

A Simplified Point-of-Care Echocardiographic Method to Detect Critical Mitral Stenosis in the Patient with Undifferentiated Acute Pulmonary Edema

Kevin Gardner*, Daniel Mantuani and Arun Nagdev

Alameda Health System Highland Campus, Department of Emergency 1411 E 31st St, Oakland, CA 94602, USA

Received Date: February 13, 2016, Accepted Date: March 30, 2016, Published Date: April 05, 2016

*Corresponding author: Kevin Gardner, Alameda Health System Highland Campus, Department of Emergency 1411 E 31st St, Oakland, CA 94602, USA, Email: kfgardner1@gmail.com

Abstract

Point-of-care ultrasound (POCUS) is an important tool for emergency medicine providers in identifying the presence and etiology of undifferentiated acute pulmonary edema [1,2]. When acute pulmonary edema is present, but point-of-care echocardiography does not demonstrate systolic or diastolic dysfunction, evaluation of the mitral valve should be performed [3-7]. Mitral stenosis, the obstruction of left ventricular inflow at the level of the mitral valve, is typically a progressive process that can lead to acute decompensation. Establishing the diagnosis of mitral stenosis with point-of-care echocardiography in the emergency department can be challenging as assessment of the mitral valve has traditionally required advanced color Doppler echocardiographic skills [8]. Effective POCUS techniques should be simple, rapid, and accurate, without requiring advanced techniques not known to the average provider. Utilizing M-mode across the mitral valve is an often overlooked and simple technique that can rapidly identify mitral stenosis, and in the correct clinical setting, alert the physician to the need for urgent consultation. Here we present a case of critical mitral stenosis in a young Honduran immigrant with acute pulmonary edema who was rapidly diagnosed by point-of-care echocardiography using M-mode across the mitral valve.

Keywords: Point-of-Care Echocardiography; Critical Mitral Stenosis; Pulmonary; Edema

Case Presentation

A 41-year-old female who recently emigrated from Honduras, presented to the emergency department with a history and physical exam suggestive of pelvic inflammatory disease. During her initial evaluation, the patient received a 2L intravenous bolus of normal saline for tachycardia and presumed volume depletion. Soon after, the patient became acutely dyspneic and was noted to have bilateral crackles on pulmonary auscultation.

Because of the patient's rapid clinical deterioration and acute dyspnea, POCUS examination was performed [1,2]. The patient's inferior vena cava was noted to be plethoric with minimal respiratory variation. Lung ultrasound confirmed diffuse bilateral B-lines consistent with pulmonary edema. The patient was unable to tolerate laying in the left lateral decubitus position to obtain an apical four chamber examination. Thus, only a parasternal long axis view in the upright seated position was obtained. The parasternal long axis view did not indicate impaired systolic or diastolic function, but rather a dilated left atrium and a "hockey stick" appearance of the anterior mitral valve leaflet, suggestive of mitral stenosis (Video).

To confirm the potential dysfunction of the mitral valve, M-mode measurement was performed across the anterior leaflet. A normal mitral valve anterior leaflet, when examined with M-mode, will demonstrate the characteristic two-peaks of the E and A waves,



Video: Parasternal long view demonstrating dilated left atrium and "hockey stick" appearance of anterior mitral leaflet

correlating with the phases of early filling and atrial kick (Figure 1). In mitral stenosis, this physiology is distorted as the valve movement is restricted secondary to stenosis. This pathology leads to a "table top" appearance of the valve in M-mode (Figure 2), characteristic of mitral stenosis. In this case, identification of the characteristic "table top" appearance in M-mode, in addition to the findings of a dilated left atrium and a "hockey stick" appearance of the anterior leaflet, led to the rapid and accurate diagnosis of mitral stenosis. An



Figure 1: Parasternal long view, in M-mode, examining the mitral valve in a patient without pathology. Note the characteristic two-peaks of the E and A waves as seen in normal physiology.

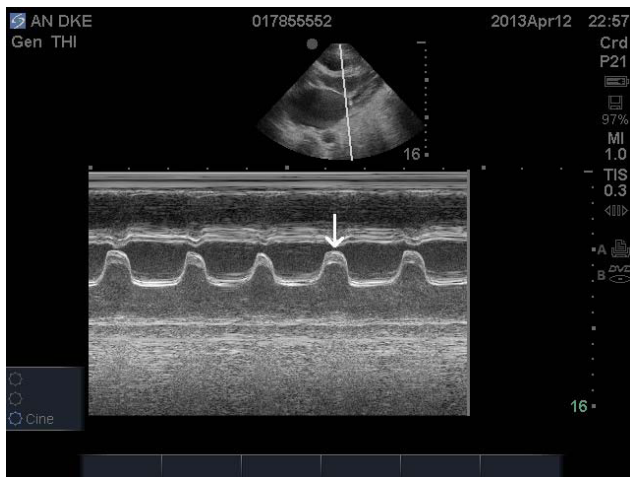


Figure 2: Parasternal long view, in M-mode, examining the mitral valve in the described patient with mitral stenosis. Note, as identified by the arrow, the characteristic table top appearance, with loss of the typical E and A waves.

