

A CASE OF SEVERE HYPOPHOSPHATEMIA CAUSING REVERSIBLE CARDIOGENIC SHOCK

BACKGROUND

- Severe hypophosphatemia (less than 1 mg/dL) is associated with cardiovascular complications, such as lethal arrhythmias and heart failure.
- The heart failure is often **reversible** and caused by the depletion of adenosine triphosphate in muscles, leading to decreased contractility.

CASE

- An 18 year old male with a past medical history of Type 1 diabetes mellitus was found unresponsive and brought to the emergency department, where he was intubated.
- He was diagnosed with diabetic ketoacidosis (DKA), with a serum bicarbonate less than 10 mg/dL, a serum glucose of 1059 mg/dL, a pH less than 7.0, and positive serum/urine ketones.
- He was transferred to the Medical Intensive Care Unit and started on crystalloids, insulin and bicarbonate infusions, vasopressors, and steroids.
- A few hours into the insulin infusion, his phosphate level decreased to **0.9 mg/dL** from an admission value of 7.9 mg/dL.
- Concordantly, his electrocardiogram (ECG) demonstrated a new right bundle branch block (Figure 1).
- High-sensitivity troponins were checked and peaked at **95,000 ng/dL**.

References:

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Cohen J, Kogan A, Sahar G, Lev S, Vidne B, Singer P. Hypophosphatemia following open heart surgery: incidence and consequences. *European Journal of Cardio-Thoracic Surgery.* 2004;26(2):306-310. doi:10.1016/j.ejcts.2004.03.004
Ariyoshi N, Nogi M, Ando A, Watanabe H, Umekawa S. Hypophosphatemia-induced Cardiomyopathy. *The American Journal of the Medical Sciences.* 2016;352(3):317-323. doi:10.1016/j.amjms.2016.04.013

