

You're the Flight Surgeon

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You're the flight surgeon deployed to Southwest Asia as a Squadron Medical Element assigned to an F-16 squadron. You are called to the flight line because one of your pilots is unable to extricate himself out of the cockpit after a 6-h close air support mission due to acute low back pain (LBP). Arriving at the scene you see your squadron's Weapons School graduate being dragged away from his aircraft in obvious pain. Bent over in pain, he complains of localized acute LBP without neurological symptoms. You bring him to your airfield clinic and establish that he has no "red flags." His history is significant for chronic LBP controlled with occasional nonsteroidal anti-inflammatory drugs (NSAIDs). He denies radiation, numbness, or muscle weakness chronically or with this acute episode. On physical exam, deep tendon reflexes and muscle strength are symmetric. Since he is one of your mission essential pilots, the squadron commander approaches you and asks about his prognosis. You assure him that 90% of patients with these symptoms get better with time and his pilot will most likely resume flying within a few days or weeks.

1. Which of the following is not an appropriate treatment for acute LBP for this patient after excluding "red flags"?

- A. Heat.
- B. Bed rest.
- C. NSAIDs.
- D. Muscle relaxants.

ANSWER/DISCUSSION

1. B. Bed rest does not improve function or decrease pain levels and is not indicated for acute, subacute, or chronic LBP. LBP refers to spinal and paraspinal symptoms in the lumbosacral region. Acute LBP is typically defined by duration of less than 30 d, subacute lasts up to 90 d, and chronic typically refers to more than 90 d. LBP is extremely common, with a lifetime incidence of at least 80%.¹⁷ The "red flags" of LBP include trauma, age greater than 50, history of malignancy, pain that worsens when supine, onset of bowel or bladder dysfunction, saddle anesthesia, or neurological deficit of the lower extremities.²

The following are American College of Occupational and Environmental Medicine (ACOEM) evidence-based recommendations based upon a spectrum of nine categories including: three levels of

recommended; insufficient evidence recommended, no recommendation, or not recommended; and three levels of not recommended.⁹ Based upon nine randomized controlled trials (RCTs), heat therapies are therapeutic and recommended for acute, subacute, and chronic LBP. Cryotherapies as a therapeutic modality for acute LBP received "insufficient evidence" based on two RCTs that showed no quality evidence of efficacy. These RCTs suggest subacute and chronic LBP cryotherapies may be less beneficial. Based on existing studies, heat therapies are more beneficial than cold. NSAIDs for acute LBP were rated as "strongly recommended" based on 37 high or moderate quality RCTs. Muscle relaxants are second-line ("moderately recommended") treatment after NSAIDs for acute LBP based upon 32 RCTs. However, for chronic LBP, muscle relaxants are not recommended. Tricyclic antidepressants have been shown to effectively treat pain in about one-third of those with chronic LBP.⁵ Treating chronic LBP with narcotics is "strongly not recommended." Bed rest is "strongly not recommended" for the management of acute LBP.^{7,10} For patients with acute LBP, approximately 75% report improvement within 4 wk with or without intervention; 95% recover in 12 wk.³

Your F-16 pilot was given NSAIDs and muscle relaxants overnight and is now able to ambulate. He reports back to your clinic asking questions about different modalities to expedite his recovery. As a resourceful flight surgeon, you brought your deployment tool kit, which contains transcutaneous electrical neurostimulation (TENS) units, acupuncture needles, and injectable glucocorticosteroids for trigger point injections (TPIs). You also have access to radiological imaging and a physical therapist.

2. Which of the following modalities would benefit your pilot with acute LBP?

- A. Specific stretching exercises.
- B. Oral glucocorticosteroids.
- C. TENS.
- D. TPIs.
- E. Traditional Chinese acupuncture.

