Efficacy of U.S. NAVY Treatment Tables in 103 Recreational SCUBA Divers

UCLA

Gonda Center for Wound Healing and Hyperbaric Medicine

Walter Chin
BSN, CHT, ADMT

Rachelle Jacoby
BS, EMT

Monika Marcinkevicius
BS

Grace H. Wegrzyn
BS, EMT

Joanne Feldman
MD, UHM

Atilla Uner
MD

Nisha Talati,
BS

Susan Sprau
MD, MACP, FCCP, FAASM

Background

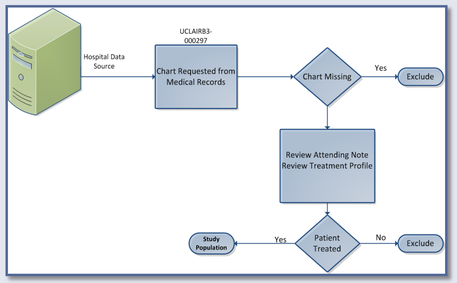
Despite the advancement of decompression models, DCS continues to be present in recreational SCUBA divers. Nonspecific symptoms can lead to a delay in treatment and incomplete symptom resolution. In 1924, the U.S. Navy published the first standard recompression treatment procedure in its Diving Manual. They found 50% of divers treated on these air tables suffered recurrence of symptoms. In 1965, Goodman and Workman developed the minimal-recompression oxygen treatment tables, U.S. Navy Treatment 5 and 6. Cure rates of up to 98% on treatment table 5 and 6 have been reported. Treatment tables have shown high efficacy in subjects being treated with minimal delay of symptom manifestation.

Purpose

The development of treatment tables were tailored to the U.S NAVY diver. SCUBA divers do not generally represent U.S NAVY divers and therefore conduct different types of dives. Several divers presenting to the UCLA Health System for therapy often times had several hours to days of delay. Are we treating the patients with an inadequate drug?

Methods

Expedited UCLA IRB review and approval (13-000297) to preform a single center retrospective chart review was conducted from 2003-2013. Exclusion criteria included incomplete chart, arterial gas embolism, treatment delay>14 days, aborted treatment, and first treatment not completed at UCLA. A data collection tool was created and 12 variables were identified as sensitive determents of disease, such as signs and symptoms of DCS development and symptom resolution at the end of all treatments. Resolution was categorized as complete relief (no clinical symptoms reported by patient), partial relief, or no relief of symptoms.



Variables

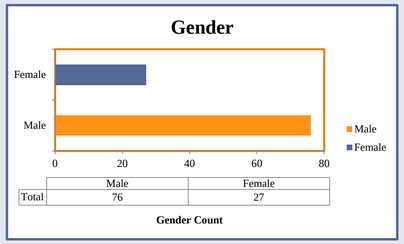
12 variables were analyzed: age, gender, number of dives, number of HBOT, symptom relief within first 10 minutes, amount of time it took for relief to occur, symptom resolution with first treatment, type of DCS, symptom onset during or after dive, amount of time before symptom onset, amount of time between symptom onset and first HBOT, and type of resolution.

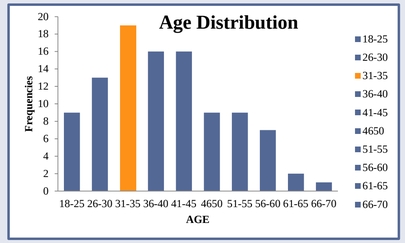
Data Analysis

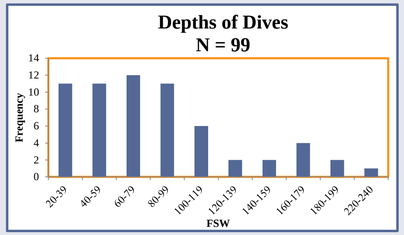
Spearman's Rank Correlation, a nonparametric statistical technique, was used to analyze correlation between variables. Spearman's correlation coefficient (r_s) measures the strength of association between two ranked variables. A Levene's test was used to measure equality of variance.

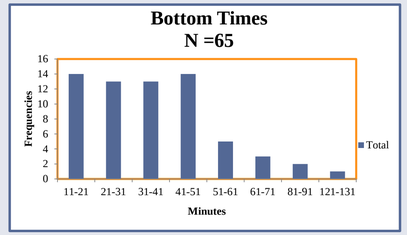
Results

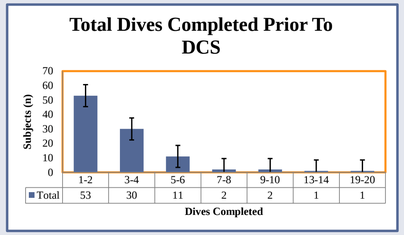
Of 103 cases included, 51.5% of patients felt complete relief (46 DCS type II; 7 DCS type I), 43.7% felt partial relief (40 DCS type II; 5 DCS type I), and 4.8% felt no relief (3 DCS type II; 2 DCS type I). Of the 53 patients having complete resolution, only 47% felt complete relief after the first treatment. 30.2% (N=16) needed only one HBO treatment while 69.8% (N=37) needed at least two to feel complete relief. 47.6% (N=49) of all patients felt symptomatic relief during the first 10 minutes of therapy but only 53.1% (N=26) of those patients had complete relief at the end of all therapy.

