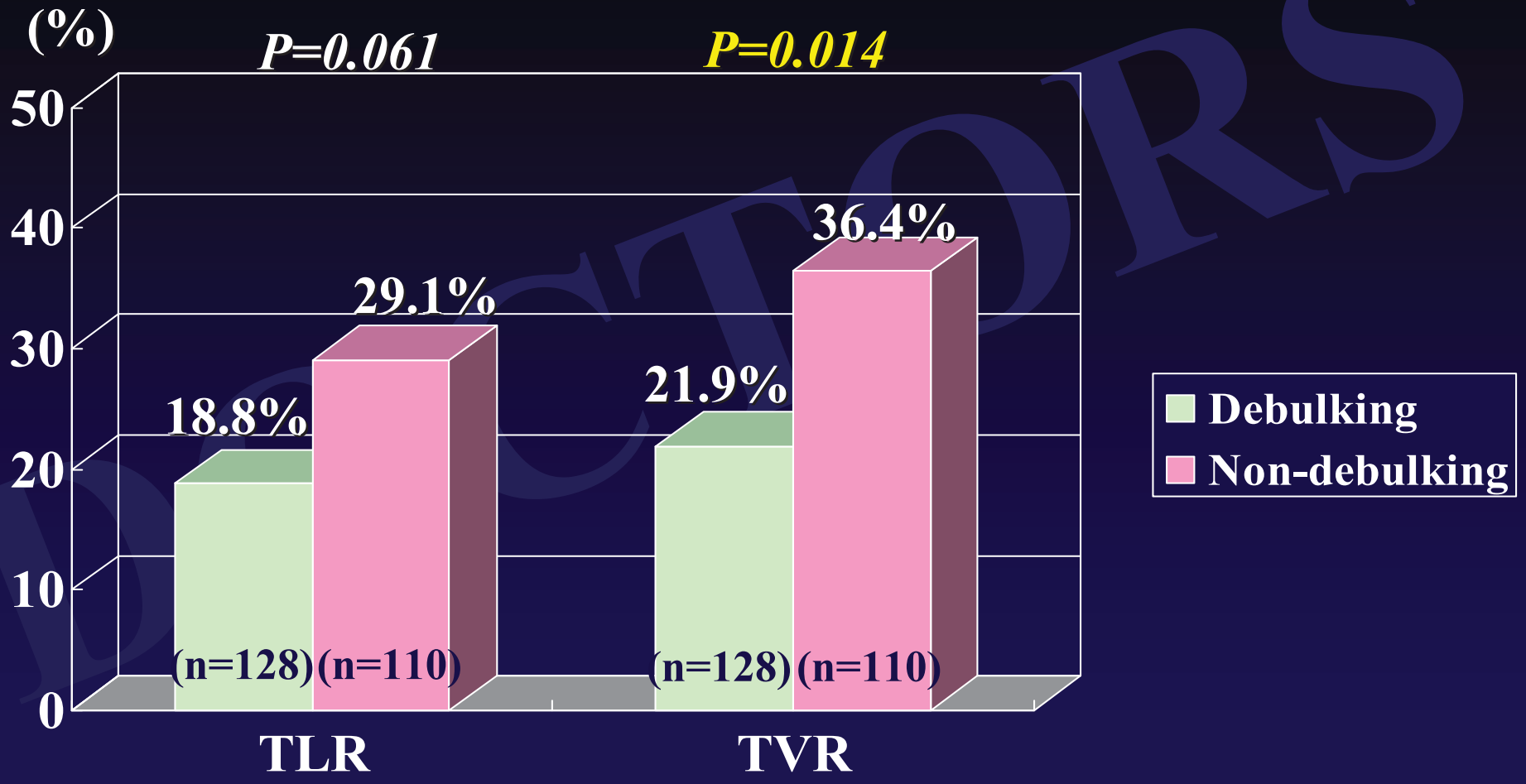
	Debulking	Non-debulking	P value
Number	138	128	
Death	0.7% (1*)	0	NS
CABG	0.7% (1)	0	NS
Q-wave MI	1.4% (2*)	0	NS
Subsequent PCI	0	0.8% (1)	NS

