

A nighttime photograph of a city skyline across a body of water. The sky is a deep blue with some light clouds. The city lights are reflected in the water. A prominent skyscraper is illuminated in orange and white. Other buildings are lit in various colors like green and blue. A bridge is visible in the foreground.

CHRONIC TOTAL OCCLUSION:
***Rationale for Recanalization,
Patient Selection & Results***

Barry D. Rutherford, MD

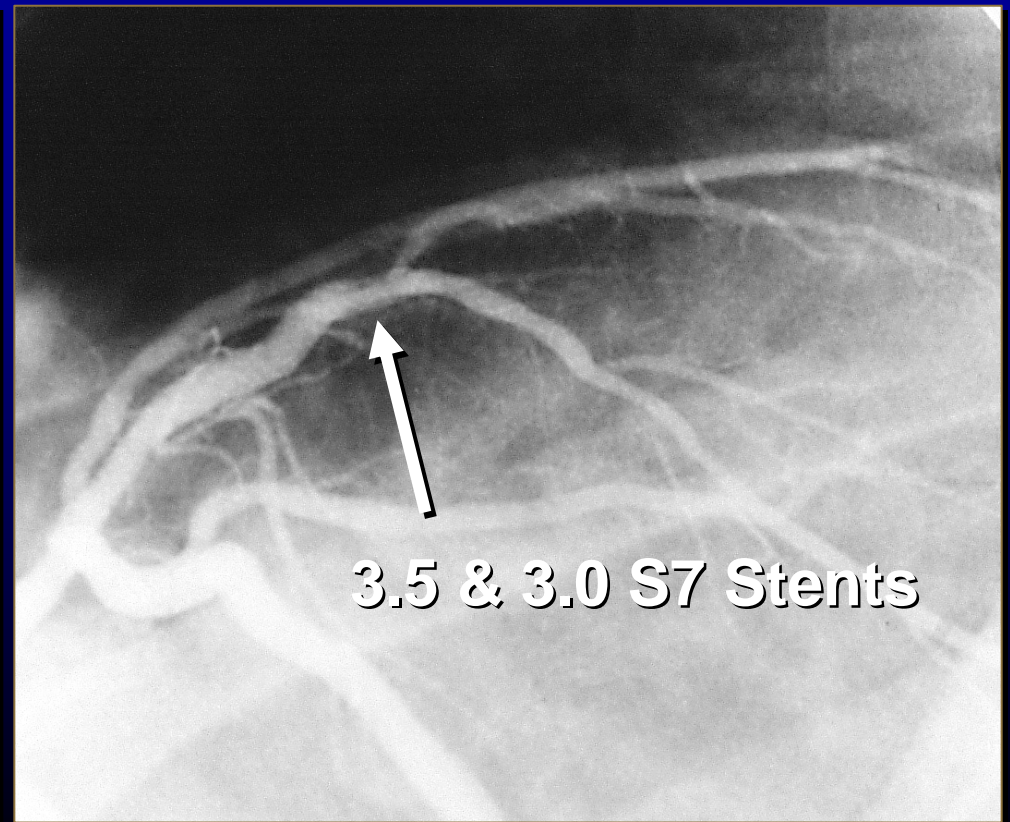
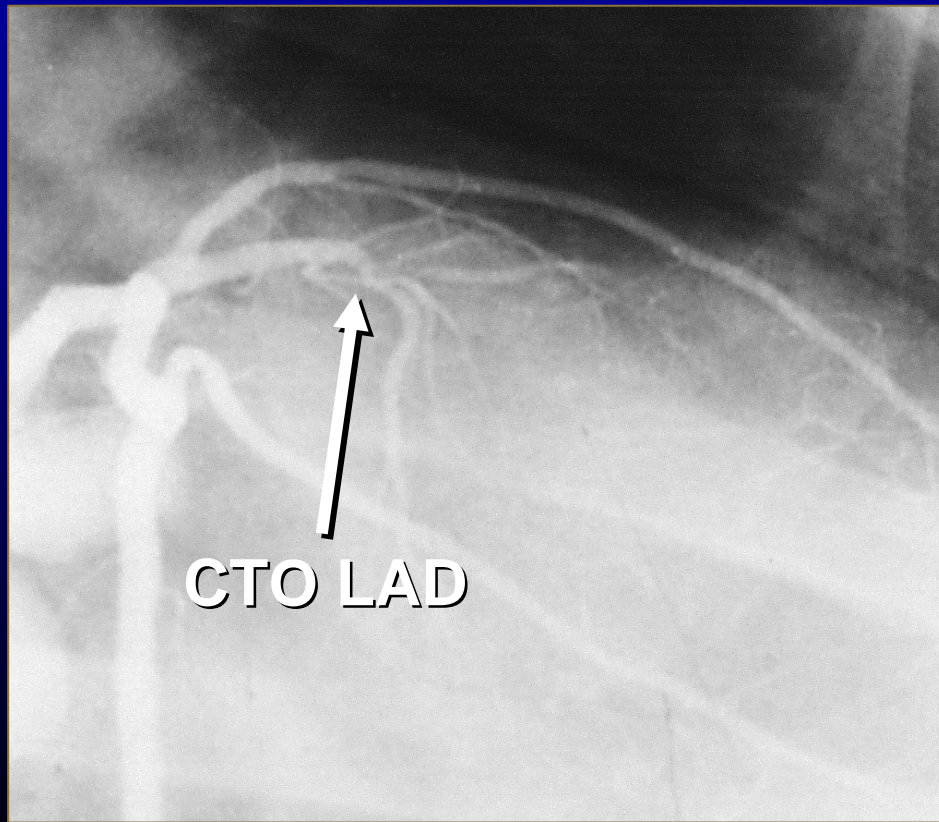
Angioplasty Summit 2006 – TCT Asia Pacific

