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Anesthesia for cardiac diseases

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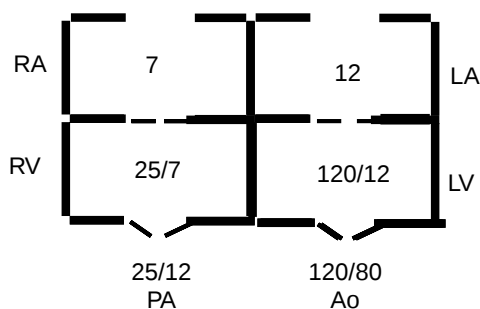
Anesthesia for cardiac diseases

Stephen J. Thomas, M.D.*

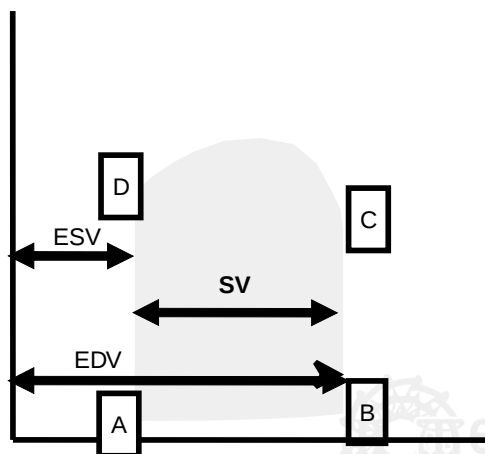
* Professor and Vice Chair, Department of Anesthesiology. Weill Cornell Medical Center New York, NY, USA.

NORMAL

Everything goes in the right direction without impediment

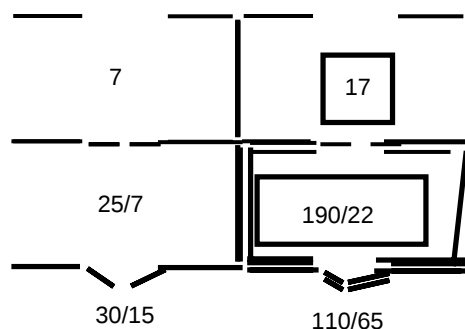


YOUR BASIC LOOP

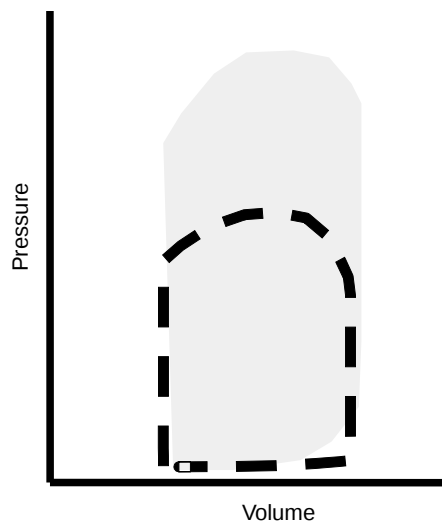


AORTIC STENOSIS

Fixed, chronic obstruction to LV ejection at the level of the aortic valve LV ↑



AORTIC STENOSIS



AS-LV PRESSURE OVERLOAD

- LV mass (concentric)
- LV compliance
- LV wall tension
→ LaPlace - $T = (P \times R)/h$
- Contractility OK

- LV dysfunction late
- Potential for myocardial ischemia
- Both supply & demand

→ Systolic dysfunction - ↑ LVEDP secondary to poor LV function

LOW COMPLIANCE VENTRICLE



AS-LOW COMPLIANCE VENTRICLE

- Need adequate filling pressure to fill the ventricle
 - Sensitive to volume depletion
 - Atrial kick crucial
- Wide swings in ventricular filling pressure
 - Don't overtreat
 - PAOP & LAP underestimate LVEDP

AS - MVO₂

- Demand up
 - Pressure generation
 - More muscle to feed
 - ↑ Wall tension
- Supply may be impaired
 - ↓ perfusion pressure
 - ↓ capillary density
 - ? ↓ diastolic relaxation
- 1/3 of AS pts with angina have clinically unimportant CAD

