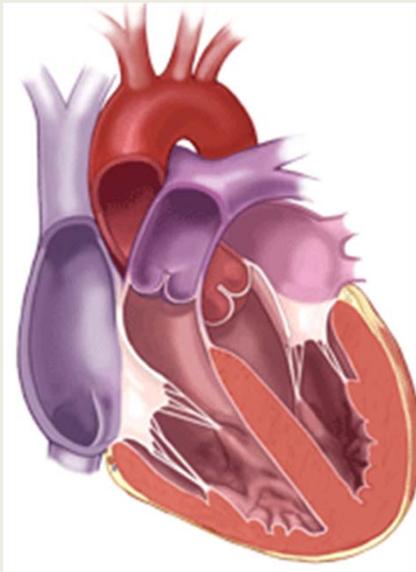


Role of Cardiac Surgery In Heart Failure



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21-1-2018



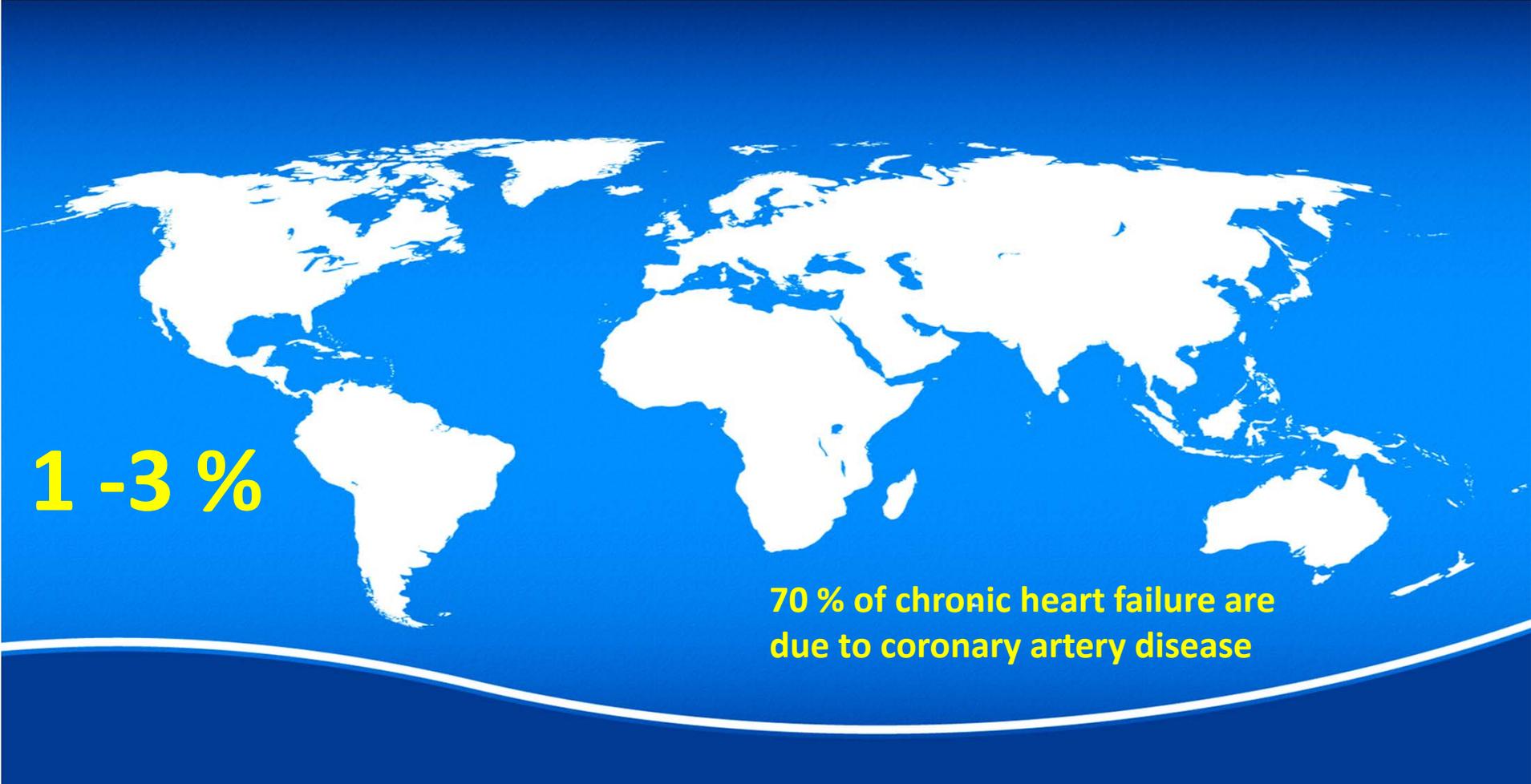
Heart Failure

- Clinical syndrome
 - characterized by
 - Typical symptoms (e.g. breathlessness, ankle swelling and fatigue) that maybe
 - accompanied by
 - Signs (e.g. elevated jugular venous pressure, pulmonary crackles and peripheral oedema)
 - Caused by
 - A structural and/or functional cardiac abnormality
 - Resulting in
 - A reduced cardiac output and/or elevated intracardiac pressures at rest or during stress.



Types of Heart Failure

Type of HF	HFrEF	HFmrEF	HFpEF
CRITERIA	1	Symptoms ± Signs ^a	Symptoms ± Signs ^a
	2	LVEF <40%	LVEF 40–49%
	3	–	1. Elevated levels of natriuretic peptides ^b ; 2. At least one additional criterion: a. relevant structural heart disease (LVH and/or LAE), b. diastolic dysfunction

A world map is centered on the slide, showing the continents in white against a blue background. The map is slightly tilted and has a soft glow effect.

1 -3 %

**70 % of chronic heart failure are
due to coronary artery disease**

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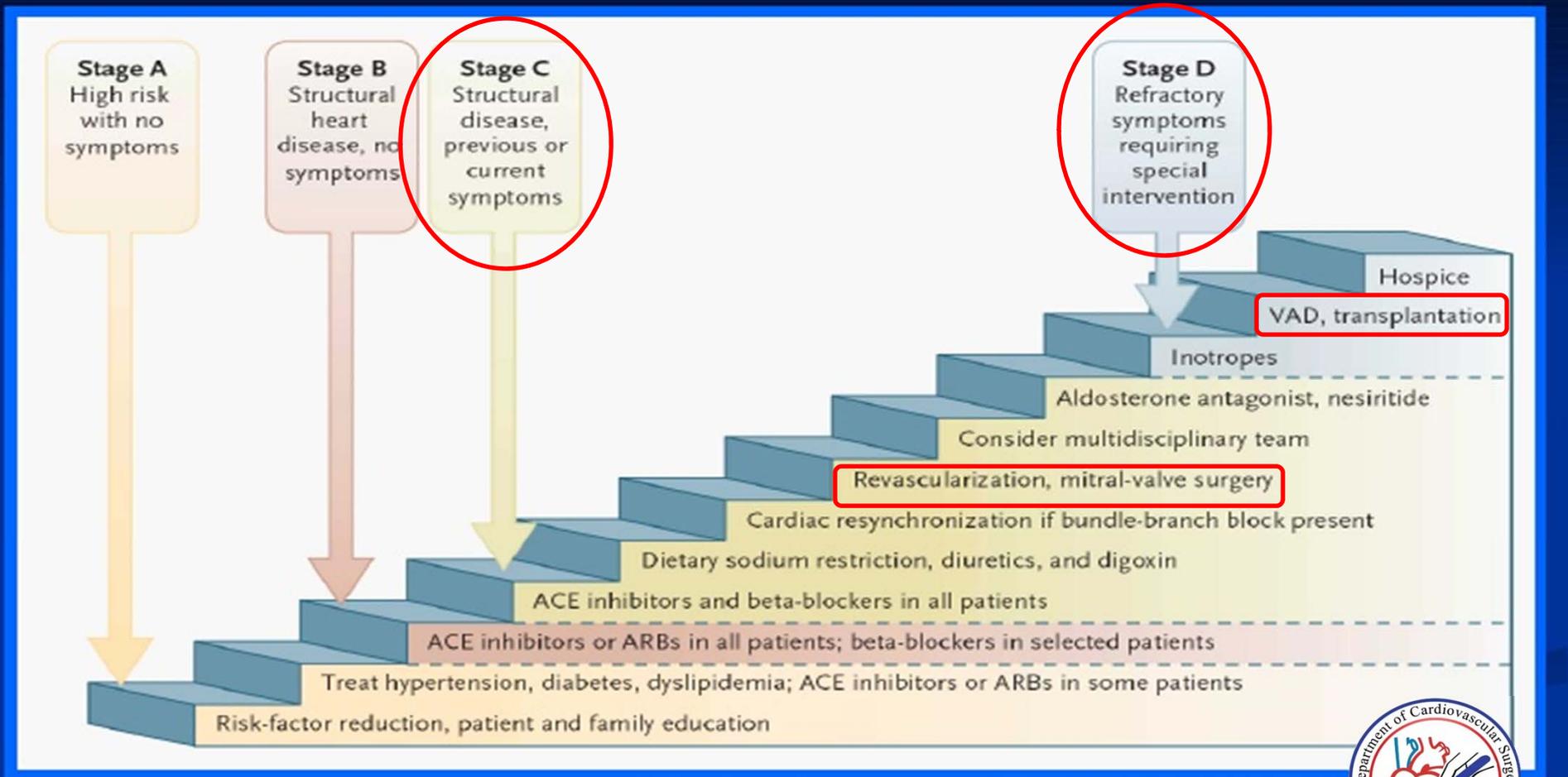
Classification of Heart Failure: ACC/AHA Stage vs NYHA Class