**Why open a chronically
occluded coronary vessel?**



J.S. 48-Year-Old Male 6-Month Post Anterior MI

Procedure Date: June 22, 2000





Short Axis

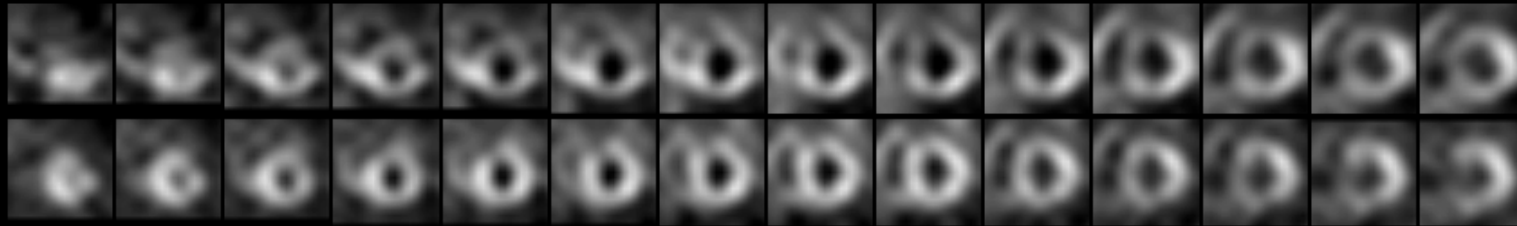
apex to base

ACQ: KF

PR: MJS

DSP: MJS

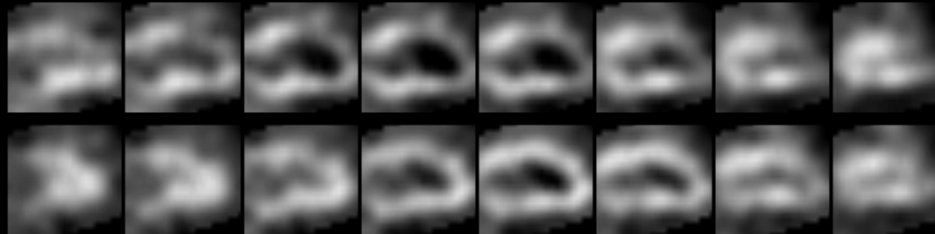
ant
sep lat
inf



Vertical Long Axis

sep to lat

ant
base apex
inf



Horizontal Long Axis

inf to ant

apex
sep lat
base



PERFUSION

STRESS

REST



63	LAD%	23
0	RCA%	0
0	LCX%	0
38	TOTAL%	15

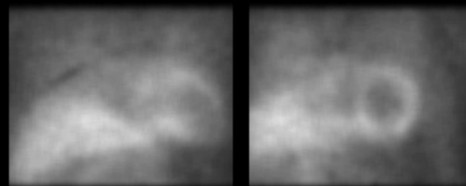
MOCO/TID= 1.13

FUNCTION

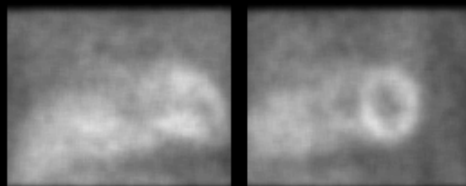
0.60 LUNG/HEART RATIO

LVEF 32%

STRESS



REST



20 Jun 00

JS



Short Axis

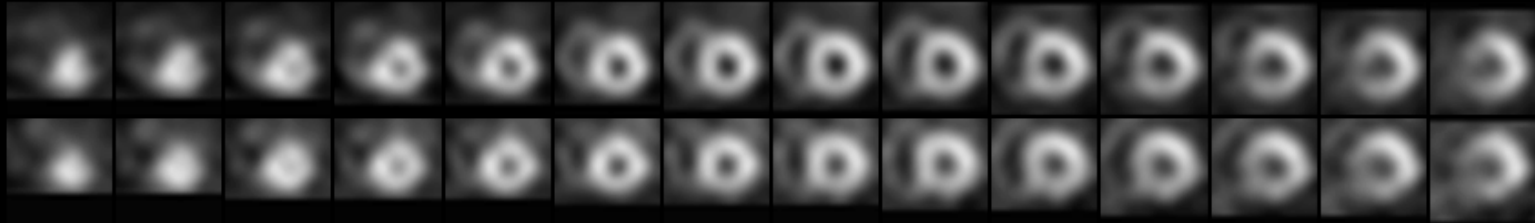
apex to base

ACQ: WS

PR: MJS

DSP: MJS

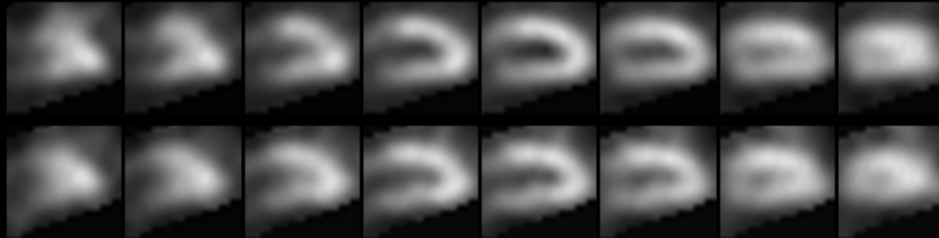
ant
sep lat
inf



Vertical Long Axis

sep to lat

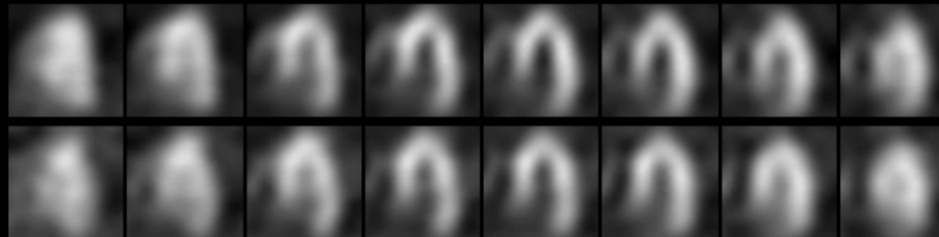
ant
base apex
inf



Horizontal Long Axis

inf to ant

apex
sep lat
base



PERFUSION

STRESS

REST



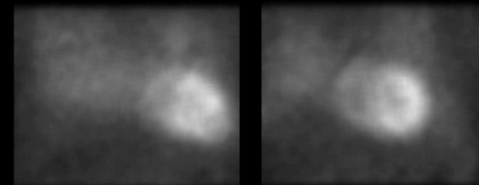
0	LAD%	0
0	RCA%	0
0	LCX%	0
3	TOTAL%	0

MOCO TID= 1.01

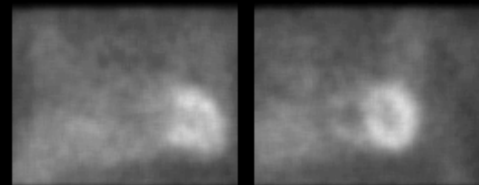
FUNCTION

0.50 LUNG/HEART RATIO

STRESS



REST



LVEF 52%

30 Aug 01

JS

Predictors of Improvement in LV Function After PCI of Occluded Coronary Arteries (TOSCA)

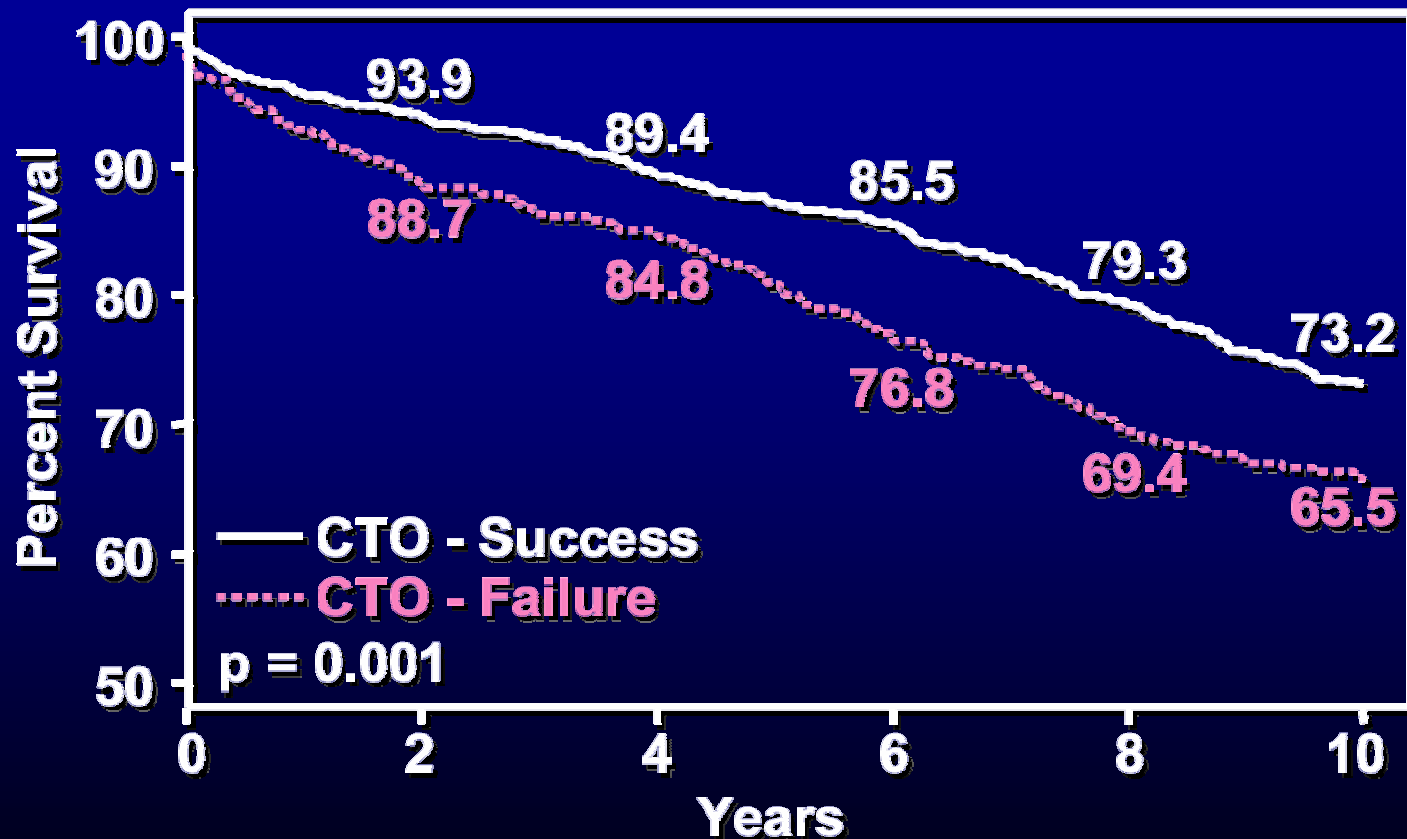
244 pts, baseline & 6-month F/U angios, target vessel patency

	Baseline LVEF	Change	p-value
All patients (%)	59.4 ± 11.9	1.6 ± 7.8	< 0.005
Occlusion Duration			
≤ 6 weeks	56.0 ± 11.6	3.0 ± 8.7	0.014
> 6 weeks	62.0 ± 11.5	0.5 ± 7.0	
Baseline LVEF (%)			
≤ 60 (%)	45.6 ± 8.7	3.8 ± 8.4	< 0.001
> 60 (%)	68.3 ± 6.0	-0.4 ± 6.7	
F/U Vessel Patency			
TIMI 0-2	59.4 ± 11.4	-0.6 ± 6.1	0.06
TIMI 3	59.4 ± 12.0	2.0 ± 8.1	



