THE ROLE OF HEMODYNAMIC SUPPORT IN EMERGENT PERCUTANEOUS REVASCULARIZATION

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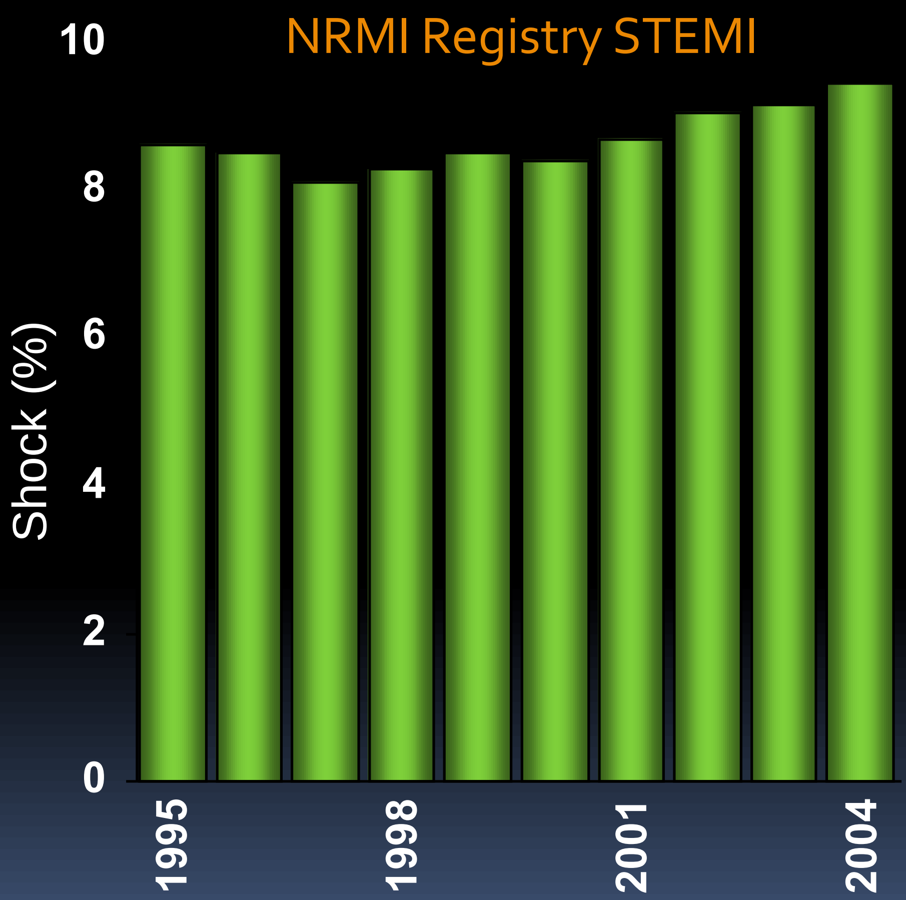
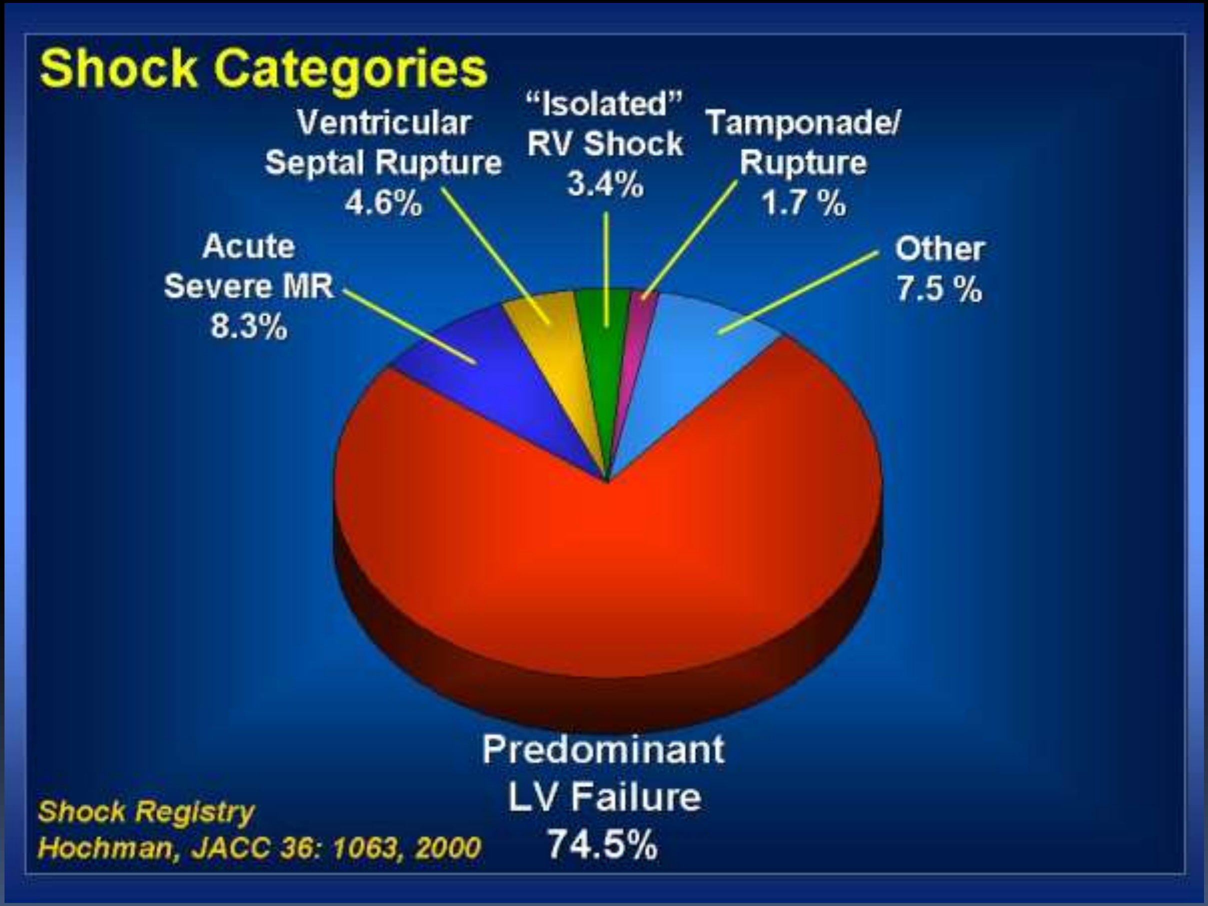
Cardiogenic Shock Incidence



- ~8% of STEMI in NRMI
- 2% of NSTEMI
- ~50,000 patients per year
- 11% 2014

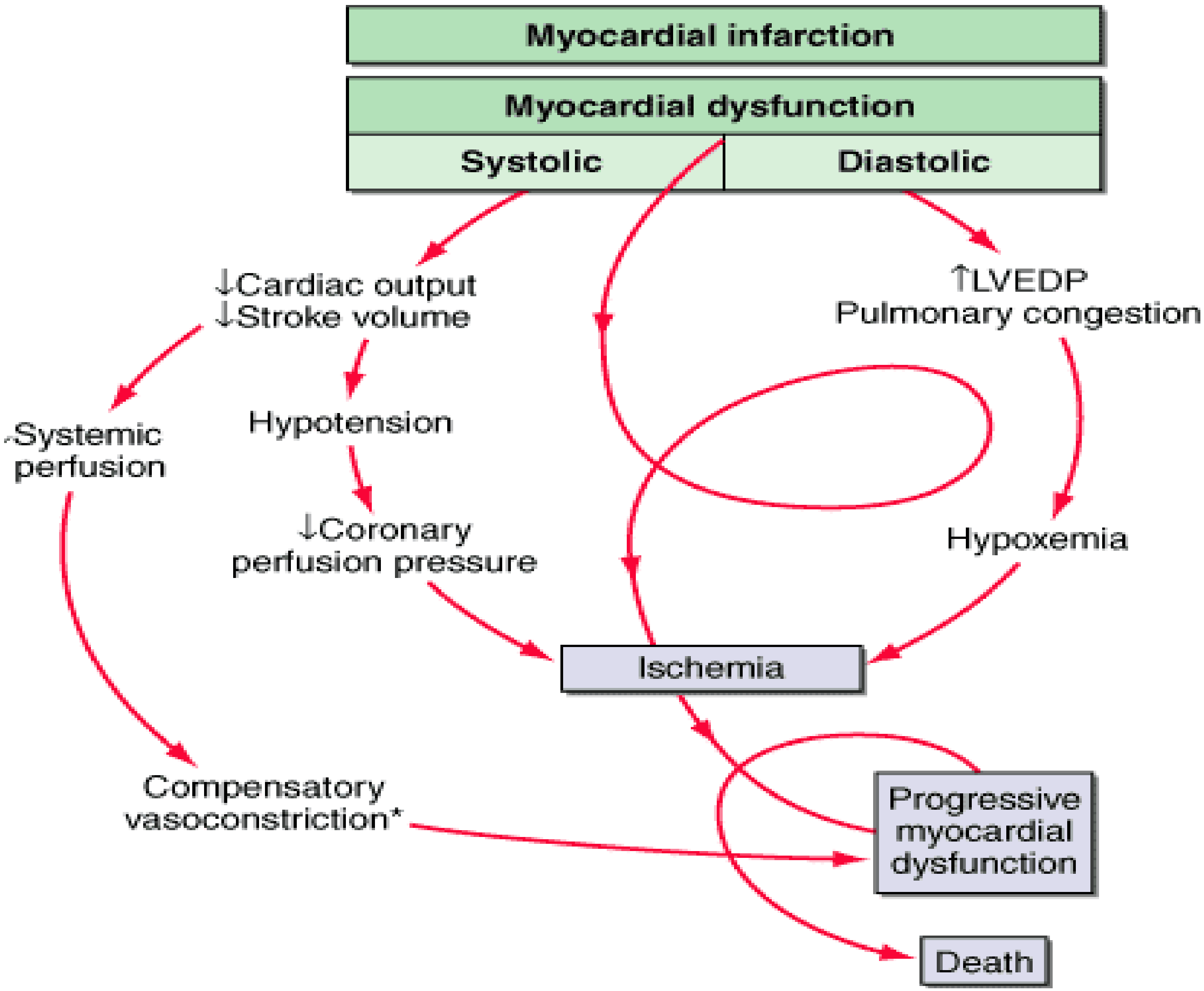
Babaev et al: JAMA 294:448, 2005

Cardiogenic Shock Etiology Shock Trial and Registry



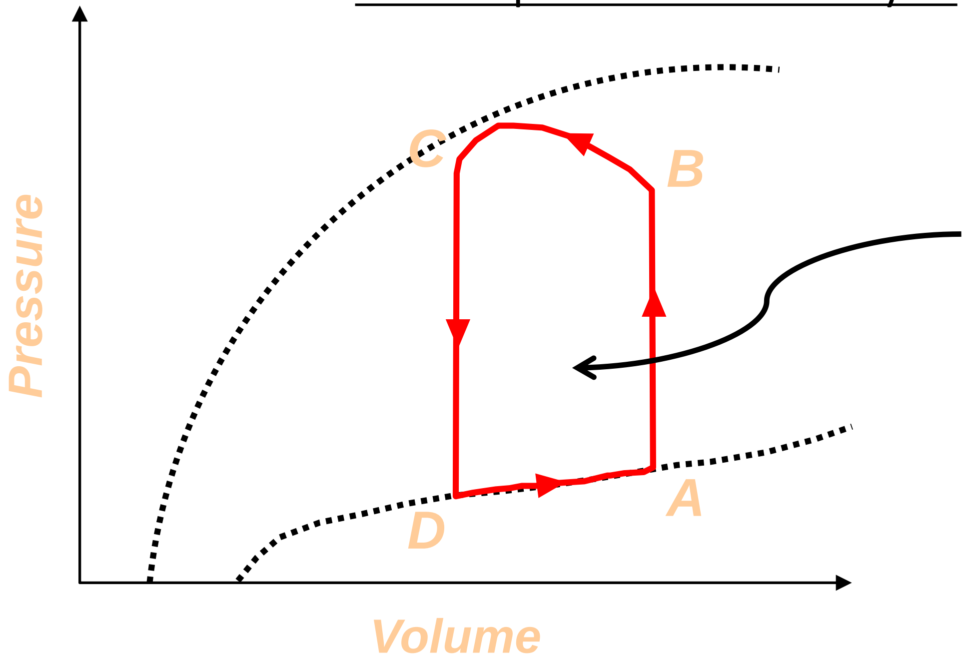
Hochman et al. JACC 2000; 36: 1063

Pathophysiology



"Unloading" … Reducing Work (O_2 demand) of the Myocardium

"PV Loop" of the Cardiac Cycle

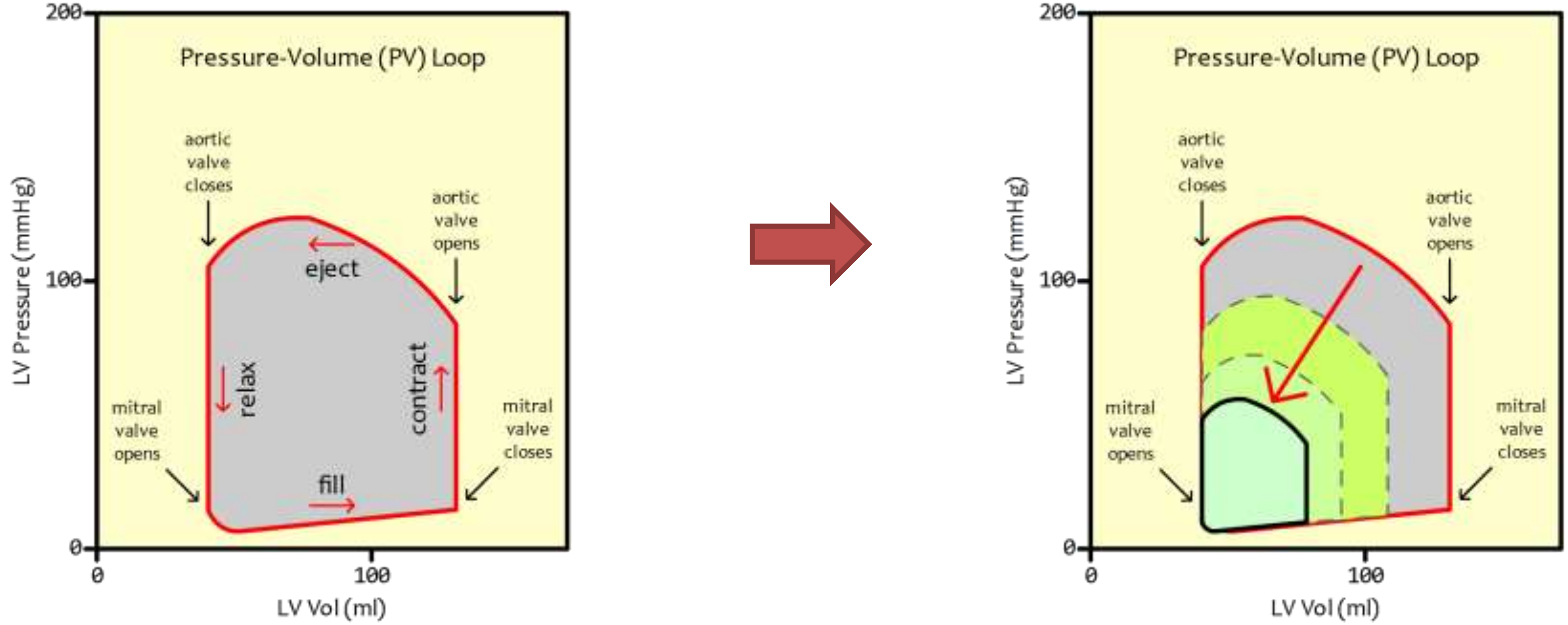


- ***Work = Pressure x Volume***
- ***Ventricular "Work" = Area of PV Loop; proportional to O_2 demand***
- ***Unloading Work = Reducing Area of PV Loop***

A. End Diastole – Mitral Valve Closure
B. Aortic Valve Opening
C. End Systole - Aortic Valve Closure
D. Mitral Valve Opening

Measuring Performance in Circulatory Support

The area inside the resulting PV loop is equal to the work being done by the heart in a single cardiac cycle



Smaller area inside the PV loop means less work being done by the LV

The Evidence for Pressors in Shock

The NEW ENGLAND JOURNAL of MEDICINE

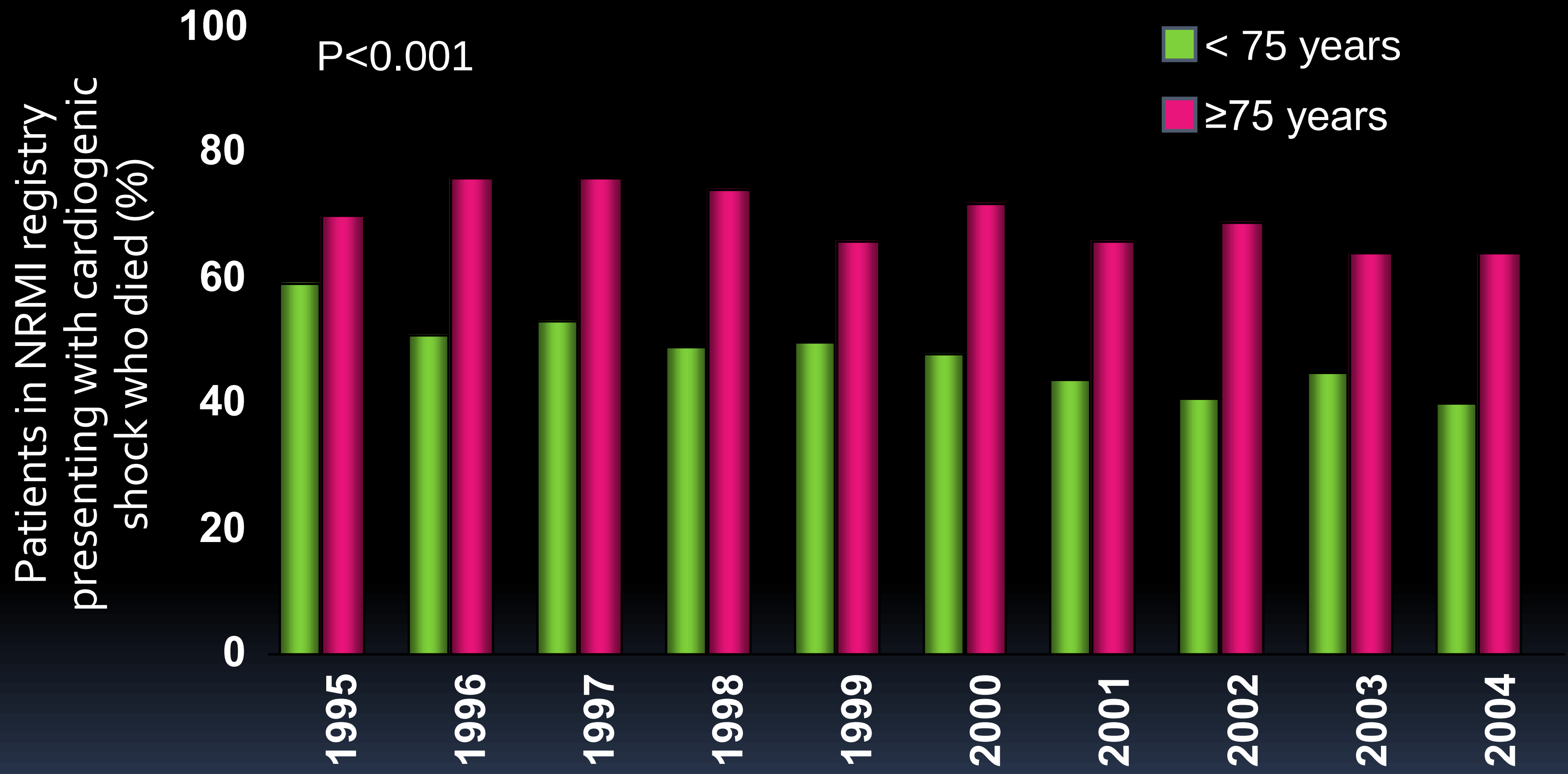
ESTABLISHED IN 1812 MARCH 4, 2010 VOL. 362 NO. 9

Comparison of Dopamine and Norepinephrine in the Treatment of Shock

Daniel De Backer, M.D., Ph.D., Patrick Biston, M.D., Jacques Devriendt, M.D., Christian Madl, M.D., Didier Chochrad, M.D., Cesar Aldecoa, M.D., Alexandre Brasseur, M.D., Pierre Defrance, M.D., Philippe Gottignies, M.D., and Jean-Louis Vincent, M.D., Ph.D., for the SOAP II Investigators*

A subgroup analysis showed that dopamine, as compared with norepinephrine, was associated with an increased rate of death at 28 days among the 280 patients with cardiogenic shock but not among the 1044 patients with septic shock or the 263 with hypovolemic shock (P=0.03 for cardiogenic shock, P=0.19 for septic shock, and P=0.84 for hypovolemic shock, in Kaplan–Meier analyses).

Cardiogenic Shock Prognosis



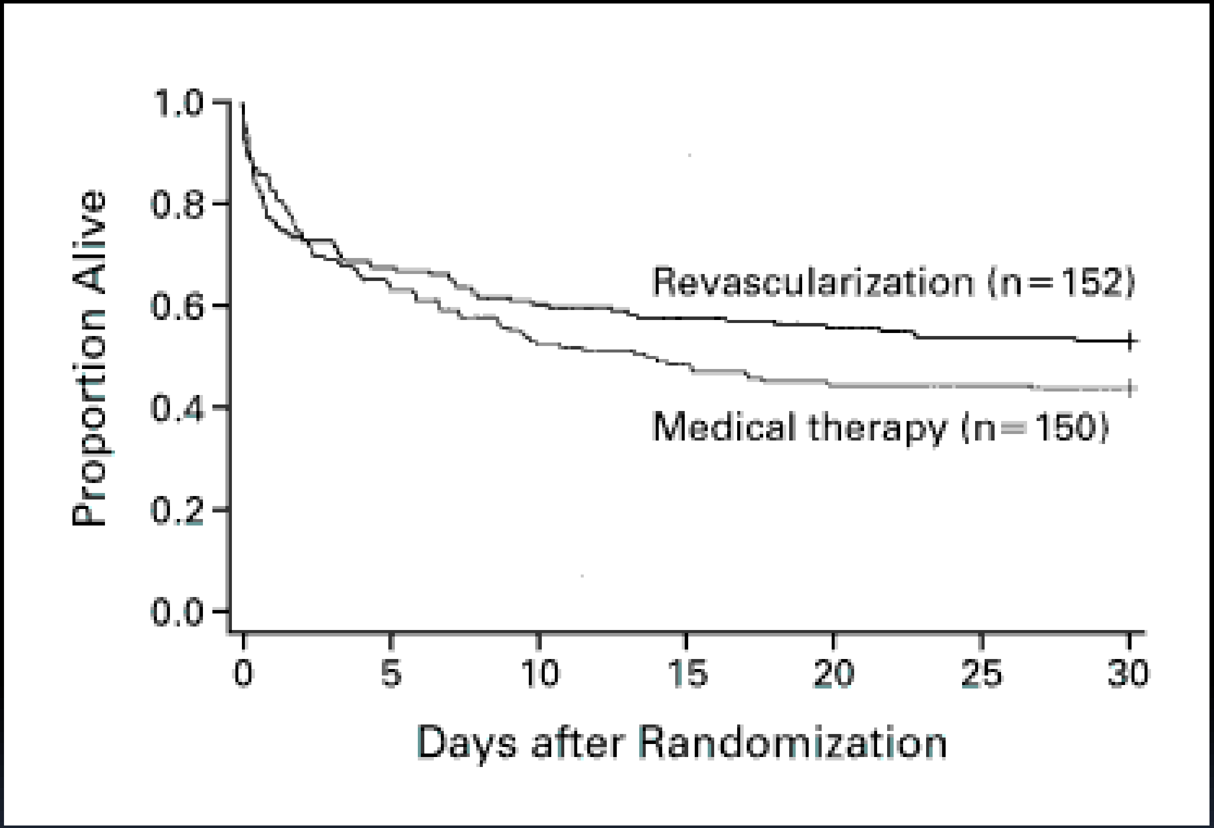
Babaer et al: JAMA 1294:448, 2005

Clinical Goals of Emergent Support

- Revascularization
- Restore Stable Hemodynamics
  - reversing decline of end-organ perfusion, reducing risk of end-organ failure, breaking cycle of cardiogenic shock
- Minimize Infarct Size
  - reducing myocardial ischemia, halting cell damage, maximizing residual cardiac function
- Ease-of-Use & Safety
  - consistent with critical treatment time scenarios and risk-benefit considerations of emergency care

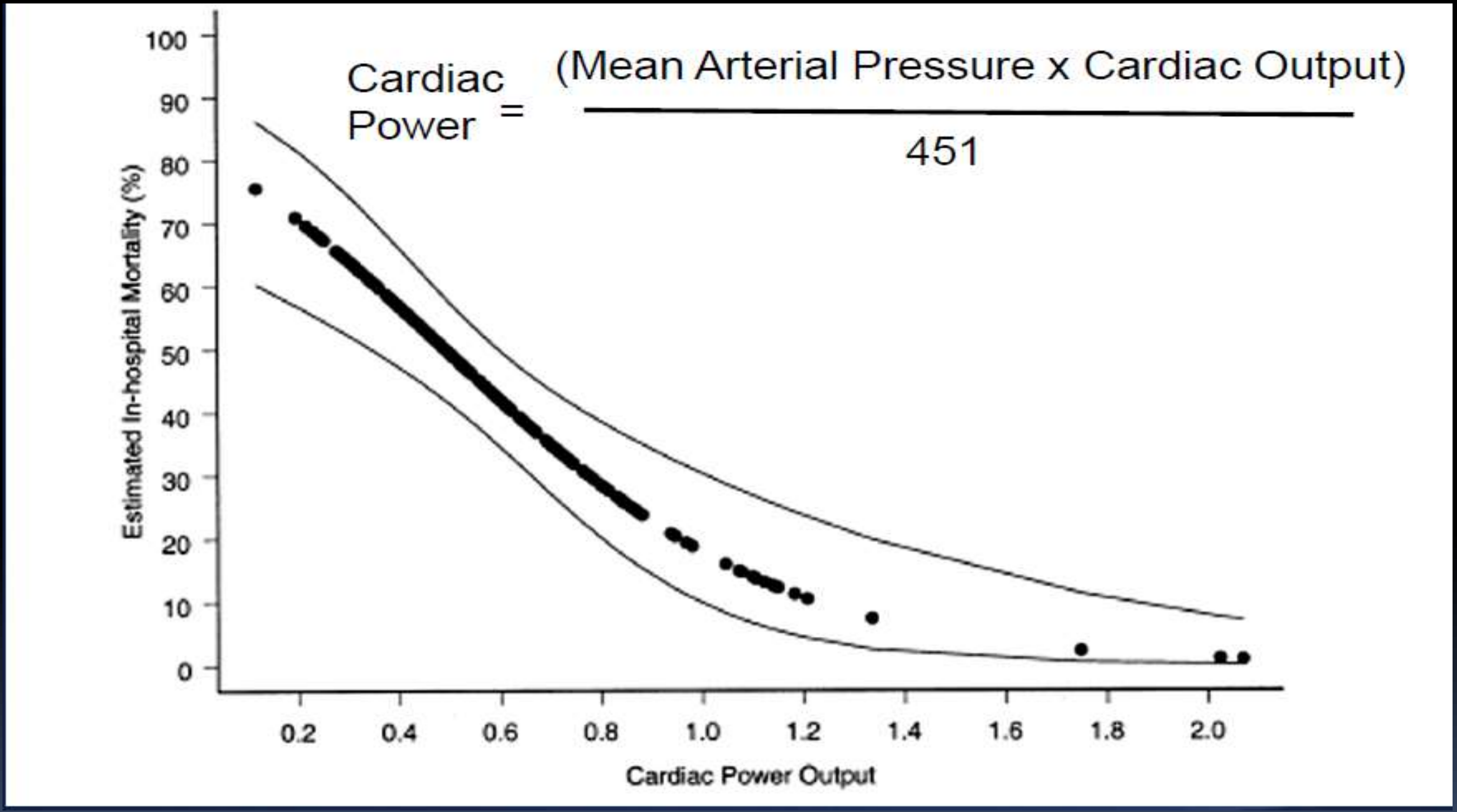
SHOCK Trial

Early intervention vs. Conservative medical management



30-day Mortality – 44.0% vs 53.3%

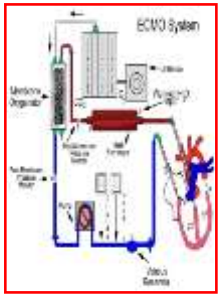
Cardiac Power
The Most Important Predictor of Mortality in the SHOCK Trial

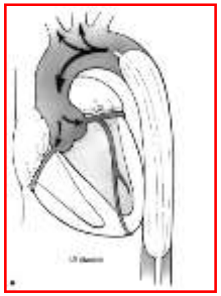


2011 ACCF/AHA/SCAI PCI Guidelines

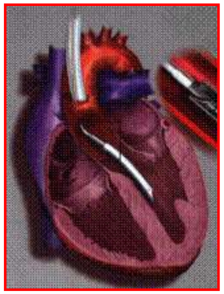
- Class I: Section 5.2.3 Cardiogenic Shock: Recommendation: "A hemodynamic support device is recommended for patients with cardiogenic shock after STEMI who do not quickly stabilize with pharmacological therapy (384,424–427)." This classification includes the statement: "Refractory cardiogenic shock unresponsive to revascularization may necessitate institution of more intensive cardiac support with a ventricular assist device or other hemodynamic support devices to allow for myocardial recovery or subsequent cardiac transplantation in suitable patients."
- Class II b: Section 5.6 Percutaneous Hemodynamic Support Devices: Recommendation: "Elective insertion of an appropriate hemodynamic support device as an adjunct to PCI may be reasonable in carefully selected high-risk patients."

