The Houston Aortic Symposium 2026

Low LVEF Patients. The "New Reality" in Aortic Surgery

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General Approach

"Patients with a low ejection fraction face significantly higher perioperative mortality and morbidity, yet they should not be denied surgery and may experience substantial functional recovery postoperatively"

Myocardial protection is crucial during the operation. Use of continuous Retrograde Cardioplegia…

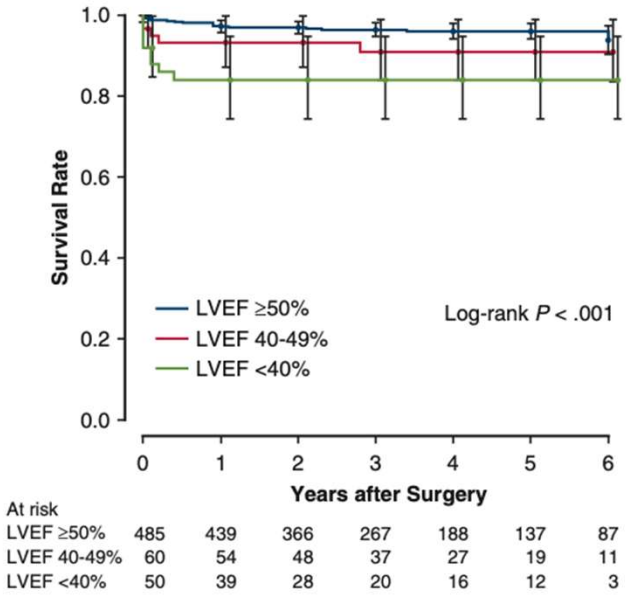
Langer NB, Ando M, Simpson M, van Boxtel BS, Sorabella RA, Patel V, George I, Smith CR, Takayama H. Influence of left ventricular ejection fraction on morbidity and mortality after aortic root replacement. J Thorac Cardiovasc Surg. 2019 Oct;158(4):984-991.e1. Epub 2018 Nov 16. PMID: 30578054.

Epidemiology

Influence of left ventricular ejection fraction on morbidity and mortality after aortic root replacement

Nathaniel B. Langer, MD, MSc · Masahiko Ando, MD, PhD, MPH · Michael Simpson, BA · ... · Isaac George, MD · Craig R. Smith, MD · Hiroo Takayama, MD, PhD ... Show more

The Journal of Thoracic and Cardiovascular Surgery JTCVS



Root replacement: LVEF <40% experienced 14.0% in-hospital mortality compared to 5.0% for LVEF 40-49% and 1.0% for LVEF ≥50%

Epidemiology

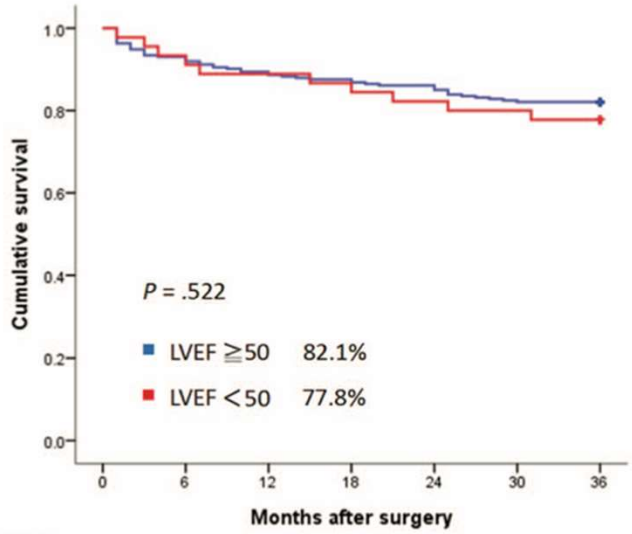
Impact of reduced left ventricular function on repairing acute type A aortic dissection

Outcome and risk factors analysis from a single institutional experience

Chun-Yu Lin, MD[a,*], Kuang-Tso Lee, MD[b], Ming-Yang Ni, MD[c], Chi-Nan Tseng, MD, PhD[a], Hsiu-An Le
I-Li Su, MD[a], Heng-Psan Ho, MD[a], Feng-Chun Tsai, MD[a]

Medicine®

TAAD: LVEF <50% had 23.3% in-hospital mortality versus 13.9% in those with normal LVEF.



