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CASE REPORT

BEGINNER

CLINICAL CASE

ST-Segment Elevation Myocardial Infarction in a Young Woman

Undiagnosed Turner Syndrome

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ABSTRACT

We report a case of a 34-year-old woman who presented with an ST-segment elevation myocardial infarction with acute heart failure and a subsequent diagnosis of mosaic Turner syndrome (TS). The report also discusses cardiovascular disease in patients with TS and the current recommendations for screening and follow-up in these patients. (**Level of Difficulty: Beginner.**) (J Am Coll Cardiol Case Rep 2020;2:55-8) © 2020 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

HISTORY OF PRESENTATION

A 34-year-old woman of European ancestry with a past medical history of anxiety, obesity, hyperlipidemia, and pre-diabetes presented with a chief symptom of chest pain. She confirmed a 10-day history of intermittent chest pain for which she had already been evaluated twice as an outpatient, with reportedly normal chest radiographs and electrocardiograms. Her chest pain occurred at rest and was substernal with radiation to the left arm. On the day of presentation, she became acutely diaphoretic with her chest pain, which was still present at the time of our evaluation. She denied syncope, shortness of breath, or nausea. She had never smoked or consumed alcohol or illicit drugs. She was married and, by choice, had never been pregnant. She had no family history of early ischemic heart disease.

She was afebrile, with a heart rate of 140 beats/min, and had a blood pressure of 161/113 mm Hg and an oxygen saturation of 97% on room air. She was obese and of short stature (167 lbs, 59 inches tall, body mass index of 33.7 kg/m^2, body surface area of 1.78 m^2), and she had a short neck. She appeared anxious, had regular tachycardia, and had no murmurs, rubs, or gallops. Her lungs were clear bilaterally, and her breathing was non-labored when she was lying flat. Her distal extremities were cool. She had no peripheral edema.

LEARNING OBJECTIVES

- Recognize TS as a cause of early cardiovascular disease in women.
- Apply current recommendations for cardiovascular screening and follow-up for patients with TS.

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Informed consent was obtained for this case.

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ABBREVIATIONS AND ACRONYMS

ASI = aortic size index

LAD = left anterior descending coronary artery

TS = Turner syndrome

PAST MEDICAL HISTORY

She had a history of obesity, polycystic ovarian syndrome, pre-diabetes on metformin, untreated hyperlipidemia, generalized anxiety disorder, and congenital malposition of the ureters.

DIFFERENTIAL DIAGNOSIS

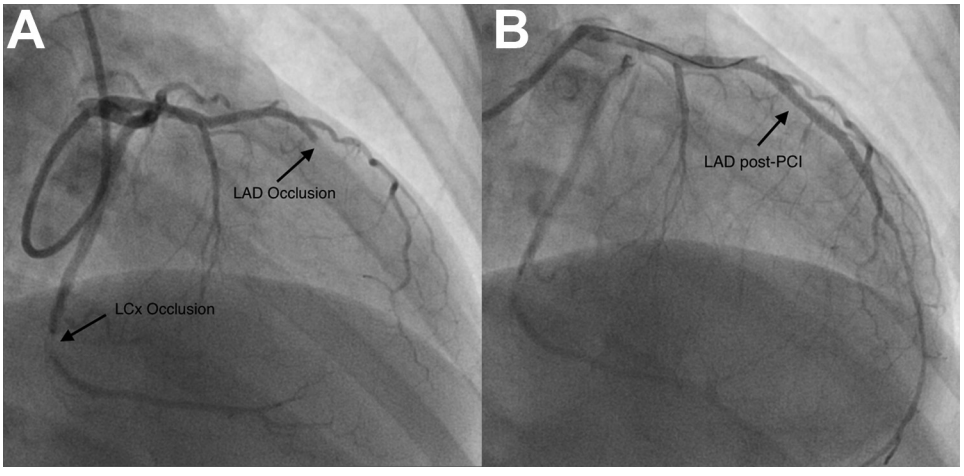
The differential diagnosis included acute coronary syndrome, pericarditis, tachyarrhythmia, aortic dissection, pulmonary embolism, esophageal spasm, gastroesophageal reflux, musculoskeletal pain, and pleurisy.