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ANSWER/DISCUSSION

2. A. Specific stretching exercises such as slump and directional exercises are somewhat helpful for acute LBP evidence. Nonspecific stretching does not work for acute LBP, but specific stretching exercises are recommended for treatment of acute, subacute, or chronic LBP. However, aerobic exercises should be first-line treatment and stretching exercises may be added for self-treatment if needed based on strength of evidence recommendations. In the absence of “red flags,” 4–6 wk of conservative care is safe and appropriate, and imaging is not indicated.⁴ Referring to physical therapy after 4–6 wk is appropriate since aerobic exercise, specific stretching, and a structured, progressive walking program are “strongly recommended” for all patients with LBP. Other exercises to include are aquatic therapy, yoga, and tai chi; each receives a rating of “recommended.” Oral glucocorticosteroids are not recommended for acute LBP unless there is radiculopathy. TENS is “not recommended” for acute LBP based on 32 RCTs of insufficient evidence, but is reserved for chronic LBP evidence. TPIs are “not recommended” for acute LBP based on six RCTs; however, TPI for chronic LBP using only topical anesthetics is “recommended.” A review of 36 RCTs on spinal manipulation yielded mixed results. Current guidelines are unable to validate any recommendation; however, consideration is warranted. Epidural glucocorticosteroid injections are “not recommended” for acute, subacute, or chronic LBP in the absence of significant radicular symptoms based on a review of 24 RCTs. Based on 20 RCTs, there is no quality evidence for traditional Chinese acupuncture with acute LBP, yet with chronic LBP it may be effectively used as an adjunct to other treatments. Discectomy is “not recommended” as treatment of acute, subacute, or chronic LBP unless there is significant radiculopathy based on 24 RCTs. Patients should be informed that there is no need to rush to surgical decisions, as there is no difference in long-term functional recovery.

Your deployed F-16 pilot improves within a week with conservative treatment and desires to return to flying status. He continues on NSAIDs as needed but discontinued his muscle relaxants days ago and no longer has any residual effects.

3. All of the following are considerations when returning a pilot to flying status after LBP except:

- A. Ability to accomplish duties without prohibited medications.
- B. Ability to egress the aircraft.
- C. Ability to perform duties pain free.
- D. Sufficient range of motion to perform all duties.

ANSWER/DISCUSSION

3. C. Many pilots fly with unreported chronic LBP. Research suggests that 75% of people with acute LBP self-treat and do not seek medical evaluation.¹⁰ In the aviation community, where pilots lose incentives if they cannot perform their duties, rates may be higher.

As operational flight surgeons, our goal should be to assess pilots' functionality and their ability to properly egress the aircraft in the case of an emergency. Pain is subjective, and requiring pilots to be pain free may not be realistic. In competitive sports, specific return-to-play guidelines have been established. Athletic trainers and team physicians suggest two criteria in considering return-to-play guidelines: relatively

pain-free full range of motion and normal strength. When these have been obtained, athletes may be returned to full sports participation. Modifying these criteria to aviators, to return to flight duties a flight surgeon should have a pilot demonstrate relatively pain-free full range of motion and the ability to egress the aircraft without distraction. For most patients with acute LBP, an exact etiology is identifiable in only about 15%.¹⁹ Since the etiology of most LBP is nonspecific, mechanical, and self-limited, the goal of the evaluation is to efficiently exclude potentially serious causes, to identify patients who may be at higher risk for delayed improvement due to abnormal physical findings or psychosocial issues, and to ensure safety of flight.

4. Which of the following is not a risk factor for developing acute LBP in an aviator?

- A. Smoking.
- B. Obesity.
- C. Job satisfaction.
- D. Moderate exercise.

ANSWER/DISCUSSION

4. D. Research indicates that too little or too much exercise can have a detrimental impact on the low back. Back pain related risk factors can be divided into four domains: mechanical, psychological, lifestyle, and social factors.

Mechanical factors include exercise, vibration, and ergonomics. Lifting is the primary cause of acute LBP, and there are five primary factors associated with lifting: the load, the load's location from the floor and torso, the torso posture, and lift frequency. Increased risk is encountered lifting a heavy, bulky load from the floor with a twisting rotation force numerous times. For pilots sitting in the cockpit for prolonged time, the low back compressive forces increase significantly and bodyweight is an added contributor to this low back compressive force. Whole body vibration has been associated with LBP, and helicopter pilots have a higher prevalence for LBP compared with other airframes.