Number at Risk							
LVEF ≥50	273	251	242	237	232	224	224
LVEF <50	45	41	40	38	37	36	35

Figure 1. Kaplan–Meier curves for cumulative survival stratified by left ventricular ejection fraction.

Epidemiology

Impact of left ventricular ejection fraction on the outcomes of open repair of descending thoracic and thoracoabdominal aneurysms

Ivancarmine Gambardella, MD, FRCS · Mario F.L. Gaudino, MD, FEBCTS · Mohamad Rahouma, MD · ... · Christopher Lau, MD · Erin Iannacone, MD · Leonard N. Girardi, MD ... Show more

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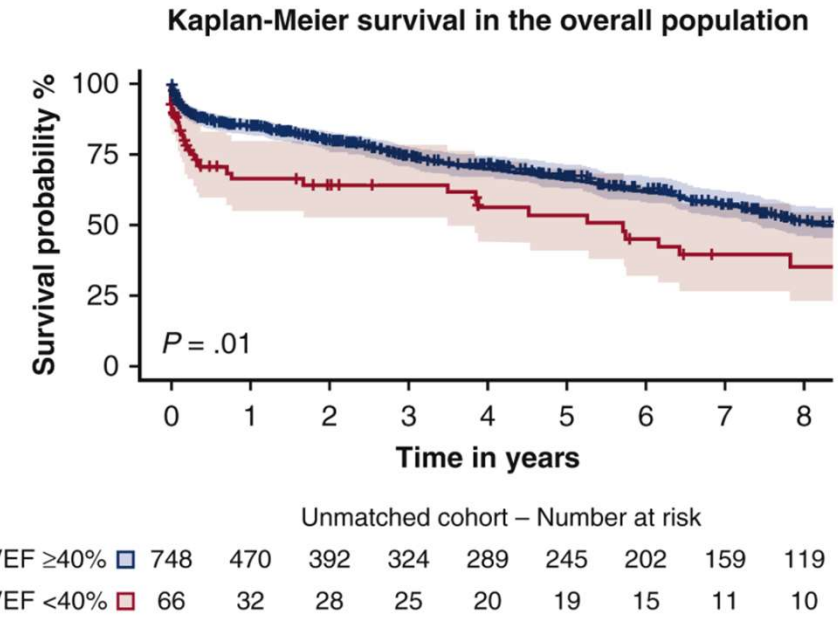
Descending Thoracic/TAAA: LVEF <40% was associated with increased operative mortality (OR 2.72, 95% CI 1.21-6.12)



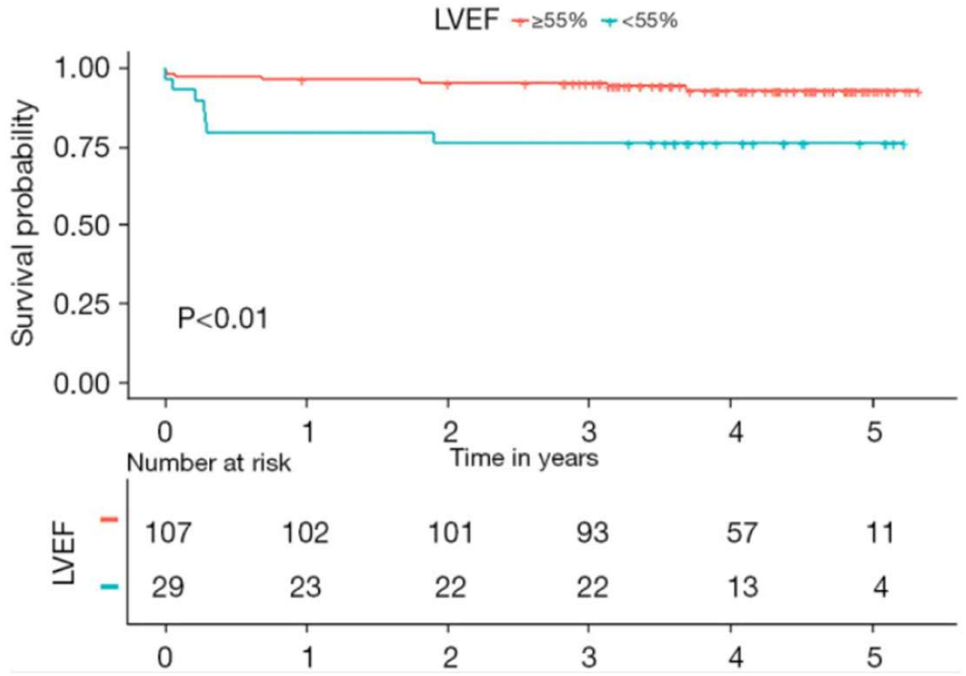
Epidemiology

Effect of left ventricular ejection fraction (LVEF) on mortality of total arch replacement in subacute/chronic type A aortic dissection