*same patient

Clinical 6Mo Fu Results after Discharge

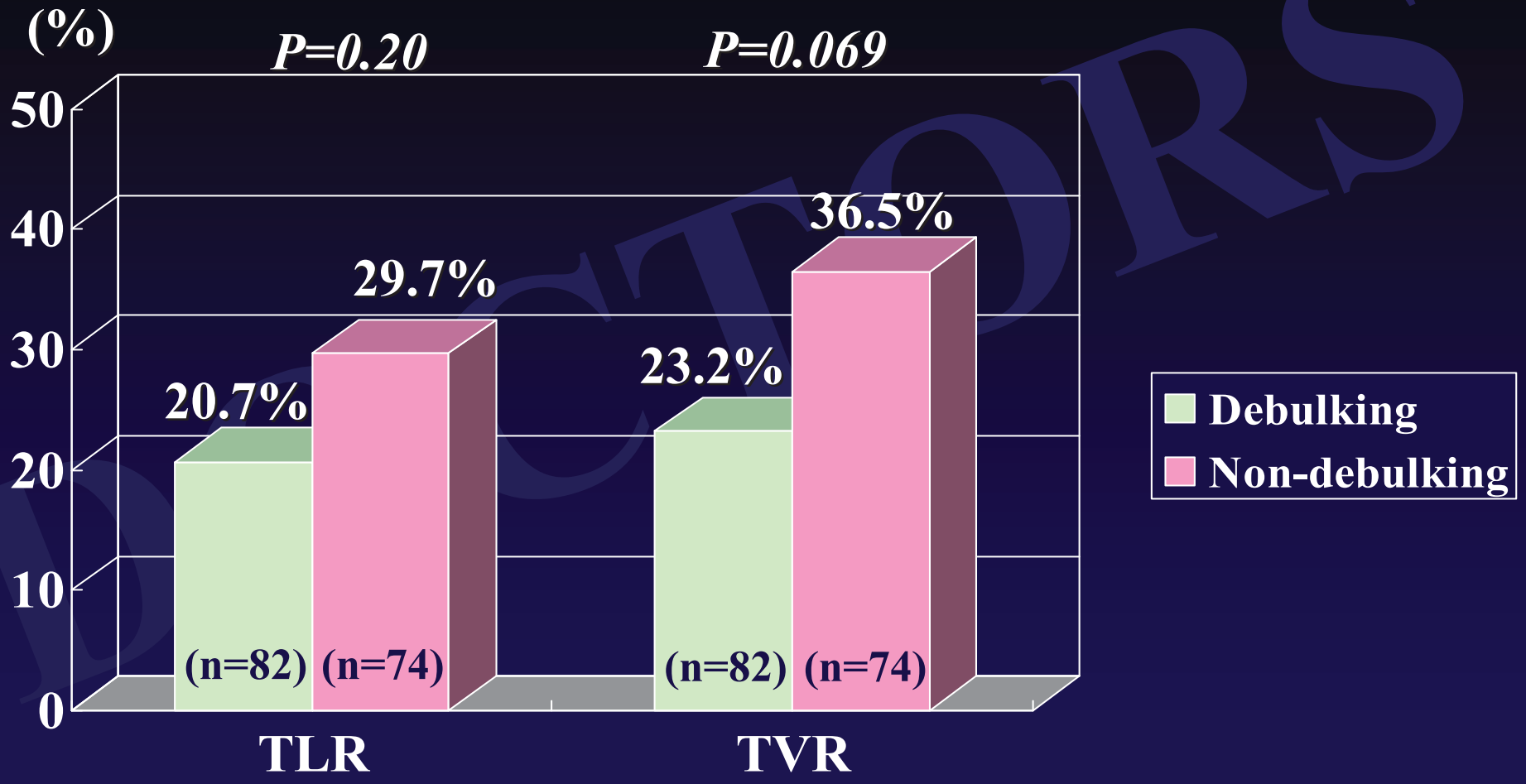
	Debulking	Non-debulking	P value
Number	132	114	
Death	0	0	NS
CABG	0	0	NS
Q-wave MI	0.8% (1)	0	NS
CHF	0	1.8% (2)	NS
Any event	0.8% (1)	1.8% (2)	NS