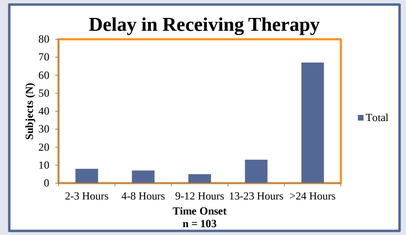


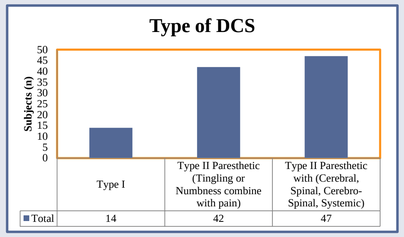


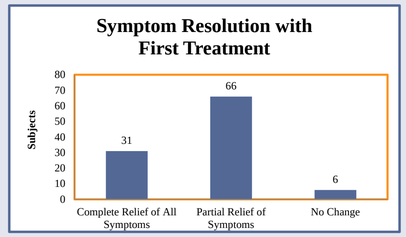


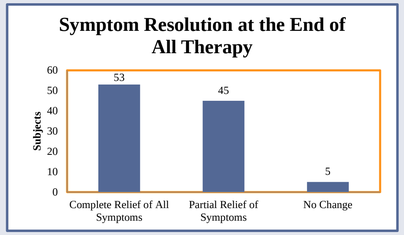


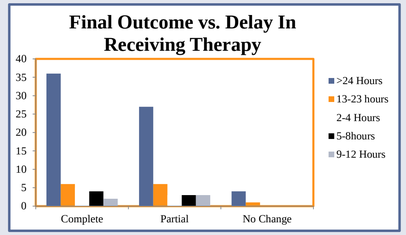


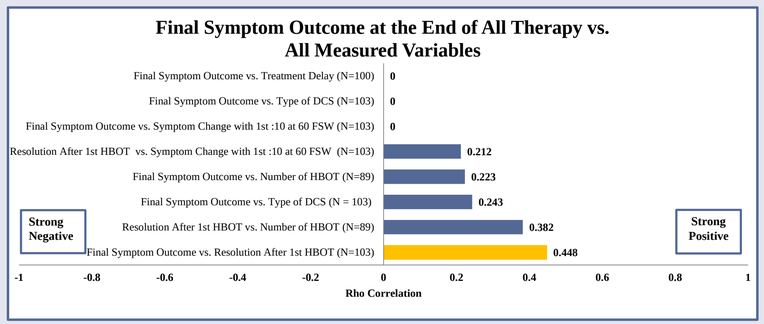


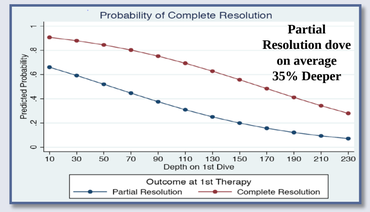










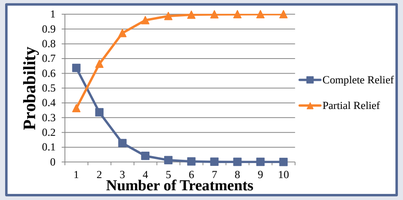


Discriminant Analysis

Logistic regression analysis was used to predict the probability of a patient achieving complete or partial resolution. The predictor variables were depth of first dive and symptom resolution with first treatment.

There is a 79% probability of having complete resolution at the end of all therapy if patient has complete resolution with first therapy (z = 10.11, p> 0.000, 95% CI [0.6381]).

There is a 43% probability of having complete resolution at the end of therapy if patient has partial resolution with first therapy (z=6.62, p>0.000, CI 95, 0.3020).



Conclusion

- No strong correlations were found between variables.
- These treatment tables proved partially effective for recreational divers as only half achieved complete resolution at the end of therapy.
- Change of symptoms with the first treatment was not a good indicator of overall outcome.
- Symptom relief at 10 minutes at 60 FSW, type of DCS, and treatment delay had no correlation with resolution of symptoms at the end of HBOT.

Discussion

This study aimed to test the efficacy of the US Navy treatment tables. In our population, only 51.5% of recreational divers felt complete relief. While previous studies found a correlation between treatment delay and complete relief, our study did not. We found that the most significant factor to achieving complete relief was depth of first dive. Further research should be conducted to understand all potential predictors of outcome.