INVESTIGATIONS

An electrocardiogram in the emergency department showed anterior ST-segment elevation with a normal QTc interval. Emergency coronary angiography (Figures 1A and 1B) revealed 100% occlusion of the mid-left anterior descending artery (LAD). She also had 60% to 70% stenosis of the ostial LAD and 70% to 80% stenosis in the distal co-dominant left circumflex artery. She underwent insertion of 2 overlapping drug-eluting stents to the mid-LAD culprit lesion, and on the following day she underwent staged intervention with a drug-eluting stent to the left circumflex artery lesion. During left-sided heart catheterization, she was also noted to have an ascending thoracic aortic aneurysm on the left ventriculogram (Figure 2). She had otherwise normal coronary anatomy without evidence of anomalous coronary arteries or coronary fistulas. Transthoracic echocardiography showed a left ventricular ejection fraction of 25% with apical akinesis, severely reduced right ventricular systolic function, and a normal tricuspid aortic valve. She had combined hyperlipidemia: total cholesterol, 220 mg/dl; low-density lipoprotein, 162 mg/dl; high-density lipoprotein, 35 mg/dl; and triglycerides, 255 mg/dl. Her hemoglobin A1c was 5.3%, and her thyroid-stimulating hormone level was normal.

Given the presentation of an ST-segment elevation myocardial infarction in a young woman with limited cardiovascular risk factors, we were concerned that she could have a genetic predisposition to early ischemic heart disease. Further history revealed a history of congenital ureter malposition requiring surgical reimplantation, late menarche, irregular menstrual periods that led to a diagnosis of polycystic ovarian syndrome, and a learning disability in early education. This history, in combination with her short stature, short neck, and ascending aortic aneurysm in a young woman with early ischemic heart disease, raised our suspicion for Turner syndrome (TS). With the patient's permission and guidance by the genetics consultation team, we ordered a karyotype analysis that, post-discharge, confirmed mosaic TS with 13 of the 30 sampled cells from serum showing the diagnostic 45X karyotype.

FIGURE 1 Coronary Angiography

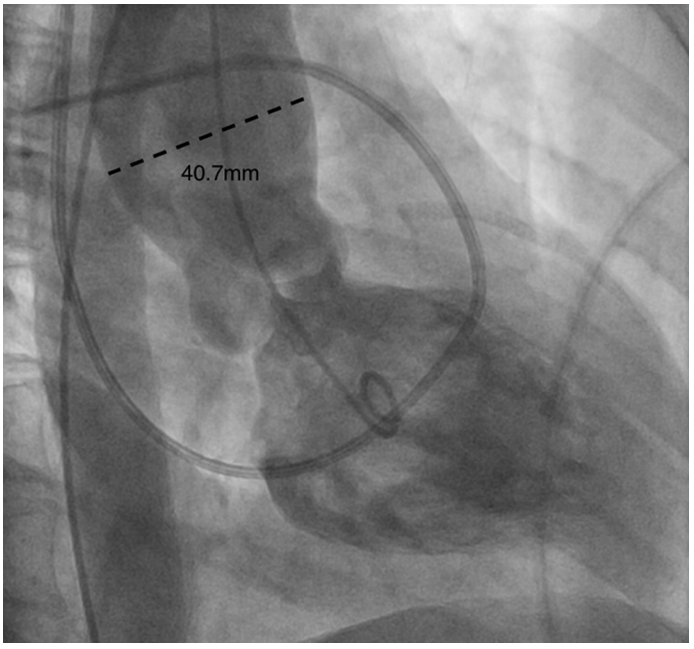


(A) Coronary angiography with a view of the completely occluded mid-left anterior descending coronary artery (LAD) and the nearly occluded distal left circumflex artery (LCx). **(B)** View of the LAD after percutaneous coronary intervention (PCI) with overlapping drug-eluting stents.

