



TWO MONTH DELAYED HYPERBARIC RECOMPRESSION OF DCS FROM INJURY AT DEPTH MISDIAGNOSED AS MUSCULOSKELETAL STRAIN AND POST-CONCUSSIVE SYNDROME.

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RESULTS

The patient noted dramatic improvement in his symptomatology. Neck pain resolved by the fourth treatment. Headaches became occasional and markedly improved with a 1 to 2 on a scale of 10. General fatigue was improved significantly and left leg fatigability resolved with USN 6. Slight residual dry left eye sensation remained but improved. Olfactory hallucinations resolved. Frustration and anxiety to baseline pre-accident occurring midway through treatments per his wife.

Neuropsychiatry evaluation, when compared before and after the treatments, showed notable improvement in his performance scale intellect, from the high average to very superior range. Processing speed improved from low average to normal range. Slight increases in motor strength, dexterity and hand speed were demonstrated. There were substantial improvements in memory function from average to very superior range. Slight improvement in overall reasoning and judgment skills were seen. His conceptual set shifting speed and accuracy improved significantly. No major changes in emotional functioning were noted despite subjective improvements.



DISCUSSION

This case demonstrates the need for consideration of DCS as a component of all in water diving injuries. It is our belief that acute trauma at depth, as it alters blood flow to the site of injury, affects gas metabolism and can predispose the area to DCS. Therefore, all pain or neurological symptoms following a dive deserve a test at pressure. Delay to treatment can worsen outcome; however, the majority of divers respond to HBO even days to weeks after injury.

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CASE REVIEW

DIVE

J.B., a 35 year-old man, was diving off the coast of Mexico on an every six hour rotation for 10 days with occasional 12 hour intervals due to nitrogen residual. After a 12 hour rest period he performed a very hard working dive to 75 feet for 120 minutes in 10 foot seas with a strong current to separate two flanges, equalize pressures in two pipelines, and then send a pig-launcher down one of the pipes.

INJURY

Approximately 80 minutes into the dive, the sea surged while lowering of the 1,200 lbs steel pig-launcher, lifting the diver into the pig; striking his right posterior side of head and neck. Becoming entangled in the line, he reported feeling anxious and hyperventilated. As the swell receded, he was again struck in the head by the pig and developed immediate neck pain. There was no loss of consciousness and he was able to detangle himself and complete the remaining 30 minutes of the dive.

No dive records were available. Ascent was reported at 6 ft. per minute. Following a surface interval of 4 minutes, he proceeded to a Sur DO2 which he believes was a 40 ft. stop for 25 minutes with an 8 minute slide to surface. During his Sur DO2 he noticed a headache beginning at depth, which worsened upon exiting the chamber. Over the next two days the diver complained of constant headaches, fatigue, decreased concentration, and "cheesecloth" vision; but was able to perform two more dives without noted exacerbation until he was placed on rack operation due to the complaints.

PREEVALUATION TREATMENT

Returning home four days later he was evaluated by his general practitioner with complaints of neck pain and worsening headaches, who noted the diver to have short-term memory problems. A CT of the brain and C-spine radiographs were normal. MRI of the C-spine showed minimal spondylosis of C3-C4 and MRI of the T-spine showed minimal right paracentral protrusion of T9-T10 intervertebral disc. J.B. was diagnosed with "post-concussive headaches", "acute cervical strain", and "generalized anxiety with new adjustment disorder" for which he was prescribed NSAIDS, Flexeril, and Prozac.

At that time, he was also referred to a Neurologist; who diagnosed him with "mild post-concussion syndrome" and prognosticated a "full and complete recovery" with recommendations of returning to work in one week. Two months following the accident, despite rest, NSAIDS, muscle relaxers, and physical therapy, the patient failed to improve and sought a second opinion from our hyperbaric group.

DIVER EVALUATION

HISTORY OF PRESENT ILLNESS

Constant left frontal and bioccipital headaches ranging from 2 to 7.5 on a 10 point scale. Right neck and back pain-Constant C-7 to T-10 right sided pain ranging from 3 to 6 on a 10 point scale. Also complained of weakness in his left upper extremity and intermittent paresthesias in his right fingertips, thumb through ring finger. Fatigue- Generalized and easy fatigability of the left leg. Short term memory deficits- Forgetful and repeating himself. Dry left eye and olfactory hallucination of spearmint in his left nostril.

PAST MEDICAL HISTORY

7 years of commercial diving, mostly surface-supplied air, approximately 150 dives per a year, bent twice- once in the left elbow resolved with treatment table 6 and skin bends resolved with a treatment table 5A, no chronic medical conditions, no prior head injuries.

SOCIAL HISTORY

No tobacco or drug use, drinks 2 to 4 drinks three times a week while onshore, three cups of coffee daily, finished high school with one year of college, six years as an electronic technician in the military.

PHYSICAL EXAMINATION

Significant for tenderness posteriorly at C-7 in the midline and pain with rotation and extension, very mild pain up and down the entire C-spine with flexion, slight left upper extremity asymmetry within normal limits for right-hand dominant, pinprick slightly decreased in left temporal area, vibratory sensation decreased to left ankle and foot with decreased cold sensation to left dorsal lateral foot, blunted anal wink and bulbocavernosus reflex, marked decrease in rhythm and speed with left foot tapping.

STUDIES

MRI of the Brain showed diffuse white matter changes, SPECT brain imaging showed abnormal heterogeneous tracer uptake throughout the cortex with focal deficit in the left parietal lobe and slight depression of basal ganglia bilaterally. Contrast TEE showed a minimal 2mm PFO.

TREATMENT

Patient underwent one table 6 then a series of low pressure treatments guided by improvement and plateau of clinical symptoms. Total daily low pressure treatments numbered 36. 2.8ATA for 60 minutes for 3 dives, followed by 2.0 ATA for 60 minutes for 9 dives, then the remaining 24 dives at 1.5 ATA for 60 minutes.

INTRODUCTION:

Injuries occurring at depth are potential sites for abnormal gas exchange that can predispose to DCS. We report a case of injury at depth misdiagnosed as cervical strain and post-concussive syndrome that responded to recompression two months after injury.

CASE REPORT:

A 35 year-old male surface supplied air commercial diver, struck on the head and neck by a 1,200 lb pig sled at 75fsw, experienced transient dizziness and immediate neck pain. Headache during surface decompression worsened over the next 48 hours as he developed fatigue, cognitive problems, and left sided: hand weakness, eye dryness, and olfactory hallucinations. His M.D. and neurologist diagnosed post-concussive syndrome, cervical strain, and reactive depression after MRI of the brain and c-spine showed diffuse white matter lesions and DJD. Complaints persisted despite two months of therapies. Diving physician second opinion revealed left sided motor, sensory and sacral plexus findings, mild neuropsychiatric impairments, two millimeter PFO on TEE, and abnormal SPECT brain imaging. Standard recompression commenced and was tapered to lower pressure treatments over 6 weeks.

RESULTS:

Cervical complaints resolved following 4 HBOT's. Remaining symptoms and physical findings resolved or to plateau at 36 HBOT's. Neuropsychiatric re-evaluation showed significant improvement in previous deficits as well as multiple normal tests on baseline evaluation. Repeat SPECT brain was improved consistent with improved symptoms, physical exam, and neuropsychological testing. Four year follow-up reveals minimal symptoms and an "A" average in college.

DISCUSSION:

This case demonstrates the importance of recompression regardless of delay and that symptoms post dive are DCS until proven otherwise. It also suggests the probability that injury at depth predisposes to DCS at the sites of injury.