AS - SYMPTOMS

- Angina
- Syncope
 - Inability to maintain CO & BP in face of peripheral arteriolar dilation
 - Bradycardia - "fixed" SV dependent on HR
- Dyspnea
 - Diastolic dysfunction - ↑ LVEDP secondary to ↑ compliance; contractility is normal

AS - ANESTHESIA

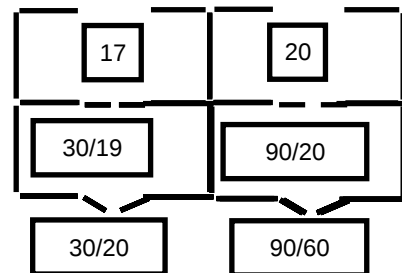
- Preop: interpret symptoms
 - Echo
- Intraop: anticipate
 - Keep full
 - Keep perfused
 - Love sinus rhythm
- Monitor
 - A-line - "beat-to-beat!"
 - ECG often not helpful; same with PA cath

AS - HEMODYNAMICS

PRE	▲
AFTER	▲
CONTR	No prob
RATE	NTS-NTF
RHYTHM	NSR
MVO ₂	Worry

CARDIAC TAMPONADE

Acute and/or chronic cardiac underloading LV, LA, RV, RA ↓

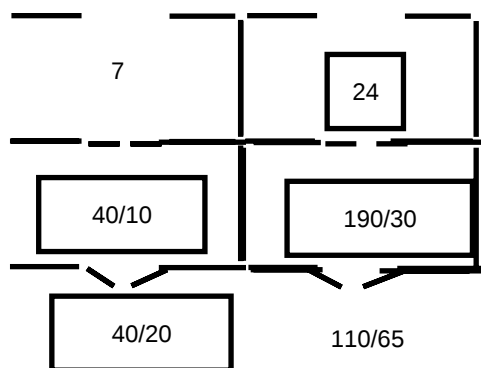


TAMPONADE - HEMODYNAMICS

PRE	▲
AFTER	▲
CONTR	No prob
RATE	▲
RHYTHM	Sinus tach
MVO ₂	????

HCM (IHSS)

Dynamic obstruction to LV ejection below the level of the aortic valve LV ↑



HCM - HEMODYNAMICS

PRE
AFTER
CONTR
RATE
RHYTHM
MVO₂

▲
▲
▲
▼
Sinus
???

ASH & ANESTHESIA

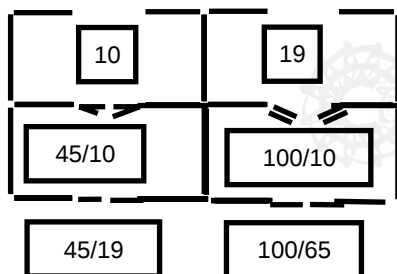
- 77 pts: retrospective review
- 31 adverse events
 - 1-MI/VT cardioversion
 - 12 CHF
- Risk factors
 - Surgical time, major surgery, monitoring
- Who cares?
 - Age, gender, gradient, SAM, MR, anesthetic

Anesthesiology. 1996;85:254-9
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Cardiac Risk of Noncardiac Surgery in Patients with Asymmetric Septal Hypertrophy
J. Michel Haering, M.D.,* Mark E. Comunale, M.D.,* Robert A. Parker, D.Sc.,† Edward Lowenstein, M.D.,‡ Pamela S. Douglas, M.D.,§ Harlan M. Krumholz, M.D.,|| Warren J. Manning, M.D.#

