

# *Is TAVI better than SAVR in patients with LV Dysfunction*

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**Université  
LAVAL**

# *Disclosure*

## *Philippe Pibarot*

### **Financial relationship with industry:**

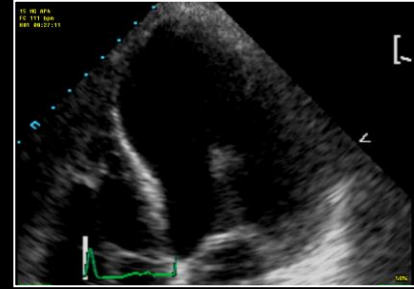
- **Edwards Lifesciences: Echo CoreLab for PARTNER II - SAPIEN 3 and TAVR-UNLOAD**
- **V-Wave: Echo CoreLab**
- **Cardiac Pheonix: Echo CoreLab**

### **Other financial disclosure:**

- **Research Grants from Canadian Institutes of Health**
- **Research and Heart & Stroke Foundation of Quebec**

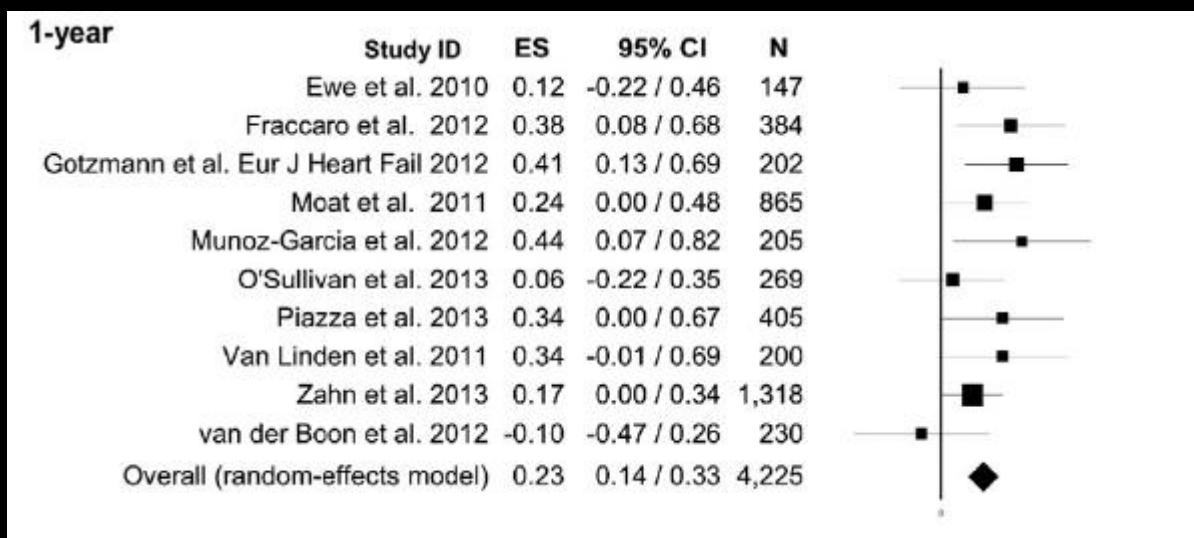
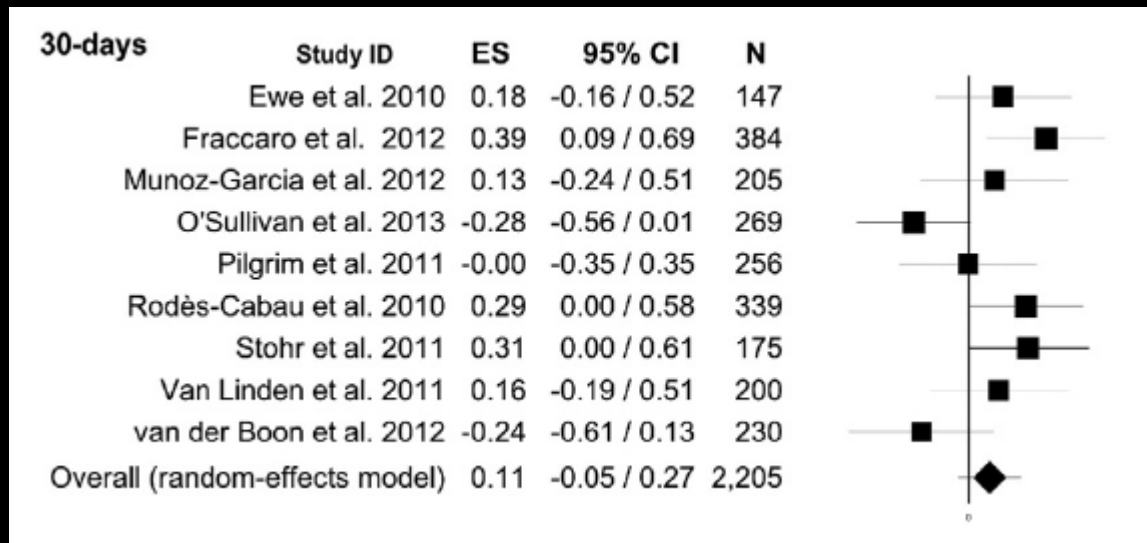
**Off label Use: None**

# *Left Ventricular Dysfunction in SAVR and TAVR*

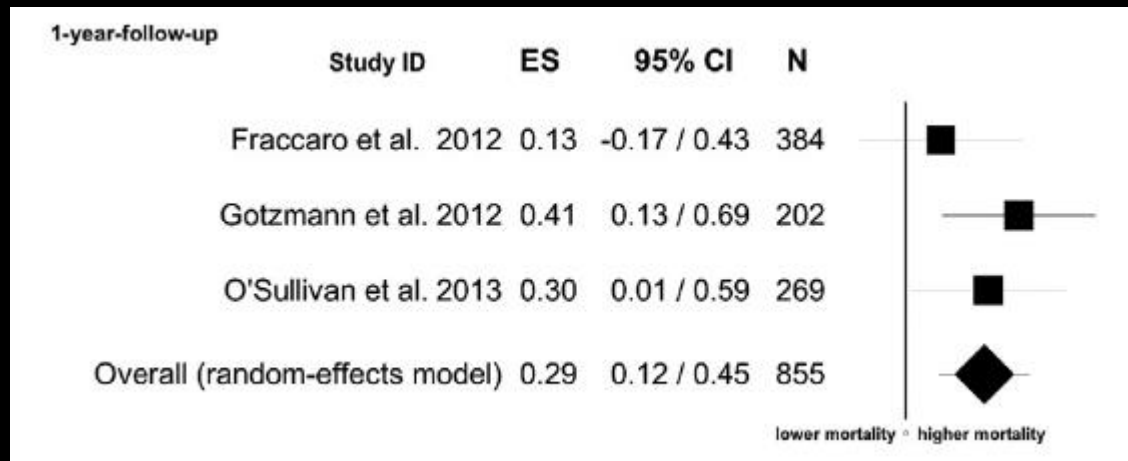
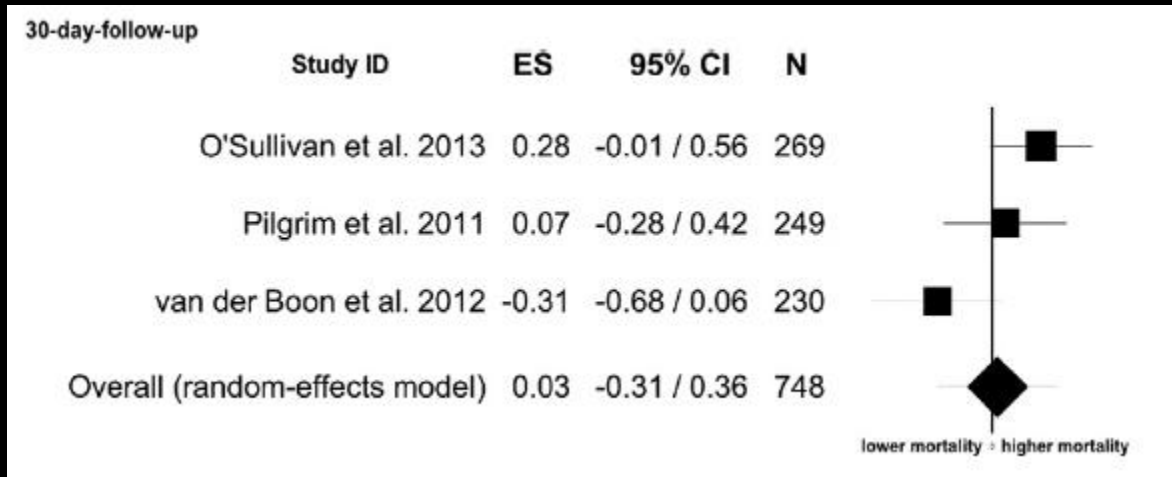


- **Prevalence :**
  - **LV dysfunction (LVEF<50%): 15-45%**
  - **Severe LV dysfunction (LVEF<30-35%): 5-25%**
- **Impact of pre-existing LV dysfunction on outcomes following TAVR and SAVR**
- **Effect of therapy (TAVR vs. SAVR) and approach (TF vs. TA) on outcome of patients with LV dysfunction**
- **Implications for procedure selection**

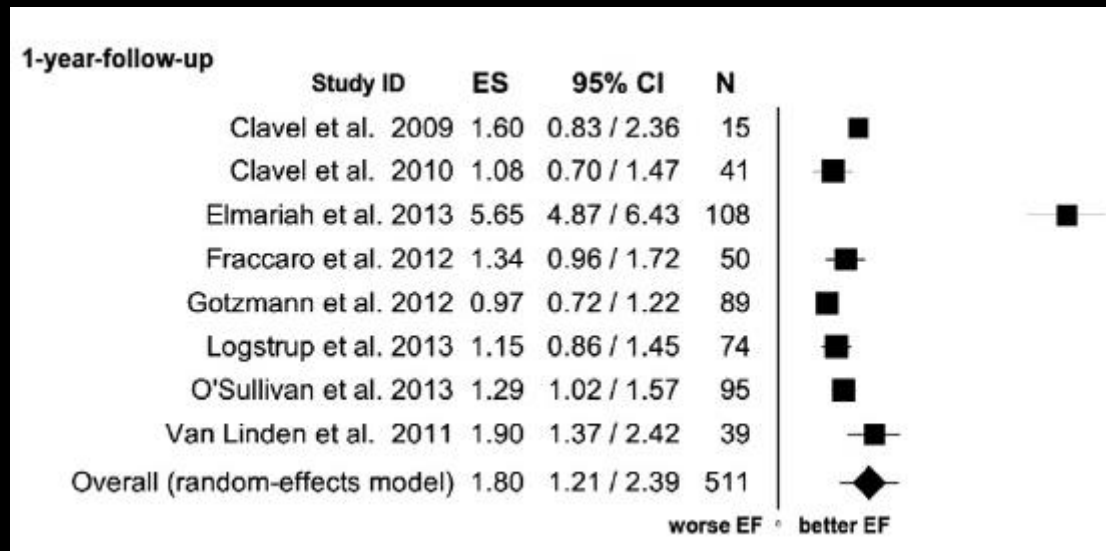
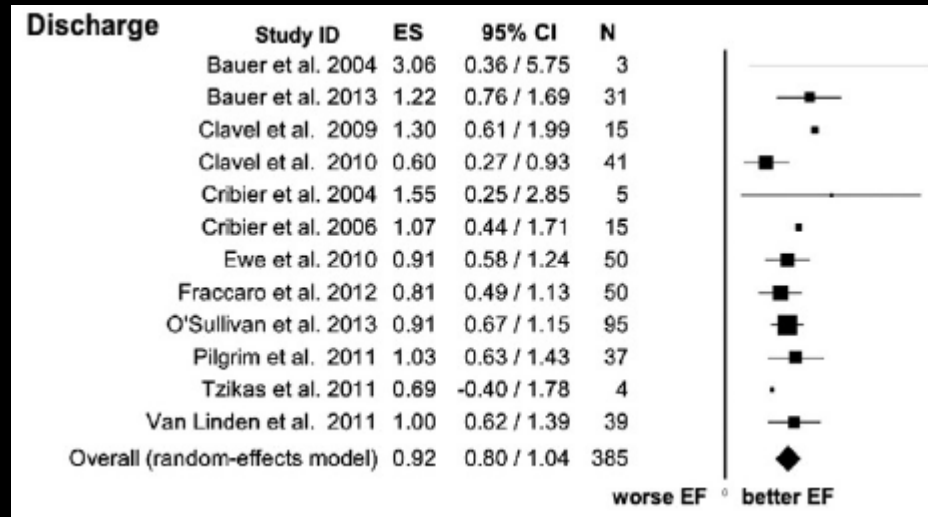
# Impact of Low LVEF on Overall Mortality after TAVR