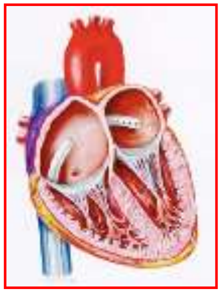
Mechanical Assist:
Historical Perspectives


ECMO


IABP


CPS


Hemopump

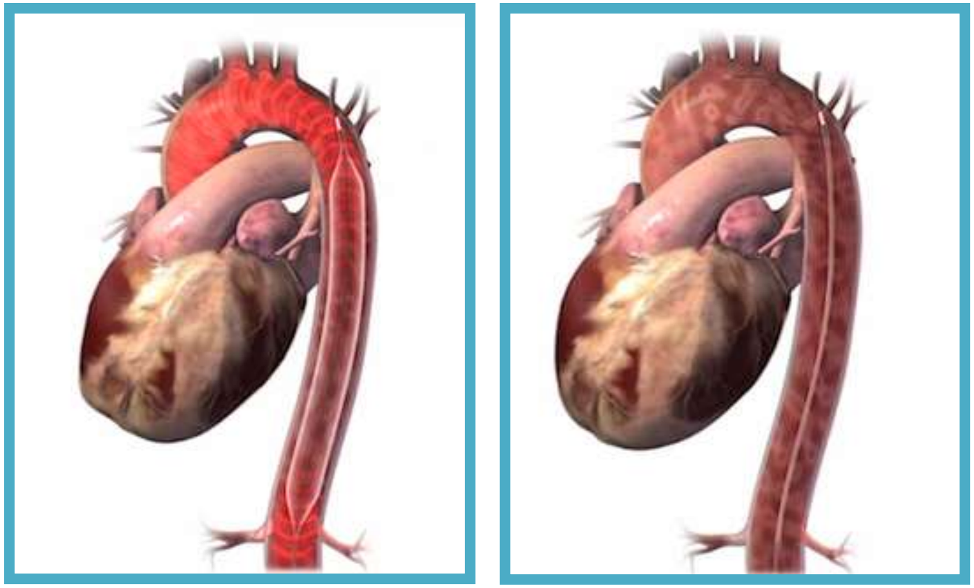

TandemHeart


Impella

70's *80's* *90's* *00's*

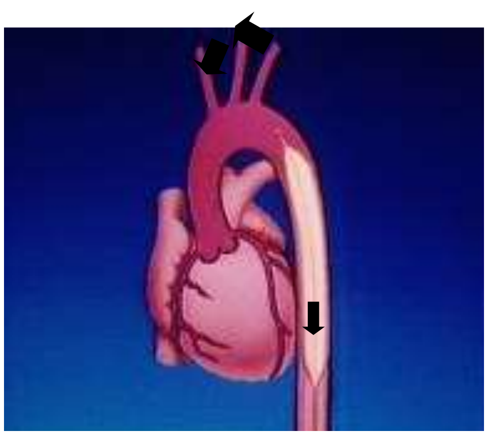
PRIMARY GOAL OF IABP THERAPY

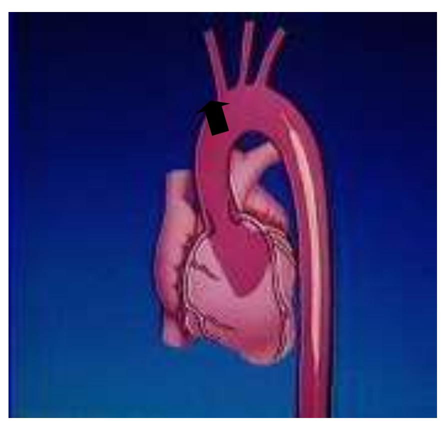
- Increase blood flow to the coronary arteries by augmenting diastole
- Decrease left ventricular end diastolic pressure and systolic pressure to improve pumping efficiency and improve cardiac output

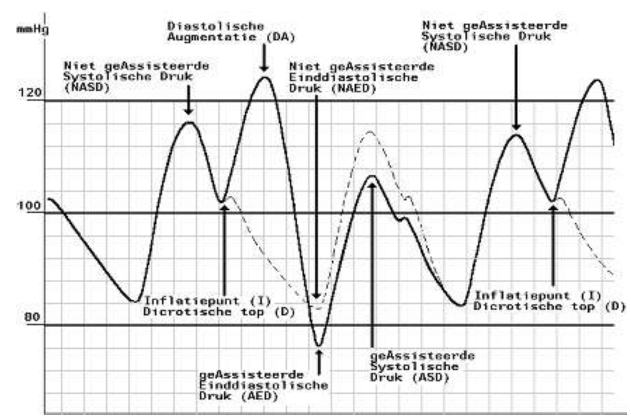


Intra Aortic Balloon Counterpulsation

- Hemodynamic stabilization:
  → cardiac index ↑ and early diastolic pressure ↑
  - diastolic blood flow augmentation in the coronary and systemic circulation
  - systolic reduction in afterload and aortic impedance
- LV recovery / infarct size reduction
  - peak left ventricular wall stress ↓
  - myocardial oxygen consumption ↓







IABP in daily clinical practice

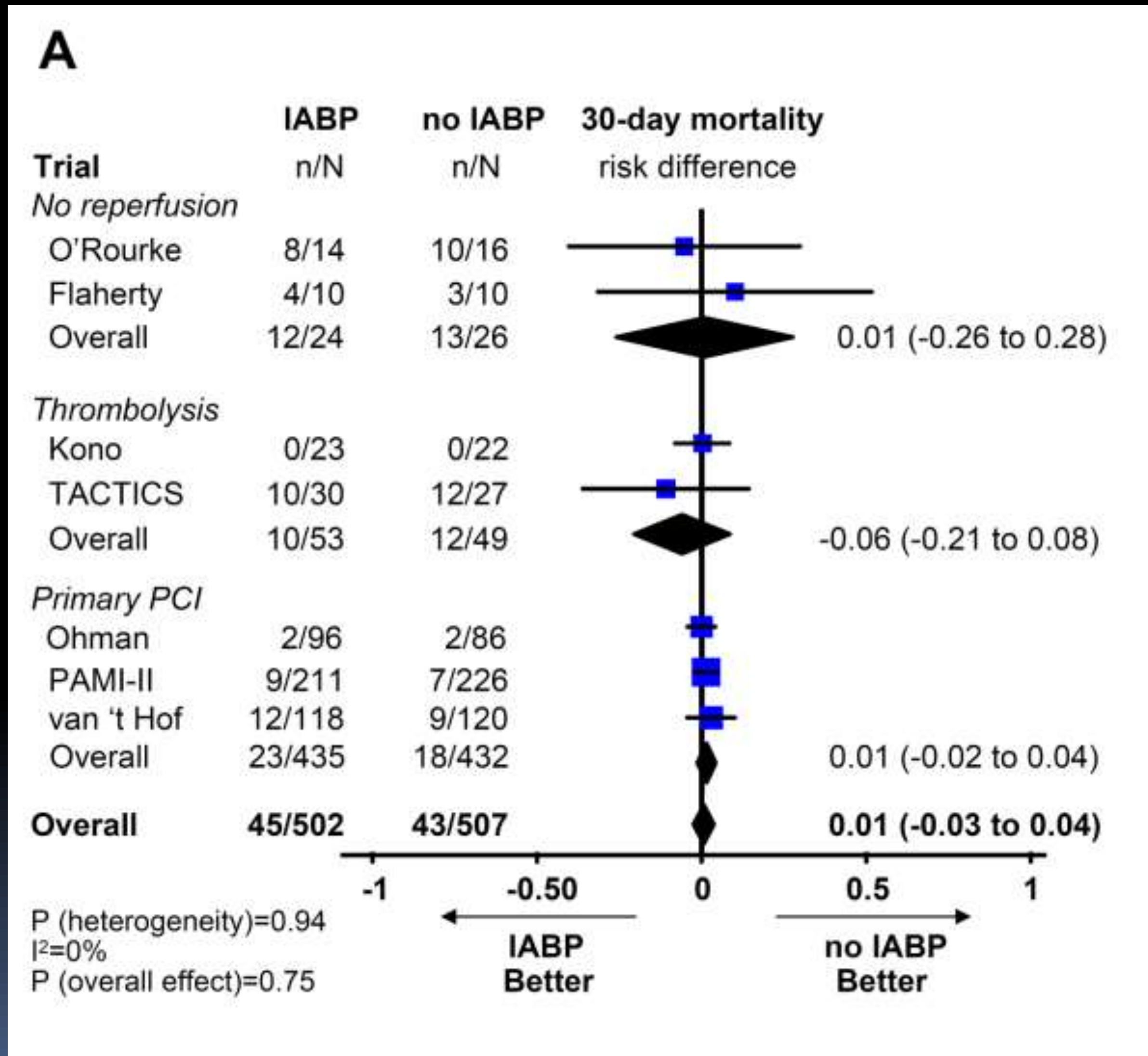
Table 1. Principal Indications for Intra-Aortic Balloon Pump Use in 5,495 Patients With AMI

Cardiogenic shock	27.3%
Support for high-risk catheterization and angioplasty	27.2%
Mechanical complications of AMI (VSD and PMR)	11.7%
Pre-operative support for high-risk cardiac surgery	11.2%
Refractory post-MI unstable angina	10.0%
Weaning from cardiopulmonary bypass	4.8%
Refractory left ventricular failure	4.5%
Refractory ventricular arrhythmias	1.3%
Intra-operative support during surgery	0.5%
Other or indication not recorded	1.5%

AMI = acute myocardial infarction; MI = myocardial infarction; PMR = papillary muscle rupture; VSD = ventricular septal defect.

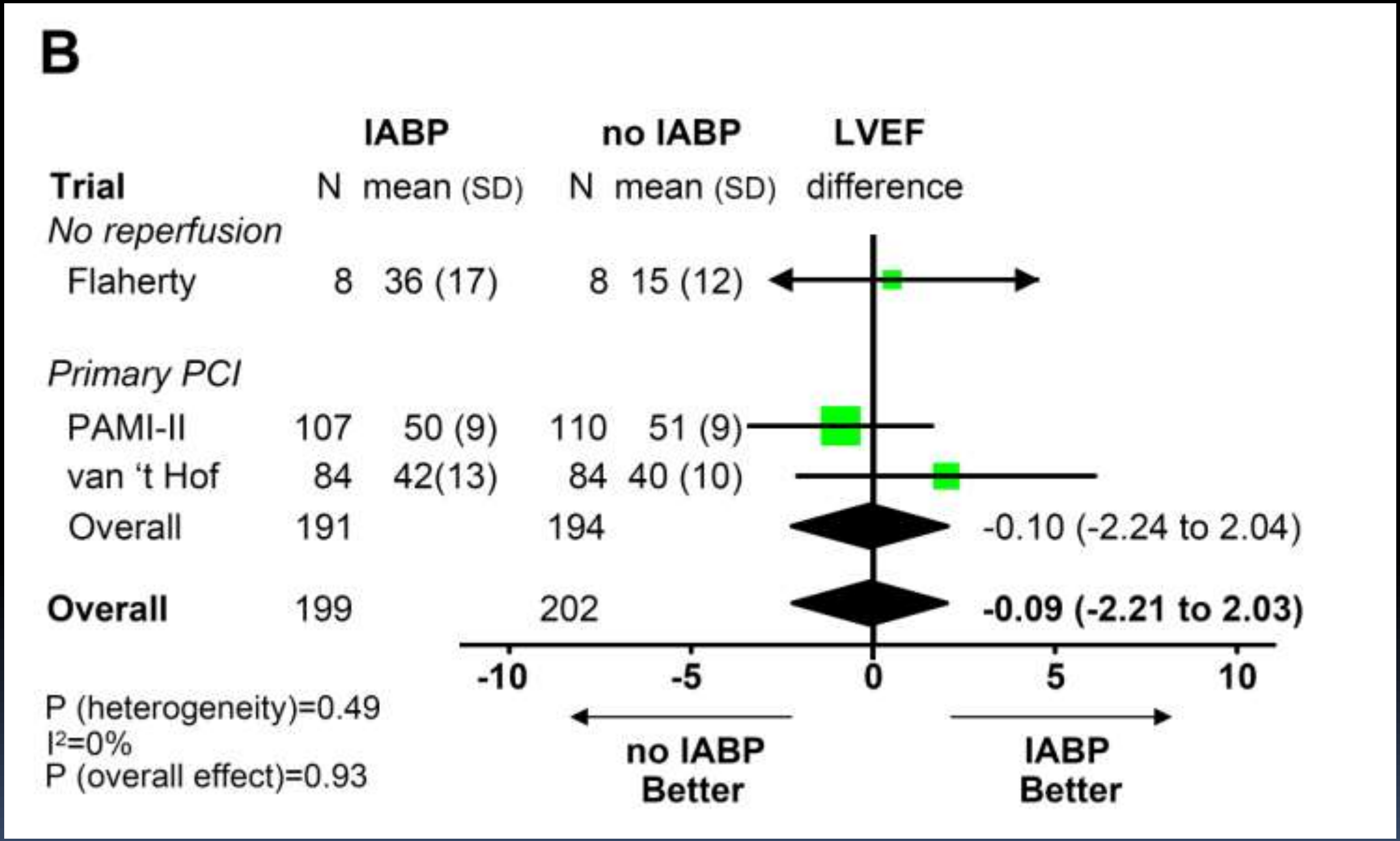
IABP vs Control in HR-STEMI – 30-day mortality

Randomized controlled trials



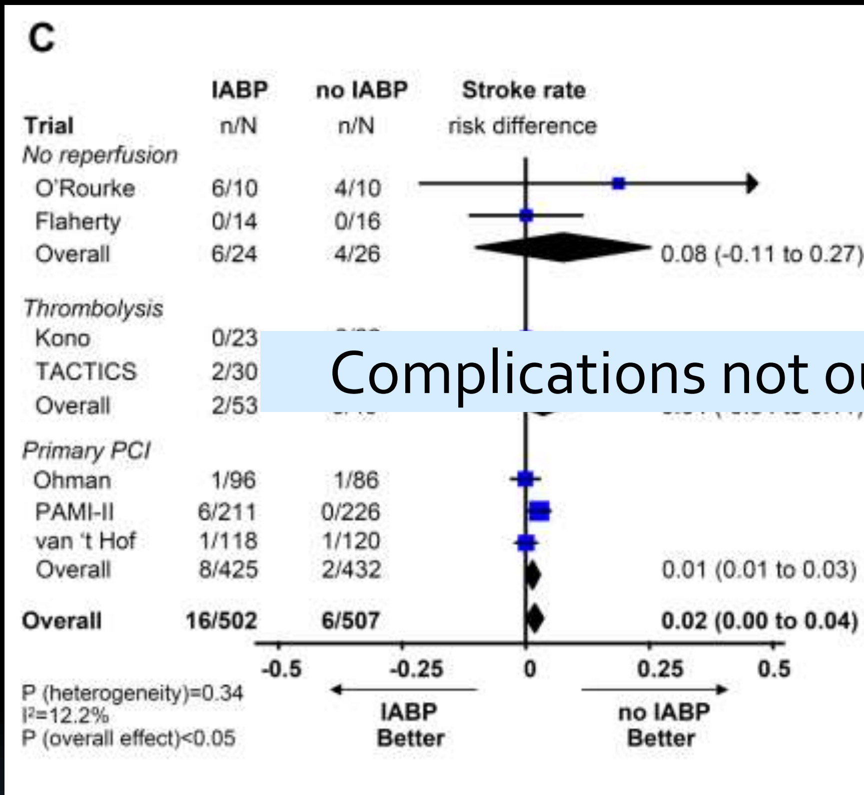
IABP vs Control in HR-STEMI – LVEF

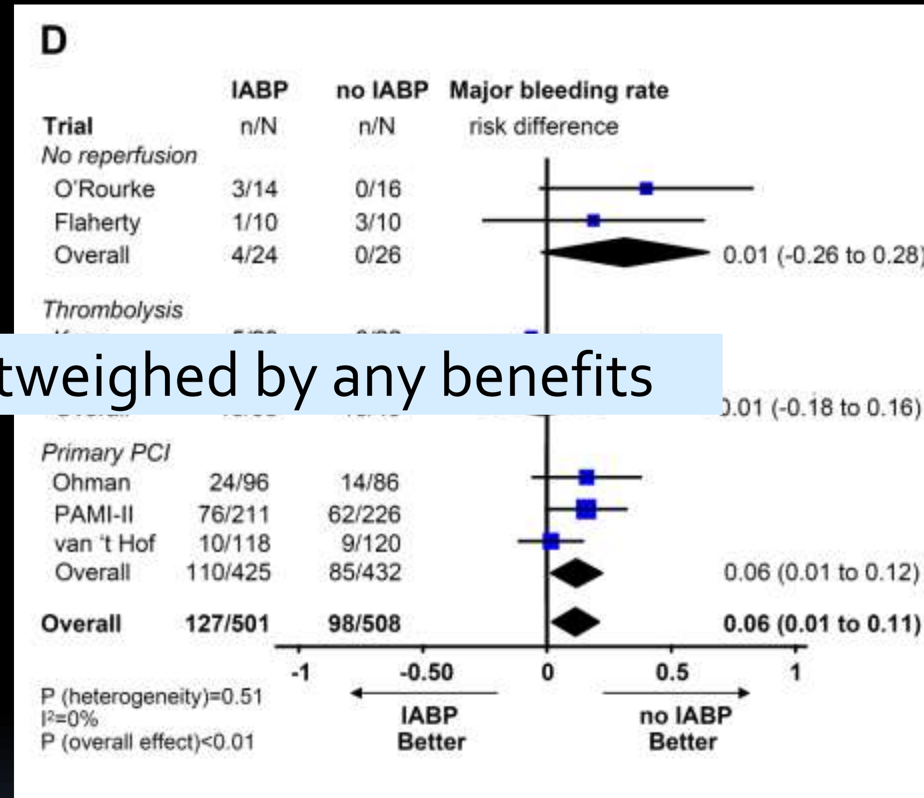
Randomized controlled trials



IABP vs Control in HR-STEMI – Stroke / Bleeding

Randomized controlled trials





Complications not outweighed by any benefits

IABP 2% increase in Stroke

IABP 6% increase in Bleeding

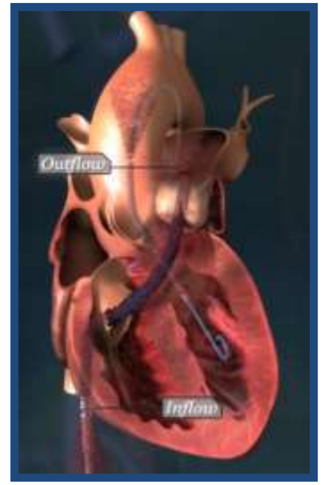
PRIMARY GOAL OF pVADS & ECLS

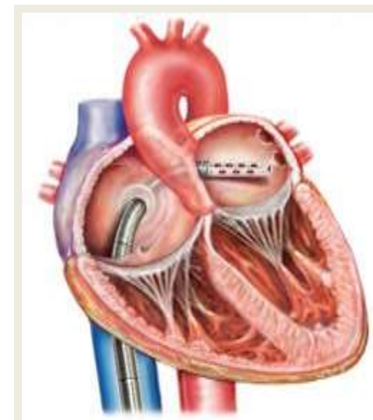
Primary Goal of pVADs

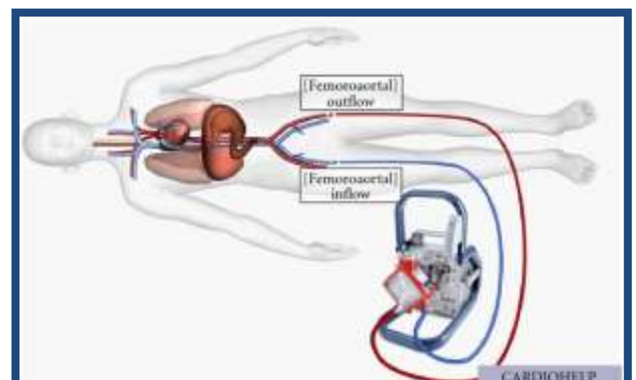
- Actively unload the left ventricle
- Removes blood from the left ventricle and places in the ascending aorta

Primary Goal of ECLS

- Removes blood from the left atrium and returns to the circulation
- Provides extracorporeal support to replace or support cardiac circulation
- Provides oxygenation and CO2 removal



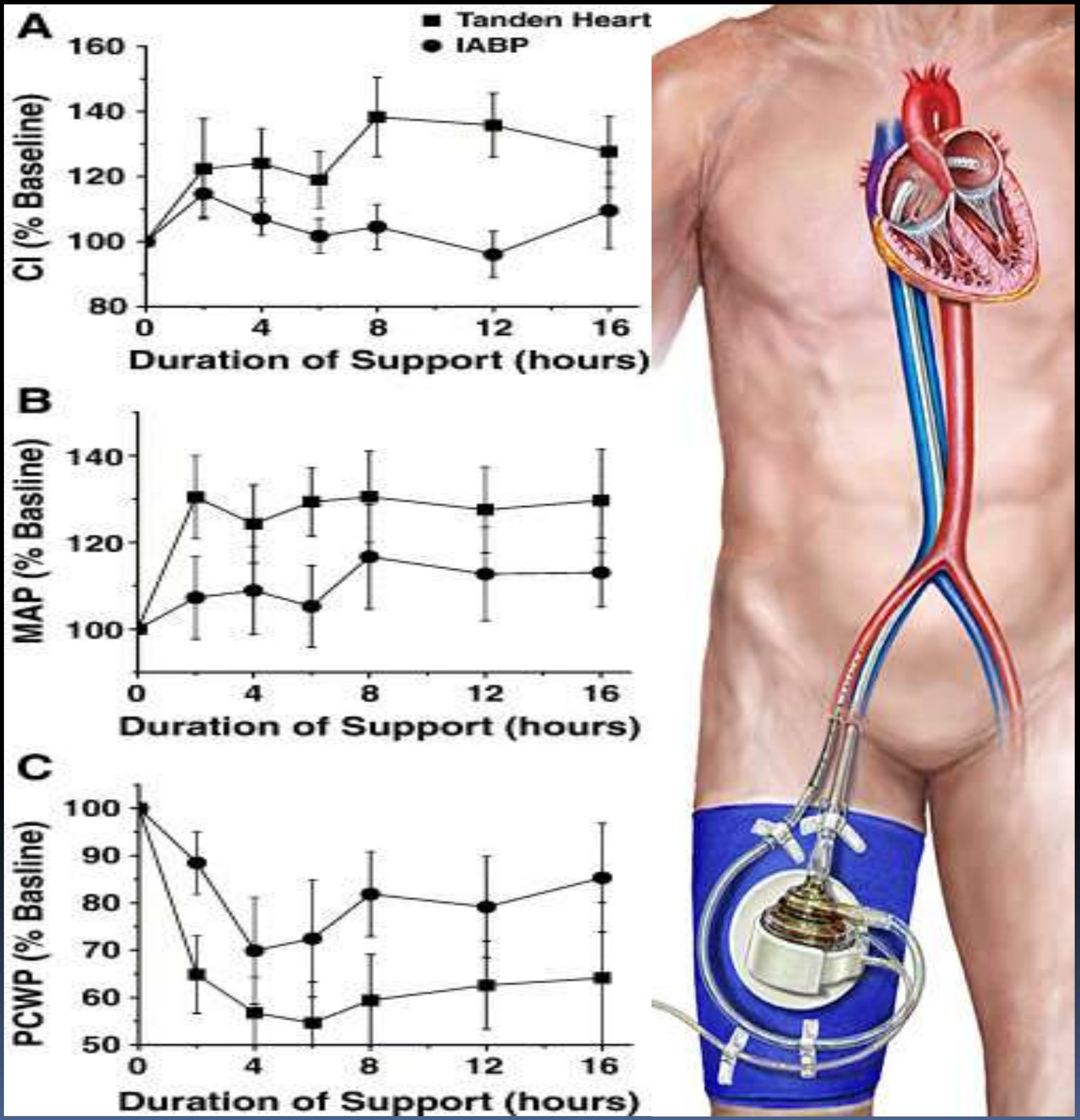




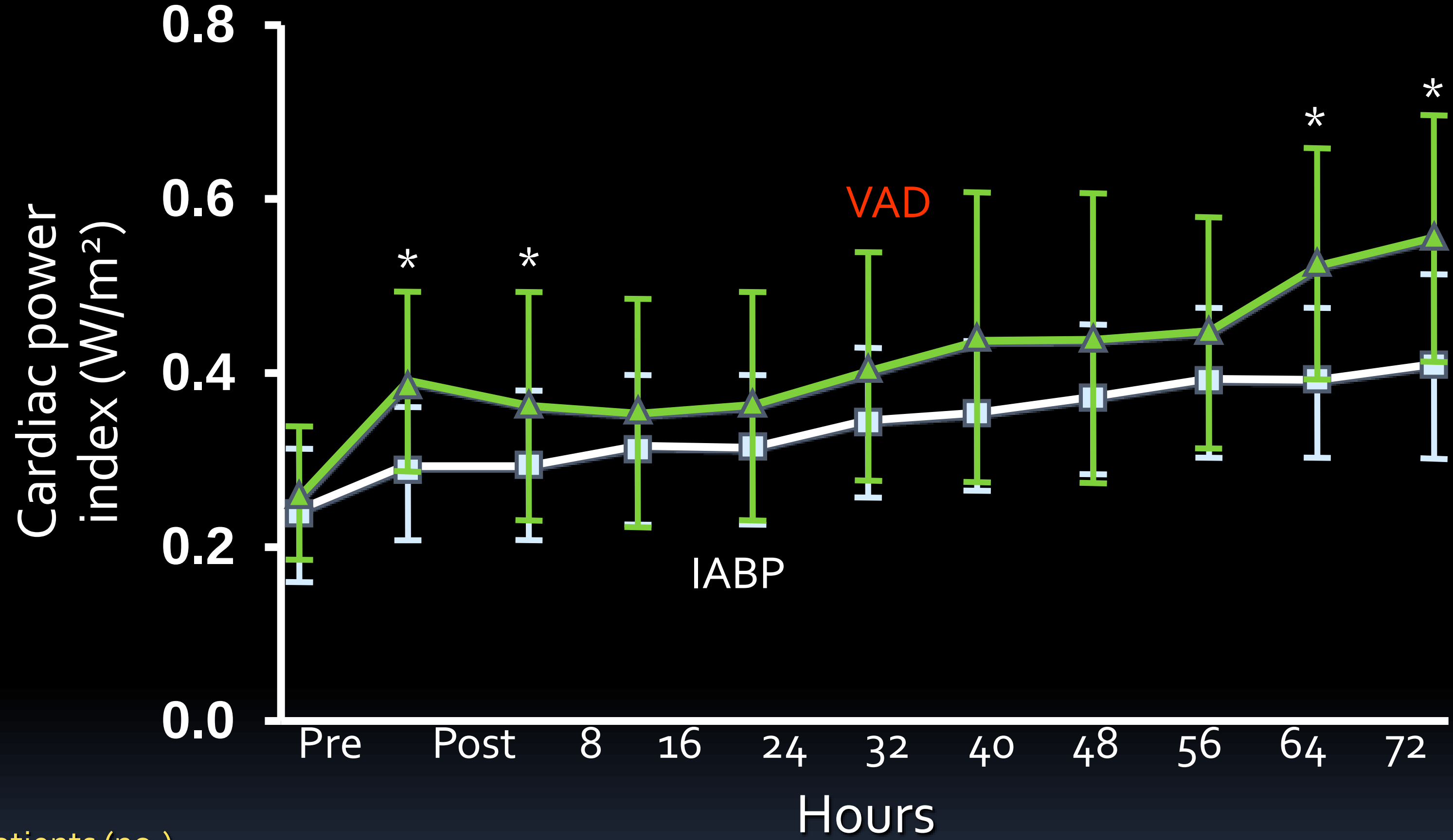
Percutaneous Devices for Hemodynamic Support: Technical Features

