

NOBENDEM QUIZ 3

The bizarre dive of the month club is out this weekend. You are the hyperbaricist on call, and at 0400 in the morning, you get a frantic call from one of the chambers that you cover:

“Doc! We have a patient in the chamber - he just had a seizure and we’re bringing him up to 60 feet now. Our doc has locked in and he’s on his way down to meet the patient. The patient is non-responsive with a pulse of 145, resps of 23, and a BP of 114/68.”

PS - helping the matter is the fact that the tech on the phone is just a little excited!

After a few minutes of thought provoking discussion, you manage to determine the following:

The patient is a 20 YO Marine who was out on his first open water free-dive. Earlier in the day, he had made a dive to 110 FSW for 15 min, then up to 80 FSW for 25 min, followed by the ascent (no decompression stops made). After a 2 hour surface interval, he strapped on a new tank and jumped back in, going to 50 FSW for 15 min, then back down to 110 FSW for around 10 min when he “ran out of air” (but it was an otherwise nice narc while it lasted).

At the surface, he was coughing up pinkish frothy material, and then became unresponsive. He was put on 100% O2 and transported to the ER. He recovered enough to answer some questions while en-route to the ER, spoke with the ER doc long enough for him to determine that this was a diving injury, and ship him off to the recompression chamber. While doing the physical at the chamber, the doc noted slowed mentation, hyper-reflexia, gait and balance disturbances, among other things. During the exam, the patient mentioned rapidly increasing shortness of breath, the onset of progressive pleuritic inspiratory pain, and became less and less responsive. The doc had had all the fun he could stand, made the Dx of AGE, and plopped patient and IO into the chamber for a quick trip to 165 FSW!

After 4 minutes at 165, the patients remained unresponsive, so he was placed on 100% O2 by tight fitting mask, and shortly thereafter, began to become more responsive. After about 10 minutes, he was sitting up, talking to the IO, recalling some of the earlier events of the day. At about 15 minutes, he suddenly “went out”, convulsing in what appeared to be a generalized tonic-clonic seizure. Fearing the worst, the doc DCed the O2 and commanded the chamber return to 60 FSW.

And this is when you received the call. After obtaining the history, the chamber had reached 60 FSW and has been there, with the doc (who met the main chamber in the lock at about 80 FSW) for about 10 min. The patient is awake, sluggish, complaining of chest pains. You then determine that the local ambulance has been called as the treatment team feels the patient is too unstable and needs acute neurological care. The tech on the phone acutely wants the benefit of your expertise and brilliance (at 0415) as to what they should do next!!

- A: Immediate ascent and transfer to the ICU under the care of a neurologist (go to Pg 2)
- B: Immediately begin oxygen per TT-6 (go to Pg 3)
- C: Immediately begin a descent to 165 (go to Pg 4)

During the ascent, the patient has another seizure and becomes decerebrate. Respirations become more labored and more pinkish frothy sputum is produced, confirming the acute nature of this case, and reinforcing your decision to get this patient to competent medical care as quickly as possible.

The ambulance arrives just as the chamber reaches the surface. Your inside observer is now complaining of left elbow pain and diplopia. The ambulance loads the comatose diver and screams off into the night. You learn later that the patient arrested before he could reach the hospital and could not be revived.

“Those blasted sport divers”, you think! When will they ever learn to plan their dives, then dive their plans?? They oughta require an IQ test before selling SCUBA tanks!

Oh yeah - - your IO now has bilateral elbow pain and wants some motrin before he goes home. How much should you give him?

After the first 2 O₂ periods at 60 FSW the patient regains consciousness. His mentation is slowed, and he has a cough, complaining about chest and bilateral knee pains, but otherwise seems to be responding. The local doc wants to Lock Out, but isn't sure of how to decompress.

Develop a decompression schedule for the doc to get him back on the outside.

You continue the TT-6, using full extensions at 60 FSW but since the patient is still a bit fuzzy about how he got there, you feel he may benefit by going to a "Catalina" table. You also realize that the IO has absorbed one whopper of a nitrogen load.

Develop an oxygen schedule to safely extricate the IO.

You managed to swap out IO's, and finished the Catalina table. The patient is again complaining of a cough and inspiratory chest pain. His neuro exam is significant for a positive Romberg, some dizziness, and he complains that he "can't think right". You figure that's no change for a fella who would make such unwise decisions about what to do on a sport dive, but give him the benefit of the doubt and agree to see him back the next day for consideration of a few tailing treatments. The cough is obviously oxygen toxicity, and should resolve over the next couple of hours.