ACC/AHA Heart Failure Stage	NYHA Functional Class
A. At risk for heart failure but without structural heart disease or symptoms	None
B. Structural heart disease but without heart failure	I. Asymptomatic
C. Structural heart disease with prior or current heart failure symptoms	II. Symptomatic with moderate exertion III. Symptomatic with minimal exertion
D. Refractory heart failure requiring specialized interventions	IV. Symptomatic at rest

Hunt SA et al. *Circulation*. 2001;104:2996-3007.
Farrell MH et al. *JAMA*. 2002;287:890-897.



Stages of Heart Failure and Treatment options



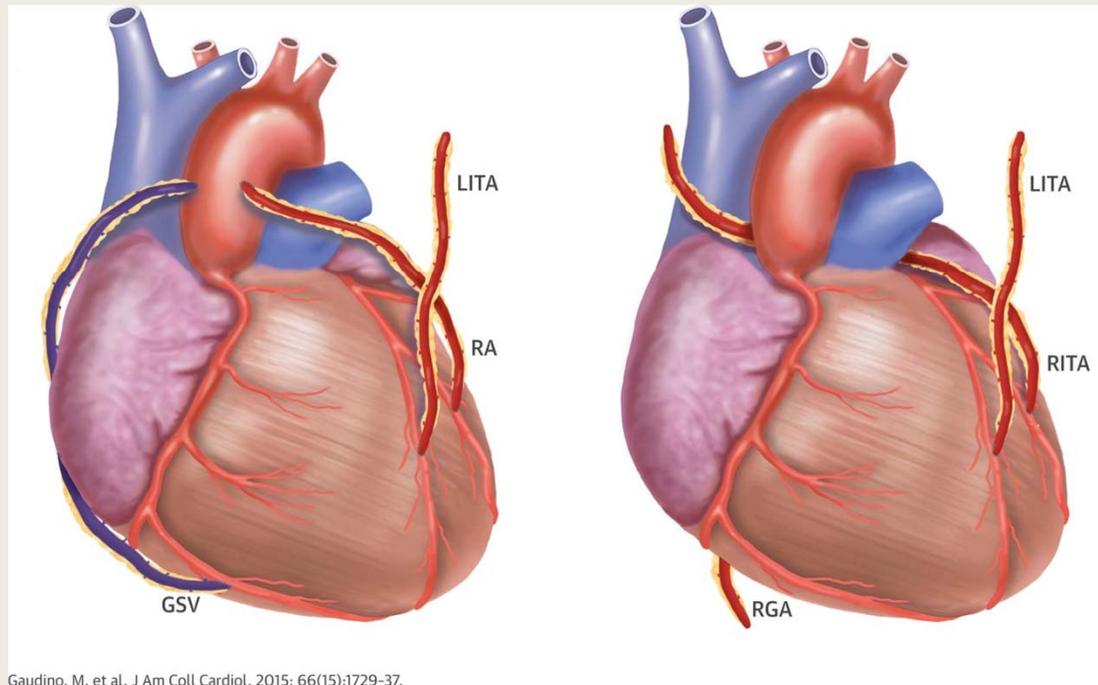
Surgery for Heart Failure include

- Coronary Artery Bypass Grafting (CABG)
- Valve Surgery
- LV remodeling
- Ventricular Assist Devices (VADs)
- Transplantation



Coronary Artery Bypass Grafting (CABG)

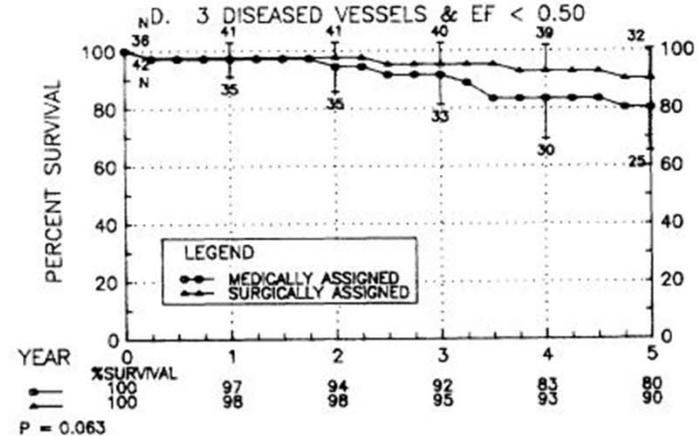
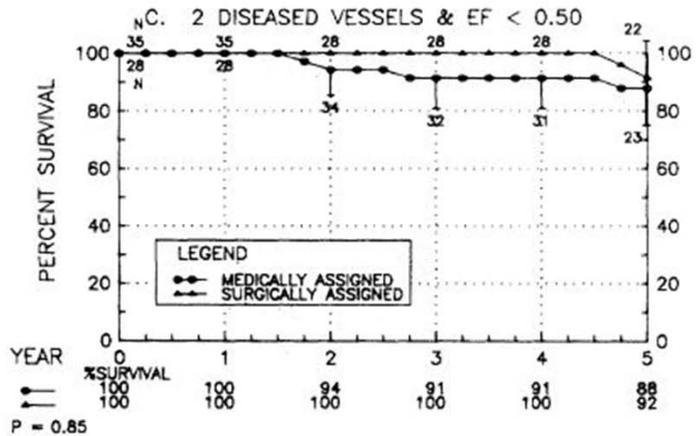
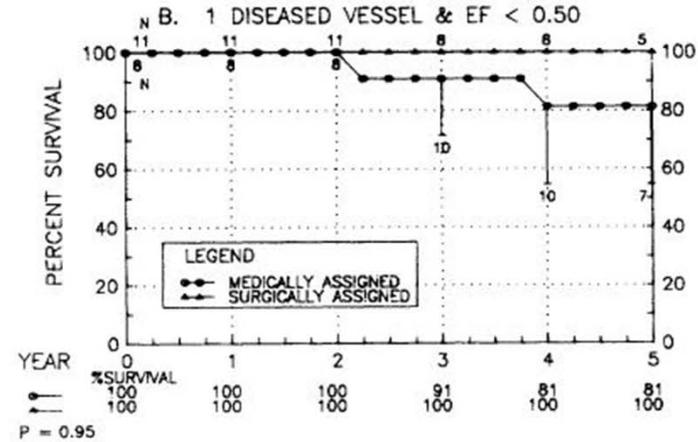
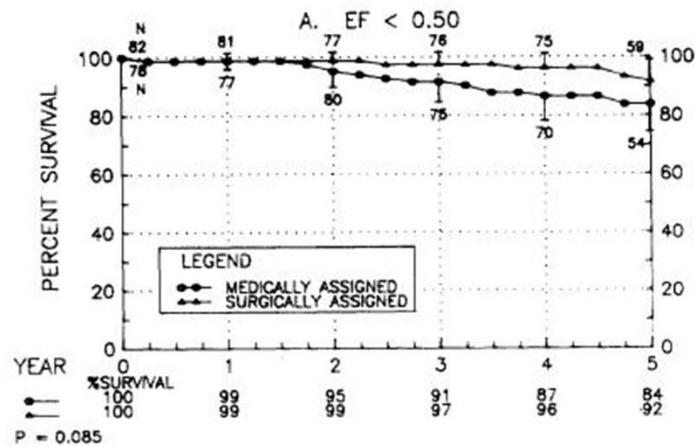
- Coronary artery disease with LV dysfunction
- Better than medical treatment in terms of symptoms, freedom from revascularization and survival



