You're the Flight Surgeon

This article was prepared by Anthony L. Mitchell, M.D., M.P.H.

You are the flight surgeon at a joint base with active duty, Guard, and Reserve members. Your first patient in the morning is an urgent care visit, a 48-yr-old female Air Force pilot currently on active duty status who complains of severe lack of energy for the past few weeks with an episode of "feeling hot" and vague discomfort around her epigastric area with radiation to her right shoulder/back that woke her up from sleep around 3 a.m. Her fatigue symptoms became noticeable about 2 wk ago when she was unable to complete her usual workout program, although she admits to picking up the intensity in preparation for an upcoming physical training test. She scored an excellent on her most recent physical training test 8 mo ago. She additionally describes the episode as a sudden onset of feeling flushed with a vague fullness across her shoulders with some nausea and mild shortness of breath. The episode lasted about 20–30 min and went away after taking an oral antacid. She finally decided to present for evaluation when her symptoms returned after she ate breakfast. She reports having a similar although less severe episode yesterday, but thought it was heartburn due to stress from work. She took Maalox, with relief of her symptoms after an hour and sitting in her office. She reports no history of similar symptoms prior to onset of symptoms over the past 2 d.

In her review of systems, she denies chest pain, pain with eating, diaphoresis, melena, hematochezia, lightheadedness, headache, weakness, diarrhea, or constipation. She just completed her most recent menstrual cycle 4 mo ago and took a home pregnancy test 2 d ago that was negative. During a recent deployment to Southwest Asia, she lost 20 lb, which she attributes to exercise and diet. She had been under stress during her deployment because she had to leave her small children behind and her mother had a transient ischemic attack during her deployment. She was treated for depressive symptoms during her deployment but has stopped treatment since her return. She has no other family history. She only takes pravachol for hypercholesterolemia besides the Maalox noted above and does not use tobacco or illicit drugs. She does not take any supplements or use performance-enhancing drugs. She drinks alcohol only socially, averaging less than one drink a week and never more than two drinks at one time. She is married and had her second child 11 yr ago.

She appears comfortable on exam. She is 64 in tall and weighs 135 lb with a calculated body mass index of 23.1. She is afebrile with a blood pressure of 125/70. She has a heart rate of 109 bpm, respiratory rate of 20 breaths/min, and a pulse oximeter reading of 100% on room air. Head, eyes, ears, nose, and throat exam is within normal limits. Her heart and lung examination is normal to auscultation, and she denies pain on deep inspiration. She had a nontender abdomen. She has no hepatosplenomegaly and her liver span is 9 cm. Bowel sounds are normal and no abdominal bruits are appreciated. She has no rebound or guarding. Her extremities have no tenderness, clubbing, cyanosis, or edema. An electrocardiogram (EKG) shows normal sinus rhythm with sinus tachycardia. Her EKG from 1 yr ago reveals normal sinus rhythm without tachycardia and no other acute changes.

1. What medical problem does this airman most likely have?

A. Biliary colic.
B. Gastro-esophageal reflux disease.
C. Pulmonary embolism.
D. Cardiac ischemia.

ANSWER/DISCUSSION

1. D. Cardiac ischemia. Chest pain is the hallmark and critical symptom used to initiate diagnostic testing for acute coronary syndrome (ACS). However, up to 35% of patients with ACS do not report chest pain and approximately 18% of patients with ACS are younger than 55 yr of age.[3] Additionally, these patients are frequently misdiagnosed and experience greater hospital morbidity and mortality compared to those who present with chest pain.[1] The Gender and Sex Determinants of Cardiovascular Disease: From Bench to Beyond Premature Acute Coronary Syndrome study notes that one in five women under the age of 55 with diagnosed ACS do not report chest pain.[7] The most commonly reported symptoms in ACS occurring without chest pain were weakness, feeling hot, shortness of breath, cold sweats, and pain in a shoulder. In ACS, as with this case, worsening symptoms or symptoms that occur at rest are also an important consideration. The presence of tachycardia has also been noted to be independently associated with ACS in

DOI: https://doi.org/10.3357/AMHP.4802.2017

women.[2] While strong consideration can be given to the other diagnoses in her differential, this patient has several noted historical features and risk factors, such as worsening symptoms and symptoms that now occur at rest, perimenopause, depression, and hyperlipidemia, that make cardiac ischemia a possible diagnosis until proven otherwise.