TLR and TVR in Fu CAG Pts



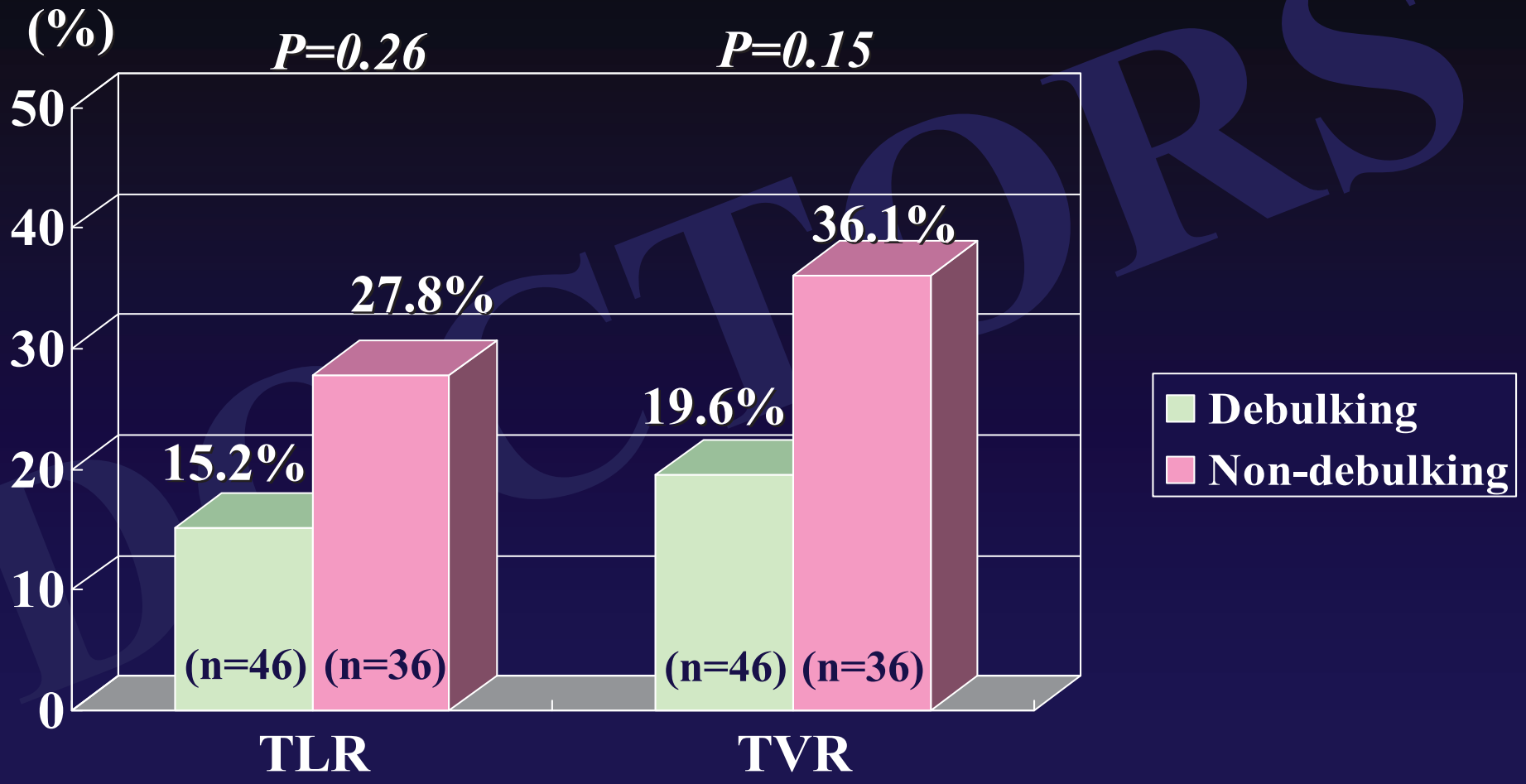
TLR and TVR in Fu CAG Pts

RA indicated



TLR and TVR in Fu CAG Pts

DCA indicated

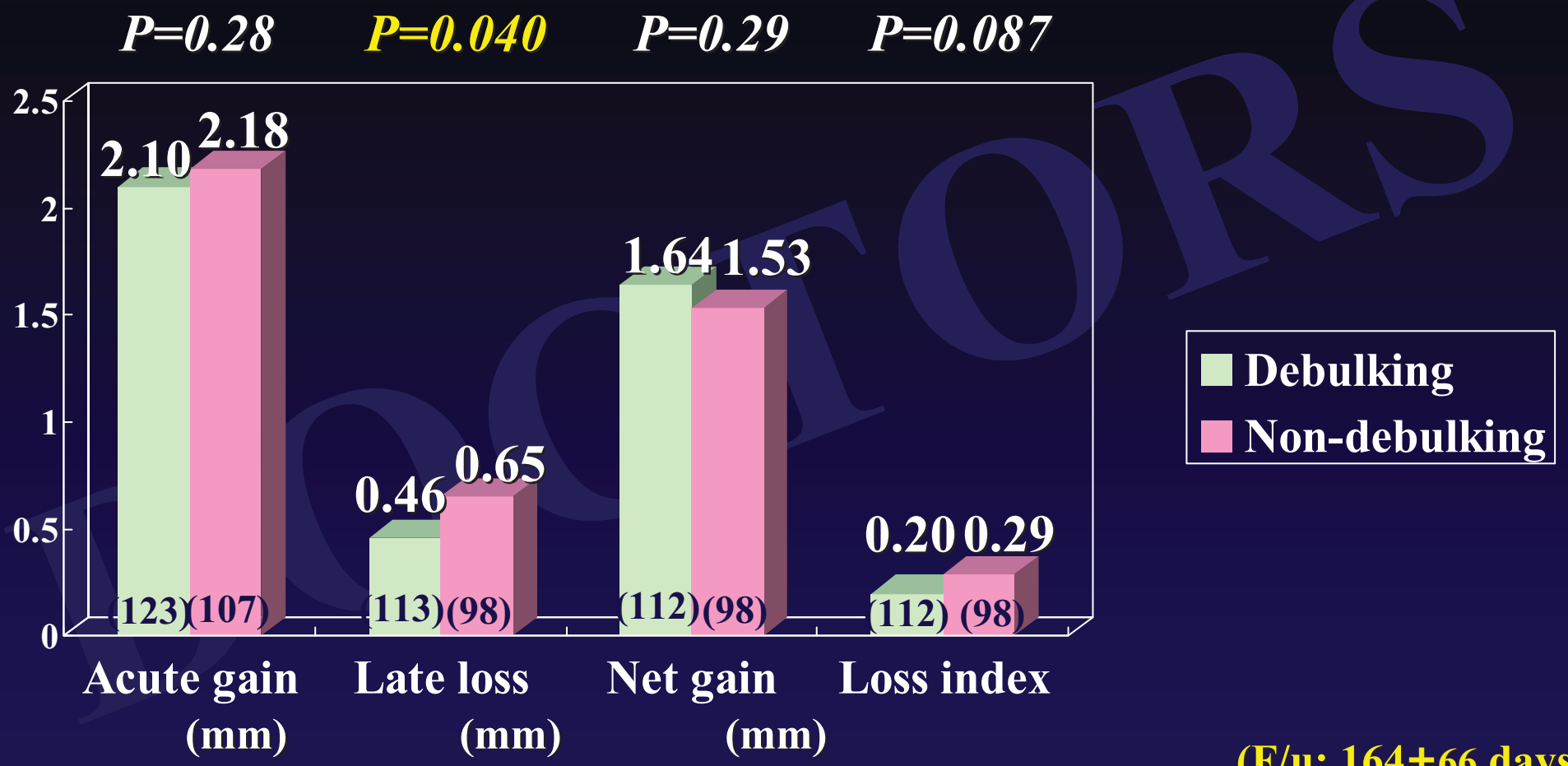


Tentative QCA Results

(F/u: 164±66 days)