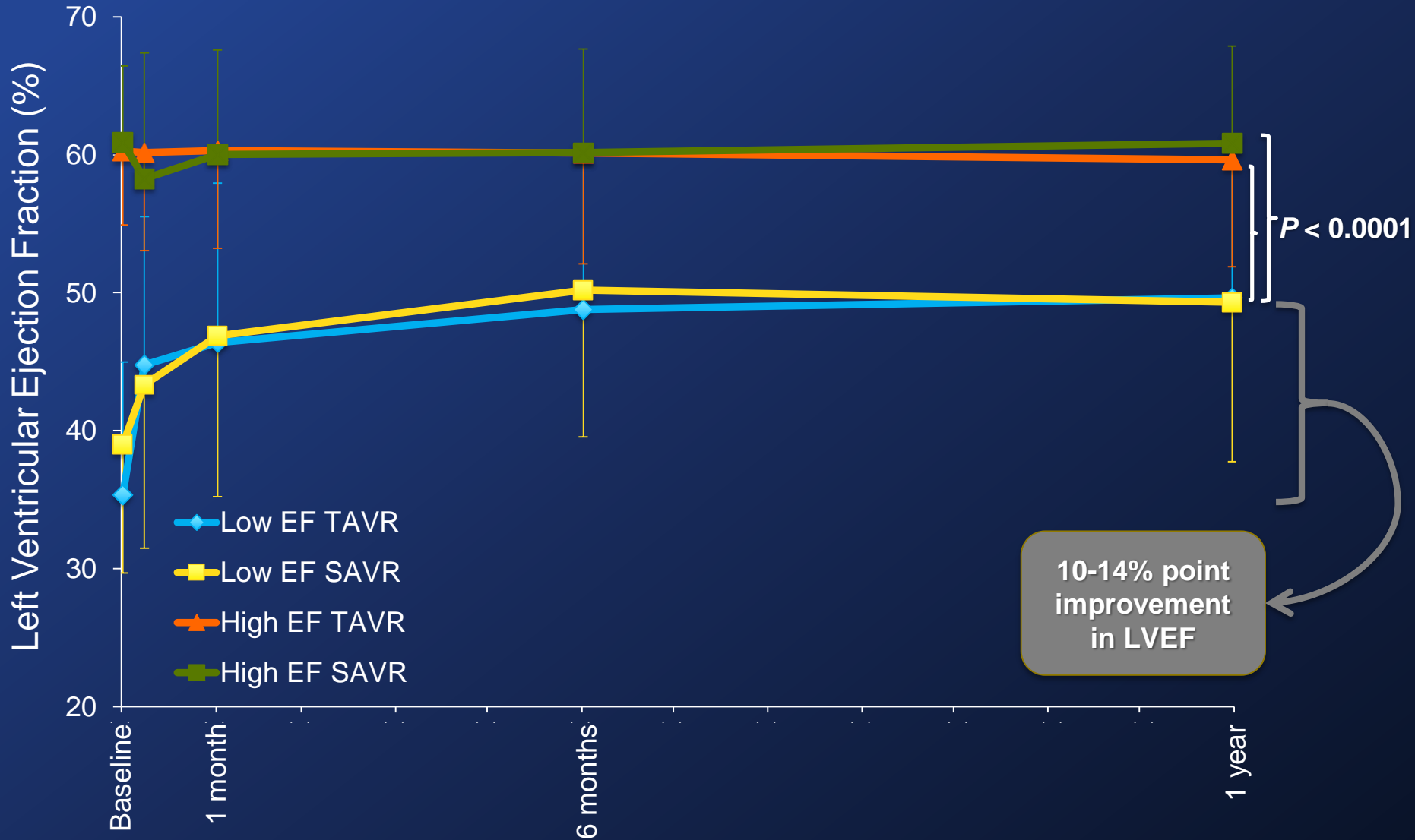
# Impact of Low LVEF on Cardiac Mortality after TAVR



# Recovery of LVEF following TAVR in Patients with Low LVEF

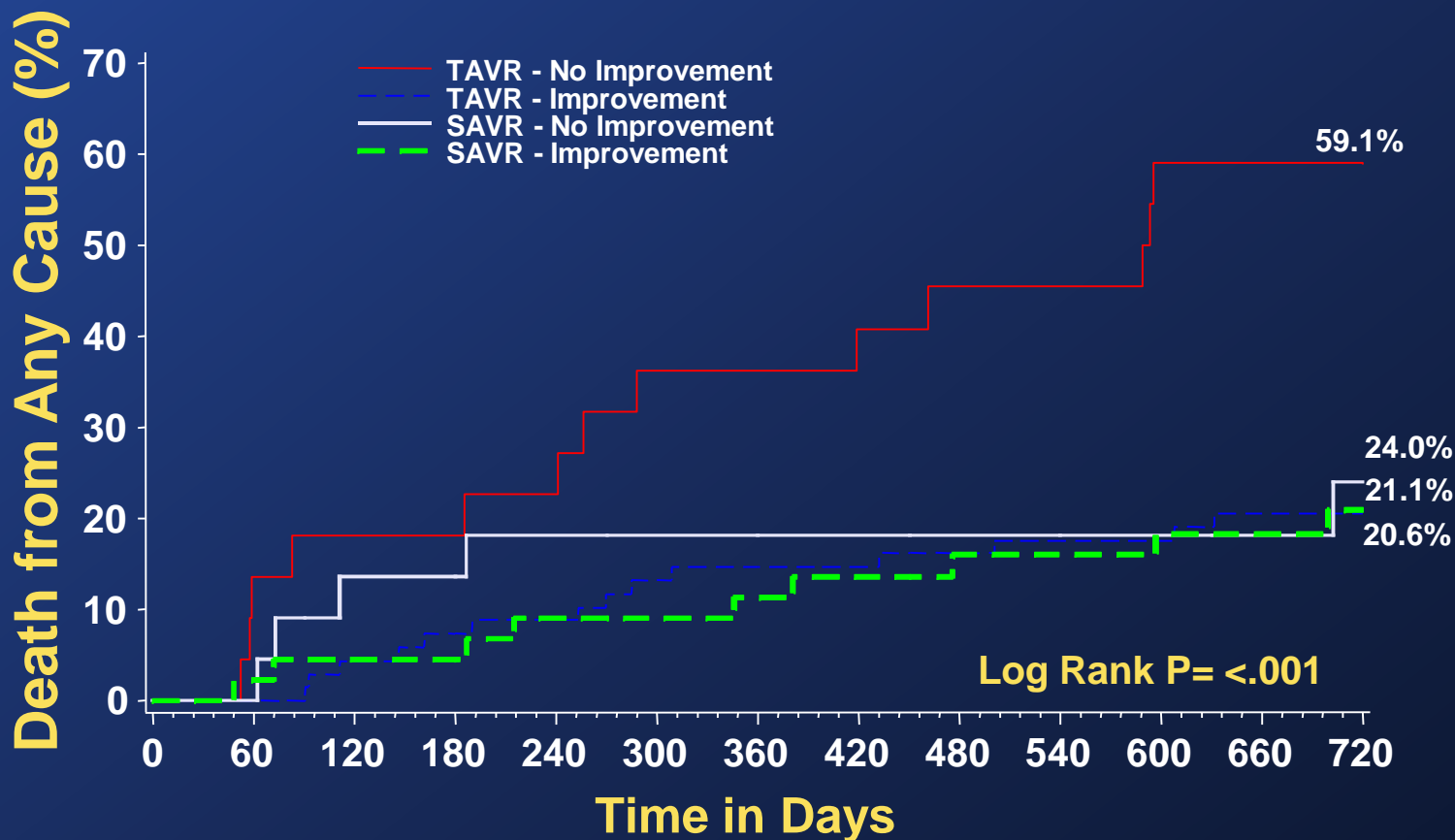


# PARTNER-IA: Change in LVEF over Time



# PARTNER-IA: All Cause Mortality

## LVEF Improvement at 30-days (LVEF<50%)

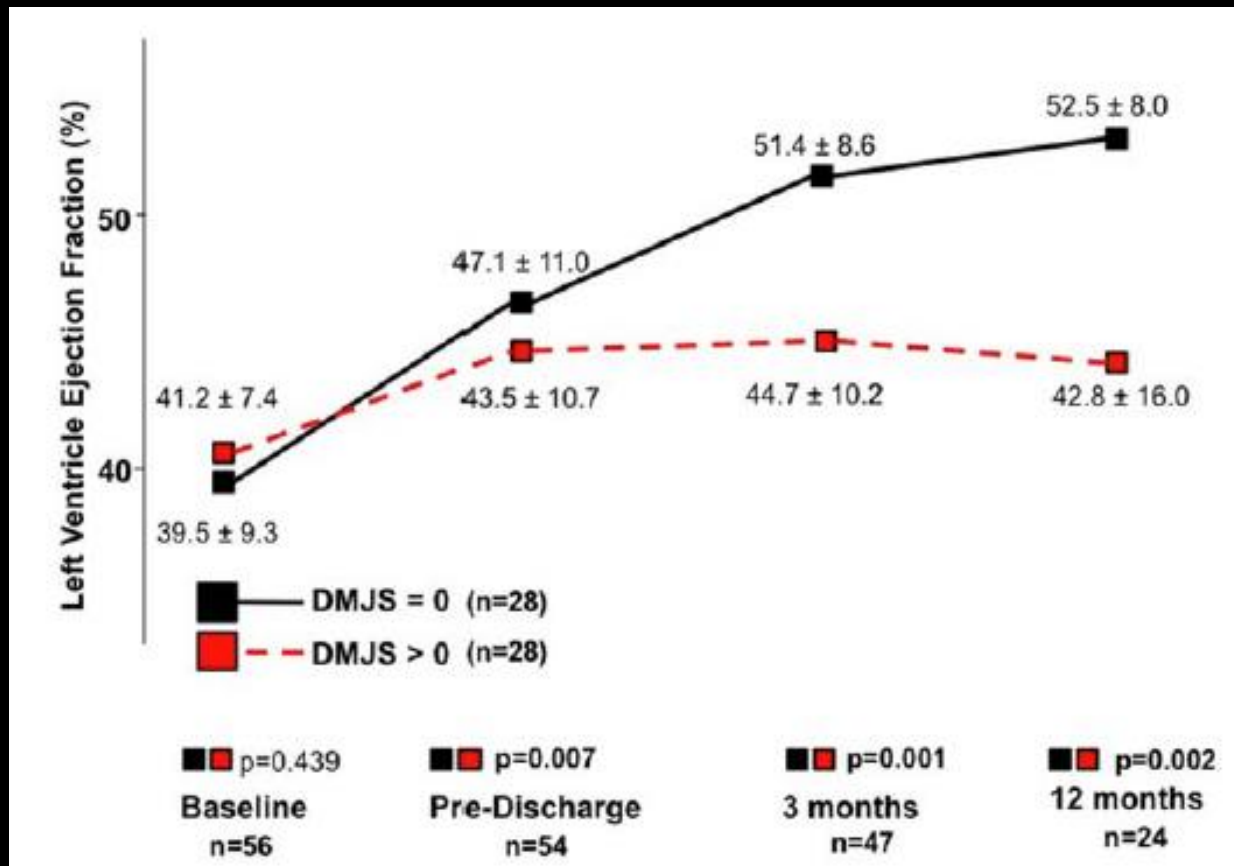


### Number At Risk

	0	60	120	180	240	300	360	420	480	540	600	660	720
TAVR - No Improvement	22	18	18	15	14	13	12	9	9				
TAVR - Improvement	68	68	63	60	58	57	56	54	45				
SAVR - No Improvement	22	20	19	18	18	17	17	17	13				
SAVR - Improvement	44	42	42	40	39	36	35	33	28				