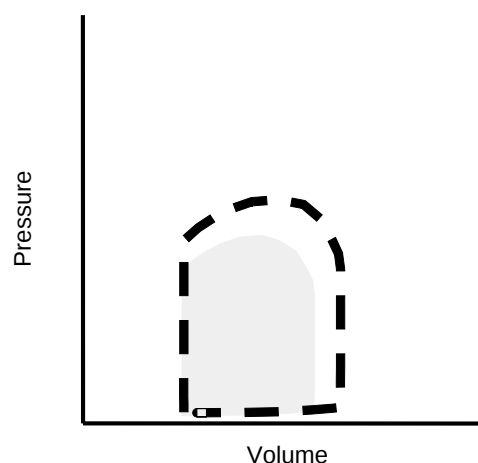
MITRAL STENOSIS

Fixed, chronic obstruction to LV filling

LA, RV ↑
LV ↓



MITRAL STENOSIS



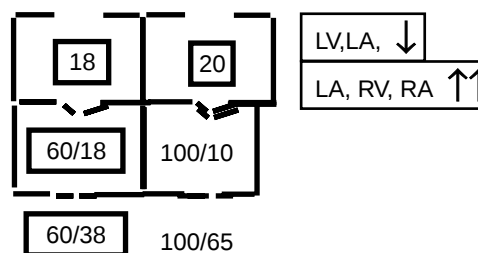
MS - HEMODYNAMICS

PRE
AFTER
CONTR
RATE
RHYTHM
MVO₂

▲
Usually low**
No prob**
NTS-DNTF
AF
No worry

** = careful if RV failure present

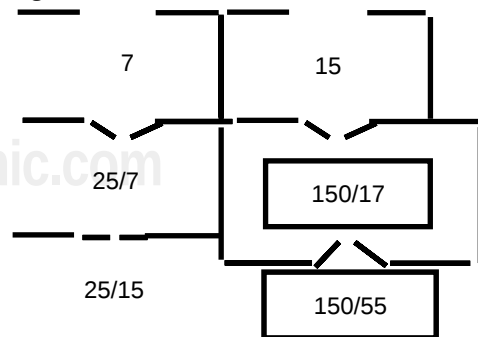
MITRAL STENOSIS (PHT)



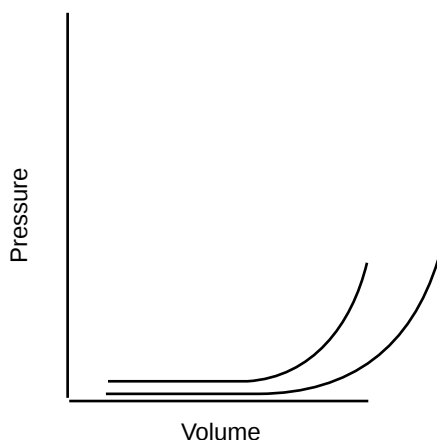
AORTIC INSUFFICIENCY

Chronic LV volume overload $\propto$ orifice size, time, pressure gradient

LV ↑



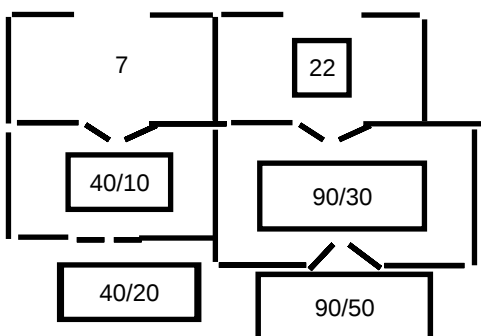
HIGH COMPLIANCE VENTRICLE



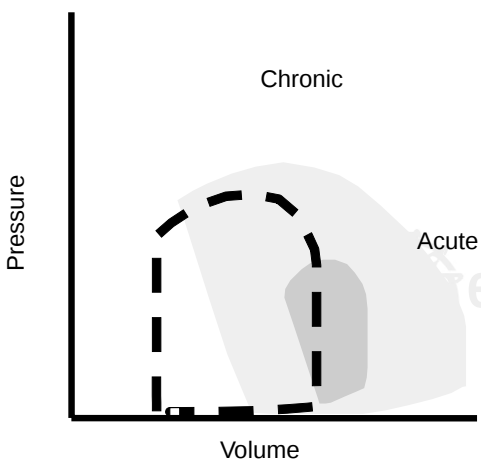
AORTIC INSUFFICIENCY (ACUTE)

LV volume overload $\propto$ orifice size, time, pressure gradient, ventricular size

