

A Widowmaker in the Storm

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Case Presentation

The patient is a 47-year-old female with a past medical history of heart failure secondary to tachycardia-induced cardiomyopathy, Graves' disease, and a 30-pack-year smoking history who presents to the emergency department with two days of worsening, episodic, severe chest pain. Associated symptoms include tachycardia, fevers, diarrhea, and dyspnea. She endorses poor compliance with all of her medications.

On exam she is hypertensive and tachycardic; appears distressed, diaphoretic and agitated with exophthalmos and bilateral pretibial myxedema. Labs significant for high-sensitivity troponin (hs-cTn) 613 ng/L, TSH <0.008 mIU/mL, and free T4 (FT4) 3.92 ng/dL. An ECG showed sinus tachycardia. Her Burch Wartofsky Point Scale is 40, consistent with an impending thyroid storm.

She is started on propylthiouracil (PTU) and propranolol. She develops crushing chest pain and an ECG now shows dynamic ST-segment and T-wave changes in the right and lateral precordial leads. The pain resolves with nitroglycerine. An echocardiogram is obtained and shows a reduction in her ejection fraction from 45% to 20% over the past six months. Coronary angiography reveals a 70% left main stenosis with multiple smaller lesions.

She undergoes a coronary artery bypass graft with two grafts, one bypassing her critical LM stenosis and the other her symptomatic RCA lesion. Her recovery is uncomplicated and she is discharged home on methimazole and standard goal-directed medical therapy for her heart failure. She is seen at a three-month follow up visit at which time she is asymptomatic. A repeat echocardiogram at that time shows an improvement in her ejection fraction back up to 40%.

