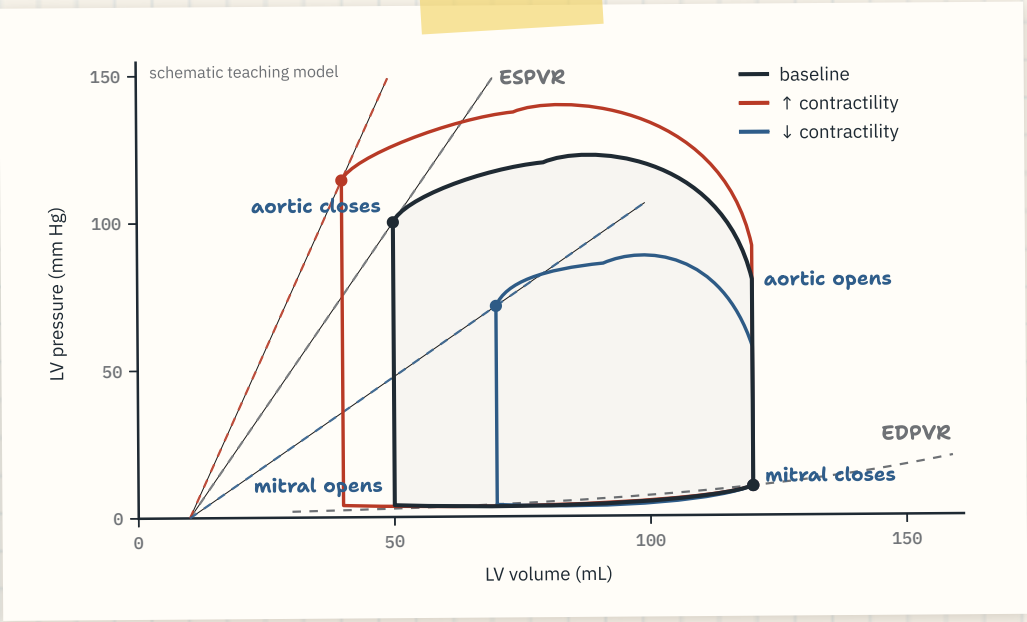
Contractility on the PV loop

Contractility rotates the ESPVR



Step by step

1. Contractility = intrinsic ability to generate force at a given preload and afterload; SV and EF depend on load
2. ESPVR = highest pressure at each volume for a given contractile state; found by IVC occlusion
3. ↑ Contractility (sympathetic drive, dobutamine): steeper → ↓ ESV, ↑ SV, ↑ EF
4. ↓ Contractility (ischaemia, beta-blocker): flatter → ↑ ESV, ↓ SV, ↓ EF

Loop	ESV	SV	EF
Baseline	50 mL	70 mL	≈ 58%
↑ Contractility	≈ 40 mL	≈ 80 mL	≈ 67%
↓ Contractility	≈ 70 mL	≈ 50 mL	≈ 42%

Fixed EDV 120 mL, same arterial load (teaching model)

ESPVR (LINEAR TEACHING FORM)

$$Pes = Ees \times (ESV - V0)$$

Ees = slope = end-systolic elastance, a relatively load-independent index of contractility.

Three moves

Preload moves along the curves.
Afterload slides along the ESPVR.
Contractility rotates it.

Exam traps

- Contractility is not stroke volume: SV also changes with preload and afterload.
- Ees is relatively, not absolutely, load-independent.
- When one factor changes: smaller ESV with lower end-systolic pressure is afterload reduction; smaller ESV with higher end-systolic pressure is more contractility.

Contractility on the pressure-volume loop: the ESPVR explained

Video, written lesson, practice question and sources: medservatory.com/usmle-step-1/cardiovascular/contractility-espvr

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