LV $\uparrow$
LA, RV $\uparrow$



AORTIC INSUFFICIENCY



AI - HEMODYNAMICS

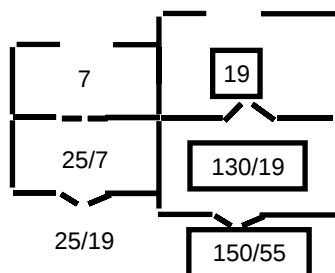
PRE
AFTER
CONTR
RATE
RHYTHM
MVO₂

NAP (?)
sI $\uparrow$
NAP
NS

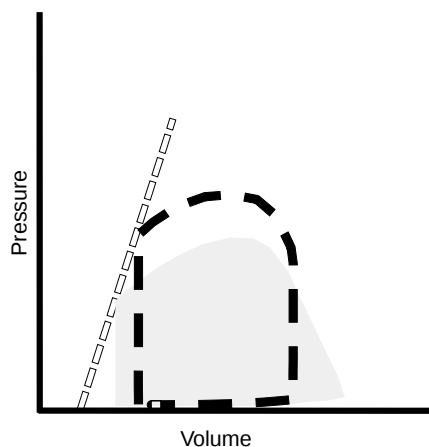
MITRAL REGURGITATION

Chronic LV & LA volume overload $\propto$ orifice size, time, pressure gradient

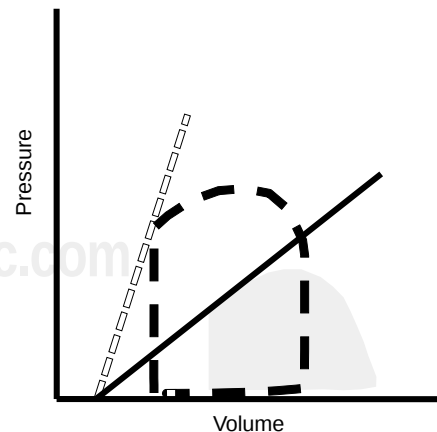
LV, LV $\uparrow$

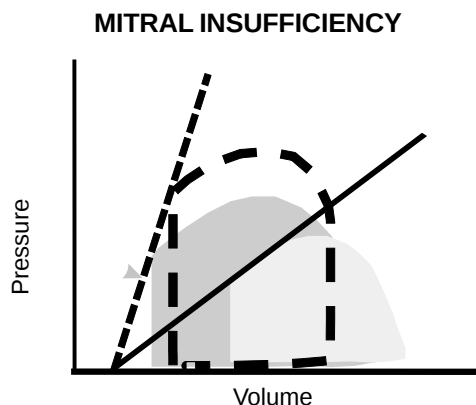


MITRAL INSUFFICIENCY (GOOD LV)



MITRAL INSUFFICIENCY (NOT-SO-GOOD LV)





MR - HEMODYNAMICS

PRE
AFTER
CONTR
RATE
RHYTHM
MVO₂

▲
▼
Watch out
sI ▲
NSR
?? CAD

CARDIAC EVALUATION

- Valve abnormality
- LV function
 - Systolic (no squeeze) AND diastolic (no relax)
 - Hx, PE, CXR - cardiomegaly
 - Echo
 - ? Cath
- RV function - systolic
- Rate and rhythm
- Pulmonary

NCD ALA ABA

- Preop assessment
 - Co-morbidity
 - Airway, vascular access, etc

- ** Cardiac evaluation
- Intraop mgt
 - Routine monitors (DFTRM!!)
 - Surgery considerations
 - ** Ideal hemodynamics
 - ** Appropriate monitoring
 - ** Anesthetic technique

don't forget those routine monitor

CARDIAC EVALUATION

- LV function
 - Systolic (no squeeze) AND diastolic (no relax)
 - Hx, PE
 - CXR - cardiomegaly
 - Echo
- RV function - systolic
- Rate and rhythm
- Pulmonary (N, PFT's ANNFECC)
 - CXR, Hx

(No, PFT's are not needed for every case!)

AS

