You're the Flight Surgeon: Pulmonary Decompression Sickness

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14. ABSTRACT

You're the flight surgeon on call for about 1100 USAF pilots, boom operators, survival instructors, and other special operational duty personnel as well as their family members at a KC-135 base in the northern tier of the U.S. You receive a call about a flyer who had an altitude chamber ride earlier in the day and was now being transported by ambulance to the hospital with chest pain and difficulty breathing. What do you do? Through a series of questions and answers, this article guides you through the diagnosis, treatment, and follow-up of this patient. Diagnosis: Decompression sickness (DCS) with pulmonary symptoms (Type II DCS, older nomenclature). Treatment: Hyperbaric oxygen therapy under USAF TT6 or U.S. Navy TT6, which are both widely accepted as the ideal treatments for Type II DCS. The patient experienced a slight burning in his chest with slight cough upon return to ambient pressurization, so he was immediately taken down to 60 FSW and the U.S. Navy TT6 was repeated. Follow-up: The patient is put in a no-flying status for a week but will require no waiver because he has recovered uneventfully.

18. SUBJECT TERMS

Decompression sickness, hyperbaric oxygen therapy, Type II DCS, pulmonary symptoms
ANSWER/DISCUSSION
2. A. While it could be an acute myocardial infarction, this would be unlikely in this exceedingly fit, young man. The EKG also reveals no evidence of any cardiac pathology other than sinus tachycardia—probably the result of pain. Pain is indeed a part of decompression sickness, as well as air gas embolism. Answer “C” would be extremely unwise. You have no admitting privileges and are not licensed in this state. You need to have excellent rapport with the local physicians that provide care for your flyers and their family members when their required care outstrips what you and your medical treatment facility can provide. This patient’s condition is likely a form of decompression sickness and is due to this patient’s recent hyperbaric altitude chamber training, but can also occur in a diver who ascends too quickly from depth (4).

As you discuss the case with the emergency room physician you suggest that the hyperbaric medicine specialist be called. She agrees and thanks you for coming in and for your advice. The hyperbaricist is called and is on the way; you return to your flyer’s bedside. He is not breathing any better. His legs are drawn up and he is lying on his side with a look of intense pain on his face. You breathe a sigh of relief a few minutes later when the attending hyperbaricist comes to the bedside. You present the case.

3. What is your most likely diagnosis?
A. DCS with bone/joint involvement (Type I DCS, older nomenclature).
B. DCS with Pulmonary Symptoms (Type II DCS, older nomenclature).
C. Air Gas Embolism.

ANSWER/DISCUSSION
3. B. This is likely pulmonary decompression sickness or a case of the “chokes” which is a severe form of decompression sickness (8). This is labeled as DCS with Pulmonary Symptoms. “Chokes” is thought to occur in as many as 10% of aviation decompression sickness cases (6). Type I DCS is usually a milder form of the disease (1). Examples of this are “the bends,” whereby a patient has pain in a joint such as the knee or hip, and skin involvement (4). While this could possibly be a case of Air Gas Embolism (AGE), the history and presentation are not consistent with this flyer’s presentation and condition (1). AGE usually, if not always, occurs upon rapid, uncontrolled ascent from diving and has occurred in as little as 4 ft (1.2 m) of water (3,4).

The attending hyperbaric medicine specialist asks you what you would like to do. You indicate that you believe the patient needs urgent hyperbaric oxygen (HBO) therapy. He agrees and asks you to call the hyperbaricists at Brooks City-Base to discuss the case as he readiness the HBO facility for the treatment. You call and communicate with the hyperbaric medicine resident on call. He has you relate the history and physical examination and then asks you for your plan.

4. You tell him that this patient needs HBO therapy under which of the following?
A. USAF Treatment Table (TT) 5 (or U.S. Navy TT5).
B. USAF TT 6 (or U.S. Navy TT6).
C. USAF TT 6A (or U.S. Navy TT6A).

