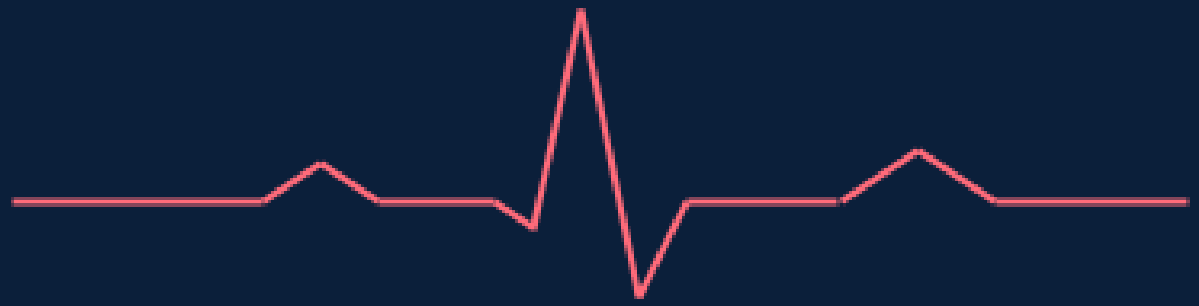
CONFERENCE PRESENTATION

Anesthetic Management of Femoral Fracture Surgery in Patients with Heart Failure



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Case Presentation: Hip Fracture in an Elderly Patient with HFpEF

Patient

- 78-year-old woman
- Hip (femoral neck/intertrochanteric) fracture after fall; scheduled for surgery

Past Medical History

- Type 2 diabetes ×10 years, on insulin
- Hypertension
- CKD (creatinine 1.6 mg/dL)

Medications

- Insulin (basal-bolus)
- Losartan 50 mg daily
- Amlodipine 5 mg daily
- Aspirin 80 mg daily

Echocardiography

- LVEF 55–60% (preserved)
- Concentric LVH; grade II diastolic dysfunction (E/e' ≈ 15)
- Enlarged LA; mild MR; PASP ≈ 38 mmHg

Laboratory Results

Hb	10.8 g/dL	**Cr**	1.6 mg/dL
WBC	9.8 ×10³/μL	**BUN**	38 mg/dL
Plt	235 ×10³/μL	**eGFR**	≈ 33
Na / K	136 / 4.6	**FBS**	168 mg/dL
INR	1.0	**HbA1c**	7.8 %
NT-proBNP	780 pg/mL	**Troponin**	Negative

ECG: sinus rhythm, LVH, no acute ischemic changes

Key issues: HFpEF (preload-dependent) • CKD • diabetes on insulin • antiplatelet therapy • anemia • anesthetic technique & monitoring choice

Echo: HFpEF vs HFrEF — What to Look For

Echo finding	HFrEF	HFpEF
LVEF	≤ 40%	≥ 50% (normal)
LV size	Dilated, spherical	Normal or small cavity
Wall thickness	Thin / normal	Increased: LVH, concentric remodeling
Wall motion	Global hypokinesis (or regional if ischemic)	Normal contraction
Diastolic function	Often abnormal (restrictive in advanced cases)	Abnormal: E/e′ > 14, septal e′ < 7 or lateral e′ < 10 cm/s
Left atrium	Enlarged	Enlarged (LAVI > 34 mL/m²)
Other clues	Functional MR, low LVOT VTI (low stroke volume)	TR velocity > 2.8 m/s, ↑ PASP

Quick approach: 1) LVEF → 2) LV size & wall thickness → 3) E/e′ and LA size

Diastolic dysfunction (HFpEF)

Preserved ejection fraction does not mean a forgiving heart

Impaired ventricular relaxation and increased myocardial stiffness

Although ejection fraction is preserved, ventricular filling is highly dependent on:

- **A** — **Proper diastolic time**
  Tachycardia shortens it
- **B** — **Atrial contribution**
- **C** — **Controlled preload**
  Overload, pulmonary congestion (PC)

Consequently, HFpEF patients may present significant hemodynamic instability despite apparently normal systolic function.

Rapid changes in heart rate and fluid therapy raise the perioperative risk.

