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You are a flight surgeon at a Marine Corps base in an overseas location. You are asked by a physician assistant (PA) for assistance on a dermatological case. Prior to seeing the patient, you ask the PA for more information. He states the patient is a 20-yr-old man who recently returned to base after 8 d in the field and complains of a rash developing on his right arm. On exam, the PA noticed a tattoo on his right arm and firm, granulomatous 2- to 3-mm papules within the tattoo. The patient said he received the tattoo 4 wk ago. The initial diagnosis was folliculitis and the patient completed a course of Keflex 250 mg four times a day for 10 d. Complete blood count, comprehensive metabolic panel, and hepatitis C panel were obtained and unremarkable. When the lesions did not resolve, he was given triamcinolone 0.5% twice a day with no improvement. On exam today, the PA states there are erythematous pustules within the tattoo.

1. What should you do next?

A. Send the patient home on Septra DS.
B. Tell him to continue with the triamcinolone.
C. Obtain more history on the tattoo.
D. Perform a biopsy.
E. Both C and D.

ANSWER/DISCUSSION

1. E. Tattoos have become increasingly popular in society, with one in five U.S. adults reporting at least one tattoo (21%).[4] Potential complications of tattooing include hepatitis B, hepatitis C, bacterial endocarditis, squamous cell carcinoma, and basal cell carcinoma, as well as skin and soft tissue infections due to methicillin-resistant *Staphylococcus aureus* and nontuberculous mycobacteria (NTM).[12] The presentation of these cutaneous infections is quite variable, leading to frequently missed diagnoses. Lesions with characteristic inflammatory changes should be biopsied, especially in a case such as this, which has been refractory to medication.[10]

You ask the patient about his tattoo and he states he obtained it about a month ago and developed a rash in the area 2 wk later. He has noticed an increase in the size and number of lesions and describes them as pruritic. He says he received the tattoo with a friend who has also developed a similar rash. Upon further inspection you notice the affected areas are those within the gray shading. The patient states the black ink was diluted with tap water to create gray ink for the shading. You perform a punch biopsy.

2. While you wait for the results of the biopsy, what should you do?

A. Treat empirically for a suspected *Mycobacterium* species.
B. Contact the public health officer so the case can be reported.
C. Wait until the biopsy results come back before treating the patient.
D. Both A and B.

ANSWER/DISCUSSION

2. D. Nontuberculous mycobacteria infections associated with tattoo placement have been reported worldwide.[7,11] The majority of these infections are caused by three types of rapid-growing nontuberculous mycobacteria (RGM): *Mycobacterium chelonae*, *M. abscessus*, and *M. fortuitum*.[14,19] RGM contamination has been found to occur

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during the ink manufacturing process as well as during the dilution stage in which darker colors such as black ink are diluted with nonsterile water to create a lighter shade for contrast purposes.[3] Atypical mycobacteria (also known as NTM) are environmental bacteria found in soil, natural and processed water sources, animals, birds, and plant material.[14] Tap water is the major reservoir for the NTM that cause human disease.[6]

Unlike *M. tuberculosis*, which is transmitted from person to person, nontuberculous RGM, such as *M. abscessus* and *M. chelonae*, have been reported to cause cutaneous and soft tissue infections following esthetic procedures, acupuncture, cosmetic surgery, Mohs micrographic surgery, and after exposure to public baths.[1,2,9,17,20] Patients with RGM cutaneous infections often present with lesions appearing 7-21 d after tattoo placement.[5–7,16] The most common result of RGM affecting the skin is the formation of painful, red nodules that ulcerate and drain. In the case of tattoo infections, this is most often seen in the portions of gray pigment.[2,16] However, papules, pustules, plaques, plaques with scales, folliculitis, furuncles, abscesses, cellulitis, nodules, draining lesions, ulcers, and fistulae have also been described.[6]

Given this variability in presentation, confirmation of NTM infection should include skin biopsy for tissue culture or polymerase chain reaction (PCR) data to better tailor therapy. It has been suggested that using special stains such as acid-fast bacilli or Fite may be tried, but should not be relied upon to establish or exclude the diagnosis.[7] Although previously grouped together with *M. chelonae*, it is important to recognize that *M. abscessus* differs in its 16S rDNA sequence, which can be distinguished with PCR testing.[18] Recognizing that these two are distinct species will aid in treatment choice regimens, as *M. abscessus* is the most chemotherapy resistant of the known pathogenic RGM.[16]

Histopathology was positive for acid-fast bacilli, but showed negative results on PCR for tuberculous mycobacteria and nontuberculous mycobacteria. Given a high index of suspicion based on history and clinical exam, he was treated for RGM. Interestingly, his friend also received a biopsy, which revealed *M. abscessus*.

3. What is the treatment of choice for this patient?

A. Clarithromycin 500 mg twice a day.
B. Doxycycline 100 mg twice a day.
C. Septra DS one to two double-strength tablets twice a day.
D. Intravenous vancomycin.
E. Both A and B.
F. Both A and C.

ANSWERS/DISCUSSION

3. E. The use of a macrolide or quinolone, either as single agents or in combination, is most often the recommended treatment for *M. abscessus*.[7] Clarithromycin is the drug of choice and has been shown to be effective when given as monotherapy for RGM.[2,23] Other drugs that have been used to treat *M. abscessus* include cefoxitin, imipenem, minocycline, doxycycline, amikacin, tigecycline, and ciprofloxacin.[2] Preferably, at least two drugs should be used, as monotherapy with clarithromycin may lead to acquired resistance.[15,16]

Duration of therapy has not been studied with any large-scale clinical trials, but 2 to 4 mo of antibiotics is recommended in localized disease and 6 mo of treatment in disseminated cutaneous disease.[6,15] There have also been reports that treatment can be over 6 mo in some cases.[7]

It is important for clinicians to consider NTM infections when assessing patients presenting with skin and soft tissue complaints after receiving tattoos, as many patients often go incorrectly diagnosed for long periods of time. The use of skin biopsy should be used to ensure patients are diagnosed and treated appropriately and resistant antibiotics are avoided, especially in the case of *M. abscessus*, which is the most resistant of the RGM. Given that there is no gold standard for treatment duration, patients will require close following to ensure secondary infections do not develop and that acquired resistance is not developing.

The patient was started on minocycline 100 mg twice a day and clarithromycin 500 mg twice a day. Secondary to gastrointestinal side effects and headache, he was switched to doxycycline 100 mg twice a day at his 1-wk follow-up. All lesions resolved with no recurrences after 6 mo and treatment was discontinued.

From an aeromedical standpoint, many of the service waiver guides do not explicitly discuss skin infections and highlight different requirements for antibiotic use. While the Federal Aviation Administration does not comment specifically, all other waiver guides state minocycline should not be used due to the increased incidence of central nervous system side effects. Providers should consult their respective waiver guides for specific medications such as those mentioned here, as long-term use may require a waiver. However, flight surgeons should always use good judgment in ensuring a member is free from the effects of the illness and/or medication prior to return to flight. Some services may allow for consideration of return to flying status prior to the completion of the course of therapy as long as the condition being treated has resolved in all significant aspects with no adverse reaction that might compromise safety of flight or mission completion.[8,13,21,22]

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