ANSWER/DISCUSSION
4. B. USAF TT 6 and U.S. Navy TT 6 are widely accepted as the ideal treatments for Type II decompression sickness (7). In either TT 6, the patient is placed in a hyperbaric oxygen chamber and is taken rapidly to 60 ft sea water (FSW) or 2.8 atmospheres absolute (ATA) pressure. This is thought to shrink the size of the nitrogen bubbles causing the patient’s problem (2). Initially placed on 100% oxygen, the patient is given “air breaks” to avoid oxygen toxicity. The pressure is decreased after several hours to 30 ft FSW (2.0 ATA) and then to the surface (1.0 ATA) as long as the patient responds favorably. The basic difference between the two treatment tables is at the 30 FSW portions of the profiles and concerns the length and number of 100% oxygen and room
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air breaks (9,10). Both TT 6s can be extended should there be a need based on symptom persistence (9,10). Tolerance of the U.S. Navy TT 6 is excellent but decompression sickness is one condition that might limit its use, especially in monoplace chambers (11). Neither TT 5 would be appropriate for a severe episode of decompression sickness, especially DCS with pulmonary symptoms, but would be appropriate for pain only “bends.” A U.S. Navy TT 6A would be used for an air gas embolism affecting the cranial circulation (2,3).

Your flyer has been dressed appropriately in the proper fire-resistant scrub and is placed in a monoplace chamber. You are anxiously observing him as the hyperbaric medicine specialist reaches the chamber. Your flyer has turned an ash color and is beginning to make peculiar “gulping” movements between his coughs. He has curled up in a fetal position. The door closes and the pressure soon begins to rise within the chamber. Within 5 mi of descending to 60 FSW the patient begins to relax. No longer ashen in appearance, the patient begins to rest comfortably. Your flyer is asked periodically how he is doing and answers that the pain has all but disappeared.

He is observed for the entire U.S. Navy TT 6 and the patient is returned to ambient pressurization. At the “surface” he begins to complain of a slight burning in his chest with slight cough, but states that he feels much, much better.

5. The hyperbaricist asks you for further recommendations. The best recommendation is which of the following?
   A. It is probably okay at this time to discharge the patient back to his home. He has been given adequate treatment and is much improved over what his condition was at presentation.
   B. Admit to a monitored bed and place the patient on oxygen at 2 L by nasal cannula. This will remove any residual nitrogen bubbles that might still exist.
   C. The patient should immediately be taken down to 60 FSW and repeat the U.S. Navy TT 6.

ANSWER/DISCUSSION

5. C. This patient may still have some residual bubbles in his pulmonary circulation and tissues, as evidenced by the returning symptoms. Oxygen by nasal cannula is unlikely to help this patient. Discharging him at this time would be unwise. He needs to have the U.S. Navy TT 6 repeated. Only HBO therapy is likely to help. Discharging this patient before a U.S. Navy TT 6 is repeated could very well be a fatal error (9).

The patient responds very well to this second U.S. Navy TT 6 and is discharged to home the next morning. The hyperbaricist informs you that this patient needs to report to your clinic for follow up on Monday morning and that you should be in communication periodically throughout the weekend to see how the patient is doing. He reminds you to call him immediately should the patient begin to decompensate. He also suggests that you call the USAF hyperbaric medicine resident to let them know that your patient is doing fine.

The patient continues to do well and you see him back in your office the first thing Monday morning. You call the USAF hyperbaric consultant that day with the patient in your office and they suggest that he not fly for a week. He will require no waiver as he has recovered uneventfully. This would also be true if he were a U.S. Navy, U.S. Army, or a civilian flyer. Of interest, this patient had the full 30-min 100% oxygen prebreathe before his altitude chamber ride. This “prebreathe” is thought to dramatically decrease the incidence of DCS in those patients exposed to altitude but DCS can occur even when procedures are followed perfectly (5,12).


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REFERENCES