# Impact of CAD on LVEF recovery following TAVR

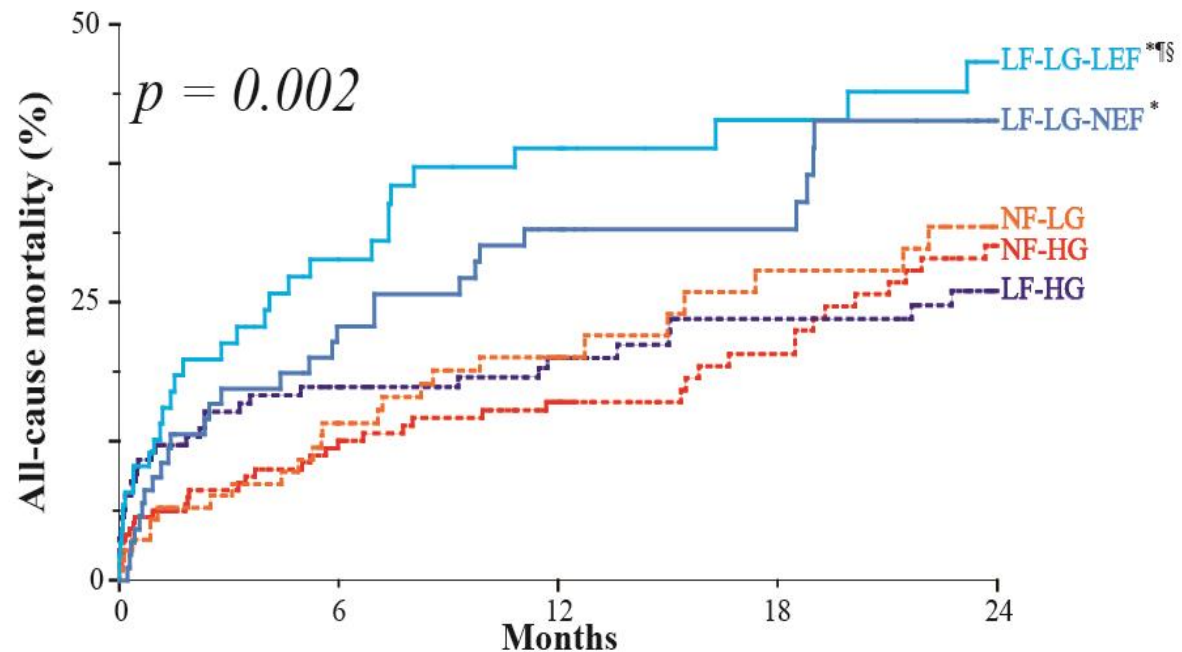


# Outcome of Patients with Low LVEF after TAVR: Flow and Gradient Matter

## The Québec-Vancouver Experience

**Low Flow:**  
SVi < 35 ml/m<sup>2</sup>

**Low Gradient:**  
MG < 40 mmHg

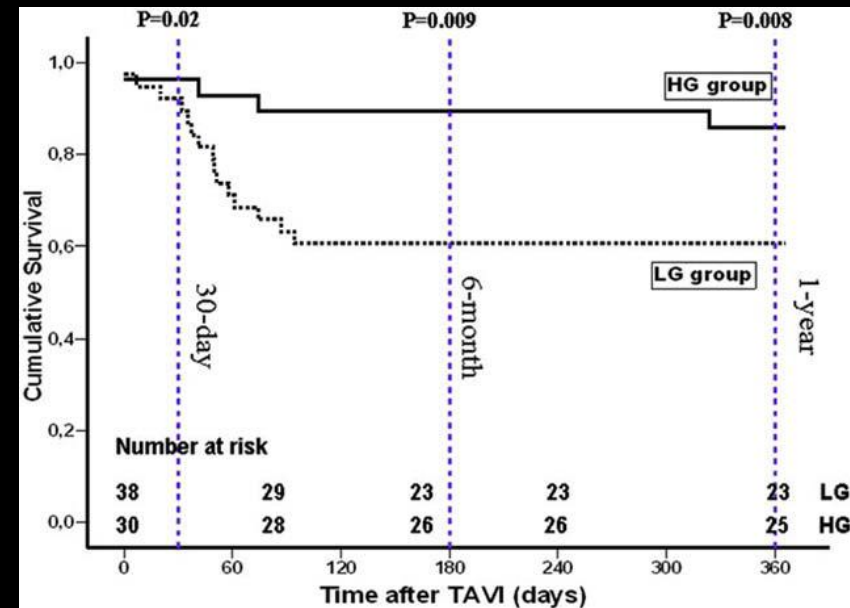
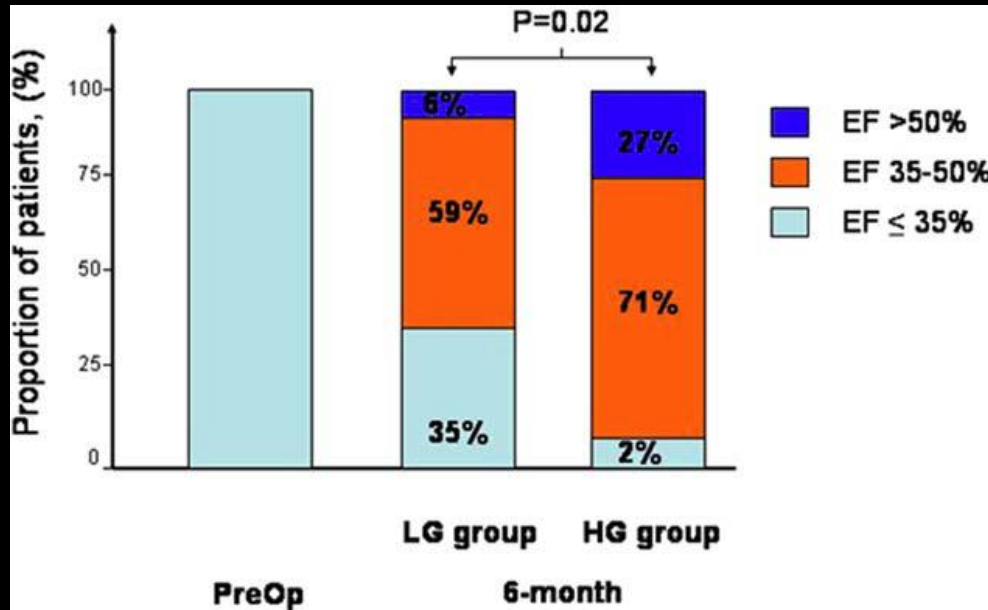


Patients at risk

NF-HG	195	135	112	75	57
NF-LG	110	76	60	37	31
LF-HG	158	107	88	63	53
LF-LG-NEF	86	55	44	28	17
LF-LG-LEF	90	46	34	23	18

*LeVen F et al.*  
*JACC 2013*

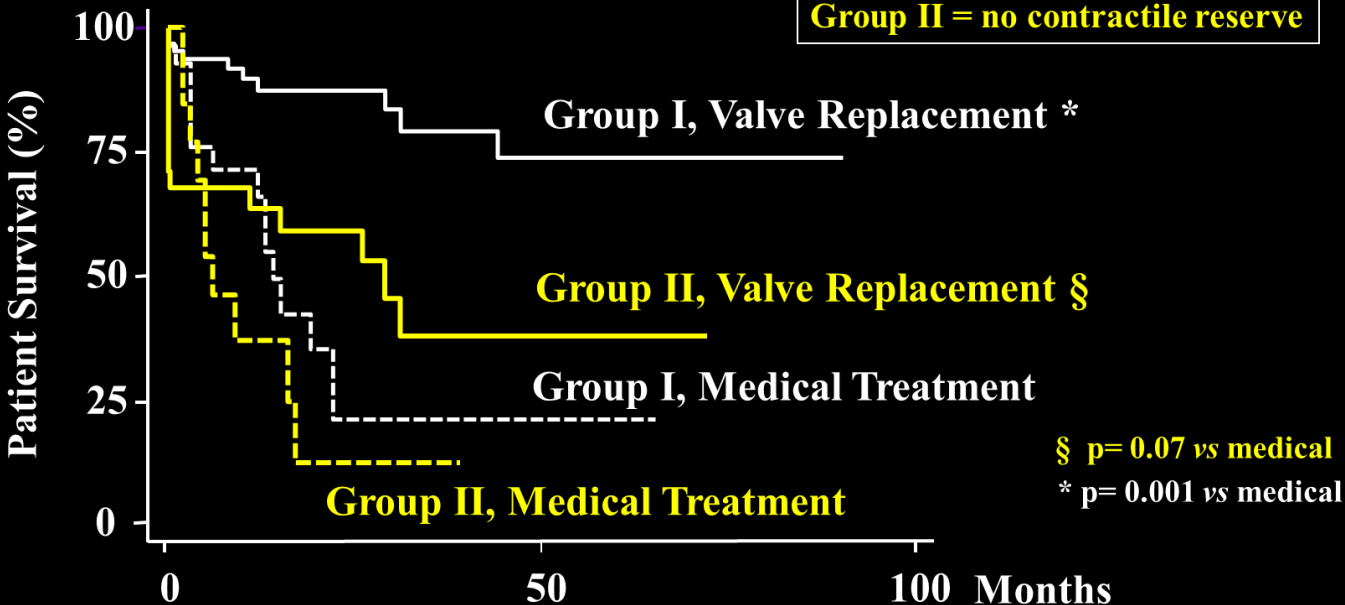
# Outcome of Patients with Low LVEF following TAVR: Low vs. High Gradient



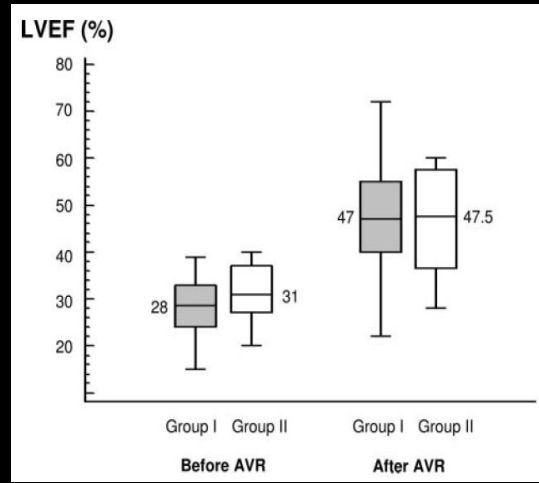
# Impact of Preoperative Contractile (flow) Reserve on Survival and LVEF after SAVR

126 Patients

Group I = contractile reserve  $\Delta SV \geq 20\%$  under DSE  
 Group II = no contractile reserve