	TandemHeart	Impella LP 5.0	Impella 2.5
Cannula size	21 Vein ,15-17 Arterial (12 Fr arterial x 2)	21 Fr	13 Fr
Flow (L/min)	4	5	2.5
Pump speed (rpm)	7500 (Centrifugal)	33,000 (axial)	33,000 (axial)
Insertion	FA + LA	FA cutdown	FA perc.
Anticoagulation	Yes	Yes	Yes
Cost (relative to IABP)	+++++	++++	+++

Modified from Thiele,
Eur Heart J 28: 2057, 2007


A
Tanden Heart
IABP
CI (% Baseline)
160
140
120
100
80
0
4
8
12
16
Duration of Support (hours)
B
MAP (% Basline)
140
120
100
0
4
8
12
16
Duration of Support (hours)
C
PCWP (% Basline)
100
90
80
70
60
50
0
4
8
12
16
Duration of Support (hours)

Randomized Trial of Tandem Heart vs IABP
n=41



Patients (no.)											
IABP	20	20	17	17	16	16	16	16	16	16	16
VAD	21	21	21	21	21	19	19	18	18	17	17

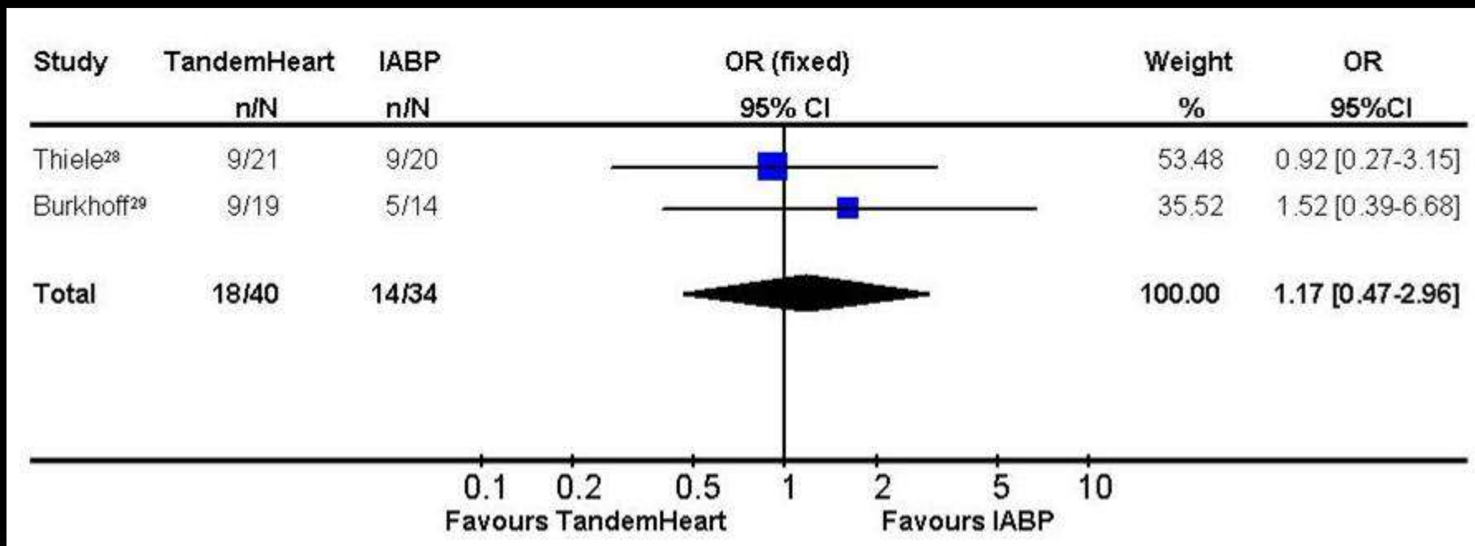
Primary endpoint: cardiac power index = CI x mean arterial pressure x 0.0022

Thiele et al: EHJ 26:1276, 2005

Tandem Heart

Randomized Trials TandemHeart vs. IABP in STEMI + CS

Meta-analysis



Venous sheath 21F
Transseptal puncture - inflow left atrium.
15F or 17F arterial cannulae.

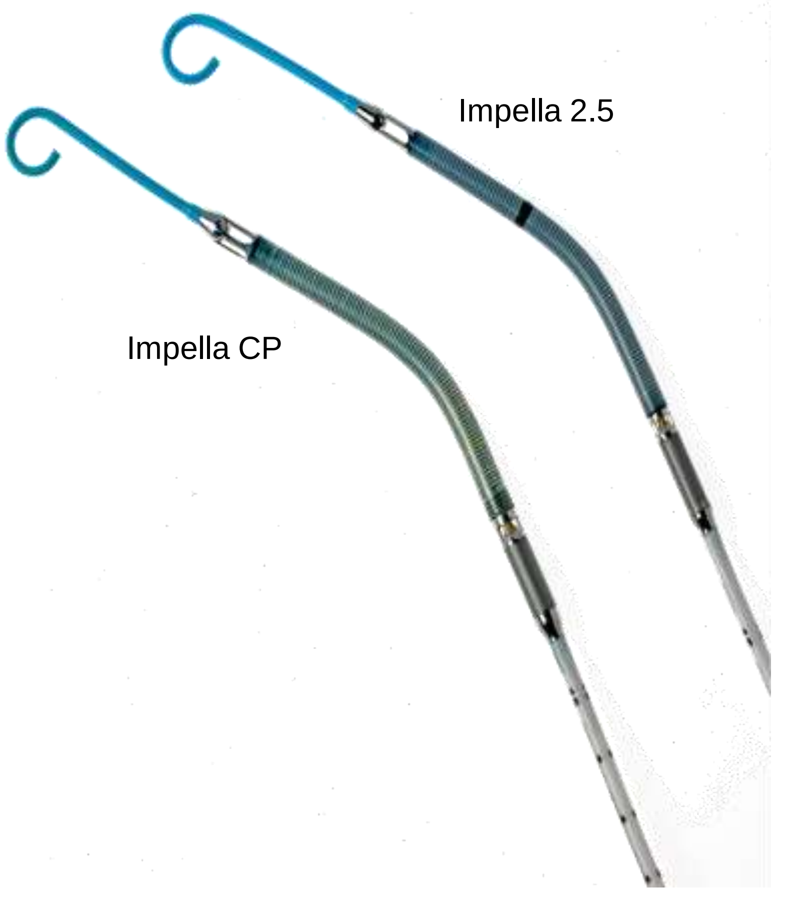
average insertion time > 30 45–60 min
ACT > 200 seconds during support

Not easy
Time consuming
Learning curve
Limb ischemia
Bleeding

Impella

Impella CP™– Impella® 2.5 Comparison

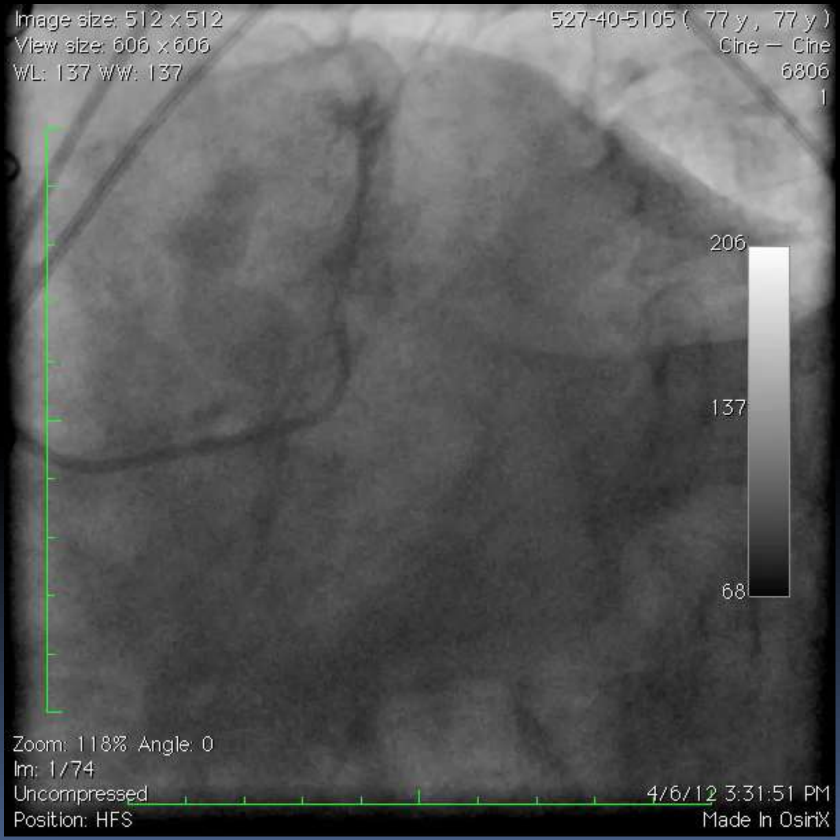
	Impella 2.5	Impella CP
Mean Flow Rate (L/min, max)	2.3 to 2.5	3.3. to 3.5 (at P9)
Catheter Size	9 Fr	9 Fr
Pump Size	12 Fr	14 Fr
Insertion Method	Percutaneous via 13 Fr Introducer Sheath	Percutaneous via 14 Fr Introducer Sheath
Guidewire	0.018” Silicone Wire	0.018” PTFE Wire
Placement Measurement	Fluid-filled Pressure Lumen	Fluid-filled Pressure Lumen
Cannula Geometry	Curved, Pigtail	Curved, Pigtail
RPM	51,000	46,000
P-level	P1-P9 (Boost Mode)	P1-P9



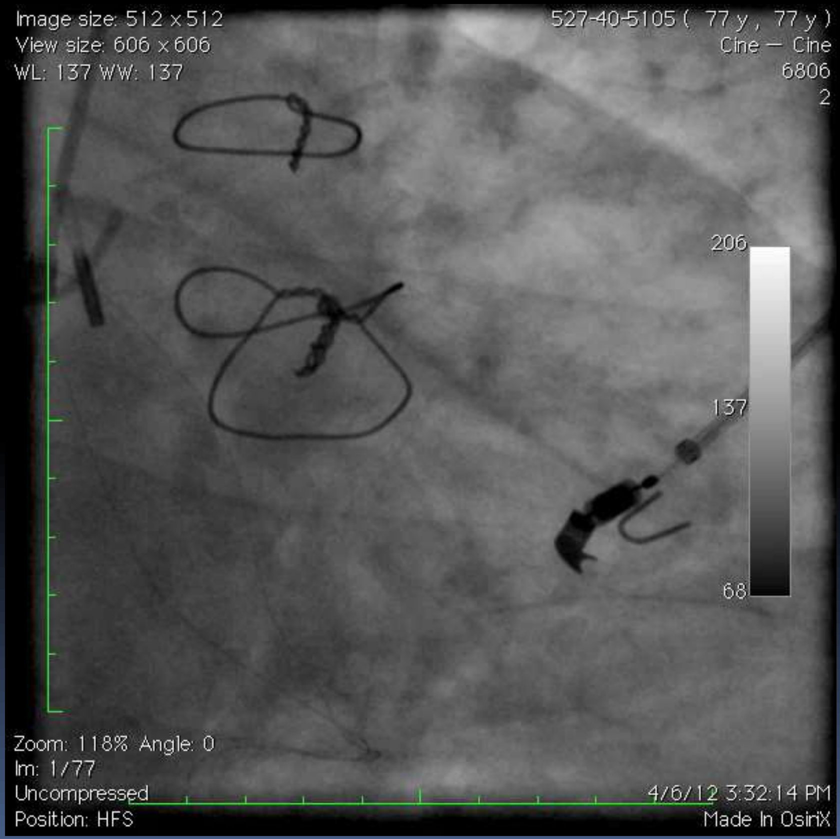
- 89 yo male with admitted with NSTEMI
- PMH:
  - MVR (bioprosthetic) – No CABG
  - DM
- Treated conservatively with heparin/integrilin/ASA/plavix
- In the next 24 hours: Developed pulmonary edema and early shock
- Taken to the cath lab

89 yo male with multi-vessel CAD, NSTEMI LVEF 20% in early cardiogenic shock

89 yo male with multivessel CAD



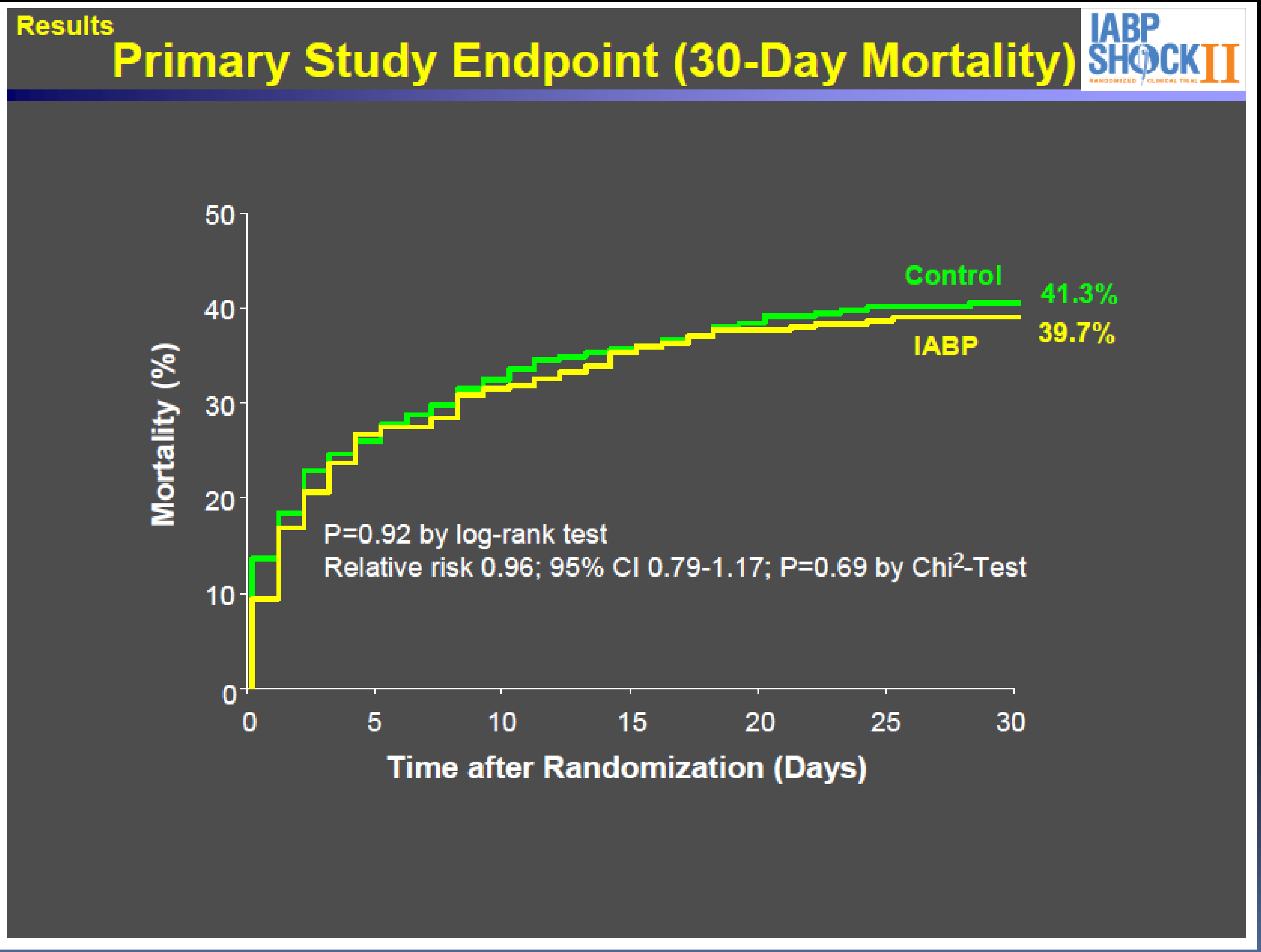
LVEF 20%, turned down by CT surgery



What is the contemporary clinical evidence in emergent cases?

- Hemodynamic support in clinical trials
  - IABP vs Impella
    - Cardiogenic shock

SHOCK II


Results
Primary Study Endpoint (30-Day Mortality)
IABP SHOCK II
Mortality (%)
50
40
30
20
10
0
0
5
10
15
20
25
30
Time after Randomization (Days)
Control
41.3%
IABP
39.7%
P=0.92 by log-rank test
Relative risk 0.96; 95% CI 0.79-1.17; P=0.69 by Chi2-Test

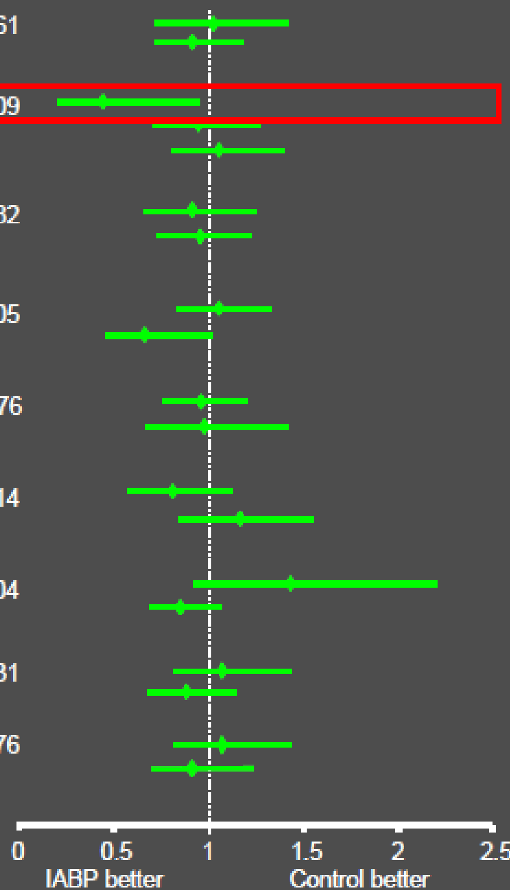
SHOCK II

Results

Subgroups (30-Day Mortality)

IABP SHOCK II

Baseline Variable	N	30-Day Mortality (%) IABP	30-Day Mortality (%) Control	Relative Risk (95% CI)	P-Value for Interaction
Female	187	44.4	43.2	1.03 (0.74-1.43)	0.61
Male	411	37.3	40.5	0.92 (0.72-1.18)	
Age <50 years	70	19.4	44.1	0.44 (0.21-0.95)	0.09
Age 50-75 years	334	34.6	36.5	0.95 (0.71-1.27)	
Age >75 years	194	53.7	40.0	1.07 (0.81-1.41)	
Diabetes	195	42.9	46.7	0.92 (0.67-1.26)	0.82
No diabetes	399	37.2	38.9	0.96 (0.74-1.23)	
Hypertension	410	42.9	40.4	1.06 (0.84-1.34)	0.05
No hypertension	183	28.9	43.0	0.67 (0.45-1.01)	
STEMI/LBBB	412	41.0	42.9	0.96 (0.77-1.21)	0.76
NSTEMI	177	37.5	38.3	0.98 (0.67-1.43)	
Anterior STEMI	216	35.4	43.7	0.81 (0.58-1.13)	0.14
Non-anterior STEMI	196	48.3	42.2	1.16 (0.85-1.57)	
Previous infarction	131	47.9	33.3	1.44 (0.93-2.21)	0.04
No previous infarction	466	37.3	43.3	0.86 (0.69-1.07)	
Hypothermia	226	48.1	44.2	1.09 (0.82-1.44)	0.31
No hypothermia	372	35.1	39.3	0.89 (0.68-1.16)	
Blood pressure <80 mmHg	161	50.7	46.4	1.09 (0.79-1.50)	0.76
Blood pressure ≥80 mmHg	432	35.9	39.2	0.92 (0.72-1.17)	



SHOCK II

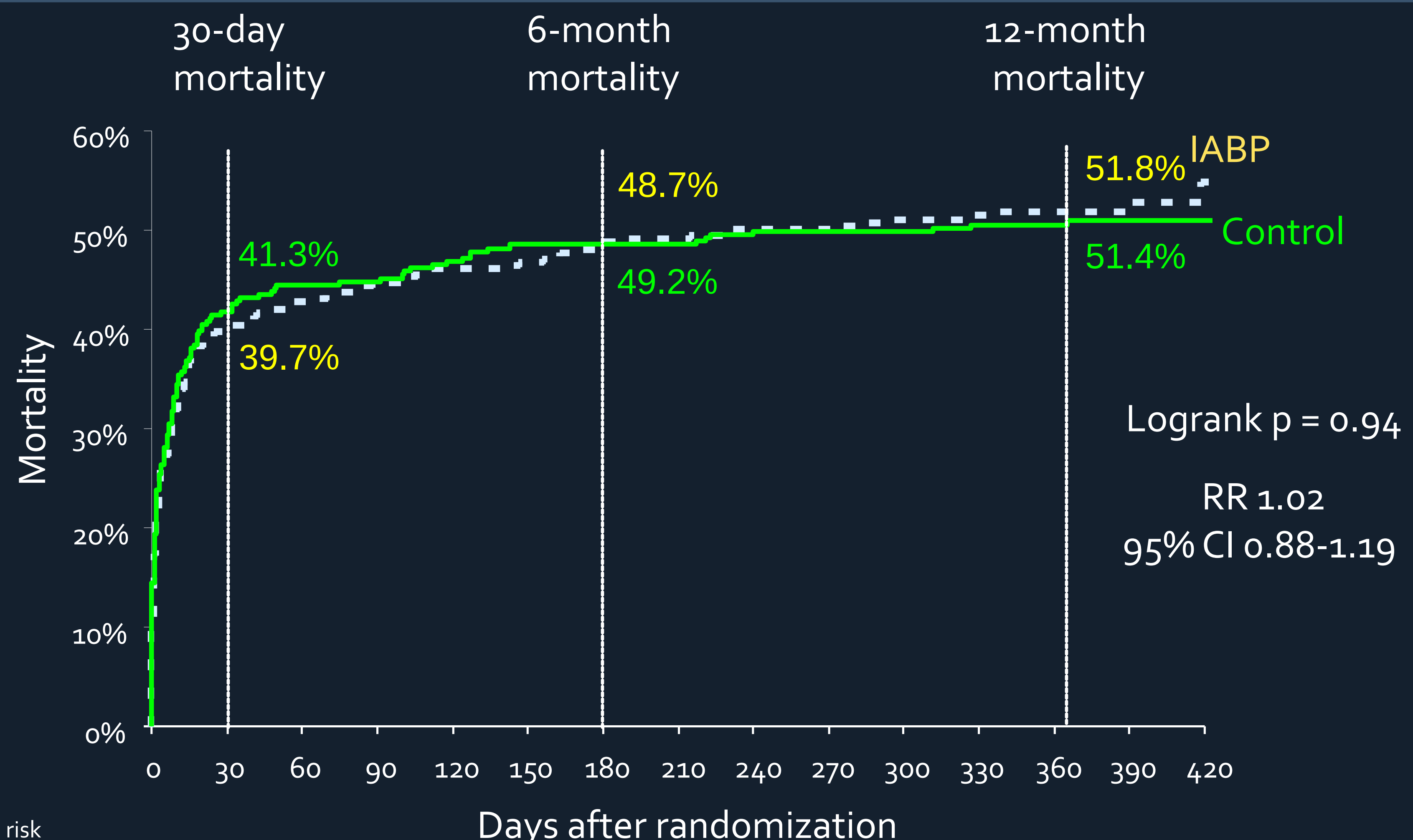
Results

Safety

IABP SHOCK II

	IABP (n=300)	Control (n=298)	P
Stroke in-hospital n/total (%)	2/300 (0.7)	5/298 (1.7)	0.28
GUSTO bleeding; n/total n (%)			
Life-threatening/severe	10/300 (3.3)	13/298 (4.4)	0.51
Moderate	52/300 (17.3)	49/298 (16.4)	0.77
Peripheral ischemic complication requiring intervention; n/total n (%)	13/300 (4.3)	10/298 (3.4)	0.53
Sepsis; n/total n (%)	47/300 (15.7)	61/298 (20.5)	0.15

IABP SHOCK II: 1 year Mortality



No. at risk															
IABP	301	181	171	165	161	159	154	152	149	147	146	144	136	45	21
Control	299	174	166	165	159	154	154	152	147	147	146	144	140	55	29

Thiele et al. Lancet 2013

The Current Use of Impella 2.5 in Acute Myocardial Infarction Complicated by Cardiogenic Shock: Results from the USpella Registry

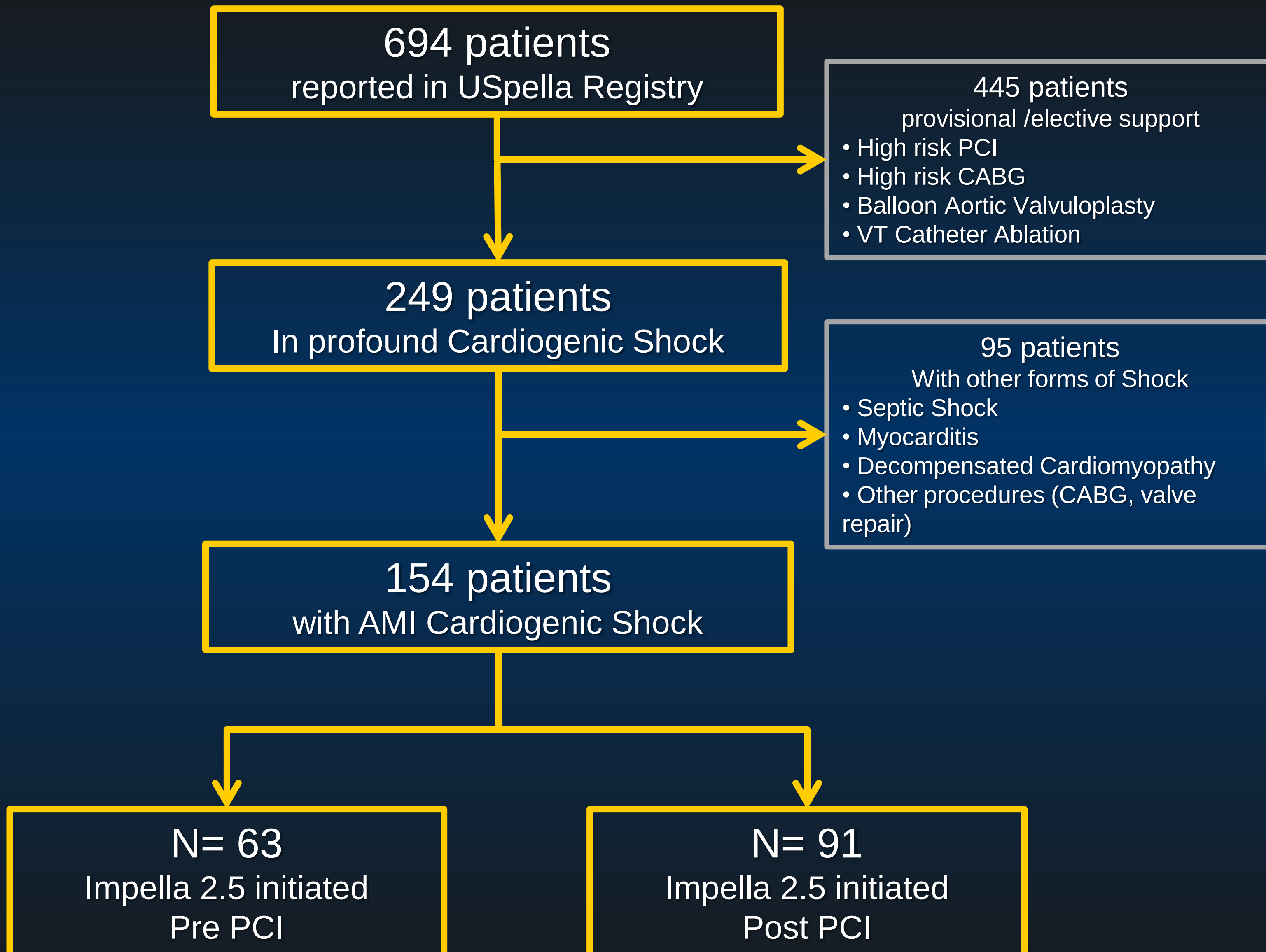
William W. O'Neill, MD[*]; Theodore Schreiber, MD[‡]; David H. W. Wohns, MD[±]; Charanjit Rihal, MD[¶]; Srihari S. Naidu, MD[#]; Andrew B. Civitello, MD[†]; Simon R. Dixon, MBChB[**]; Joseph M. Massaro, PhD [‖]; Brijeshwar Maini, MD[††]; E. Magnus Ohman, MD [¶¶].