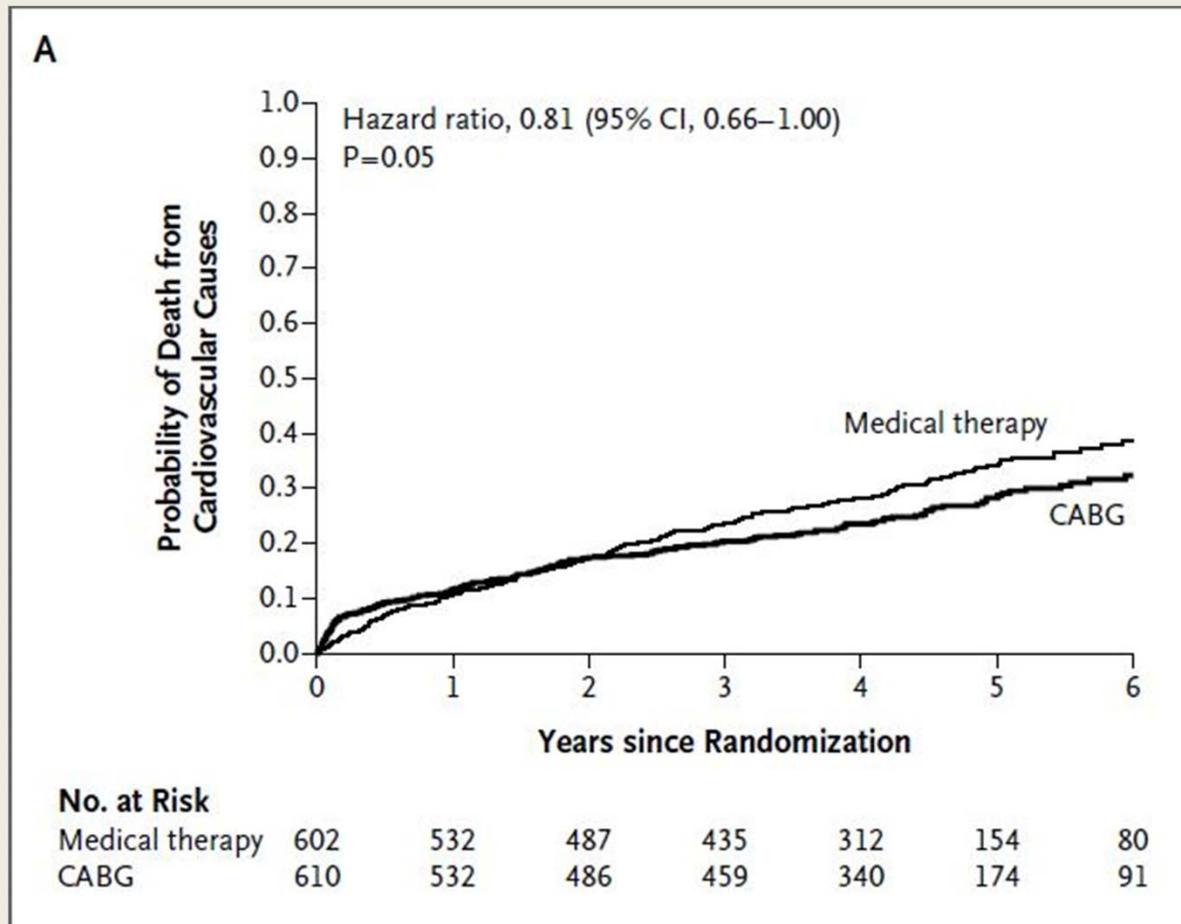
Gaudino, M. et al. J Am Coll Cardiol. 2015; 66(15):1729-37.

- Severely dilated LV may have low likelihood to have improvement in LVEF, unless combined with concomitant ventricular restoration procedure

CASS : A Randomized trial of Coronary Artery Bypass Surgery (n=780, Year 1983)



STICH Trial : Surgical Treatment for Ischaemic Heart Failure (n= 1212, Year 2011)



2014 ESC/EACTS guidelines for Myocardial Revascularization

Recommendations on revascularizations in patients with chronic heart failure and systolic LV dysfunction (ejection fraction $\leq 35\%$)

Recommendations	Class ^a	Level ^b	Ref ^c
CABG is recommended for patients with significant LM stenosis and LM equivalent with proximal stenosis of both LAD and LCx arteries.	I	C	-
CABG is recommended for patients with significant LAD artery stenosis and multivessel disease to reduce death and hospitalization for cardiovascular causes.	I	B	112,288
LV aneurysmectomy during CABG should be considered in patients with a large LV aneurysm, if there is a risk of rupture, large thrombus formation or the aneurysm is the origin of arrhythmias.	IIa	C	
Myocardial revascularization should be considered in the presence of viable myocardium.	IIa	B	55
CABG with surgical ventricular restoration may be considered in patients with scarred LAD territory, especially if a post-operative LVESV index <70 mL/m ² can be predictably achieved.	IIb	B	291–295
PCI may be considered if anatomy is suitable, in the presence of viable myocardium, and surgery is not indicated.	IIb	C	

Mitral Valve Surgery

- Mitral regurgitation may be the cause or the consequence of heart failure
- Surgery is likely to improve symptoms, survival in patients with **LV dysfunction due to MR**
- **Severe MR with severe LV dysfunction**, valve surgery is in dilemma

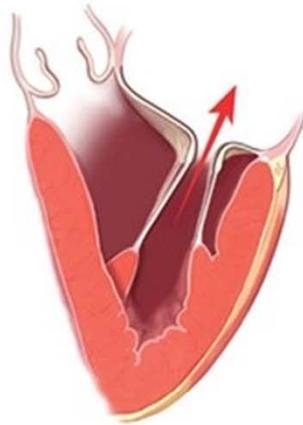


CARPENTIER CLASSIFICATION OF MITRAL REGURGITATION

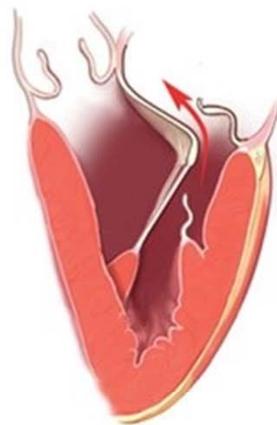
Carpentier et al *J Thorac Cardiovasc Surgery* 1980;79:338-348

