INVESTIGATION OF DELAYED RECOMPRESSION TREATMENT FOR LIMITING THE INDUCTION OF DYSBARIC OSTEONECROSIS IN UW SHEEP MODEL.

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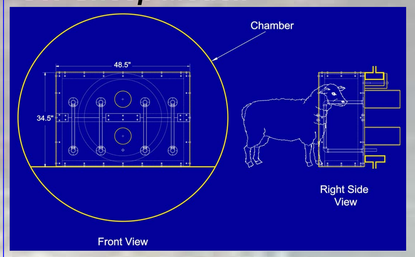
Introduction:

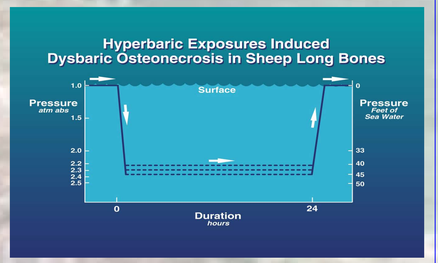
It was successfully demonstrated that dysbaric osteonecrosis (DON) can be induced using the sheep model of the diver by prolonged compressed air exposures and provocative "dropout" decompressions. Dysbaric osteonecrosis may lead to the joint collapse of disabling secondary osteoarthritis. We investigated of delayed recompression treatment for limiting the induction in sheep of dysbaric osteonecrosis (DON) in sheep.

Goal of study:

These findings provide a practical tool for estimating risk of dysbaric osteonecrosis in humans from outcomes in sheep, especially in decompression profiles too risky to test with humans. This model supports the hypothesis that species of similar body mass have similar DCS risk.

UW Sheep Model:



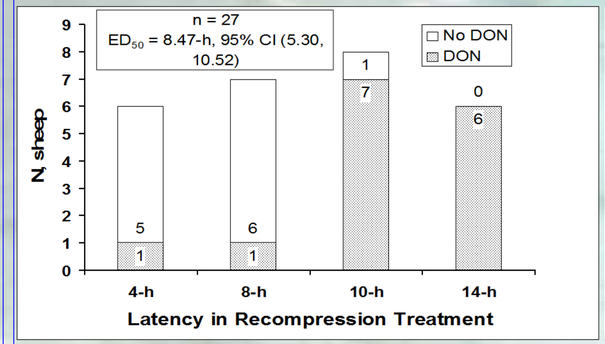


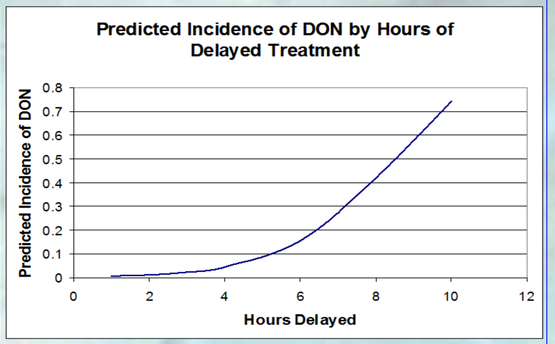
Materials and Methods:

- Twenty-seven adult female sheep (90.5 ± 15.5 SD kg) underwent dry-air chamber exposures at 2.27 atm abs (43 fsw, 12.8 msw) for 24 hours, then rapid decompression at 30 feet/min (0.9 atm/min) to surface followed by air recompression treatment (Modified USN Table 6) with latencies of 4, 8, 10, or 14 hours.
- One month after decompression, sheep were injected with 99mTc-methylene diphosphonate (MDP) for bone scans of radii and tibiae to identify "hot spots" signifying long-bone DON lesions.
- During bone scans, alizarin complexone fluorochrome was administered IV to visualize DON repair.
- One week later, sheep underwent necropsy for observation of DON pathology.

Results:

- Of 27 sheep that underwent recompression in the 4 groups, 12 sheep sustained DON lesions with active remodeling.
- Logistic regression showed that DON occurrence was significantly associated with hours of delayed recompression (Wald p = 0.015), with the odds of developing DON about twice as large for each additional hour of recompression delay (odds ratio = 1.99; 95% CI [1.15, 3.45]).
- Based on the logistic model, predicted incidence of DON rose from 4% at 4 hours to 98% at 14 hours, with DON incidence predicted to be 50% at 8.47 hours of delay (95% CI [5.30, 10.52]).





Conclusion:

- Prompt therapeutic recompression after the hyperbaric exposure effectively prevented the development of DON.
- Delaying recompression treatment of limb bends can markedly elevate the incidence of DON and potentially disabling osteoarthritis in the affected diver.

Acknowledgments:

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