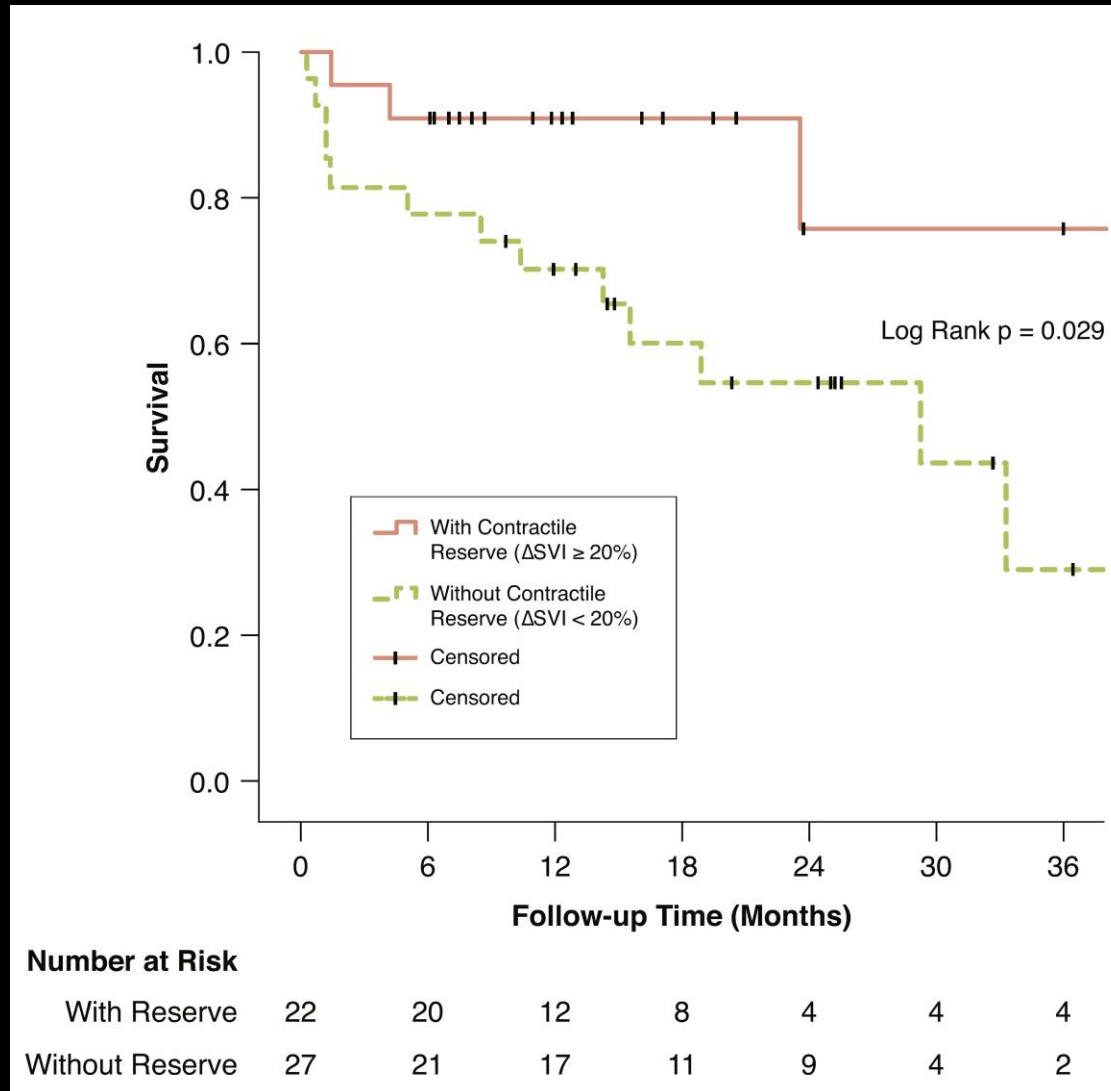


Monin et al, Circulation  
 2003;108:319-324



Quere et al, Circulation  
 2006;113:1738-1734

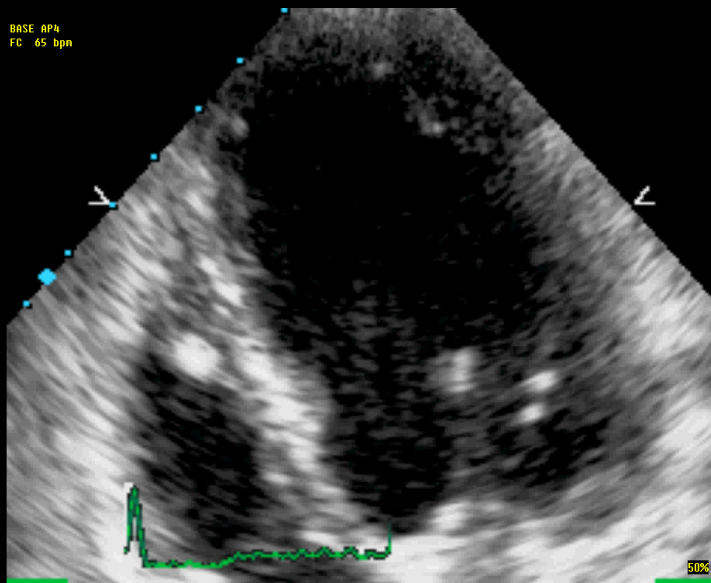
# Impact of Preprocedural Contractile (flow) Reserve on Survival after TAVR



Hayek et al.  
JACC Img 2015

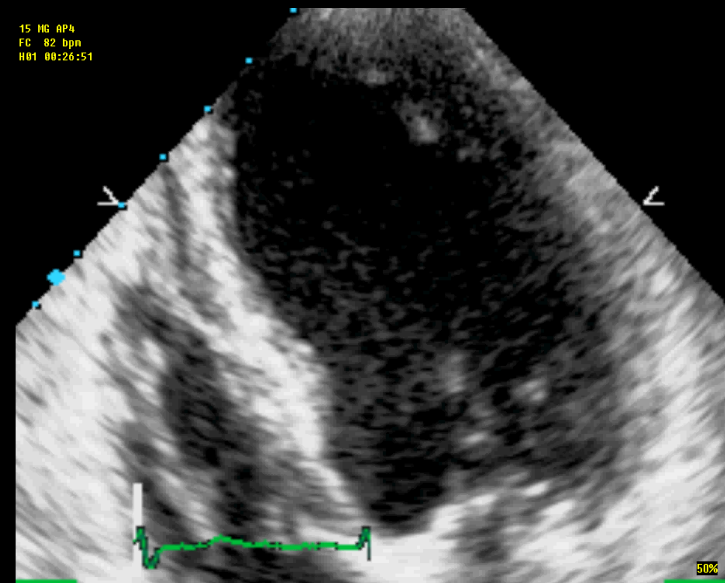
# Case #1

## Resting Echo

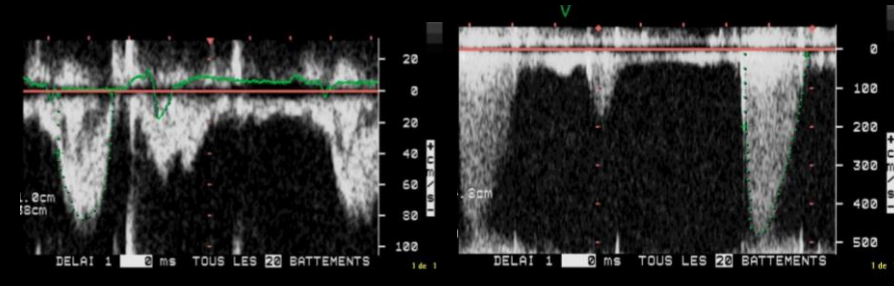
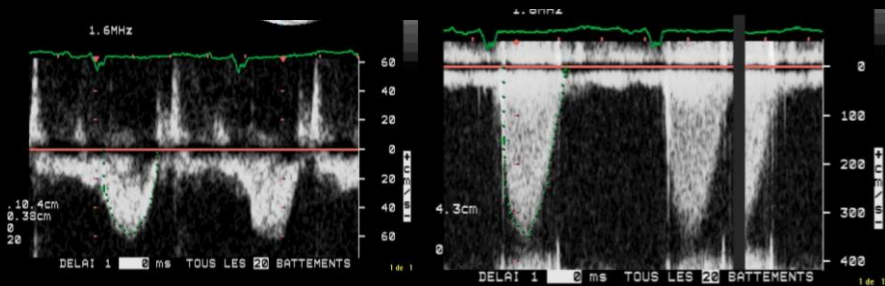


**LVEF=40%    SV= 53 ml**  
**AVA= 0.77 cm<sup>2</sup>**  
 **$\Delta P= 49 / 29$  mmHg**

## DSE

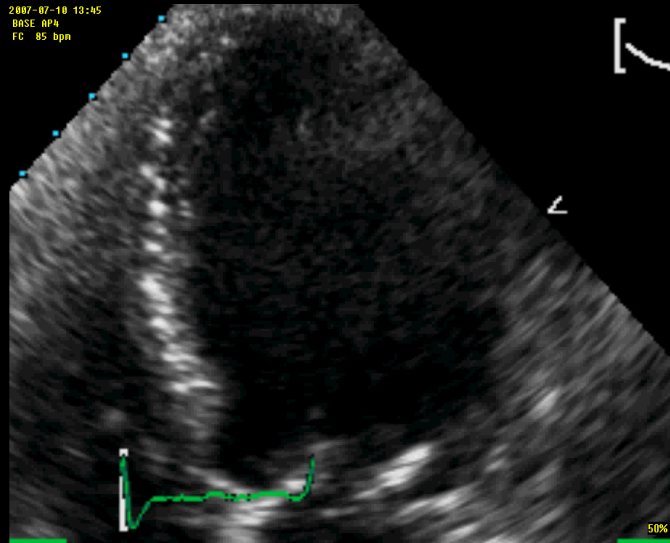


**LVEF=50%    SV= 73 ml**  
**AVA= 0.75 cm<sup>2</sup>**  
 **$\Delta P= 92 / 52$  mmHg**



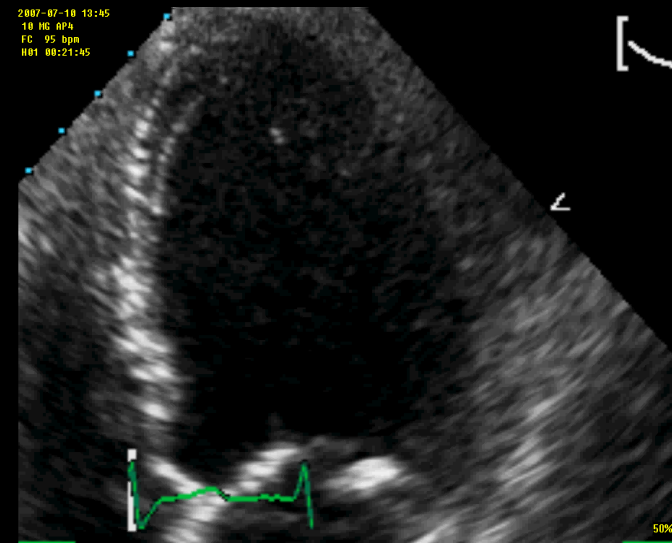
# Case #2

## Resting Echo

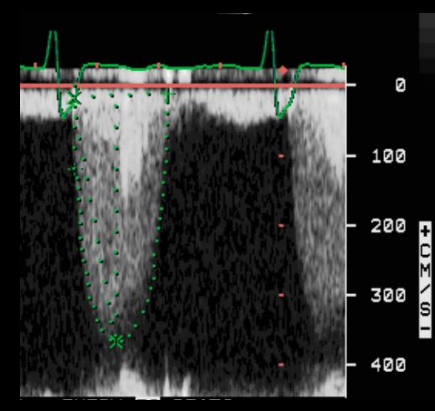
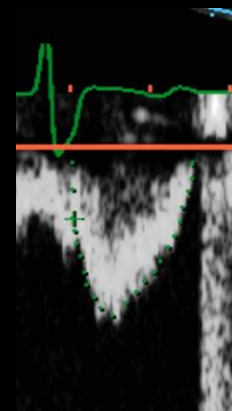
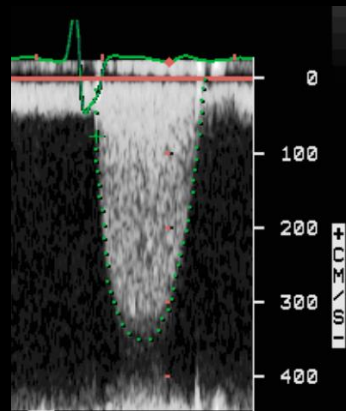
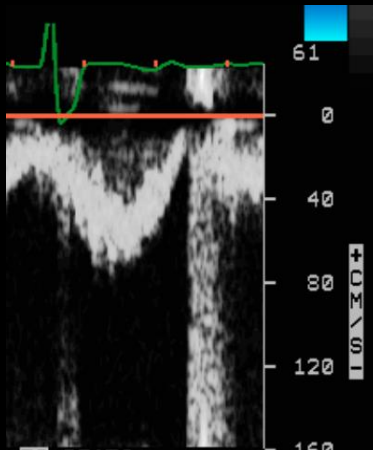