Procedural Outcomes and Long-Term Survival for PCI of Chronic Total Occlusion

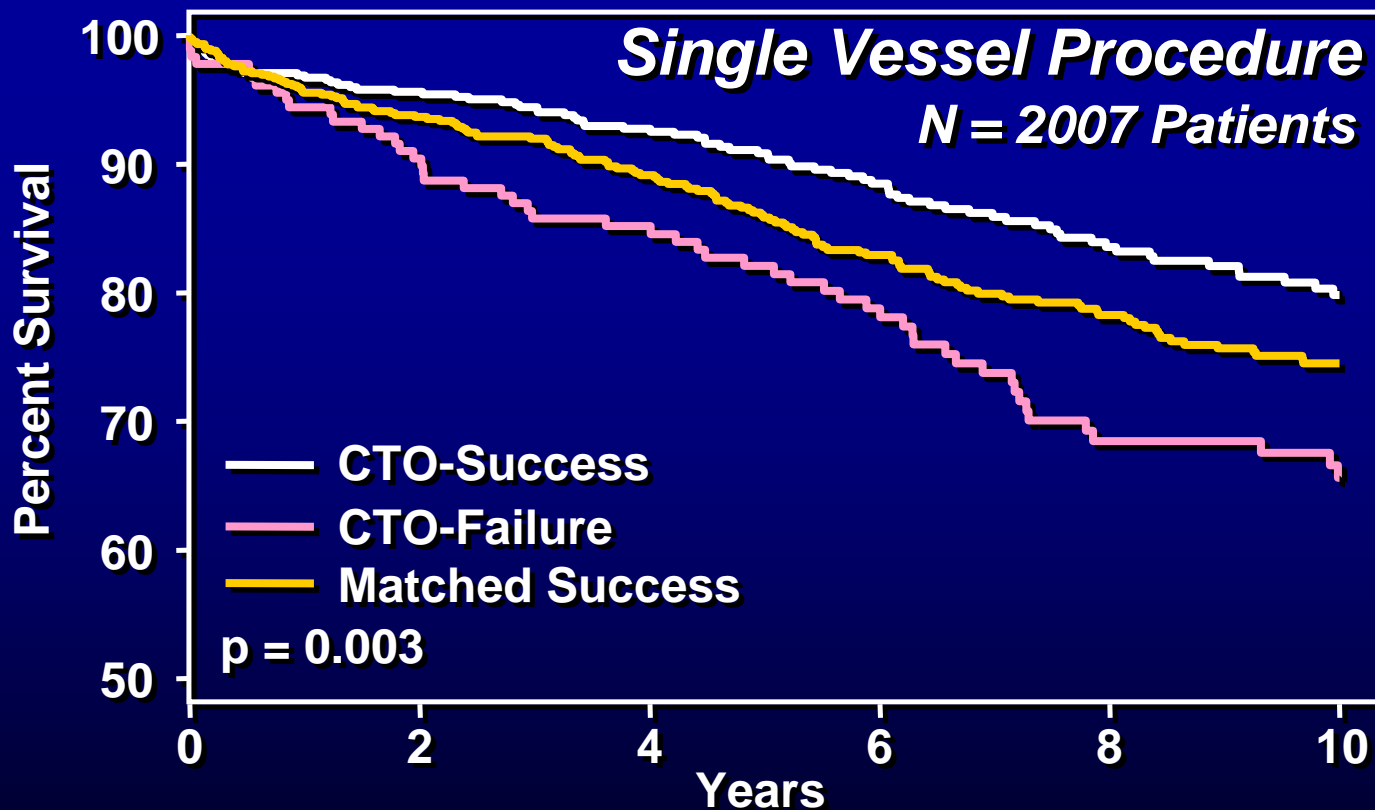
2007 Patients, 20-Year Experience



CTO, n = 1486 1294 1065 806 582



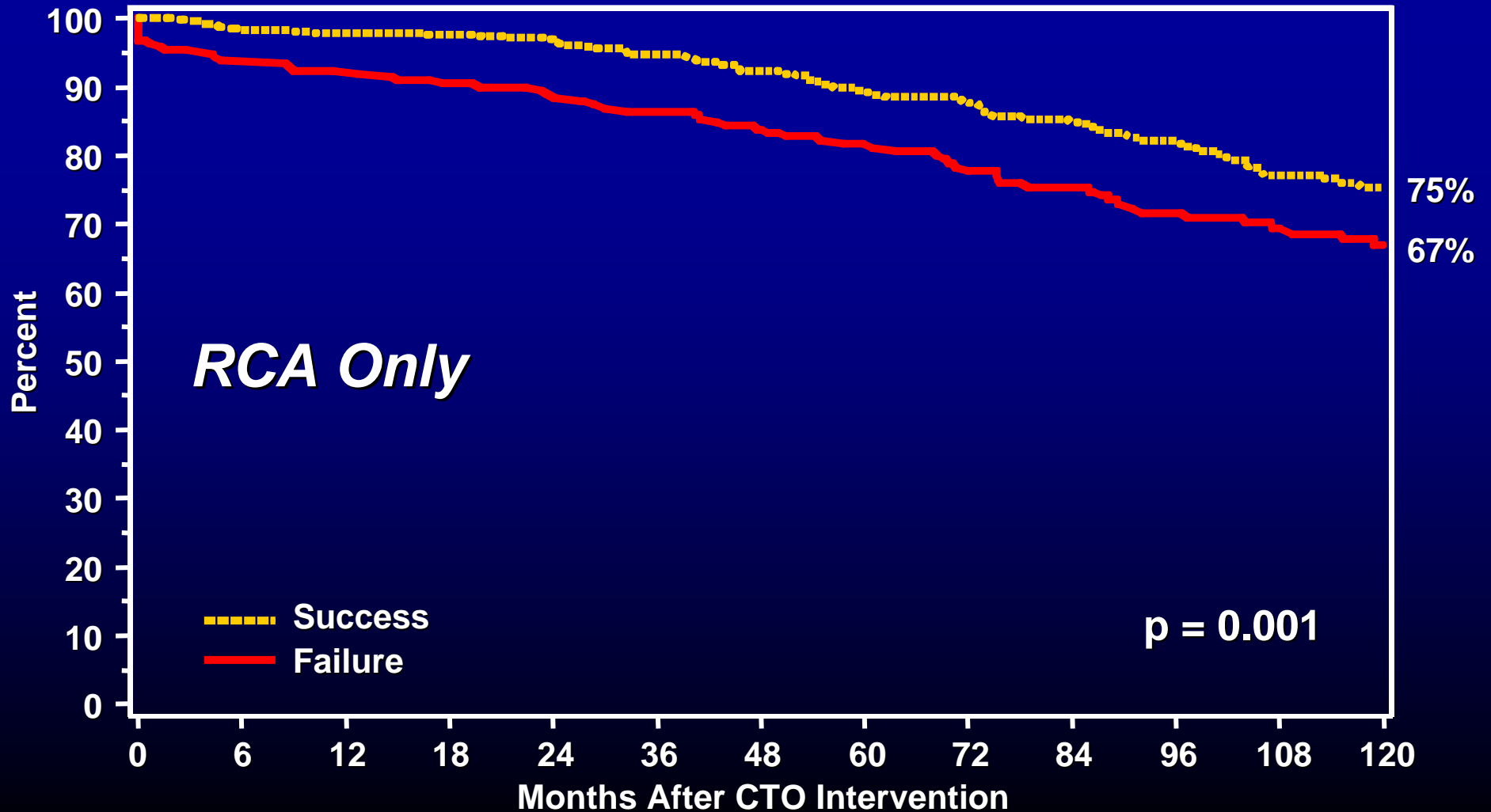
Procedural Outcomes and Long-Term Survival for PCI of Chronic Total Occlusion



CTO-Success %	95.6	92.7	88.5	83.6	79.8
CTO-Failure %	90.4	85.2	78.8	68.5	65.6
Matched Success %	93.7	89.1	82.9	78.3	74.5

