

You're the Flight Surgeon

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You are the flight surgeon for a military unit located in a remote area known for its abundant outdoor activities. A 36-yr-old Caucasian male aviator just returned from a hunting trip presents to clinic with a complaint of a week old, painful, nonhealing wound of his right thumb. He describes the wound as a painful, red, mildly weeping 3.0-mm nick in the skin that extends under his thumbnail. His axillary areas are also painful and this pain prohibits him from raising his arm to reach the switches above his head in the aircraft. His other concerns are general malaise, fatigue, and body aches. The patient denies having a rash, neck stiffness, cough, or fever.

1. What is the next best question to ask to narrow your differential diagnosis?

- A. Have you taken anything for it?
- B. How did you injure your thumb?
- C. Do you use tobacco products?
- D. Does anything make the pain better or worse?

ANSWER/DISCUSSION

1. B. Knowing that the service member (SM) had just returned from a hunting trip, it is pertinent to ask how the wound occurred as the differential diagnosis for his condition would be different for an animal bite vs. insect envenomation, poisonous plant exposure, burn from a campfire, inadvertent firearm discharge, etc. Completing the initial history is key for this case. It is also important to know what medications your pilot is taking for aeromedical safety, but it is not the best answer for helping to determine what the diagnosis is. Likewise possible tobacco use, though it has a role in delayed wound healing, and pain level do not help us to focus our efforts.

Upon further questioning, the SM stated that he nicked his thumb with a knife when he was cleaning a wild rabbit he had caught on his hunting trip. He said that he briefly rinsed his thumb off with tap water from his faucet at home and continued cleaning the game. On exam, he is noted to have a 1.0 cm × 0.6 cm paronychia on his right lateral thumbnail. The paronychia was painful to touch with erythema and a small amount of fluctuance on palpation. There was a small amount of dried, crusty material over the cut. The aviator also reported that it just seemed like the cut wouldn't heal. He rated the pain as about a 7/10. He

also noted a significant amount of lymphadenopathy in the right axillary area. Three lymph nodes were palpated in the right central axillary region. They were firm, tender to palpation, and about 1.0 to 2.0 cm in size. There was no streaking, redness, or ecchymosis within the axillary region. There was no obvious eschar noted around the paronychia.

2. What diseases should you be most concerned about in this aviator?

- A. Anthrax
- B. Lyme Disease
- C. Tularemia
- D. Brucellosis
- E. All of the above

ANSWER/DISCUSSION

2. C. *Francisella tularensis* is a gram-positive, rod-shaped aerobic coccobacillus and the causative agent of tularemia, a potentially lethal infection if not treated appropriately. Rabbits are the best known vector for tularemia, but it can also be spread by other small mammals. There are many subspecies of *Francisella tularensis*, but the two most common are *tularensis* (Type A) and *holarctica* (Type B). Type A is the subspecies most commonly found in the United States, whereas Type B is more frequently found in Europe.⁷ It is important to recognize that these are two major subspecies and can have differing clinical manifestations and disease courses. Type A is typically more severe and has a mortality rate of around 10% if left untreated.⁷ Type B, on the other hand, is typically less severe and has a mortality rate of 1% if left untreated.⁷

In addition, many species of game are associated with other zoonotic infections. Therefore, it is important to know what vector this patient was exposed to. Anthrax is a naturally occurring bacteria in soil throughout the United States, with large areas of the plains having significantly higher counts.⁶ However, *Bacillus anthracis*, the etiologic agent of anthrax, can infect wildlife such as bears, bison, elk, and other game indigenous to the affected areas. However, the presentation of cutaneous anthrax is typically that of a painless necrotic ulceration with a black and depressed eschar. Our SM did not have a black eschar and

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his paronychia was very painful to the touch. It is possible for rabbits to harbor ticks and for game handlers to receive tick bites when cleaning them. Typical presentation of a tick bite due to Lyme disease (*Lyme borreliosis*) results in a bullseye target-like rash (*erythema chronicum migrans*) followed by severe headaches, nerve pain, pain in the joints, and potentially facial palsy.⁴ Our SM had a pain distribution pattern into the axillary region and not in the shoulder joint itself. He also denied any bullseye target rashes or seeing any ticks on his person. Brucellosis is caused by several species of *Brucella* and is known to infect cattle as well as bison and elk.⁹ Initial symptoms typically include fever, night sweats, malaise, fatigue, and headache.³ Hunters are especially at risk if they eat undercooked meat, cut their skin when cleaning the animal, or inhale the bacteria from the hide of the animal when cleaning them. Despite having a majority of these symptoms, his paronychia and lymphadenopathy is unlikely to account for an infection with a *Brucella* species.

3. What is the “gold standard” test used to confirm diagnosis of tularemia?

- A. Culture.
- B. ELISA.
- C. Microagglutination test (MAT).
- D. Indirect immunofluorescence assay (IRF).
- E. Serology.
- F. This is no consensus “gold standard” test.