**LVEF=25%    SV= 51 ml**  
**AVA= 0.8 cm<sup>2</sup>**  
 **$\Delta P= 46 / 27$  mmHg**

## DSE



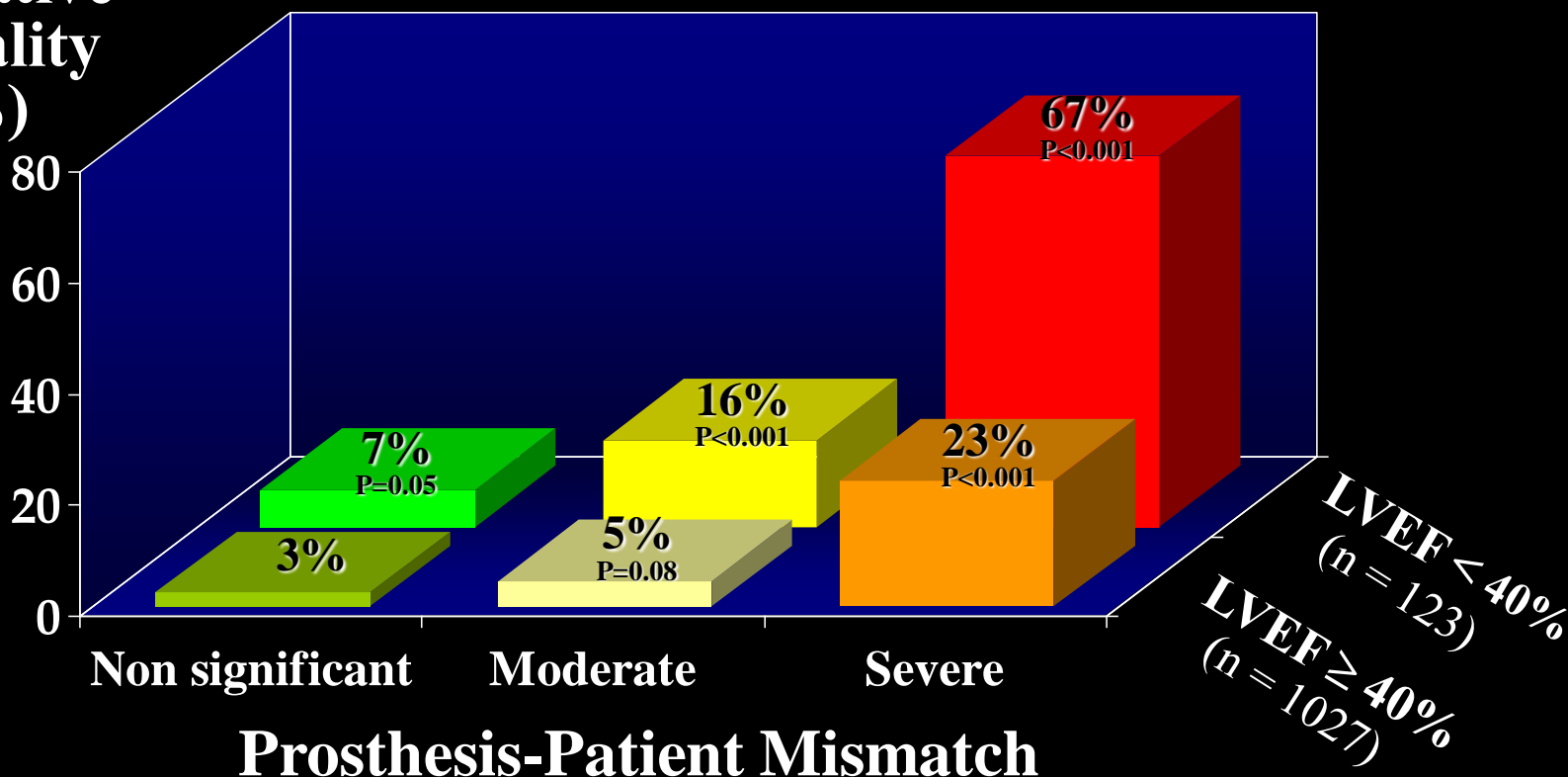
**LVEF=30%    SV= 57 ml**  
**AVA= 0.8 cm<sup>2</sup>**  
 **$\Delta P= 52 / 30$  mmHg**



# *Impact of PPM on Operative Mortality in Patients with Pre-existing LV dysfunction*

1200 patients undergoing SAVR

Operative Mortality (%)

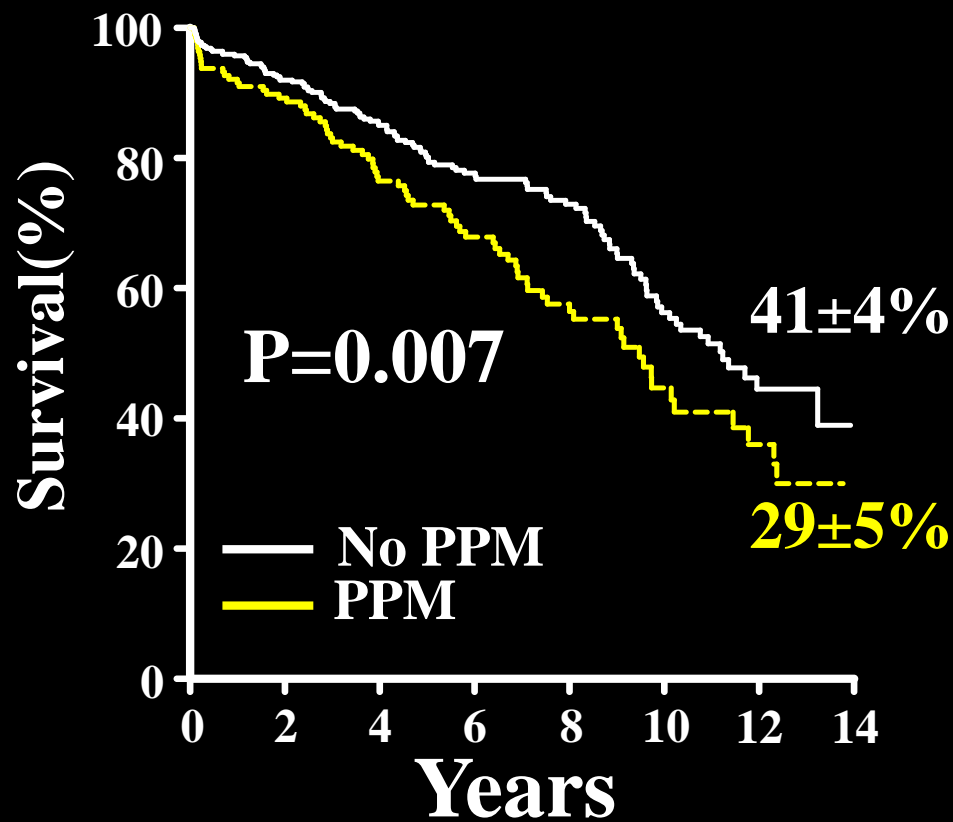


Prosthesis-Patient Mismatch

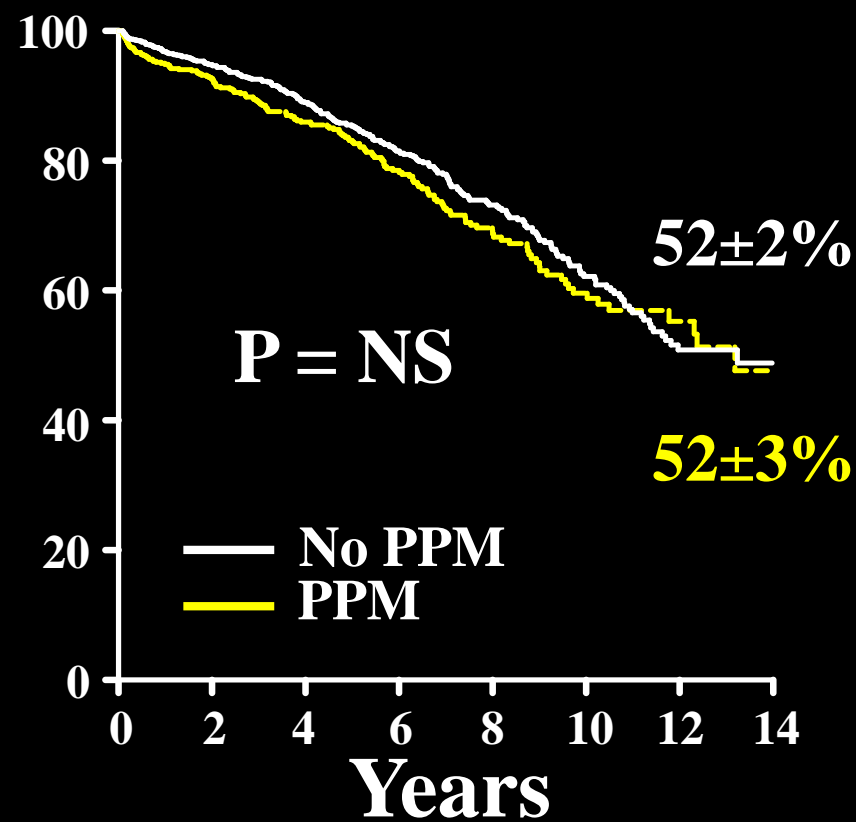


# *Impact of PPM on Late Mortality in Patients with Pre-existing LV dysfunction*

## **LVEF < 50%**

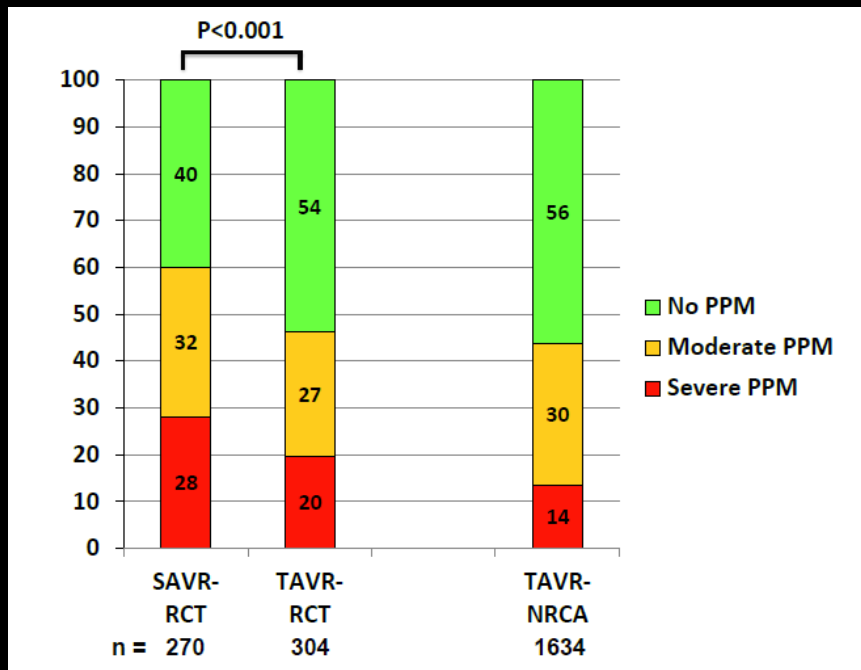


## **LVEF ≥ 50%**

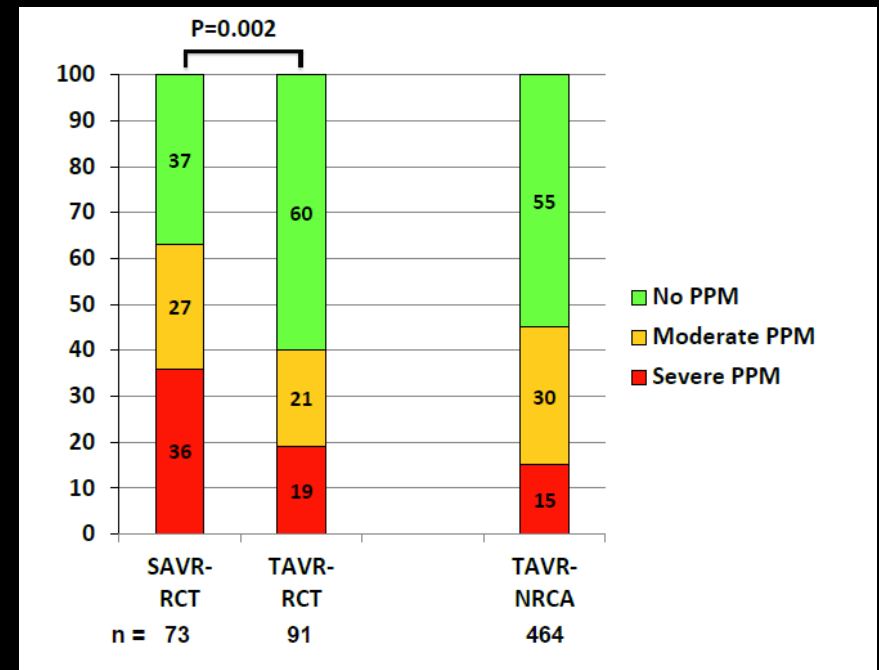


# Prosthesis-Patient Mismatch in PARTNER-IA: TAVR vs. SAVR

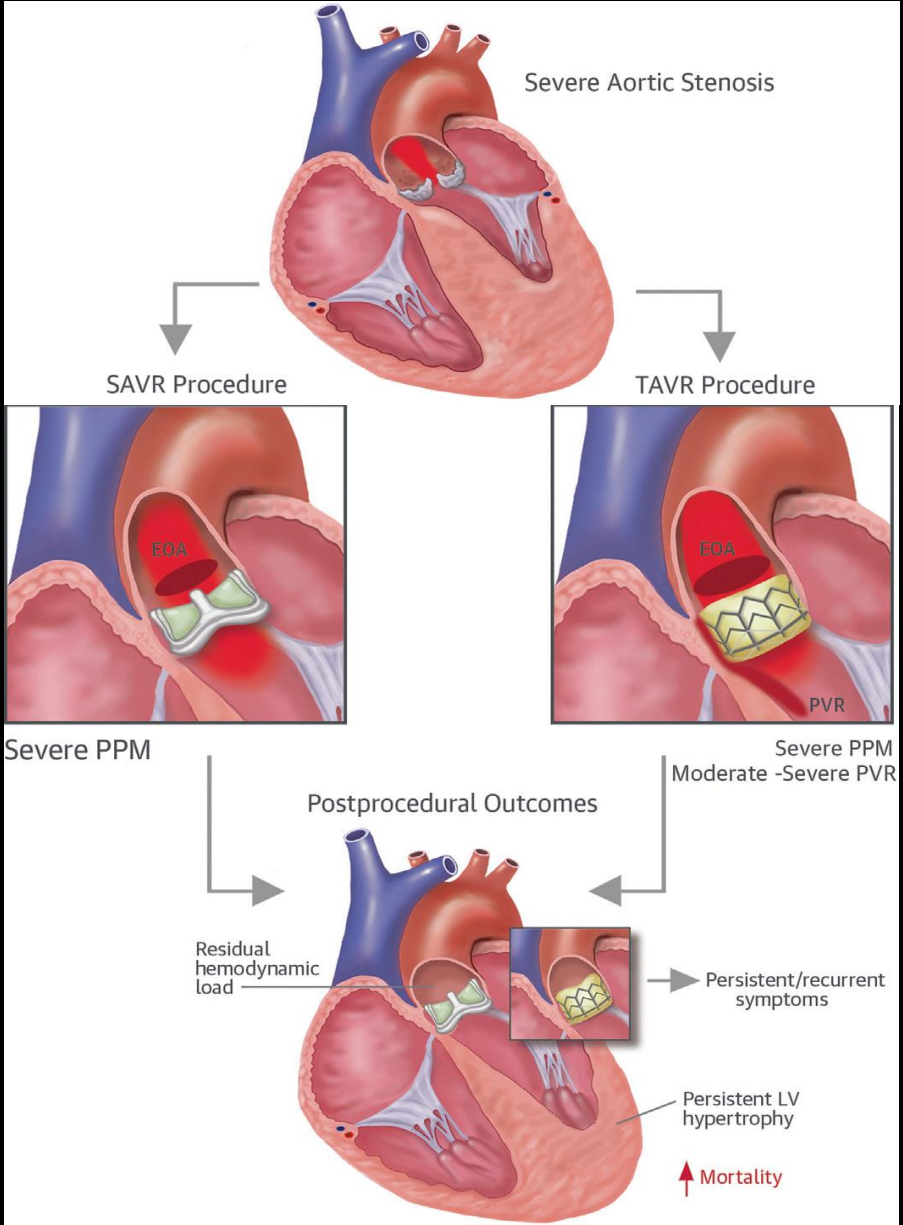
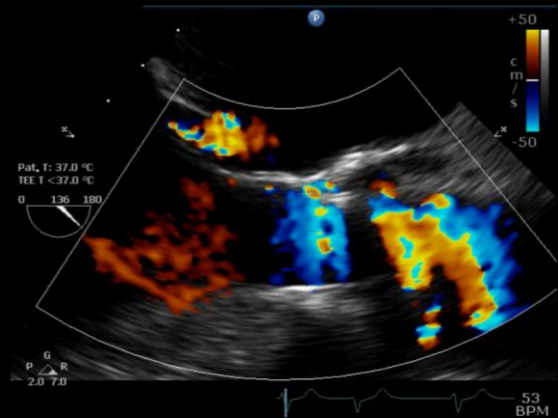
*Whole Cohort*