PRIMARY MR

SECONDARY MR



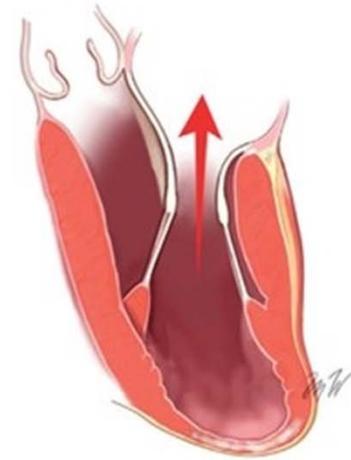
Type I
Normal leaflet
motion



Type II
Increased leaflet
motion



Type IIIa
Restricted leaflet
motion
(systole and diastole)



Type IIIb
Restricted leaflet
motion
(systole)

LEAFLET PERFORATION

ANNULAR DILATION

**CORDAL ELONGATION
OR RUPTURE**

**RHEUMATIC
DISEASE**

**ISCHEMIC OR NONISCHEMIC
LV REMODELING**



2014 ESC/EACTS guidelines for Myocardial Revascularization

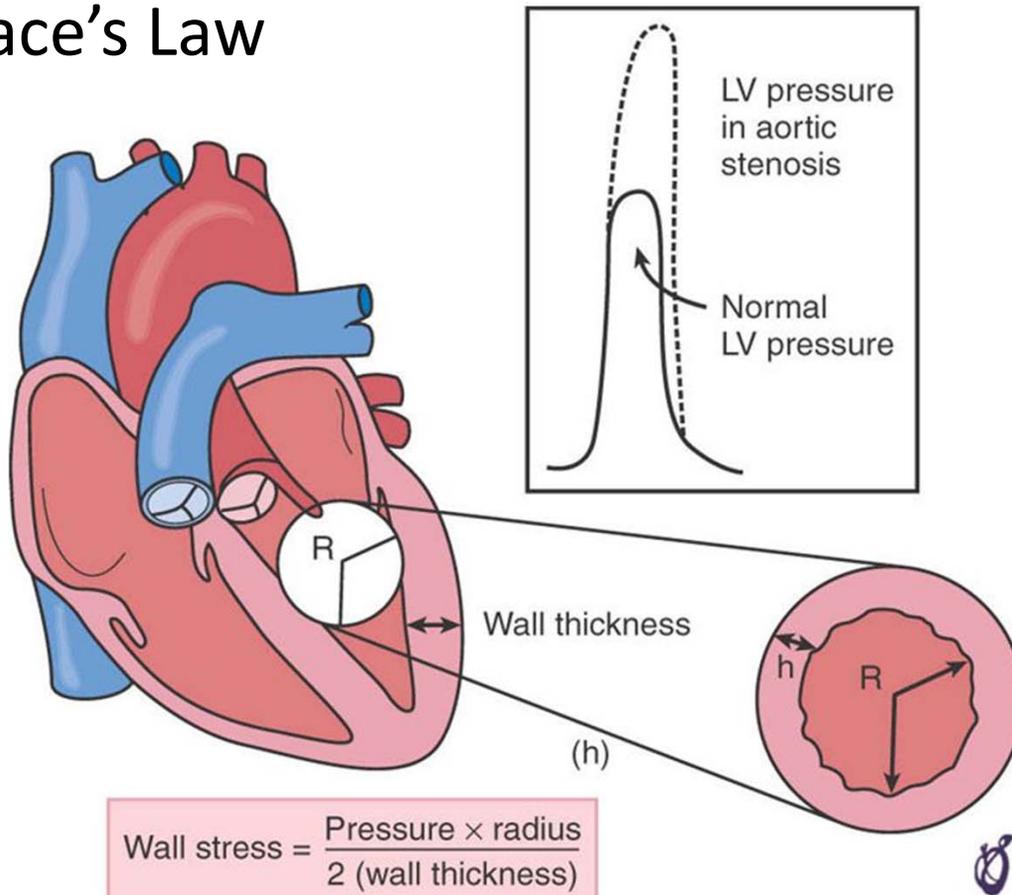
Primary revascularization and non-coronary intervention			
Mitral valve surgery is indicated in patients with severe mitral regurgitation undergoing CABG, and LVEF >30%.	I	C	–
Mitral valve surgery should be considered in patients with moderate mitral regurgitation undergoing CABG to improve symptoms.	IIa	B	432
Repair of moderate-to-severe mitral regurgitation should be considered in patients with a primary indication for CABG and LVEF ≤35%.	IIa	B	431
Stress testing should be considered in patients with a primary indication for CABG and moderate mitral regurgitation to determine the extent of ischaemia and regurgitation.	IIa	C	–
Aortic valve surgery should be considered in patients with a primary indication for CABG and moderate aortic stenosis (defined as valve area 1.0–1.5 cm ² [0.6 cm ² /m ² to 0.9 cm ² /m ² body surface area] or mean aortic gradient 25–40 mmHg in the presence of normal flow conditions).	IIa	C	–

Left Ventricular Remodeling Surgery

- Batista procedure (partial left ventriculectomy)
- Dor procedure (left ventricular restoration)