Biliary tract disease is a strong consideration, as this patient has the principal risk factors of age and gender and secondary risk factors of weight loss, multiparity, and abstinence from alcohol. However, she has more risk factors and symptoms consistent with ACS. Additionally, even if her current episode is secondary to biliary disease, it does not carry the same mortality risk as ACS; thus, ACS must first be ruled out. Pulmonary embolism is unlikely given the intermittent nature of her symptoms, no pleuritic chest pain, and no significant risk factors for deep vein thrombosis (oral contraceptives/prolonged immobilization). Gastro-esophageal reflux disease is also a consideration, but given the ineffectiveness of Maalox and other associated symptoms, ischemic heart disease is likely and should be excluded first.

The patient is currently not in pain but is given baby aspirin to chew and lab work is drawn. Complete blood count, urinalysis, comprehensive metabolic panel, and cardiac enzymes with troponin-I are all normal. Liver function tests along with amylase and lipase are also normal. Pregnancy test is negative. At this time the patient continues to be without symptoms and vital signs are stable, and she would like to know your plan.

2. The most appropriate disposition for this patient at this time would be to send her

A. For an urgent outpatient stress test in the next 24 h.
B. For cardiology consultation in the next 3 to 5 d.
C. To the closest emergency department for further evaluation and admission.
D. Home with quarters since the EKG was nondiagnostic and labs were normal.

ANSWER/DISCUSSION

2. C. Send the patient to the closest emergency department for further evaluation. Once the suspicion of an ACS is seriously entertained, it should be treated as potentially life threatening until proven otherwise, particularly in light of the diagnostic challenges of evaluating a patient with potential ACS. For example, in two series of patients, the initial EKG was nondiagnostic in 45% and normal in 20% of patients subsequently shown to have a myocardial infarction (MI).[6,12] Additionally, serial EKGs and serial cardiac enzymes are standard approaches for patients with sufficient pretest probability and are proven to increase sensitivity in detecting ACS. While cardiology consultation and further studies such as a stress test are appropriate, for this particular patient, obtaining them during a period of observation would be more appropriate.

During hospitalization, the patient had negative serial cardiac enzymes and no EKG changes, although her tachycardia resolved. She performed a treadmill stress test with stress echocardiogram. She exercised for 21 min on a standard Bruce treadmill protocol and achieved 100% of her maximum predicted heart rate without ischemic EKG changes. Although she denied chest pain or other symptoms, she did note she felt more fatigued than expected. Her resting echocardiogram images demonstrate normal left ventricular size and thickness with normal contractility. Exercise images reveal a moderate decrease in contractility of the distal anterior wall and apex suggestive of ischemia. Coronary angiography demonstrates a 75–90% left anterior descending stenosis, which is treated with a stent. She tolerates the procedure well and is back to her workout and regular duties within 6 mo of the procedure. She approaches her flight surgeon regarding her opportunity to return to flying, but for her family she wants to know her risk for having more cardiac problems.

3. Military aviators with mild to moderate coronary artery disease (CAD) or post-revascularization with normal perfusion, based on U.S. Air Force Aeromedical Consultation Service stratification guidelines with proper secondary risk factor goals met, experience an annual event rate per year of approximately what percent?