*Annulus Diameter <20 mm*



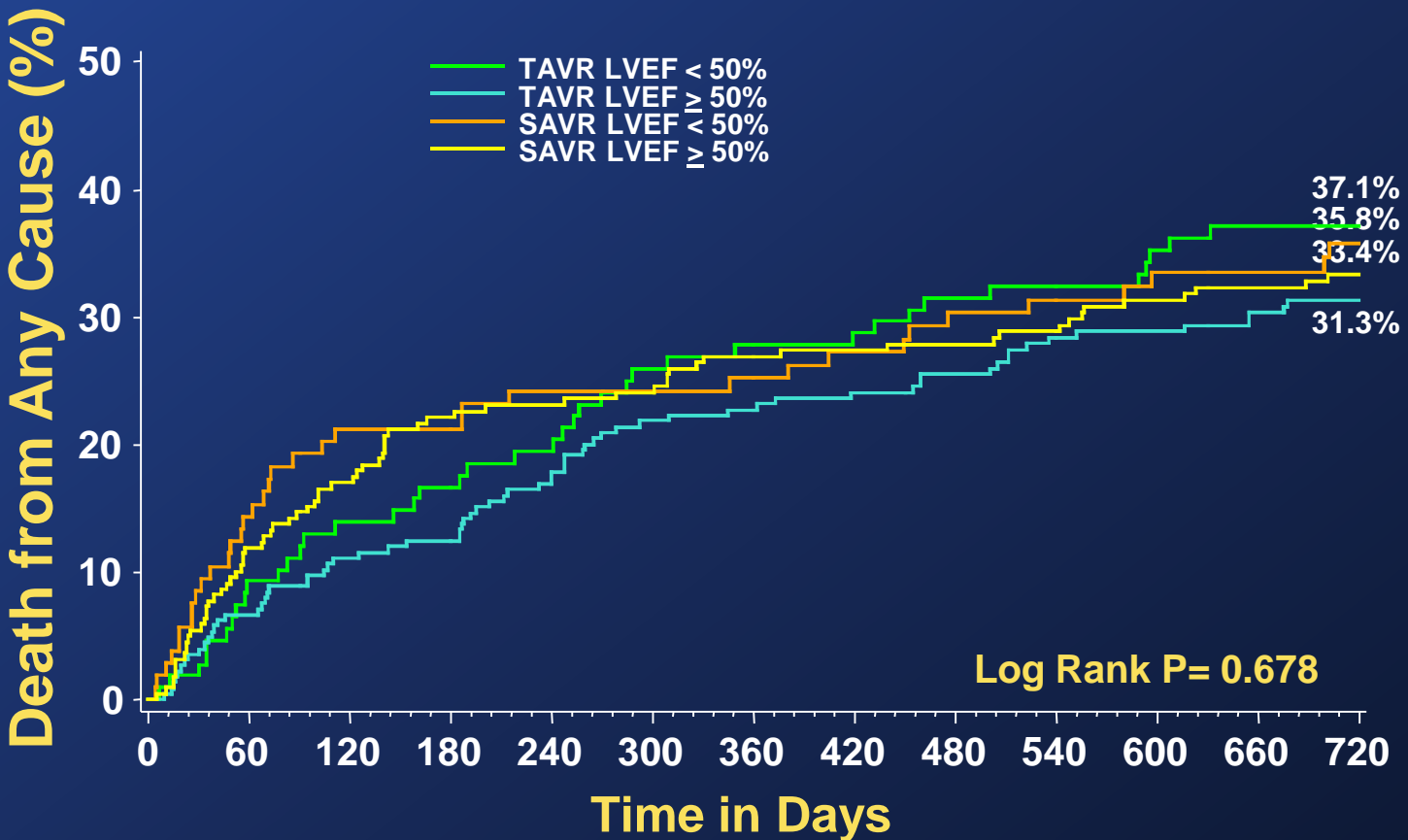
# TAVR vs. SAVR: Less PPM but more PVR



Pibarot et al. JACC 2014

# PARTNER-IA: All Cause Mortality

## Baseline LVEF



**Number At Risk**

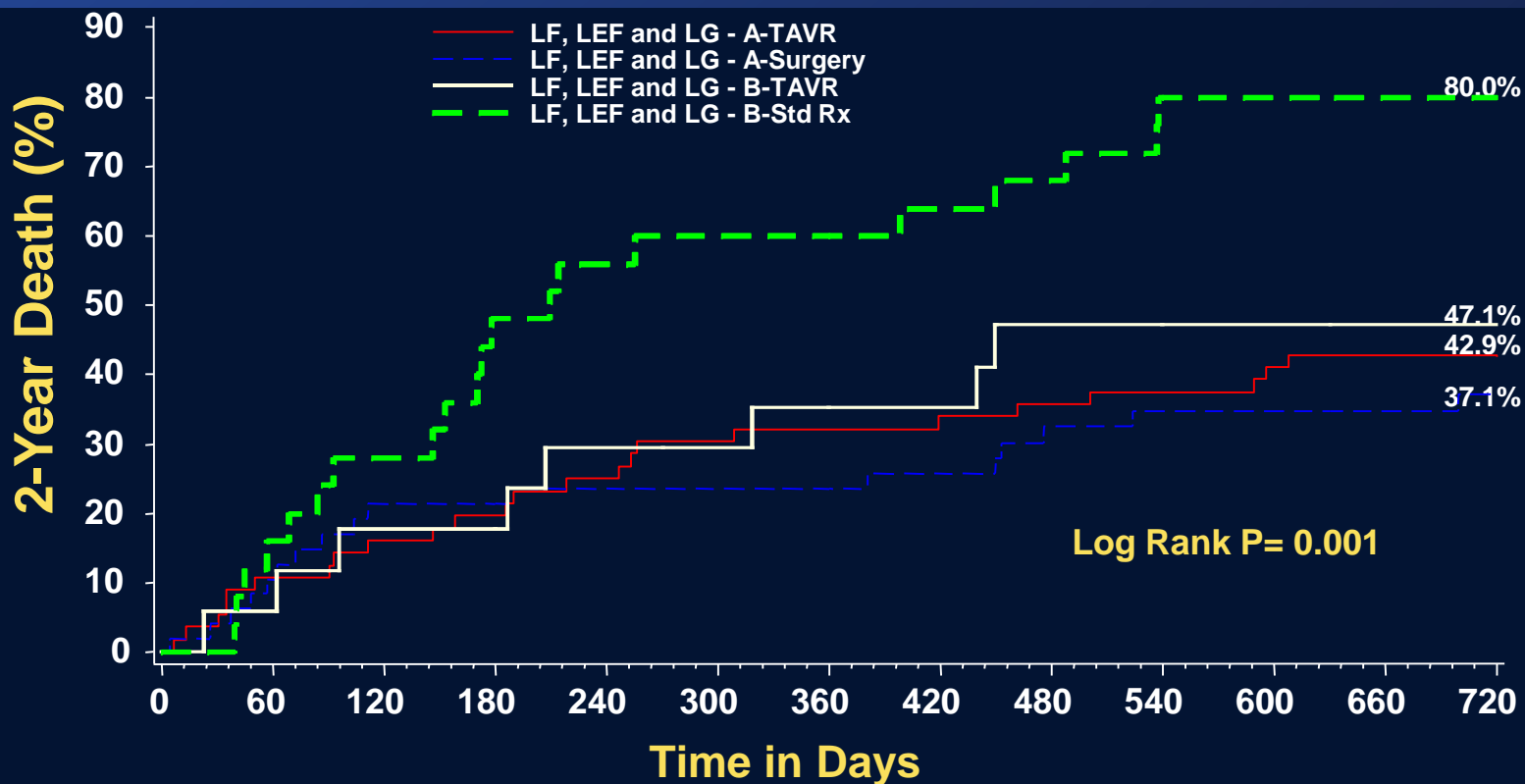
TAVR LVEF < 50%	108	96	90	82	78	76	73	68	59
TAVR LVEF ≥ 50%	226	205	197	176	172	160	149	145	121
SAVR LVEF < 50%	107	81	79	76	75	69	66	63	50
SAVR LVEF ≥ 50%	228	184	165	160	153	149	145	135	116

Elmariah et al. Circ Cardiovasc Interv. 2013;6:604-14.

# PARTNER I (Cohorts A and B)



## Low-EF, Low-Flow, Low-Gradient

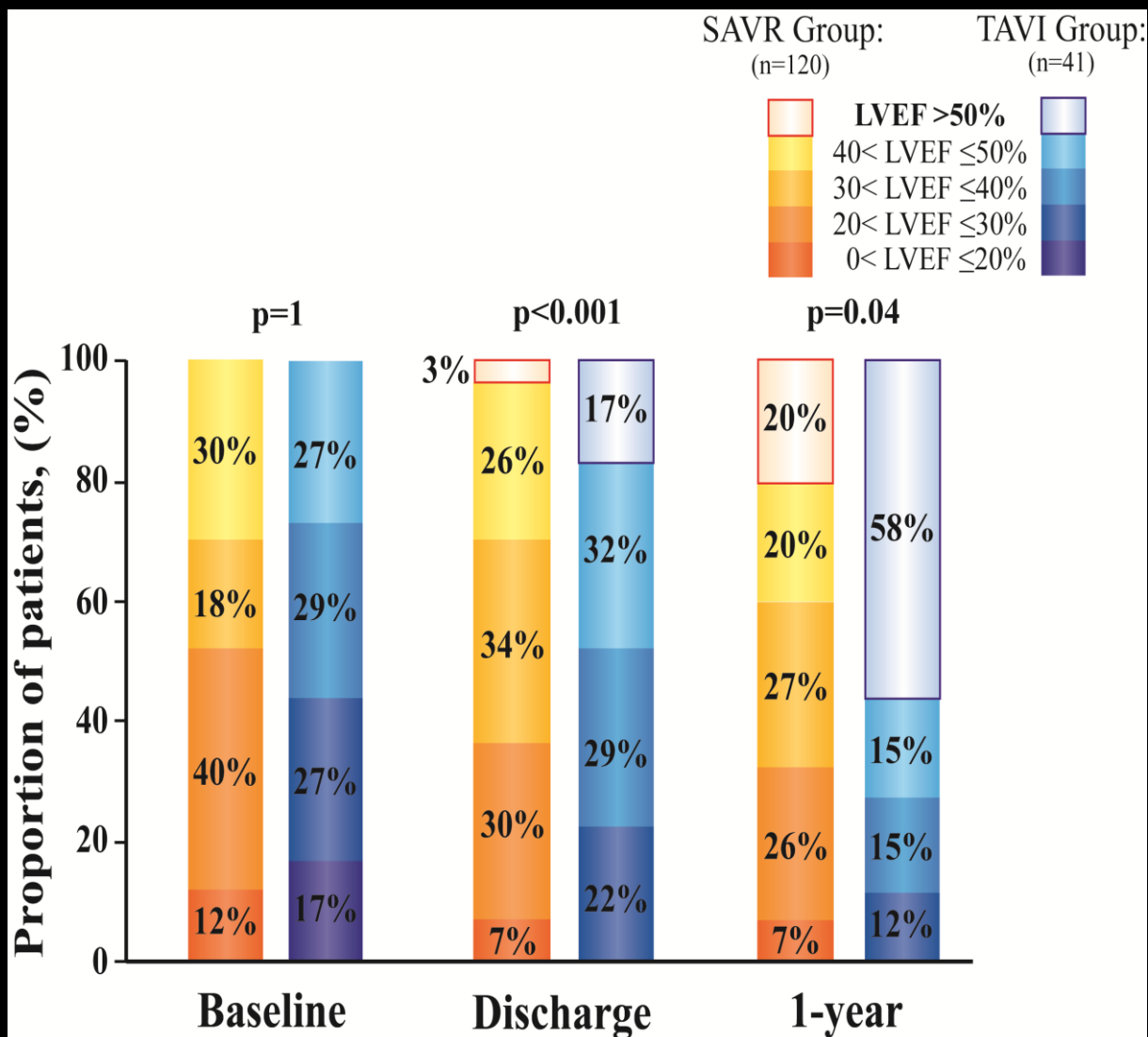


### Number At Risk

	0	60	120	180	240	300	360	420	480	540	600	660	720
A-TAVR	56	50	45	39	38	37	35	32	32	32	32	32	32
A-Surgery	49	38	36	35	35	32	29	29	29	29	29	29	27
B-TAVR	17	15	14	12	11	9	9	9	9	9	9	9	9
B-Std Rx	25	19	13	10	10	8	5	5	5	5	5	5	5

*Herrmann et al Circulation 2013*

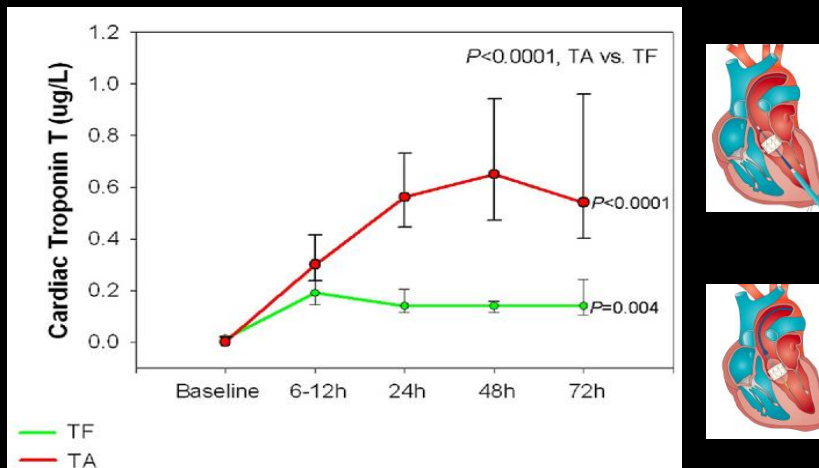
# Recovery of LVEF in Patients with LV Systolic Dysfunction (LVEF < 50%): TAVR versus SAVR



*Clavel Circulation, 122:1928-36., 2010*

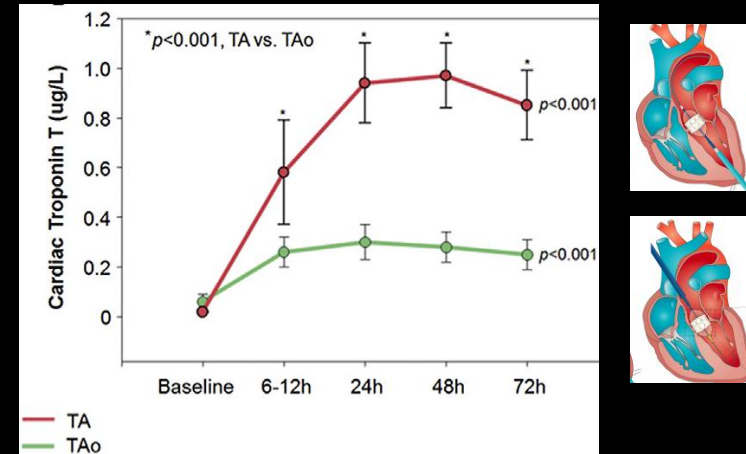
# Impact of Approach (TF vs. TA vs. TAO) on Myocardial Injury Following TAVR

