



# Images In Medicine

## Chest Pain as the Presenting Features of High Output Heart Disease Due to Congenital Arteriovenous Malformation

Anil T. Taner, Michael K. Atalay, MD, PhD, and Ned H. Gutman, MD

**A 19 year old woman with a right lower extremity arteriovenous malformation (AVM)** status post multiple embolizations presented to the emergency department with chest pain and shortness of breath. An EKG showed sinus tachycardia and left atrial enlargement. Cardiac enzymes were normal but D-dimer was elevated. CT-Angiography showed no pulmonary embolism. The patient was monitored overnight and discharged with a presumed diagnosis of pericarditis. An echo ordered six months later for palpitations showed bi-ventricular dilation and an **atrial septal defect (ASD)** with left to right shunting. Subsequent cardiac MRI confirmed an 8mm ASD with minimal shunting. Cardiac MRI also showed severe 4-chamber enlargement, normal bi-ventricular function, and a cardiac output of 10.8 l/min (Image (a), LA: left atrium; transaxial view. LV/RV: left/right ventricle; sp: spine). The patient was referred to a vascular clinic for surgical evaluation. Images (b)-(d) are from the most recent embolization (2005). Image (b) provides anatomic reference (knee: dashed arrow). Images (c) and (d) are subtraction images showing arterial and venous opacification, respectively, during catheter-based contrast injection. The superficial femoral artery (arrowhead), arteriovenous malformation (\*), and massive draining veins (solid arrows) are readily evident.

### DISCUSSION

Chest pain and shortness of breath in a young person is often attributed to anxiety, musculoskeletal causes, drug use or pulmonary embolism. In the case presented here, it is likely that the symptoms developed secondary to worsening high cardiac output state. The increase in cardiac output from an AVM can

cause both subendocardial perfusion defects as well as structural heart deformities. Treatment of AVMs may restore normal cardiac output and eliminate heart failure symptoms. Given the potential consequences of untreated high-output cardiac failure, it is important for physicians to recognize the condition early in the course and refer the patient for definitive treatment.

### REFERENCES

1. Cava JR, Sayger PL. Chest pain in children and adolescents. *Pediatr Clin North Am* 2004; 51: 1553-68.
2. MacRae JM, Pandeya S, et al. Arteriovenous fistula-associated high-output cardiac failure. *Am J Kidney Dis* 2004; 43: E17-22.
3. Webb, JB, O'Brien M. Early presentation of an extremity arteriovenous malformation. *Br J Plast Surg* 2004; 57: 785-8.

*Anil T. Taner is a 4<sup>th</sup> year student at the Warren Alpert Medical School of Brown University.*

*Michael K. Atalay, MD, PhD, is an Assistant Professor of Diagnostic Imaging at the Warren Alpert Medical School of Brown University.*

*Ned H. Gutman, MD, is a Clinical Assistant Professor of Medicine at the Warren Alpert Medical School of Brown University.*

### Disclosure of Financial Interests

The authors have no financial interests to disclose.

### CORRESPONDENCE:

Michael K. Atalay, MD, PhD  
email: MAtalay@lifespan.org