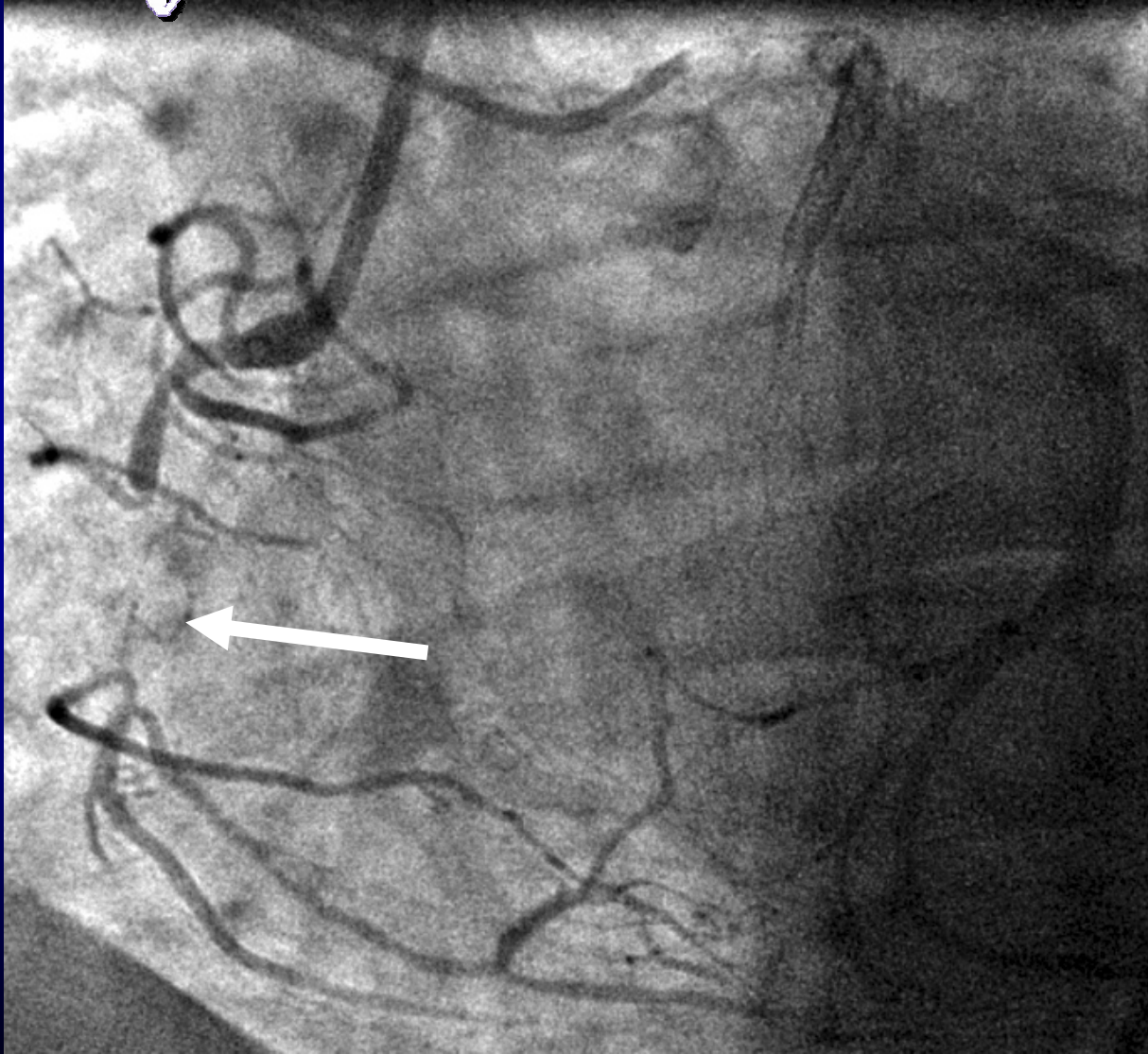


Procedural Outcomes and Long-Term Survival for PCI of Chronic Total Occlusion



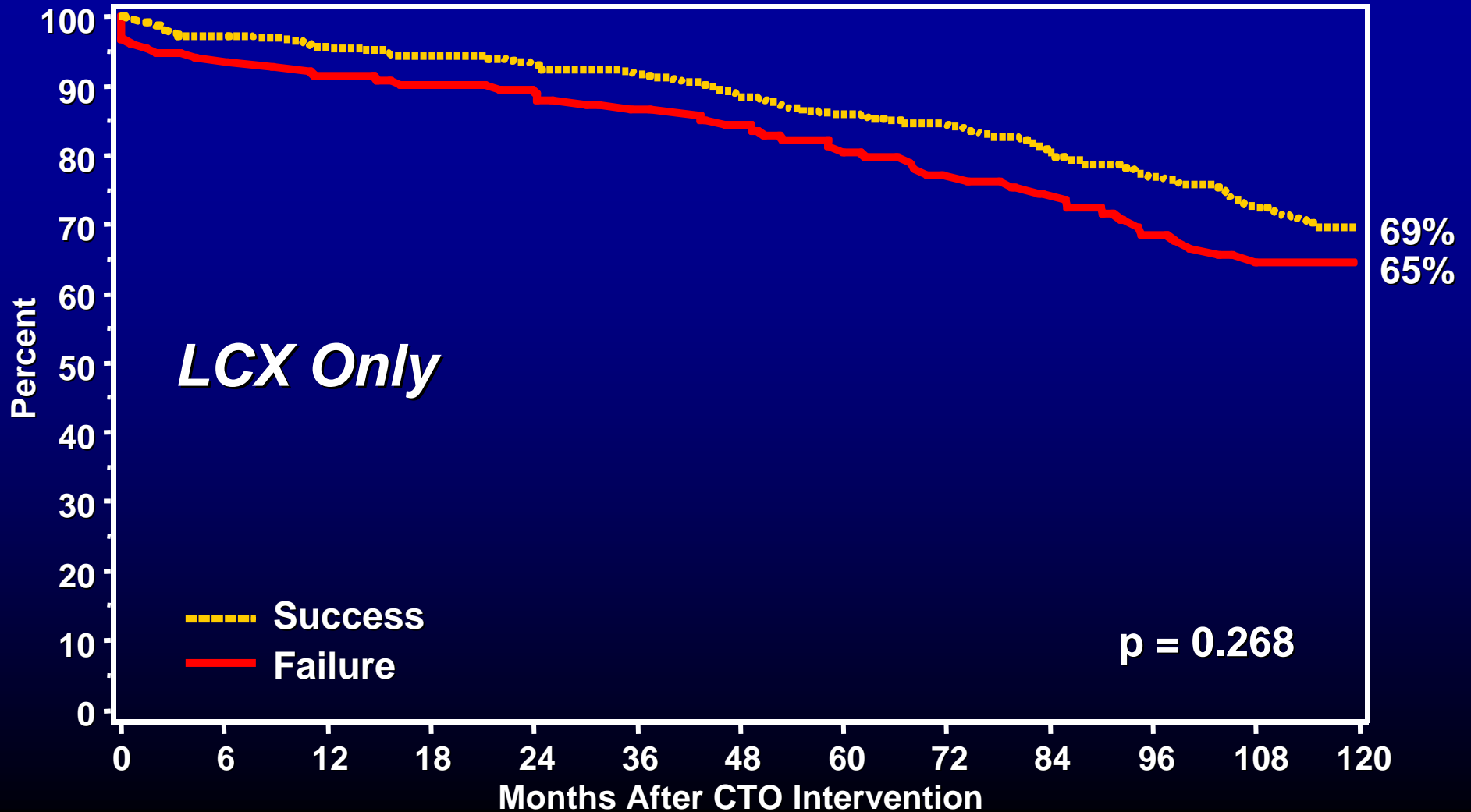


64-Year-Old Male 24-Month CTO of RCA



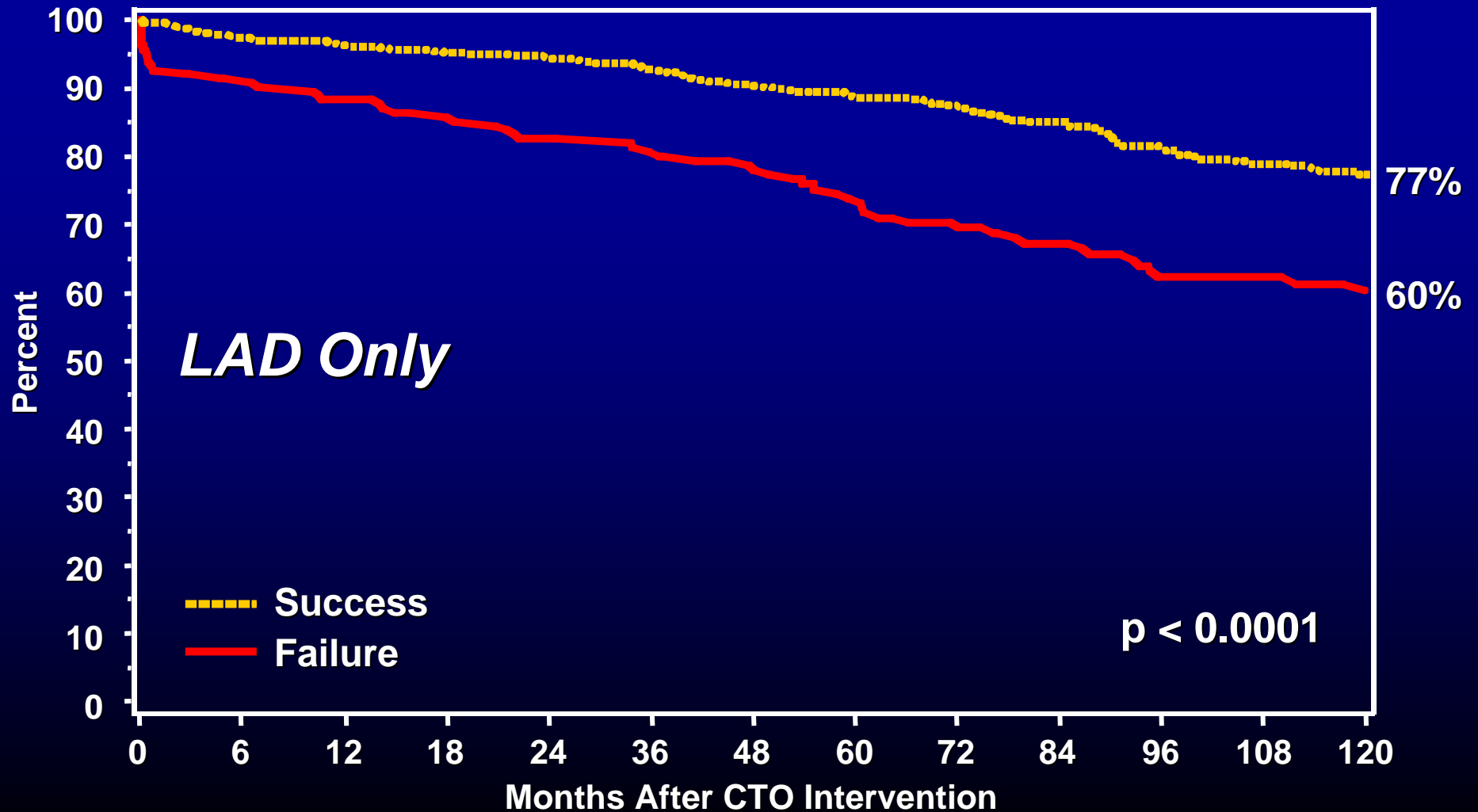


Procedural Outcomes and Long-Term Survival for PCI of Chronic Total Occlusion



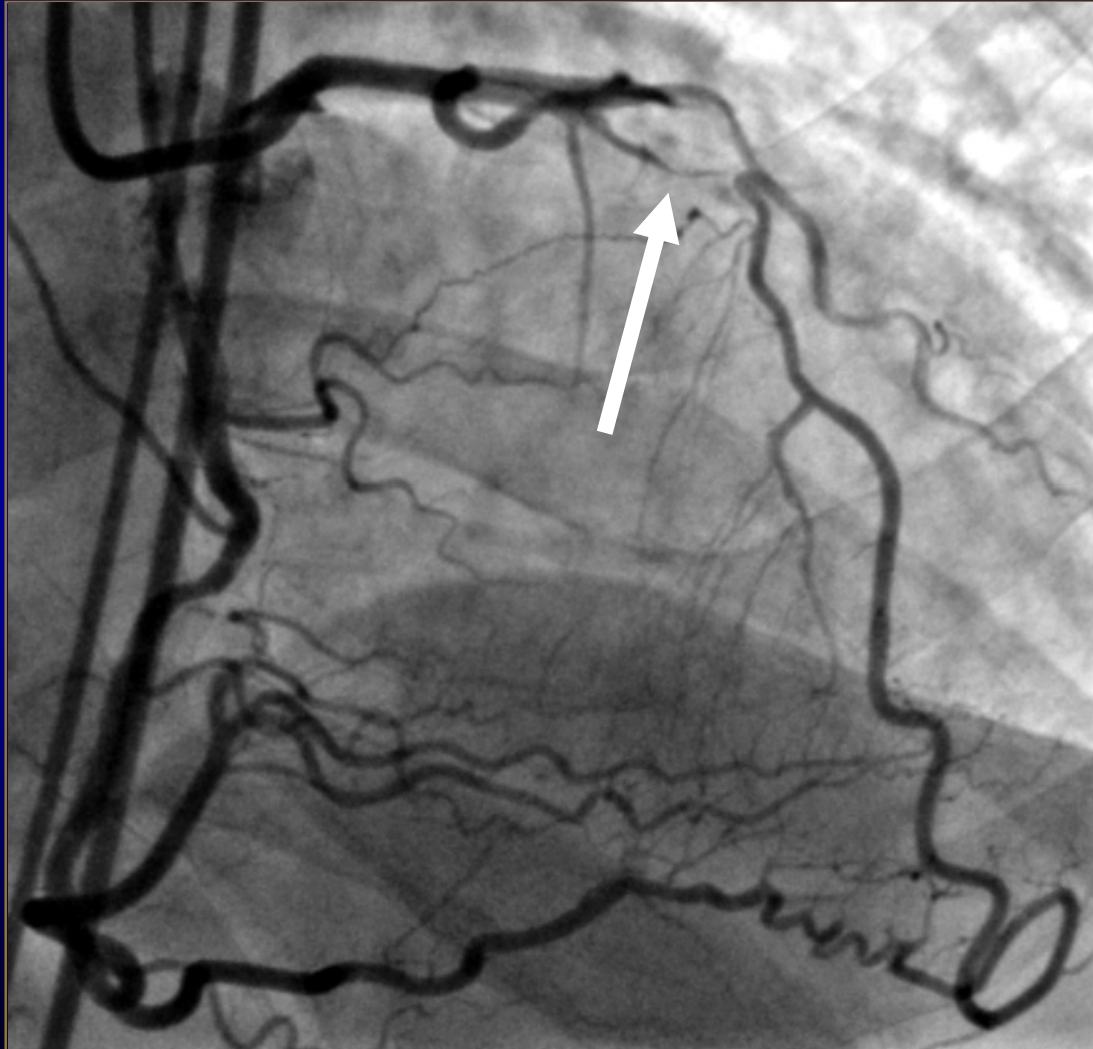


Procedural Outcomes and Long-Term Survival for PCI of Chronic Total Occlusion





53-Year-Old Male 6-months CTO LAD



Immediate Results and One-Year Clinical Outcome After PCI in Chronic Total Occlusions

Data from Multicenter, Prospective Study (TOAST-GISE)

12-Month Clinical Outcome

	CTO Success N = 286	CTO Failure N = 83	p-value
All deaths	3 (1.05%)	3 (3.6%)	0.13
Cardiac death	1 (0.3%)	3 (3.6%)	0.03
Non fatal Q MI	1 (0.3%)	-	
Non fatal Non Q MI	1 (0.3%)	3 (3.6%)	0.3
Cardiac death/MI	3 (1.0%)	6 (7.2%)	0.005
