

Alcohol use in scuba divers treated for diving injuries: A comparison of decompression sickness and arterial gas embolism

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Introduction

Decompression sickness (DCS) is a rare but serious illness known colloquially as “the bends.” This condition is found in scuba divers, high-altitude pilots, and others who breathe air at pressures significantly different from 1 atmosphere. DCS is caused by the formation and/or growth of nitrogen gas bubbles in the body following a reduction in ambient pressure. These bubbles may become lodged in tissue or block blood flow, causing pain, motor weakness, sensory deficit, and paralysis. Although its incidence is low, DCS is the most common scuba diving injury requiring treatment.

Diver training and safety organizations suggest that the consumption of alcohol before or after diving increases the risk of DCS by contributing to dehydration and affecting peripheral blood flow, thereby altering the absorption and elimination of nitrogen. However, there is no empirical evidence that drinking increases DCS risk, and in the absence of available data about alcohol consumption in both injured and non-injured divers, an association of drinking to DCS risk cannot be established.

We can investigate the role of alcohol in DCS risk by comparing the presence of alcohol in DCS injuries vs. another kind of diving injury, arterial gas embolism (AGE). The differences in the etiology and pathology of DCS and AGE (DCS is caused by rapid off-gassing of nitrogen leading to nitrogen gas bubbles in blood and tissue, AGE is caused by air bubbles in arterial blood resulting from lung overinflation) suggests that the postulated mechanisms for alcohol-related DCS risk are not relevant to AGE. If alcohol use is more often present in DCS relative to AGE, a hypothesis of increased DCS risk with drinking would be supported.

Methods

Analyses were conducted on a database of scuba diving injuries maintained by the Divers Alert Network. The database includes information from recreational scuba divers who were treated between 1989 and 1994 for a diving injury at hyperbaric chambers in North America or the Caribbean.

Multivariate logistic regression was used to predict the type of diving injury (DCS or AGE) from characteristics of the injured diver and characteristics of the dive on which the injury occurred. Included in the analyses were dive parameters that are known to increase the risk of AGE (rapid ascent; running out of air, which leads to a fast ascent) and parameters that increase the risk of DCS (depth of dive, exceeding the standard depth-time limits for the dive), as well as diver characteristics that might confound the relationship of alcohol use to DCS (gender, smoking, and diving experience).

Results

Characteristics of DCS and AGE injuries

	Percent in DCS cases (2499)	Percent in AGE cases (323)
Diver characteristics		
Male	72.8	66.8
Age (mean)	34.7	34.6
Ever smoker	40.5	47.5
Lifetime dives (mean)	331.7	190.9
Dives last 12 months (mean)	46.9	25.9
Dive characteristics		
Rapid ascent	22.3	56.1
Low/out of air	14.2	25.2
Deepest dive in series (mean)	94.9	75.1
Out of limits	30.4	19.3
Drank night before dive	38.9	39.4

Multivariate predictors of DCS vs. AGE diagnosis

	Odds ratio	95% C.I.
Diver characteristics		
Male	1.04	0.78, 1.38
Age	0.99	0.98, 1.01
Ever smoker	0.69	0.53, 0.90
Dives last 12 months	1.04	1.01, 1.07
Dive characteristics		
Rapid ascent	0.28	0.21, 0.37
Low/out of air	0.64	0.46, 0.88
Deepest dive in series	1.15	1.10, 1.21
Out of limits	1.63	1.18, 2.26
Drank night before dive	0.96	0.73, 1.27
Drank pre-dive	1.00	0.36, 2.80

