
Update on Adult Cardiac Surgery

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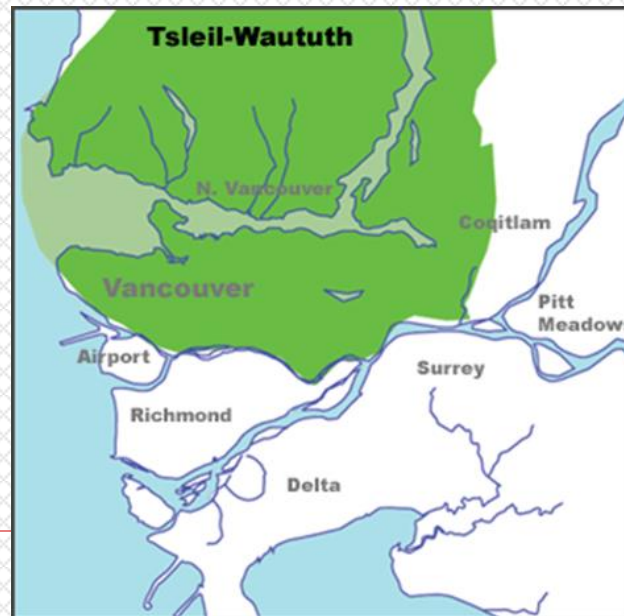
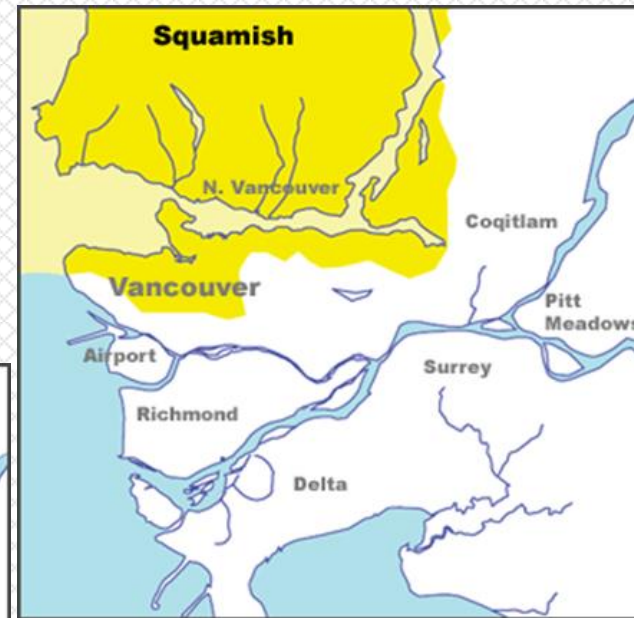


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Acknowledgement

We would like to acknowledge that we are gathered today on the traditional territories of the Musqueam, Squamish and Tsleil-Waututh peoples.

Source: www.johomaps.net/na/canada/bc/vancouver/firstnations/firstnations.html



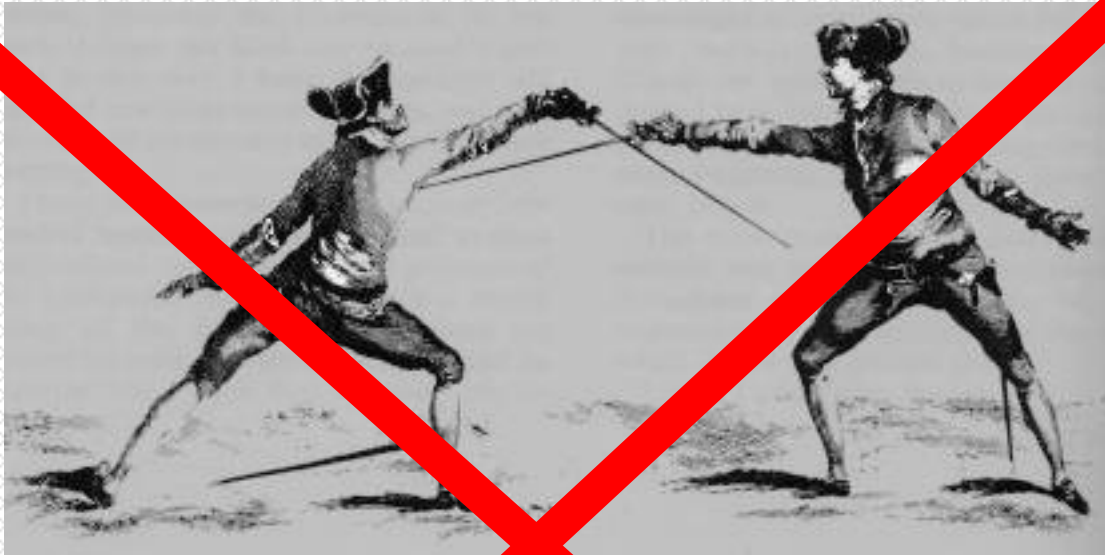
Disclosures

- ◆ Edwards: honoraria
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Goals for today: Talk About Changes...

- ◆ Discuss *new and evolving* ways of treating some common cardiac pathologies.
 - **NOT** a review of AHA/ESC guidelines
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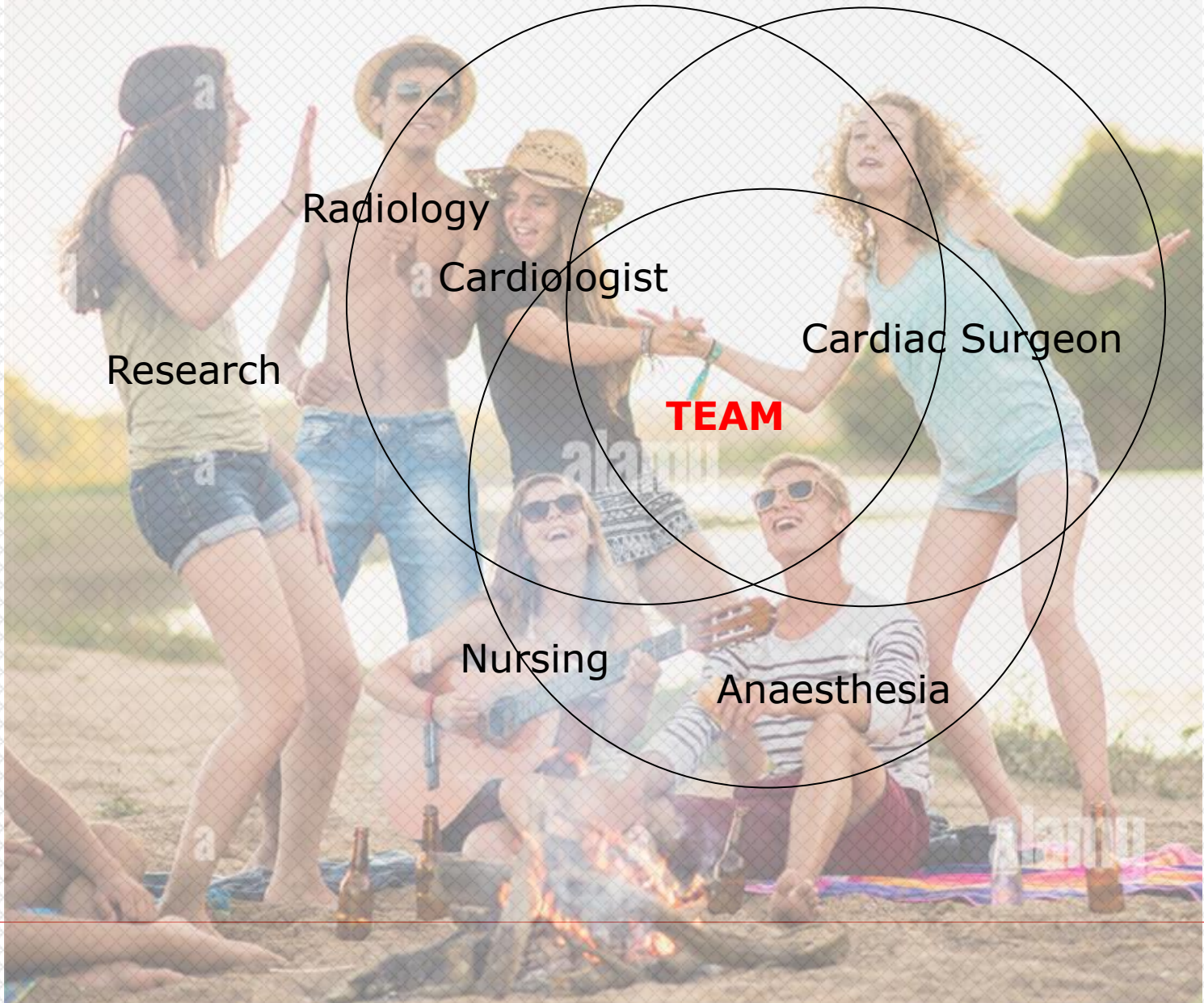
Who To Refer To?



Cardiac
Surgeon

Interventional
Cardiologist

Team-Based Decision Making



What Does This Mean?

