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Echocardiography

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Isolated Left Ventricular Diastolic Collapse Due to Extra-Thoracic Compression

Rana Costa, M.D.,* Jad Zahnan, M.D.,* Hadi Skouri, M.D.,* Walid Gharzuddine, M.D.,* Lara Al-Masri, R.C.S.,* Chakib Ayyoub, M.D.,† and Antoine B. Abchee, M.D.*

*Department of Internal Medicine, Division of Cardiology, American University of Beirut Medical Center, Beirut, Lebanon; and †Department of Anesthesiology, American University of Beirut Medical Center, Beirut, Lebanon

Isolated collapse of the left ventricle (LV) in diastole is not a very common finding on two-dimensional echocardiography. Reported cases in the literature were due to either loculated postoperative pericardial effusion/hematoma or left pleural effusion. To our knowledge, this is the first case report of LV diastolic collapse secondary to extra-thoracic compression. (Echocardiography 2015;32:1314–1317)

Key words: left ventricular diastolic collapse, extra-thoracic compression, small bowel obstruction

Case Report:

A 56-year-old male, known to have dilated nonischemic cardiomyopathy with an ejection fraction of 40–44%, presented to the emergency department complaining of a 4-day history of vomiting and dyspnea. Patient was diagnosed with cerebellar lymphoma 2 years earlier for which he completed treatment. His initial presenting symptom 2 years ago was also vomiting. Brain MRI 3 weeks prior to the current presentation was negative for recurrence of lymphoma.

The patient was conscious, oriented but in mild distress. He was found to be hypotensive (blood pressure = 90/50 mmHg). He had collapsed neck veins on cardiovascular exam. There were decreased breath sounds over the left lower lung field. His abdomen was distended and tympanic, mainly in the epigastric region. Intravenous fluids were started.

As workup for his dyspnea, follow-up echocardiogram revealed, in addition to his previously known left ventricular (LV) dysfunction and left atrial dilatation, LV diastolic collapse with evidence of an extra-cardiac structure posteriorly compressing the heart (Figs. 1 and 2 and movie clips S1 and S2). The mitral inflow pattern by Doppler was compatible with Grade I diastolic dysfunction (Fig. 3). His baseline diastology was Grade II, with elevated filling pressures (Figs. 4 and 5). This change was secondary to severe dehydration. Chest x-ray carried out at the time showed an elevated left hemi-diaphragm with an air-fluid level at the level of the stomach (Fig. 6).

The patient had a nasogastric (NG) tube inserted, and 4.5 liters of fluid was drained from his stomach. Workup for gastrointestinal obstruction was initiated and the patient was ultimately diagnosed with small bowel obstruction due to intussusception. Follow-up echocardiogram after decompression of the stomach by NG tube 2 days after admission confirmed resolution of

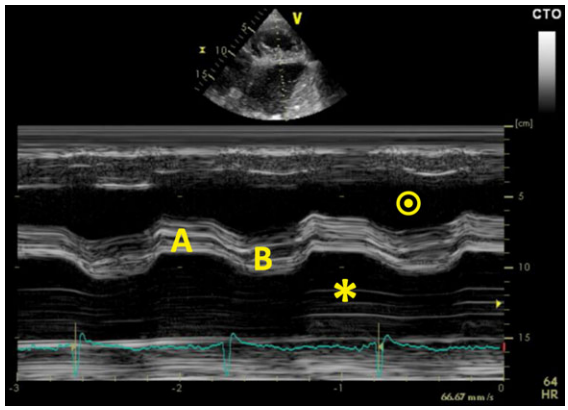

Figure 1. M-mode across the left ventricle in short axis. **A.** Diastole. **B.** Systole. *= distended stomach compressing the left ventricle; ⊙ = left ventricular cavity.