Change in Troponin in TF vs. TA

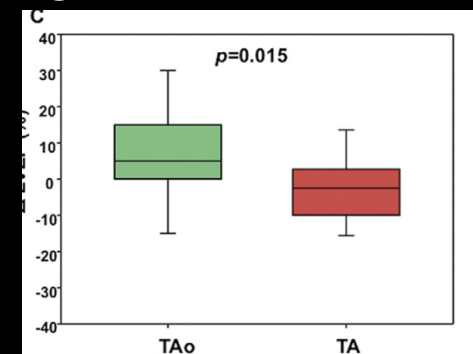


Rodés-Cabau et al. JACC 2011

Change in Troponin in TAO vs. TA

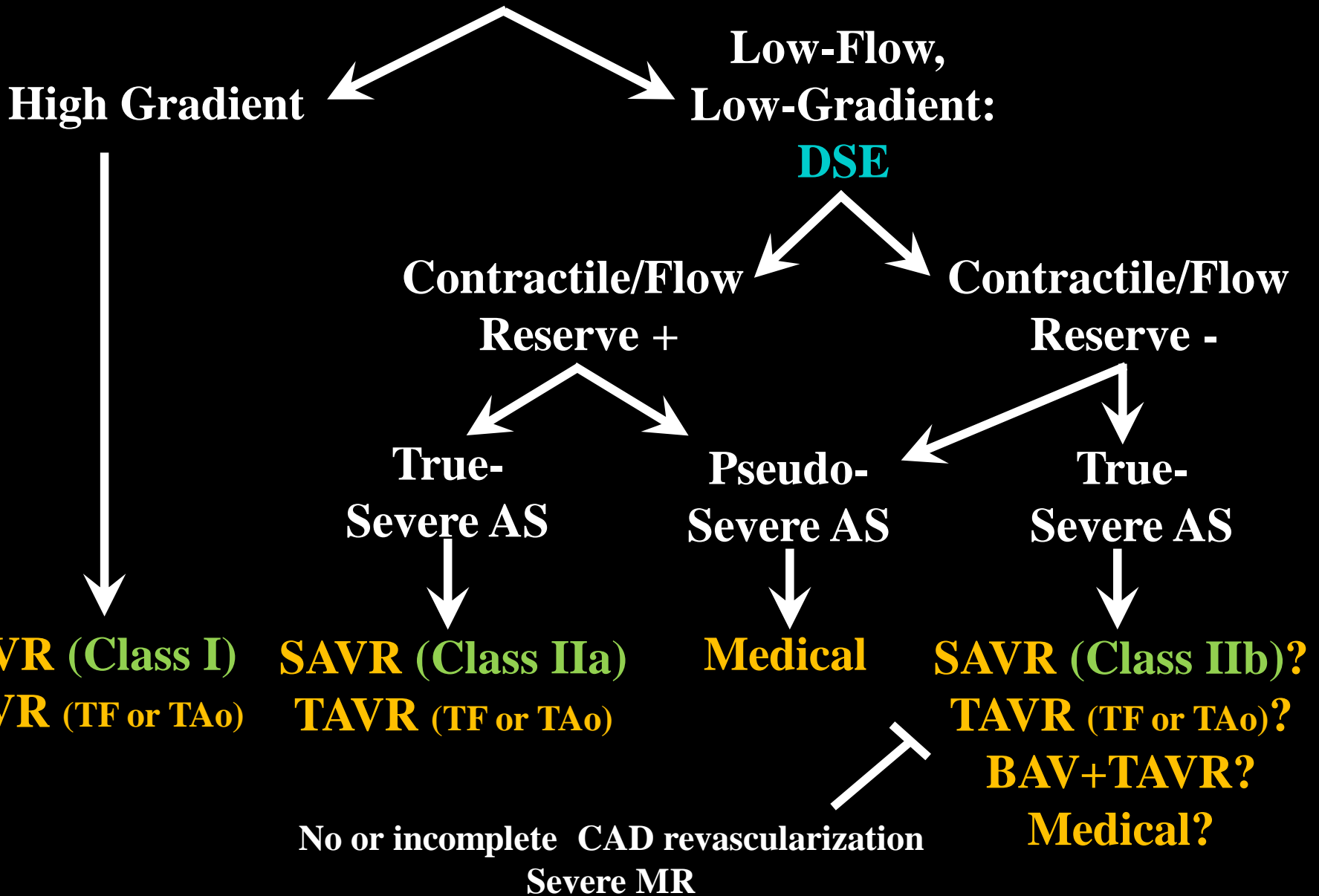


Change in LVEF in TAO vs. TA

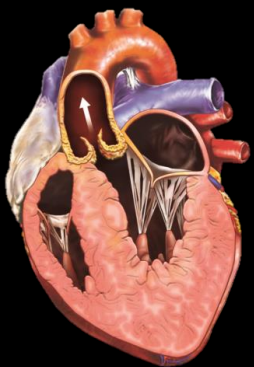


Ribeiro et al. Ann Thorac Surg 2015

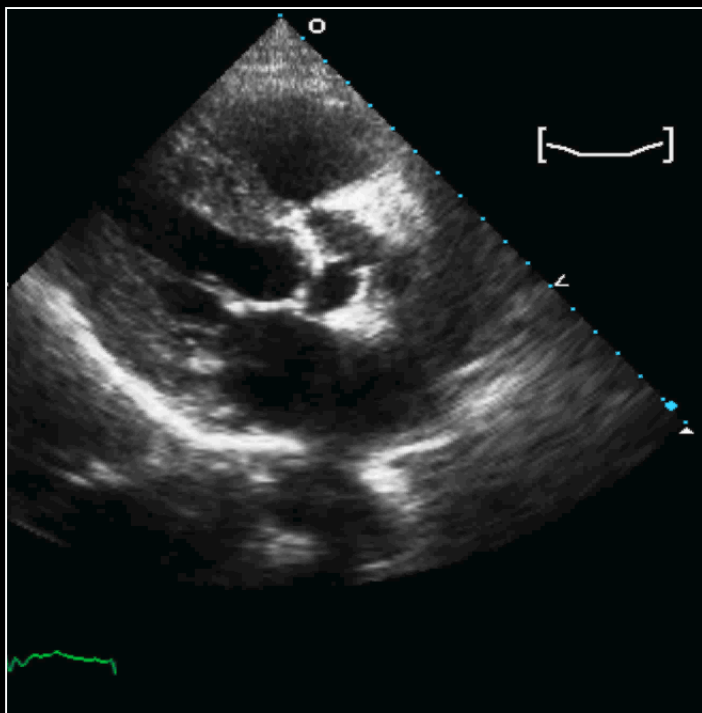
# LV Systolic Dysfunction



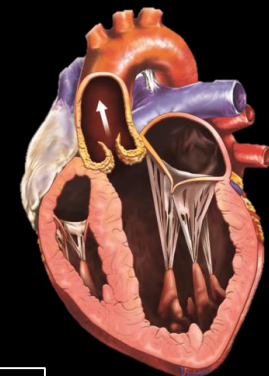




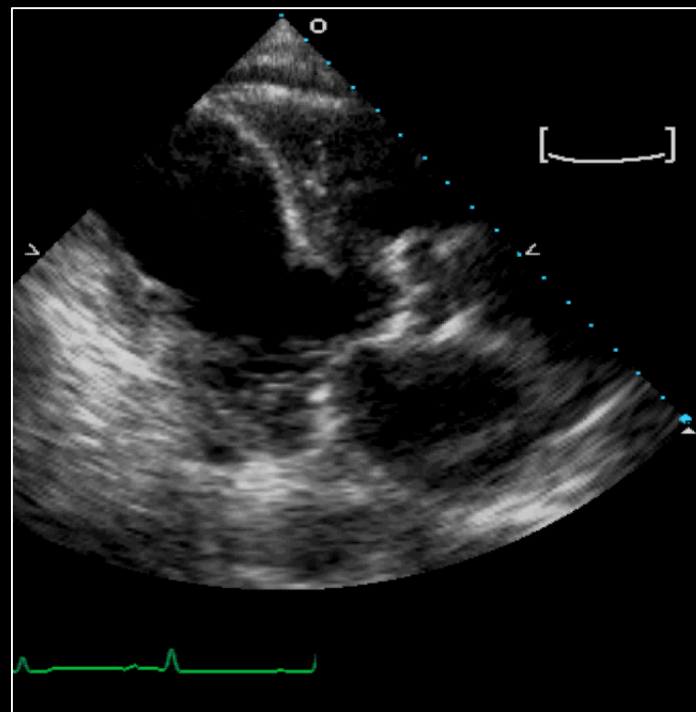
**NORMAL-LVEF**  
**«PARADOXICAL»**  
**LOW-FLOW**  
**LOW-GRADIENT**  
**Stage D3**



**LVEF=60%**  
**SV=46 mL**  
**MG=29 mmHg**



**LOW-LVEF**  
**«CLASSICAL»**  
**LOW-FLOW**  
**LOW-GRADIENT**  
**Stage D2**

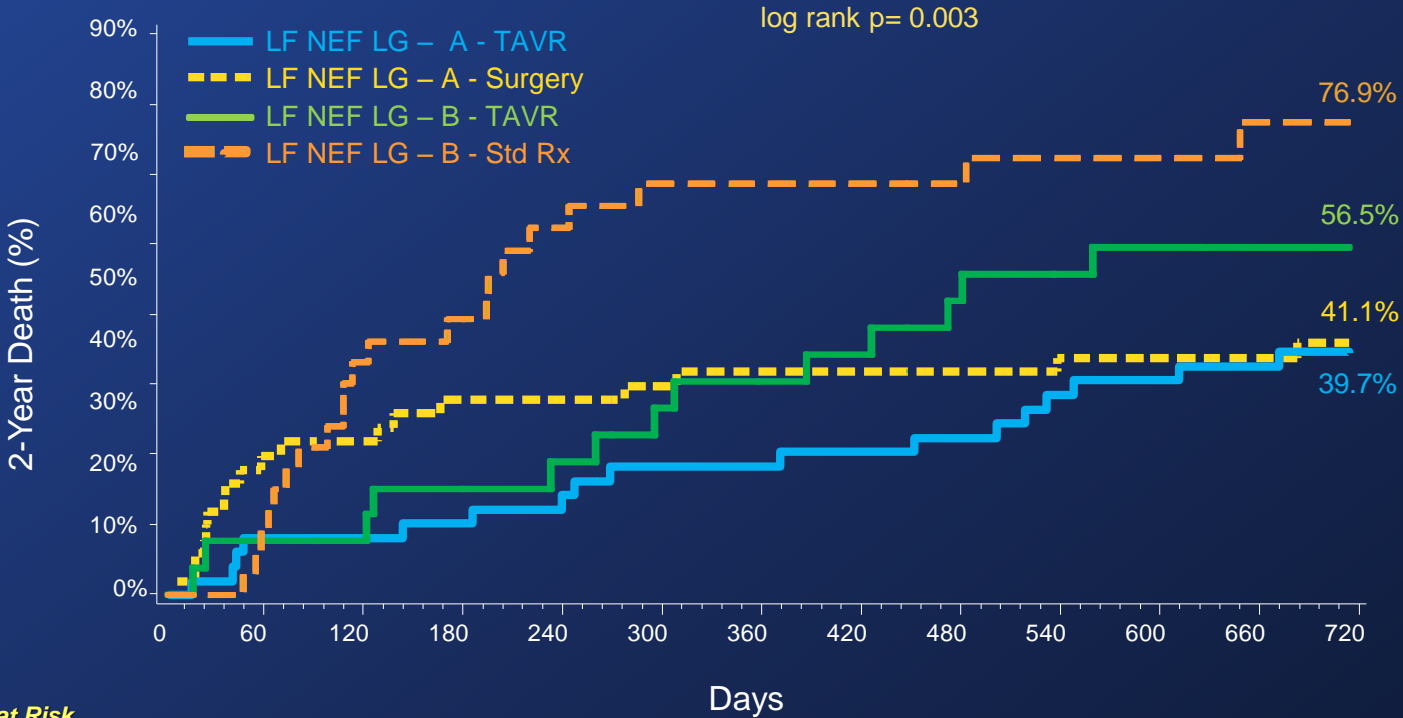


**LVEF=25%**  
**SV=42 mL**  
**MG=25 mmHg**

# PARTNER I (Cohorts A and B)



## Paradoxical (Normal-EF), Low-Flow, Low-Gradient



**Numbers at Risk**

	0	60	120	180	240	300	360	420	480	540	600	660	720
A - TAVR	43	39	38	34	34	34	33	29	26	22			
A - Surgery	44	33	30	30	28	27	27	26	23				
B - TAVR	23	21	19	17	15	13	11	10	10				
B - Std Rx	29	22	15	10	9	9	6	5	4				

*Herrmann et al. Circulation 2013*

# Conclusions

- **Patients with LV systolic dysfunction, and particularly those with low gradient, are at higher risk of CV morbidity and mortality following AVR**
- **Poor LV function and/or low gradient and/or absence of flow reserve should NOT preclude AVR**
- **TAVR with TF or TAO approach may be superior to SAVR in patients with LV dysfunction and most particularly in those with:**
  - **Low-flow, low-gradient AS and no flow reserve**
  - **Paradoxical low-flow, low-gradient AS**

**SUCCESS CONSISTS OF  
GOING FROM FAILURE  
TO FAILURE WITHOUT  
LOSS OF ENTHUSIASM**

**Winston Churchill**