Psychological factors include job satisfaction, mental illness, intelligence, and certain personality traits. There is strong evidence that several psychosocial factors correlate with the development of back pain.^{12,13} The Boeing back study suggests that job satisfaction has predictive power for episodes of acute LBP. The authors prospectively evaluated 3020 volunteers from the Boeing-Everett plant to assess risk factors that predispose workers to file industrial back injury claims. During 4 yr of follow-up observation, more than 279 subjects reported acute back problems. The only predictive physical variable was explainable by a history of medical treatment. The most predictive individual factors were job task dissatisfaction and distress as reported on Scale 3 of the Minnesota Multiphasic Personality Inventory.¹⁸

Lifestyle factors include tobacco usage and body mass index. ACOEM guidelines associate these two with an increased risk for LBP. Three large studies concluded that smoking increases the risk for all forms of LBP. These studies include the Boeing back study, a Norwegian national survey, and a study from the University of Manchester. The hypothesis is that the vaso-occlusive nature of nicotine contributes to LBP.¹ Numerous studies conclude that obesity increases the risk of

LBP.⁸ This may be multifactorial based upon how low back compressive forces and bodyweight are calculated into the equation and whether an individual exercises regularly. A lack of exercise is an independent risk factor for LBP.

Social factors include education, income, and marital status. Single, poor, uneducated individuals have a higher risk for LBP. This association is likely due to the low paying, manual work engaged in by these individuals. Secondary gain is also a significant factor when legal claims or workers' compensation is involved.

5. Which of the following is not a preventative measure to mitigate reoccurrence of LBP in this pilot?

- A. Educate him on the use of a lumbar pad in the cockpit.
- B. Prescribe a specific back stretching regimen.
- C. Encourage him to start a moderate exercise program.
- D. Encourage the use of a back brace during lifting activities.

ANSWER/DISCUSSION

5. D. Back braces give artificial support to the lumbar spine, cause atrophy of the paravertebral muscles, and increase the risk of injury. Nonspecific low back stretching exercises for acute LBP are “not recommended” per ACOEM guidelines. For acute LBP, specific stretching exercises are somewhat helpful but not as effective as a graded walking program. Stretching exercises as an isolated prescription or program for preventing LBP are “not recommended.” Moderate exercise is protective, whereas no or excessive exercise is a risk factor for LBP. The F-16 ACES2 ejection seat is reclined at 30°. Many pilots report the necessity of leaning forward in the seat to accomplish certain tasks. This flattens the lumbar lordotic curve and increases the strain on the paravertebral muscles. Air Force Instruction 11-301, Vol. 2, permits a flight surgeon to authorize use of the inflatable lumbar support pad MXU-22/P.¹⁴ This pad, if correctly fitted, may help to preserve the lordotic curve, reducing muscle strain on the lower back. According to the Air Force Waiver Guide and Technical Order 14P3-12-1, a lumbar pad may be used by aircrew to provide comfort and support to the lumbar region and position the spine to withstand shock.¹⁶ This is commonly unknown in the pilot community, and many F-16 pilots report using other devices to include towel rolls or helmet bags to relieve stress on the lower back.

The Air Force Waiver Guide addresses chronic back pain, herniated nucleus pulposus, spinal fusion, spinal fracture, spondylolysis, and spondylolisthesis. Regarding chronic back pain, the aeromedical disposition is dependent on the degree of functional impairment after treatment is complete. The flight surgeon must determine whether the airman can perform his or her duties without distraction and safely egress the aircraft. If LBP is recurrent and disabling, it is disqualifying for all flight classes regardless of the cause. The other conditions are generally considered disqualifying. Trained assets are considered for waivers on a case-by-case basis.¹⁶

The U.S. Navy Aeromedical Reference and Waiver Guide uses guidelines to describe spinal conditions considered disqualifying. If being seated for a prolonged time causes chronic back pain and the aircrew member requires more than NSAIDs or acetaminophen,

then the individual may need a waiver. Interestingly, back pain that is amenable to manual medicine is not considered disqualifying. A waiver is usually granted only if conservative, nonpharmacological means are necessary and the condition is not associated with an organic cause.¹¹