Monitoring & Hemodynamic Management in Heart Failure

Monitoring

Invasive arterial BP (beat-to-beat)

- Prior LV dysfunction
- Hemodynamic instability
- On vasopressors
- Risk of rapid blood loss or large fluid shifts

CVP monitoring

- Potential for blood loss or large fluid shifts
- Likely vasoactive infusions

Management

Severe systolic dysfunction

- Inotropes may be preferable to fluids for end-organ perfusion
- Avoid myocardial depressant agents, or use low doses

Severe diastolic dysfunction

- Maintain adequate preload: underfilling the LV ↓ CO and may cause hypotension (even if LVEF is normal)
- Acute perioperative decompensation: inotropes may become necessary

Anesthetic goals in HFpEF

A stiff ventricle: cardiac output depends on filling and heart rate

Keep sinus rhythm

Atrial kick matters in a stiff LV; treat fast AF promptly

Control heart rate

Avoid tachycardia: it shortens diastolic filling time

Stay euvolemic

Narrow window: too little drops CO, too much causes pulmonary edema

Avoid sympathetic swings

Blunt laryngoscopy and pain; avoid both hypertension and hypotension

Regional anesthesia: use with care

- Benefit: lowers surgical stress and afterload
- Risk: extensive neuraxial block causes sudden sympathetic withdrawal and hypotension
- Limited reserve tolerates this poorly
- Safer: titrated block or a peripheral block (e.g. fascia iliaca), vasopressor ready

Choose the technique within a broader hemodynamic plan, not in isolation.

Choice of anesthetic technique

The technique should reflect two things

1. Underlying ventricular physiology
2. Anticipated surgical stress

No single approach has been shown to be superior for all patients with heart failure, so management must be tailored to the individual.

In HFrEF

A limited contractile reserve increases the risk of anesthetic-induced myocardial depression and sudden reductions in preload.

Match the technique to the ventricle and to the surgery.

Premedication and induction in heart failure

Blunt the sympathetic response and respect the slow circulation

Adequate premedication allays anxiety and avoids sympathetic stimulation

General anesthesia can be induced with a combination of:

- **Short-acting benzodiazepine**
  midazolam, diazepam
- **Hypnotic**
  etomidate, ketamine, or low-dose propofol
- **Moderate-dose opioid**
  e.g. fentanyl
- **Lidocaine**
- **Rapid-onset NMB agent**
  neuromuscular blocking

30–50% Keeping the slow circulation in mind, induction doses of most anesthetic agents are reduced by 30–50%, and induction may be prolonged in HF.

Sevoflurane in heart failure

A well-tolerated volatile agent, but hypotension is dose-dependent

0.65
Blood/gas coefficient: fast onset and offset

≈2%
MAC in young adults; lower with age

Non-pungent
Smooth, well-tolerated mask induction

Advantages

- Rapid onset and recovery because of low solubility
- Little airway irritation, smooth inhalation induction
- Heart rate stays stable; minimal catecholamine sensitization
- Possible cardioprotection (preconditioning effect)

Cautions in HF

- Dose-dependent vasodilation and myocardial depression
- Low cardiac output speeds the rise in alveolar concentration, so overshoot is easy
- Lower MAC in the elderly; an opioid reduces the dose needed
- Keep fresh gas flow ≥2 L/min (compound A); watch renal function

Titrate to the lowest effective end-tidal dose, with a vasopressor ready and invasive BP monitoring.

Hypotension and rate management

Hypotension is treated with:

1. Careful volume expansion
2. Vasopressor or inotropic administration

≈80
beats/min
target heart rate

Treat arrhythmia

Symptomatic arrhythmia, if any, should be treated

Defibrillation pads

External pads should be placed in patients with ADHF

Treat low pressure early and keep rescue tools within reach.

In HFpEF: fluids and vasoactive agents

A stiff ventricle tolerates extra fluid poorly

Fluids

- Increased ventricular stiffness makes patients more susceptible to fluid overload
- Careful, limited fluid therapy is often recommended, especially in procedures with low blood loss
- Aim: maintain normal fluid balance rather than increasing the circulating volume

Vasoactive agents play a central role in maintaining perfusion pressure

Norepinephrine

Generally preferred for intraoperative hypotension because of its balanced effect on systemic vascular resistance and coronary perfusion.

Dobutamine

For low cardiac output, balanced against the risk of tachyarrhythmia and increased myocardial oxygen consumption.

Early use of vasopressors may reduce the need for fluid boluses.

Lusitropic inotropes

Both play a significant role in managing circulatory failure

Milrinone

Phosphodiesterase III inhibitor

- Acts by increasing calcium ion uptake

Levosimendan

Calcium channel sensitizer, an inodilator

- Increases the sensitivity of the heart to calcium, so contractility rises
- Systolic contractility is enhanced, while diastolic relaxation is preserved or improved

Levosimendan's vasodilatory effect makes it unsuitable for hypotension or cardiogenic shock, and it may require other inotropes or vasopressors at the same time.

Positive lusitropy means better relaxation as well as better contraction.


Thank you
for your attention.