Yuan Xue [1,2], Bridget Hwang [3], Shipan Wang [1,2], Songhao Jia [1,2], Haiyang Li [1,2,✉], Hongjia Zhang [1,2,✉], Wenjian Jiang [1,2,✉]

Journal of Thoracic Disease

Subacute/Chronic TAAD-Total Arch Replacement: patients with LVEF <55% demonstrated significantly worse mid-term survival, with reduced LVEF being an independent predictor of mortality (HR 0.93, 95% CI 0.86-0.99)



Etiology

Patients with low LVEF undergoing aortic surgery experience increased morbidity and mortality primarily due to:

1. Inadequate cardiac reserve
2. Myocardial ischemia and intraoperative failure
3. Increased perioperative complications
4. Prolonged recovery and resource utilization/ surgical complexion
5. Multisystem organ dysfunction

Inadequate cardiac reserve and Hemodynamic Stress

- Diminished contractile reserve to meet the increased hemodynamic demands of major aortic surgery
- Aortic surgery imposes substantial physiologic stress through cardiopulmonary bypass, aortic cross-clamping, hypothermia, and significant fluid shifts.
- The dysfunctional left ventricle cannot adequately increase cardiac output in response to these stressors, leading to end-organ hypoperfusion and increased risk of cardiogenic shock requiring mechanical circulatory support (8.0% in LVEF <40% vs 1.4% in LVEF ≥50%)

Langer NB, Ando M, Simpson M, van Boxtel BS, Sorabella RA, Patel V, George I, Smith CR, Takayama H. Influence of left ventricular ejection fraction on morbidity and mortality after aortic root replacement. J Thorac Cardiovasc Surg. 2019 Oct;158(4):984-991.e1. doi: 10.1016/j.jtcvs.2018.10.147. Epub 2018 Nov 16. PMID: 30578054.

Myocardial Ischemia and Intraoperative Failure

- Intraoperative myocardial failure requiring ECMO support is a key mortality predictor in patients with reduced LVEF undergoing acute type A dissection repair.

- The combination of preexisting ventricular dysfunction and perioperative myocardial ischemia creates a vicious cycle: reduced coronary perfusion pressure during bypass, increased myocardial oxygen demand, and impaired diastolic filling all contribute to further myocardial injury

Lin CY, Lee KT, Ni MY, Tseng CN, Lee HA, Su IL, Ho HP, Tsai FC. Impact of reduced left ventricular function on repairing acute type A aortic dissection: Outcome and r factors analysis from a single institutional experience. Medicine (Baltimore). 2018 Aug;97(35):e12165. doi: 10.1097/MD.0000000000012165. Erratum in: Medici (Baltimore). 2018 Sep;97(38):e12571. doi: 10.1097/MD.0000000000012571. PMID: 30170461; PMCID: PMC6392594.

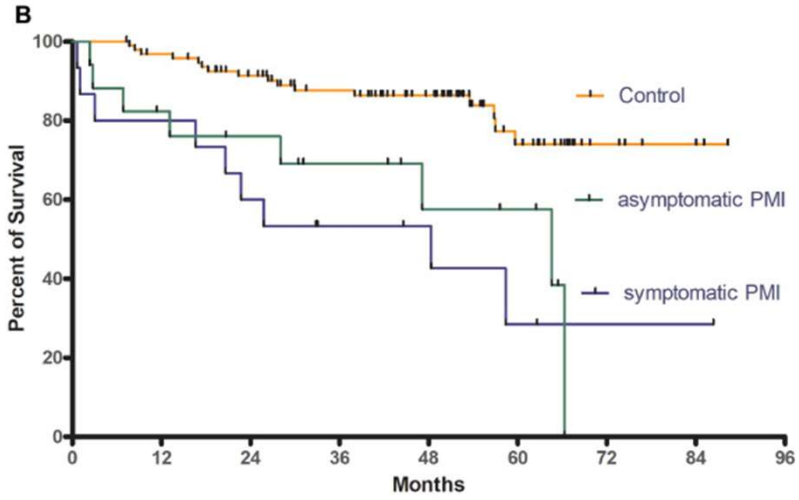
Myocardial Ischemia and Intraoperative Failure