		Debulking	Non-debulking	
Pre	Lesion Length (mm)	13.0±8.5	14.1±9.4	n.s.
	Reference Diameter (mm)	2.30±0.87	2.33±0.81	n.s.
	Minimal Lumen Diameter (mm)	0.024±0.15	0.042±0.19	n.s.
	Diameter Stenosis (%)	99.1±6.1	97.8±11.6	n.s.
Post	Reference Diameter (mm)	2.87±0.61	3.01±0.65	n.s.
	Minimal Lumen Diameter (mm)	2.11±0.55	2.22±0.58	n.s.
	Diameter Stenosis(%)	25.6±13.8	25.8±13.1	n.s.
F/u	Reference Diameter (mm)	2.60±0.63	2.61±0.68	n.s.
	Minimal Lumen Diameter (mm)	1.64±0.68	1.57±0.77	n.s.
	Diameter Stenosis(%)	37.0±22.4	41.5±25.5	n.s.
	Binary Restenosis Rate	21.0%	26.2%	n.s.

Lumen Dynamics - QCA



(F/u: 164±66 days)

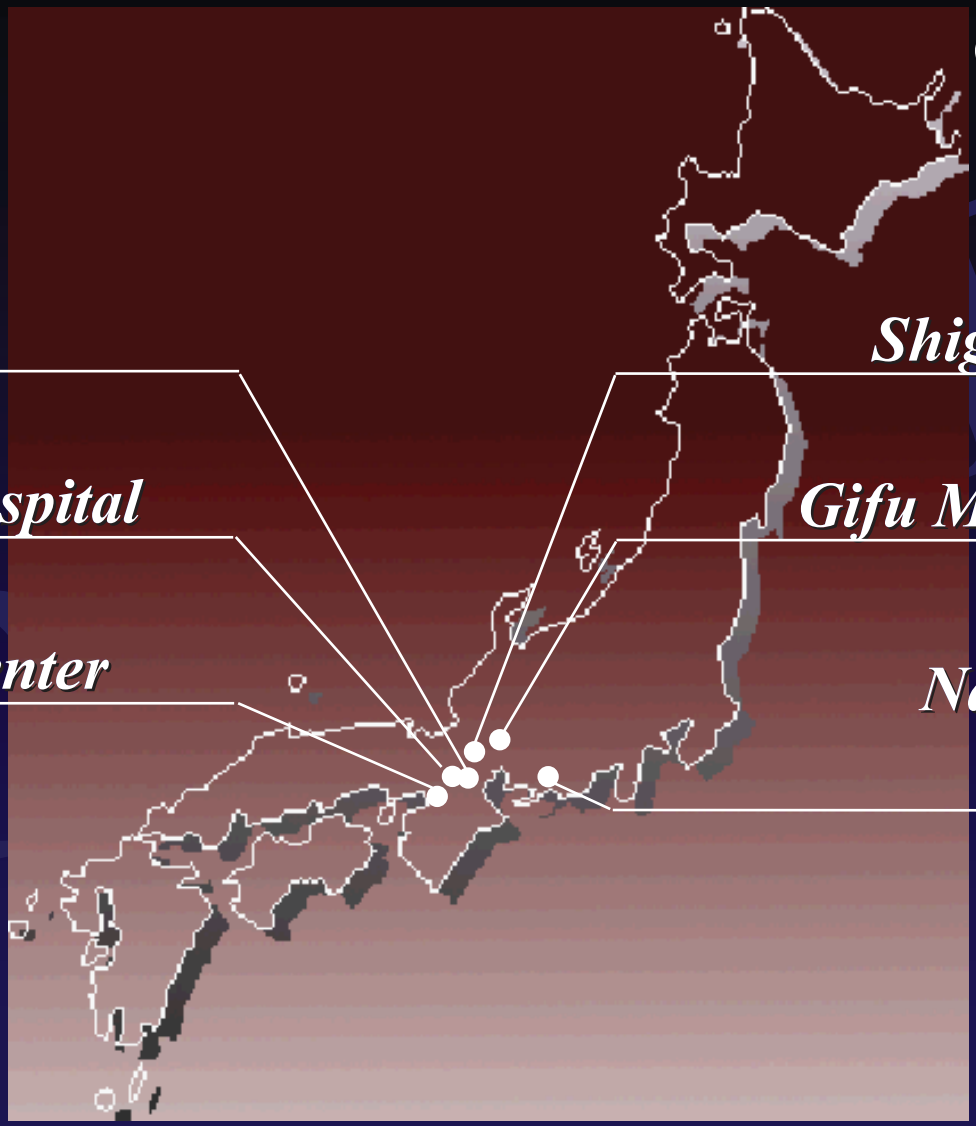
Summary

1. Both RA and DCA could be performed safely in selected CTO cases and facilitated subsequent stent implantation.

2. Pre-stent plaque debulking reduced the need of target vessel revascularization.

CTO-RA Multi-center Experience

(presented in JCS 1999)