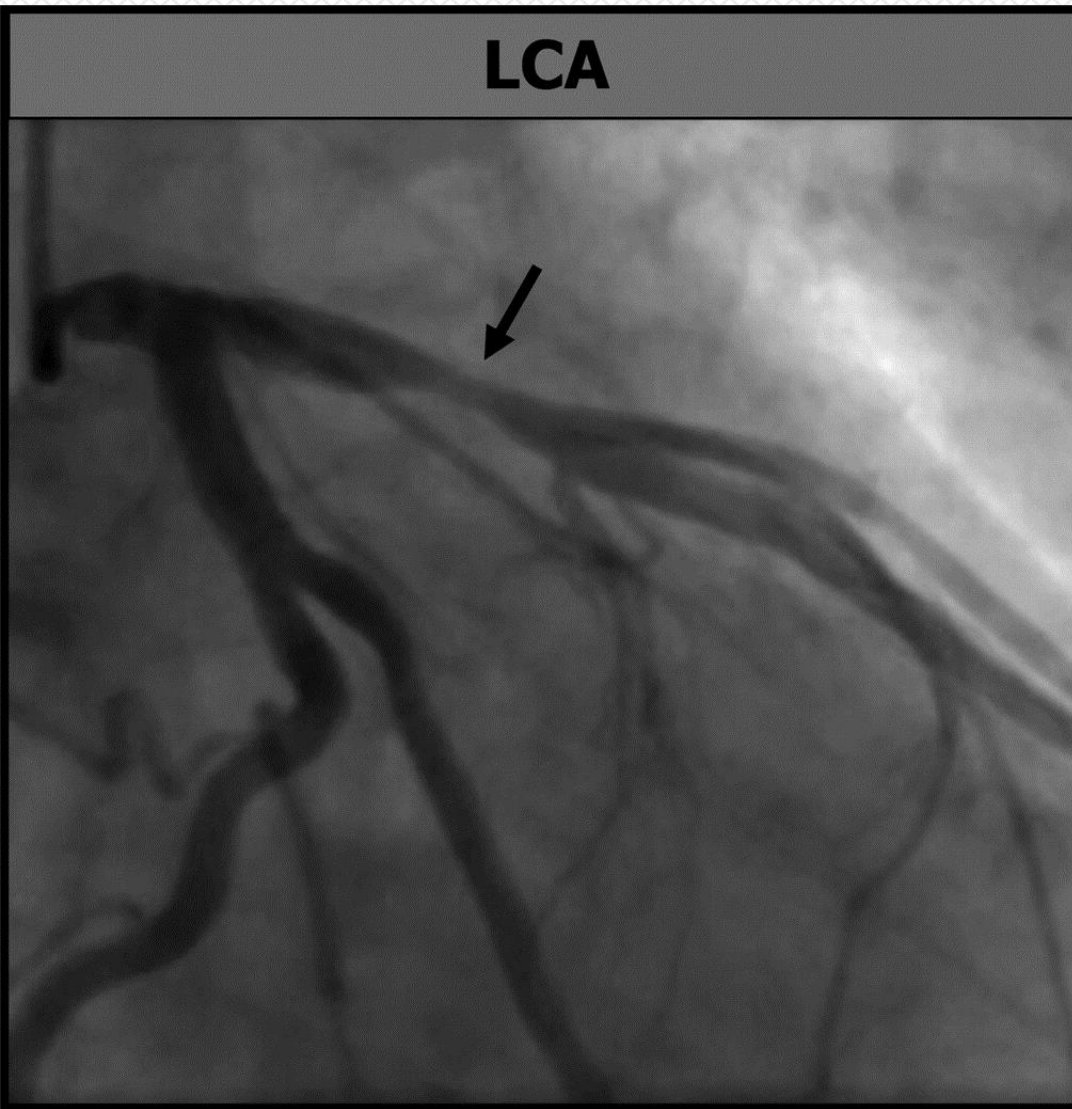
- ◆ At VGH/SPH, it's ok to refer to either cardiology or surgery, because...
 - ◆ The current approach is to consider all 3 options:
 - Medical management
 - Percutaneous management
 - Surgical management
 - ◆ "Ideal" strategy differs for each individual patient
 - ◆ Guidelines are rapidly changing
-

CORONARY ARTERY DISEASE

Coronary Artery Disease SUMMARY

- ◆ FFR (fractional flow reserve) is a quantitative way of determining if a coronary lesion is physiologically significant
- ◆ Medical management is a reasonable strategy for some patients with stable CAD
 - Revascularization for symptoms
 - Revascularization for left main CAD or multi-vessel CAD with low LVEF or DM
- ◆ Surgery offers a survival advantage over stenting in diabetic patients
- ◆ Robotically-assisted surgery is possible for some patients with LAD disease

How Severe Is This Stenosis?



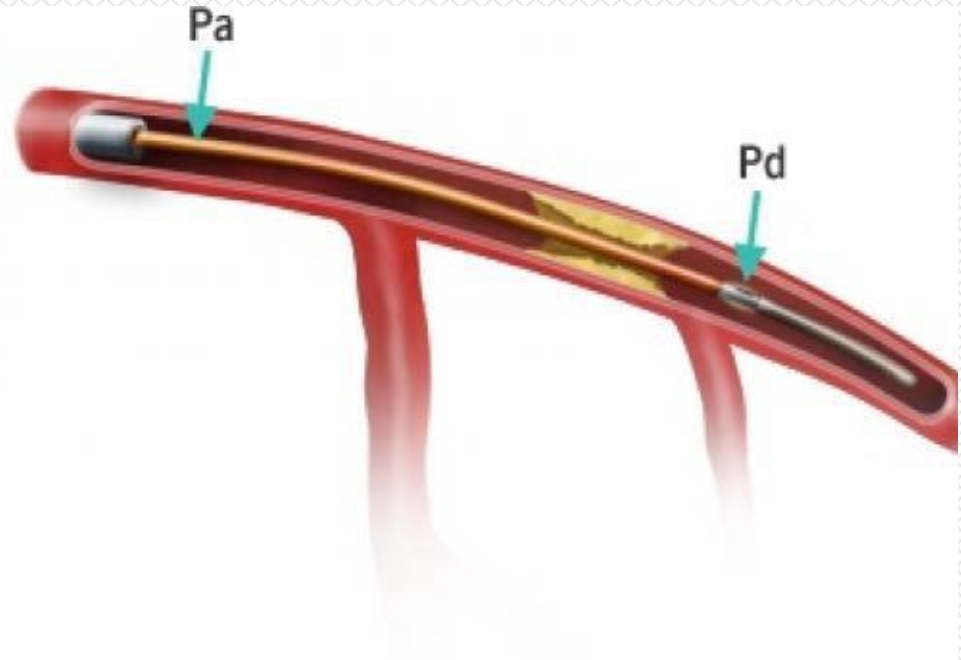
- ◆ Coronary angio is qualitative (subjective)
 - Stenosis > "70%": symptoms w/ exertion
 - Stenosis > "90%": symptoms at rest
 - Stenosis < "50%": no angina

"60% stenosis of the proximal LAD"

FFR: Fractional Flow Reserve

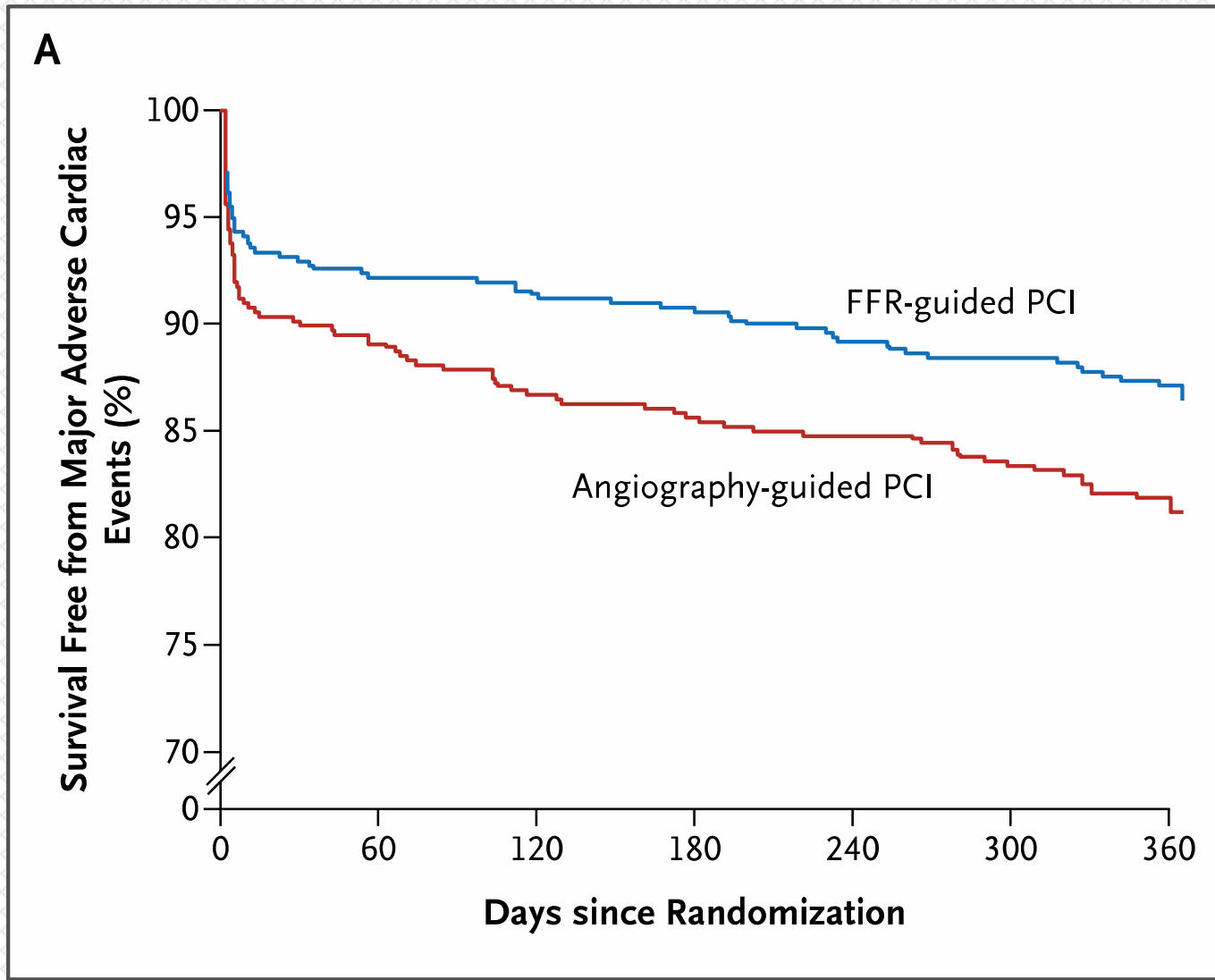
- ◆ A quantitative assessment of stenosis

$$\text{FFR} = \frac{\text{Distal Coronary Pressure (Pd)}}{\text{Proximal Coronary Pressure (Pa)}} \\ \text{(During Maximum Hyperemia)}$$

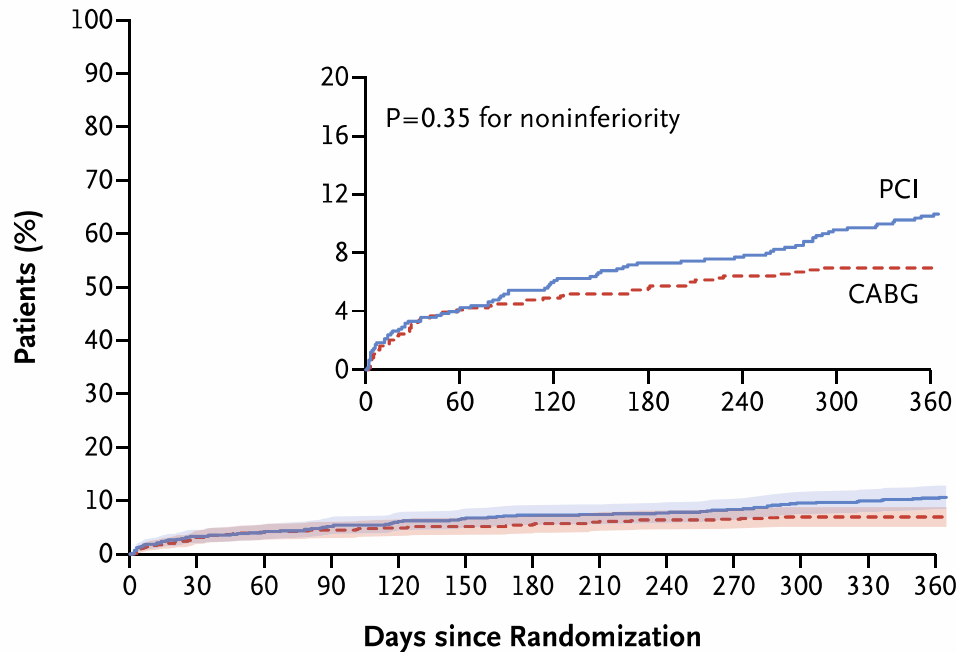


- ◆ $\text{FFR} < 0.80 =$ physiologically significant
-

FFR-Guided PCI (stenting): “FAME”



CABG vs PCI (FFR): “FAME-3”



No. at Risk

PCI	757	728	721	713	707	702	697	696	693	687	678	674	670
CABG	743	709	701	698	695	693	691	686	683	682	679	679	679

Figure 1. Kaplan–Meier Curves for the Primary End Point.