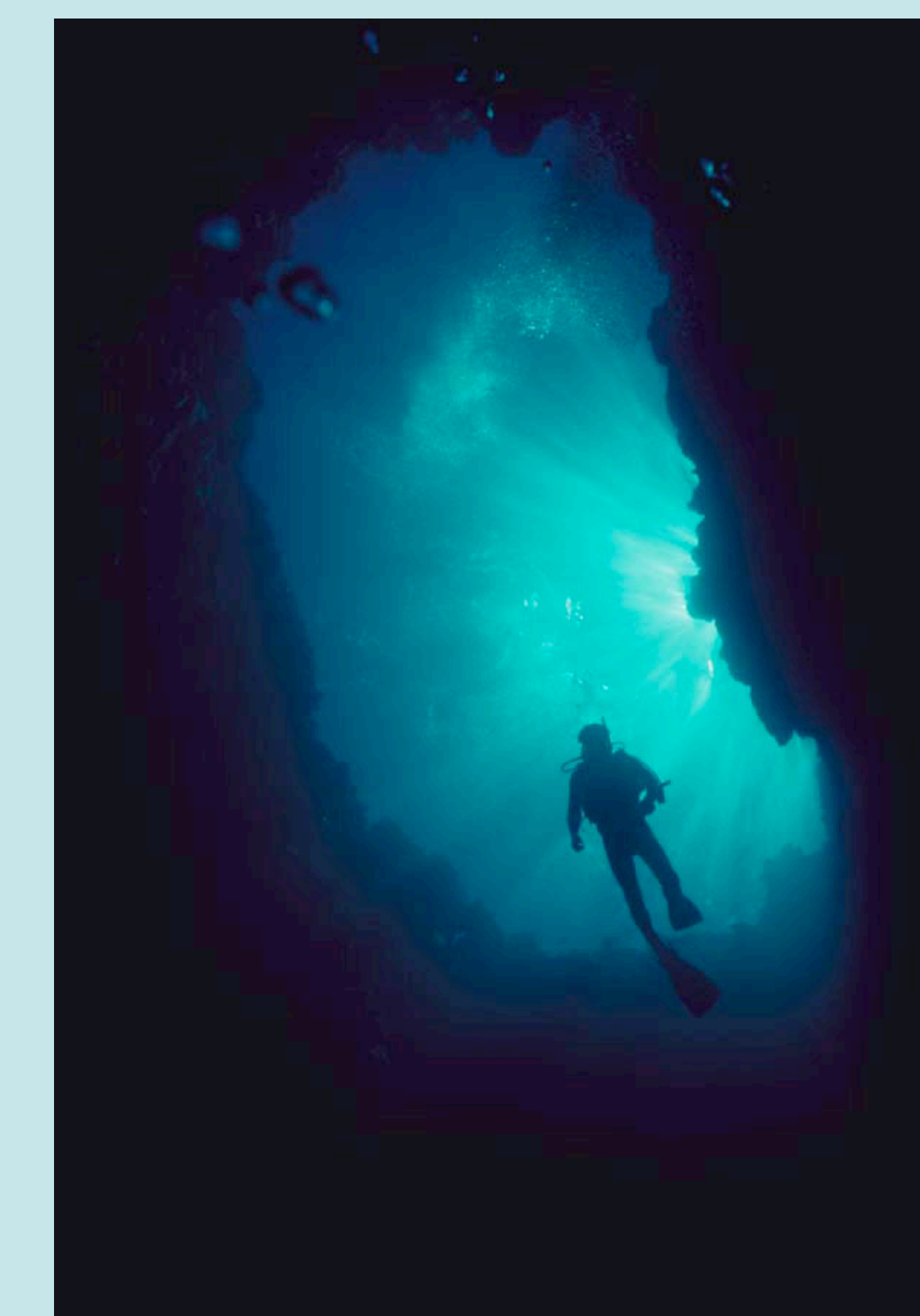
DCS: Decompression sickness
AGE: Arterial gas embolism
Dives in last 12 months: Increments of 10 dives
Deepest dive: Increments of 10 feet
Out of limits: Exceeded recommended depth-time limits

Conclusions

The results of the multivariate logistic regression showed that:

- Divers who had ever smoked were more likely to have an AGE injury
- More experienced divers were less likely to have an AGE injury
- Rapid ascent and running out of air were associated with AGE injury
- Deeper dives and exceeding depth-time limits were associated with DCS injury
- Drinking alcohol the night before diving, or drinking on the day of the dive, were unrelated to type of injury.

If drinking alcohol increases the risk of DCS through the physiological mechanisms outlined above, we would expect that drinking would be more likely to be present in DCS injuries than in other diving injuries. In this sample of injured scuba divers, alcohol use was equally prevalent in DCS injuries and AGE injuries. Although known risk factors for AGE (rapid ascent, running out of air) and for DCS (deep diving, exceeding tabled limits for depth and time) discriminated between DCS and AGE injury, alcohol consumption did not. These findings do not support the contention that alcohol increases the risk of DCS.



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