From the [*]Henry Ford Hospital, Detroit, MI, USA; [‡] Detroit Medical Center, Detroit, MI, USA; [±] Spectrum Health, Grand Rapids, MI, USA; [¶] Mayo Clinic, Rochester, MN, USA; [#] Winthrop University Hospital, Mineola, NY, USA; [†] Texas Heart Institute, Houston, TX, USA; [**] Beaumont Hospital, Royal Oak, MI, USA; [‖]Harvard Research Institute, Boston, MA, USA; [††]Pinnacle Health Medical Center, Wormleysburg, PA, USA; [¶¶]Duke University Medical Center, Durham, NC, USA.

O'Neill et al, J Interven Cardiol 2013;9999:1-11

Study Flow Chart

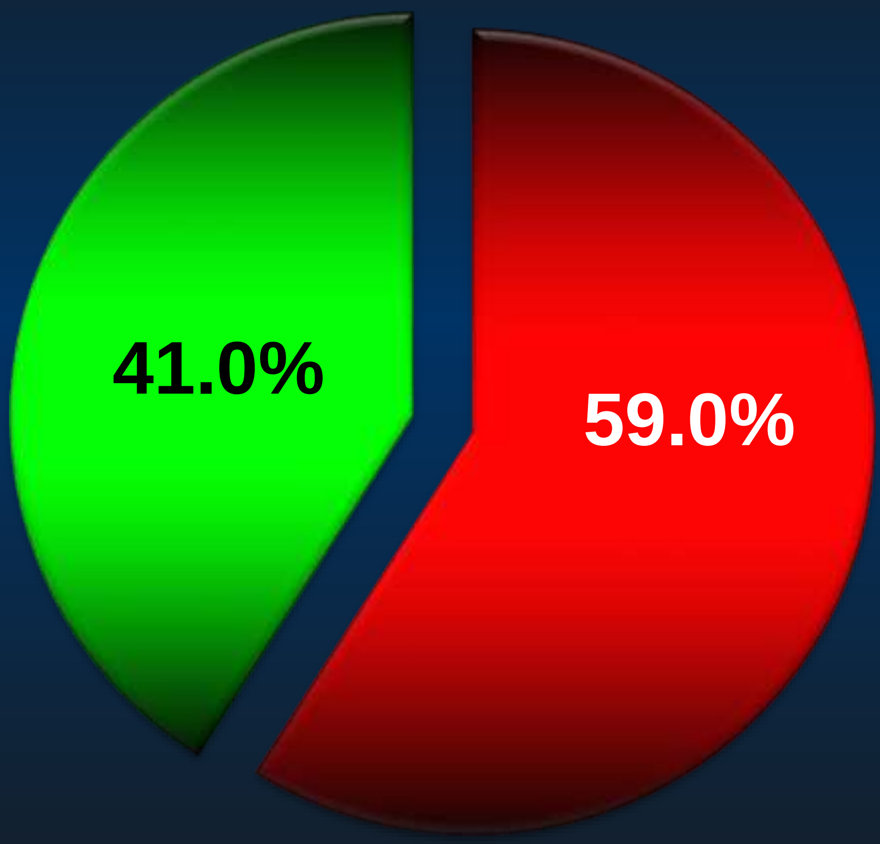
(06/08-05/12)



O'Neill et al, J Interven Cardiol 2013;9999:1-11

Impella® Insertion Timing
(N= 154)

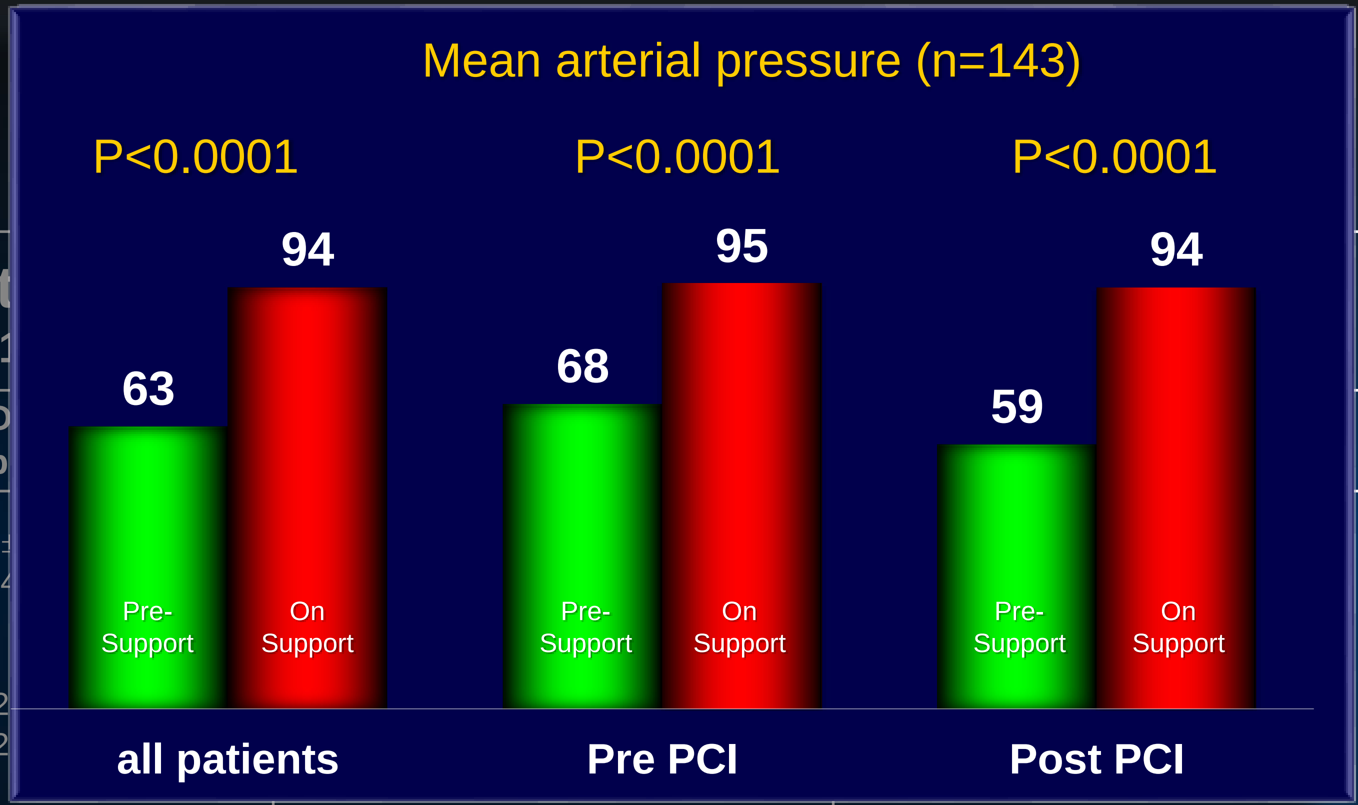
Prior to PCI
(n=63)



Post PCI
(n=91)

O'Neill et al, J Interven Cardiol 2013;9999:1-11

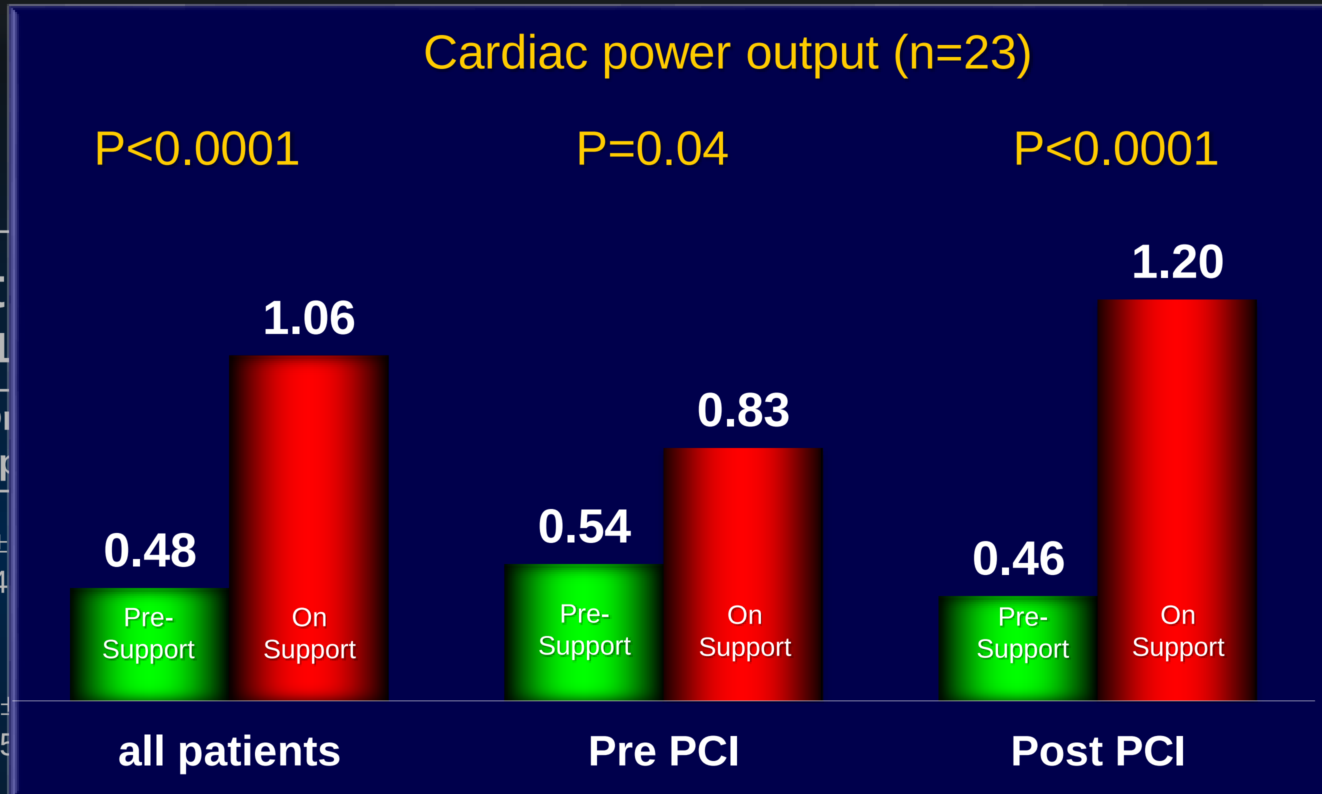
Hemodynamics



	All pat… N = 1…								
	Pre Support	O… Sup…							
MAP, mmHg	62.7±19.2 (143)	94.4… (14…							
PCWP, mmHg	31.9±11.1 (25)	19.2… (2…							
Cardiac Index, L/min/m^2	1.9±0.7 (23)	2.7±0.7 (23)	<0.0001	1.9±0.9 (7)	2.3±0.8 (7)	0.055	1.9±0.6 (16)	2.9±0.6 (16)	<0.0001
Cardiac Power Output, Watt	0.48±0.17 (23)	1.06±0.48 (23)	<0.0001	0.54±0.2 (7)	0.83±0.4 (7)	0.035	0.46±0.1 (16)	1.2±0.5 (16)	<0.0001

O'Neill et al, J Interven Cardiol 2013;9999:1-11

Hemodynamics

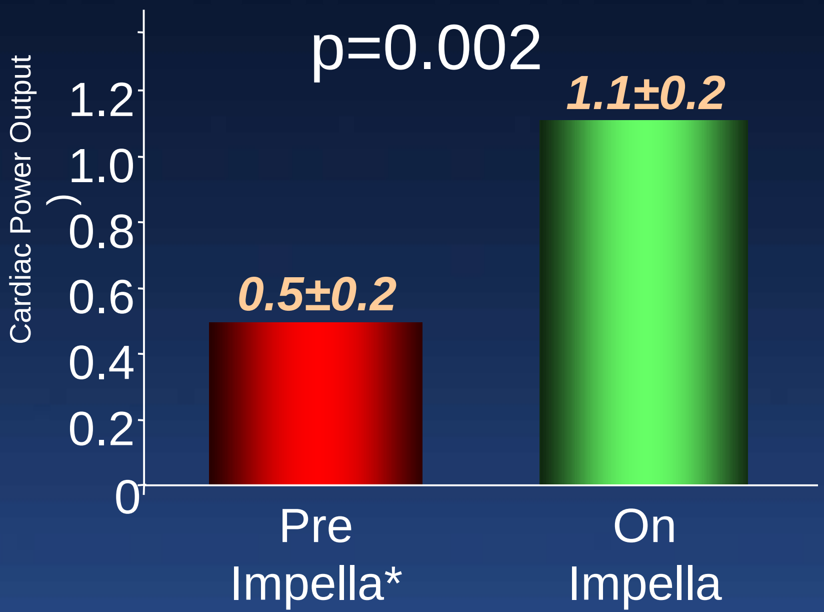


	All pat N = 1								
	Pre Support	On Supp							
MAP, mmHg	62.7±19.2 (143)	94.4± (14							
PCWP, mmHg	31.9±11.1 (25)	19.2± (25							
Cardiac Index, L/min/m^2	1.9±0.7 (23)	2.7±0.7 (23)	<0.0001	1.9±0.9 (7)	2.3±0.8 (7)	0.055	1.9±0.6 (16)	2.9±0.6 (16)	<0.0001
Cardiac Power Output, Watt	0.48±0.17 (23)	1.06±0.48 (23)	<0.0001	0.54±0.2 (7)	0.83±0.4 (7)	0.035	0.46±0.1 (16)	1.2±0.5 (16)	<0.0001

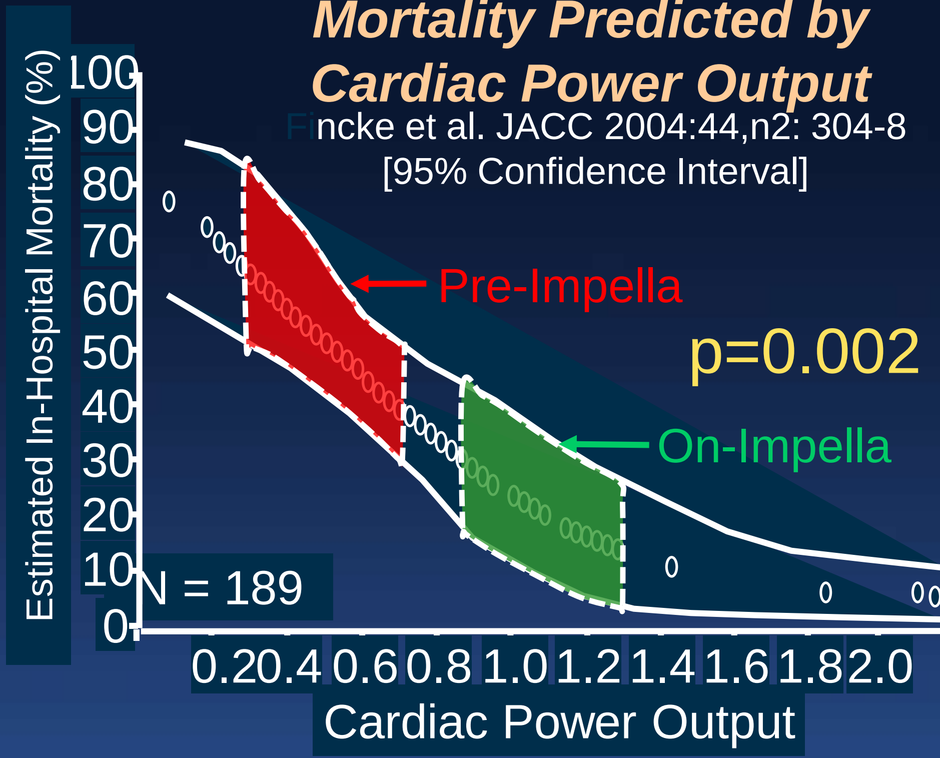
O'Neill et al, J Interven Cardiol 2013;9999:1-11

Impella Improves Cardiac Power Output, the Strongest Correlate of in-hospital Mortality

Cardiac Power Output in USpella AMI Shock

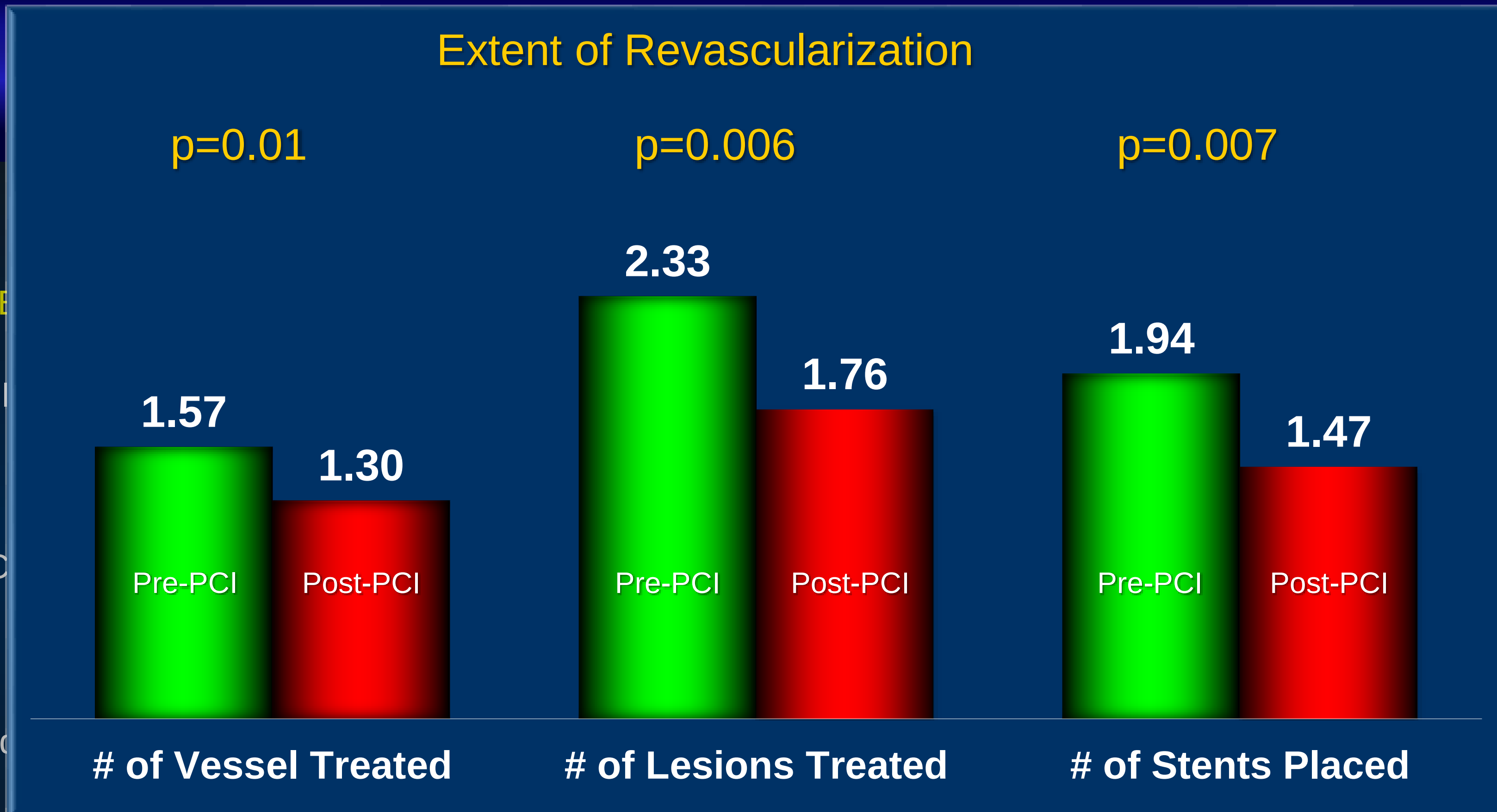


Mortality Predicted by Cardiac Power Output



*Pre-Impella measurements were recorded under clinical conditions (i.e, with inotropes + IABP)

Procedural Characteristics

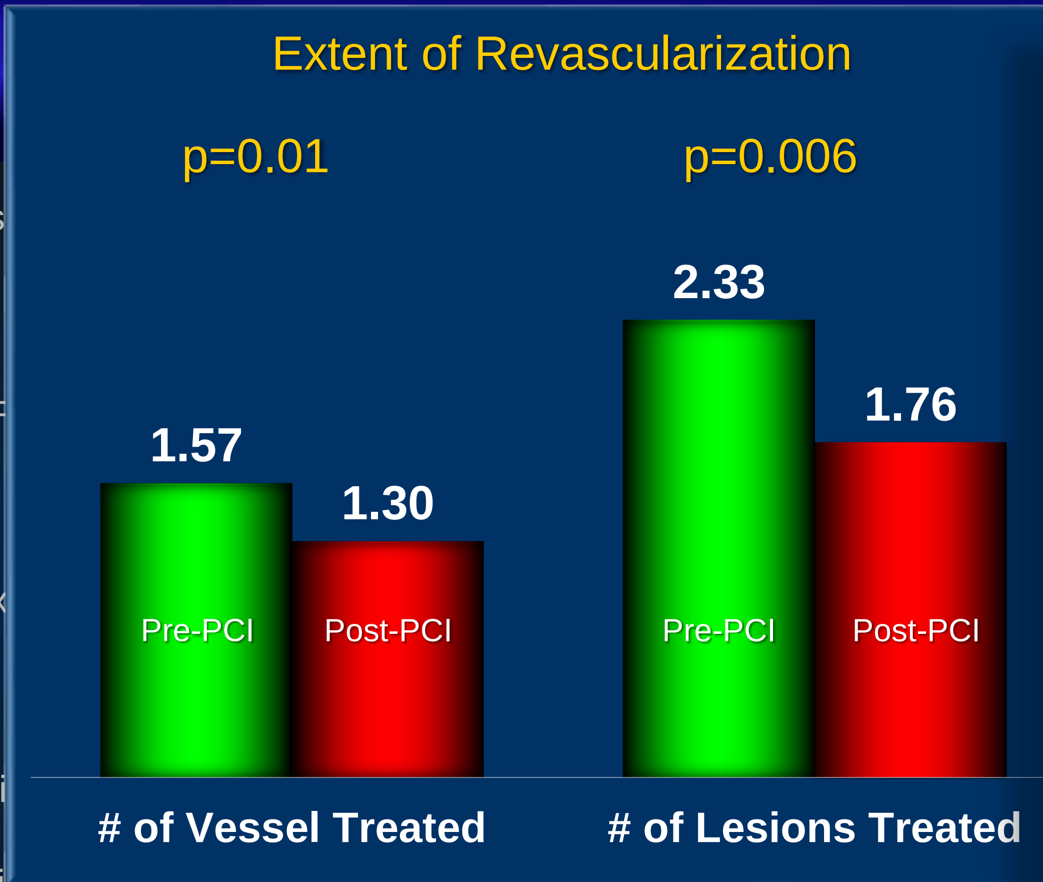


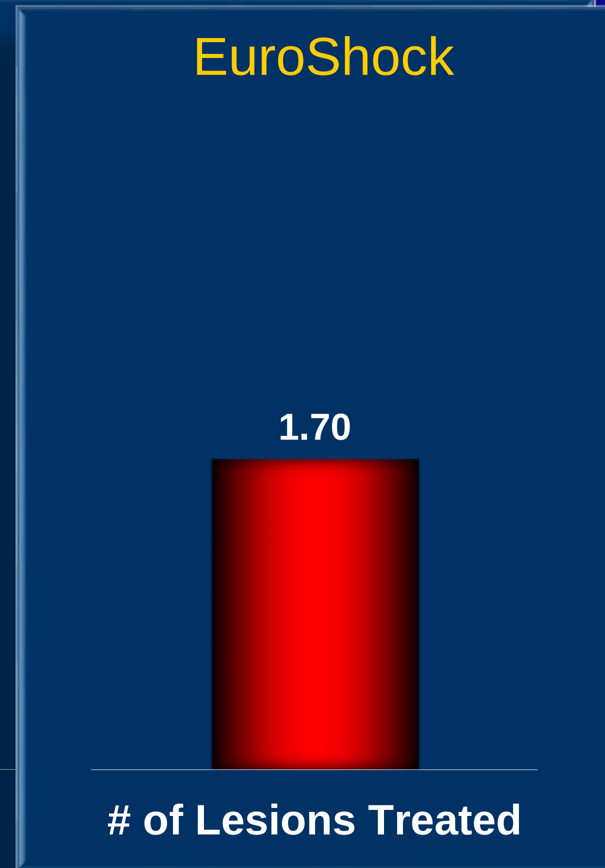
Duration of				
Median DTE				
Suspected I				
LM				
LAD				
Left C				
RCA				
Graft				
Number of c				
Number of significant Lesions	2.57±1.39	2.74±1.49	2.42±1.28	0.19
Number of vessel treated	1.42±0.63	1.57±0.67	1.30±0.57	0.01
TIMI Flow [0-1] Prior to PCI	80.2%	71.9%	84.8%	0.14
TIMI Flow [0-1] Post PCI	8.7%	4.6%	11.9%	0.19

*: DTB time for patients admitted for STEMI

O'Neill et al, J Interven Cardiol 2013;9999:1-11

Procedural Characteristics





Duration of s				
Median DTB				
Suspected IF				
LM				
LAD				
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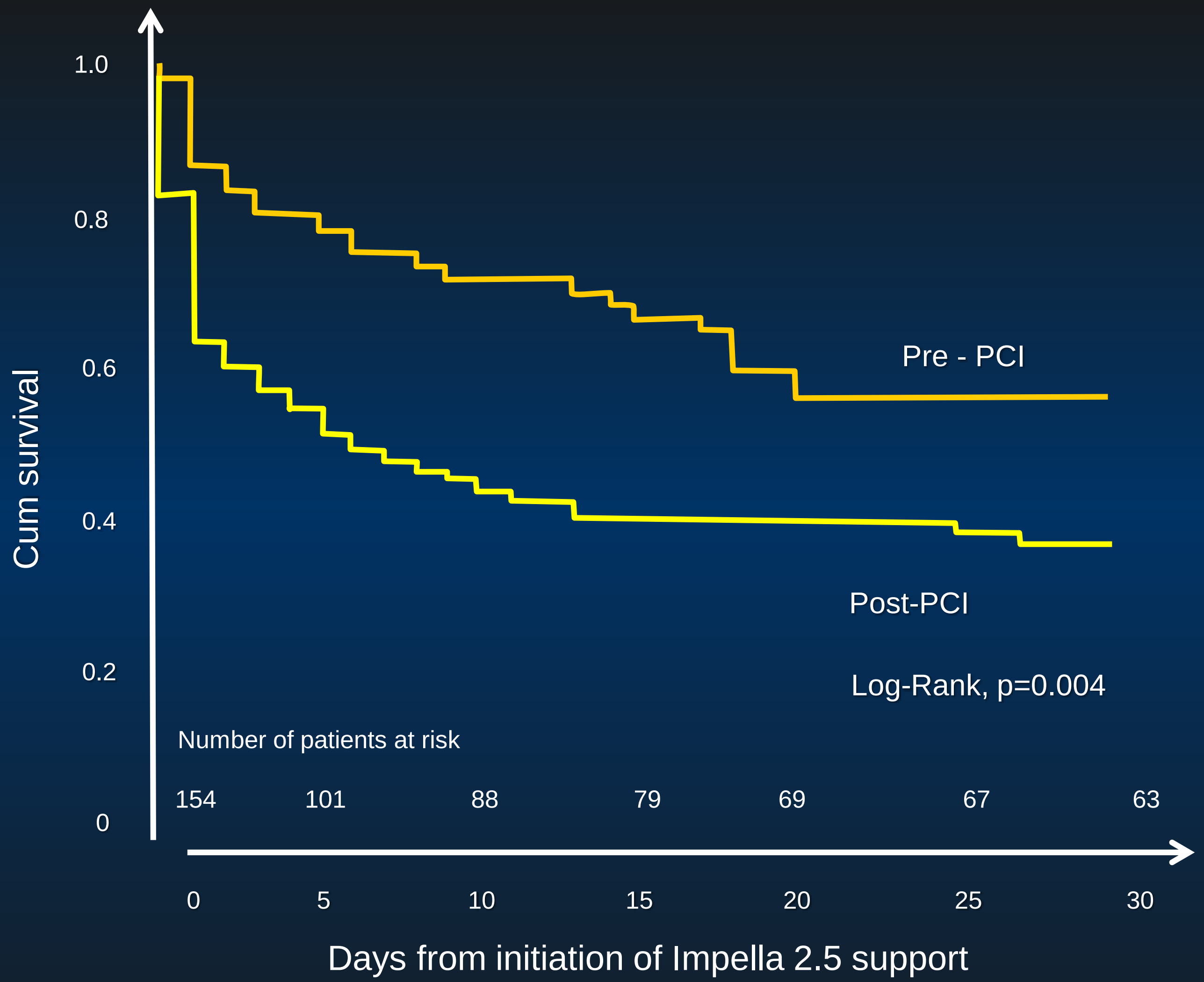
*: DTB time for patients admitted for STEMI