ANSWER/DISCUSSION

3. F. All of the above answers are tests that can be used to diagnose tularemia. There is also a difference in opinion on the most appropriate way to confirm the diagnosis of tularemia between the Centers for Disease Control and Prevention (CDC), the Infectious Diseases Society of America, and research published in the *Journal of Clinical Microbiology*. The CDC recommends the confirmatory test be a culture.² However, the Infectious Diseases Society of America (IDSA) recommend serology as the preferred method of diagnosing tularemia.¹¹ According to the IDSA, routine cultures are often negative unless the lab knows to add cysteine to culture media. They also noted that PCR could be useful for diagnosis as well.

Yanes *et al.* recently published a study in the *Journal of Clinical Microbiology* reporting that tularemia is rarely detected in culture samples or by PCR.¹³ They compared the specificity and sensitivity between MAT, IFA, and Serion ELISA tests and found that ELISA tests have “earlier detection of specific antibodies (1 to 2 weeks vs. 2 to 3 weeks after onset of symptoms).”¹³ Thus, the conclusion was that ELISA could be useful as a screening tool for tularemia. However, additional tests like MAT and IFA are needed to confirm diagnosis. In summary, it is important to take these results and recommendations into consideration, especially if you are in remote area with limited testing facilities that may have to send tests to more comprehensive labs. ELISA testing may allow for early screening and presumptive diagnosis while waiting for confirmation. However, serology appears to be the preferred test to confirm tularemia.

The SM's finger was anesthetized and the paronychia was lanced. A culture was collected from the wound and sent to the lab for

evaluation. The lab was contacted and asked to have a high level of suspicion for tularemia.

4. At this point what is the best management for this patient?

- A. Treat empirically while waiting for results of diagnosis and issue a “down slip.”
- B. Wait for results of diagnostic tests to direct treatment and issue a “down slip.”
- C. Anesthetize the finger, de-roof the area, and allow him to continue to fly.
- D. Apply topical antibiotics, apply dressing, and allow him to continue to fly.

ANSWER/DISCUSSION

4. A. As tularemia can be fatal, you should initiate treatment with either streptomycin, tetracycline, or doxycycline and not wait for test results to return.⁷ Note that diagnostic tests for tularemia make take anywhere from 1–3 wk to return results. You also want to make sure to remove this pilot from flying duties. He currently is not able to reach switches above him that are required for him to operate the aircraft and the pain is a significant distractor.

DISPOSITION

The Army does not specifically address tularemia in its aeromedical policies. However, there are policies regarding other infectious diseases such as Lyme, hepatitis, etc. The recommendation is that the pilot be grounded until the course of antibiotics is complete and a reexamination takes place to make sure there is no residual sequela from the disease process.¹ The Air Force is similar in its flying duties recommendations when it comes to infectious diseases. Again, they do not have a specific policy for tularemia. However, like the Army, they have policies for other infectious diseases where grounding is recommended until treatment is complete and no further symptoms exist.¹² The Navy also does not have a policy specific to tularemia, but unlike the other services, may require waiver for return to flight once the treatment is complete with no sequela or chronic treatment produces stable, nondistracting symptoms. These waivers are on a case-by-case basis and the aviator is grounded until the waiver is approved.⁸ The FAA also does not have a policy regarding tularemia nor most other infectious diseases. However, the FAA recommends that the AME “should ascertain for what condition the medication is being used, how long, frequency, and any side effects of the medication. The safety impact of the underlying condition should also be considered.”²⁵ Despite not having a policy letter to address all conditions they encourage the AME to determine if the treatment or the condition being treated is a safety risk in flight. If so, the pilot should be instructed not to fly.

The SM's wound appeared to be a typical paronychia that would only require anesthetizing the finger and lancing the paronychia. There is no need to de-roof an acute paronychia. You can apply topical antibiotics. However, his symptoms appeared to potentially be systemic based on his complaints and significant lymphadenopathy. Thus, systemic antibiotics should be considered along with topical medication.

Also, distracting pain and limited range of motion of his left upper extremity calls for restriction from flight duties.

Despite the SM's history of contact with rabbits, the patient was placed on PO clindamycin for 14 d because of an initial concern for a *Staphylococcus aureus* infection, as this is the single most common bacteria responsible for paronychias.¹⁰ However, a couple days later the lab reported possible tularemia and the sample was sent to a state lab for confirmation. After the diagnosis was confirmed approximately a week later, the patient was switched to oral ciprofloxacin. Treatment was for 3 mo under the guidance and recommendation of an Infectious Disease Specialist. The case was also reported to the local and state health department. Over the ensuing month he developed an axillary abscess that was incised and drained, from which he recovered with no sequela. The SM was grounded for 4 mo due to the slow resolution of pain due to axillary lymphadenopathy. At 4 mo, he had completed the prescribed course of antibiotics, his pain had resolved, and he was returned to flight status. Of note, he was monitored for fatigue for nearly a year after his diagnosis, but has now completely recovered.

In conclusion, have a high level of suspicion for uncommon infectious diseases, especially if your pilots live, work, or enjoy the outdoors where they could come in contact with wildlife. Remember, if left untreated or treated with the incorrect antibiotic, *Francisella tularensis* can be fatal. If it had not been for a detailed history from the Flight Surgeon uncovering his recent hunting trips for rabbits along with the subsequent culture due to high suspicion of tularemia from the history, this diagnosis might have been missed.

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