Address for correspondence and reprint requests: Antoine B. Abchee, M.D., Division of Cardiology, Department of Internal Medicine, American University of Beirut Medical Center, P.O. Box 11-0236/Internal Medicine, Riad-El-Solh 1107 2020 Beirut, Lebanon. Fax: +961-1-350814;
E-mail: aa14@aub.edu.lb

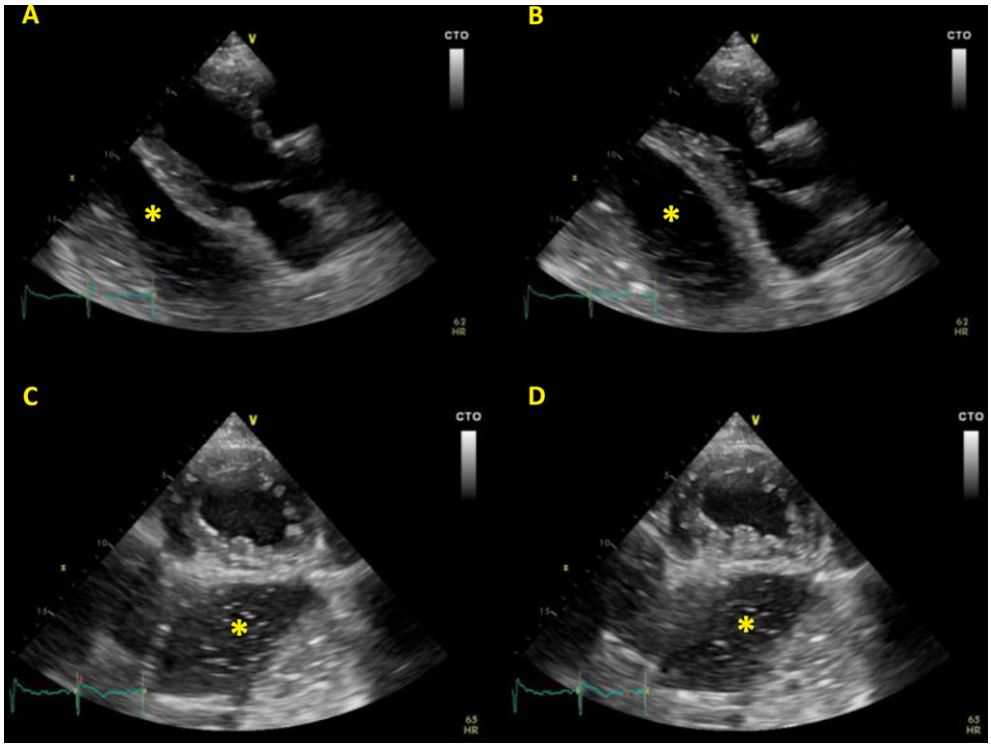

Figure 2. Diastolic collapse of the left ventricle. **A.** Systole in the three-chamber view. **B.** Diastole in the three-chamber view. **C.** Systole in the short-axis view. **D.** Diastolic in the short-axis view. (Movie clips S1 and S2). *= distended stomach compressing the left ventricle.

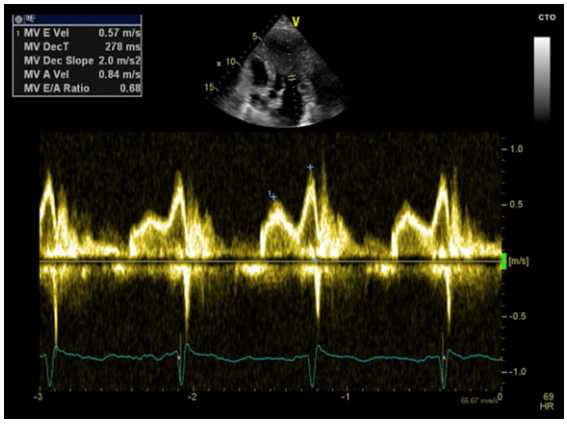

Figure 3. Mitral inflow showing grade I diastolic dysfunction.

the LV diastolic collapse (Figs. 7 and 8 and movie clips S3 and S4), with normalization of his blood pressure.

Discussion:

Collapse of cardiac chambers is not an uncommon finding on echocardiography. In cases of cardiac tamponade, classically, there is collapse of the right atrium (RA), the right ventricle (RV) and, less commonly, the left atrium (LA).[1,2] This is due to the low-pressure system in the right side of the heart, as well as the mechanical properties of the right-sided chambers compared with those on the left (less muscle mass, more compliance).[1,3] There have been, however, several reports of LV diastolic collapse. These were usually noted postoperatively due to pericardial fluid or hematoma.[1,4,5] In nonsurgical cases, the LV collapse due to a moderate pericardial effusion occurred in the presence of severe pulmonary hypertension and RV pressure overload, rendering the right side of the heart less collapsible.[3,6] In an experimental study, a gradual increase in intraabdominal pressure (IAP) up to 15 mmHg did not result in any significant change in left ventricular end-diastolic transmural pressure (LVEDTP) and, thus, cardiac output, left ventricular end-diastolic area (LVEDA), and left ventricular end-diastolic pressure (LVEDP) remained stable. However, upon continued increase up to an IAP of 30 mmHg, LVEDTP and LVEDA decreased.[7]

