

THE EFFECTS OF AN IV-FLUID BOLUS ON THE ASSESSMENT OF DIASTOLIC FUNCTION

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Diastolic function is the result of impaired LV relaxation with or without reduced storing forces (and early diastolic suction), and increased LV chamber stiffness, which increase cardiac filling pressures.¹ Abnormal diastolic function exists in greater than 50% of patients presenting for cardiac or high-risk non-cardiac surgery and has been shown to be an independent predictor of adverse postoperative outcome.² More recent studies have confirmed some of these poor outcomes: diastolic dysfunction has been associated with prolonged ventilation, death, and longer ICU and hospital length of stay.³ We explored the perioperative assessment and reproducibility of grading diastolic function with a simplified algorithm⁴ before and after an IV-fluid bolus (500cc over 10 min) in sequential patients undergoing cardiac surgery. In 84 patients the paired comparison of early diastolic mitral annular velocities before and after the fluid bolus was not statistically significant ($p=.10$). Comparison of trans-mitral flow velocities revealed a statistically significant change with Wilcoxon matched-pairs signed rank test analysis of E/A ($p=0.002$, and E/e' ($p=.0002$). Overall, the distribution of diastolic function did not change as evidenced with the Chi-square comparison of grade distribution that was not statistically significant. However, 15% of patients had progressive diastolic dysfunction assessment changes. Our results are consistent with previous studies: early diastolic mitral annular velocity is a relatively pre-load independent assessment of LV relaxation allowing for surveying of diastolic dysfunction despite the grade of severity.⁵ We demonstrated that: (1) The algorithm captures many of the patients that were surveyed as 100% of candidates fit the simplified algorithm parameters, (2) highlights the clinical utility of the algorithm as the grading of diastolic function was both reproducible and (3) could perhaps offer some prognostic value when appreciating the worsening of diastolic grading across our sample pre and post fluid bolus sample population. Our study has some limitations, it was focused on the intraoperative setting and a controlled fluid challenge. In addition, another notable limitation includes patient demographics, many patients had valvular dysfunction, which could affect both e' and E measurements. Further studies are warranted to explore the intraoperative effects of anesthetic agents on diastolic function. We are currently exploring both pre and postoperative follow up echo data to characterize longitudinal changes of diastolic function assessment.

¹ F. Nagueh, Sherif & A. Smiseth, Otto & Appleton, Christopher & F. Byrd, Benjamin & Dokainish, Hisham & Edvardsen, Thor & A. Flachskampf, Frank & Gillebert, Thierry & Klein, Allan & Lancellotti, Patrizio & Marino, Paolo & Oh, Jae & Popescu, Bogdan Alexandru & D. Waggoner, Alan. (2016). Recommendations for the Evaluation of Left Ventricular Diastolic Function by Echocardiography: An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. *European Heart Journal Cardiovascular Imaging*. 17. jew082. 10.1093/ehjci/jew082.

² Matyal R, Skubas NJ, Shernan SK, Mahmood F. Perioperative assessment of diastolic dysfunction. *Anesthesia and analgesia*. 2011;113(3):449-472.

³ Metkus TS, Suarez-Pierre A, Crawford TC, et al. Diastolic dysfunction is common and predicts outcome after cardiac surgery. *Journal of Cardiothoracic Surgery*. 2018;13(1):67.

⁴ Swaminathan M, Nicoara A, Phillips-Bute BG, et al. Utility of a Simple Algorithm to Grade Diastolic Dysfunction and Predict Outcome After Coronary Artery Bypass Graft Surgery. *The Annals of thoracic surgery*. 2011;91(6):1844-1850.

⁵ Oki T, Tabata T, Yamada H, et al. Clinical application of pulsed Doppler tissue imaging for assessing abnormal left ventricular relaxation. *The American journal of cardiology*. 1997;79(7):921-928.