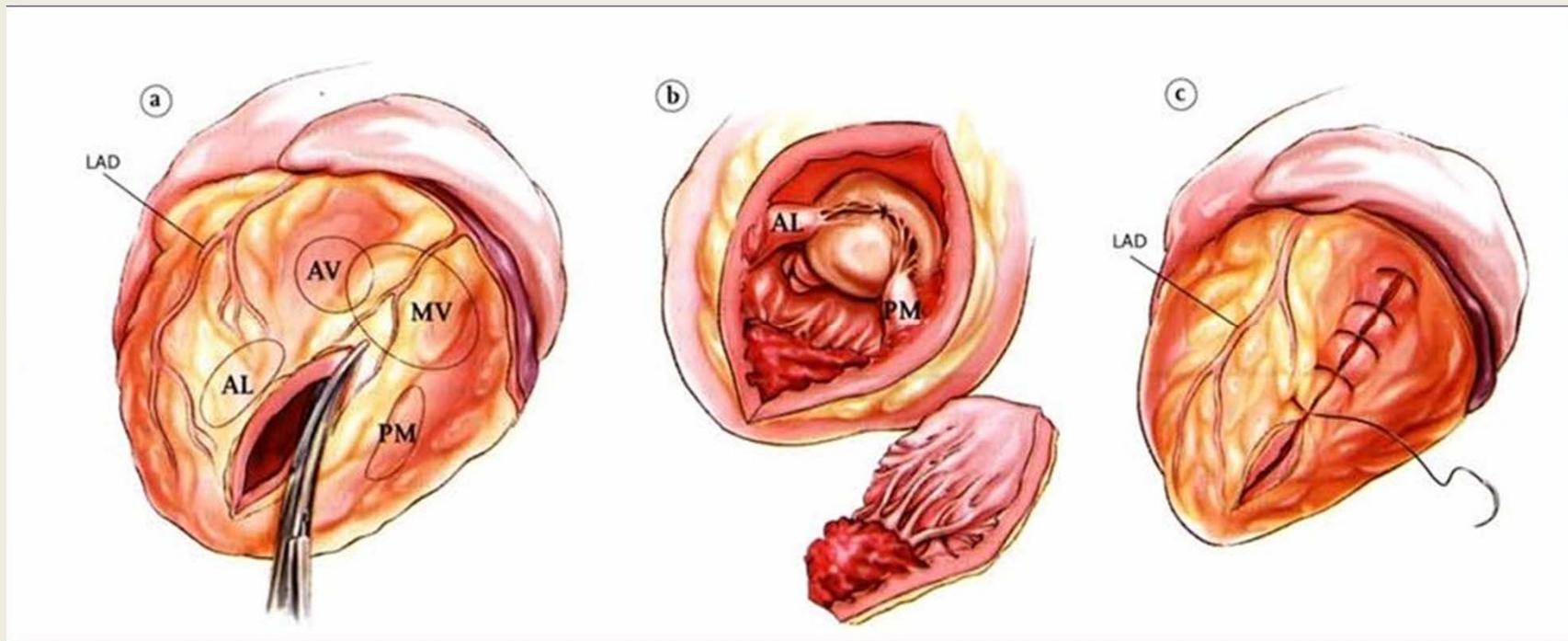
- Based on Laplace's Law

Laplace's Law



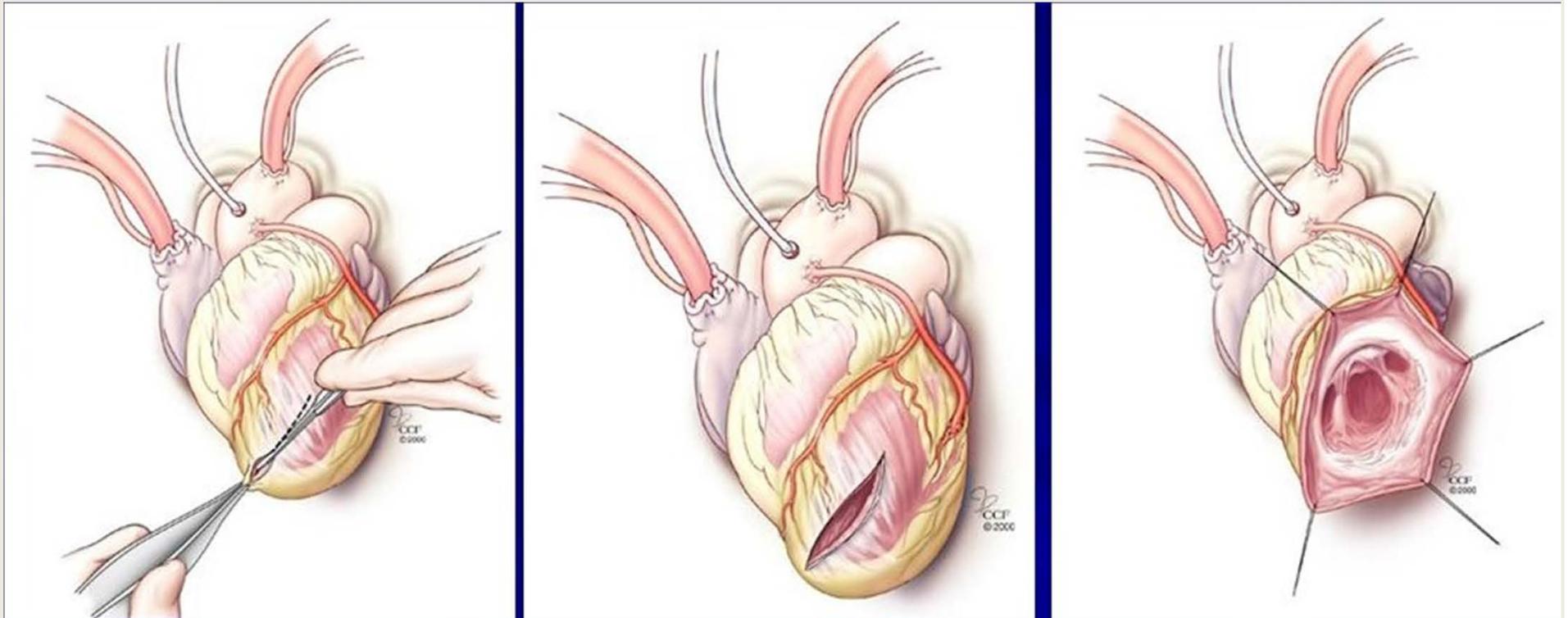
(From Opie LH: Heart Physiology: From Cell to Circulation. Philadelphia, Lippincott Williams & Wilkins, 2004. © LH Opie, 2004.)

Batista procedure (Partial left ventriculectomy)



- Limited to those in whom lateral LV wall is worst affected
- Largely been abandoned

Dor Procedure (left ventricular restoration)

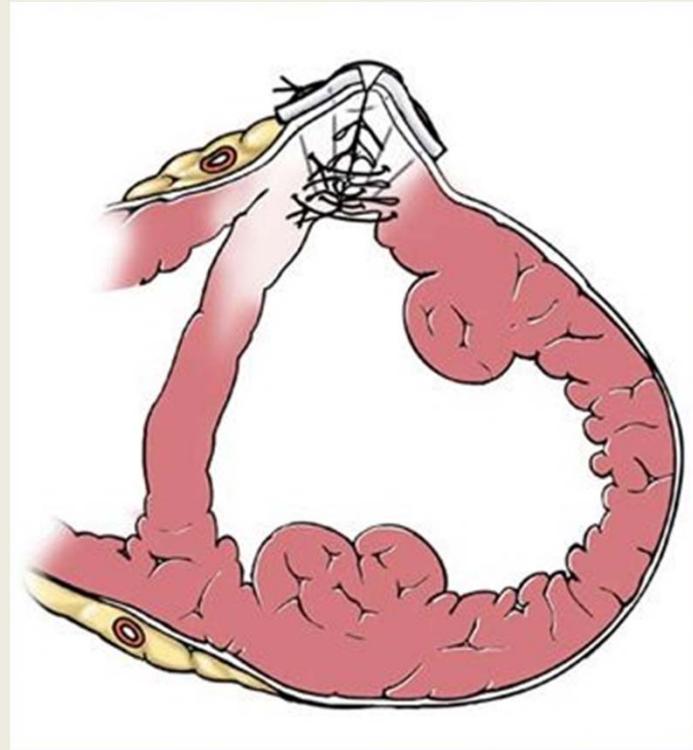
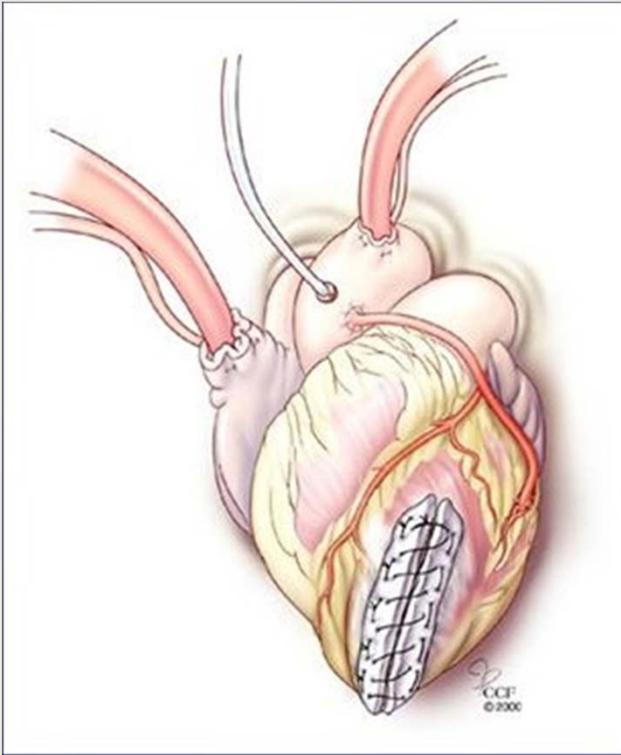


Procedure for Chronic Heart Failure due to Ischaemic Cardiomyopathy

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Dor Procedure (left ventricular restoration)



Usually performed with CABG ± mitral repair

2014 ESC/EACTS guidelines for Myocardial Revascularization

Recommendations on revascularizations in patients with chronic heart failure and systolic LV dysfunction (ejection fraction $\leq 35\%$)