So, did you enjoy pages 3 and 4?? ☺ Anyway - you got here! During the descent, the patient “woke up” at 110 FSW, but was still fairly groggy. You halted the dive at 125 FSW - (chamber actually held at 127) and remained for 15 min to track the patients progress and ensure stability. Also to get a handle on the extent of post-ictal CNS slowing VS possible residual AGE.

After 15 min, the patient was sitting up, talking with the IO and Doc on the inside; chest pain was gone, “cobwebs” were clearing, pulse was down to 102, resps were at 18. The ambulance was sent home, and a second doc had arrived on the outside to monitor things. What do you want to do now??

A: Slam on up to 60 FSW and get back on the table 6A

B: Ascend 10 FSW, monitor 5 min, ascend 10 FSW, monitor 5 min, etc. till reach 60 FSW.

C: Do something totally different

Next page for answer.

Shoot, Huck! Nothing routine 'bout this case! Lets take everything nice and easy!! You decide to ascend at 1 FPM so the doc inside can assess the patient for any return of symptoms. After 15 min, the chamber was at 112 FSW, and the patients mental status was still improving. Time to get the Doc out of there! To the nearest 10 FSW, where does the doc need to make his first decompression stop (use a safety enhancement of 65!). Hint - you can't do this with Navy tables!! So try Nobendem!! (Hint - you might want to locate the new version of Nobendem (31 Aug 98) which provides a long section with more dive segments. It is in the network drive under AOHDdocuments/HBO/Nobendem. It may also be downloaded from our web site at <http://wwwsam.brooks.af.mil/hyper/>. Transfer a COPY to your hard disk to work with!)

The Doc has to make his first stop at 60 FSW. Looking at the Deco times showed 20 minutes on air, but only 4 min required on 100% O2 if the subsequent stop was to be at 40 FSW. Although 100% O2 at 60 FSW can be tricky, the 4 min exposure time is well within permissible limits. The ascent to 40 FSW was uneventful, and you determine that 13 minutes of O2 are required at 40 FSW before ascending to 20 FSW (on air). At 20 FSW, you give the doc a 5 min air break, then 10 minutes of O2 are required before ascending to 10 FSW. You make the ascent over 20 sec, leaving the doc on O2, then stay for 28 min before bringing him up to the surface.

You're right - - Nobendem won't let you have that many segments. ☹ I had to do some fancy footwork to extend the standard Nobendem to permit the extra stops. The longer profile calculator option has been added to Nobendem (Long Parts A & B) and is available on the network drive under AOHDdocuments/HBO/Nobendem, or on our website.

So what about the patient? The doc was in the lock, on his way out. The patient continued to do well, and while you wanted to speed things along, you don't want to rush things unnecessarily. Having seen the sexy French B-30 table which goes to 99 FSW and uses 15 min of 100% O2, you instruct the chamber to pause at 90 FSW and administer 10 min O2. True - this is a gutsy move, since the patient already had what was more than likely, an O2 toxicity seizure at 165 FSW, but you were feeling frisky, and knew that the prior seizure was not a sensitizing event for a subsequent seizure. The patient had no problems with the O2 at 90 FSW, so you then proceeded at 1 FPM to 60 FSW and began a standard TT-6 protocol. After the first O2 period at 60 FSW, the Pt reported Rt great toe pain at 2/6 (gee - maybe "the good hurt"??), which resolved completely during the second O2 period, never to return. Likewise his mental status had completely stabilized at 90 FSW during the O2, so no extensions to the TT-6 were needed.

So how in the blazes are you going to get the IO out??

