Federal Aviation Administration policy. However, without a known etiology, it is difficult to predict the specific risks in flight, as there is a paucity of data regarding these individuals when exposed to environments of hypoxia and other stressors of flight, including temperature extremes, decompression sickness, acceleration effects/G forces, etc. According to a meta-analysis by Debette and Markus, individuals with incidental white matter hyperintensities appear to be at increased risk of stroke, dementia, and death.[3] However, our population would be significantly younger than the age at which these concerns would arise.

A recent study looking at the high-altitude U-2 community found a significant increase in volume of white matter hyperintensities compared to age-matched controls.[8] None of these pilots were grounded or required a waiver to continue flying duties. Our cadet's MRI findings are different in distribution compared to the U-2 pilots. Both the U-2 pilots and our cadet were asymptomatic without an identifiable insult that would cause the white matter hyperintensities, although it is assumed that the hypobaric environment of the U-2 cockpit is the culprit. The key difference between these aviators and our cadet is that the U-2 pilots are already rated and our cadet is still an untrained asset with significant MRI findings that have too many uncertainties with our current level of knowledge. These uncertainties drive the ACS recommendation of IFC I disqualification. The operational stresses of RPA operations are felt by the ACS to be aeromedically safe for this cadet and result in the IFC II (RPA only) recommendation. Follow-up is crucial to see how the patient does both clinically and radiographically throughout his USAF career.

Park B. ***You're the flight surgeon: white matter hyperintensities.*** **Aerosp Med Hum Perform. 2015; 86(12):1075–1077.**

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This article was prepared by Sky Jennifer Wolf, D.O., M.P.H.

A 40-yr-old male A-10 pilot reports to your flight clinic with a complaint of persistent right elbow pain and weakened grip strength for 2 wk. A thorough but focused history reveals that he had similar symptoms 10 yr ago that resolved without treatment. The pain has moved into a new location in his elbow and was brought on by yard work and house renovations. He denies any trauma and states that he does not experience pain during in-flight tasks, but that the pain is exacerbated by activities such as grabbing flight manuals from a shelf and lifting his flight bag, and he has noticed difficulty with shaking hands. He denies neck pain, but has pain when fully extending the elbow. He has tried icing the elbow, but he has not taken any medication to relieve his symptoms for fear of being removed from his flying duties. He is otherwise healthy and denies constitutional symptoms. He is not on any regular medications and has no known drug allergies. Other than mild ankle sprains, he has no significant medical history. He does not smoke and admits to one glass of wine three times a week. He is an avid runner and biker. His vital signs are stable and within normal limits. Upon physical exam, you discover point tenderness at the lateral epicondyle, pain with passive flexion of the wrist, and pain with resisted wrist extension when the elbow is extended versus when the elbow is flexed. There is no pain with extension of the

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middle finger. Swelling and ecchymosis are not noted. Grip strength is mildly decreased when the elbow is fully extended. Sensation is grossly intact. He has full range of motion and normal strength in his neck with movement and is without radicular pain with spine compression or extension. Triceps tendon reflex is normal.

1. What is the likely diagnosis?

A. Cervical spine disease with radiculopathy.
B. Radial tunnel syndrome.
C. Lateral epicondylitis.
D. Intra-articular loose bodies.

ANSWER/DISCUSSION

1. C. Commonly referred to as "tennis elbow," lateral epicondylitis is the result of wrist extension and supination during recreation or work.[10,11] The prevalence of lateral epicondylitis ranges from 1 to 3% in the general population, it affects men and women equally, and it is most common in those over 40 yr of age.[10,11] Interestingly, only 10% of those with lateral epicondylitis actually play tennis.[11] A 1982 study by Farr described two cases of lateral epicondylitis in aviators due to flight duties.[4]

With regard to anatomy, the extensor carpi radialis brevis (ECRB) originates from the lateral humeral epicondyle and inserts into the base of the third metacarpal.[11] It is part of the common wrist extensor tendon, which also includes the extensor carpi radialis longus, extensor digitorum communis, and the extensor carpi ulnaris. The ECRB is located beneath the extensor carpi radialis longus.[2]

For the most part, lateral epicondylitis is a clinical diagnosis that most frequently presents clinically with tenderness to palpation over the ECRB tendon origin, just distal to the lateral epicondyle.[11] Usually, patients have a history of a repetitive activity and often they report reproduction of symptoms with grasping and while shaking hands.[2,11] Clinically, symptoms can be elicited with resisted supination or wrist extension with the arm in full extension[7] or when the patient lifts a chair using the affected hand with the forearm in a neutral or pronated position.[11]

All of the other answers listed above would be on your differential diagnosis list, but at this point you can exclude them based on the history and physical examination. Cervical spine disease with radiculopathy is less likely since the patient does not have a history of radicular pain into the elbow, he denies neck pain, and you could not elicit any symptoms with spine compression and extension.[11] The symptoms of radial tunnel syndrome occur in 15% of cases of lateral epicondylitis. Symptoms can be reproduced with active middle finger extension against resistance,[2] which you did not find during the exam. Intra-articular loose bodies result from trauma and activities like weightlifting and manifest with a clicking sound and often with limitation in range of motion. The patient denied any trauma and the physical exam did not elicit any clicking sounds or decreased range of motion.[11]