Outcome Analysis and Risk Factors for Perioperative Myocardial Ischemia After Elective Aortic Surgery

Dmitriy I. Dovzhanskiy, Petra Jäckel, Moritz S. Bischoff, Maani Hakimi, Ulf Hinz, and Dittmar Böckler, Heidelberg, Germany

ANNALS of VASCULAR SURGERY

Primary Myocardial Insufficiency after aortic surgery not only affects long-term survival, but also correlates with worsening of surgical outcome. Thus, meticulous preoperative risk stratification is required for high-risk patients, together with routine postoperative monitoring of troponin levels after aortic surgery.



Numbers at Risk								
Control	95	90	79	67	52	22	6	3
asymptomatic PMI	17	13	11	8	5	4	0	0
symptomatic PMI	15	12	9	6	5	2	1	1

Peri-operative Complications

Complication	Low LVEF (<40-50%)	Normal LVEF (≥50%)
In-hospital mortality	14.0-23.3%	1.0-13.9%
Reoperation for bleeding	18%	5.0-5.8%
Postoperative respiratory failure	16%	4.9%
Mechanical circulatory support	8.0%	1.4%
Heart failure exacerbation	53.6% (LVEF <30%)	26.0% (LVEF ≥30%)
ICU length of stay	4 days (median)	2 days (median)
Hospital length of stay	10.5 days (median)	6 days (median)
30-day mortality (noncardiac surgery)	8.34% (LVEF <30%) 6.58% (LVEF 30-39%) 5.11% (LVEF 40-49%)	1.22% (no heart failure)
Myocardial infarction	1-5% (general aortic surgery)	1-5% (general aortic surgery)
Stroke	2-8% (general aortic surgery)	2-8% (general aortic surgery)

Long-term Outcomes

Survival Outcomes by Preoperative LVEF:

- LVEF <35% undergoing aortic valve replacement (AVR) for aortic regurgitation, 10-year survival ranges from **41-48%**
- Patients with moderate dysfunction (LVEF 35-50%) achieve 10-year survival of **56-70%**
- Patients with preserved function (LVEF ≥50%) reach **70-93%**
- For acute type A dissection repair, patients who survive to discharge with low LVEF demonstrate 3-year survival of **77.8% versus 82.1%** in the normal LVEF group (p=0.522)

Long-term Outcomes

Left Ventricular Recovery

- Substantial improvement in LVEF occurs postoperatively across **all baseline function groups**
- Patients with preoperative LVEF <35% experience **mean improvements of 4-5%** in ejection fraction
- Serial echocardiography demonstrates **no postoperative deterioration** during follow-up, and maximum LV mass regression takes 24 months in aortic stenosis and nearly 5 years in aortic regurgitation.

Long-term Outcomes

Predictors of Poor Long-term Outcomes

- Low baseline LVEF: failure to achieve postoperative **LVEF ≥35% at 1 year** predicts worse survival (p=0.0086) and higher rates of major adverse cardiovascular events (p=0.024)

- Specific predictors of failure to recover ventricular function include preoperative **LVEF <25%, brain natriuretic peptide >365 pg/mL, and LV mass index >193 g/m²**

- Additionally, **prosthesis-patient mismatch (indexed effective orifice area ≤0.85 cm²/m²), low transaortic valve gradient, and higher preoperative LV mass** correlate with increased mortality or heart failure after AVR.

Long-term Outcomes

Freedom from Heart Failure

- Freedom from hospital readmission for heart failure **at 5 years is 57.2%** in patients with severely reduced LVEF undergoing cardiac surgery

- At 10 years post-AVR, congestive heart failure occurs in **25% of patients with preoperative LVEF <35%** compared to 9-17% in those with higher baseline function.

Take Home Points

- Perioperative risk increased dramatically with declining LVEF
- Surgery should not be denied despite high risk
- Timing is critical: Operate before irreversible damage ensues
- Preoperative optimization saves lives
- Failure to recover LVEF postoperatively predicts poor long-term outcomes

Thank you!