

The Twisted Path: Unraveling a Hidden Threat in a Young Athlete

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Background

Anomalous coronary artery origins occur in ~1% of the population and account for ~17% of sudden cardiac death (SCD) in athletes. While anomalous right coronary artery (ARCA) is most common, left coronary anomalies are more often linked to SCD. An interarterial course may cause ischemia due to dynamic compression, ostial narrowing, or impaired perfusion during exercise. Diagnosing physiologic significance is challenging in well-trained athletes, especially if there is collateralization. Symptomatic cases, particularly with exertional dyspnea or reduced exercise tolerance, require thorough evaluation to determine if surgical intervention is warranted for definitive management.

History

An 18-year-old male high school lacrosse player presented for cardiovascular evaluation due to 1 year of progressive exertional dyspnea, primarily while sprinting. Bronchodilator therapy provided nor elief. He felt his level of conditioning was incongruent with his level of training, and he struggled to keep up with peers that played the same position. He denied chest pain, syncope, or palpitations, but endorsed chest tightness with deep inspiration during exertion. He had no known family history as he was adopted. His training included speed endurance, agility exercises and powerlifting, and excluded long-distance running. He denied smoking, drug use or supplements.

Exam/Imaging

The patient had normal vitals and unremarkable cardiopulmonary exam. ECG revealed normal sinus rhythm. Transthoracic echocardiography suggested a possible ARCA. Coronary computed tomography angiography (CTA) confirmed ARCA with interarterial and intramural course with mild ostial stenosis. Cardiac MRI demonstrated no myocardial scarring or ischemia. Exercise nuclear stress test was negative for ischemia, demonstrating excellent exercise capacity (20.3 METs). Cardiopulmonary exercise testing (CPET) with sprint testing confirmed supranormal aerobic capacity (peak VO₂ 51.4 ml/kg/min, 129% predicted), no myocardial ischemia or arrhythmia on electrocardiogram. Notably, there was a plateau of VO₂ and O₂ pulse at submaximal heart rate. Pulmonary function testing was unremarkable.