O’Neill et al, J Interven Cardiol 2013;9999:1-11

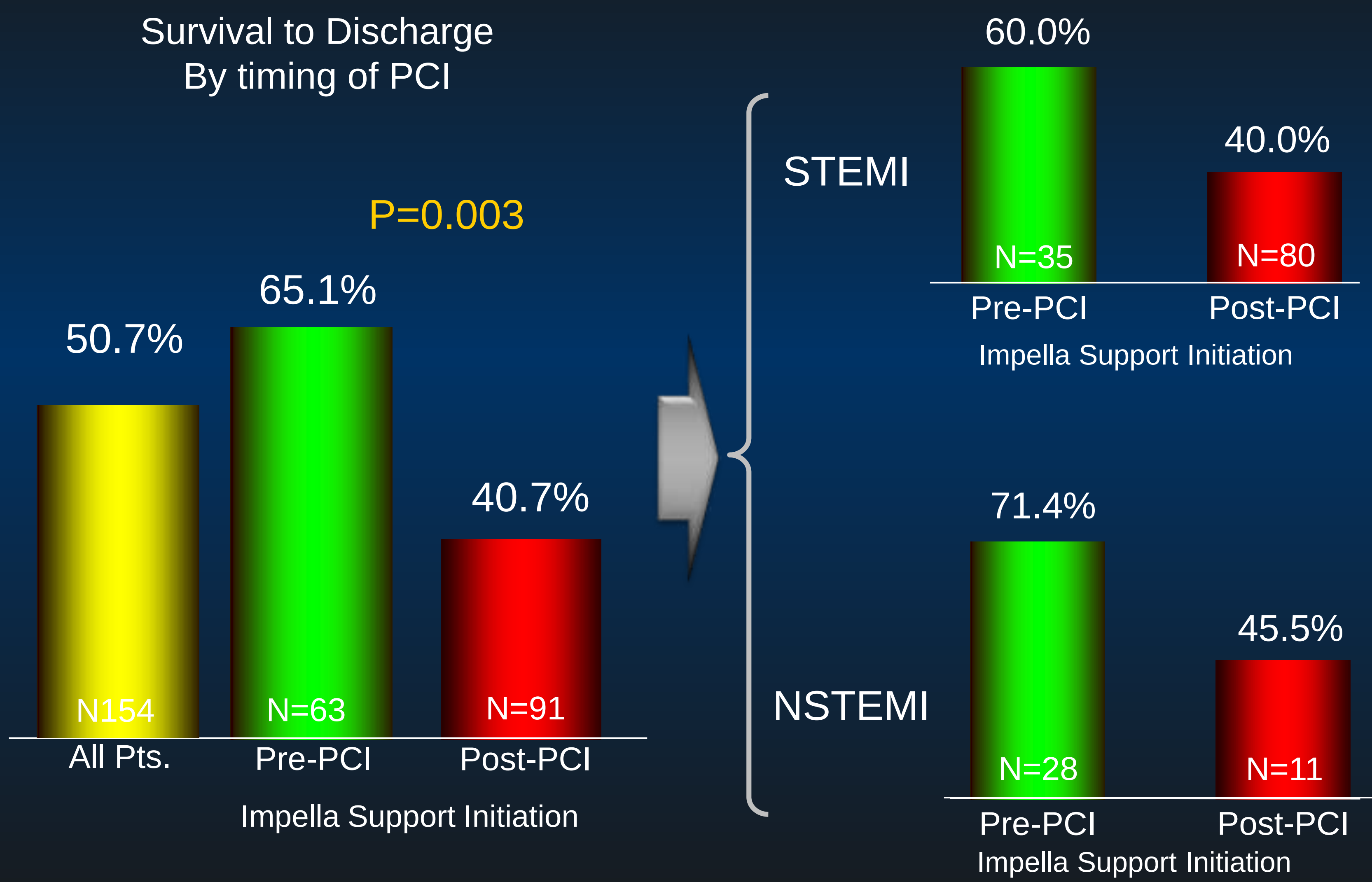
Outcome



O'Neill et al, J Interven Cardiol 2013;9999:1-11

Survival to Discharge by Timing of PCI

Timing of Support Initiation (154)



O'Neill et al, J Interven Cardiol 2013;9999:1-11

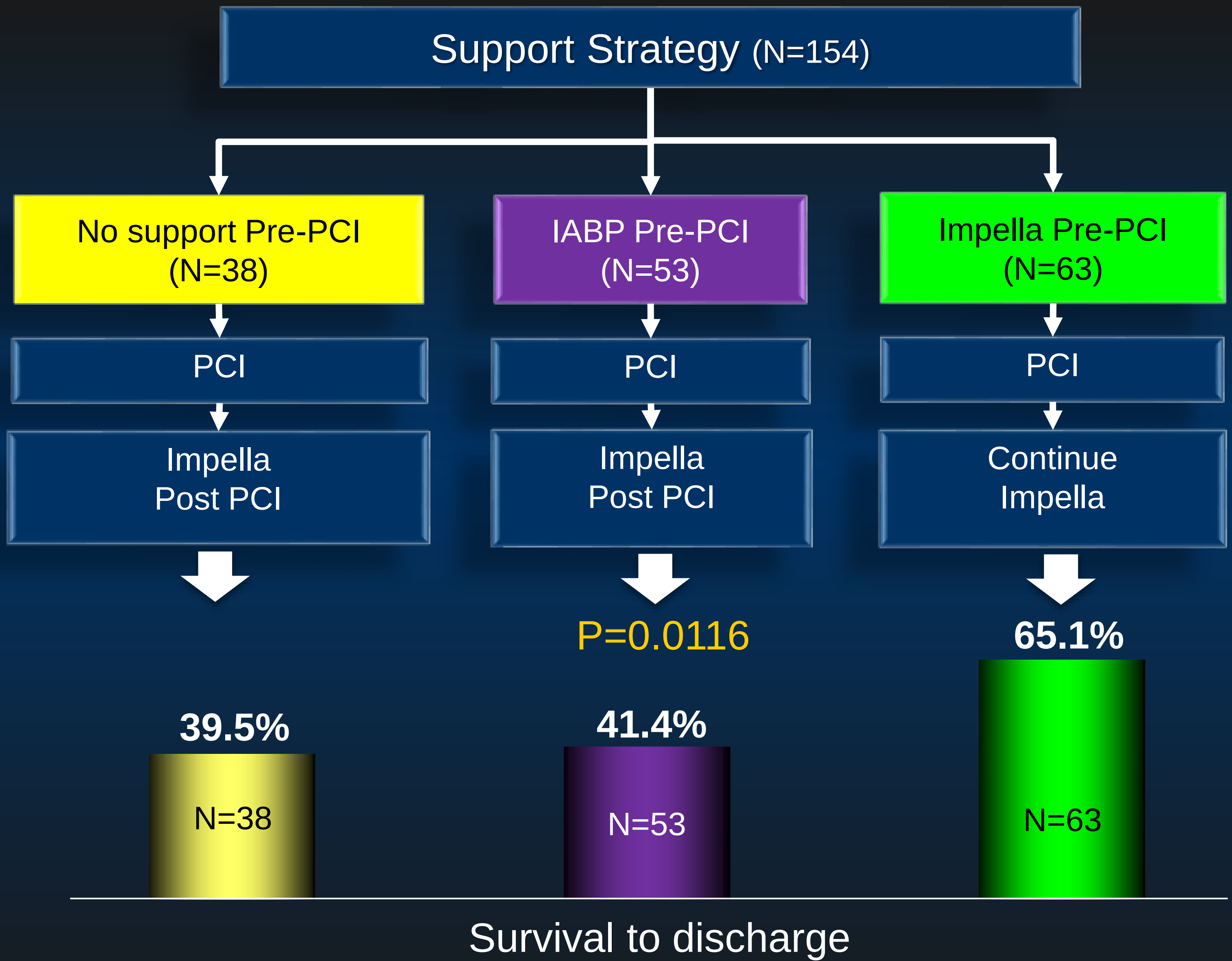
Independent Predictors of In-Hospital Mortality Using a Multivariate Analysis*

Parameter Tested*	Odds-ratio	[CI 95%]	*p-value*
Initiation of Impella support prior to PCI	0.37	0.17 - 0.79	0.01
Age	1.05	1.02 - 1.08	0.003
Number of inotropes	1.56	11 - 2.18	0.01
Cardiogenic shock onset prior to admission	2.42	1.12 - 5.24	0.03
Mechanical ventilation	4.59	2.02 - 10.42	0.0003

* The multivariate analysis logistic model included the following as candidates for entry age, gender, history of chronic obstructive pulmonary disease, diabetes, peripheral vascular disease or prior stroke, STEMI vs. NSTEMI, cardiac arrest prior to admission, onset and duration of CS, patient transfer from outlying facility, evidence of anoxic brain injury pre-Impella support, need for mechanical ventilation, systolic and diastolic blood pressure , level of inotropic support pre-Impella support and potential use of IABP prior to Impella support, and baseline serum creatinine levels.

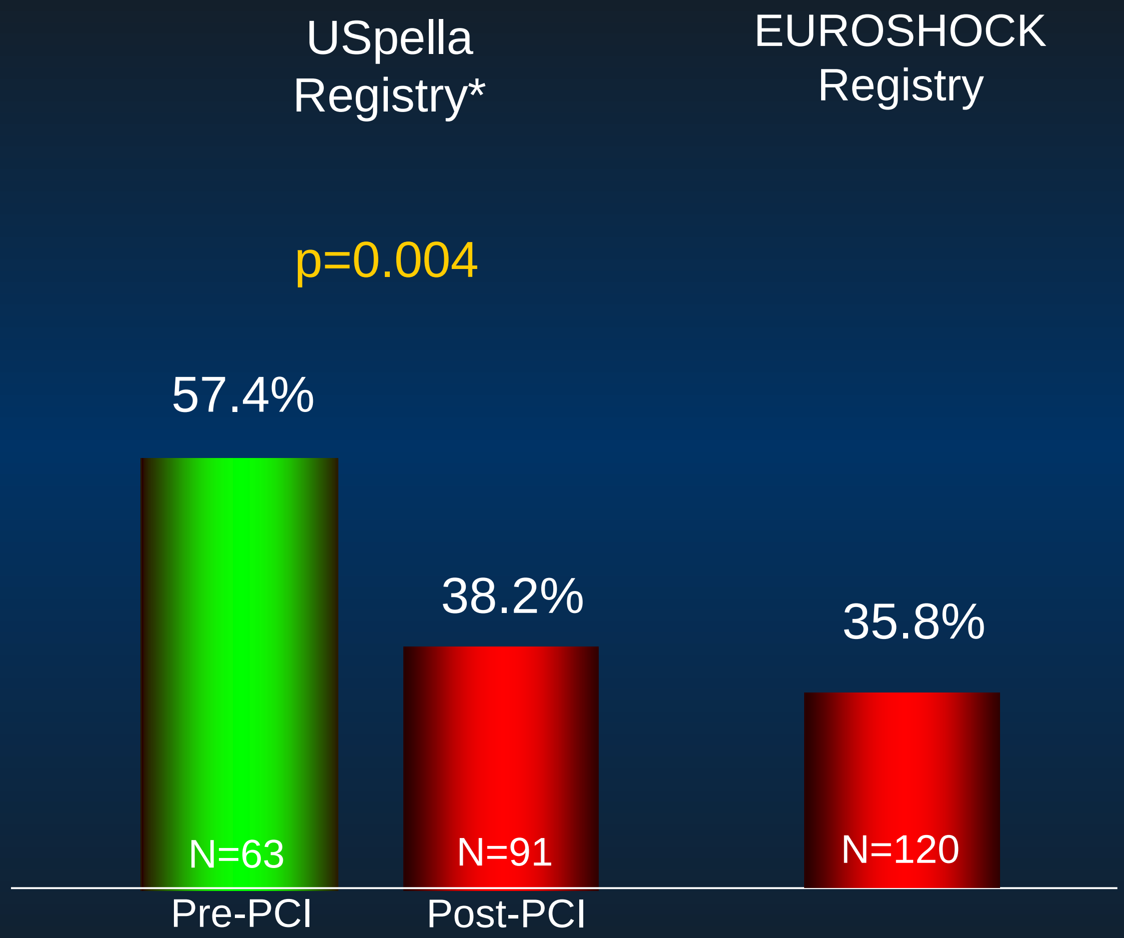
O’Neill et al, J Interven Cardiol 2013;9999:1-11

Outcome By Support Strategy



O'Neill et al, J Interven Cardiol 2013;9999:1-11

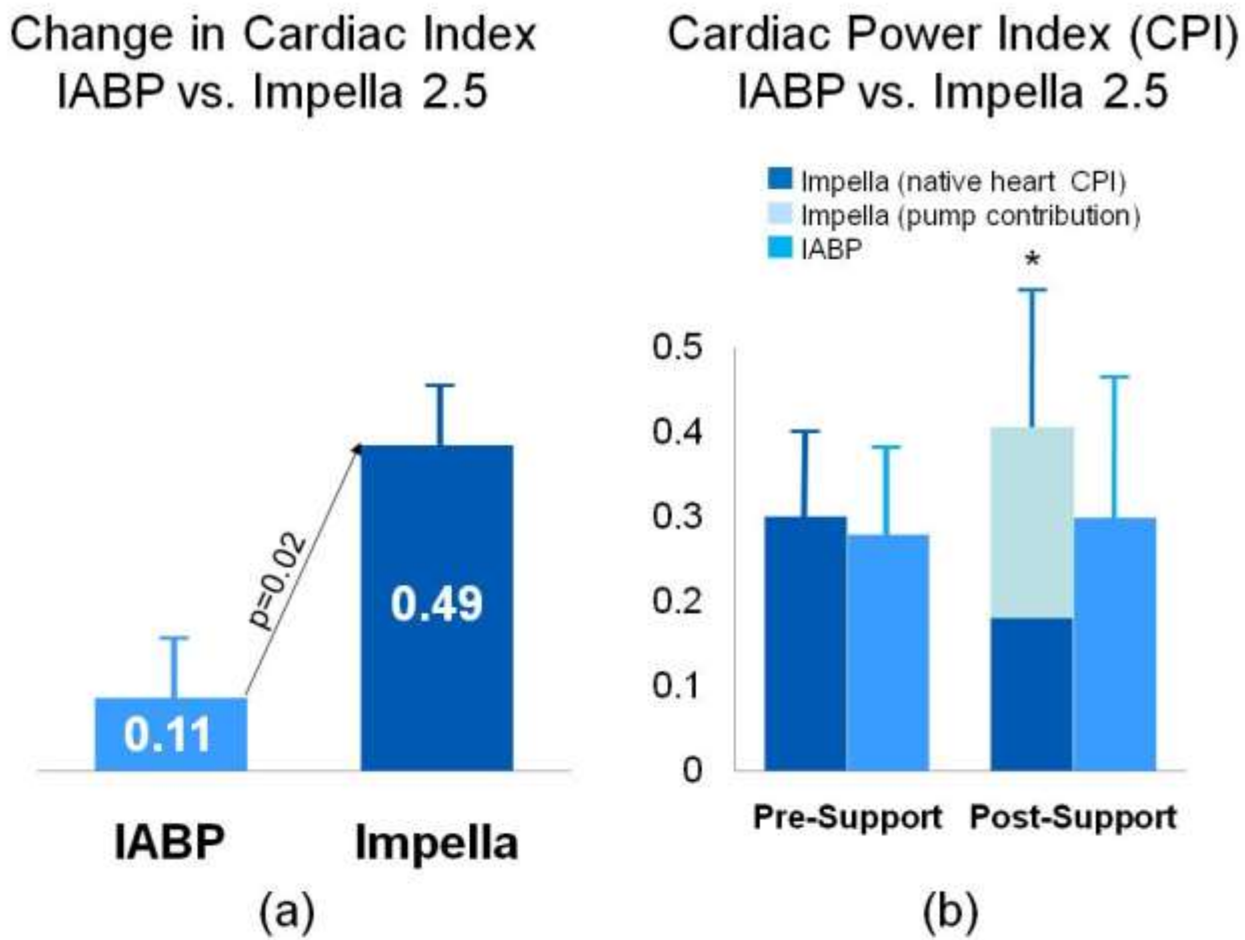
30 Day Survival



*: Kaplan Meier analysis estimated 30 day survival

O'Neill et al, J Interven Cardiol 2013;9999:1-11

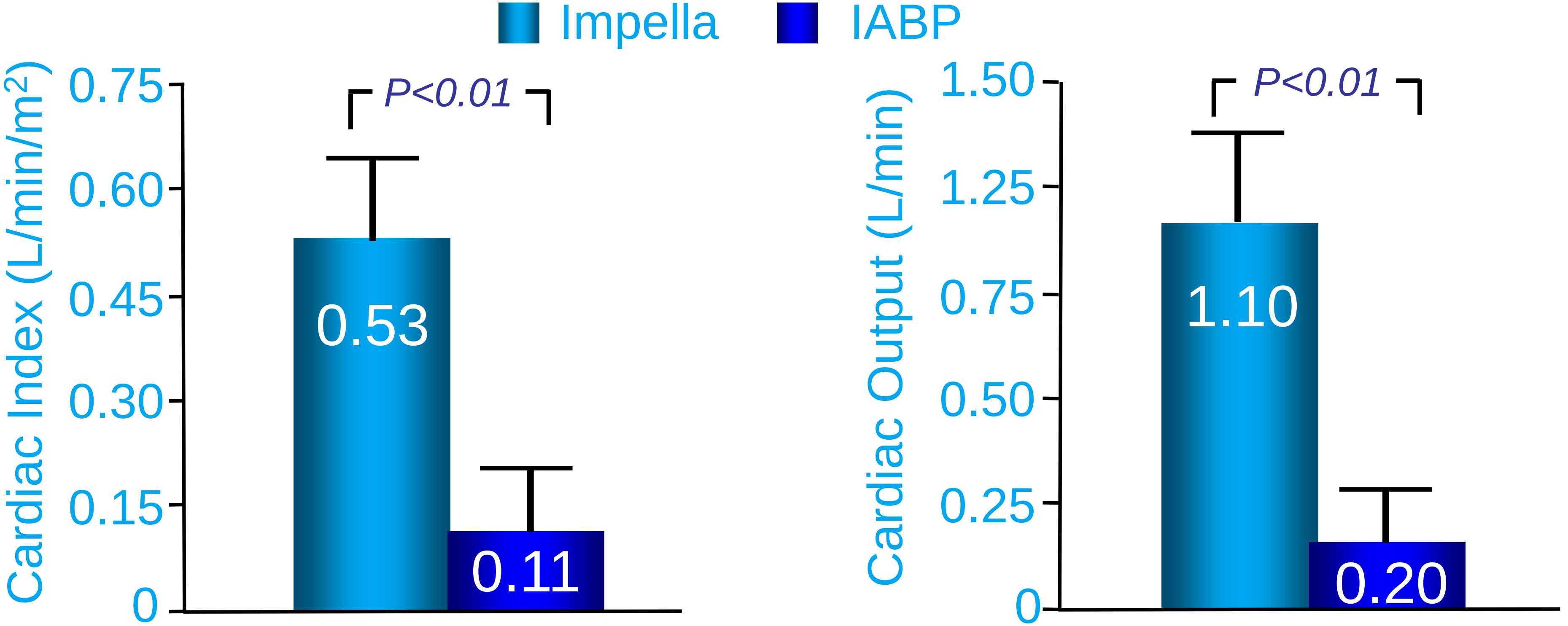
Impella vs. IABP for STEMI+CS
ISAR-SHOCK (n=26)



*Adapted from Seyfarth, et al., J Am Coll Cardiol. 2008 Nov 4;52(19):1584-8

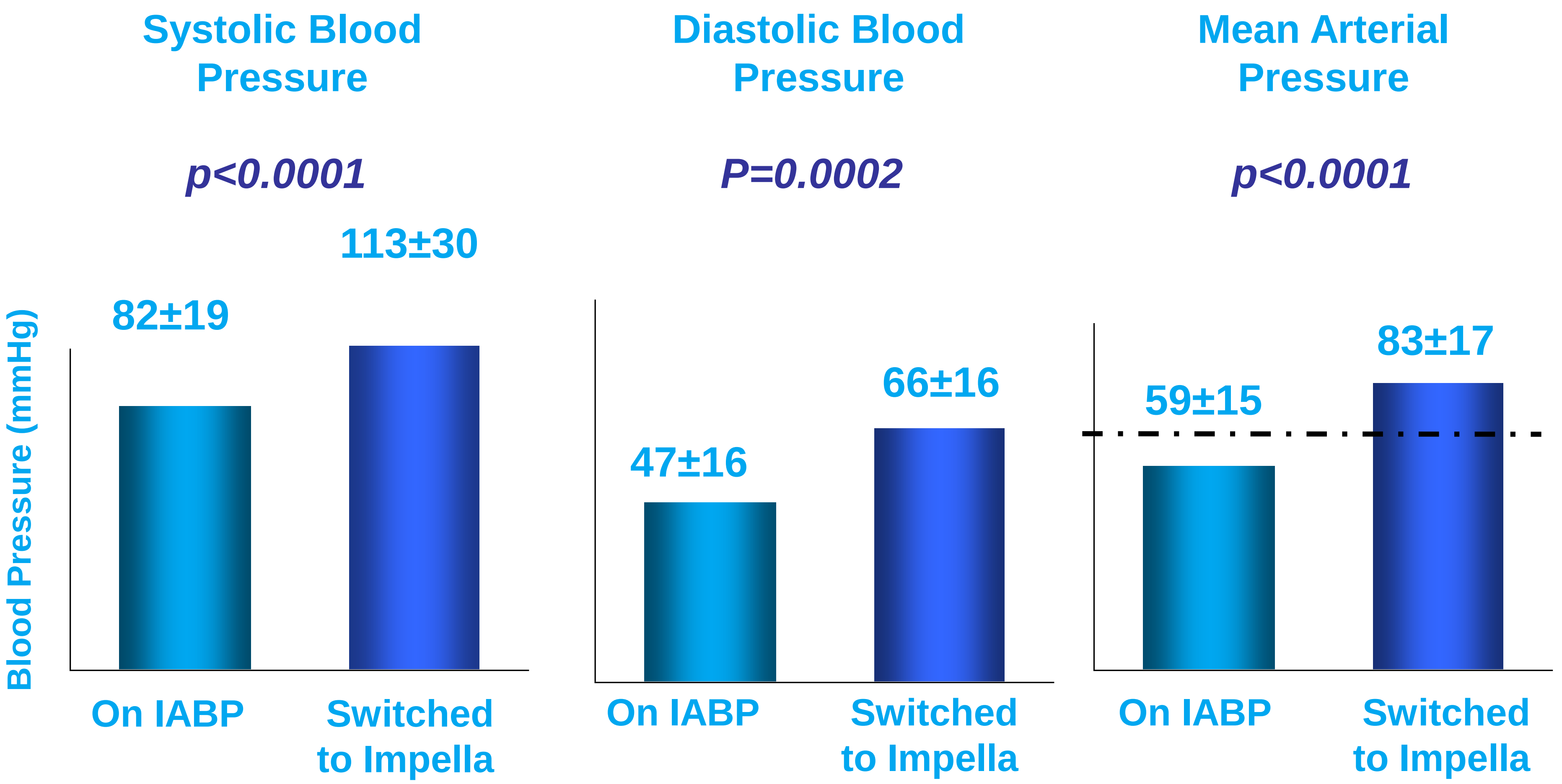
ISAR-SHOCK Randomized Trial:
IMPELLA 2.5 Provides a Better Hemodynamic Support Than IABP in AMI Cardiogenic Shock

Primary Endpoint:
Increase in Cardiac Index From Baseline
(measured after 20 min of support)



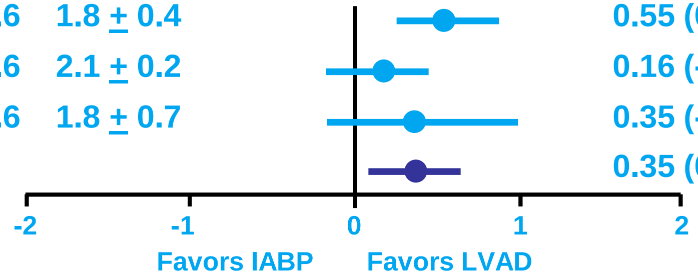
Gain on Hemodynamics When Switching from IABP to Impella in AMI Shock

Patient serves as his/her own control (N=20)

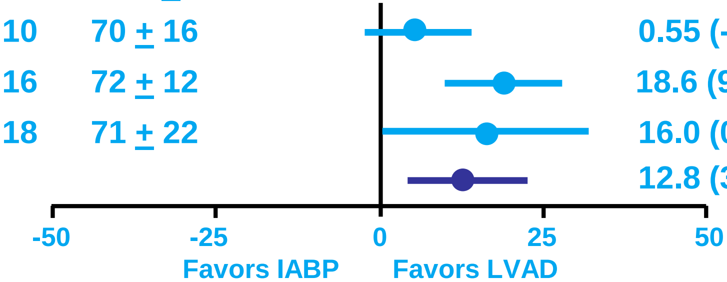


Hemodynamics

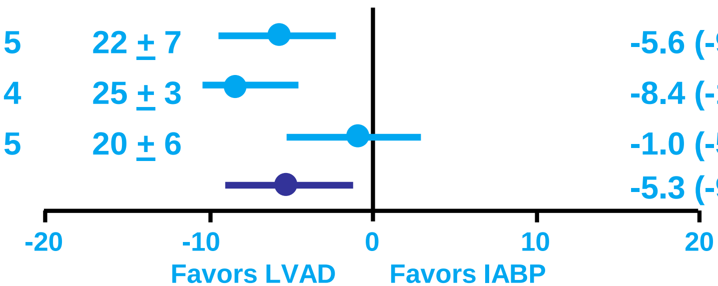
	LVAD Mean ± SD	IABP Mean ± SD	Cardiac index Mean Difference	P(heterogeneity) = 0.22 I^2 = 34.0%
Thiele et al.	2.3 ± 0.6	1.8 ± 0.4		0.55 (0.23-0.87)
Burkoff et al.	2.2 ± 0.6	2.1 ± 0.2		0.16 (-0.14-0.46)
Seyfarth et al.	2.2 ± 0.6	1.8 ± 0.7		0.35 (-0.16-0.88)
Pooled				0.35 (0.09-0.61)



	LVAD Mean ± SD	IABP Mean ± SD	Mean Arterial Pressure Mean Difference	P(heterogeneity) = 0.10 I^2 = 55.9%
Thiele et al.	76 ± 10	70 ± 16		0.55 (-2.9-13.9)
Burkoff et al.	91 ± 16	72 ± 12		18.6 (9.4-27.9)
Seyfarth et al.	87 ± 18	71 ± 22		16.0 (0.5-31.5)
Pooled				12.8 (3.6-22.0)