CABG	7 (2.4%)	13 (15.7%)	< 0.0001
Any TLR	33 (11.5%)	19 (22.9%)	0.01
Any MACE	35 (12.2%)	21 (25.3%)	0.005

Only MV predictor of MACE free survival was successful opening of CTO

Percutaneous Coronary Intervention for CTO: Thoraxcenter Experience 1992-2002

874 pts, 885 CTO's, Follow-up mean 4.1 years
Success Rate 65.1%, Stents in 81%

	CTO Success N = 567	CTO Failure N = 3.4	p-value
MACE at 30 days (%)	5.5	14.8	< 0.0001
Death or AMI (%)	1.2	2.3	0.2
Death or CABG (%)	1.8	9.9	< 0.0001
5-Year Survival (%)	93.5	88.0	0.02
5-Year MACE-Free Survival (%)	63.7	41.7	0.0001

Percutaneous Coronary Intervention for CTO: Thoraxcenter Experience 1992-2002

Independent Predictors of Death and MACE After Attempted PCI of CTO

	Hazard Ratio	p-value
Death		
Successful Revascul.	0.58	0.04
Age	1.04	0.002
Diabetes mellitus	2.49	0.005
MVD	4.29	< 0.001
MACE		
Successful Revascul.	0.55	< 0.001
MVD	1.43	0.002
Use of Stent	0.69	0.002



