Perioperative Diastolic Dysfunction and Outcome

A history of congestive heart failure (CHF) significantly increases the risk of postoperative morbidity and mortality after non-cardiac surgery.\(^\text{(1-3)}\) CHF is a clinical diagnosis that can be due to both systolic and diastolic ventricular dysfunction; whether patients with history of CHF should be treated differently based on their specific cardiac dysfunction is not known, and preoperative risk assessment in non-cardiac surgery has thus far been limited to the evaluation to ventricular systolic function or wall motion abnormalities.\(^\text{(4-7)}\) However, when evaluated in conjunction with other clinical risk factors, left ventricular systolic function has not been found to add significant predictive value of postoperative cardiac complications.\(^\text{(4)}\) On the other hand, the evaluation of diastolic function as a characteristic that may exert an independent effect on postoperative morbidity has thus far been limited. Further, assessment of diastolic function prior to surgery is not routinely performed.\(^\text{(8-11)}\)

While the identification of perioperative diastolic dysfunction using echocardiography during vascular surgery has previously been reported, an association with postoperative outcome has not been thoroughly described.\(^\text{(12,13)}\) Diastolic dysfunction is common in the population of patients undergoing high-risk vascular surgery. Phillip et al.\(^\text{(14)}\) have reported that more than 50% of geriatric patients undergoing cardiac and non-cardiac surgery had preoperative diastolic dysfunction with normal LVEF. They concluded that a comprehensive left ventricular functional assessment should include evaluation of both systolic and diastolic function, and recent data suggests that this is an appropriate approach. If preoperative assessment were limited to systolic function alone, a significant proportion of patients with diastolic dysfunction who are at risk for postoperative adverse events would not be identified. Whether identification of these patients could lead changes in care that would result in improved outcome remains a point of future study. For example, one hypothesis may be that utilizing a care pathway that includes aggressive fluid restriction and early diuresis might reduce the incidence of postoperative CHF. This and other strategies remain to be tested, but we believe that recent findings provide evidence that such research is possible \(^\text{(12,15)}\).
Diastolic function has not received significant study as a factor in outcome research possibly due to the absence of a universal, non-invasive method of classification and diagnosis. Traditionally, assessment was based on the pulse wave Doppler interrogation of the transmitral and pulmonary venous inflow.(16) This method can sometimes be inconclusive, in part due to the natural history and progression of relaxation abnormalities (impaired relaxation to pseudo-normal to restrictive).(17-20) Furthermore, rapidly changing loading conditions in the operating room make it more challenging to accurately assess perioperative diastolic function with the traditional PWD measures.(12) We recommend assessing diastolic function using a more recently described method: transmitral flow propagation velocity, or Vp.(17,21) Despite limitations, Vp is easily obtained, reproducible, and does not require post-acquisition manipulation. Also, Vp is a reliable method during periods of changing loading condition and fluctuating heart rate.(22,23) These features makes it useful for assessment of perioperative relaxation abnormalities in the OR setting.(24-26)

It has been suggested that preoperative assessment of cardiac function using dipyridamole-Thallium or transthoracic echocardiography does not add significant incremental predictive value of postoperative complications over the clinical assessment.(4,27-30) One possible explanation might be that these diagnostic tests primarily assess the systolic function of the left ventricle. We likewise found the assessment of systolic function of the left ventricle to be of lesser value in predicting immediate adverse events after surgery.

We can identify certain limitations to perioperative assessment of diastolic function. General anesthesia is known to alter the hemodynamic loading conditions, which can affect the Doppler filling pattern of the LV. We recommend to use Vp or Doppler tissue as the diagnostic criteria for diastolic function because it has been known to be less affected by loading conditions and can be reliably used in the operating room.(12) Measurement of Vp has shown excellent reproducibility and intra- and inter-observer reliability.(31,32) However, we cannot be certain that our measure of diastolic function taken after the induction of anesthesia would be comparable to a transthoracic measure taken prior to surgery.
Although we have demonstrated the predictive value of perioperative assessment of diastolic function(33), because of the lack of a specific therapy, the true significance of the impact of the presence of diastolic dysfunction on postoperative outcome remains uncertain. Until the availability of a specific lusitropic therapy, the mainstay of therapy will likely remains anti-ischemic heart rate control, avoidance of fluid overload and diuretic therapy. Establishment of an accurate diagnosis is the first step to develop an effective predictive and therapeutic strategy, and we have demonstrated in our study that utilizing TEE it is possible to diagnose diastolic function in the perioperative arena.

In conclusion, the presence of perioperative diastolic dysfunction, as assessed with Vp, was an independent predictor of postoperative CHF and prolonged length of stay after major vascular surgery as compared to patients without diastolic dysfunction in this study(33). Perioperative systolic function was not a predictor of postoperative outcome in our patients. Future studies will be needed to assess the benefits of inclusion of diastolic function during preoperative risk stratification, and also goals for treatment. Furthermore the lack familiarity with the Doppler techniques to assess perioperative diastolic function and dysfunction may actually be responsible for the lack of studies to specifically answer this question.

References:


