January 2017 Critical Care Case of the Month

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History of Present Illness

The patient is a 48-year-old man who presented with two days of progressive shortness of breath and non-productive cough. There were no associated symptoms and the patient specifically denied fever, chills, night sweats, myalgia or other evidence of viral prodrome. He had no chest pain or tightness, nausea, vomiting, or leg swelling and he could lay flat. He had no recent travel or sick contacts and was Influenza-immunized this season.

Past Medical History

- Hypertension
- Hyperlipidemia
- Type 2 diabetes mellitus with a recent hemoglobin A1C of 11%

Social History

- Cook at pizzeria
- Gay and lives at home with roommate of several years
- Smokes marijuana weekly.
- Prior history of cocaine use

Family History

- Noncontributory

Physical Examination

- Vitals: T 99.1º F / HR 125 / BP 193/93 / RR 24 / SpO2 88%
- General: Tachypneic. Alert and oriented X 4.
- Lungs: Crackles at bases bilaterally, no wheezes
- Heart: tachycardia
- Abdomen: NSA
- Skin: no needle marks or cellulitis

Laboratory

- CBC: WBC 11,700 cells/mcL with 80% polymorphonuclear leukocytes, otherwise normal

- Basic metabolic panel: normal
- Brain natriuretic peptide: 120 pg/ml
- Urine drug screen was negative for cocaine but positive for marijuana.
- D-dimer: 0.32 mcg/mL

Hospital Course

He was admitted to the ICU but quickly deteriorated and was intubated for hypoxemia. Empiric ceftriaxone and levofloxacin were begun.

Chest x-ray demonstrated bilateral patchy airspace opacities (Figure 1).

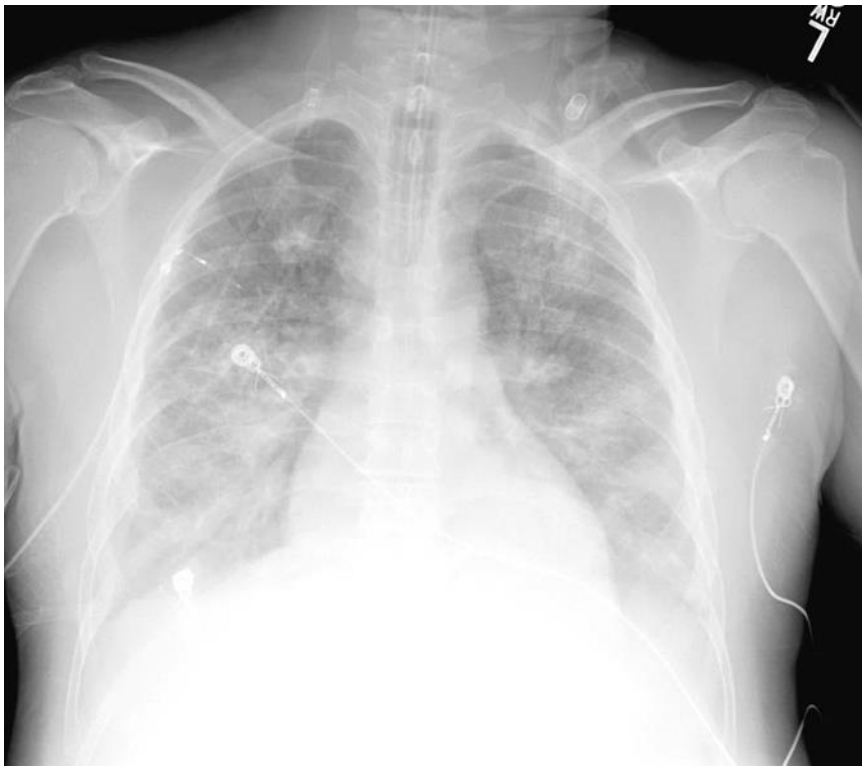

Figure 1. Admission chest x-ray.

Which of the following should be ***done next***?