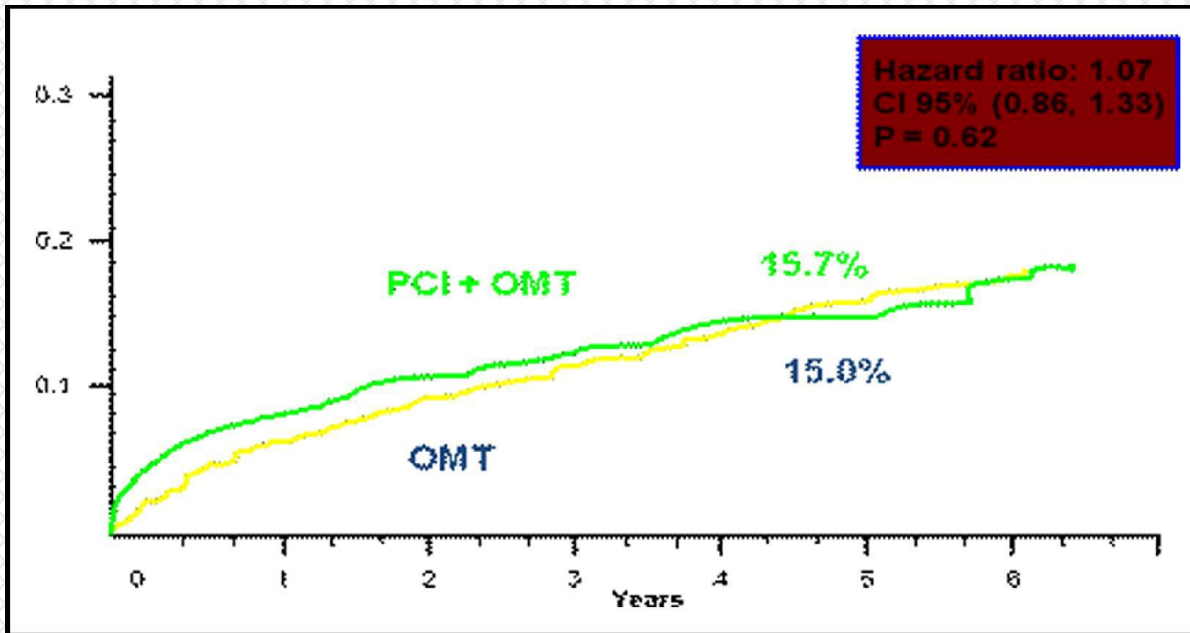
The primary end point was the occurrence within 1 year of a major adverse cardiac or cerebrovascular event, defined as death from any cause, myocardial infarction, stroke, or repeat revascularization. The inset shows the same data on an enlarged y axis. CABG denotes coronary-artery bypass grafting, and PCI percutaneous coronary intervention.

- ◆ Inclusion
 - 3 vessel CAD (> 50% stenosis)
 - FFR for all PCI patients
- ◆ Exclusion
 - Cardiogenic shock
 - LVEF < 30%

Noninferiority trial:
Result = PCI is NOT noninferior to CABG

Translation: CABG had a better outcome re: death, MI, stroke, or repeat revasc

COURAGE trial: Survival



NO difference in 5 year survival between medical mgmt and revascularization with PCI!

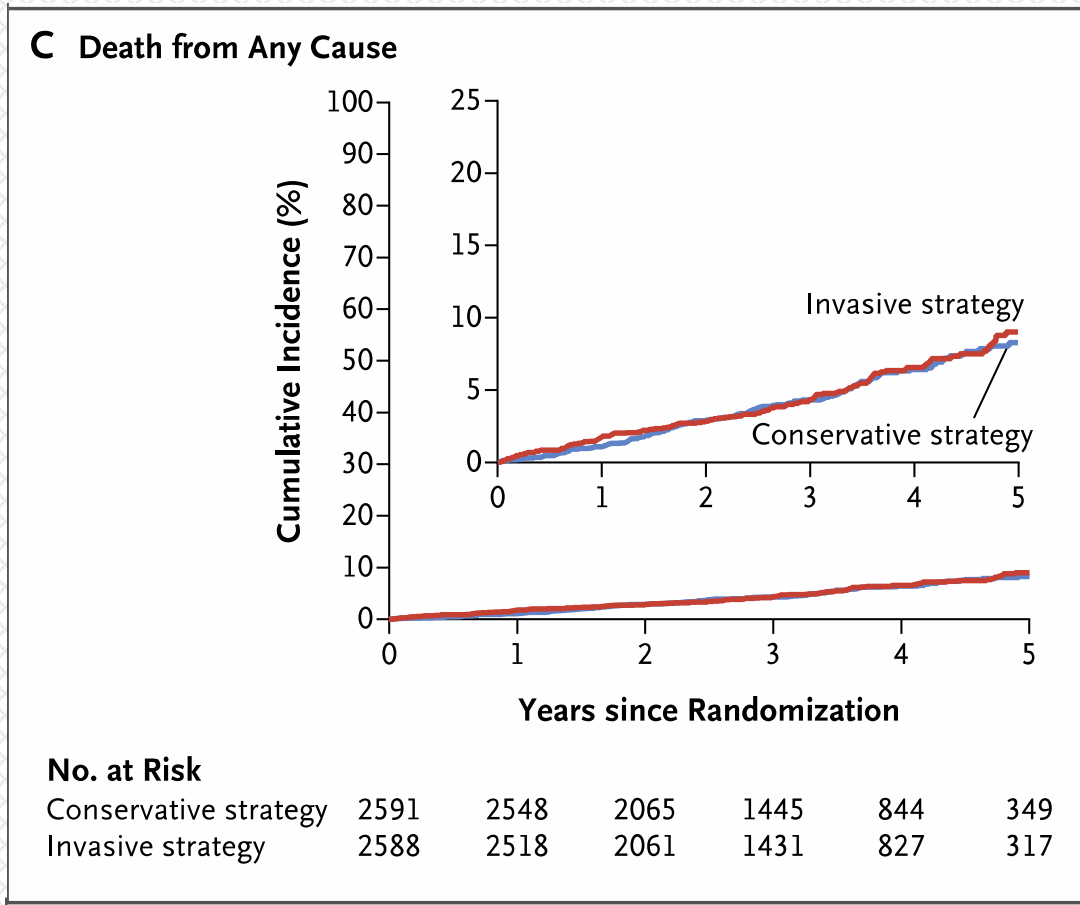
◆ Inclusion

- ≥ 1 artery with $\geq 70\%$ stenosis
- Stable angina, evidence of ischemia

◆ Exclusion

- Unstable angina (including ACS), LVEF < 30%, shock
- Markedly +ve stress test

ISCHEMIA trial

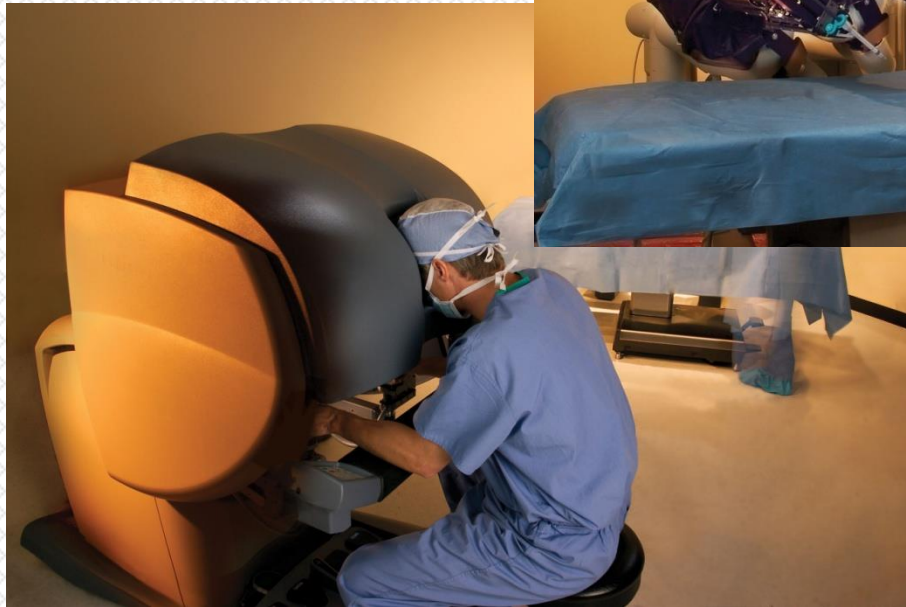


- ◆ Inclusion
 - STABLE CAD
 - +ve stress test
- ◆ Exclusion
 - ACS
 - Left main > 50%
 - LVEF < 35%
 - Class III-IV CHF

Caveat: Ostial/Proximal LAD Stenosis



Intuitive Surgical, da Vinci Robot

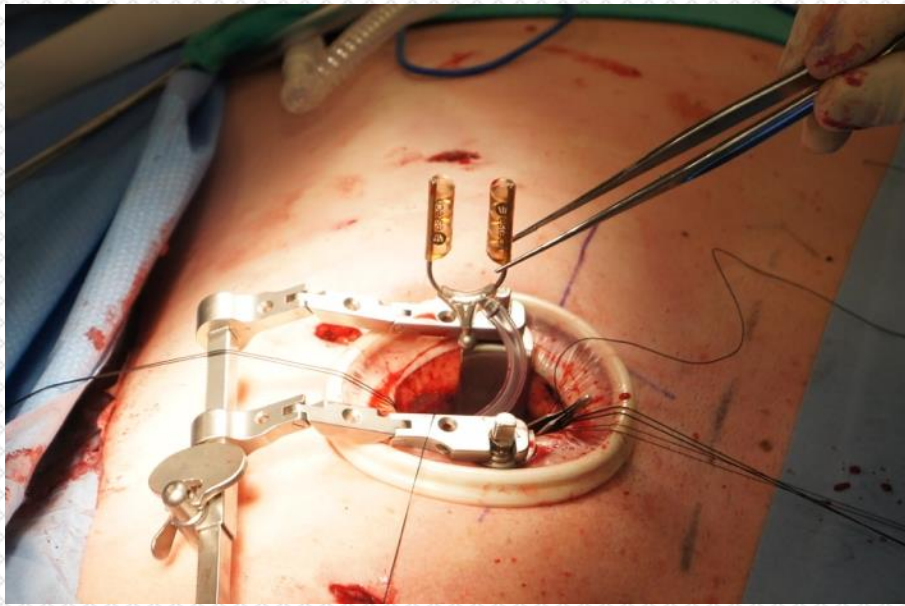
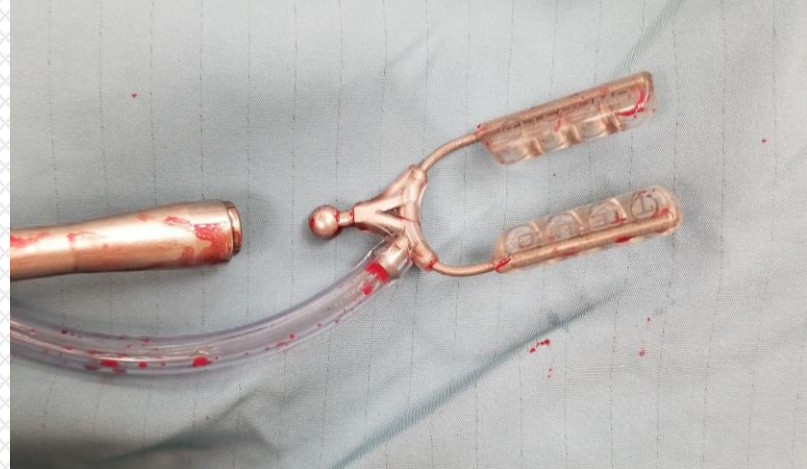