Chronic Total Occlusion

Selection of Patients for PCI

Favorable Anatomy

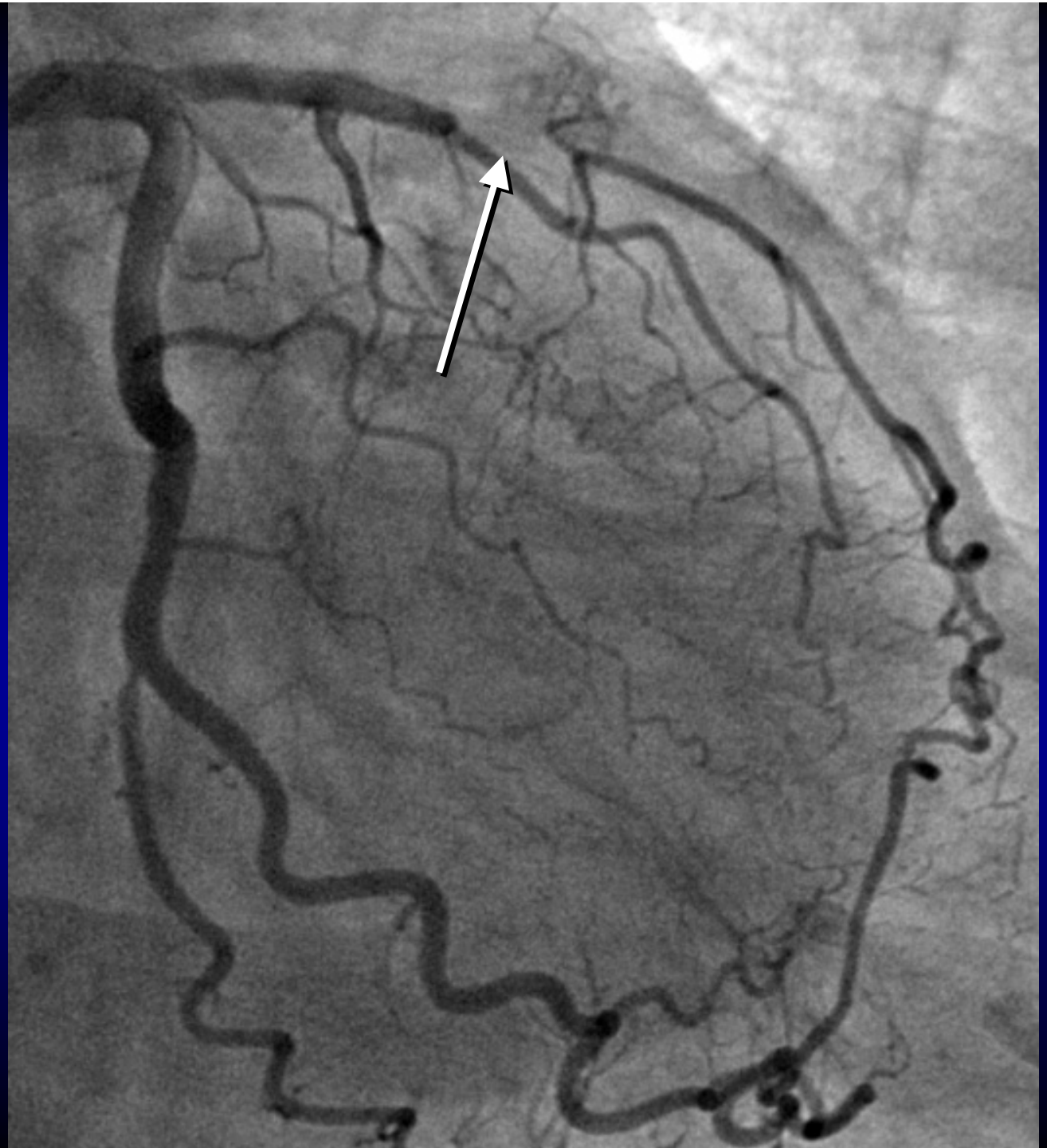
- ✧ Tapered point of occlusion
- ✧ Visible microchannels
- ✧ No side branch
- ✧ Bridging collaterals absent
- ✧ CTO < 3 months old
- ✧ Short gap < 15-20 mm
- ✧ Mild calcification

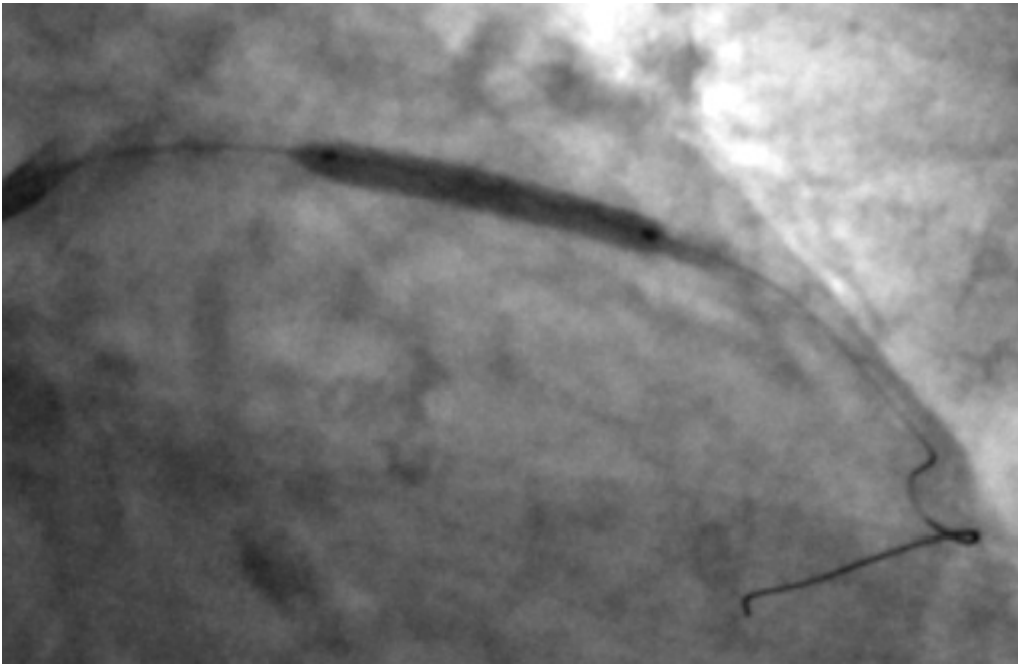
Complex Anatomy

- ✧ Blunt occlusion
- ✧ No visible channel
- ✧ Side branch at site of CTO
- ✧ Bridging collaterals present
- ✧ CTO > 3 months old or unknown
- ✧ Gap > 20 mm
- ✧ Severe calcification