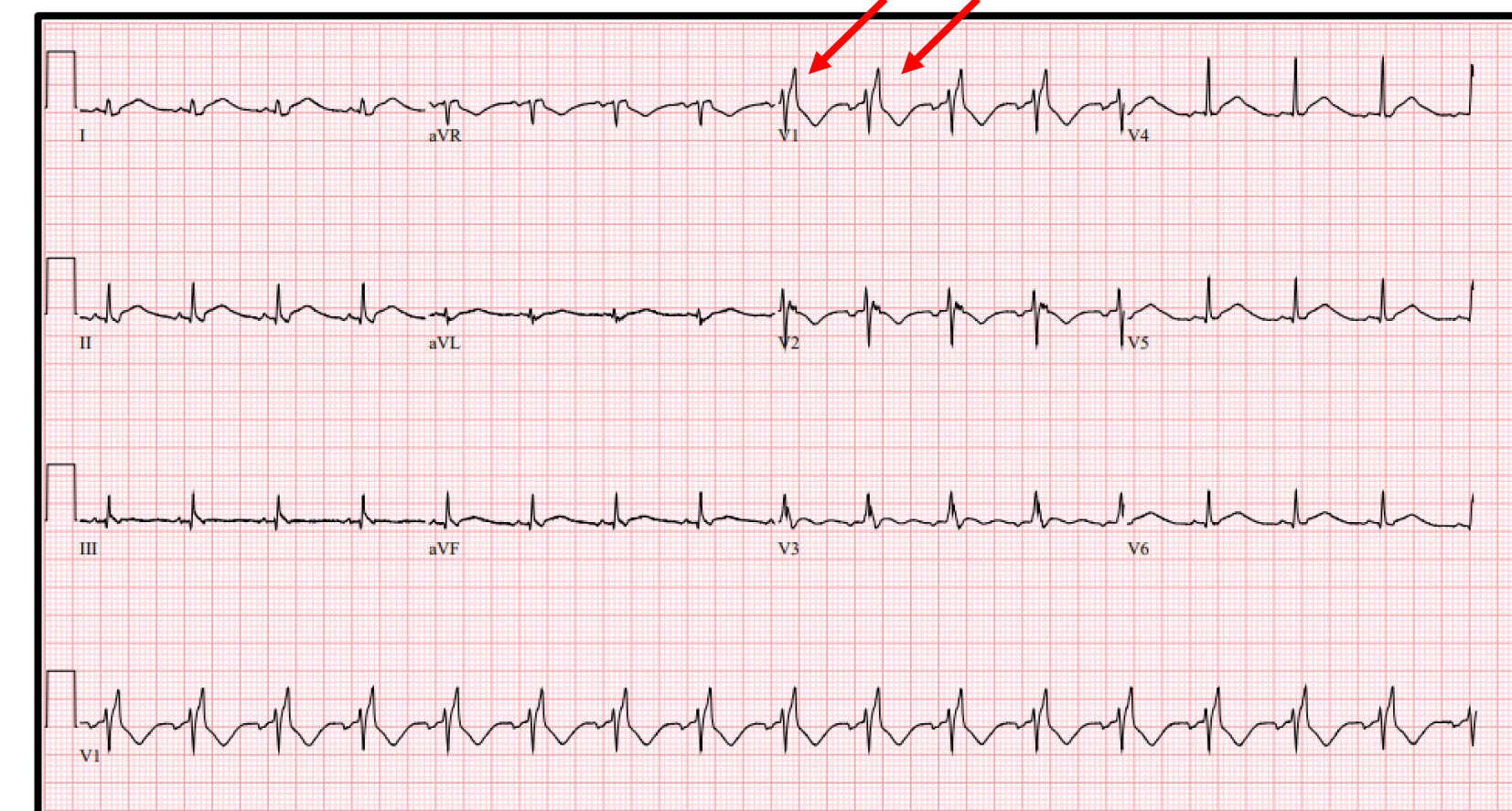


Figure 1. ECG demonstrating sinus tachycardia with a new right bundle branch block (RSR' pattern shown by red arrows)

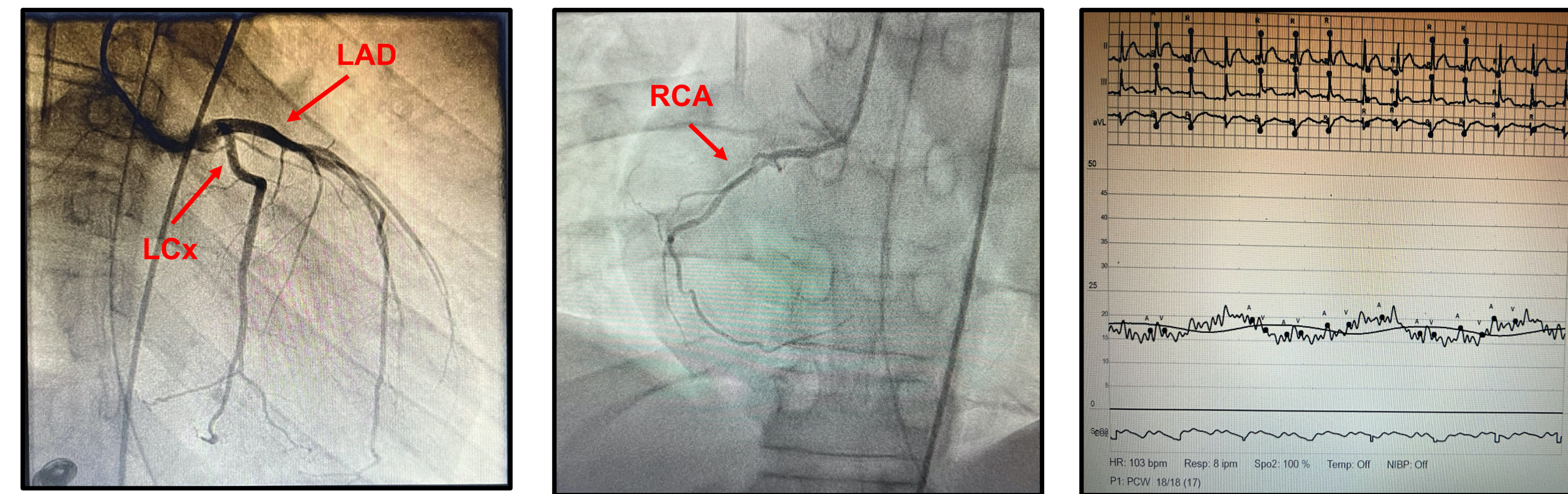


Figure 2. Left: RAO caudal view showing left anterior descending (LAD) and left circumflex (LCx) arteries; Center: RAO view showing the right coronary artery (RCA); Right: pulmonary capillary wedge pressure waveform demonstrating an elevated pressure of approximately 18 mmHg

