Thoracic disc disease places patient at risk for DCS

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Case: A thirty-five year-old male with no pertinent past medical history presented to an outside emergency department with generalized myalgias, fatigue, disequilibrium and urinary retention after a total of eight recreational spearfishing air dives averaging between 150-170fsw with the deepest depth of 206fsw. Vigorous activity, including fending off a shark, resulted in many Valsalva maneuvers. His extreme dive profiles resulted in appropriate lock-out of his dive computer. Symptoms began upon boarding his boat and did not resolve after an improvised in-water recompression attempt to 24fsw. Patient presented to a local ED and work up was significant for leg weakness and urinary retention of 1 liter. He was transferred to LSU Hyperbaric Medicine for hyperbaric oxygen therapy (HBO_2). Upon arrival exam findings were notable for inability to lift RLE against gravity, LLE weakness recorded at 3/5, truncal ataxia, inability to stand, hyporeflexia, and abdominal hypoesthesia. He was immediately placed into the hyperbaric oxygen chamber and received a US Navy Treatment Table 6 (USN TT6 – 100% O_2 at 2.8 ATA) with two thirty-minute extensions at 30fsw and 60fsw, totaling roughly 365 minutes. Upon ascent from the chamber, the patient was able to raise his RLE against gravity, stand for a few seconds, and pivot transfer into bed; however urinary retention persisted requiring a foley. MRI of the brain, cervical and lumbar spine revealed no manifestations of decompression sickness (DCS). MRI Thoracic spine showed an isolated disc herniation at T4-T5 with an associated short-segment abnormal cord signal representing mild cord edema, contusion or myelomalacia without myelitis. He underwent a repeat USN TT6 four hours later. Afterwards he was able to perform a heel-to-shin test with his RLE and the proximal strength in that extremity improved to 4/5, yet still could not stand. To avoid pulmonary oxygen toxicity, his treatment profile was changed to US Navy Treatment Table 9 (100% O_2 at 2.4 ATA) for the remainder of his treatments. The patient was able to stand and walk four feet with assistance after his third treatment and was able to void spontaneously allowing for discharge after his fourth treatment. By his seventh and last treatment, he was able to walk greater than 100ft unassisted and his truncal disequilibrium had improved but was not yet to baseline. At follow-up seven weeks later, the patient endorsed post-void fullness and constipation requiring PRNs and his exam was notable for a mild unsteady gait.

Discussion: Decompression sickness (DCS), as defined in the Undersea and Hyperbaric Medical Society Indications Manual, is caused by the formation of bubbles in blood and/or tissues when the sum of dissolved gas pressures exceeds the ambient pressure – also known as supersaturation – which occurs during ascent from a dive. Multiple mechanisms hypothesize how the presence of bubbles cause adverse outcomes including occlusion of blood flow, mechanical disruption of tissue, endothelial dysfunction, complement activation and/or cell death. The diagnosis of DCS is made after evaluating all factors related to the dive, symptomology, possible risk factors, and the medical history. Most common manifestations are mild and constitutional such as musculoskeletal pain, skin rashes (cutis marmorata), malaise, and paresthesias. More concerning symptoms include motor weakness, ataxia, hemiplegia, paraplegia, hearing loss, vertigo, dyspnea, pulmonary edema, bladder/sphincter dysfunction, shock, and death. DCS is a clinical diagnosis, and imaging is often useful to rule out alternative diagnoses and offer context to the case. In this case, the MRI thoracic findings are vital in understanding the pathophysiology of this patient's disease process. The area of thoracic spinal cord compression has decreased perfusion and altered gas exchange thus making him more vulnerable to developing spinal DCS. Further research into this mechanism of disease is important as it could offer insight into divers at increased risk of DCS if ascent protocols are not followed.