immediate cardiothoracic consultation for emergent valvuloplasty was initiated while awaiting a confirmatory comprehensive echocardiogram. Formal echocardiography confirmed the findings of mitral stenosis and the patient received mitral valvuloplasty with an excellent outcome.

Discussion

POCUS techniques should be simple, rapid, and accurate, allowing the emergency medicine provider to come to the correct diagnosis in a time sensitive manner [1]. When acute pulmonary edema is identified by lung ultrasound, but the point-of-care echocardiography does not reveal clear systolic or diastolic dysfunction, evaluation of the mitral valve should be considered [3-7]. Color Doppler evaluation of valvular pathology has been demonstrated to be accurate when assessing patients in the echocardiography lab [8]. However, this requires both an

understanding of the use of color Doppler settings and the ability to properly position the patient to obtain clear views, which is often not possible in the unstable dyspneic patient. The use of a simplified M-mode technique during a multi-organ symptom based POCUS examination enabled the clinicians to diagnose an uncommon cause of cardiogenic pulmonary edema using an easy to obtain parasternal long axis view. In this case, recognition of critical mitral stenosis led to appropriate stabilization of the patient and early cardiothoracic consultation facilitating transfer for mitral valvuloplasty. By using M-mode across the mitral valve in the parasternal long view, we describe a novel technique to emergency physicians that can both rapidly and accurately diagnose critical mitral stenosis.

References

1. Mantuani D, Frazee BW, Fahimi J, Nagdev A. Point-of-Care Multi-Organ Ultrasound Improves Diagnostic Accuracy in Adults Presenting to the Emergency Department with Acute Dyspnea. *West J Emerg Med.* 2016;17(1):46-53.
2. Pirozzi C, Numis FG, Pagano A, Melillo P, Copetti R, Schiraldi F. Immediate versus delayed integrated point-of-care ultrasonography to manage acute dyspnea in the emergency department. *Crit Ultrasound J.* 2014;6(1):5. doi: 10.1186/2036-7902-6-5. eCollection 2014.
3. Akram MR, Chan T, McAuliffe S, Chenzbraun A. Non-rheumatic annular mitral stenosis: prevalence and characteristics. *Eur J Echocardiogr.* 2009;10(1):103-5. doi: 10.1093/ejehocard/jen179.
4. Cardoz J, Jayaprakash K, George R. Mitral stenosis and acute ST elevation myocardial infarction. *Proc (Bayl Univ Med Cent).* 2015;28(2):207-9.
5. Kobulnik J, Hutchison SJ. Mitral stenosis and cardiogenic shock from an obstructive abscess of the mitral annulus. *Can J Cardiol.* 2008;24(4):e22-4.
6. Reardon R, Joing S. Mitral valve stenosis in a pregnant immigrant. *Acad Emerg Med.* 2006;13(6):628.
7. Riley DC, Cordi HP. Emergency department diagnosis of mitral stenosis and left atrial thrombus using bedside ultrasonography. *Acad Emerg Med.* 2010;17(5):e30-1. doi: 10.1111/j.1553-2712.2010.00726.x.
8. Lee TY, Tseng CJ, Chiao CD, Chiou CW, Mar GY, Liu CP, et al. Clinical applicability for the assessment of the valvular mitral stenosis severity with Doppler echocardiography and the proximal isovelocity surface area (PISA) method. *Echocardiography.* 2004;21(1):1-6.

*Corresponding author: Kevin Gardner, Alameda Health System Highland Campus, Department of Emergency 1411 E 31st St, Oakland, CA 94602, USA, Email: kfgardner1@gmail.com

Received Date: February 13, 2016, Accepted Date: March 30, 2016, Published Date: April 05, 2016

Copyright: © 2016 Kevin Gardner, et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Gardner K, Mantuani D, Nagdev A (2016) A Simplified Point-of-Care Echocardiographic Method to Detect Critical Mitral Stenosis in the Patient with Undifferentiated Acute Pulmonary Edema. *J Eme Med Int Care* 2(1): 110 <http://dx.doi.org/10.19104/jemi.2015.110>.