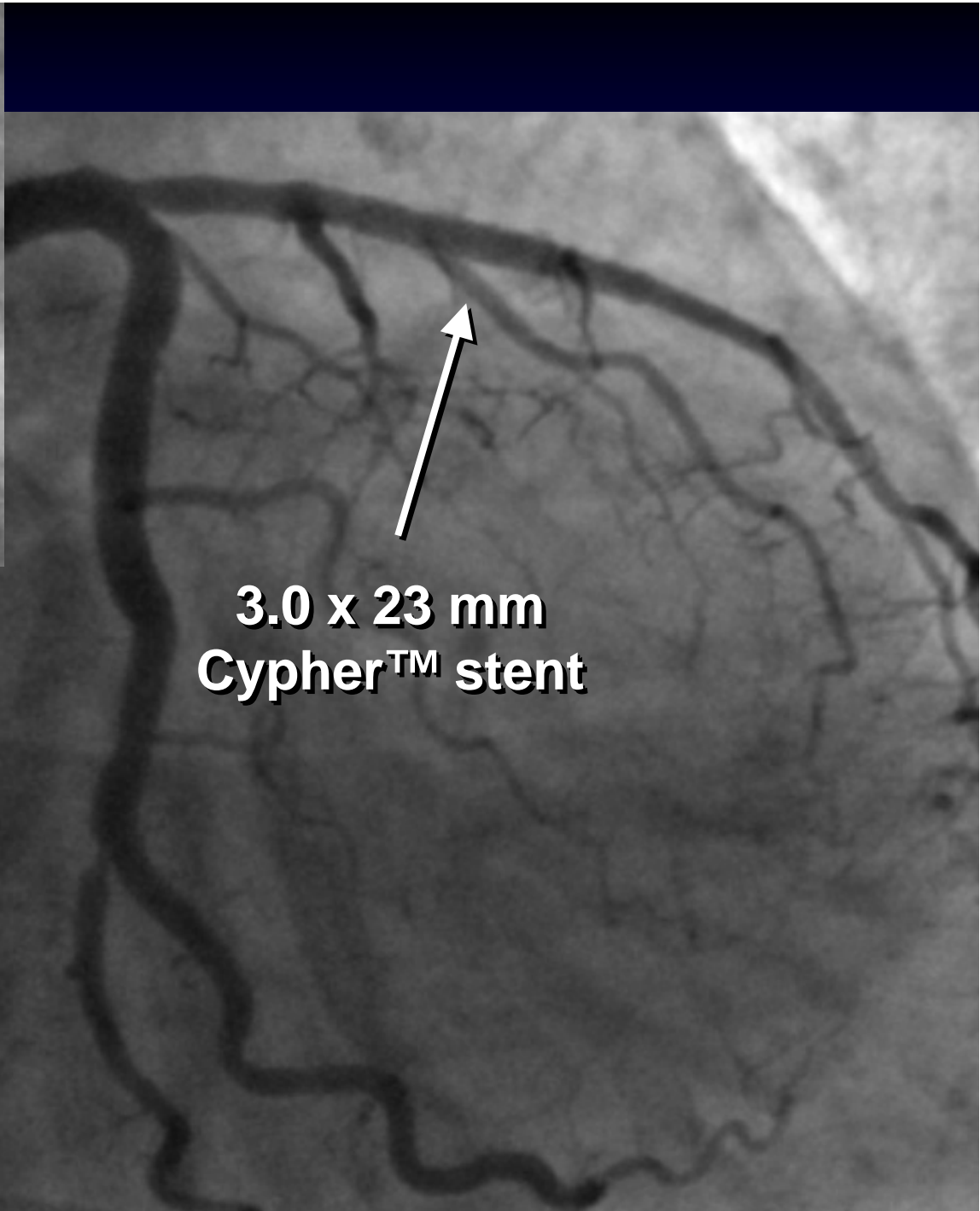


**Tapered
point
at CTO,
no bridging
collaterals
and
short gap**





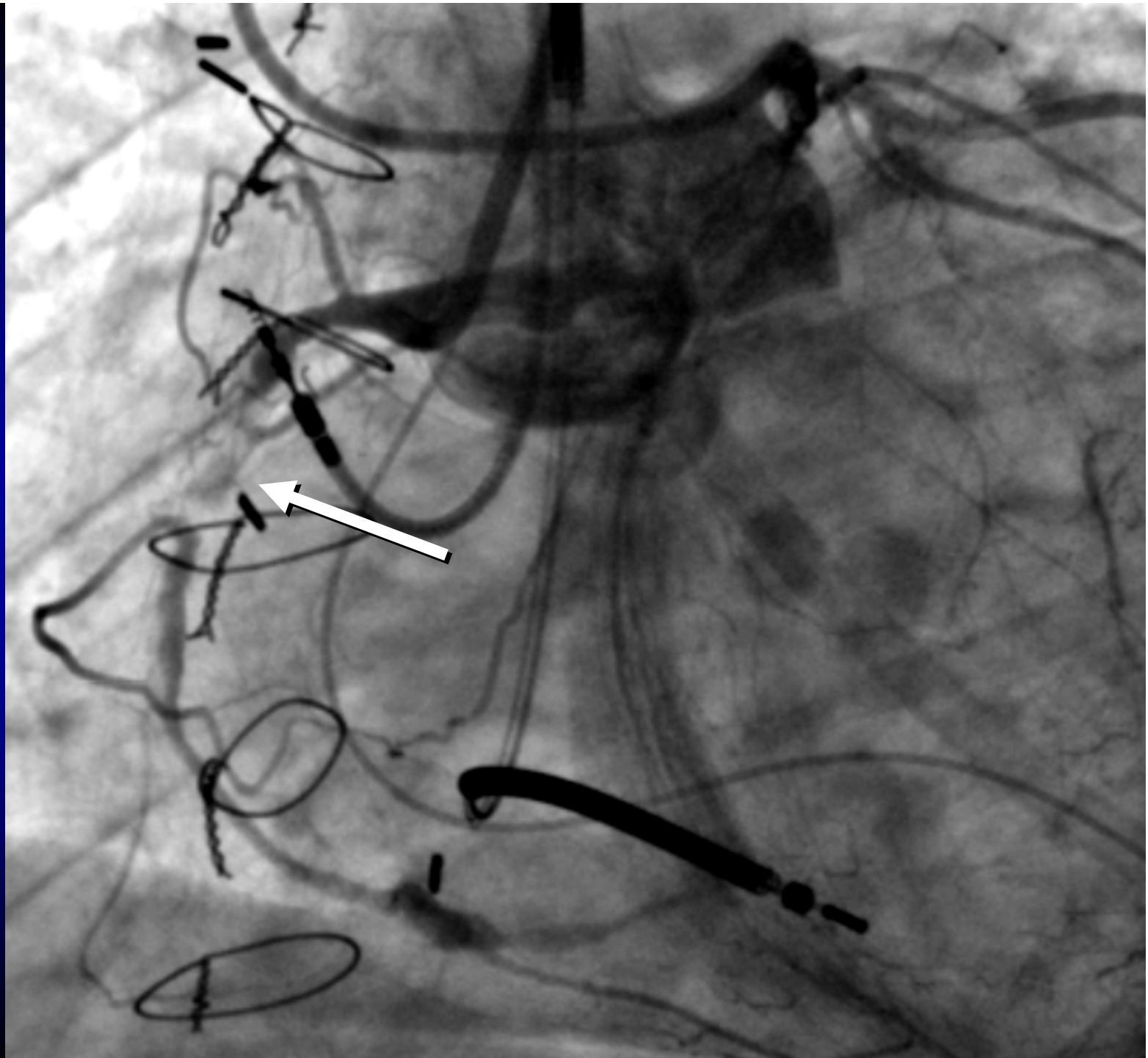
**Opened with
Asahi medium wire**



**3.0 x 23 mm
Cypher™ stent**

CTO
Severe RCA
Calcification

Failed
procedure



Predictors of Procedural Failure in Chronic Total Occlusion

934 Pts, 1039 Lesions, 1995-2004; Kurashiki, Japan

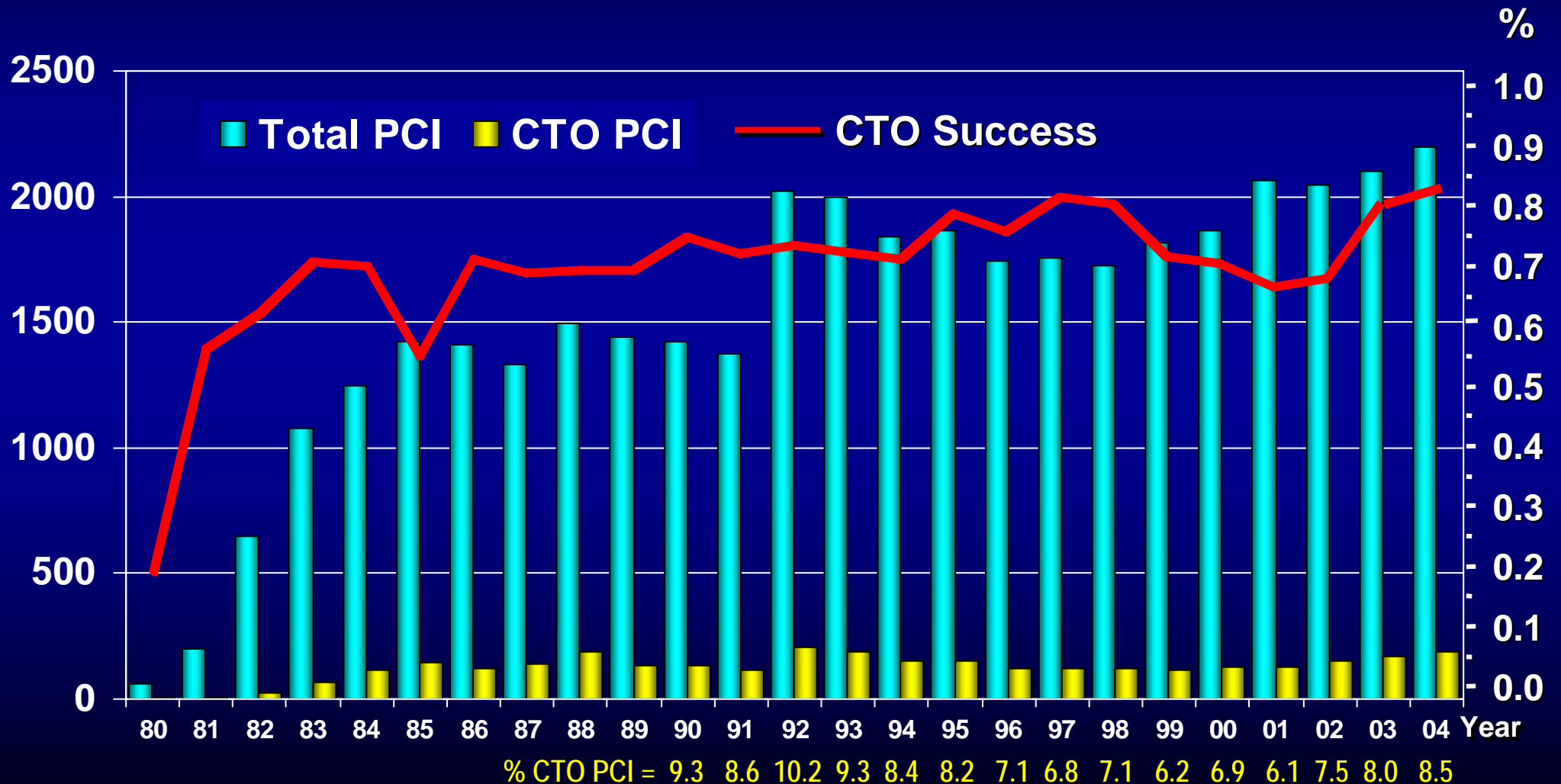
	Period 1 9/95-9/96 Conquest na	Period 2 10/96-10/98 Conquest na	Period 3 11/98-3/01 Conquest	Period 4 3/01-3/04 Double wire
Success Rate	64.6%	67.9%	81.0%	87.7%