1. Bedside cardiac ultrasound
2. Coccidioidomycosis serology
3. CT scan of the chest
4. 1 and 3
5. All of the above

Correct!
5. All of the above

Most severely ill patients in this age group would have an infectious etiology but the lack of fever or any prodrome are unusual. Blood and sputum cultures were obtained but showed no growth of pathogens. Bronchoscopy with bronchoalveolar lavage was performed which did not demonstrate a pathogenic organism. A friable edematous airway were noted without evidence of alveolar hemorrhage.

Although the normal BNP argues against heart failure, a bedside echocardiography was performed which showed normal chamber sizes and cardiac function.

Antibiotics were quickly de-escalated and the patient improved under supportive care. His chest x-ray cleared quickly (Figure 2).

Figure 2. Chest x-ray taken 7 days after admission.

He was discharged with a diagnosis of adult respiratory distress syndrome of unknown etiology. However, 22 months later he presented to another hospital with a very similar course but also developed acute kidney injury which required several episodes of hemodialysis. Again, he rapidly improved with supportive therapy and there was no apparent residual lung or kidney injury.

Ten months later he had a similar presentation. He again required mechanical ventilation. On the third day of admission, the patient's roommate presented to the critical care team vials of a liquid substance he had said he had witnessed the patient inhaling prior to the onset of his illness (Figure 3).

Figure 3. Vials which patient's roommate said he had inhaled.

Which of the following is ***contained in the vial***?

1. Cocaine
2. Isobutyl nitrite
3. Mexican chalea
4. Peyote
5. Synthetic cannabinoids

Correct!
2. Isobutyl nitrite

The vial was identified to be isobutyl nitrite; a recreational drug known as “poppers”. The patient would later admit to using this substance prior to the onset of his previous illnesses.

Which of the following have been ***associated with the use of “poppers”***?

1. Acquired immune deficiency syndrome (AIDS)
2. Acute myelogenous leukemia
3. Asthma
4. *Aspergillus* pneumonia
5. Drug reaction with eosinophilia and systemic symptoms (DRESS)

Correct!
1. Acquired immunodeficiency syndrome (AIDS)

Isobutyl nitrite and other alkyl nitrites were first used to treat angina pectoris. In the late 1970s these drugs emerged as part of the drug subculture of the disco and club scene as a sexual orgasm intensifying agent (1). The drugs were particularly popular amongst homosexual men. Early descriptions of the acquired immune deficiency syndrome implicated the substances due to their frequent use amongst afflicted individuals (2,3). When causation of the alkyl nitrites for AIDS was disproven, the strong association led to confounding theories of pathogenesis. Today, alkyl nitrites remain legal to possess.

Which of the following adverse effects ***has (have) not*** been described with the inhalation of alkyl nitrites?

1. Acute respiratory distress syndrome
2. Methemoglobinemia
3. Bronchospasm
4. 1 and 3
5. All of the above

Correct!
4. 1 and 3

Bronchospasm in response to the alkyl nitrites has not been described. A literature review describes solely chemical burns and methemoglobinemia as recognized adverse effects of alkyl nitrates. An acute respiratory distress syndrome-like illness has not been described. There is clear association of these three episodes of respiratory illness with the inhalation of isobutyl nitrite. We suspect deep inhalational injury resulting in diffuse alveolar damage as the mechanism of this unique presentation.

Which of the following is true regarding the ***treatment of methemoglobinemia***?

1. Methylene blue is the therapy of choice.
2. Glucose-6-phosphate dehydrogenase deficiency may not respond to standard therapy.
3. Pulse oximetry is not a reliable measure for monitoring.
4. 1 and 3
5. All of the above

Correct!
5. All of the above

Methylene blue 1 to 2 mg/kg IV infused over five minutes is the treatment of choice for methemoglobinemia (4). In patients with glucose-6-phosphate dehydrogenase (G6PD) deficiency, the reducing agent NADPH is not present in sufficient quantity to allow forward the methemoblogin reductase pathway, for which methylene blue is a cofactor. Large doses of oxidizing ascorbic acid can be used in this situation. In methemoglobinemia pulse oximetry is a highly unreliable method of monitoring for hypoxia, with a 6 to 44% underestimate of true hemoglobin saturation. Methemoglobin levels should be monitored for treatment response, repeating doses every hour as necessary.

References

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