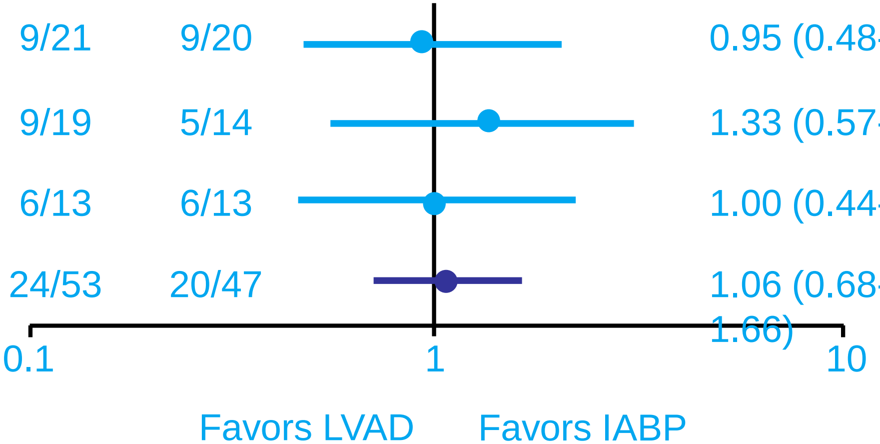


	LVAD Mean ± SD	IABP Mean ± SD	Pulmonary wedge pressure Mean Difference	P(heterogeneity) = 0.01 I^2 = 76.6%
Thiele et al.	16 ± 5	22 ± 7		-5.6 (-9.2 to -2.1)
Burkoff et al.	16 ± 4	25 ± 3		-8.4 (-11.0 to -5.8)
Seyfarth et al.	19 ± 5	20 ± 6		-1.0 (-5.2-3.2)
Pooled				-5.3 (-9.4 to -1.2)



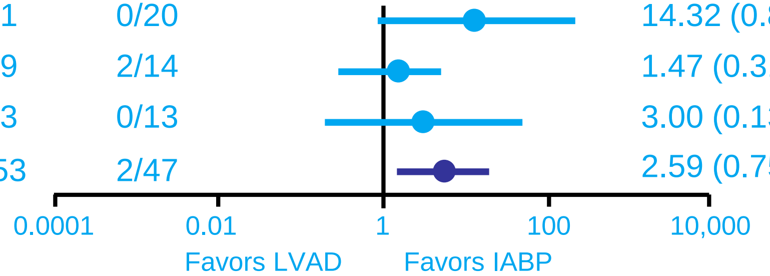
30 Day Mortality

	LVAD n/N	IABP n/N	30-day Mortality Relative Risk	*P*(heterogeneity) = 0.83 $I^2 = 0\%$
Thiele et al.	9/21	9/20		0.95 (0.48-1.90)
Burkoff et al.	9/19	5/14		1.33 (0.57-3.10)
Seyfarth et al.	6/13	6/13		1.00 (0.44-2.29)
Pooled	24/53	20/47		1.06 (0.68-1.66)

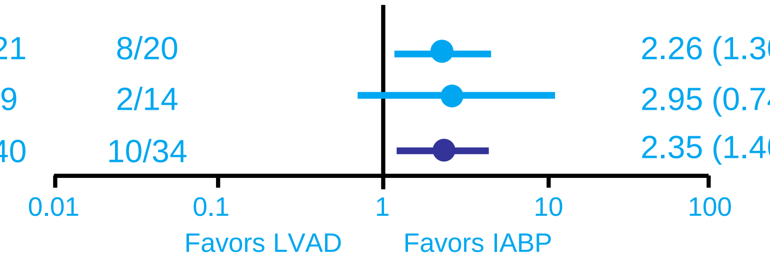


Complications

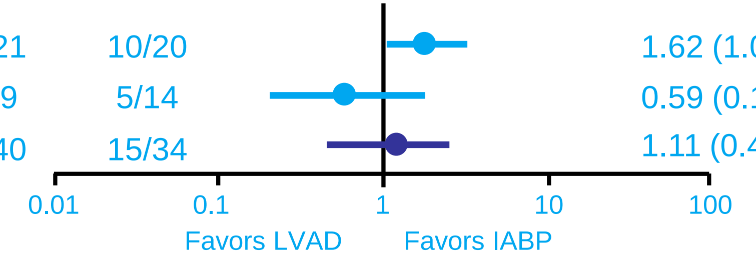
	LVAD n/N	IABP n/N	Reported Leg Ischemia Relative Risk	P(heterogeneity) = 0.38 I^2 = 0%
Thiele et al.	7/21	0/20		14.32 (0.87-235.4)
Burkoff et al.	4/19	2/14		1.47 (0.31-6.95)
Seyfarth et al.	1/13	0/13		3.00 (0.13-67.51)
Pooled	12/53	2/47		2.59 (0.75-8.97)



	LVAD n/N	IABP n/N	Reported Bleeding Relative Risk	P(heterogeneity) = 0.73 I^2 = 0%
Thiele et al.	19/21	8/20		2.26 (1.30-3.94)
Burkoff et al.	8/19	2/14		2.95 (0.74-11.80)
Pooled	27/40	10/34		2.35 (1.40-3.93)



	LVAD n/N	IABP n/N	Reported Fever or Sepsis Relative Risk	P(heterogeneity) = 0.10 I^2 = 62.1%
Thiele et al.	17/21	10/20		1.62 (1.00-2.63)
Burkoff et al.	4/19	5/14		0.59 (0.19-1.80)
Pooled	21/40	15/34		1.11 (0.43-2.90)



DanShock Trial – Enrolling

Acute MI (STEMI < 36 h)

Shock

Eligible

PCI (CABG)

Randomization

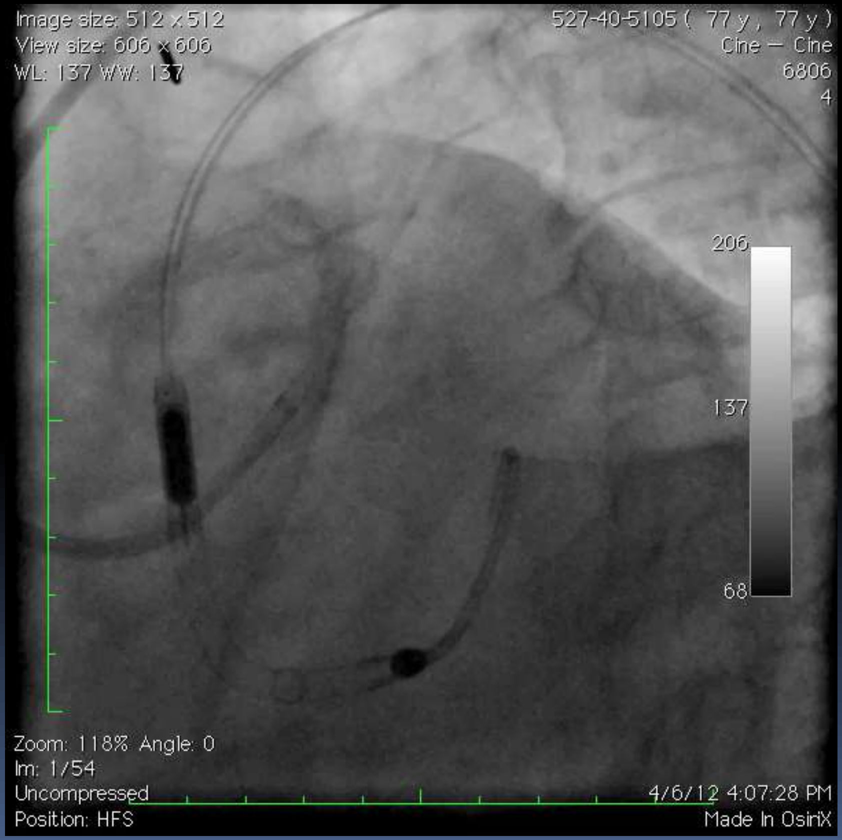
- Lactate > 2.5 mmol/l
- SBP < 100 mmHg oder Vasopressoren
- LV-EF < 35%

1 Endpoint: All Cause Mortality

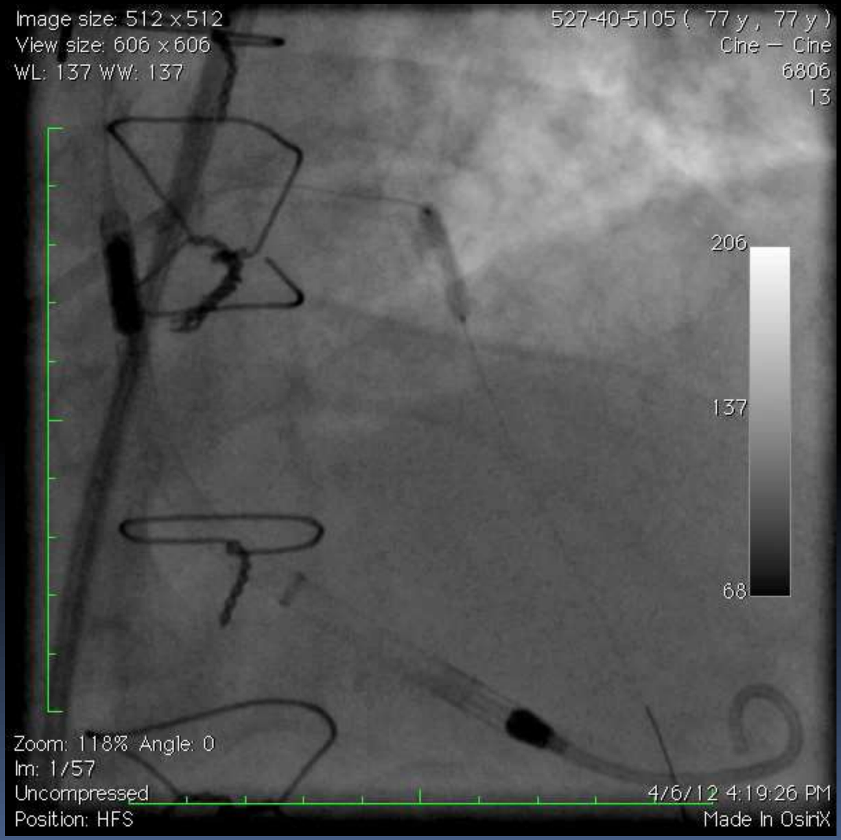
Conventional Therapy + **IABP + PCI** **(n=180)**	Conventional Therapy + Impella cVAD + PCI (n=180)

2011 ACCF/AHA/SCAI PCI Guidelines

- Class I: Section 5.2.3 Cardiogenic Shock: Recommendation: “A hemodynamic support device is recommended for patients with cardiogenic shock after STEMI who do not quickly stabilize with pharmacological therapy (384,424–427).” This classification includes the statement: “Refractory cardiogenic shock unresponsive to revascularization may necessitate institution of more intensive cardiac support with a ventricular assist device or other hemodynamic support devices to allow for myocardial recovery or subsequent cardiac transplantation in suitable patients.”
- Class II b: Section 5.6 Percutaneous Hemodynamic Support Devices: Recommendation: "Elective insertion of an appropriate hemodynamic support device as an adjunct to PCI may be reasonable in carefully selected high-risk patients.”

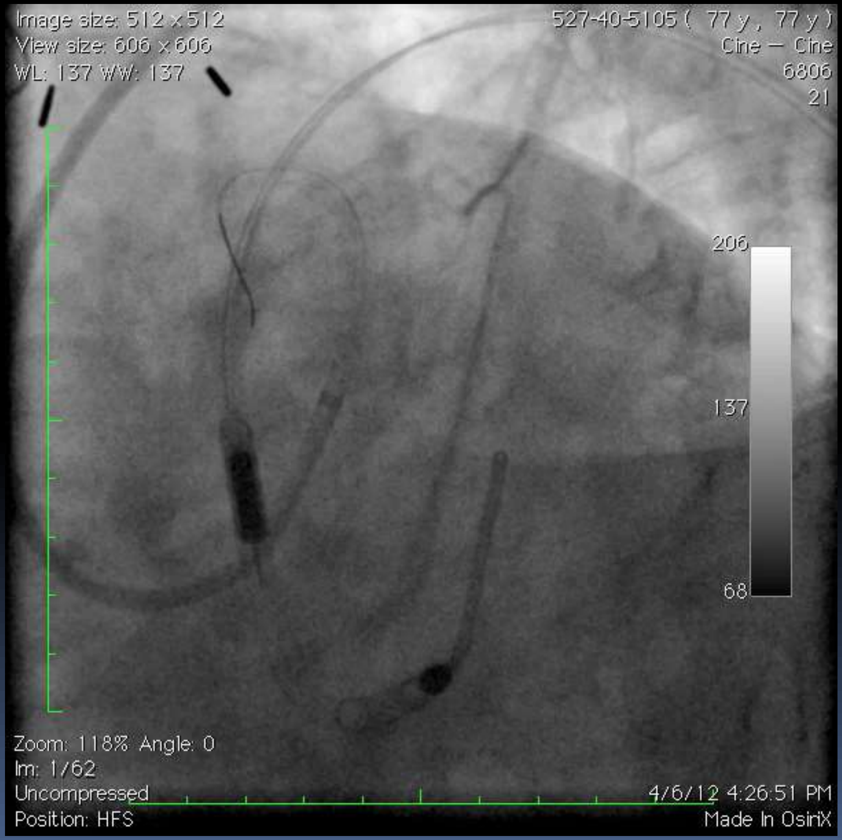


Impella deployed in LV

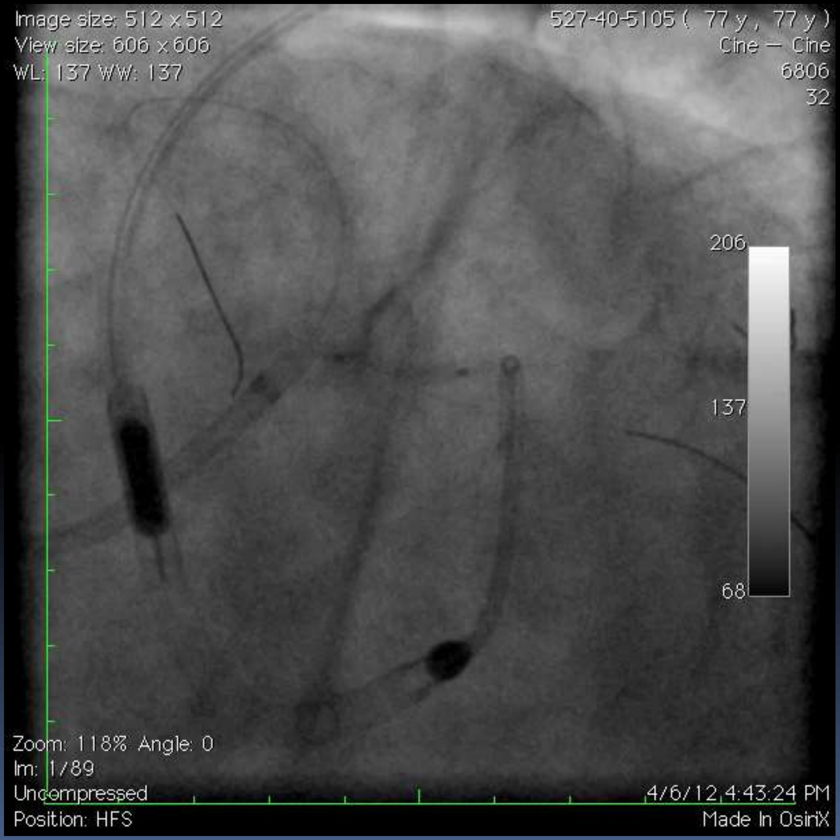


ASC balloon LAD

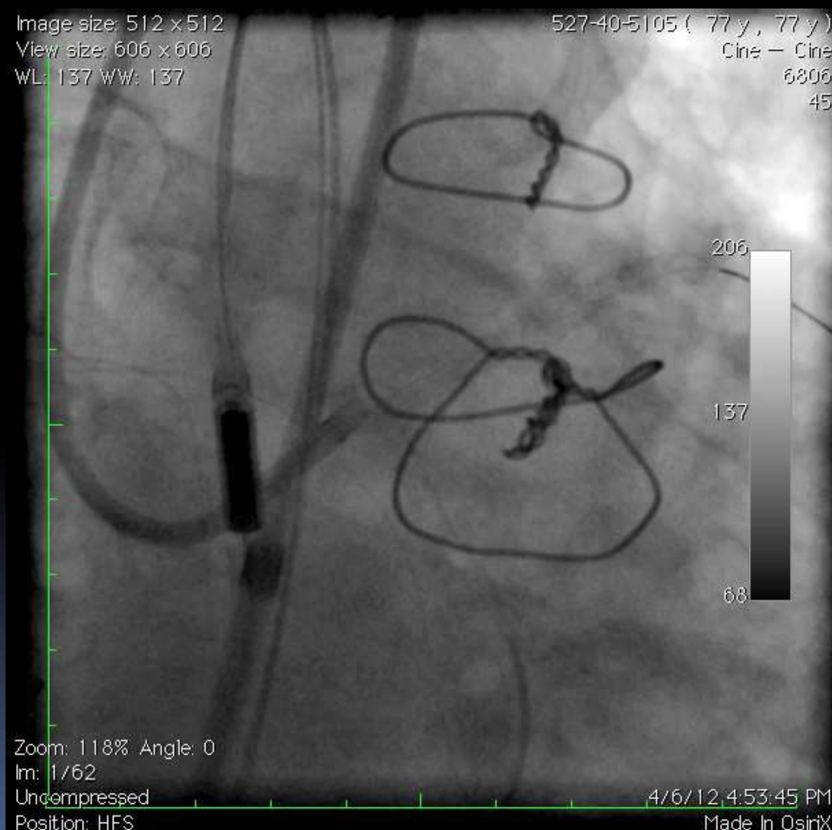
LAD completely revascularized with Resolute DES



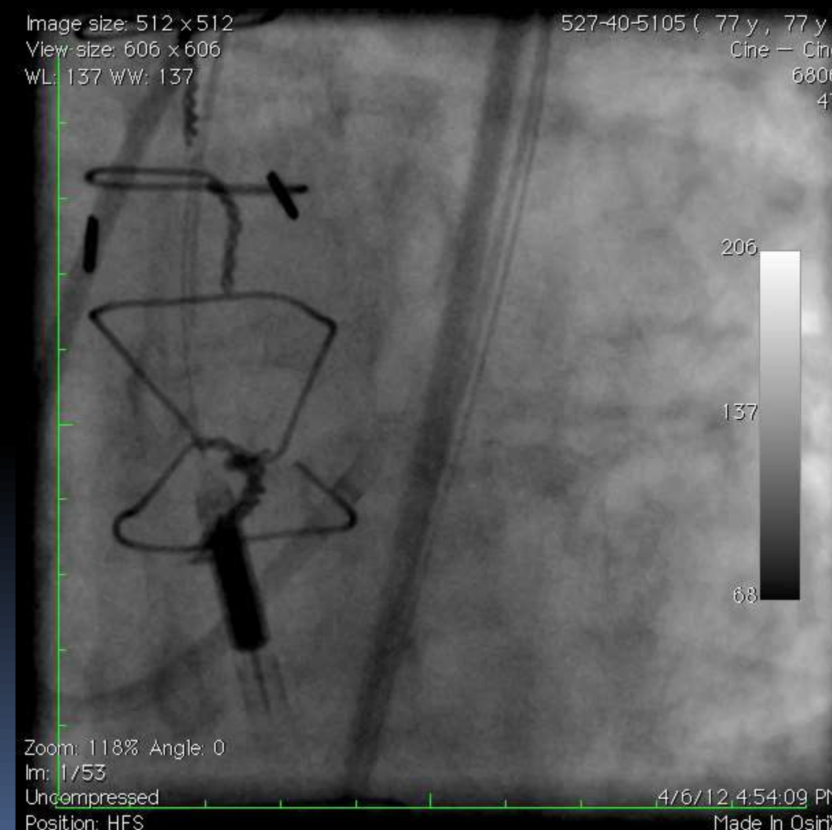
ASC balloon in Circ/OM



Circ/OM treated with Resolute post ASC balloon



Final results

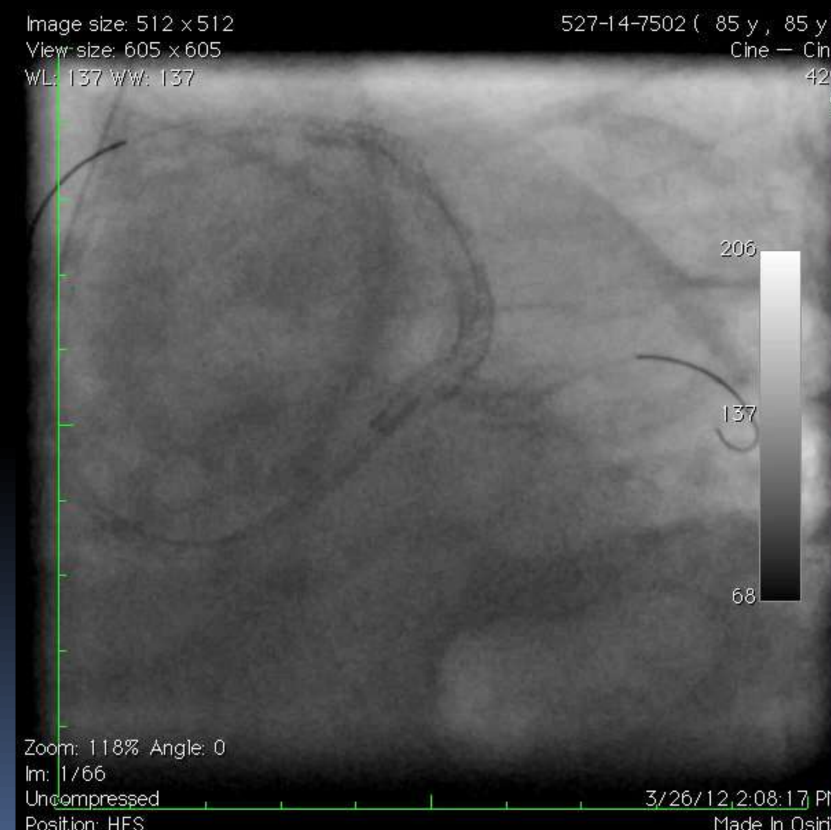


- 75 yo male with DM, ESRD on dialysis, LVEF 25%, left main disease previously turned down by CT surgery
- Received left main PCI in 2010
- Readmitted with NSTEMI

75 yo male with LM disease and ISR of DES placed in 2010

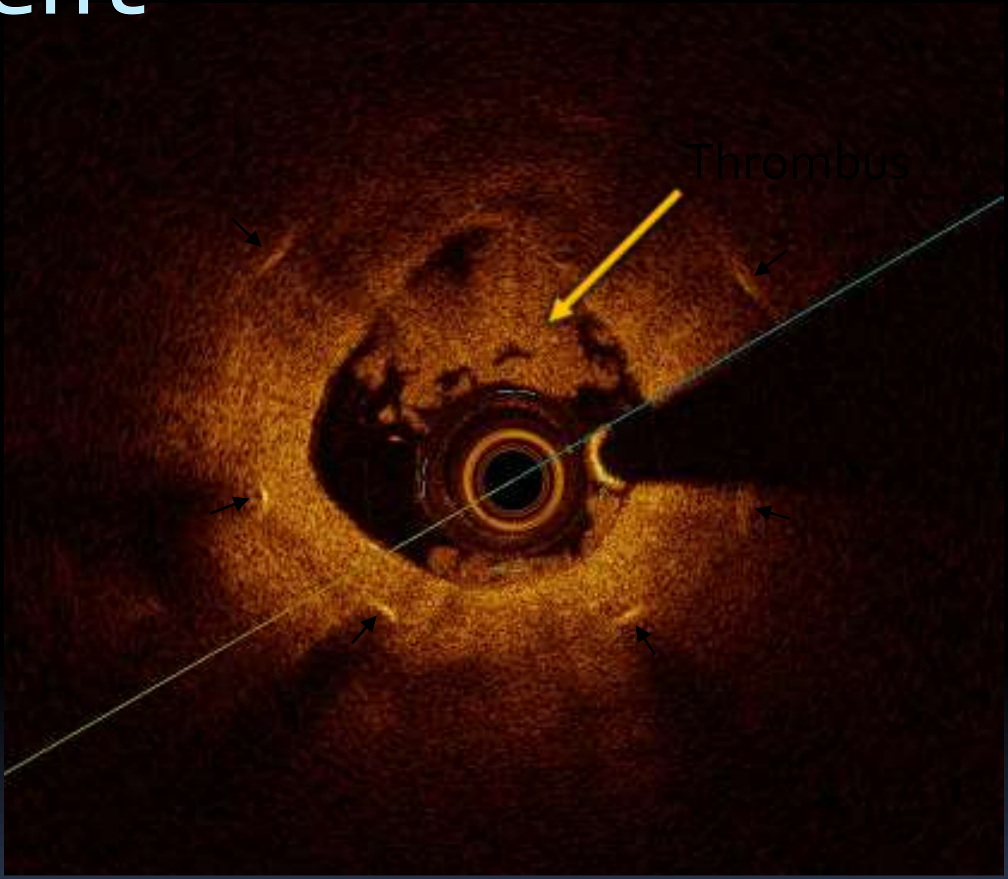
DES ISR in LM and Circ ostium

Balloon of L Circ ostium



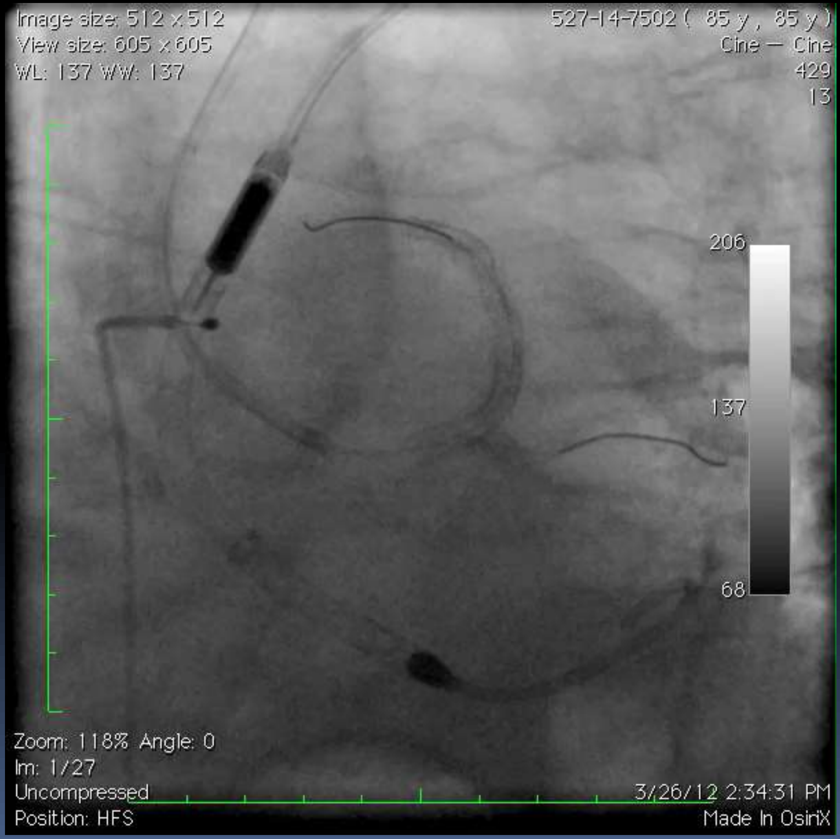
Severe In-Stent Restenosis

Ruptured plaque inside ISR segment

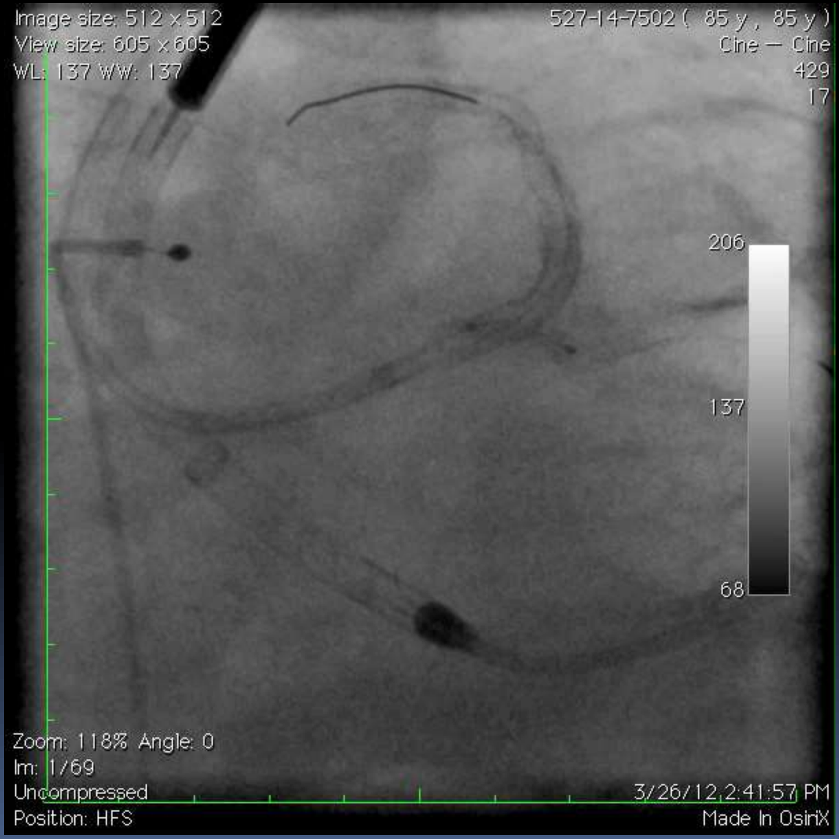


- Patient developed ventricular fibrillation
- Converted with 1 shock
- Became hypotensive and bradycardic
- Impella placed emergently

