High Risk Cardiac Surgery

How Can We Prevent Post Cardiotomy Shock?

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Disclosures

Medtronic - Speakers Board, Paid Consultant
Abbott - Paid Consultant

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High Risk?

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Risk and Cardiac Surgery
An Evaluation of Hazards

- Objective
  - STS
  - Frailty
  - Scoring Systems
- Subjective
  - Experience
  - Capacity
    - Personal
    - Institutional
  - Resources

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Risk Domains In Cardiac Surgery

- Corporeal
  - Deconditioned
  - Obesity
  - One Kidney
  - Eye patch
- Functional
  - EF
  - AI
- Structural
  - Reoperation
  - Patent Mammory
  - Promial RCA
    - Right Dominant

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An Honest Assessment of Risk
The plural of "anecdote" is not "data"

- Historic Examples
  - Columbus
  - Sound Barrier
  - Pulsatility
- Perverse Incentive (industry, outcomes, effort)
- Correlation vs Causation

Efficacy and economic assessment of conventional ventilatory support versus extracorporeal membrane oxygenation for severe adult respiratory failure (CESAR): a multicentre randomised controlled trial.

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Pre Operative

- Eval
- Nutrition
- Planning
- Team Commitment
- Preop MCS
- Access

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Coronary Artery Revascularisation

- Selection of patients :
- Several clinical factors play a major role in the decision-making,
  1. The presence of angina,
  2. The severity of heart failure symptoms,
  3. LV dimensions.
  4. The adequacy of target vessels for revascularization and
  5. The extent of jeopardized but still viable myocardium

Significant mortality and morbidity benefit occur after coronary revascularisation when at least 25% of myocardium is viable
Arnold F.L. Schinkel et al. JNM 2007

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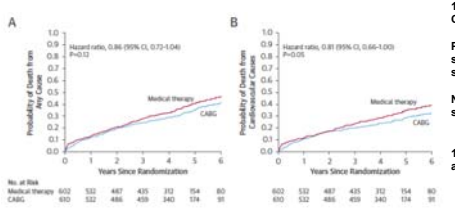
STICH (Surgical Treatment of Ischemic Heart Failure)



1212 patients randomized to CABG vs medical therapy

Patients with recent MI, major illness, significant L Main disease and severe angina excluded

No difference in all cause mortality seen at median 56 months follow-up

17% of patients in medical therapy arm crossed over to surgical arm

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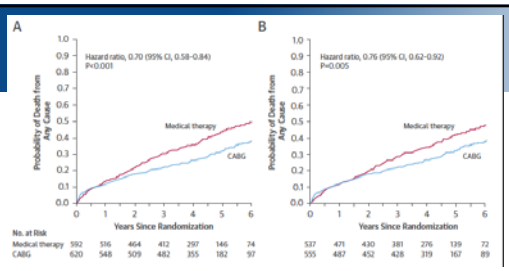

CABG associated with reduction in cardiovascular death and combined outcome of death or cardiovascular hospitalization
CABG also associated with 30% relative reduction in mortality in "on-treatment" analysis (accounting for patients crossing over within 1st year of study)

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Recommendations - Revascularization Procedures

Surgical Revascularization for Patients with IHD and HF

Consideration of coronary artery bypass surgery for patients with chronic ischemic cardiomyopathy, LVEF < 35%, graftable coronary arteries and who are otherwise suitable candidates for surgery, irrespective of the presence of angina in order to improve quality of life, cardiovascular death and hospitalization.	**Strong Recommendation Moderate Quality Evidence**
Consideration of performance of coronary revascularization procedures in patients with chronic heart failure and reduced LV ejection fraction should be undertaken with a medical-surgical team approach with experience and expertise in high risk interventions.	**Strong Recommendation Low Quality Evidence**

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STICH Analysis

Improved prognosis with viability

Analysis of 601 patients with viability testing data available

Viability defined as ≥ 11 segments on SPECT or ≥ 5 segments on DSE imaging

Bonow et al. N Engl J Med 2011

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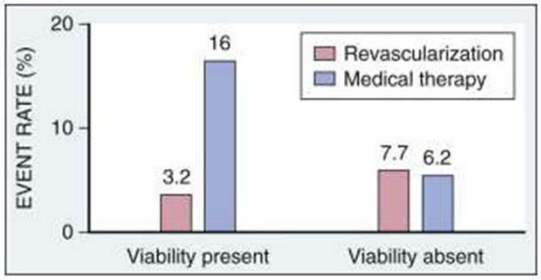
STICH Analysis

Viability doesn't necessarily predict improved outcomes with surgery vs medical therapy



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Recommendations - Revascularization Procedures

Surgical Revascularization for Patients with IHD and HF

Consideration of percutaneous coronary angioplasty for patients with heart failure and limiting symptoms of cardiac ischemia, and for whom CABG is not considered appropriate.	**Weak Recommendation Low Quality Evidence**

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Practical Tips
Revascularization Procedures

Surgical Revascularization for Patients with IHD and HF

1.In the setting of heart failure, angina and single territory coronary artery disease, PCI may be the treatment of first choice. However, PCI has not been shown to improve outcomes for patients with chronic stable heart failure, irrespective of underlying anatomy.