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Stabilizer (Estech/Terumo)

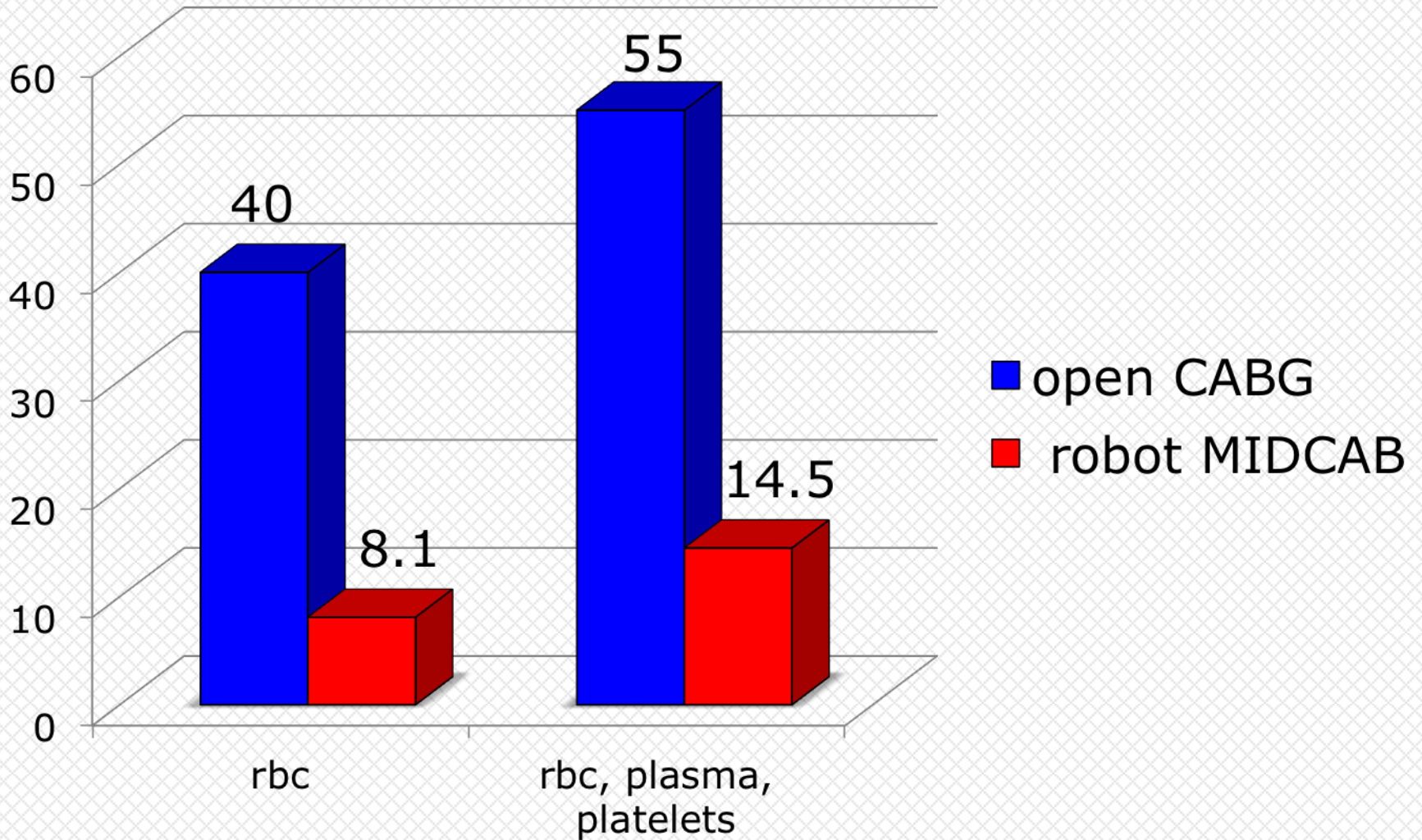




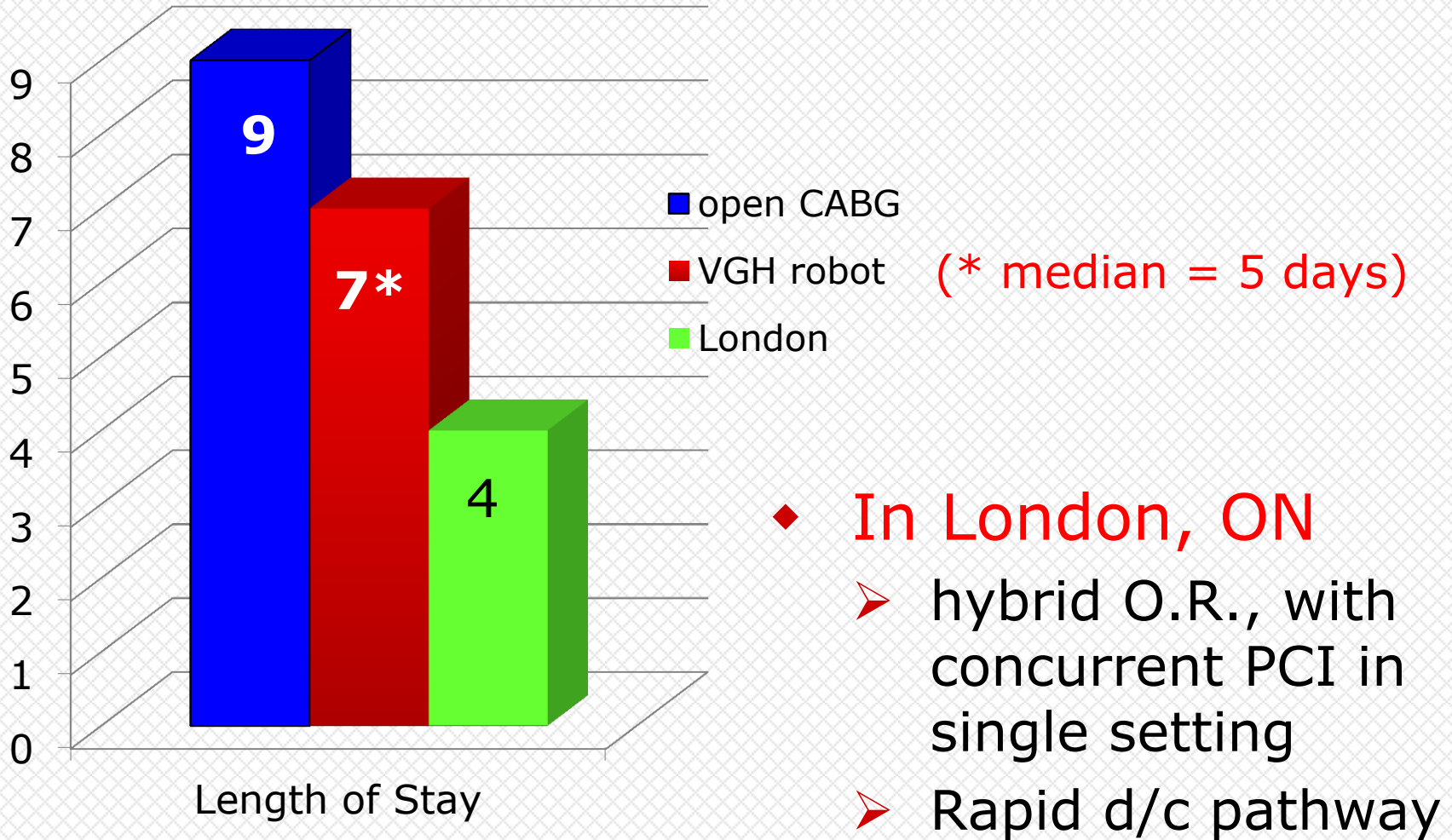
Overall Results

- ◆ >300 patients total
 - ◆ 1 mortality (0.3%)
 - ◆ 4 CVA's (1.3%)
 - ◆ 11 Failed grafts (3.7%)
 - Most in early experience (last in 2016)
-

Transfusions (% of patients)

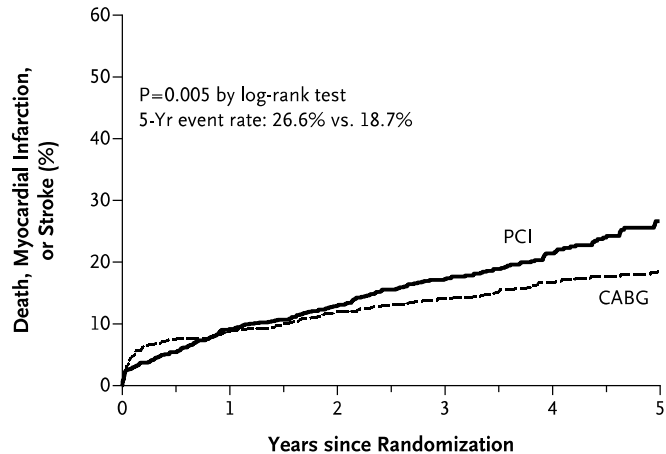


Mean Post-op Length of Stay (Days)



FREEDOM trial: CABG vs PCI (DM)