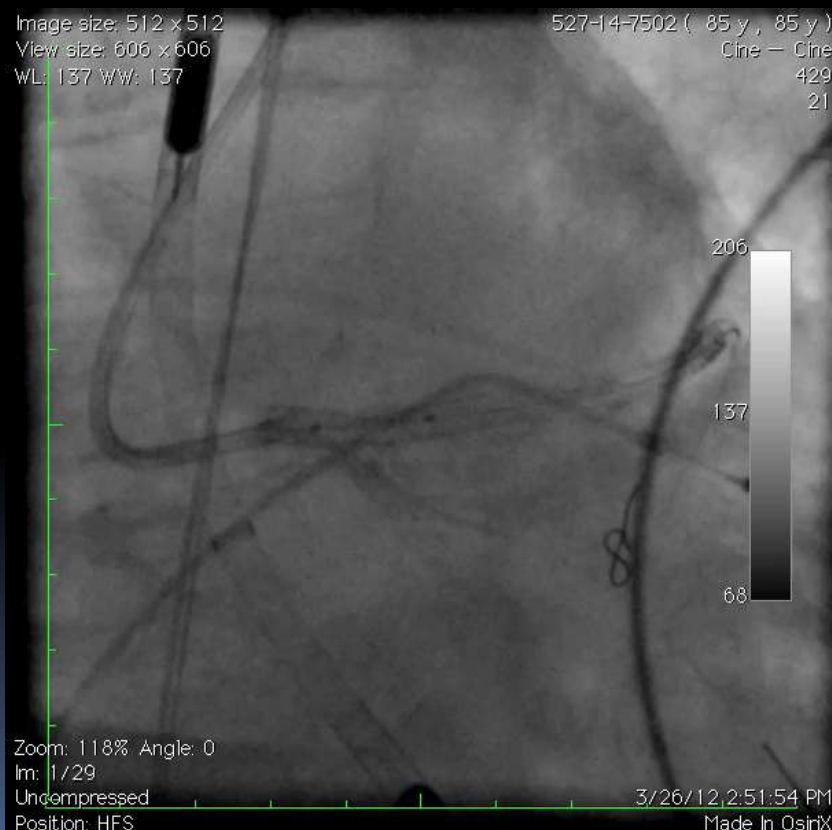
Patient went into cardiogenic shock



Stabilized after Impella placed



ASC balloon and DES in left main



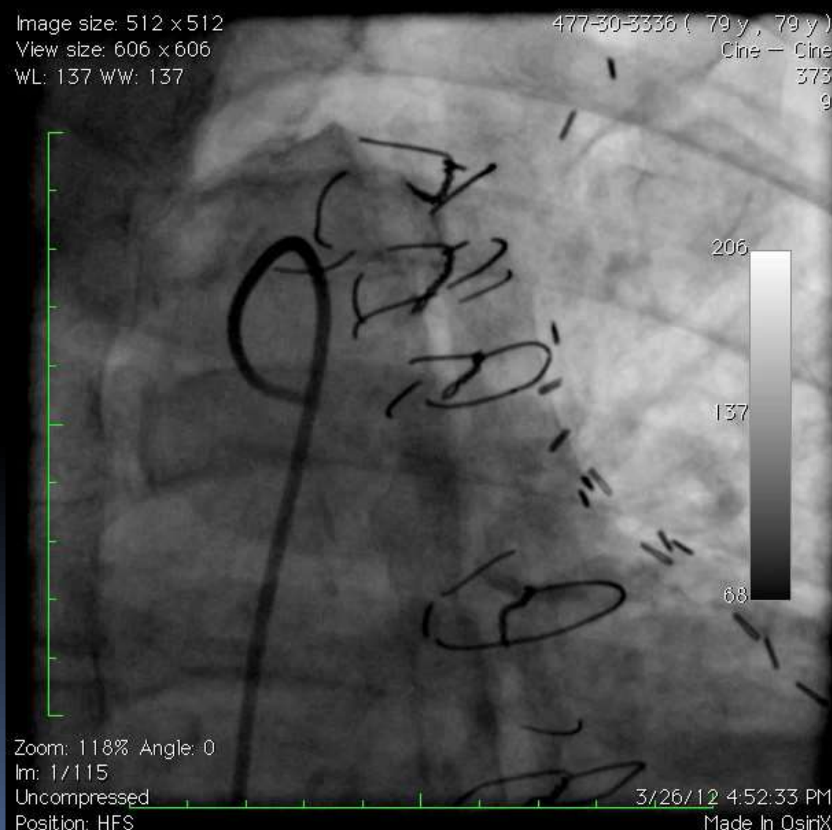
ASC balloon ‘grooves’


Image size: 512 x 512
View size: 601 x 601
WL: 137 WW: 137
527-14-7502 (85 y , 85 y)
Cine — Cine
429
26
206
137
68
Zoom: 117% Angle: 0
Im: 1/52
Uncompressed
Position: HFS
3/26/12 2:57:46 PM
Made In OsiriX

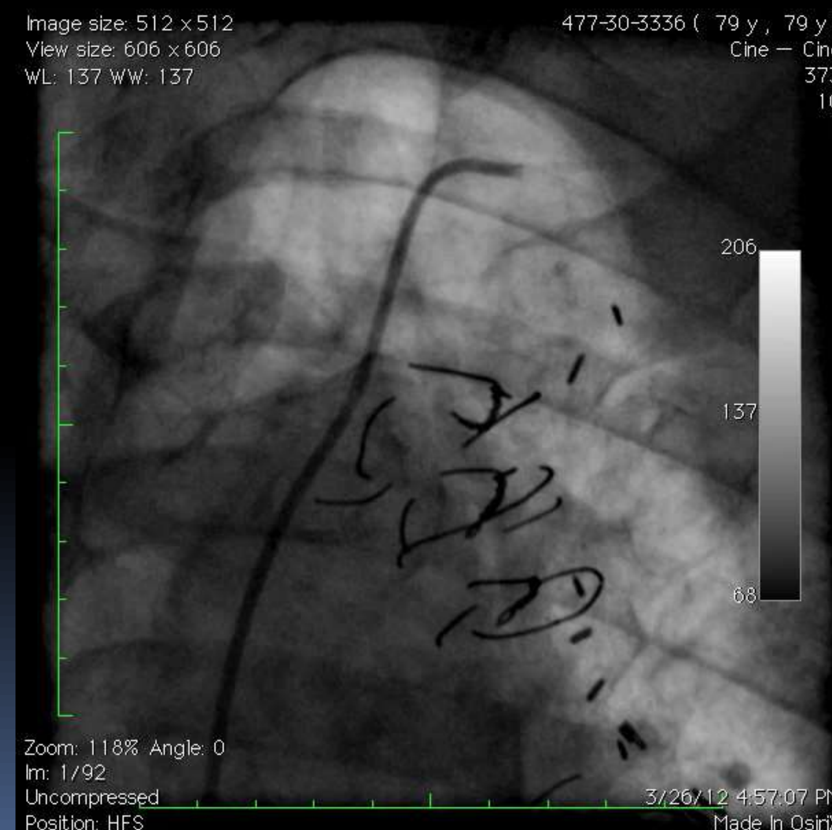
- 89 yo male with prior CABG and severe PVD
- Admitted with NSTEMI
- Single remaining SVG supplies lateral wall
- LIMA is down
- LAD supplied by collaterals from RCA
- LVEF 15%
- Hypotensive on 3 pressors

89 yo male with prior CABG and single remaining graft

SVG with severe disease

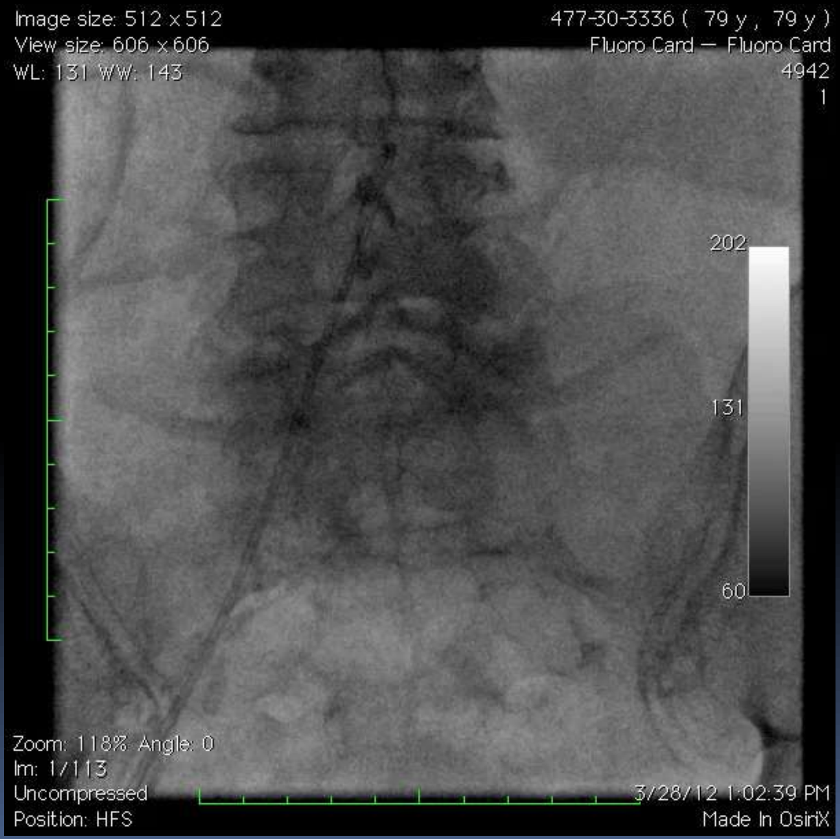


LIMA occluded

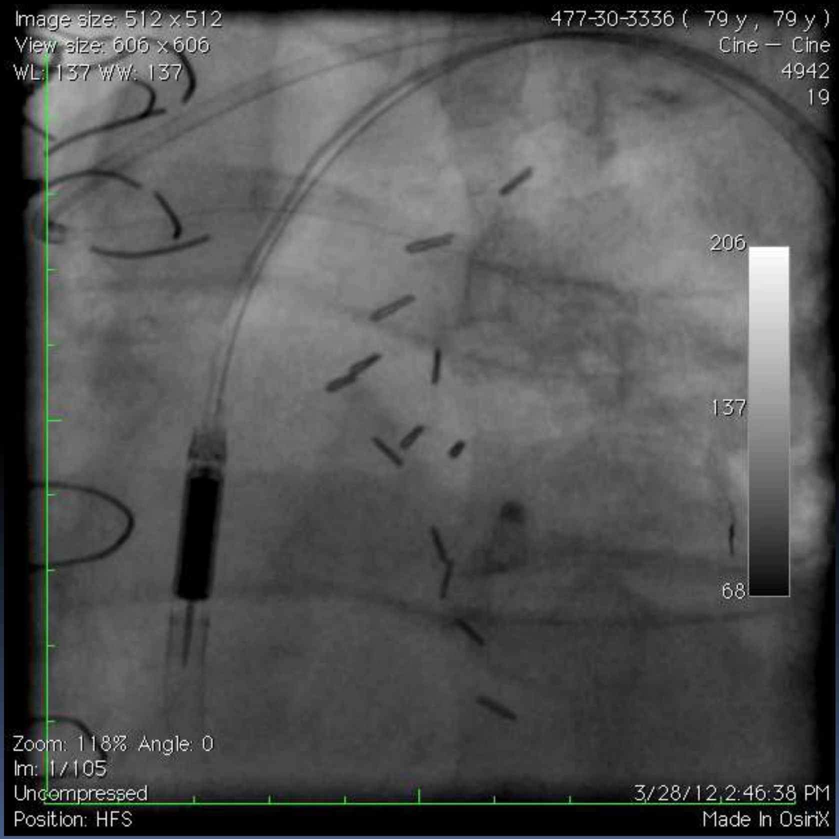


Diffuse white (platelet rich) thrombus in distal SVG

Severe PVD



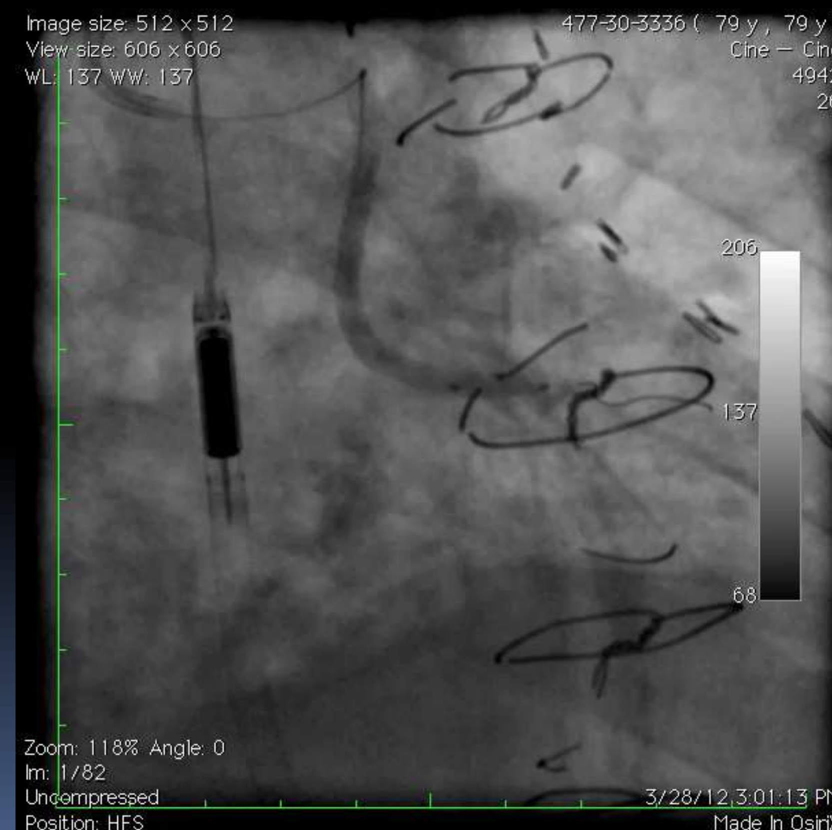
Impella 2.5 placed via long 14F sheath



- Main concern is that PCI attempt will shut down SVG, since no place to land filter device
- Not a lot of safety margin

Severe disease in SVG

No reflow in SVG



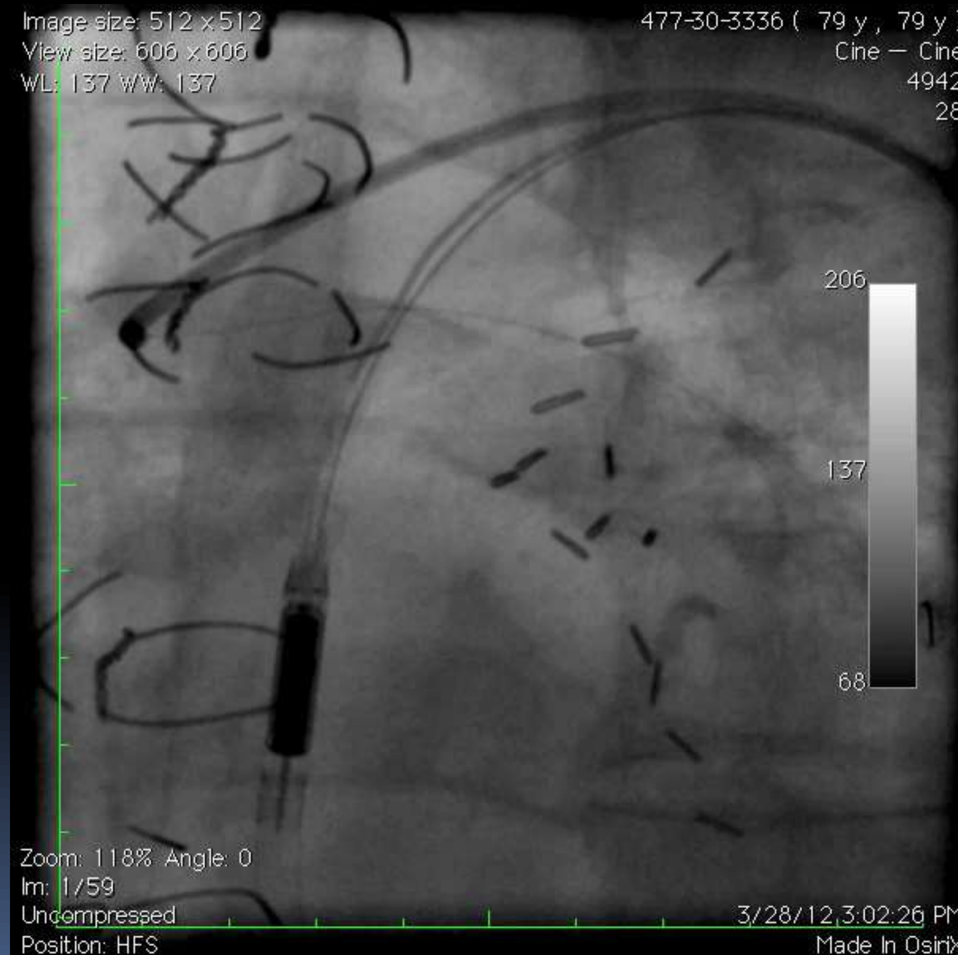
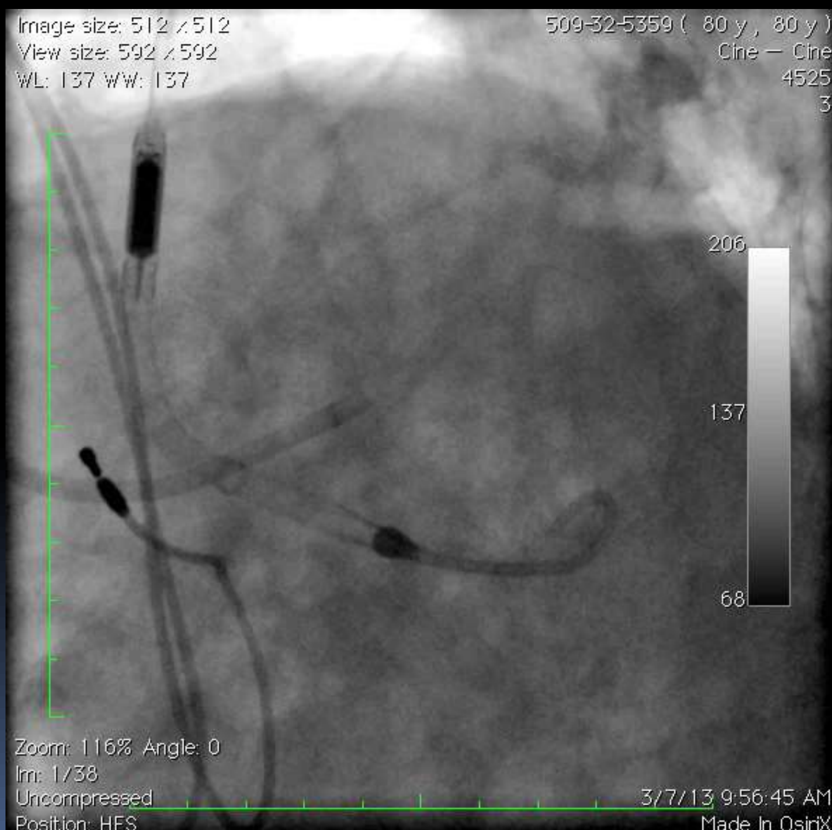


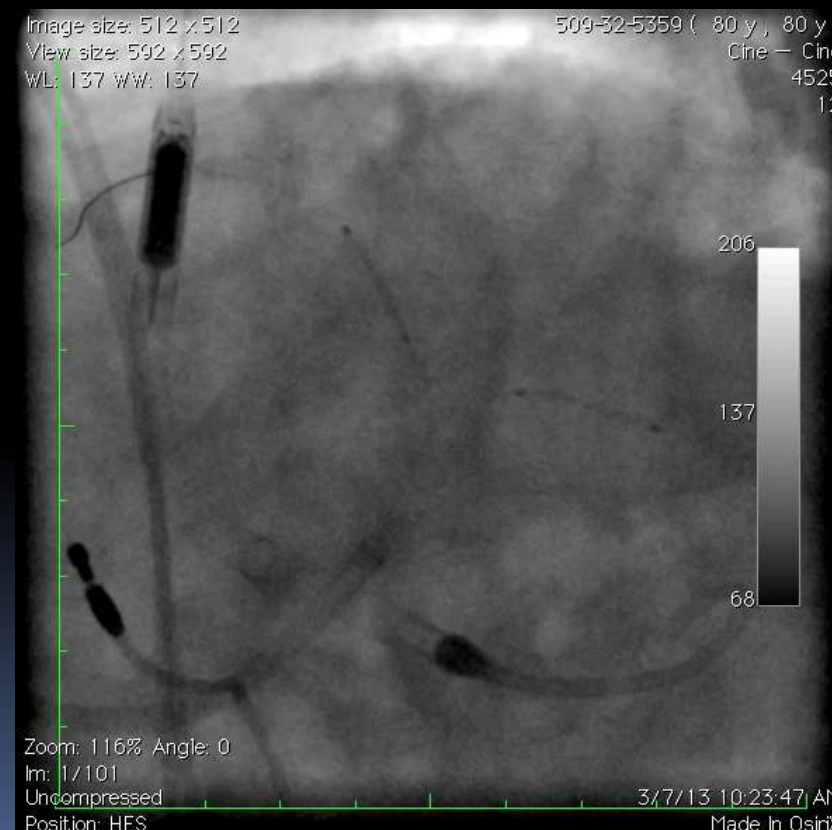
Image size: 512 x 512
View size: 606 x 606
WL: 137 WW: 137
477-30-3336 (79 y , 79 y)
Cine — Cine
4942
28
206
137
68
Zoom: 118% Angle: 0
Im: 1/59
Uncompressed
Position: HFS
3/28/12 3:02:26 PM
Made In OsiriX

- 79 yo male with 6.5 cm AAA, referred for cath after admitted with NSTEMI
- Severe left main and multivessel disease
- LVEF 25%
- In cardiogenic shock on 2 pressors
- CT surgery deemed too high risk for CABG
- Referred for Impella supported PCI

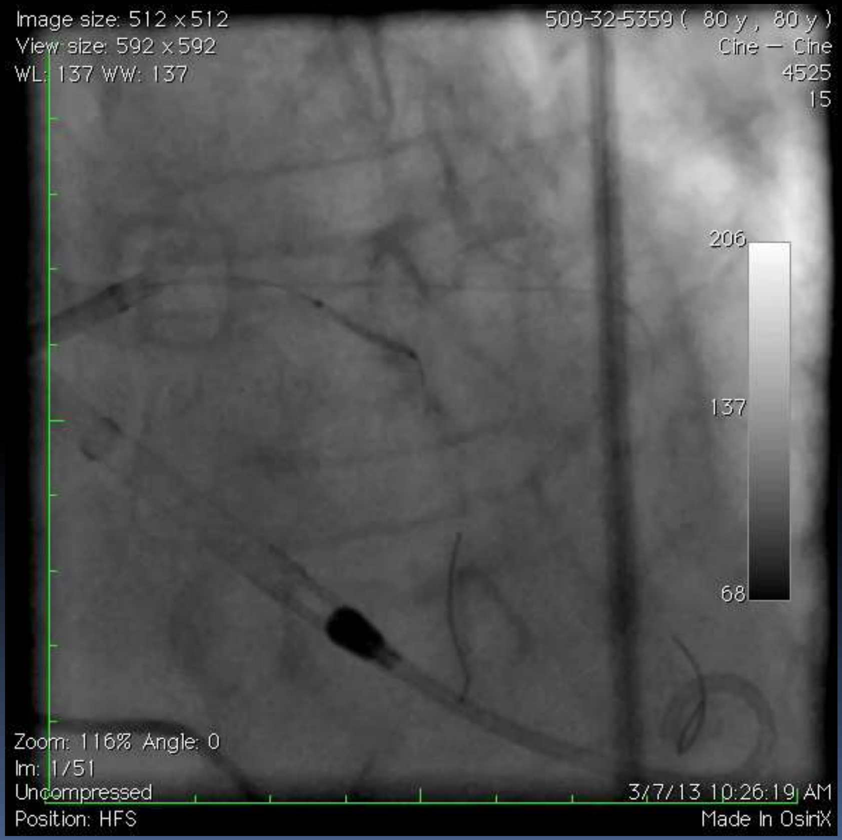
79 yo male with LM disease, severe 6.5 cm AAA