U.S. Army Regulation 40-501 specifies disqualifying spinal conditions, including current or history of ankylosing spondylitis, symptomatic scoliosis, spina bifida, spondylolysis, spondylolisthesis, or a variety of spinal surgeries. Certain spinal fractures are disqualifying as well as any other spinal abnormality that would interfere with the physical requirements necessary for Army activities.¹⁵

The Federal Aviation Administration guidelines do not specifically address nonsurgical back pain, but rather a history of intervertebral disc surgery. Asymptomatic applicants who have recovered from surgery without a neurological deficit may receive a medical certificate for the class they are applying for if they meet all other medical standards. The Aviation Medical Examiner should document this information in block 60.⁶

The natural progression of acute LBP is to resolve by itself, often within a few days. This was the case with our squadron's Weapons School graduate. He was evaluated to ensure he could perform his duties and egress the aircraft. The timing was excellent, because the day he returned to flying his expertise was necessary in coordinating a complex weapons deployment that was instrumental in saving many coalition lives.

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You're the flight surgeon at a Midwestern Air Force base when a 33-yr-old, male Caucasian C-17 loadmaster presents with painless, decreased vision in his right eye. He was seen the prior week for an upper respiratory infection (URI), which was treated symptomatically with Mucinex and ibuprofen. Today he notes the onset of visual blurring/clouding and decreased central vision on the right, on awakening. He denies headache, diplopia, pain with ocular movement, speech difficulty, vertigo, dizziness, numbness, weakness, or incoordination. He is otherwise healthy and denies prior similar occurrences. He has a waiver for reflux disease and is on maintenance therapy with Prilosec. He is also dyslipidemic, currently controlled with Zocor. He has no other significant past medical history or history of ophthalmological surgery. Review of systems is noncontributory, except as noted above, and some minor residua from his URI several days earlier. His vitals are within normal limits and he is obese, with a body mass index of 31. Through a combination of your examination and your local optometry office, you determine that the patient has decreased central visual acuity and color vision oculus dexter (OD), relative afferent pupillary defect OD, and optic nerve swelling OD. His intraocular tensions, as measured by applanation, were 14 mmHg bilaterally.

1. What is your initial diagnosis, based on these findings?

- A. Central retinal vein occlusion.
- B. Optic disc (nerve head) drusen.
- C. (Atypical) optic neuritis.
- D. Ocular histoplasmosis syndrome.

ANSWER/DISCUSSION

1. C. Optic neuritis (ON) is a clinical diagnosis based on history and physical examination findings. It is a demyelinating disorder of the optic nerve that typically presents as acute, painful, monocular vision loss.¹ Common visual deficits include visual field defects, color vision deficits, and reduced visual acuity. In 15–20% of patients subsequently diagnosed with multiple sclerosis (MS), ON is the presenting diagnosis and occurs in one-half to two-thirds of MS patients during the course of their illness.²⁰ Central retinal vein occlusion (CRVO) is the second most common retinal vascular disorder and a significant cause of vision loss. Although it usually occurs over age 50, younger patients can develop it as well.^{18,19} CRVO is most often associated with compression of a retinal vein by an adjacent atherosclerotic retinal artery, which ultimately causes increased vascular permeability and leakage of fluid into the surrounding retinal tissue.^{4,6,24} In this case, there were no hemorrhages or venous dilation demonstrated on fundoscopic exam, decreasing the possibility that this was CRVO. Optic disc drusen (ODD) are congenital and developmental anomalies of the optic nerve head commonly seen as an incidental finding during routine eye exams. ODD tend to lie beneath the surface of the optic nerve head, but may become visible later in life as yellow-white refractile bodies, always found superficial to the lamina cribrosa. ODD typically demonstrate elevation and blurring of disc margins.^{2,8,13} Since the patient's optic nerve head did not demonstrate any yellow-white refractile bodies or disc margin blurring, the diagnosis of ODD is extremely unlikely. Ocular histoplasmosis syndrome

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