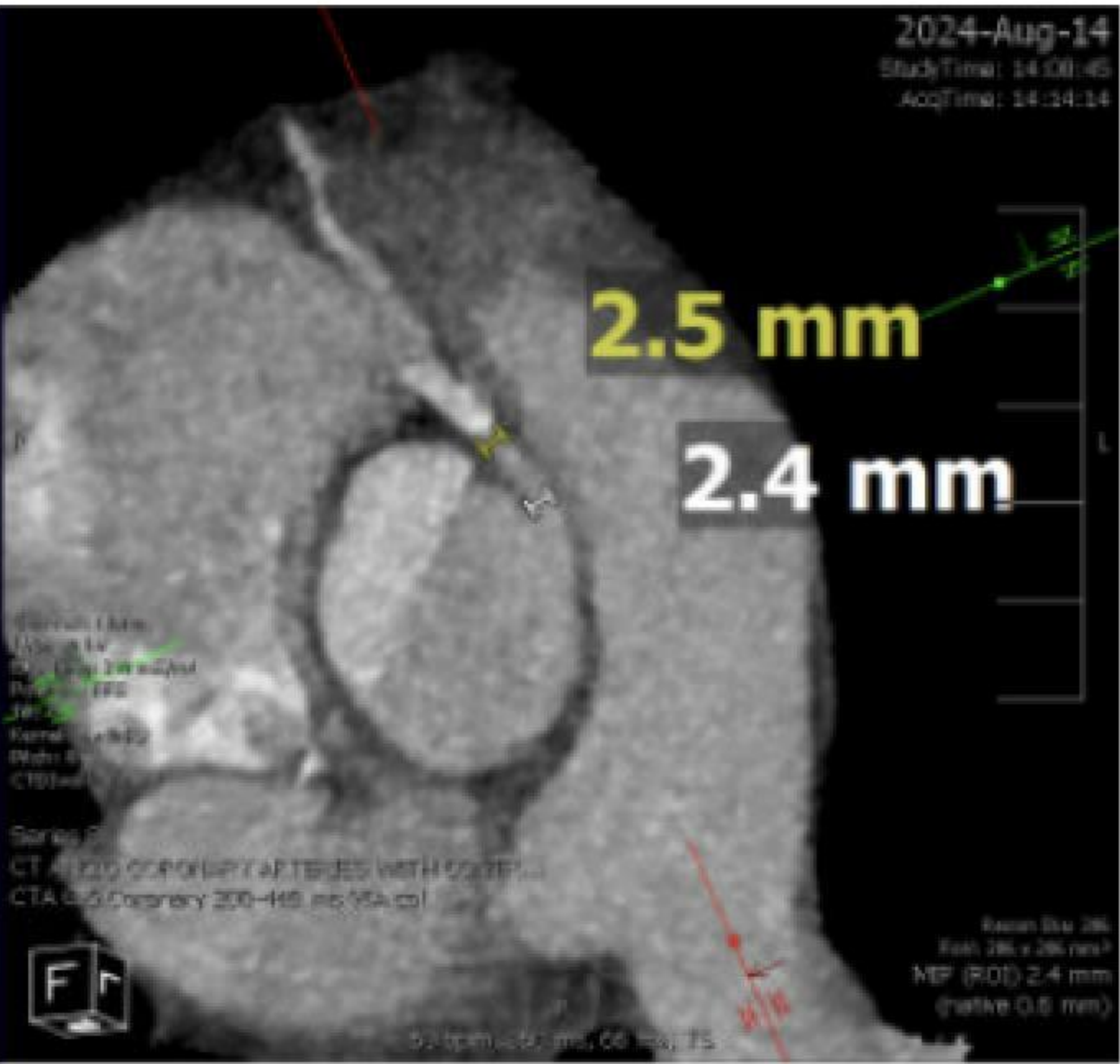


Image 1. Preoperative Coronary CTA

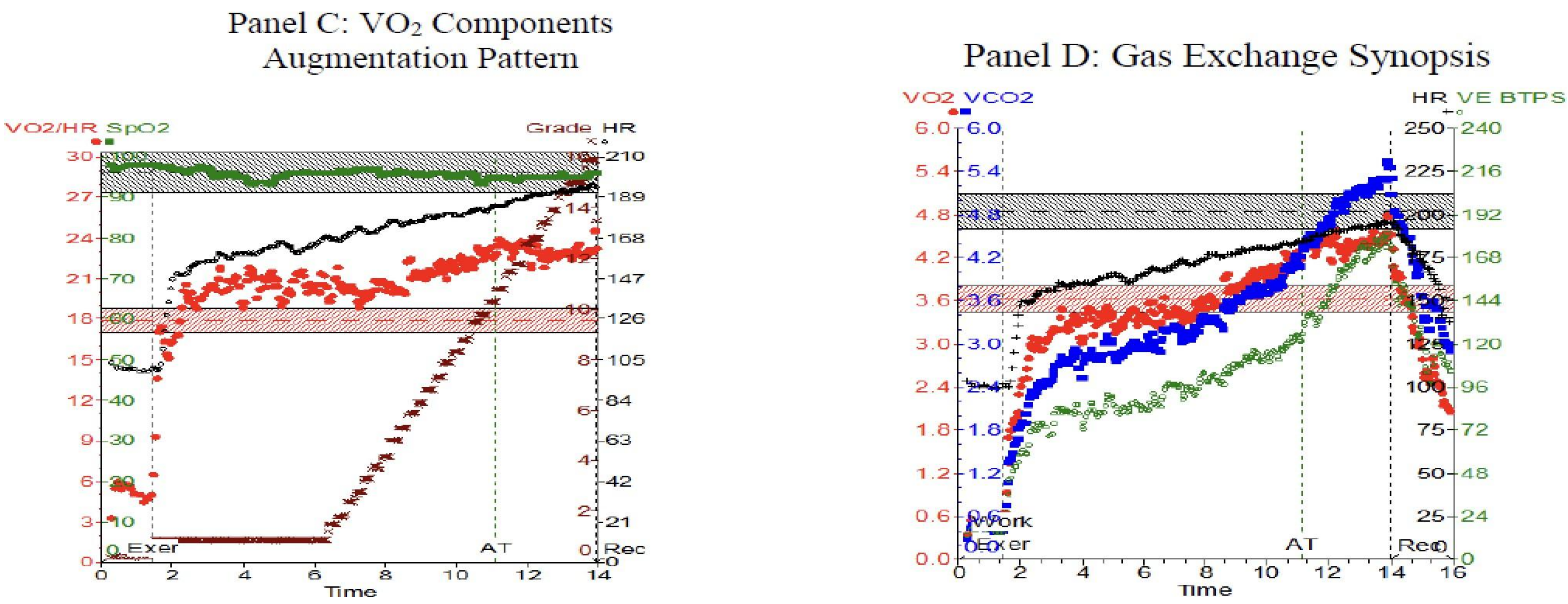


Figure 1. Preoperative Cardiopulmonary Exercise Test

Management

Despite supranormal exercise capacity and negative stress imaging, the premature plateau in VO₂ was concerning for ischemia. A multidisciplinary approach, including sports cardiology, congenital heart disease, and cardiac surgery, was implemented. With shared decision making, surgical management was pursued. The patient underwent a mini-sternotomy with unroofing and neo-ostium creation of the ARCA. Intraoperative TEE confirmed proper RCA repositioning. He had no postoperative complications, was weaned off vasopressors, and started on aspirin, low-dose beta-blockade, and colchicine for pericarditis prophylaxis. He remained hemodynamically stable and without evidence of ischemia or arrhythmia. He progressed well and was discharged home on postoperative day three.

Patient outcomes

At his sports cardiology follow-up approximately 8 weeks postop, he demonstrated significant progress. Heresumed daily exercise, including 30 minutes of jump rope and lower-body strength training, without dyspnea or chest pain. CPET showed a peak VO₂ of 48.4 ml/kg/min (119% predicted) with no ischemia, though resting heart rate increased to 71 bpm. His continued improvements suggested a successful surgical outcome and reduced risk of sudden cardiac death. Furthermore, he subjectively reported marked improvement in his exertional symptoms. He had yet to resume full lacrosse participation but was on track for clearance, with expectations of gradual return to high-level athletics.

Clinical Implications

This case highlights the challenge of diagnosing and managing coronary anomalies in athletes with exertional dyspnea. While pulmonary causes are common, structural cardiac anomalies must be considered when symptoms exceed expected conditioning. As clinical signs of ischemia may be subtle, comprehensive evaluation beyond standard testing is required. Absence of ischemia does not indicate absence of clinical benefit from correction. Surgical intervention can restore perfusion, alleviate symptoms, and reduce sudden cardiac death risk. A multidisciplinary approach is essential, with management guided by symptoms, anatomical risk, and ischemia. Postoperative care includes gradual return to play with serial testing to ensure safe competition. This case underscores the need for a high index of suspicion for coronary anomalies in athletes with inordinate exertional dyspnea, emphasizing the importance of comprehensive evaluation. beyond standard ischemia testing, as surgical correction can provide significant clinical benefit even in the absence of overt ischemia, ultimately reducing sudden cardiac death risk and ensuring safe return to play.