?? Give Up??? ☺ ☺ ☺

Time to apply a little Kentucky Windage! Patient's in there for a TT-6 anyway, but the Doc is in the Lock and the lock won't be available until he comes out - timing wise that's at least 40 min into the TT-6. The IO has absorbed Beaucoup N₂, and certainly doesn't need any more! Sure would be nice if the IO could follow the TT-6 as well! And in fact, that is what was done! As soon as the Doc locked out, a second tech was locked in as the replacement IO, just in time to begin the third O₂ period at 60 FSW and complete the treatment table on both the original patient, and the original IO! Hey - it's a little weird, but there's been nothing routine about this evening, so why start now?? The risk of the original IO having any problems during 2, 20 min O₂ periods at 60 FSW with the 5 min air break, are quite low, and the alternatives were slim to none. Not only that, but by now, everyone at the chamber is convinced that you're a magician, have the entire situation well in hand, and can do no wrong. (Please note in the IO spreadsheet that oxygen times and air times were lumped together for the TT-6 - you wouldn't actually give 60 continuous min of O₂ at 60 FSW or 120 min of oxygen at 30 FSW unless you didn't really like your IO. For the purposes of the calculation, however, clumping the air and oxygen times together gives a reasonable approximation of the nitrogen load.)

So how do you get the NEW IO out??

OK - - now you're tired! You don't particularly want to work up a new Nobendem for IO #2 - so you simply remember the new profiles for a TT-6 (that have been previously worked up using Nobendem) and instruct the current IO to breathe 30 min O2 during the ascent from 60 FSW to 30 FSW, then follow the standard recommendations of the last 20 min at 30 FSW on O2, plus the 30 min ascent to the surface on O2. Later on when you recover from the ordeal, you run this through the Nobendem calculator and find that it is, indeed an entirely safe profile, with safety enhancement greater than 65. You also run the original IO's profile through Nobendem and find that the TT-6 he received is exactly what was required to get him out of the chamber with a safety enhancement of 65!!

Finally everyone is out. The IO's are tired, but otherwise OK (and remain so). The patient goes off to the hospital for admission and observation. One hour later, he's complaining of a mild headache, very mild end inspiratory dyspnea, air hunger, and his O2 sat has dropped from 98 to 88. What do you do now??

Well - you're a hyperbaricist! The hammer you have is the chamber. The question you have to ask is - - "Is the patient a nail, or might something else be going on?"

You suggest to the calling internist that this probably isn't pulmonary oxygen toxicity, as a decrease in O2 sat wouldn't occur in all but the most severe cases of O2 tox, and since the patient has only had about 690 - 700 UPTD's (standard TT-6), the only expected symptom might be a mild cough, resolving within 1-2 hours post treatment. The likelihood of recurrent chokes is a possibility, but would be most unusual, given his excellent response early on in the TT-6. Far more likely, given the earlier Hx of pink frothy sputum, and the fact that this was a diving accident, makes ARDS (either from salt water aspiration or blood) a much more likely diagnosis. Sure enough - they shoot a chest film, and the lung fields are whited out! Earlier they had put the patient on a 100% O2 by mask, and his O2 sat was quickly back up to 98%. A pulmonologist is consulted, and he agrees that this is ARDS, nothing to do with the HBO treatment.

The patient does quite well, within 4 hours has been weaned from the O2 mask, and is receiving only 4 l/min of O2 by nasal cannula. No steroids were required or administered. The patient remains neurologically intact and wonders when he can dive again (well - maybe not so intact)!

Per the Navy Dive Manual, he should wait 3 months before reapplying the tanks. In this case, I think he should probably wait 60 years, but what do I know??

Over the next 36 hours, two of this fellows diving buddies come in to be treated for Type-1 joint pain only DCS. They all do well on standard TT-6's.

There oughta be a law - -

Oh, by the way: The original patient had DCI (decompression injury) which is a particularly nasty affliction consisting of AGE plus nitrogen bubble trouble. He got the AGE during the rapid ascent, and the nitrogen bubbles by ignoring all dive planning, and exceeding safe time at depth parameters for no decompression stops (which he didn't think he had time for, as he had no air left). Generally, these folks don't do too well, so the fact that this guy walked out of the treatment chamber under his own steam was similar to Lazarus hopping up "after a brief illness" for a quick game of tennis! Sure - he later developed a very mild bout of ARDS (from sea water aspiration), which resolved relatively quickly. But all-in-all, he's a very lucky camper! Everyone involved on his treatment team did yeoman's work to pull him through!

PS - for extra credit - if anyone out there can work up another mechanism to extricate the Doc, please let me know what it was. We've thought about using Navy tables as if the Doc spent all his time at 100 FSW until the deco ascent was begun (kind of averaging the time at 60 FSW and 127 FSW) - hard to tell if that would have been appropriate or not. Remember too that the Nobendem profile had a 65 safety enhancement (quite high), so comparisons with other tables may show our solution was extremely conservative.