

Right Heart Catheterization

- Interpretation Cheat Sheet

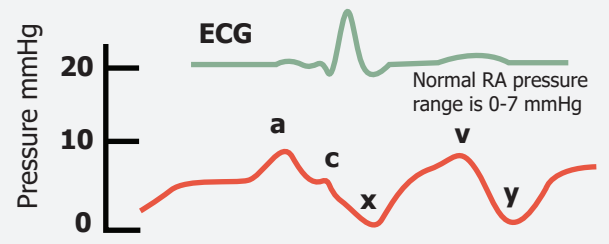
Direct measurements

- Central venous pressure (CVP)
- Right-sided intracardiac pressures (RA, RV)
- Pulmonary arterial pressure (PAp)
- Pulmonary capillary wedge pressure (PCWP)
- Cardiac output (CO)
- Mixed venous oxyhemoglobin saturation (SvO2)

Indirect measurements

- Systemic vascular resistance (770-1500 d/s/cm5)
 $(SVR = 80 \times [\text{mean arterial pressure} - \text{CVP}]/\text{CO})$
- Pulmonary vascular resistance (20-120 d/s/cm5)
 $(PVR = 80 \times [\text{mean PAp} - \text{PCWP}]/\text{CO})$
- Cardiac index (2.5-4 L/min/m2)
 $(CI = \text{CO}/\text{body surface area})$
- Stroke volume index (33-47 ml/beats/m2)
 $(SVI = CI/\text{heart rate})$
- Left ventricular stroke work index
 $(LVSWI = [\text{MAP} - \text{PCWP}] \times SVI \times 0.136)$
- Right ventricular stroke work index
 $(RVSWI = [\text{mean PAp} - \text{CVP}] \times SVI \times 0.136)$
- Oxygen delivery
 $(DO_2 = CI \times 13.4 \times \text{Hb} \times \text{SaO}_2)$
- Oxygen uptake
 $(VO_2 = CI \times 13.4 \times \text{Hb conc} \times [\text{SaO}_2 - \text{SvO}_2])$

RA pressures and waveforms

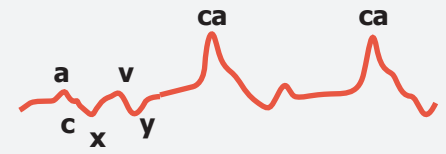


- **a wave**: contraction in atrial systole
- **x descent**: fall in RA pressure (atrial diastole)
- **c wave**: closure of the tricuspid valve.
- **v wave**: ventricular systole + passive atrial filling in atrial diastole.
- **y descent**: fall in RA pressure following opening of the TV + passive filling of RV

RA waveform abnormalities



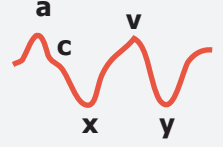
- Tricuspid regurgitation produces tall v waves due to regurgitation during ventricular systole



- Cannon a waves seen in AV dissociation due to atrial contraction against closed valve



- Loss or blunted 'Y' descent seen in cardiac tamponade

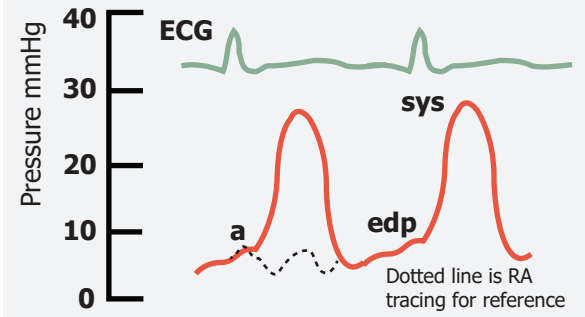


- Prominent 'X' and 'Y' descent seen in constrictive pericarditis or restrictive cardiomyopathy



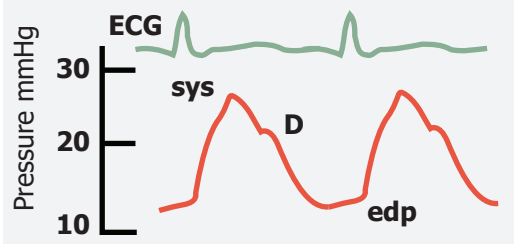
- Loss of 'a' wave seen in atrial fibrillation

RV pressures and waveforms



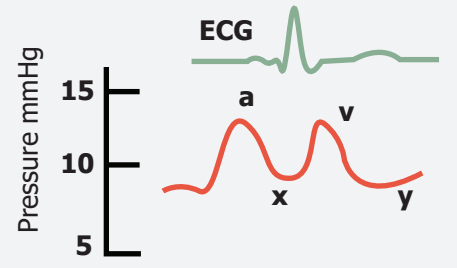
- **a wave**: contraction in atrial systole correlates with bump in RV tracing
- Normal **RV systolic pressure** range is 15-25 mmHg
- Normal **RV end-diastolic pressure** ranges from 3 to 12 mmHg. End diastole occurs immediately after the a wave
- **↑ RVSP**: PH and pulmonic stenosis, or PE
- **↑ >40 mmHg RVSP** is due to chronic elevation
- **↑ RVEDP**: cardiomyopathy, RV ischemia, RV infarction, cardiac constriction, cardiac tamponade

PA pressures and waveforms



- **PASP**: 15-25 mmHg, **PADP**: 8-15 mmHg
- Mean PAp is 16 (10-22 mmHg)
- **Dicrotic notch (D)**: closure of pulmonic valve
- Group 1 PH: idiopathic, connective tissue, congenital HD; group 2: PH due to left heart disease, MV disease; Group 3: chronic lung disease and/or hypoxemia; Group 4: chronic pulmonary thromboembolism; Group 5: multifactorial mechanisms (eg, SCD)

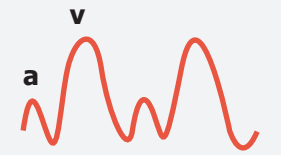
PCWP pressures and waveforms



- **a wave**: atrial systole
- **x descent**: atrial diastole
- **c wave**: closure of MV, usually not seen
- **v wave**: ventricular systole + passive atrial filling
- **y descent**: atrial emptying
- measured in supine position at end of expiration.
- Normal wedge: mean 9 mmHg range of 6-15 mmHg.
- wedge ~ LVEDP provided no AV obstruction and nl LV compliance



- **Large a waves**: Mitral stenosis, LV systolic dysfunction, diastolic dysfunction, volume overload, MI with decreased LV compliance



- **Large v waves**: MR (nonspecific), acute increase in volume to the LA (eg, acute VSD complicating MI)