Takeda Hospital

Kyoto Katsura Hospital

Osaka Medical Center

Shiga Medical Center

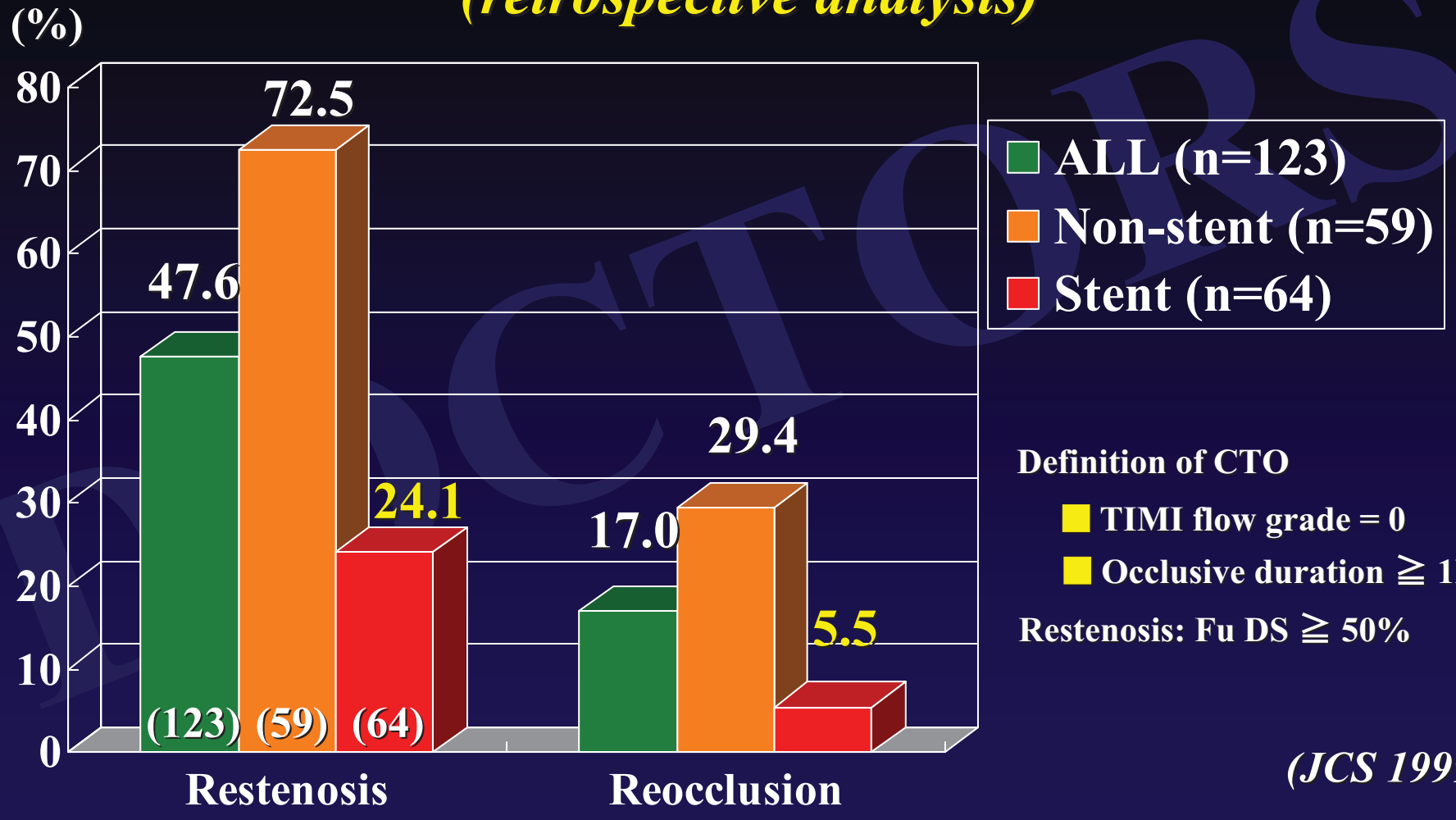
Gifu Municipal Hospital

National Toyohashi Higashi Hospital

Reduction of Restenosis

Japanese Multi-Center Experience

(retrospective analysis)



Definition of CTO

- TIMI flow grade = 0
- Occlusive duration ≧ 1Mo

Restenosis: Fu DS ≧ 50%

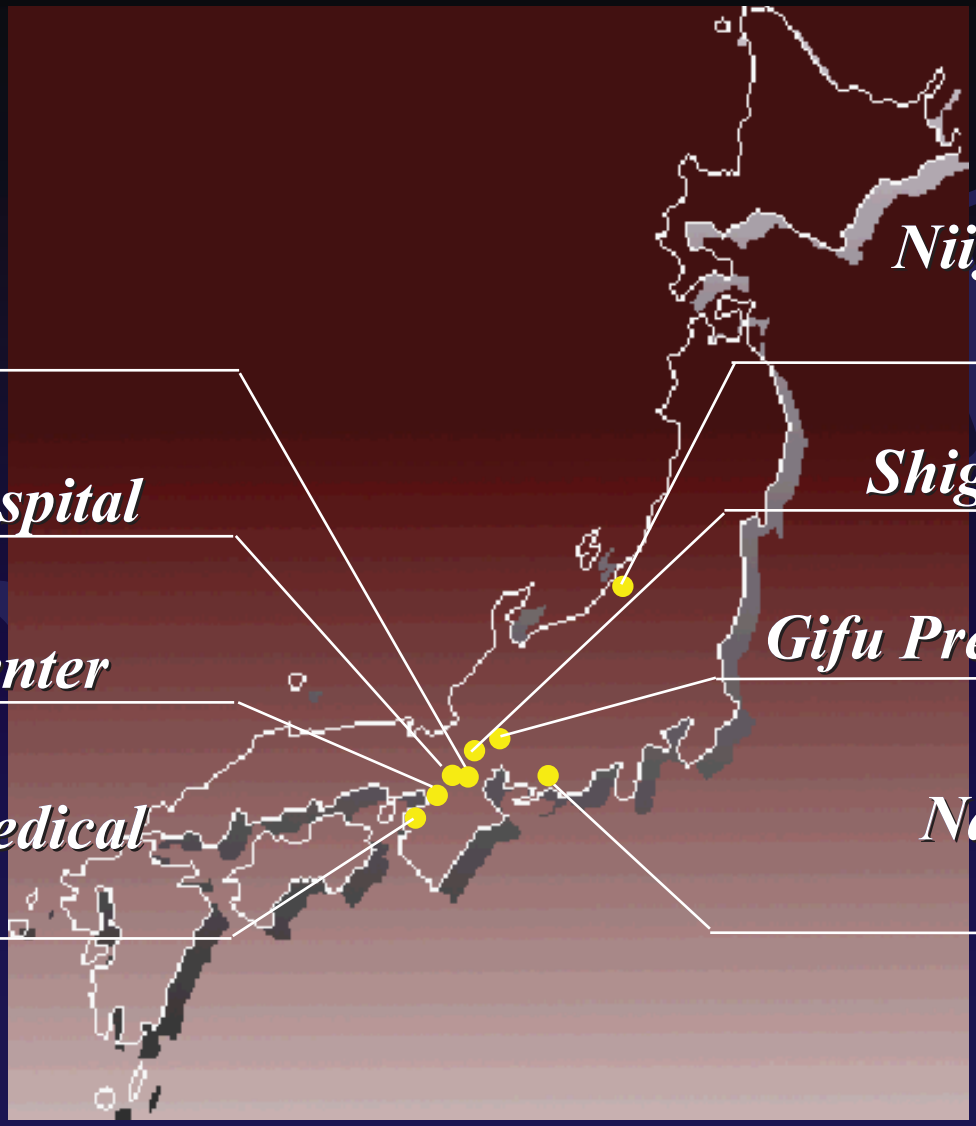
(JCS 1999)