Independent Predictors of Failure

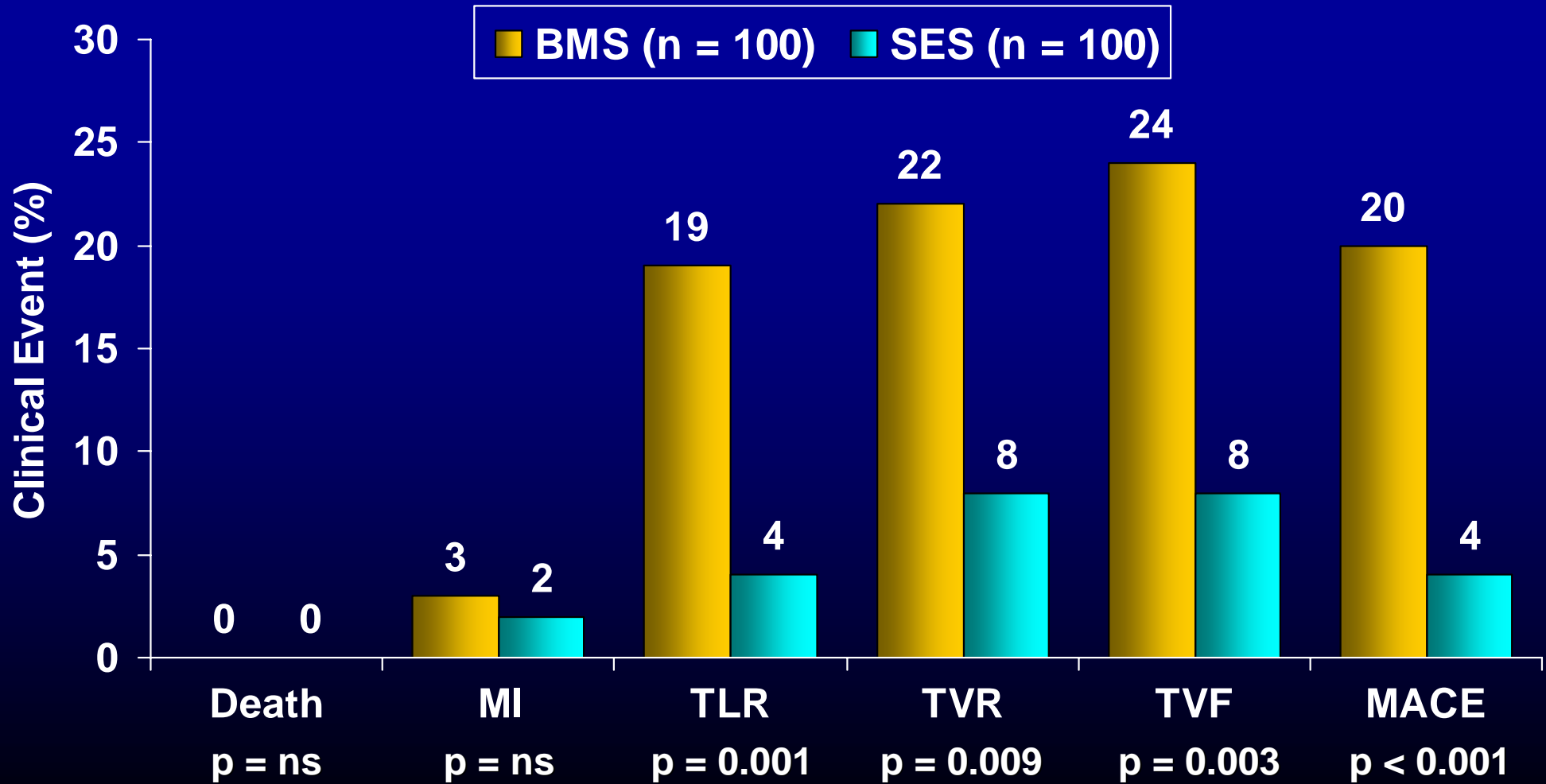
Period 1 & 2	Period 3	Period 4
Length of Occlusion	Length of Occlusion	Calcification
Duration of Occlusion		XS Tortuosity



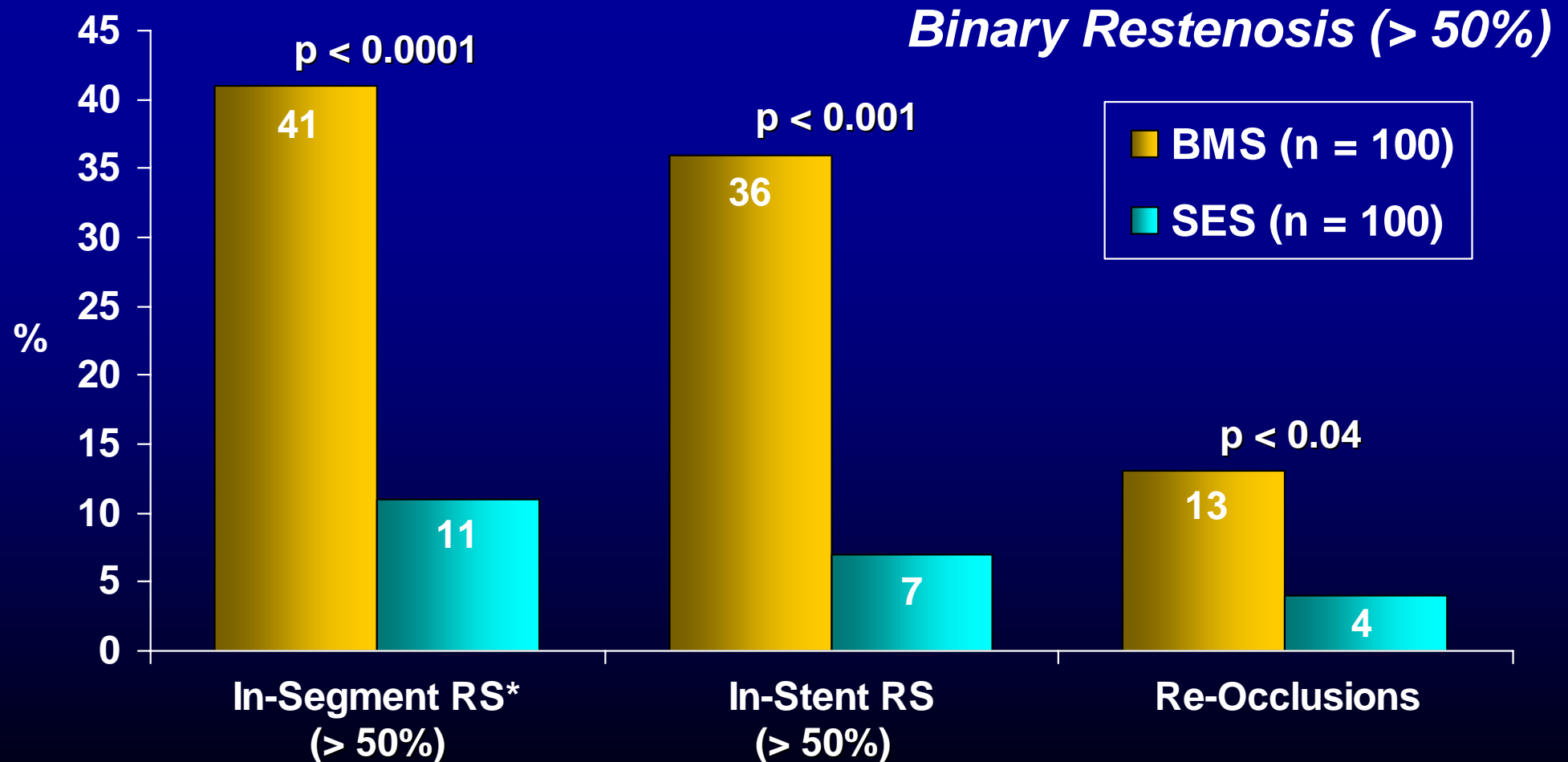
Chronic Total Coronary Occlusion MAHI Experience



PRISON II – Randomized Trial of SES vs. BMS for CTO: 6-Month Clinical F/U



PRISON II – Randomized Trial of SES vs. BMS for CTO: 6-Month Angiographic F/U



Note: *Stented segment including proximal & distal 5 mm

Chronic Total Occlusion

Keys to Success

☆ Case selection

- Careful review of angiogram**

☆ Equipment selection

- Become familiar with a single wire set**

☆ Patience and perseverance

☆ Consider concentrating cases on “CTO Day”

☆ Stent with drug eluting stents for best long-term results