Based on the history and physical examination, you feel confident about your diagnosis of lateral epicondylitis and, because this is a flyer, you decide to order an anteroposterior and lateral radiograph of the elbow to rule out a fracture or other lesions, including a spur or calcifications, which according to the literature show up in 22% of X-rays.[2,9] You explain to your pilot that, based on the literature, he has two options with regard to the next steps: 1) watchful waiting, and 2) the use of topical or oral nonsteroidal anti-inflammatory drugs (NSAIDs) in addition to activity modification, an exercise program, and possibly the use of a counterforce strap.[7] You explain that topical NSAIDs have been found to provide short-term pain[7] relief, but do not result in improvement in grip strength, and that corticosteroid injections also provide short-term pain relief and improved grip strength, but that repeated steroid injections may lead to tendon rupture.[9] Upon further discussion and consideration, you both agree to proceed with the use of a topical NSAID since it is not on the disapproved medication list. You provide him with two stretching exercises: the first consists of holding the palm up (forearm supinated) and the wrist extended; the second consists of the palm in a neutral or pronated position with the wrist in extension. Both stretches are held for 30 s, repeated five times, and done at least three times a day. You also teach him a gentle strengthening program of the forearm extensors using rubber bands and you prescribe a counterforce strap. Finally, you instruct him to avoid lifting activities that exacerbate his symptoms, including forearm curls. Your pilot expresses concerns about not being able to fly. You explain that he must be placed on duties not including flying status because his grip strength weakness could potentially limit his ability to eject or to perform other functions post-ejection or post-egress. Once the grip strength issue resolves and he regains normal strength, he can be returned to flying status. You instruct him to return in 4 to 6 wk for a follow-up visit or sooner if the pain worsens or if he experiences symptoms during in-flight activities.

Your pilot returns 3 wk later, stating that although he followed your instructions to the letter, he is now experiencing the same elbow pain during in-flight activities, especially moving the control stick from side to side.

2. What is the next step?

A. Consider a local corticosteroid injection.
B. Refer to physical therapy.
C. Orthopedic consult for surgery.
D. Watchful waiting.

ANSWER/DISCUSSION

2. B. Studies suggest that physical therapy is the appropriate next step after failure of a course of oral or topical NSAIDs, activity modification, and strength and flexibility exercises.[7,10] If symptoms persist, a local corticosteroid injection could then be considered. A lack of symptom improvement at this point would warrant an orthopedic consult for possible surgical intervention and debridement of the ECRB tendon.[7,10] However, according to the literature, up to 90–95% of cases improve with nonoperative treatments,[10,11] although complete recovery can be up to 6 to 12 mo in some cases.[10] Watchful waiting can be considered at any point and, according to Johnson, one randomized controlled trial found watchful waiting to be comparable with physical therapy at 1 yr.[7] However, since your pilot already failed watchful waiting and subsequent treatment efforts, it is not the best option at this point, especially since he is very motivated to return to flying status and certainly will not want to stay grounded for long. Recent studies have explored the use of platelet-rich plasma with some success in improved outcomes up to 2 yr.[10,11] Some orthopedic surgeons prefer a new minimally invasive technique known as the focused aspiration of

scar tissue procedure, which removes scar tissue from the ECRB elbow tendon under local anesthesia in 15 min with return to normal activities in approximately 1 to 2 mo.[8]

3. The pathophysiology of the process involved in lateral epicondylitis is:

A. Degenerative.
B. Inflammatory.
C. Microbial infection.
D. Malignancy.

ANSWER/DISCUSSION

3. A. Contrary to its misleading name, lateral epicondylitis is a degenerative process due to repetitive microtrauma of the wrist extensors, most commonly the ECRB tendon.[6,10,11] It was previously believed that this injury was mainly the result of an inflammatory process, but histological review of surgical specimens revealed few if any polymorphonuclear leukocytes, lymphocytes, and macrophages. Instead, "poorly organized collagen fibers and matrix with microvasculature suggestive of a regenerative process" were discovered.[10] In fact, the term "tendinopathy" has now replaced tendinitis, which is reserved for use after histological exam.[3] Microbial infection would require a history of local erythema or the presence of a joint effusion. Finally, concerning malignancy, a history of constitutional symptoms, night pain, or a prior malignancy and a palpable mass found on the exam would increase likelihood of this diagnosis.[11]

Your pilot returns in 4 wk after working very hard in physical therapy and states that he is no longer symptomatic and his grip strength has returned to baseline. Your physical exam confirms this as does the physical therapy report. You help coordinate a simulator training flight to ensure that he does not have any residual symptoms during in-flight activities. Later that week, he passes the simulator test with flying colors, so you happily return the pilot to flying status.

4. Given the diagnosis, injury progression, and symptom resolution, what is the appropriate aeromedical disposition for this patient?

A. Aeromedical disposition cannot be determined until a Medical Evaluation Board is completed.
B. Permanent disqualification.
C. Return to flying status with waiver or special issuance.
D. Return to flying status without restriction.

ANSWER/DISCUSSION

4. D. Return to flying status without restriction. Your pilot does not require a waiver because his symptoms have completely resolved. According to the Medical Standards Directory, a waiver is required only for "healed disease or injury of the wrist, elbow or shoulder with residual weakness or symptoms of such a degree as to interfere with the satisfactory performance of flying duty."[*]

Similarly, the Army and Navy both require a waiver if the injury results in "residual weakness or symptoms" that interfere with "satisfactory performance of duty."[1,12] A Federal Aviation Administration decision is required only if the injury is "sufficient to interfere with the performance of airman duties."[5]

Lateral epicondylitis is a common upper extremity condition and cross-sectional studies have shown that the combination of force, repetition, and vibration is strongly associated with an increased risk of epicondylitis.[13] Many jobs in the Air Force expose airmen to these forces with potential for injury and associated aeromedical implications for pilots, crew, and special duty operators.

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