



Spinal Cord Injury Case No. 2, June 2005

Presenting Symptom(s): Shortness of breath

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Disclosures: L. Blankenship, None; M. Lee, None.

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Appropriate Audience: Residents and practicing physicians

Learning Objectives: (1) develop a differential diagnosis for patients with spinal cord injury and shortness of breath; (2) define an appropriate physical examination for tetraplegic patients with shortness of breath; (3) understand the importance of recognizing the presentation of cardiac disease in spinal cord injured patients.

Level of Difficulty: Basic to intermediate

History

A 44-year-old gentleman with a history of asthma and C6 American Spinal Injury Association (ASIA) C tetraplegia secondary to a motor vehicle accident one year ago was referred from his therapy session to clinic for shortness of breath with exertion, decreased endurance, and wheezing.

- Prior to continuing, please develop a differential diagnosis
- Is there any additional information regarding the history that might be helpful in clarifying your differential diagnosis list and placing it in order of priority?

Commentary I

The differential diagnosis includes: asthma exacerbation, pneumonia, upper respiratory infection, cardiac disease, and pulmonary embolus. Asthma exacerbation, upper respiratory infection and pneumonia should be considered in a patient with a history of asthma and complaints of shortness of breath and wheezing. Spinal cord injured patients with cardiac ischemia may present with shortness of breath in the absence of chest pain. In spinal cord injured patients who survive greater than one year, cardiac disease is now the leading cause of death. Therefore, it is important to assess the patient for other risk factors for coronary artery disease. Deep vein thrombosis is common after spinal cord injury and associated with significant morbidity and mortality and should also be considered in the differential diagnosis.¹

Additional history should assess the time course of presentation, associated signs and



symptoms, response to prior treatments, assessment of cardiac and thromboembolic risk factors.

History, continued

The patient reported a one-month history of shortness of breath, which worsened acutely during a transfer in physical therapy on the day of presentation. He reported no current fevers or chills. However, he was treated with a five-day course of Azithromycin one month prior to presentation for presumed bronchitis. At that time, he had a fever to 38.3 degrees Celsius. He did not notice a significant change in his respiratory symptoms. Therefore, he was treated with a two-week course of Gatifloxacin that he completed two days prior to presentation, again without improvement. He denied coughing, sputum production, hemoptysis or chest pain.

Past medical history was significant for asthma, diabetes and a history of pulmonary embolus status post inferior vena cava (IVC) filter placement approximately one year ago following his spinal cord injury. His spasticity had not changed significantly. He did not monitor his fasting blood glucose. Systems review was significant for long-standing bilateral lower leg edema, right greater than left. He denied nausea, vomiting, diaphoresis and headache.

Medications include Metformin 500 mg p.o. b.i.d., Gabapentin 600 mg p.o. t.i.d. and 1200 mg at 6 P, M., Fluticasone, Ducusate every other day, Rosiglitazone 4 mg b.i.d., Salmeterol/Fluticasone, cranberry capsules, multivitamins, and Zlopidem as needed.

Family history was significant for cancer and diabetes. He had no family history of coronary artery disease. He was a former smoker, having quit 13 years ago.

- If necessary, revise your differential diagnosis based on the additional clinical history.
- On which details of the physical examination should you focus at this point?

Physical Examination

Examination revealed a pleasant obese gentleman who appeared in no distress. Blood pressure was 136/86. Pulse was 84 and regular. Temperature was 36.7 degrees Celsius. Oxygen saturations were 98% on room air. Neck was supple with no jugular venous distention. Respirations were clear to auscultation and percussion bilaterally. No egophony was present. Heart sounds were normal with a non-displaced apex. Abdomen was soft. Neurologic exam revealed C6 incomplete tetraplegia. There was 2+ pitting in the right lower limb and 1+ pitting edema in the left lower limb, with an approximately 3/4-inch greater right calf circumference. The remainder of the examination was unremarkable.