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CABG is recommended for patients with significant LM stenosis and LM equivalent with proximal stenosis of both LAD and LCx arteries.	I	C	-
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PCI may be considered if anatomy is suitable, in the presence of viable myocardium, and surgery is not indicated.	IIb	C	

Ventricular Assist Devices (VADs)

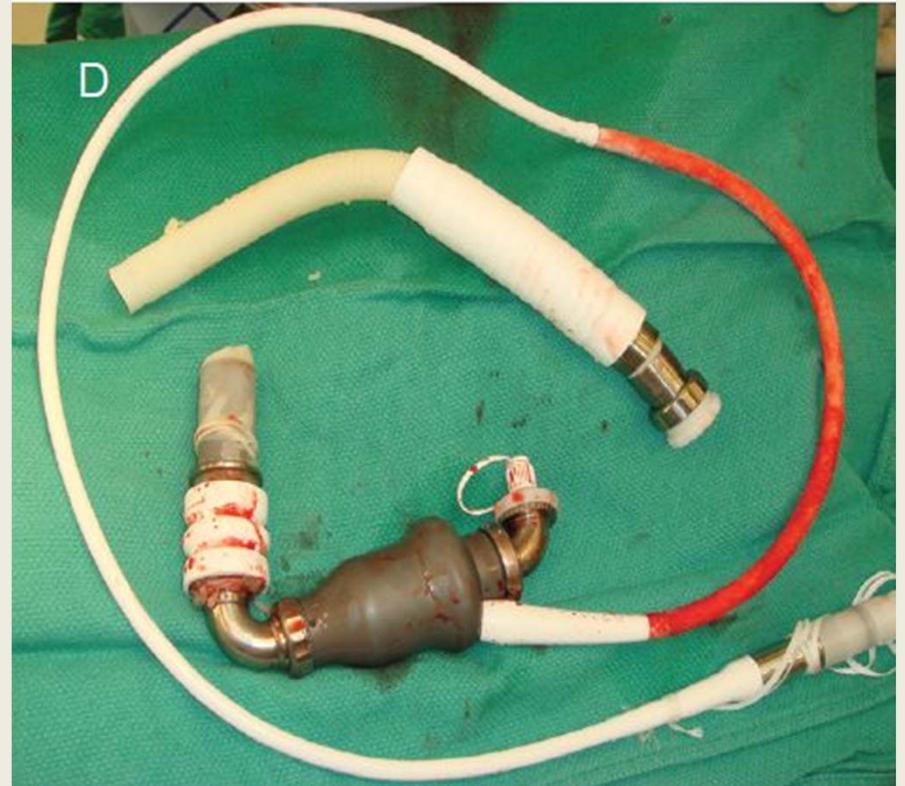
- Devices that are anastomosed to appropriate atrium and outflow vessels to provide augmentation of ventricular outflow.

Types of VADs

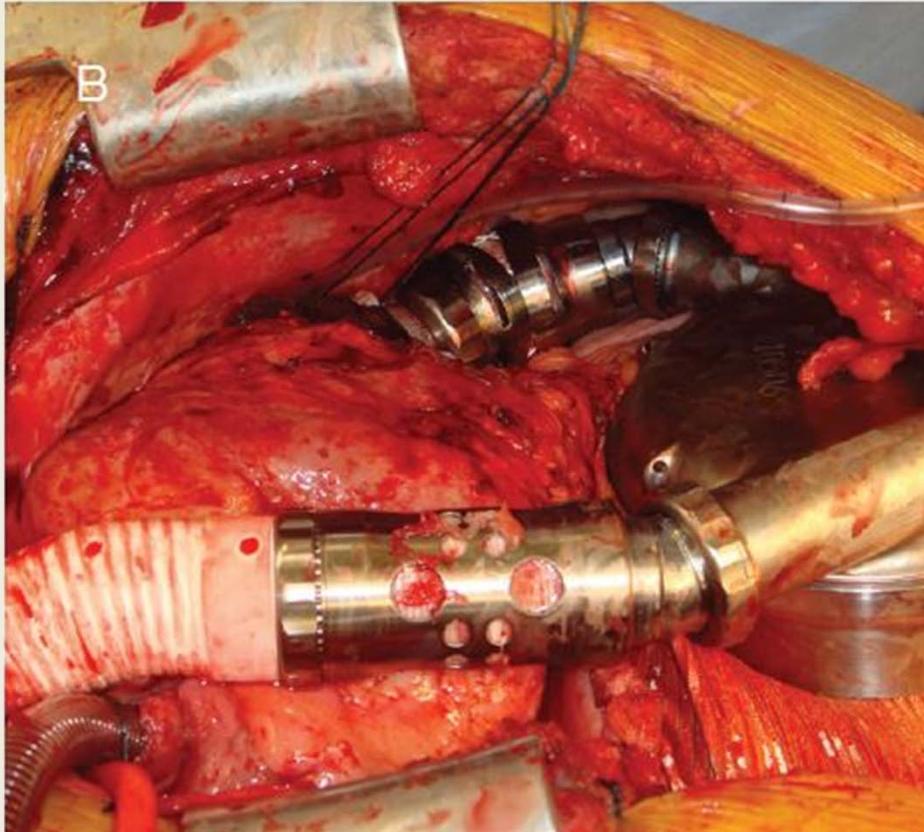
- LVAD, RVAD, BiVAD
- Pulsatile, non-pulsatile
- Intracorporeal, extracorporeal