A. 0.5–1%.
B. 1–2%.
C. 10–25%.
D. 50–60%.

ANSWER/DISCUSSION

3. B. The prevalence of known CAD in actively serving U.S. Air Force aviators is 0.5%, which is similar to published data in young civilian aviators.[8] However, retrospective analysis suggests that many cases of myocardial infarction and revascularization would not have been detected by common screening methods.[4] Since the inception of the Air Force in 1946, all cardiac studies done on aviators have been maintained in a cardiac data library. As of 2015, this cardiac data library has over 1.2 million digitized studies on over 280,000 aviators. The Aerospace Medical Service has continued to follow up clinical evaluations on nearly all Air Force aviators with CAD since 1954. In an analysis of this database, records of 1500 asymptomatic aviators with coronary angiography were examined, which allowed for the stratification of risk based upon the description of disease, as defined by most significant lesion and/or upon the sum of all lesions identified via coronary lesions.[9] Notably, aviators with an aggregate stenosis of <50% showed an average annual event rate of 0.6% per year, while those with an aggregate ≥50% but <120% had an average annual event rate of 1.1% per year. The current aeromedical classification of asymptomatic CAD is based on an aggregate stenosis, with mild CAD defined as an aggregate stenosis <50% and moderate CAD defined as an aggregate stenosis ≥50% but <120%. Severe CAD is defined as aggregate ≥120%, or two lesions ≥50%, or a maximal lesion >0%, or a left main lesion ≥50%.

Generally, all three military services provide a mechanism to allow their pilots to fly after they have had a cardiac event. With cardiac disease, the universal concern is sudden death or incapacitation due to severe angina, MI, arrhythmia, loss of consciousness, or death. In

military pilots, only initial flying class applicants with CAD are currently not granted waivers.

In the U.S. Air Force, a waiver may be considered based upon severity and extent of disease. Aviators with luminal irregularities (no graded stenosis) will require waiver submission and Aeromedical Consultation Service evaluation initially and 4 yr later, then every 2 yr. Those with mild CAD may get a nonhigh performance waiver with annual noninvasive evaluation, coronary angiography for onset of symptoms/worsened noninvasive test results, or unsuccessful risk factor modification. Those with moderate CAD may receive a nonhigh performance waiver only with another qualified pilot if they have no evidence of ischemia and normal perfusion distal to any lesion along with optimal risk factor control; annual Aeromedical Consultation Service evaluation with noninvasive testing is required. With regard to our patient, who has had a revascularization procedure, criteria for waiver consideration include normal distal perfusion, normal left ventricular wall motion and systolic function, no noninvasive evidence of reversible ischemia, successful risk factor modification, and a minimum grounding observation period of 6 mo postprocedure. In addition, annual noninvasive testing and routine serial coronary angiography are required at 5-yr intervals starting at 6 mo postrevascularization.[10]

In the U.S. Navy, aviators with asymptomatic CAD are not strictly disqualified; thus, specific criteria for waiver are not described. Waivers are available for naval aviators with documented CAD, but require revascularization/correction of any lesion along with the underlying disease process controlled to an acceptable level of risk.[11]

In the Army, CAD and particularly any revascularization procedure are considered disqualifying, in accordance with Army Regulation 40-501.[13] Recommendations for waiver are managed by the U.S. Army Aeromedical Activity. According to current Army policy, minimal CAD, defined as no hemodynamic abnormalities, abnormal wall motion on exercise echocardiogram, or evidence of reperfusion deficits, can be considered for a waiver. Aviators who have percutaneous coronary intervention with or without stent placement may be considered for a waiver if asymptomatic at 6 mo postprocedure for rated personnel and 3 mo for nonrated aircrew. For the Army, severe CAD is defined as hemodynamically significant findings, such as poor ejection fraction, abnormal wall movement on exercise echocardiogram, or abnormal perfusion on exercise thallium or sestamibi, and is generally not waiverable.*

For the Federal Aviation Administration (FAA), CAD and its associated conditions account for 3 of its 15 specific disqualifying conditions. The FAA allows all the treatments that are currently available. Civilian airmen who wish to be granted medical certification for all classes require FAA decision and must wait 3 mo for MI due to noncoronary artery disease, MI that is uncomplicated without any open or percutaneous intervention, or percutaneous intervention excluding the left main coronary artery. Per the FAA coronary heart disease protocol, the waiting period is otherwise initially 6 mo prior to any attempt at gaining certification.[5]

The patient, after discussion with her flight surgeon, pursued a waiver to return to flying status. After evaluation by the Aeromedical Consultation Service, a waiver was recommended for a Flying Class II certification with restriction to nonhigh performance aircraft with another qualified pilot.