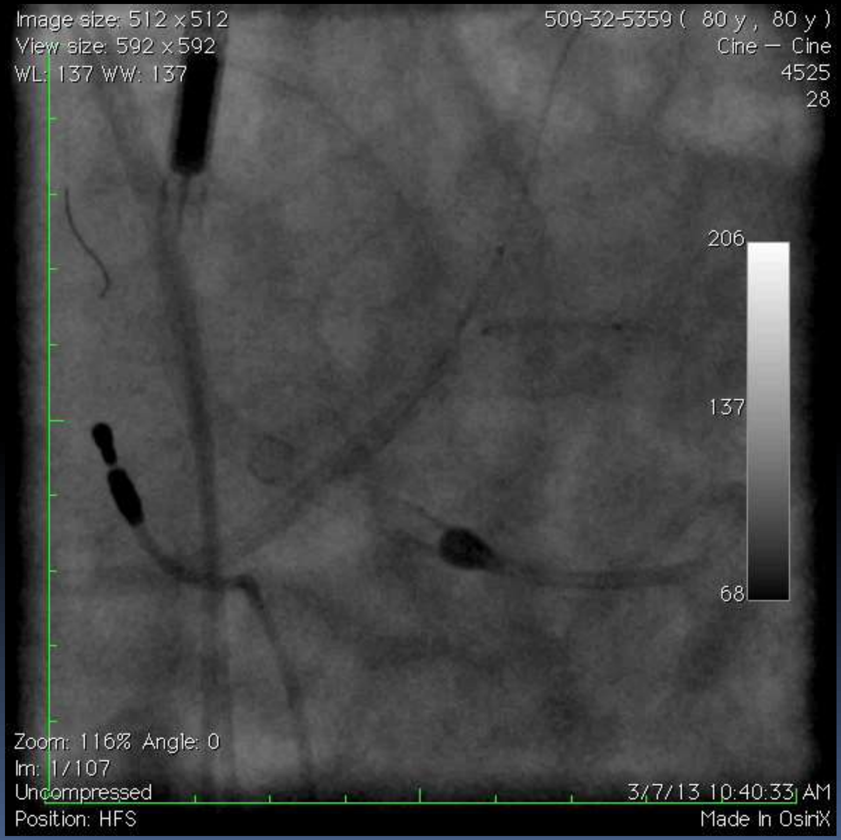
DES post ASC Ballooning



ASC Ballooning of LAD

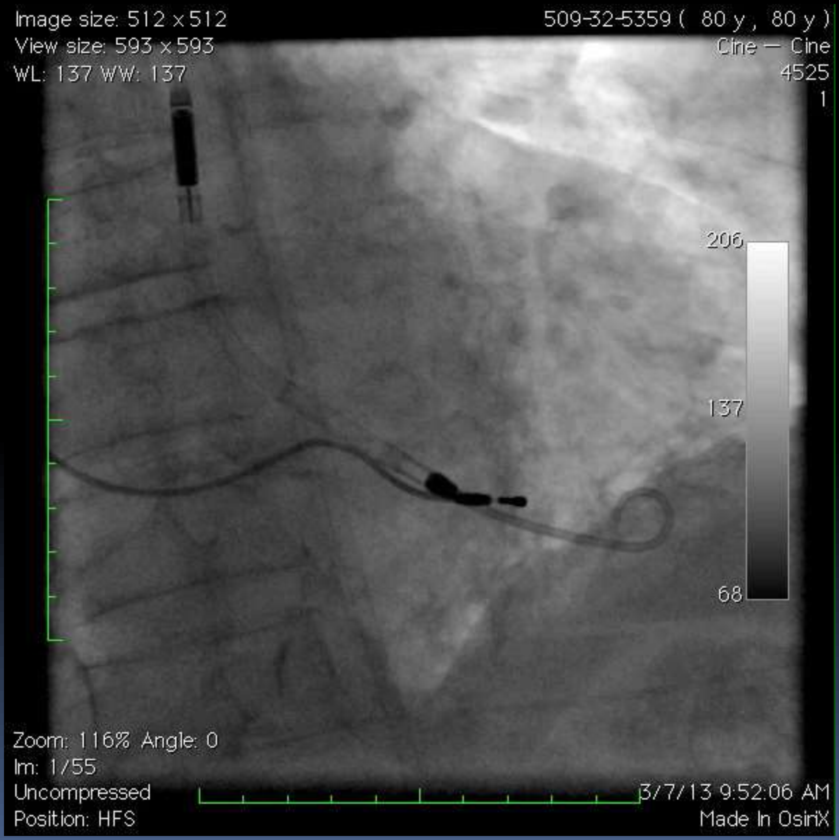


Sequential DES deployment



SKS Strategy

Impella from L subclavian access



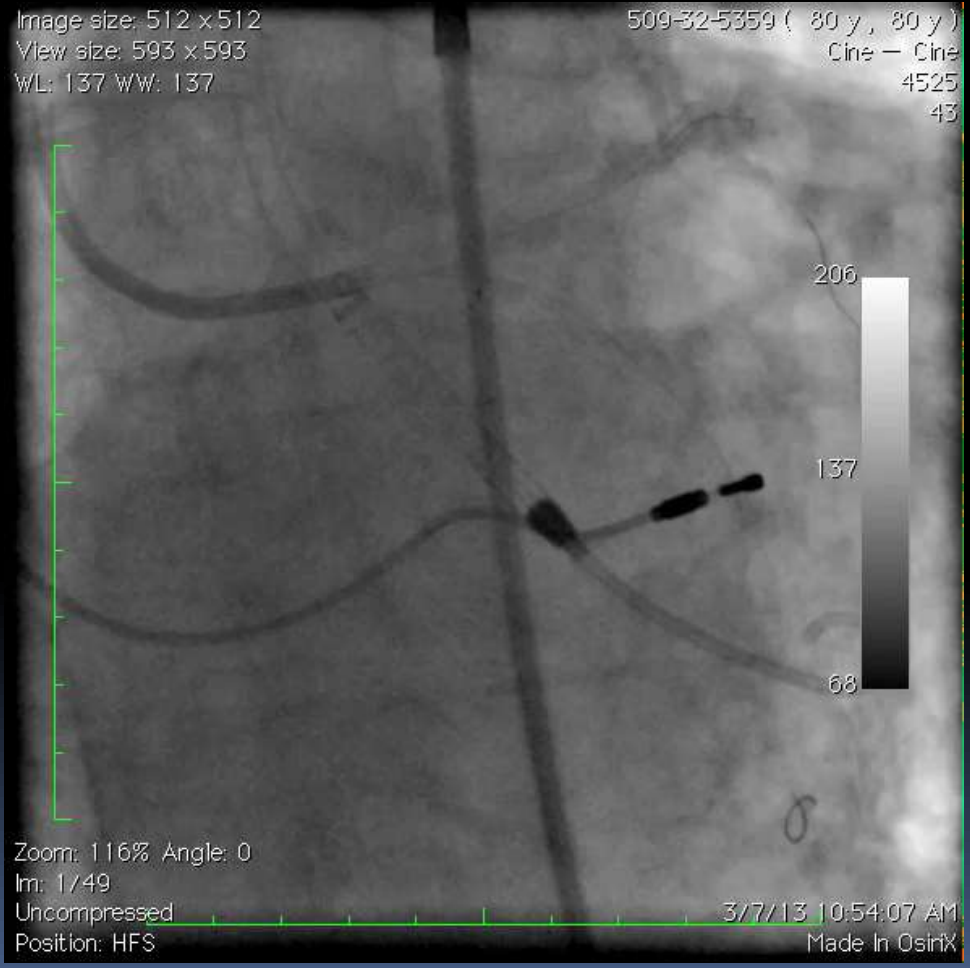


Image size: 512 x 512
View size: 593 x 593
WL: 137 WW: 137
509-32-5359 (80 y , 80 y)
Cine — Cine
4525
43
206
137
68
Zoom: 116% Angle: 0
Im: 1/49
Uncompressed
Position: HFS
3/7/13 10:54:07 AM
Made In OsiriX

- 77 yo male with left main, multivessel CAD
- LVEF 20%
- COPD, ESRD
- Presented with STEMI and CS

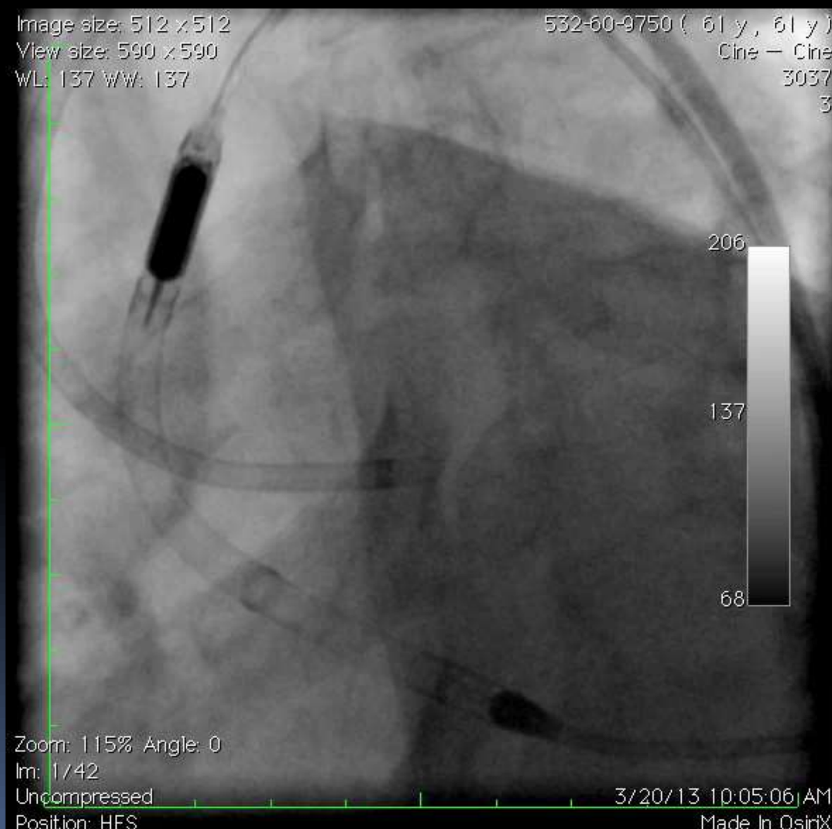
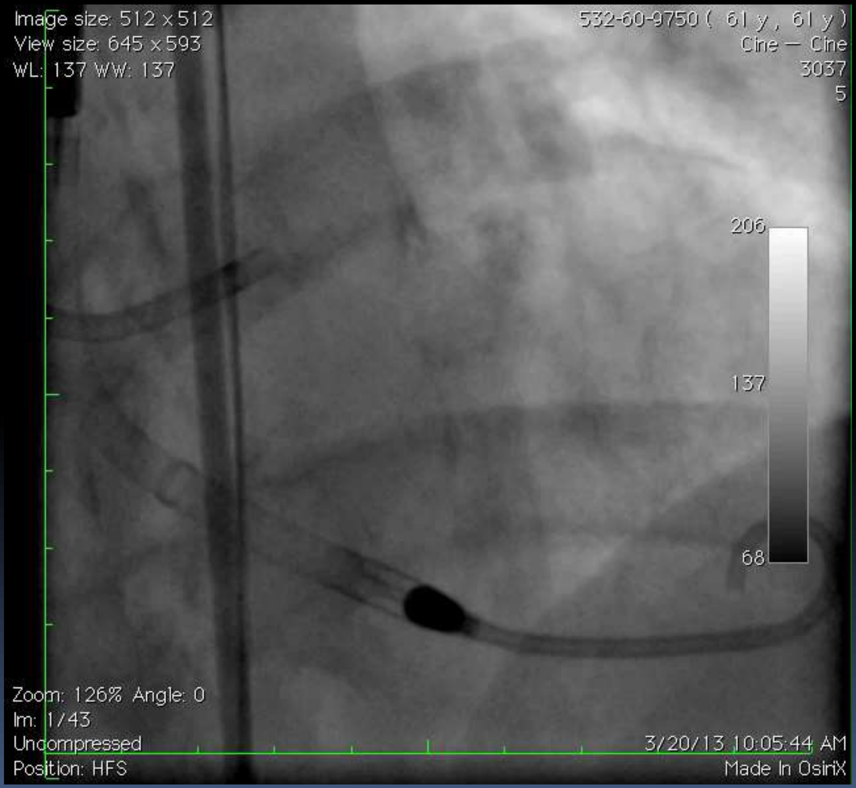
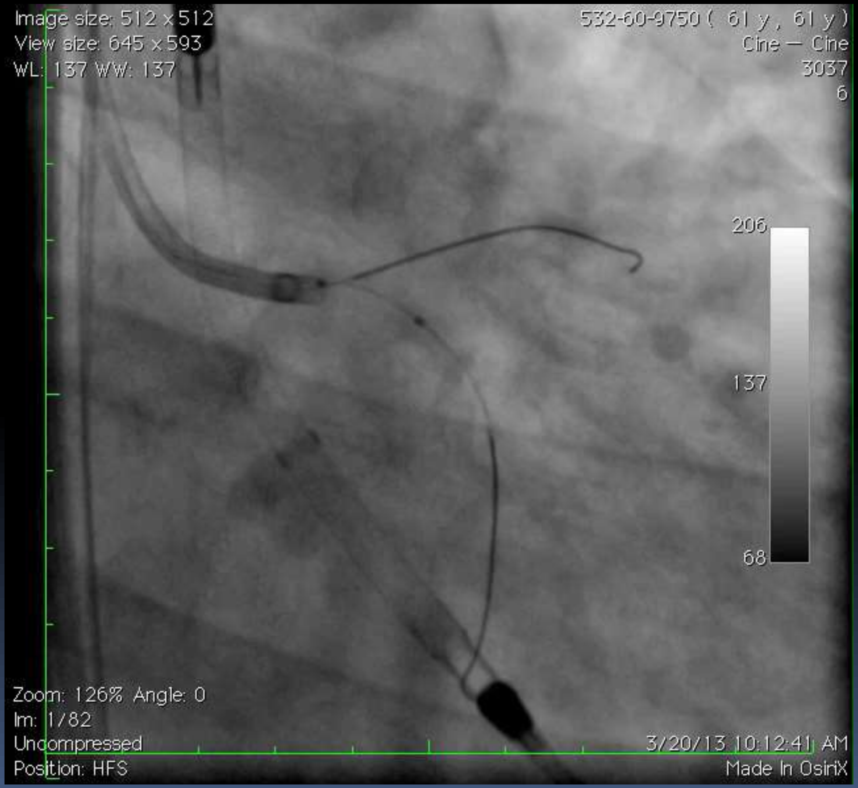


Image size: 512 x 512
View size: 590 x 590
WL: 137 WW: 137
532-60-9750 (61 y , 61 y)
Cine — Cine
3037
3
206
137
68
Zoom: 115% Angle: 0
Im: 1/42
Uncompressed
Position: HFS
3/20/13 10:05:06 AM
Made In OsiriX

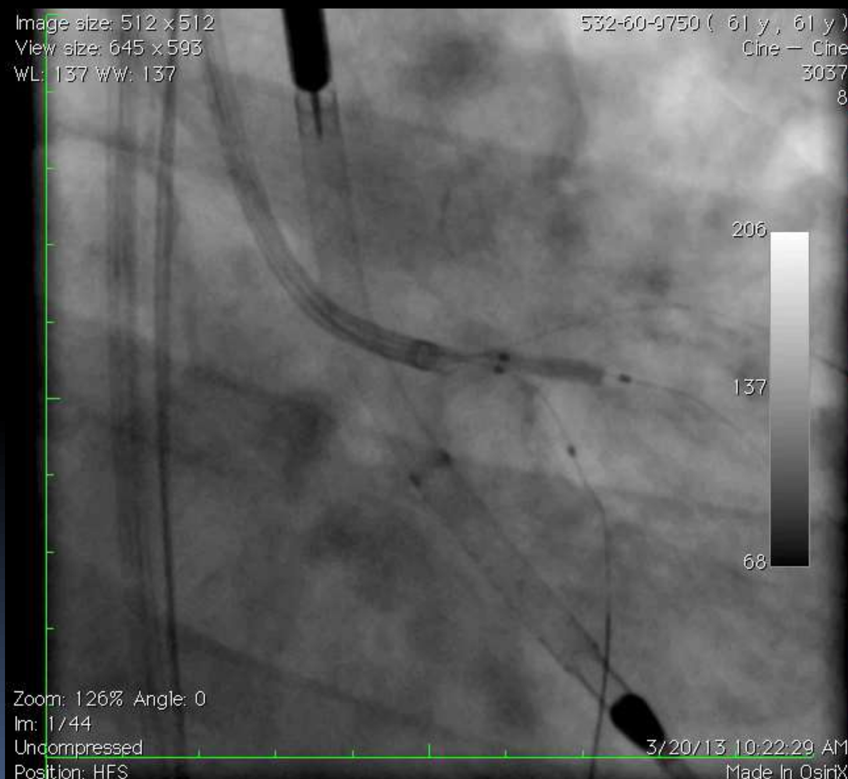

Image size: 512 x 512
View size: 645 x 593
WL: 137 WW: 137
532-60-9750 (61 y , 61 y)
Cine — Cine
3037
4
206
137
68
Zoom: 126% Angle: 0
Im: 1/39
Uncompressed
Position: HFS
3/20/13 10:05:29 AM
Made In OsiriX

ASC Balloon of Circumflex

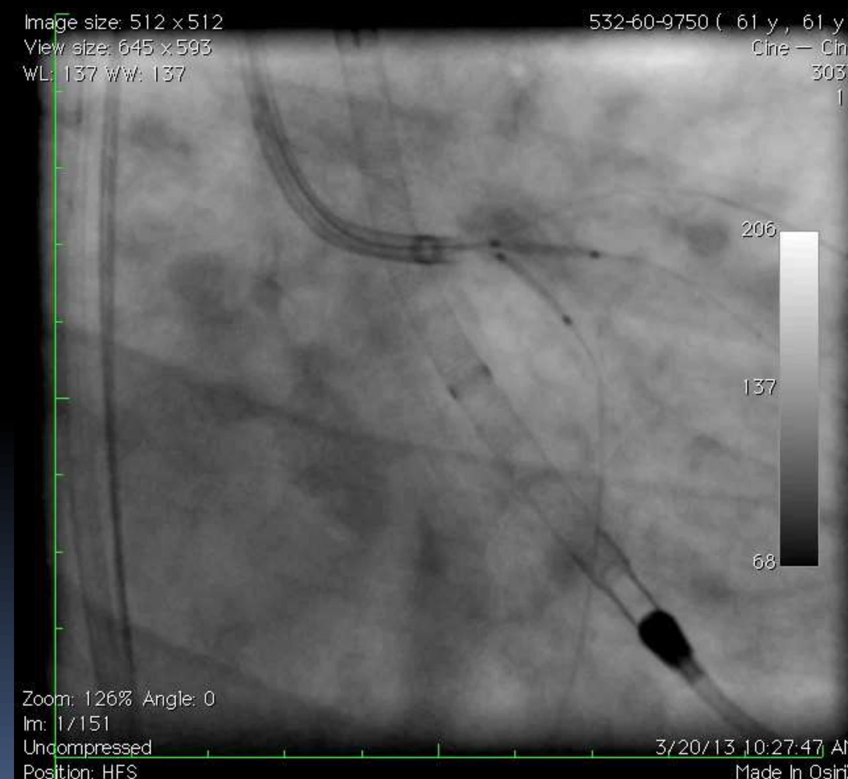




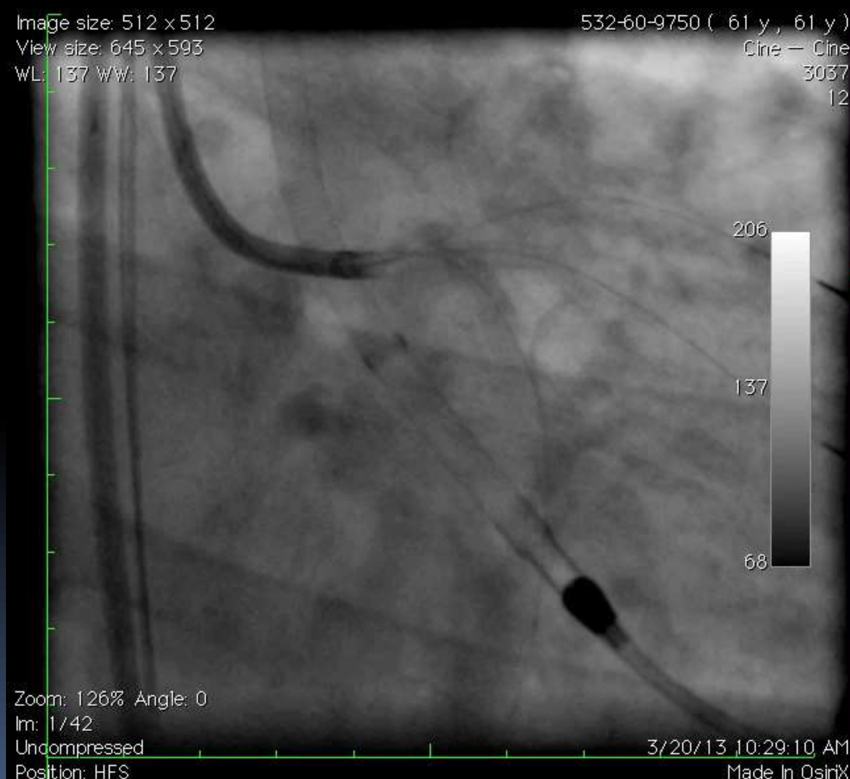
SKS ASC balloons

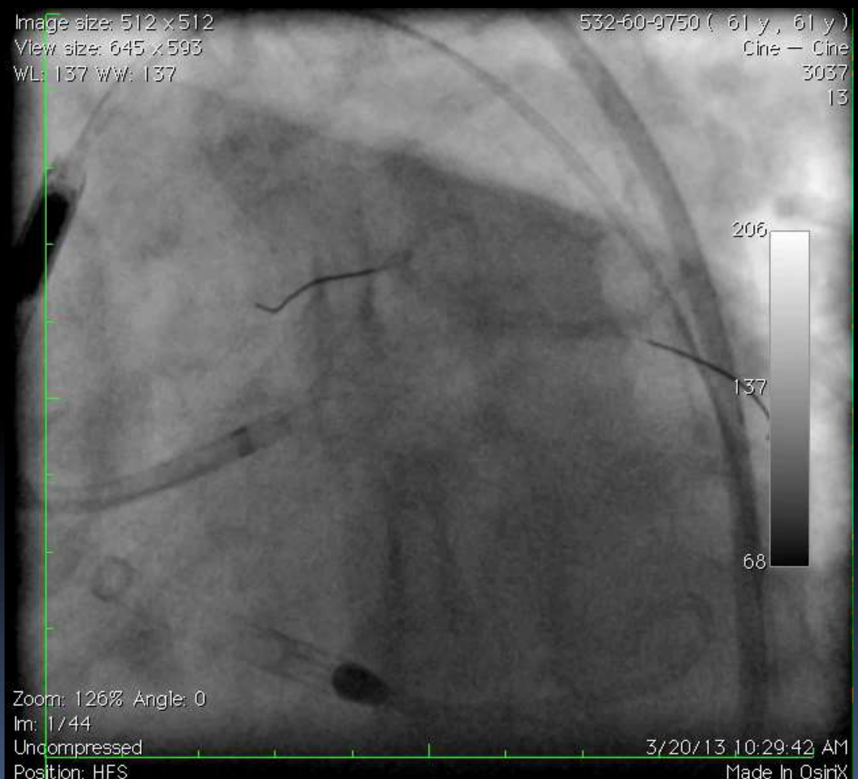


SKS Resolute

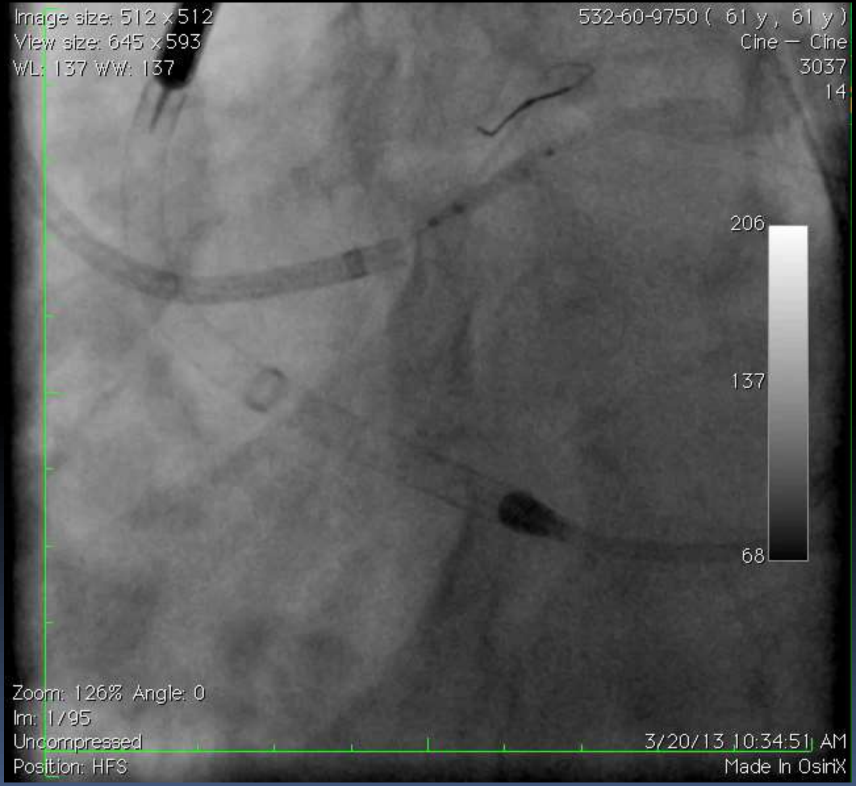


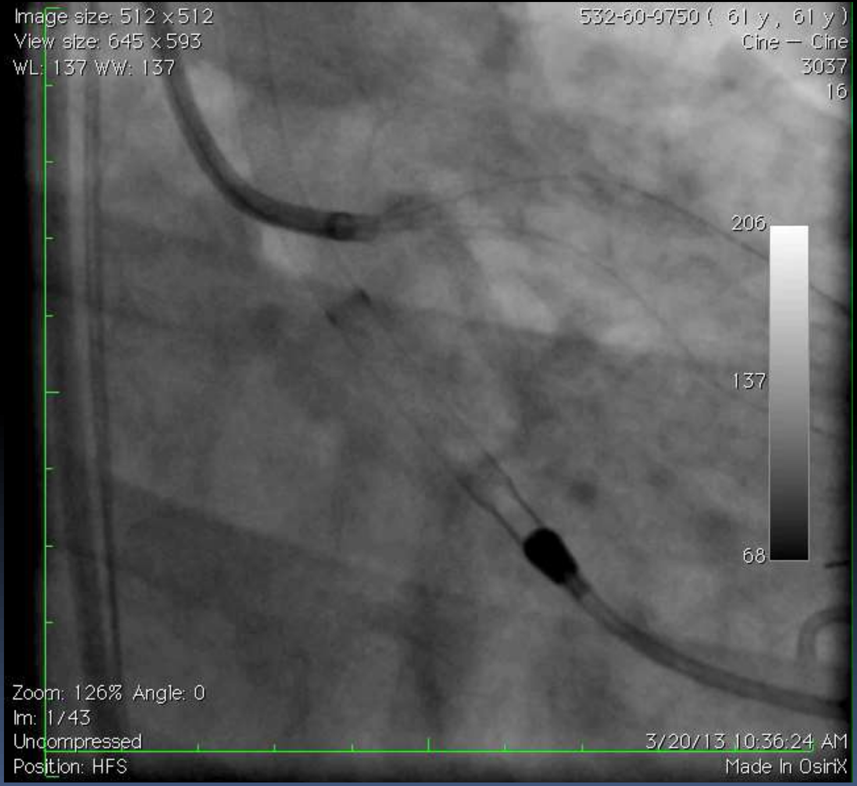
Residual left main lesion





ASC to protect Ramus while Resolute to Left Main





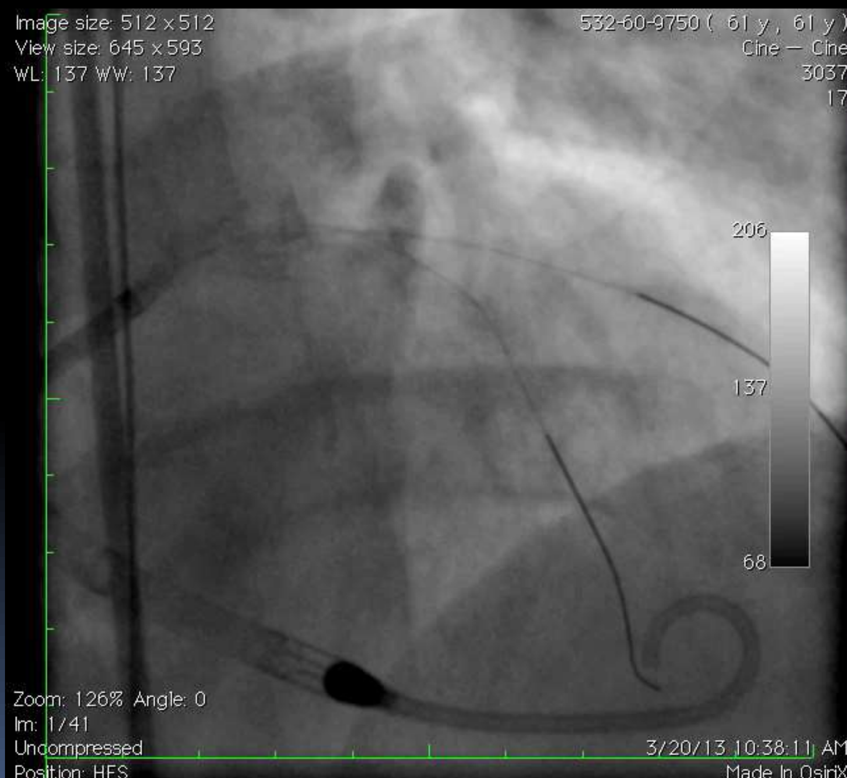


Image size: 512 x 512
View size: 645 x 593
WL: 137 WW: 137
532-60-9750 (61 y , 61 y)
Cine — Cine
3037
17
206
137
68
Zoom: 126% Angle: 0
Im: 1/41
Uncompressed
Position: HFS
3/20/13 10:38:11 AM
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MICHAEL LONG
TRUCK & CRANE HIRE


Be Persistent!