2.Urgent directed culprit vessel angioplasty continues to be the revascularization modality of choice for patients with heart failure and acute coronary syndrome.

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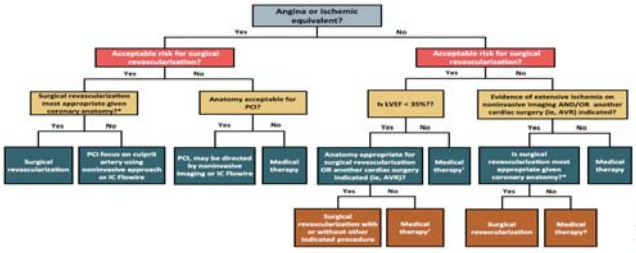
Decision Regarding Coronary Revascularization in Heart Failure



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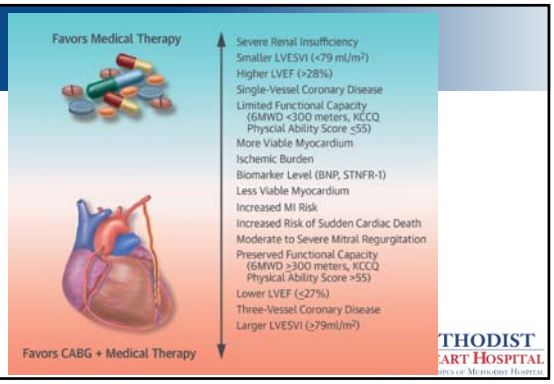

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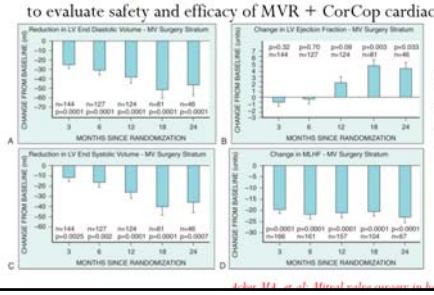
Valvular dysfunction– Mitral Valve Surgery – Benefits .

- ACORN TRIAL :
- Non randomized ,30 centres , 193 pts , on medical therapy was done to evaluate safety and efficacy of MVR + CorCop cardiac support



Change was also noted in MR , NYHA class .

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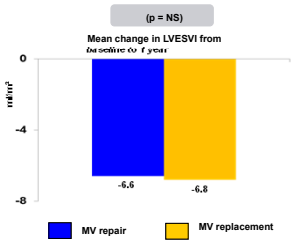
CTSN: MV Repair vs. Replacement

Trial design: Patients with severe ischemic (functional) mitral regurgitation were randomized to mitral valve repair with mitral annuloplasty (n = 126) vs. mitral valve replacement with chordal sparing (n = 125).



Results

- Mean change in LVESVI from baseline to 1 year: -6.6 ml/m² in the repair group vs. -6.8 ml/m² in the replacement group (p = NS)
- Mortality at 2 years: 19% in the repair group vs. 23% in the replacement group (p = 0.42)
- Moderate or severe mitral regurgitation at 2 years: 59% in the repair group vs. 3.8% in the replacement group (p < 0.001)

Conclusions

- Among individuals with severe ischemic mitral regurgitation, mitral valve repair with mitral annuloplasty vs. mitral valve replacement was associated with similar LV size and mortality
- Patients who underwent mitral valve repair had a marked increase in moderate or severe mitral regurgitation

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Goldstein D, et al. N Engl J Med 2015;Nov 9:[Epub]

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Chronic *Primary* Mitral Regurgitation: Intervention (cont.)