Debulking Of Chronic Total Occlusion with RA before Stenting (DOCTORS)

Pilot Study

DOCTORS Investigators

Study Institutions



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Shiga Medical Center

Gifu Prefectural Hospital

National Toyohashi Higashi Hospital

Post Procedural Results

1. Procedural success: 99%

2. Patient success: 99%

3. Complication:

Death	0%
Em-CABG	0%
AMI	0%
Coronary rupture (RA distal site)	1%

4. Final TIMI flow grade

TIMI = 2	1%
TIMI = 3	99%

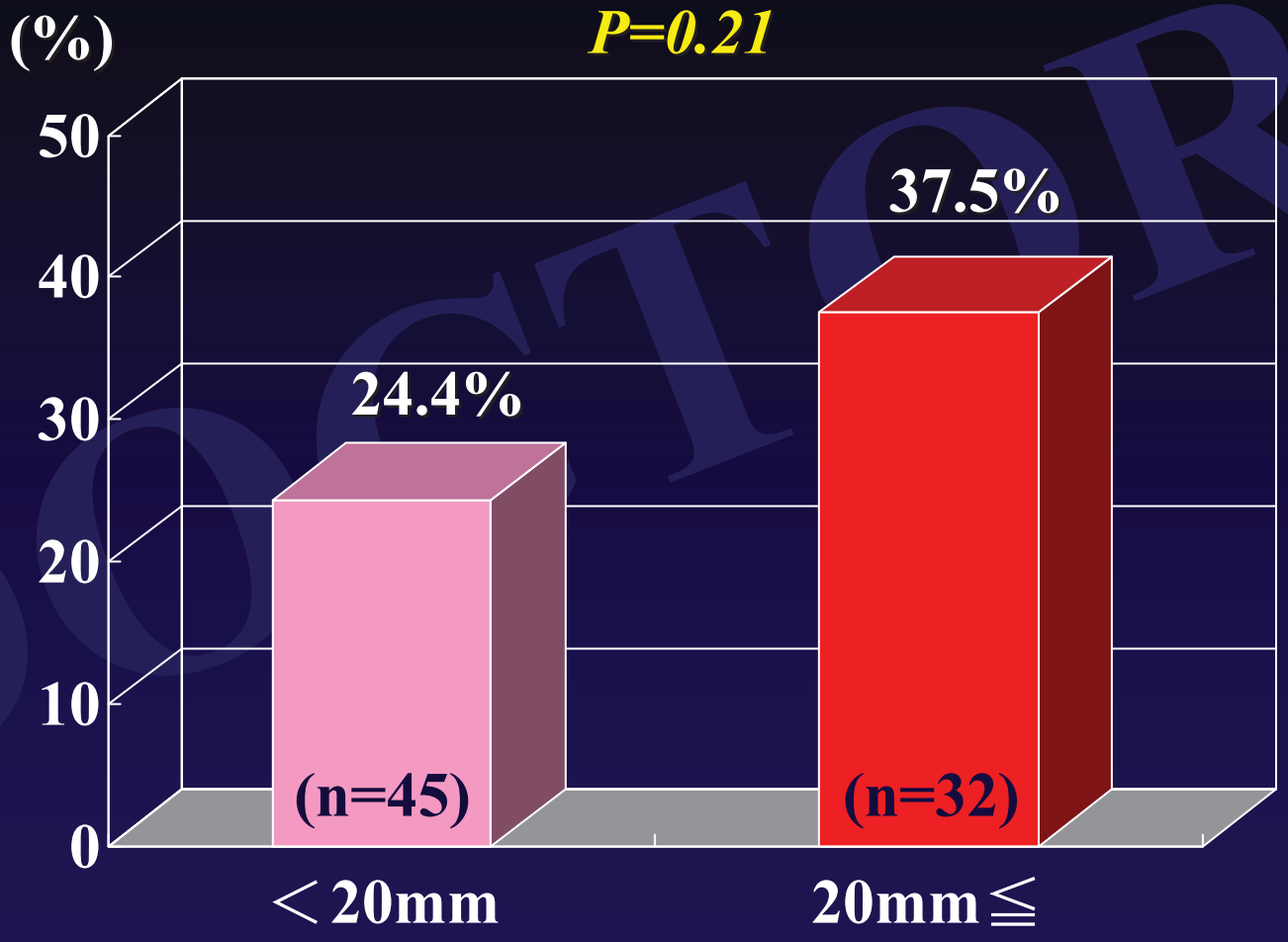
6M Follow-up Results

(N=100)