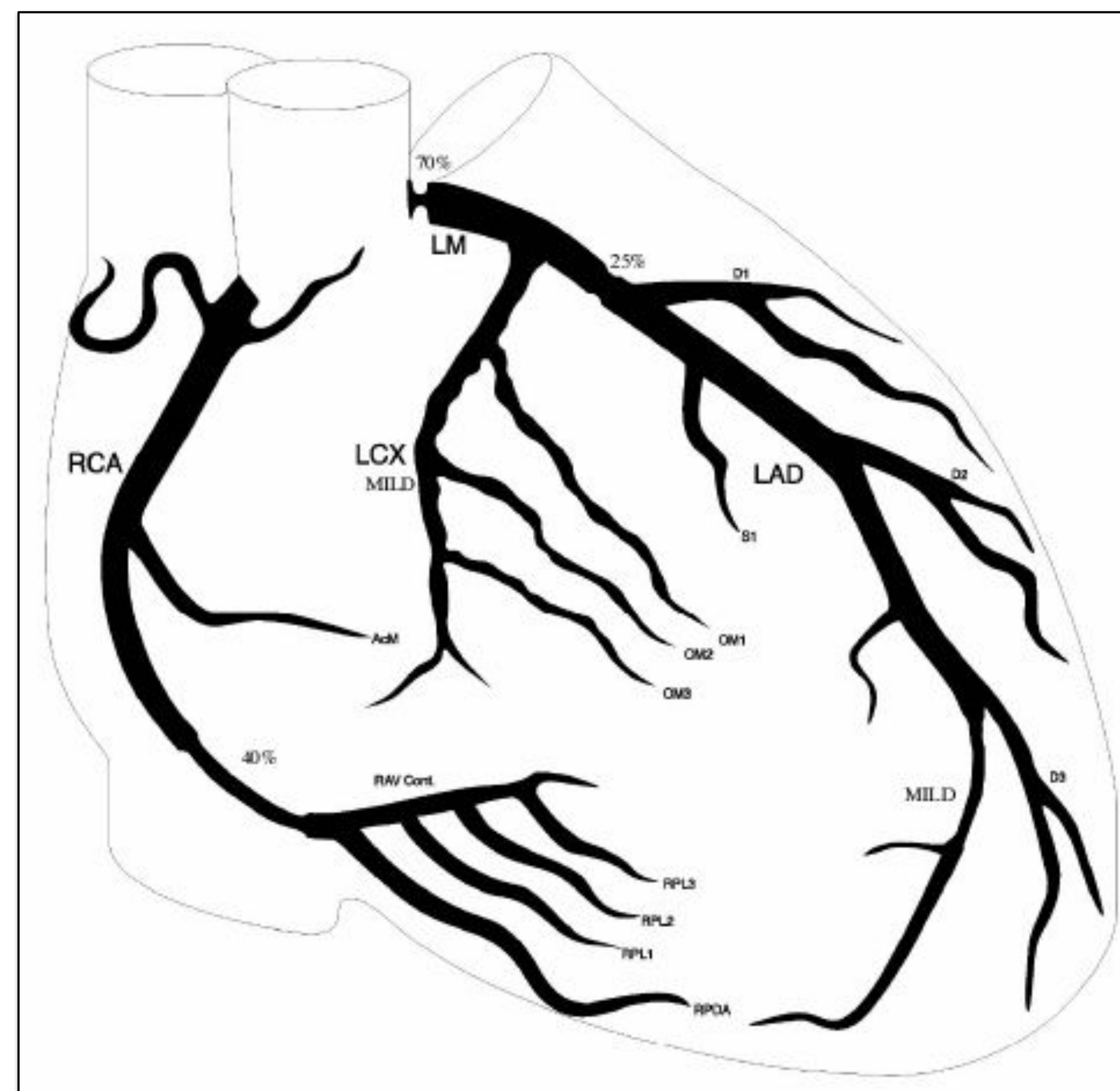


Figure 1: Coronary angiogram showing 70% left main stenosis, 25% proximal left anterior descending artery stenosis and a long 40% stenosis of the mid-right coronary artery. There is diffuse calcific disease noted along the left circumflex coronary artery.

References

Beyer C, Plank F, Friedrich G, Wildauer M, Feuchtnr G. Effects of Hyperthyroidism on Coronary Artery Disease: A Computed Tomography Angiography Study. *Can J Cardiol*. 2017 Oct;33(10):1327-1334. doi: 10.1016/j.cjca.2017.07.002. Epub 2017 Jul 17. PMID: 28867263.

Chudleigh RA, Davies JS. Graves' thyrotoxicosis and coronary artery spasm. *Postgrad Med J*. 2007;83(985):e5. doi:10.1136/pgmj.2007.062299

Discussion

Thyroid storm is a rare, life-threatening complication of Graves' disease that typically arises in the setting of untreated or undertreated severe hyperthyroidism. Graves' disease carries an established risk of cardiac arrhythmias and cardiomyopathy, including coronary vasospasm, which we likely saw during her episode of crushing chest pain. There is also evidence to support the presence of coronary artery spasm in patients with overt hyperthyroidism (Chudleigh, 2007).

Given her history of tachycardia-induced cardiomyopathy it's not surprising that she had such a significant reduction in her ejection fraction in the setting of thyrotoxicosis. The extent of her coronary artery disease at 47-years-old is remarkable. The evidence linking hyperthyroidism to coronary artery disease is very limited. A retrospective study comparing the rates of coronary artery stenosis on coronary CTA found that patients with overt as well as subclinical hyperthyroidism had more high-grade stenosis than those with euthyroidism (Beyer, 2017).

Conclusion

This case underscores the importance of keeping a wide differential when treating hospitalized patients. It would have been easy to attribute her cardiac decompensation and chest pain to her thyrotoxicosis and coronary artery spasm however it's essential to rule-out ischemia in patients with worsening heart failure, even in the setting of known precipitating events. While there is strong evidence linking Graves' disease and hyperthyroidism to cardiac arrhythmias and cardiomyopathy, less is known about the increased risk of coronary artery disease in this population. More studies are needed to further examine this relationship and establish guidelines.