Does Diastology Really Matter? Operative Implications of Diastolic Dysfunction

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Objectives
1. Appreciate the impact of diastolic dysfunction on surgical outcomes
2. Learn how diastolic dysfunction can alter anesthetic management

Biomarkers of diastolic dysfunction (DD) have become important in prognosticating outcomes in patients with myocardial infarction, atrial fibrillation, aortic stenosis, and heart failure. Emerging evidence suggests that echocardiographic assessment of diastolic function might be a valuable adjunct in perioperative risk evaluation, surgical decision making and anesthetic management in patients undergoing cardiac and noncardiac operations (Groban. Anesthesiology 2010;112:1303-6).

During this presentation we will attempt to answer the following questions:

- Why are new perioperative risk assessment tools needed?
- Why DD should be included among the standard measures of perioperative risk?
- Who portends the “risky” DD phenotype?
- What perioperative strategies might mitigate DD-related morbidity?

Why are new perioperative risk assessment tools needed?

   Profound reduction in survival was found after elective, emergent, and urgent noncardiac surgery in those patients with a heart failure history on admission. No difference in survival was found between CAD vs. Controls.

   Operative mortality and 30-d all cause readmission increased in patients with stable heart failure as opposed to patients with history of CAD.

   HF-Preserved Systolic Function patients had increased hospital LOS and increased 1-mo readmission compared with propensity matched patients.
Why should DD be included among the standard measures of perioperative risk?

4. Phillip B. The prevalence of preoperative diastolic filling abnormalities in geriatric surgical patients. Anesth Analg 2003;97:1214-1221. *Preop echo shows that LV filling abnormalities are present in about 60% of older patients presenting for noncardiac and cardiac surgery. Approximately 15% of these patients present with moderate to severe DD, in the absence of symptoms.*

5. Correa De Sa D. Progression of preclinical diastolic dysfunction to the development of symptoms. Heart 2010; 96:528-532. *Hypertension, hyperlipidemia, CAD, and renal dysfunction are prevalent in patients with preclinical DD. The 2-yr cumulative probability of developing any symptoms was as high as 31% and the probability for cardiac hospitalization was 21%.*


8. Merello I. Risk scores do not predict high mortality after coronary artery bypass surgery in the presence of diastolic dysfunction. Ann Thorac Surg 2008;85:1247. *Predictors of postoperative mortality were renal failure (odds ratio, 17), restrictive filling (odd ratio 15), and age greater than 70 (odds ratio 7.4).*


10. Licker M. Preoperative diastolic function predicts the onset of left ventricular dysfunction following aortic valve replacement in high-risk patients with aortic stenosis. Crit Care 2010;14:1-11. *Advanced age, preop DD, and prolonged aortic cross-clamp time predicted LV dysfunction post-CPB requiring inotropic support. Among the preop echocardiographic measures, Vp less than 40 cm/s identified the “risky” patient.*


12. Flu W-J. Prognostic implications of asymptomatic left ventricular dysfunction in patients undergoing vascular surgery. Anesthesiology 2010;112;1316-24. *Among a data set of 1,005 patients, asymptomatic LV dysfunction predicted early CV events and long term mortality after “open” vascular procedures. In contrast,*
history of heart failure (not preclinical dysfunction) predicted adverse events and long term mortality after endovascular procedures.

Who portends the “risky” diastolic dysfunction phenotype?

- Age >70, Female
- Systolic hypertension, pulse pressure > 70 mmHg
- Diabetes, chronic renal insufficiency, PAD
- Normal LVEF, LVH, LAE, increased LVEDP
- Recent weight gain
- Exercise intolerance

Diastology “barometers” of increased perioperative CV risk

Conventional Doppler: E/A: 1-2; Dec Time 150-200 ms
Tissue Doppler: e' < 8 cm/s; E/e' ≥ 15
Inflow Propagation: Vp < 40 cm/s; E/Vp > 1.5
Left Atrial Size: LA vol index ≥ 32 mL/m2; LA area 30-40; LA diam > 43mm
Left ventricular hypertrophy

What perioperative strategies might mitigate diastolic dysfunction-related morbidity?

- Control hypertension (Class IA evidence; AHA/ACC guidelines) (Flu WJ. Prevalence and pharmacological treatment of left-ventricular dysfunction in patients undergoing vascular surgery. Eur J Heart Fail 2010;12:288-93)
- Prevent extremes in pulse pressure (consider NTG low dose infusion with Neosynephrine; consider guiding fluid by monitoring pulse pressure variations)
- Maintain sinus rhythm
- Avoid tachycardia and severe bradycardia
- Prevent ischemia
- Avoid volume overload
- Ensure sufficient preload (hypovolemia could lead to low SV, CO and an activated renin angiotensin system, ultimately contributing to HF)

Taken together, it is the opinion of this presenter that there has evolved enough support that resting echocardiography for assessment of LV diastolic function should be included among the standard CV risk assessment tools (e.g., Goldman, Lee, Detsky risk indices) in the evaluation of asymptomatic patients undergoing high-risk noncardiac surgery. Early detection of preclinical LV diastolic dysfunction could be used to frame specific therapeutic patient care decisions, for example, open versus minimally invasive approach and improve risk estimates (Flu WJ. Anesthesiology 2010). Since we do not yet have evidence-based, “best practices” for the treatment of preclinical diastolic dysfunction among our ambulatory, community dwellers, the anesthetic management of these “risky” patients must be planned on a case-by-case basis, with meticulous control of hypertension and maintenance of normovolemia as primary goals.