1. Death	4	
Cardiac	2	(1M: infectious pericarditis) (6M: sudden death)
Non-cardiac	2	(6M: renal failure) (6M: lung cancer)
2. Q-wave MI	0	
3. Unstable angina	2	
4. Angiographic Fu	81	
CABG	0	
Repeated PTCA	24 (29.6%) → TLR rate	

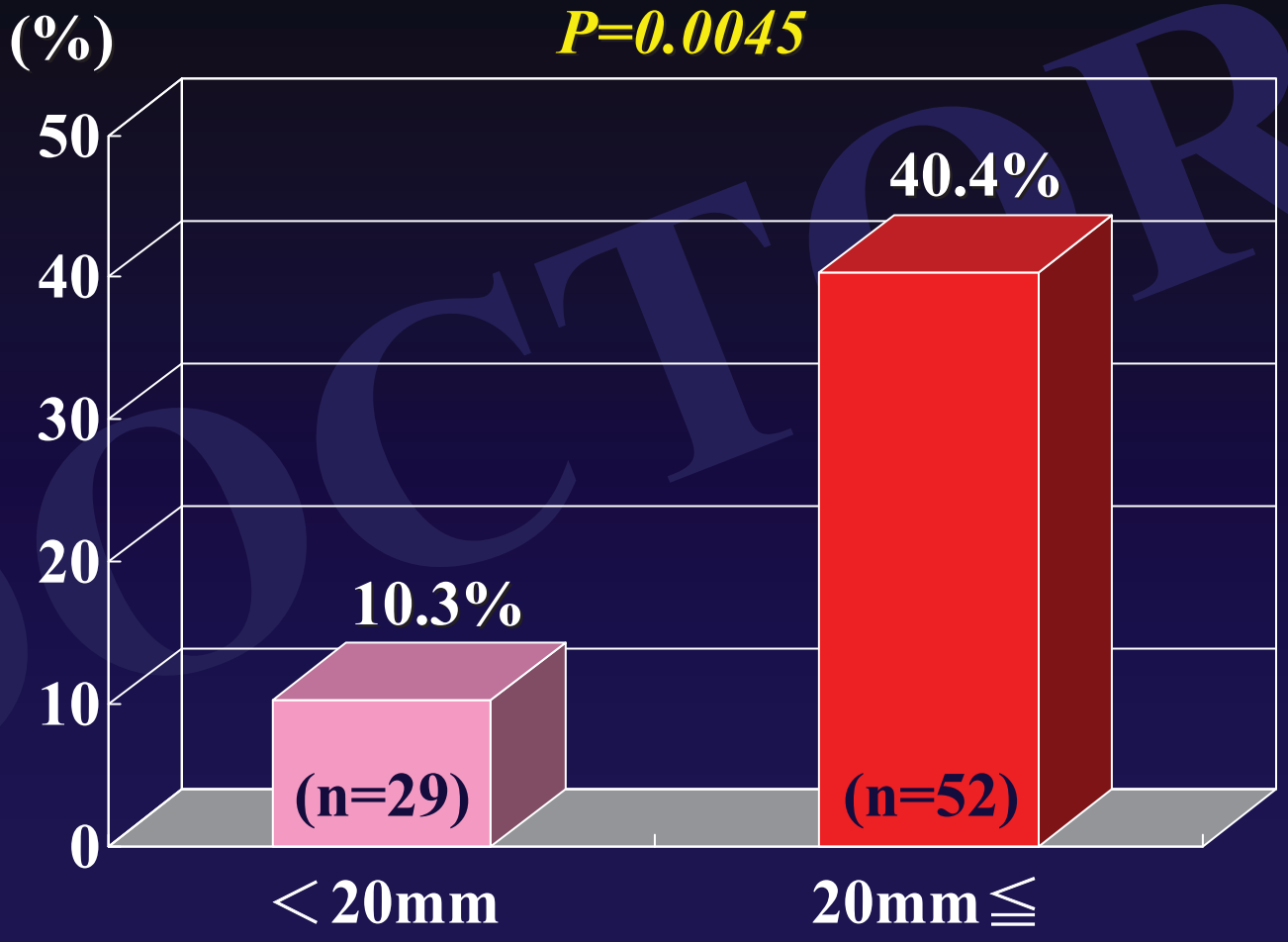