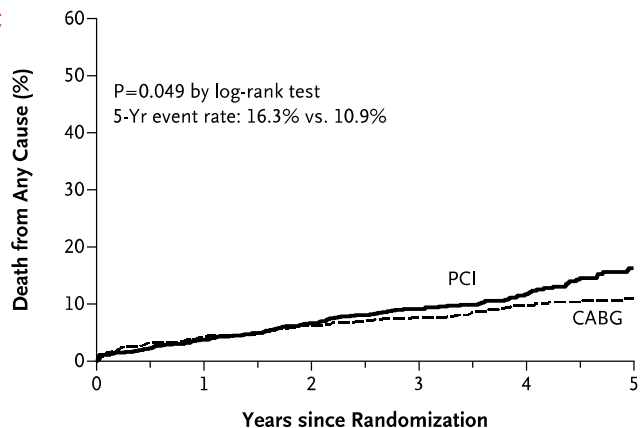
A Primary Outcome



No. at Risk

PCI	953	848	788	625	416	219
CABG	947	814	758	613	422	221

B Death



No. at Risk

PCI	953	897	845	685	466	243
CABG	947	855	806	655	449	238

◆ Inclusion

- DM, as defined by American Diabetes Association
 - High A1C
 - GTT
 - Fasting glucose level
 - Random glucose level
- At least 2 vessels with >70% stenosis

◆ Exclusion

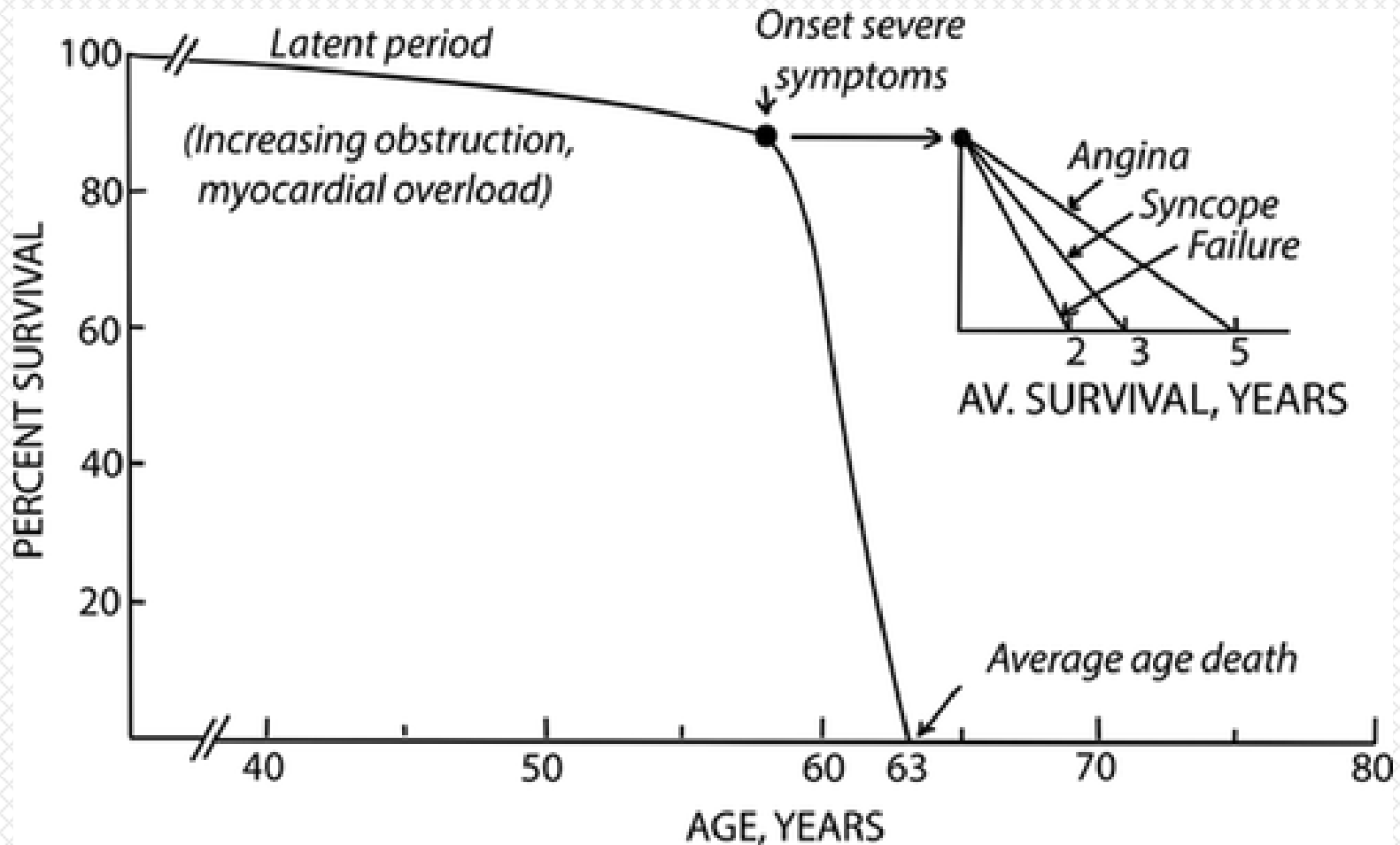
- Class III-IV CHF
- Left main > 50%
- Prior CABG, recent PCI
- 100% occluded arteries

AORTIC STENOSIS

Aortic Stenosis SUMMARY

- ◆ Asymptomatic severe aortic stenosis should not be treated medically
 - ◆ TAVI (transcatheter aortic valve implantation)
 - Majority of patients are discharged w/i 24 hrs
 - Is not just for patients at high surgical risk of M&M
 - There are still some unresolved questions
 - ◆ Outcomes with surgical AVR are excellent
-

Severe Aortic Stenosis



Asymptomatic Severe Aortic Stenosis

AVATAR trial

Primary Endpoint:

Composite Endpoint of all-cause death, MI, stroke or unplanned HF hospitalization:

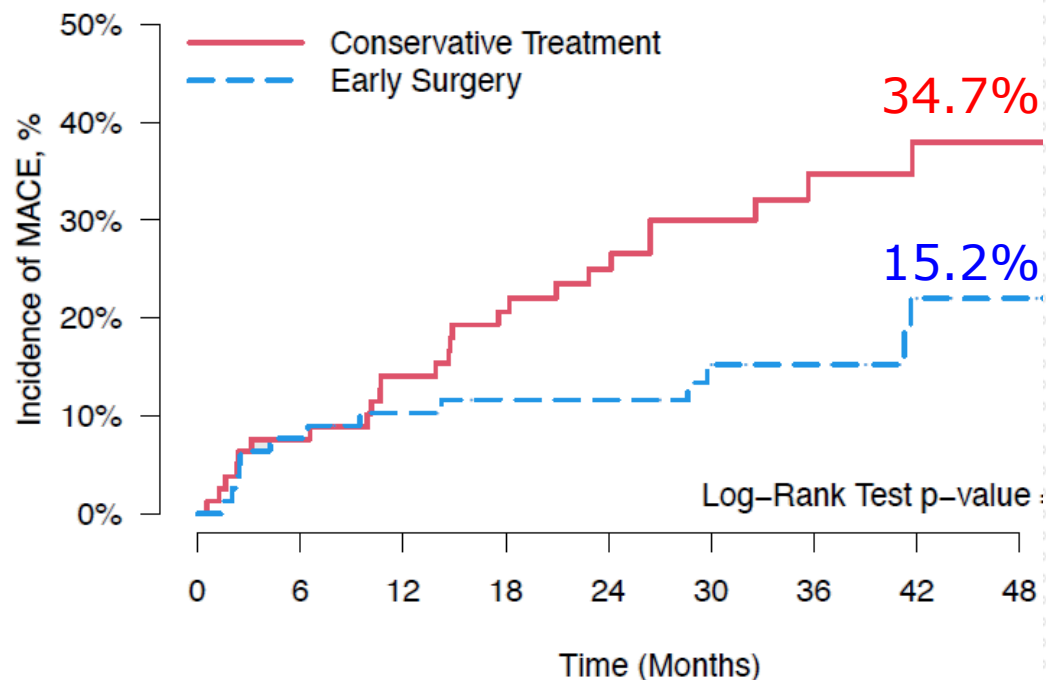
Conservative = 34.7%

Early surgery = 15.2%

P=0.002

Hazard ratio: 0.46

95% CI: 0.23-0.90



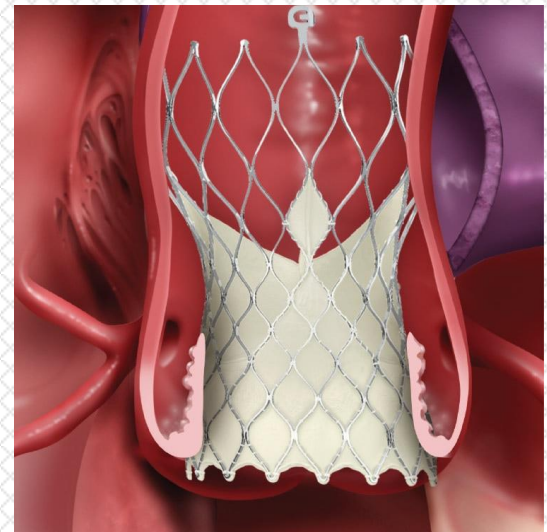
Primary Endpoint Components	Group	
	Early Surgery n	Conservative n
All cause death	9	16
Heart Failure	1	7
Acute MI	1	2
Stroke	2	1
Total	13	26

Two Main Types of TAVI Valves

- ◆ Balloon Expandable
- ◆ Self-Expanding
- ◆ Edwards Sapien
 - ~5% need pacemaker
- ◆ Medtronic CoreValve
 - Up to 25% need pacemaker



Partner 3



Evolut Low Risk

3M Clinical Pathway: Next-Day D/C

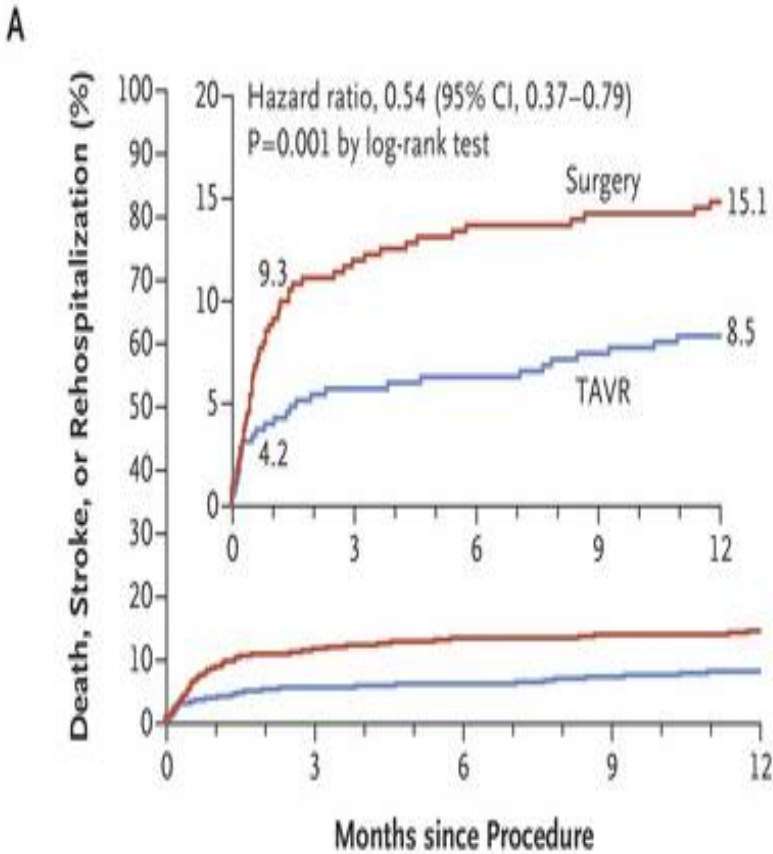
- ◆ No general anaesthetic
- ◆ Minimal/no sedation
- ◆ No foley
- ◆ No echo
- ◆ No Swan-Ganz catheter
- ◆ Mobilization within 4 hours