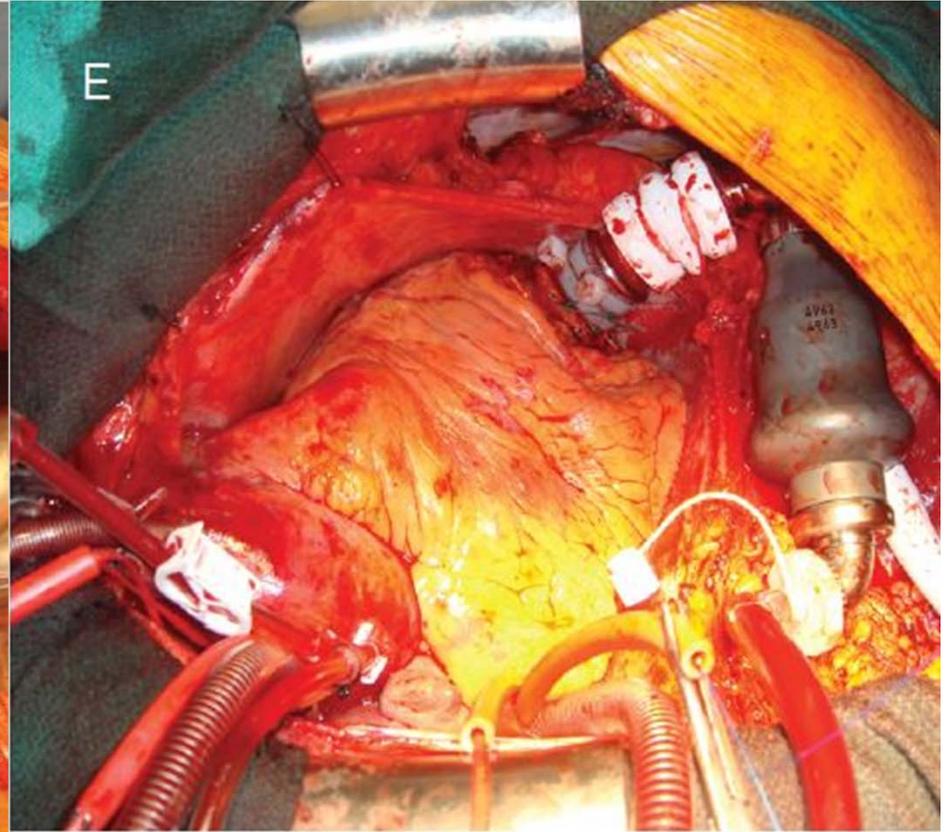
Heartmate I



Heartmate II



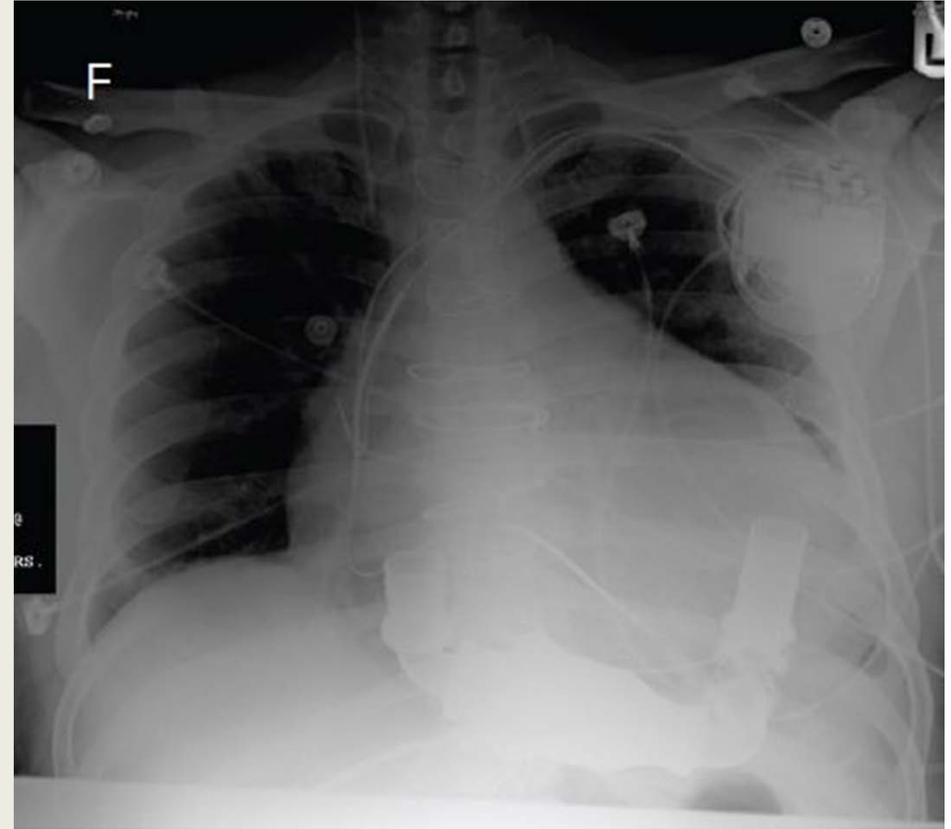
Heartmate I



Heartmate II



Heartmate I



Heartmate II

Indications for LVADs

- Bridge to recovery
 - For temporary support in cardiogenic shock
- Bridge to transplantation
- Destination
 - Permanent therapy for patients with refractory heart failure who are not eligible for transplant.



Table 13.3 Patients potentially eligible for implantation of a left ventricular assist device

Patients with >2 months of severe symptoms despite optimal medical and device therapy and more than one of the following:
LVEF <25% and, if measured, peak VO_2 <12 mL/kg/min.
≥ 3 HF hospitalizations in previous 12 months without an obvious precipitating cause.
Dependence on i.v. inotropic therapy.
Progressive end-organ dysfunction (worsening renal and/or hepatic function) due to reduced perfusion and not to inadequate ventricular filling pressure (PCWP ≥ 20 mmHg and SBP ≤ 80 –90 mmHg or CI ≤ 2 L/min/m ²).
Absence of severe right ventricular dysfunction together with severe tricuspid regurgitation.



Recommendations for implantation of mechanical circulatory support in patients with refractory heart failure

Recommendations	Class ^a	Level ^b	Ref ^c
An LVAD should be considered in patients who have end-stage HFrEF despite optimal medical and device therapy and who are eligible for heart transplantation in order to improve symptoms, reduce the risk of HF hospitalization and the risk of premature death (Bridge to transplant indication).	IIa	C	
An LVAD should be considered in patients who have end-stage HFrEF despite optimal medical and device therapy and who are not eligible for heart transplantation to, reduce the risk of premature death.	IIa	B	605, 612, 613

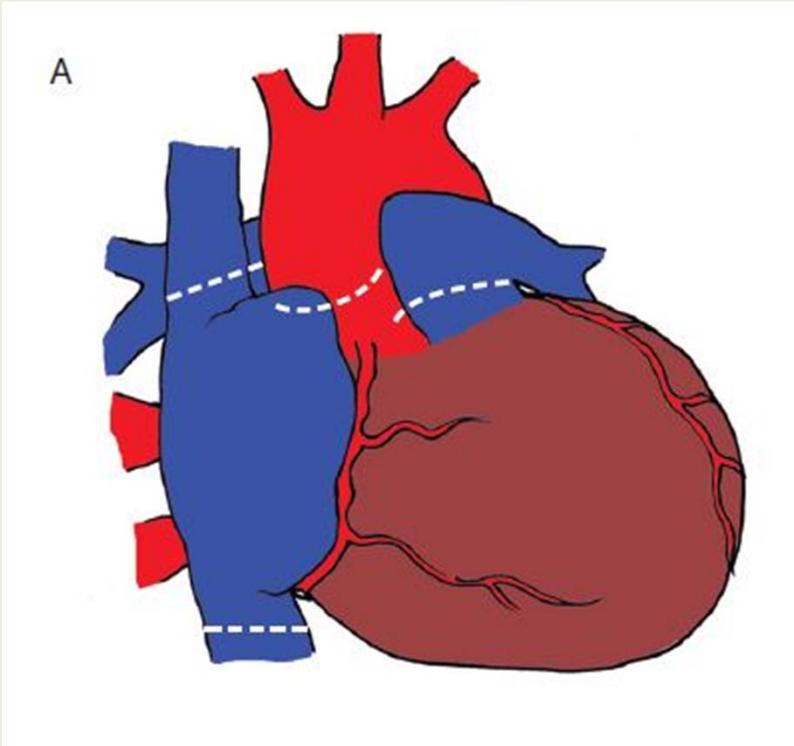
Heart Transplantation

- Accepted treatment for end-stage heart failure.
- If proper selection criteria are applied, significantly increase survival, exercise capacity, quality of life and return to work compared with conventional treatment.