Predictors of TLR

Occlusion Length



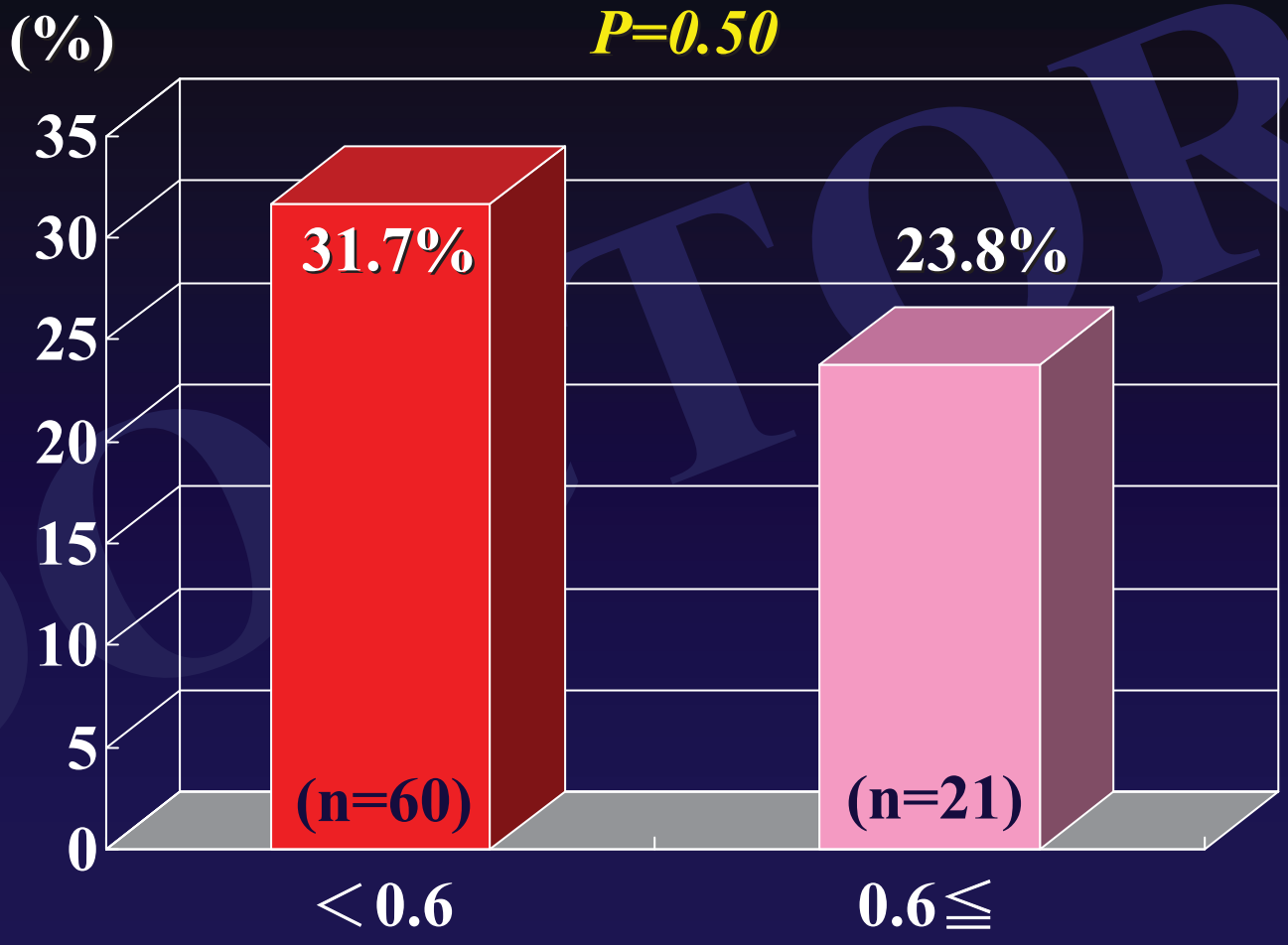
Predictors of TLR

Total Stent Length



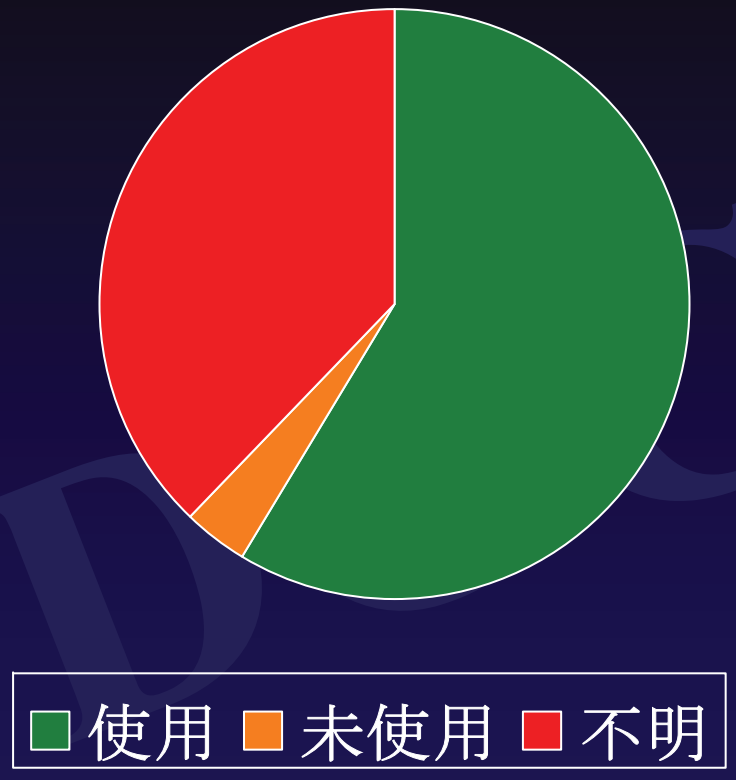
Predictors of TLR

Max. Burr / Balloon Ratio



IVUS Used

Debulking arm



Non-debulking arm