- ◆ Mean age 84
- ◆ 80% d/c within 24 hours
- ◆ 2.9% all-cause mortality/CVA at 30 days

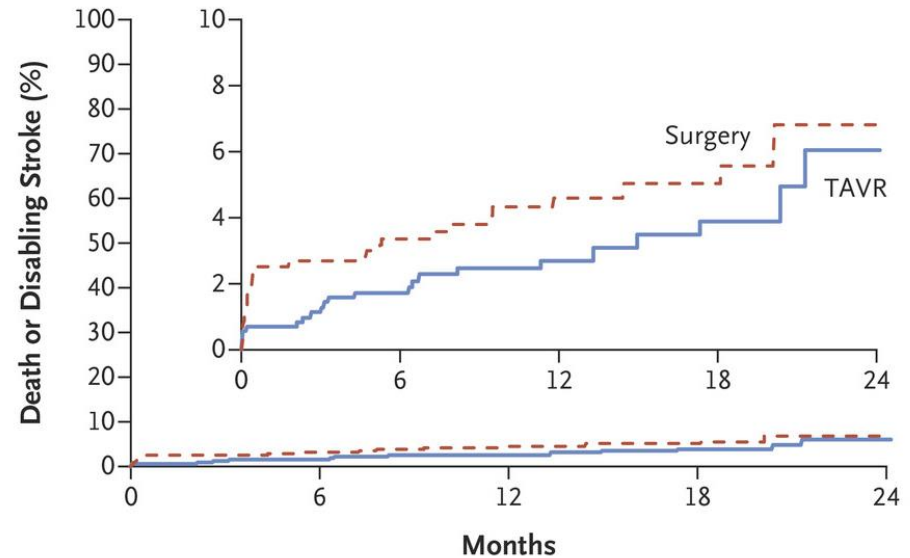
“Low-Risk TAVI” Trials

Partner 3
Edwards Sapien valve

Evolut Low Risk
Medtronic Core valve



B Incidence of Primary End Point



Popma JJ. N Engl J Med. 2019; 380:1706

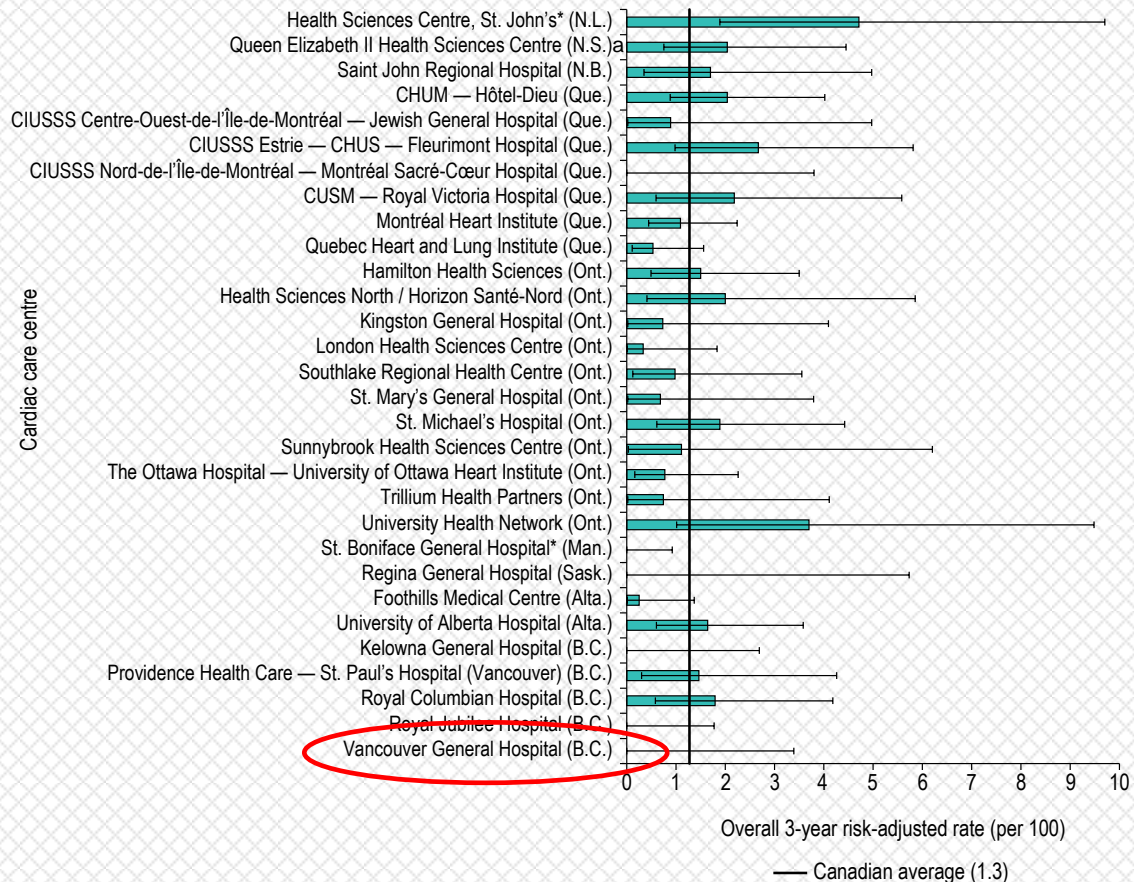
Mack MJ. N Engl J Med. 2019; 380:1695

Low-Risk TAVI Trials: Caveats

- ◆ “Low risk” = STS risk < 4%
 - ◆ 1 or 2 year follow up only
 - ◆ Exclusion
 - Bicuspid aortic valve
 - Subannular calcium
 - ◆ Substantial incidence of need for pacemakers
 - ◆ Perivalvular leak
 - Not always predictable
 - May have impact on patient longevity
 - ◆ Unknown durability of TAVI valves
-

Excellent Outcomes w/ Surgical AVR

Cardiac care centre risk-adjusted results for 30-Day In-Hospital Mortality After Isolated AVR



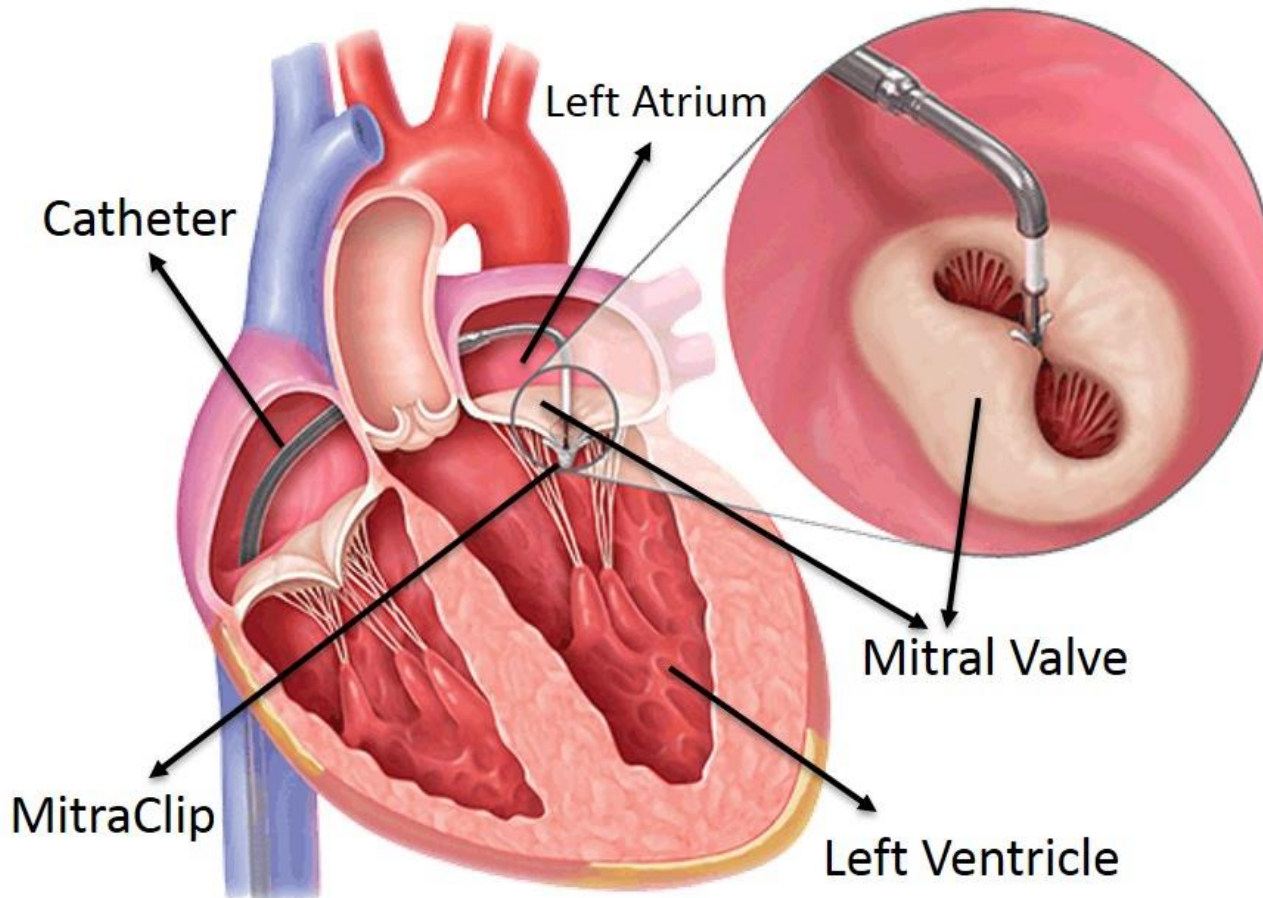
- Over the 3-year period, 6 hospitals had a 30-day in-hospital mortality rate after isolated AVR of 0.0%.
- Since AVR is performed on fewer patients, the confidence interval is a bit wider. Thus the results should be interpreted with caution.
- 1 cardiac care centre had significantly lower and 1 had significantly higher results compared with the Canadian average.