Mitchell AL. ***You're the flight surgeon: aviator with myocardial ischemia.*** **Aerosp Med Hum Perform. 2017; 88(7):697–700.**

ACKNOWLEDGMENTS

The author would like to thank Lt. Col. Eddie Davenport, Chief Cardiology Consultant, Aeromedical Consultation Service. The views expressed in this article are those of the author and do not necessarily reflect the official policy or position of the Air Force, the Department of Defense, of the U.S. Government.

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This article was prepared by Nicole M. Solana, D.O., M.P.H.

You're the flight surgeon for a combat aviation brigade. A 33-yr-old active duty female pilot presents to your clinic concerned about an asymmetrically shaped, small "black spot," approximately 5 mm × 3 mm on her left forearm. The surrounding skin is edematous and erythematous, well-demarcated, ovoid in shape, approximately 11 cm × 5 cm. There appear to be small vesicles forming just proximal to the black spot. The area of concern is painless, nonpruritic, and cool to the touch. She denies scraping or picking at the black lesion.

She is a competitive athlete on the All-Army obstacle course team and recently competed in a race on the Central Coast of California 7 d prior to her visit. Originally, she noticed the black spot a few hours after the race (**Fig. 1A**). At that time it was flat and had no visible break in the skin. Other lesions, which were pruritic, appeared at various intervals over the next 6 d and were spreading on her upper extremities (**Fig. 1B**), chest, and back. The race occurred on the mountains and through heavily vegetated trails. She mentioned there were abundant amounts of poison oak on the course and believes she has been exposed, but is primarily concerned about the black spot on her left forearm and its current appearance 1 wk after the race (**Fig. 1C**).

Her medical history is unremarkable. Her father was diagnosed with melanoma and she admits to having "too much" sun exposure while growing up in Florida. She has never had any lesions like this in the past. She is unsure if she has been exposed to poison ivy before. She denies any medication, herbal supplements, or drug/alcohol use.

1. What is your diagnosis for the black spot?

A. Brown recluse spider bite.
B. Black spot poison ivy.
C. Excoriated insect bite with mild surrounding cellulitis.
D. Melanoma.

ANSWER/DISCUSSION

1. B. The diagnosis of poison ivy dermatitis is typically made based on a history of exposure and a characteristic pattern of a well-demarcated contact dermatitis in areas of skin that could have come in contact with the plant. Typically, poison ivy exposure presents with linear streaks that are pruritic. In her case, a rare presentation of black spot poison ivy was diagnosed on her left arm with the typical presentation on the other extremities and chest. For this presentation to appear as a black spot, there must be a high concentration of urushiol from the *Toxicodendron* plant species. The darkening of the oleoresin occurs in nature because of chemical change that requires the presence of dopa-oxidase, tyrosine, moisture, and oxygen.[4] The spot may appear as soon as 6 h after exposure depending on the concentration.[1] The black spot is initially asymptomatic and takes days before symptoms occur.

Her concern was a brown recluse bite that may look very similar. For a brown recluse bite, you may be able to identify small cutaneous puncture marks with surrounding erythema. The bite may be a red plaque or a papule with central pallor, sometimes with vesiculation around the site, which is very similar to the patient's presentation. Pain will likely be present, but the lesion is self-limited and resolves without further complications in approximately 1 wk. However, in some patients, the lesion will develop a dark, depressed center over the ensuing 24 to 48 h, culminating in a dry eschar that ulcerates.[5] Brown recluse spiders are very unlikely to be in the central and northern parts of California. They are typically found in the Midwest and southern states.[5] The time presentation, symptoms, location of the leading events, and the lack of punctured skin likely rule out the brown recluse bite.

An excoriated insect bite with mild surrounding cellulitis was ruled out. The patient was not having any other symptoms such as fevers or chills and the surrounding area was not warm to the touch. The black spot was still below the skin and there was no evidence of skin excoriation.

The black spot does have features similar to melanoma, but can be ruled out based on the sudden appearance and symptoms of the lesion.

2. What ancillary workup is indicated?

A. None needed.
B. Dermoscopy.
C. Shaving biopsy.
D. Punch biopsy.

ANSWER/DISCUSSION

2. A. In this case, no further workup was needed. The diagnosis of black spot poison ivy was made based on history and clinical findings.

DOI: https://doi.org/10.3357/AMHP.4809.2017