- At this point, review your differential diagnosis and revise as appropriate.
- List each possible diagnosis in order of clinical importance and likelihood

Commentary II

Although pneumonia, asthma exacerbation and upper respiratory infection remain in the differential diagnosis, failure to respond to two courses of antibiotics, absence of fever and a normal pulmonary examination make these diagnoses less likely. Coronary heart disease is the leading cause of death in the United States. Sensory innervation to the heart is carried via T1 through T4 fibers, so patients with spinal cord injuries above this level may not



present with chest pain during myocardial ischemia due to a disruption of afferent sympathetic fibers. Therefore, a high degree of clinical suspicion is warranted, particularly in patients with risk factors for coronary artery disease. Our patient has known risk factors of male gender, diabetes and physical inactivity.² The risk of myocardial infarction in cigarette smokers decreases within a few years of quitting to a level similar to that in men who have never smoked, so his remote history of tobacco use is not a cardiovascular risk factor.³ Although the risk of deep vein thrombosis and pulmonary embolus decreases after three months following spinal cord injury, there are many clinical reports of thromboembolism after that time period. Our patient, who has an IVC filter in place, has multiple risk factors for thromboembolic disease, including a history of deep vein thrombosis and pulmonary embolus, right calf swelling, obesity, immobility and age greater than 40 years.⁴

- What diagnostic tests would you order at this time?

Test Results

Given the patient's risk factors for coronary heart disease and venous thromboembolism and the associated morbidity and mortality with these conditions, an electrocardiogram (EKG), cardiac enzymes, and a radiographic study to evaluate for pulmonary embolus should be performed.

EKG showed normal sinus rhythm with no acute ischemic changes. Lab results showed elevated Creatine Kinase–MB (CK-MB) 11.6 ng/mL (normal 0.0 to 6.0 ng/mL) and Troponin-T 0.046 ng/mL (normal < 0.029 ng/mL). A pulmonary embolus protocol (computed tomography) CT was attempted, but due to poor intravenous access, the study was suboptimal. The lung parenchyma was normal, and there was no evidence of pulmonary embolus in the main pulmonary arteries. Ventilation perfusion scan was subsequently performed and was low probability for pulmonary embolus.

Additional laboratory studies revealed creatine 0.6 mg/dL and random glucose 153 mg/dL. White blood cell count and hemoglobin were normal. Chest x-ray was negative for infiltrate. Total cholesterol was 192 mg/dL (normal < 200 mg/dL), triglycerides 858 mg/dL (normal < 150), high-density lipoprotein (HDL) 32 mg/dL (normal 40 – 59 mg/dL). Low-density lipoprotein (LDL) was not able to be calculated due to hypertriglyceridemia.

Because of the patient's positive enzymes and cardiac risk factors, cardiac catheterization and echocardiogram were performed. Cardiac catheterization revealed no significant stenosis with only mild plaquing (20% stenosis in the distal posterior descending artery) but otherwise no angiographically apparent disease. Transthoracic echocardiogram revealed normal left ventricular function with an estimated ejection fraction of 60-65%

- Considering all the data from the history, physical examination and laboratory studies, what is/are your final diagnostic impression(s)?
- What treatment would you now initiate for this patient?

Final Diagnostic Impression

The patient was diagnosed with a non-ST-segment elevated myocardial infarction (NSTEMI) and hypertriglyceridemia. Cardiac consultation recommended daily aspirin, beta blockade, statin treatment and ACE inhibitor therapy.

Commentary III



Coronary arteriography performed in the acute period following NSTEMI demonstrates no infarct-associated arterial occlusion in 60 to 85 percent of cases, felt perhaps due to rapid clot lysis, vasospasm, or microvascular disease.⁵ High-density lipoprotein tends to be decreased in spinal cord injured patients compared to the able-bodied population, felt possibly due to lack of physical activity in spinal cord injured patients.⁶ Triglycerides are increased after spinal cord injury.¹ Given the significant elevation of triglycerides on our patient, it is likely that he had underlying dyslipidemia that was exacerbated by his spinal cord injury.

- What is the prognosis of patients presenting with symptomatic myocardial infarction but without chest pain?

Commentary IV

Coronary heart disease is the leading cause of death in the United States. Although chest pain is the most common presenting symptom in acute coronary syndrome, up to one-third of patients present with atypical symptoms such as isolated shortness of breath, nausea or vomiting, palpitations, syncope, or cardiac arrest. Patients with atypical presentation have greater mortality at one month and one year. Patients with myocardial infarction without chest pain were less likely to receive treatment strategies of proven benefit and were less likely to receive evidenced-based management.⁷ Because patients with spinal cord injury may not present with typical symptoms of acute coronary syndrome, a high degree of clinical suspicion is warranted, particularly in patients with known cardiac risk factors.

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