MITRAL REGURGITATION

Mitral Valve Disease SUMMARY

- ◆ Mitraclip
 - Offers longevity benefit over medical mgmt in pts with CHF and low LVEF
 - Reduces MR, but often does not eliminate MR
 - ◆ Mitral valve surgery can now be done minimally-invasively (via a right mini-thoracotomy incision) with excellent results in selected patients
-

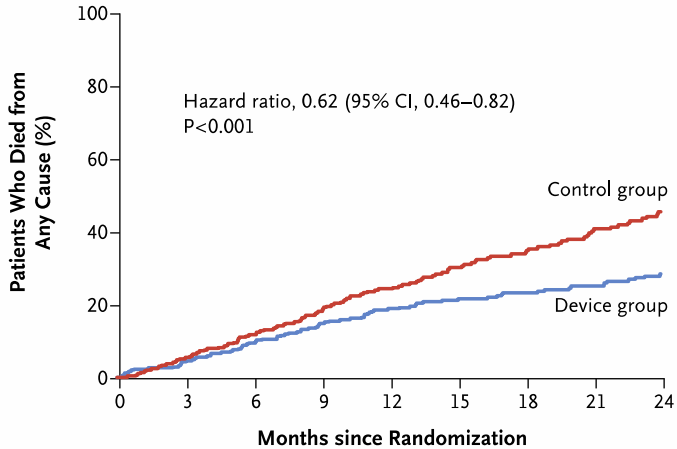
Mitraclip: Alternative to Surgery for *Selected Patients**



* Selected Patients = not surgical candidates

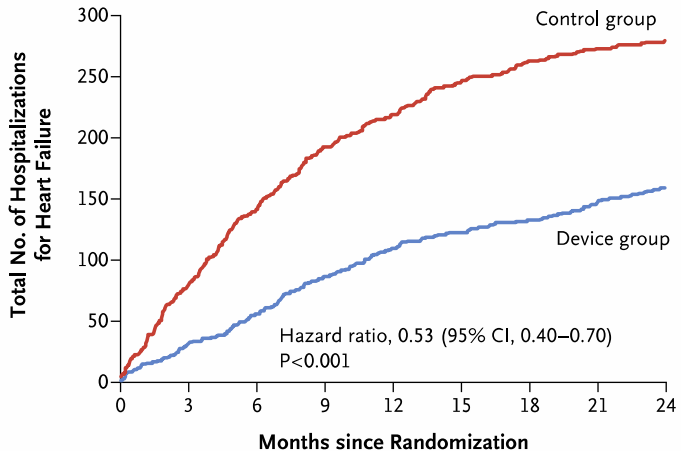
Mitraclip COAPT trial

C Death from Any Cause



No. at Risk	0	3	6	9	12	15	18	21	24
Control group	312	294	271	245	219	176	145	121	88
Device group	302	286	269	253	236	191	178	161	124

A Hospitalization for Heart Failure



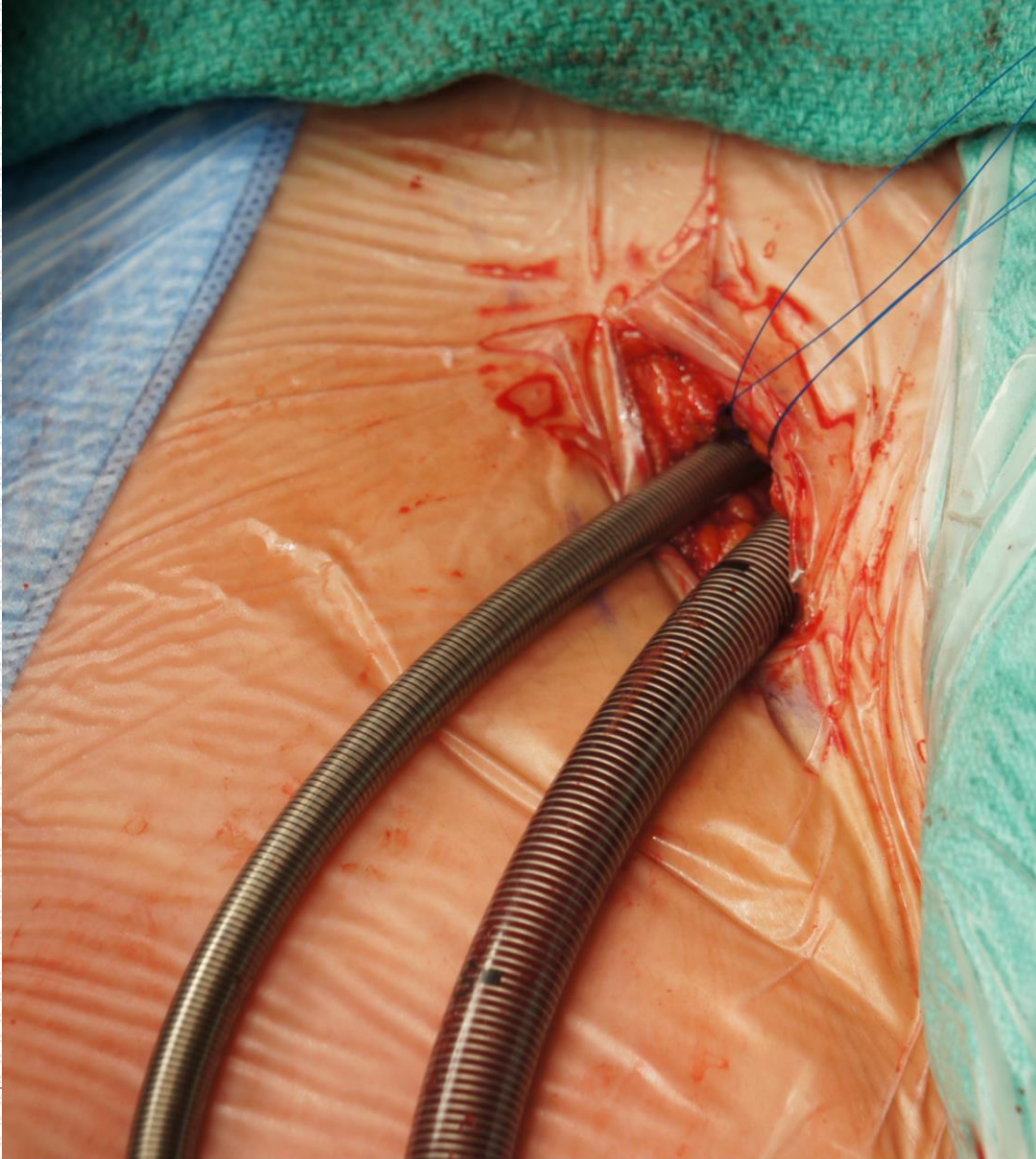
No. at Risk	0	3	6	9	12	15	18	21	24
Control group	312	294	271	245	219	176	145	121	88
Device group	302	286	269	253	236	191	178	161	124

- ◆ 3+ to 4+ “Functional” MR
 - moderately severe, or severe
- ◆ Class III – IV CHF
- ◆ Cardiomyopathy w/ LVEF 20 – 50% (ave = 31%)
- ◆ Turned down for surgery
- ◆ “success” = MR \lesssim 2+ (moderate)

Miminally-Invasive MV Surgery



Fem/Fem Cannulation



Minimally-Invasive MV Surgery: VGH

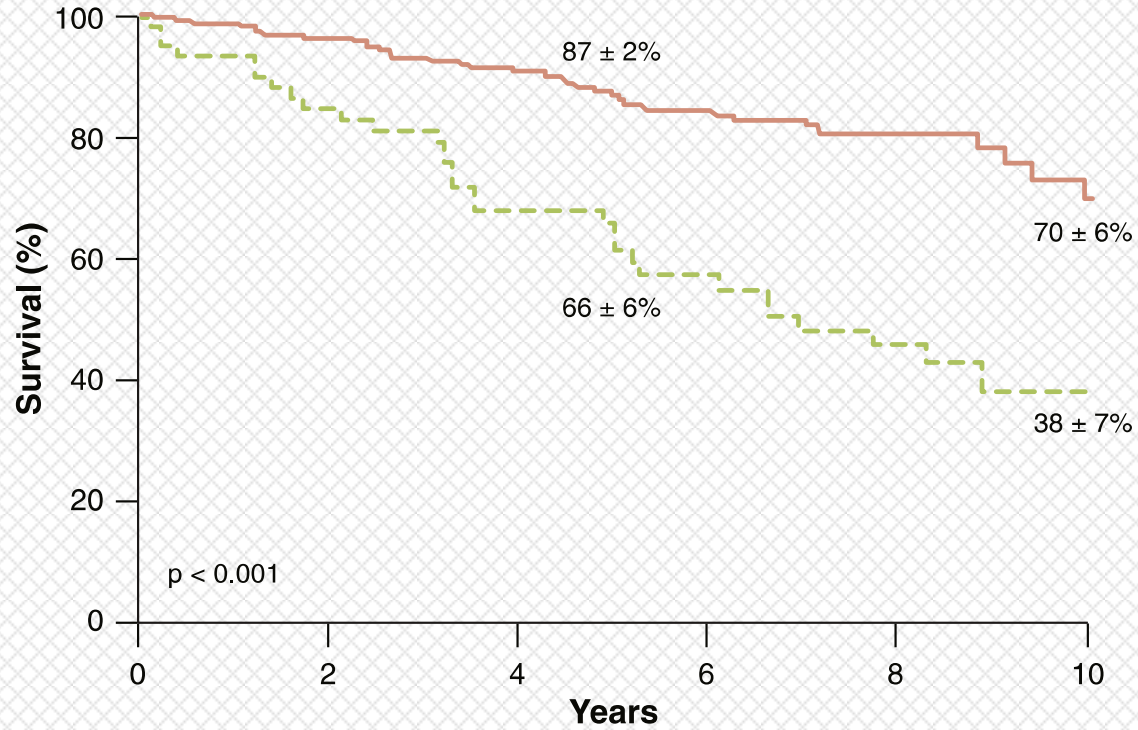
- ◆ > 250 patients
 - Majority are mitral procedures
 - *98% repair rate if repair was planned*
 - *"success" = mild MR or less, most are "trivial MR"*
 - *MVR is also possible*
 - ~20 ASD
 - 6 tricuspid procedures (2 = combo w/ MVR)
 - ◆ One Death
 - ◆ One femoral vascular complication
 - ◆ NO thoracic wound infections
-

TRICUSPID REGURGITATION

Tricuspid Regurgitation SUMMARY

- ◆ Severe tricuspid regurgitation
 - Does negatively impact longevity
 - Should probably be treated sooner (before current class I indications are met)
 - Classification of severe TR is changing
 - Percutaneous treatment options look promising
-