As far as we know, there has been no report of an extra-thoracic cause of LV collapse in diastole. The echocardiographic findings in our patient were due to a severely distended stomach that was elevating the left hemi-diaphragm and compressing the LV in the setting of a dry pericardium and no pleural effusion. Due to the lower pressure within the LV during diastole, the

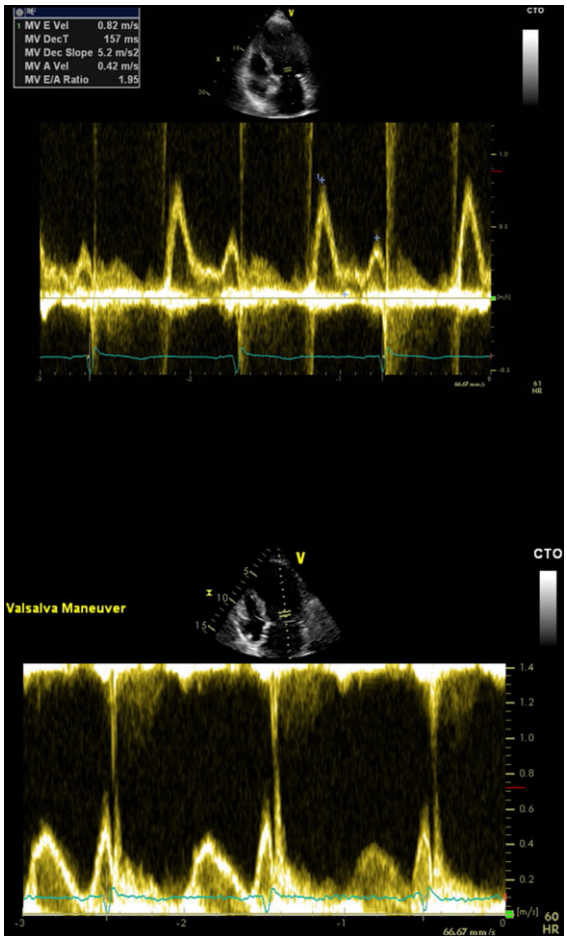

Figure 4. Baseline mitral inflow showing grade II diastolic dysfunction, as evidenced by a drop in the E wave with Valsalva maneuver.

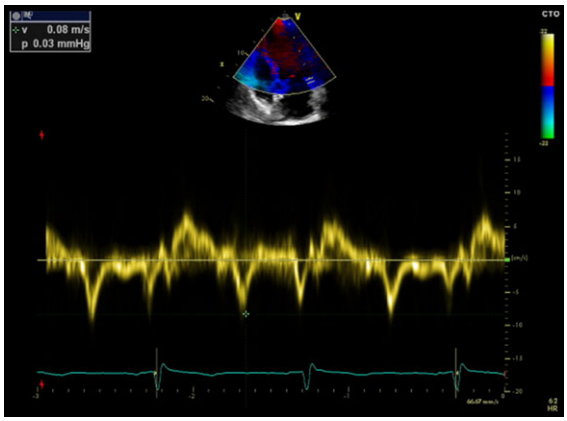

Figure 5. Baseline E′ velocity on tissue Doppler imaging, consistent with diastolic dysfunction.

distended stomach was able to compress the LV. In systole, this compression disappeared due to the high pressure generated by the contracting

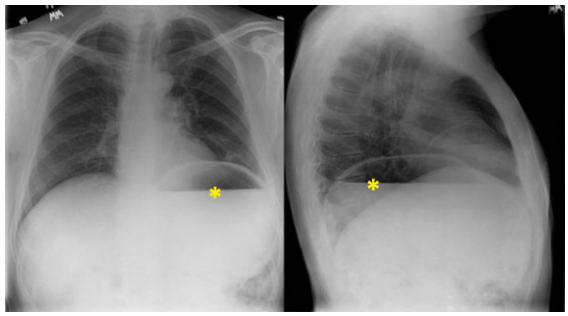

Figure 6. Chest x-ray with elevation of the left hemi-diaphragm due to a distended stomach with a gastric air-fluid level (*), suggesting obstruction.