MANAGEMENT

Her myocardial infarction, hyperlipidemia, and heart failure were managed according to national guidelines. A genetics consultant saw the patient and her family in the hospital to assist us in providing further information and in answering questions about TS pending final genetic confirmation of TS. The patient experienced significant anxiety related to the procedures and medical management necessary for her acute myocardial infarction, as well as the pending genetic work-up, so no further imaging of the aorta was obtained while she was an inpatient. Using the ascending aortic diameter of 4.07 cm obtained at angiography and her body surface area of 1.78 m^2, her aortic size index (ASI) calculates to 2.29 cm/m^2, the relevance of which is discussed in the next section.

FIGURE 2 Left Ventriculogram



Left ventriculogram showing an ascending aortic aneurysm with a diameter of approximately 4 cm as indicated by the **dotted line.** Ascending aorta dilatation is a common cardiovascular manifestation of Turner syndrome that requires surveillance imaging.

DISCUSSION

TS affects approximately 1 in 2,000 to 2,500 live female births (1), and roughly one-half of TS patients have mosaicism with a milder phenotype than those with a 45X karyotype (2,3) that can lead to a delayed diagnosis. Cardiovascular disease is a major cause of morbidity and early mortality in patients with TS. Some of the most common cardiovascular manifestations in TS are bicuspid aortic valve, aortic coarctation, ascending aorta dilatation, aortic dissection, and ischemic heart disease. It is postulated that TS patients are at higher risk for early ischemic heart disease secondary to increased prevalence of risk factors such as hypertension, hyperlipidemia, impaired glucose tolerance, obesity, and estrogen deficiency (1,4). One British cohort study showed a nearly 3-fold increased risk of ischemic heart disease and a 24-fold increased risk of aortic aneurysm in women with TS compared with the control group (4).

In 2018 the American Heart Association released a scientific statement with recommendations for cardiovascular screening and treatment in TS patients (5). TS patients should undergo transthoracic echocardiography, or preferably cardiac magnetic resonance if able to participate, at the time of diagnosis. Tomographic imaging is preferred because concomitant abnormalities of the aortic arch and descending aorta (including coarctation) are not easily visualized on echocardiography. The scientific statement recommends use of the ASI for risk stratification of aortic disease in TS patients 15 years of age or older. The ASI is calculated by dividing the ascending aorta diameter by the body surface area. Patients with an ASI <2.0 cm/m^2 should have repeat imaging every 10 years or before an anticipated pregnancy, whereas patients with an ASI >2.3 cm/m^2 should undergo repeat imaging yearly. Patients with an ASI of 2.0 to 2.3 cm/m^2 need repeat imaging every 3 to 5 years. The presence of a bicuspid aortic valve, aortic coarctation, and/or hypertension warrants closer surveillance with repeat imaging every 2 to 3 years in patients with an ASI of ≤ 2.3 cm/m^2 and every 6 months to 1 year in patients with an ASI >2.3 cm/m^2. Operative management should be considered for adults with TS and an ASI ≥ 2.5 cm/m^2.

Primary and secondary prevention of atherosclerotic cardiovascular disease in patients with TS should follow national guidelines. A small randomized controlled trial in TS women ($n = 21$; mean age 32 years) suggested potential benefits of oral estradiol or levonorgestrel therapy on central arterial hemodynamics and insulin sensitivity, but not on lipoprotein levels; the study was not powered to assess cardiovascular events (6). Hormonal therapy is ill-advised in the secondary prevention setting. Postmenopausal hormone replacement therapy has not reduced cardiovascular events among women with coronary artery disease and has not favorably altered

angiographic disease progression while increasing risk of thromboembolic events (7).

FOLLOW-UP

One month after discharge, our patient reported mild dyspnea with exercise and occasional orthostasis, but she was otherwise asymptomatic. Repeat echocardiography showed an improvement in left ventricular ejection fraction to 40% with persistent hypokinesis of the apex and normalization of right ventricular systolic function. The aortic aneurysm was not well visualized on transthoracic echocardiography, and it will require further surveillance with cardiac magnetic resonance.

CONCLUSIONS

TS is a condition that poses a significantly increased risk of cardiovascular disease in women. It is important that this risk is recognized early on and that patients with TS receive close, multidisciplinary follow-up to address their cardiovascular risk factors as well as reproductive challenges and psychosocial needs.

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