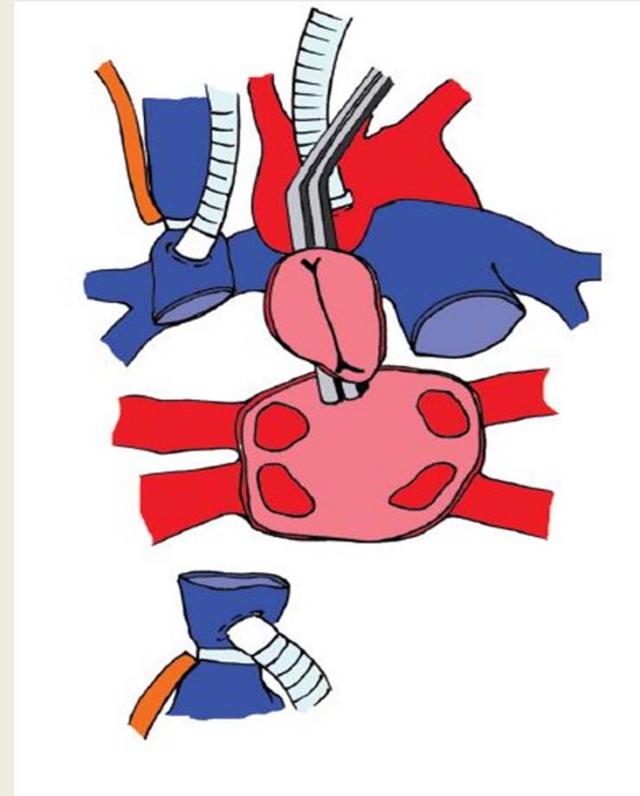


Patients to consider	<p>End-stage HF with severe symptoms, a poor prognosis, and no remaining alternative treatment options.</p> <p>Motivated, well informed, and emotionally stable.</p> <p>Capable of complying with the intensive treatment required postoperatively.</p>
Contra-indications	<p>Active infection.</p> <p>Severe peripheral arterial or cerebrovascular disease.</p> <p>Pharmacologically irreversible pulmonary hypertension (LVAD should be considered with a subsequent re-evaluation to establish candidacy).</p> <p>Cancer (a collaboration with oncology specialists should occur to stratify each patient as to their risk of tumour recurrence).</p> <p>Irreversible renal dysfunction (e.g. creatinine clearance <30 mL/min).</p> <p>Systemic disease with multi-organ involvement.</p> <p>Other serious co-morbidity with poor prognosis.</p> <p>Pre-transplant BMI >35 kg/m² (weight loss is recommended to achieve a BMI <35 kg/m²).</p> <p>Current alcohol or drug abuse.</p> <p>Any patient for whom social supports are deemed insufficient to achieve compliant care in the outpatient setting.</p>

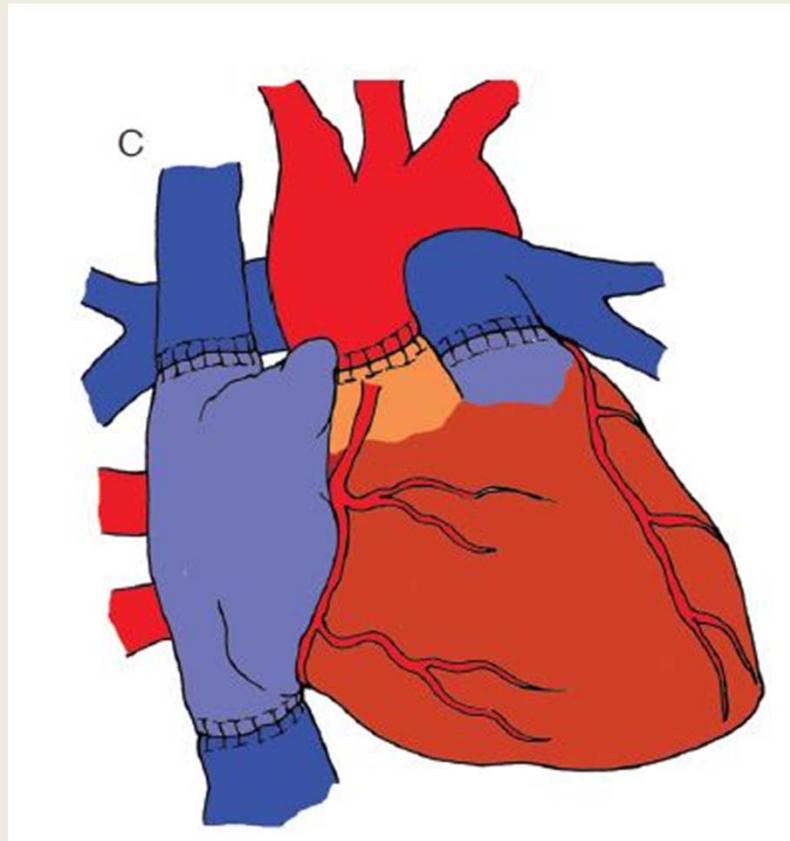




Native Failed Heart with incisions



Pericardial cavity with native great vessels following explantation of the native heart

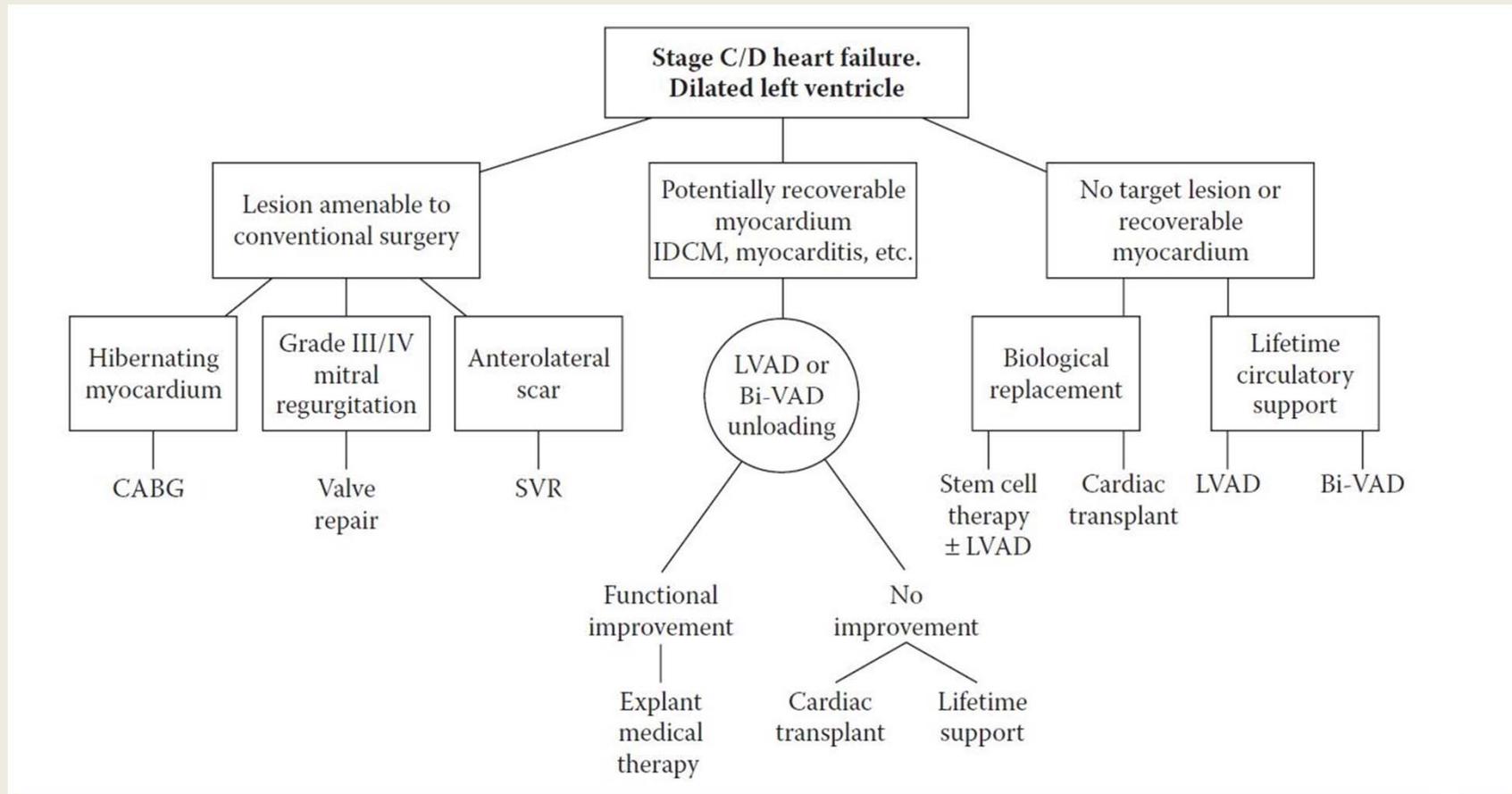


Implantation of donor heart with anastomosis of the left atrium (not seen), inferior vena cava, superior vena cava, pulmonary artery and aorta

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Surgical Options in Advanced Heart Failure





Thank You

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