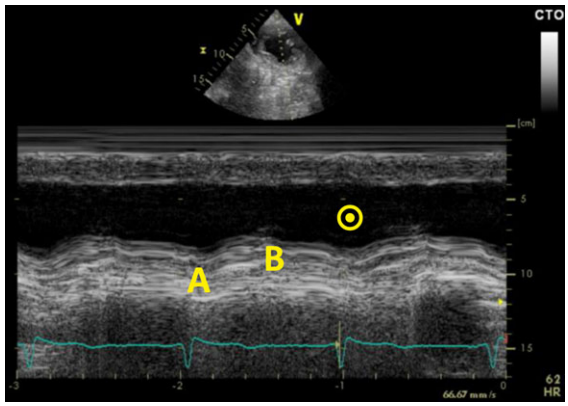

Figure 7. M-mode across the left ventricle in short axis. **A.** Diastole. **B.** Systole. = left ventricular cavity.

ventricle. Therefore, there appeared to be a paradoxically higher end-systolic dimension than the end-diastolic dimension of the LV. These findings disappeared after decompression of the stomach.

References

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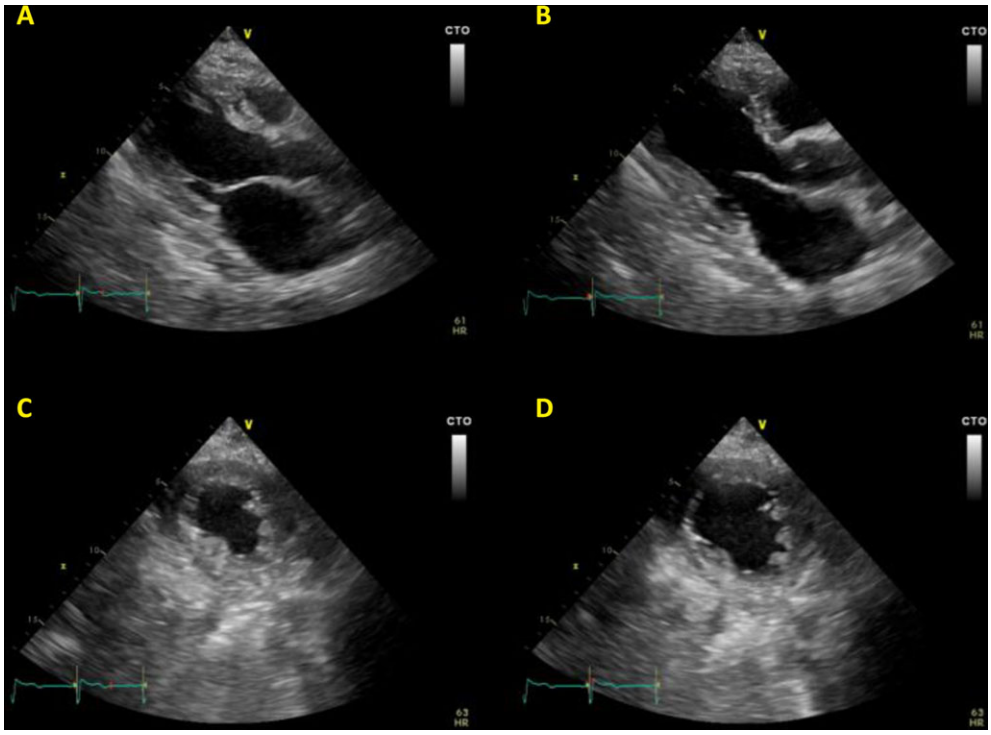

Figure 8. Resolution of diastolic collapse of the left ventricle. **A.** Systole in the parasternal long-axis view. **B.** Diastole in the parasternal long-axis view. **C.** Systole in the short-axis view. **D.** Diastole in the short-axis view. (Movie clips S3 and S4).

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Movie clip S1. Apical three-chamber view showing diastolic left ventricular collapse.

Movie clip S2. Parasternal short-axis view showing diastolic left ventricular collapse.

Movie clip S3. Parasternal long-axis view showing resolution of diastolic ventricular collapse.

Movie clip S4. Parasternal short-axis view showing resolution of diastolic ventricular collapse.