Severe TR α Worse Survival



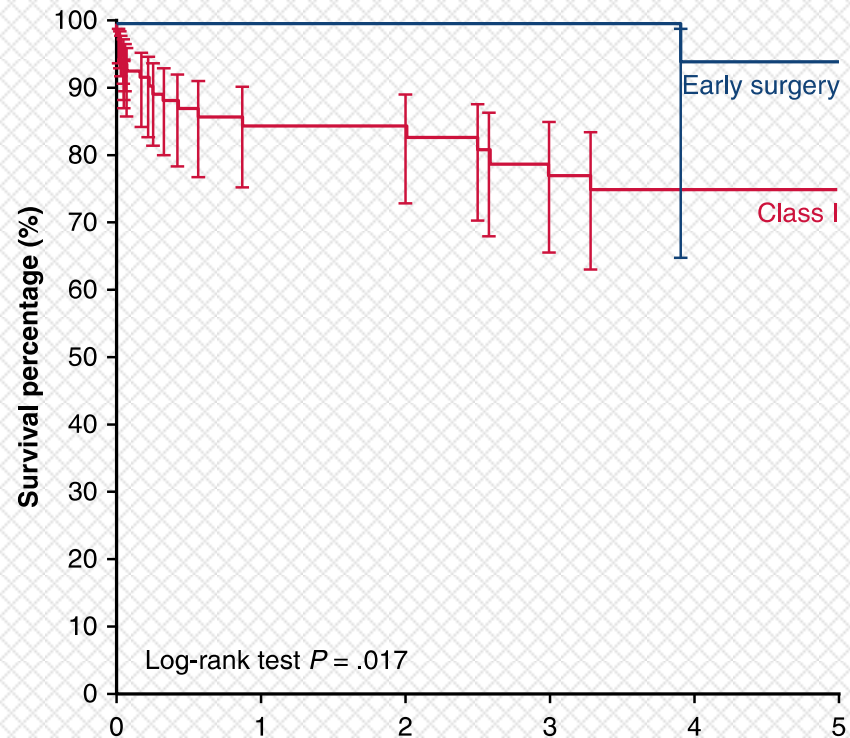
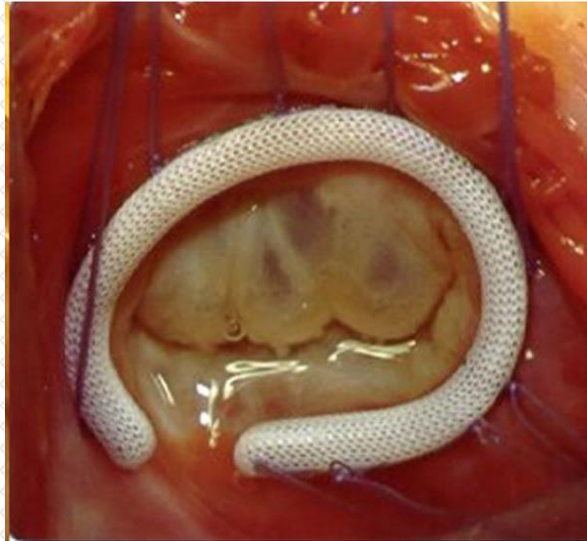
Number at Risk

	0	2	4	6	8	10
Total	353	308	252	194	70	31
ERO <math>< 40</math>	285	253	210	163	46	23
ERO ≥ 40	68	55	42	31	24	8

--- ERO $\ge 40 \text{ mm}^2$ — ERO $< 40 \text{ mm}^2$




Better Outcomes With Early Surgery!

Outcome	Class I (n = 115)	Early surgery (n = 44)
Operative mortality	8 (7.0%)	0 (0.0%)
Composite morbidity	41 (35.7%)	8 (18.2%)



	0	1	2	3	4	5
— Early surgery	43	25	22	19	17	15
— Class I	115	63	50	42	37	32

Hahn Classification (New)

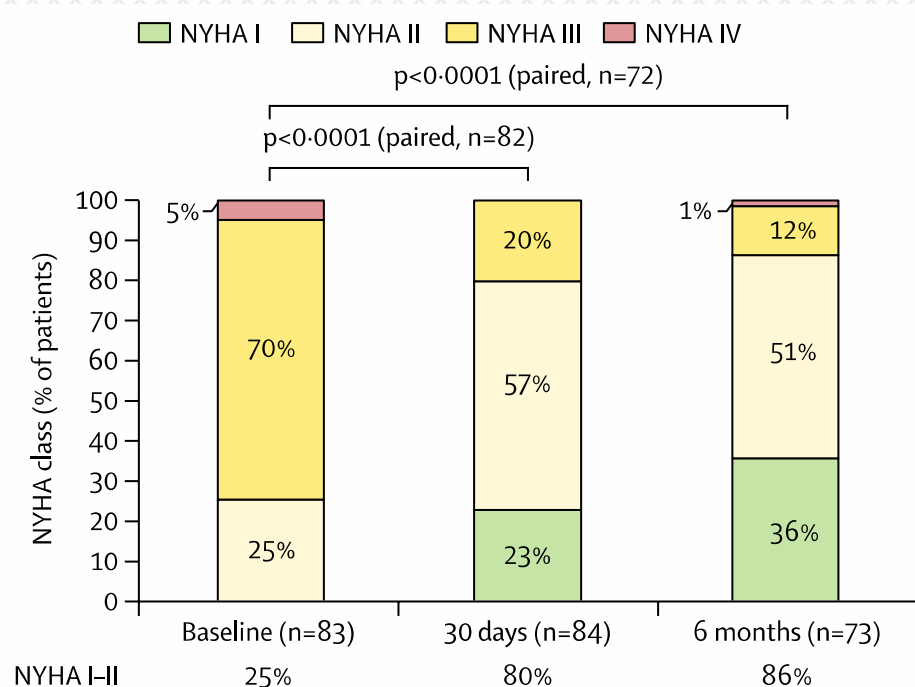
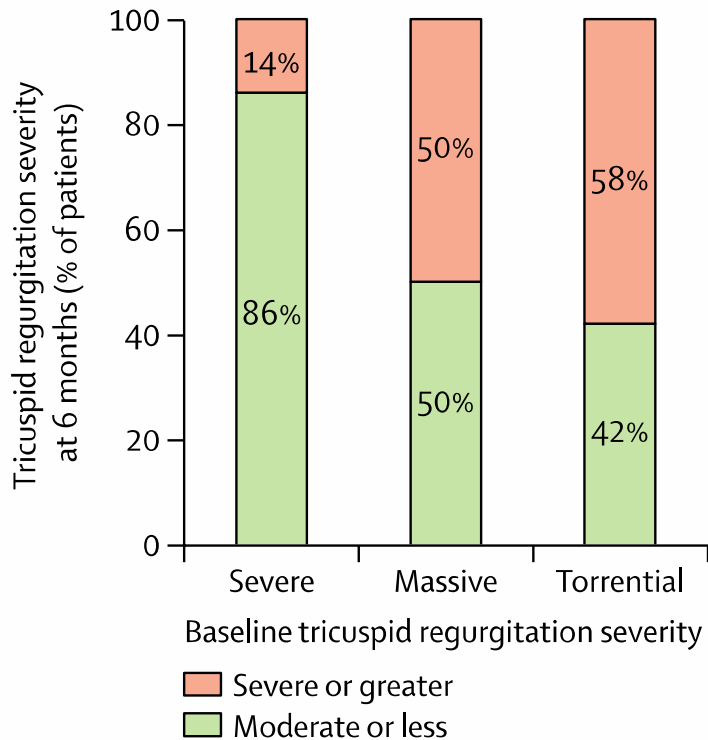
	Stage 1	Stage 2	Stage 3
			
Symptoms	None	None*	None-vague*
TR grade	Less than moderate	>Moderate	Severe
Annular remodeling	Normal	Normal or mildly remodeled	Present
Leaflet coaptation	Normal	Mildly abnormal	Abnormal
Tethering	None	None or mildly abnormal (<8 mm)	Abnormal (usually <8 mm)
RV function and remodeling	Normal	Normal function Absent or mild remodeling	Mild RV dysfunction and/or remodeling



Triluminate 6 mo study (Repair)



- ◆ Inclusion: Moderate or greater TR, NYHA II or greater SOB
- ◆ Endpoint = at least 1 grade reduction in TR
- ◆ No 30-day mortality



Evoque Transcatheter Replacement



TABLE 3 Procedural Outcomes (n = 25)

Technical success	23 (92)
Mortality	0 (0)
Myocardial infarction	0 (0)
Stroke	0 (0)
Device embolization	0 (0)
Major bleeding	0 (0)
Conversion to surgery	0 (0)
Reintervention	1 (4)
Tricuspid regurgitation $\leq 1+$	23 (92)
Procedure time (min)	140 \pm 79

- VERY sick
 - Torrential 56%, Massive 28%
 - Mean TAPSE 16, ascites 56%
 - Excluded if PAP > 60 or severe RV dysfunction
- Almost all \lesssim grade I TR postop
- Vast majority class III – IV (95%)
 - 2/3 down to class I – II
 - >70% class II

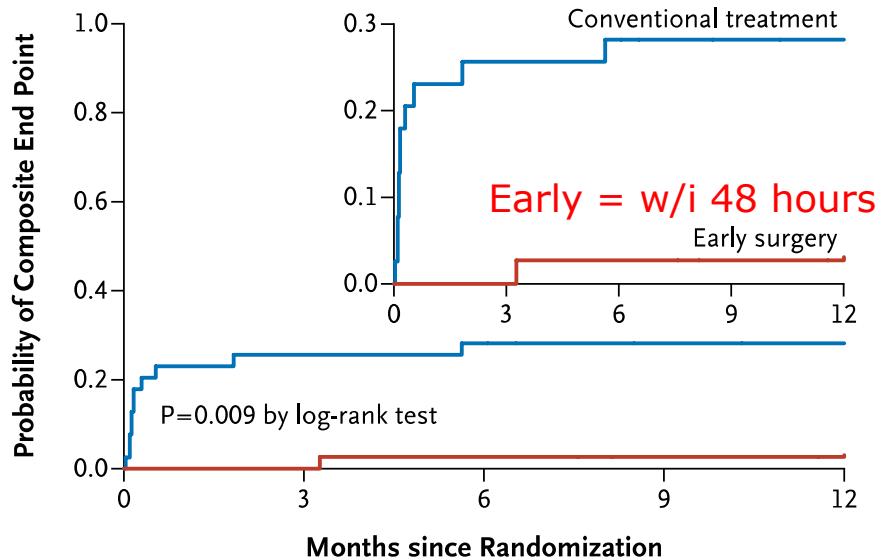
ENDOCARDITIS

Endocarditis SUMMARY

- ◆ Some patients with endocarditis should be treated as a surgical “emergency”
 - Vegetation > 10mm
 - Severe MR or AI
 - No major cerebral embolism
-

Endocarditis: A Surgical Emergency?

B



Outcome	Conventional Treatment (N=39)	Early Surgery (N=37)	P Value
Primary end point — no. (%)			
In-hospital death or embolic event at 6 wk	9 (23)	1 (3)	0.01
In-hospital death	1 (3)	1 (3)	1.00
Embolic event at 6 wk			
Any	8 (21)	0	0.005
Cerebral	5 (13)	0	
Coronary	1 (3)	0	
Popliteal	1 (3)	0	
Splenic	1 (3)	0	

◆ Inclusion

- Native Aortic or Mitral valve endocarditis
- Vegetation > 10mm
- Severe MR/AI

◆ Exclusion

- Class I indication
 - Class IV CHF
 - Abscess, heart block
- Major cerebral embolism
- Fungal or prosthetic valve
- Referred > 7 days after diagnosis

Thank You!

Questions?