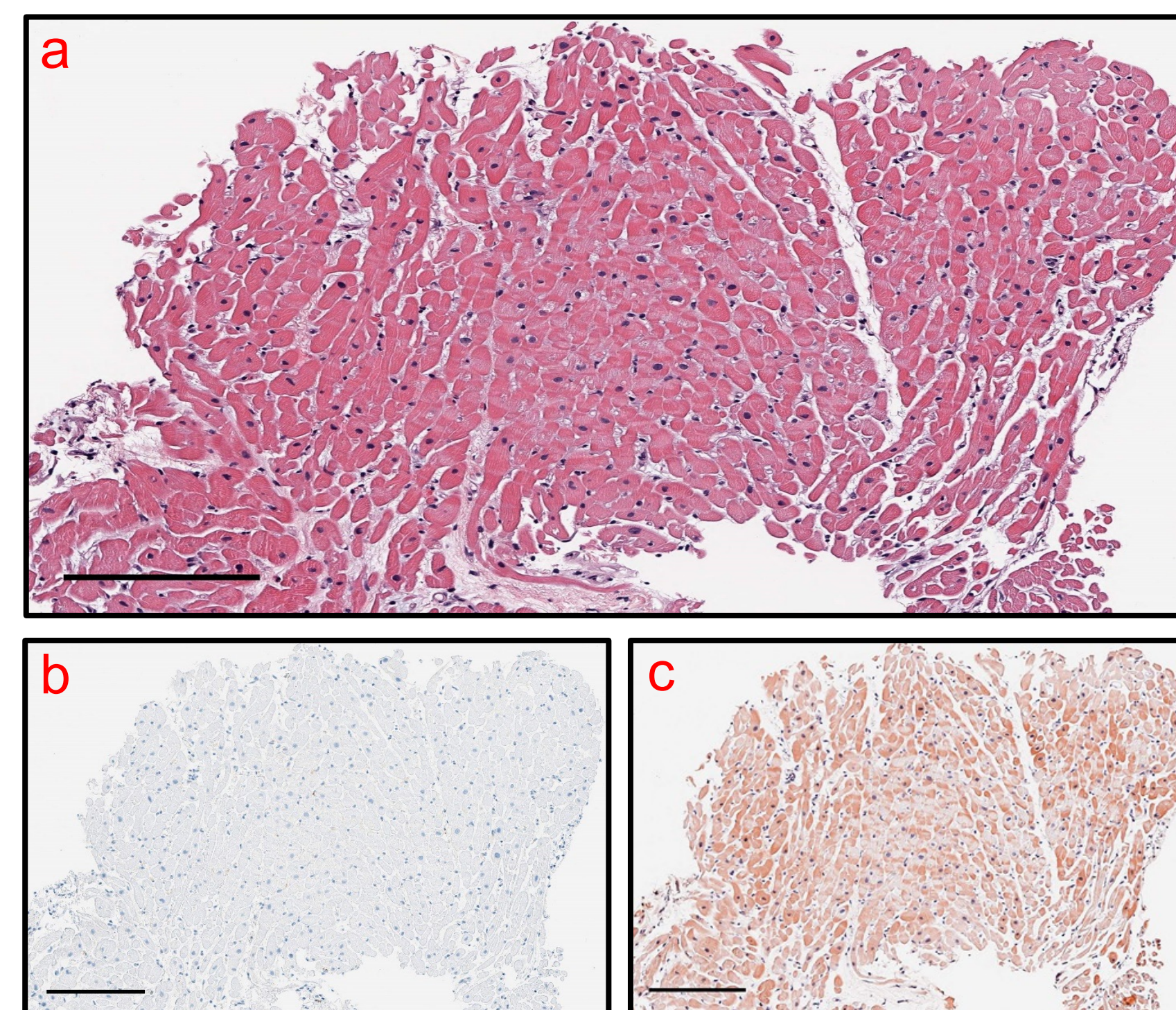


Figure 3. Hematoxylin and Eosin (H&E) stain of the endomyocardial biopsy showing histologically normal myocardium (a), without evidence of inflammation or amyloid deposition. The findings on H&E are supported by a CD3 immunostain that is negative for T-lymphocytes (b) and a Congo red immunostain that is negative for amyloid (c). Bars: 200 microns.

DIAGNOSTIC WORKUP

- Initial transthoracic echocardiogram (TTE) showed right ventricular dilation. A computerized tomography angiogram of the chest showed subsegmental pulmonary emboli and heparin was started.
- His shock worsened. A repeat TTE showed an ejection fraction (EF) of 10-20% with anterior-septal dyskinesis. Urgent left and right heart catheterizations were performed.
- The left heart catheterization showed mild luminal irregularities only (Figure 2).
- The right heart catheterization showed high intracardiac pressures with a cardiac index of 1.4 L/min/m² (Figure 2). A balloon pump was placed for cardiogenic shock.
- An endomyocardial biopsy did not show myocarditis (Figure 3).
- A viral panel was negative, as were other infectious serologies. Thyroid function tests showed euthyroid sick syndrome. Hemochromatosis testing was negative.
- The patient declined a cardiac MRI.

CONCLUSION

- Over a week, the DKA resolved, the patient was extubated, vasoactive agents and balloon pump support were weaned, and the electrolytes normalized. **His phosphate was aggressively repleted to >3.0 mg/dL.**
- EF improved to 60% by discharge.
- In conclusion, hypophosphatemia in DKA is imperative to recognize because it can cause reversible heart failure in the absence of coronary or myocardial pathology.