Recommendations	COR	LOE
MV surgery may be considered in symptomatic patients with chronic severe primary MR and LVEF ≤30% (stage D)	IIb	C
MV repair may be considered in patients with rheumatic mitral valve disease when surgical treatment is indicated if a durable and successful repair is likely or if the reliability of long-term anticoagulation management is questionable	IIb	B

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BOLLING hypothesis

- there is an *"annular solution for a ventricular problem . . . such that reconstruction of the mitral valve annulus' geometric abnormality by an undersized ring restores valvular competency, alleviates excessive ventricular workload, improves ventricular geometry and improves ventricular function."*

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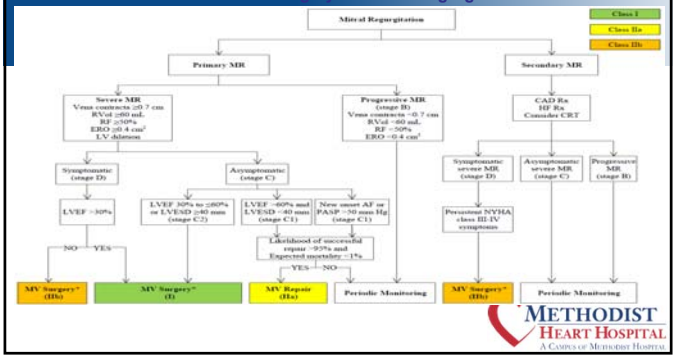
Indications for Surgery for Mitral Regurgitation



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Intra Operative

- Access
- Exposure
- Protection
- Techniques
- Pattern Recognition
  - Response
- Hemostatsis
- Pump Stewardship

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Post Operative

- Access
- Nuanced Pain Mgmt
- Pulmonary Toilet
- Goal Derived Weaning Strategy
- Rescue

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Mechanical Circulatory Support
Multiple Flavors

- Temporary
  - OR
  - ICU
- Durable
  - To Discharge
    - DT
    - BTT

→

- Rescue
- Recovery
- Bridge

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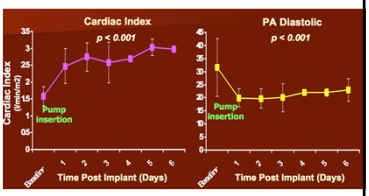
Percutaneous LVAD
Impella 2.5, 3.5, 5.5

RECOVER I

Safety and Feasibility for Impella 5.0

- 17 patients in PCCS
- 5 peripheral, 12 direct placement
- Support duration: 3.5 +/- 3.0 days
- Pump flow: 4.2 +/- 0.8 L/min
- Death: 12%
- CVA: 6%
- Aortic insufficiency: 0%
- Bleeding: 17%



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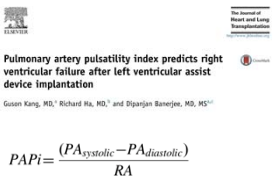
About the Right Ventricle

- RV Dysfunction
- PAPI
- Medical Optimization
  - Epoprostenol
  - PVR
- Early Intervention Improves Outcome
- Percutaneous vs Open
- In-Line vs Bypass



Pulmonary artery pulsatility index predicts right ventricular failure after left ventricular assist device implantation

Guson Kang, MD,[1] Richard Ha, MD,[1] and Dipanjan Banerjee, MD, MS[1,2]

$$PAPi = \frac{(PA_{systolic} - PA_{diastolic})}{RA}$$

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Summary comparison

Device	Flow	Biocompatibility	Deployment	Fallout	Status	Cost
IABP	♥	● ●	⚡⚡⚡	◆◆◆	2	$
ECMO	♥♥♥	● ● ●	⚡⚡	◆	1	$-$$$
Impella	♥♥ ♥♥♥	● ● ●	⚡⚡ ⚡	◆◆◆ ◆	2	$$$
EC VAD	♥♥♥	● ●	⚡	◆◆	1	$$

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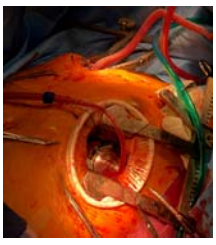
MIS meets MCS



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MCS as Critical Program Support

- Optimal Throughput Model with Minimal Loss
  - Reframing STS Risk
  - Chronic HF to durable MCS
- Rescue
  - Acute Decompensation
  - Witnessed Arrest
  - Post Pump
  - Community Salvage
- Recovery
  - Cath Lab
  - STS Outcomes

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PAPi <1.85 is sensitive and specific for RVF after LVAD

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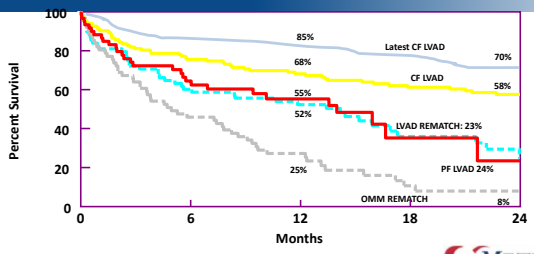
Actuarial Survival vs REMATCH

EXPERIENCE **REALLY** MATTERS



Rose E, et al. NEJM. 2001;345:1435-1443.
Slaughter MS, et al. NEJM. 2009;361:2241-2251
Slaughter MS, et al. Presented at ISHLT 2010.

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