PROTECTIVE EFFECT OF 4 MONTHS OF COMBINED INTENSIVE SCUBA DIVING AND STRENUOUS PHYSICAL TRAINING ON BUBBLE FORMATION AND CUTANEOUS ENDOTHELIAL FUNCTION IN MAN.

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Introduction: Decompression Sickness (DCS) results from arterial gas embolism due to gas invasion into the systemic circulation. The Doppler ultrasonic detection of circulating venous bubbles after diving is considered a useful index for the safety of decompression because of the relationship between bubbles and decompression sickness risk. It was previously shown that the number of intravascular bubbles after a dive can be reduced by either a single bout of physical exercise or administration of NO donors, administered before the dive. This pointed out a possible relation between vascular endothelium and intravascular bubbles formation. The aim of this study was to determine the effect of combined repeated dives and exercise training on bubble formation and cutaneous endothelial vasoreaction.

Methods: 23 healthy volunteers (25.3 ± 0.8 years; mean ± sem) were included in this study. All were Ship Divers from the French Navy, and were admitted to the Mine Clearance Divers course. For all subjects, the training program lasted 4 months and included intensive scuba dives (43 dives at depths ranging from 6 to 45 m of sea water, and 17 within 45 and 80 msw) and exercise training (bouts of either 45 min jogging or bouts of 1000 m swimming at sea). Before and after the training program, Laser Doppler was used to measure forearm cutaneous blood flow in the resting state (baseline), during post-occlusive hyperaemia (endothelium-dependent vasodilation) and local heating to 42°C (maximal vasodilation). Subjects were also examined for bubble grade after a single air dive in a hyperbaric chamber consisting of a 30 min stay at 400 kPa, the ascent rate during decompression was 150 kPa.min⁻¹ with a 9 min stop at 30 kPa (French Navy procedure). Venous circulating bubbles were monitored with a pulsed Doppler on the precordial area 30, 60 and 90 min after surfacing. Bubble grades were evaluated according to the Spencer scale. Data were analyzed using non-parametric Wilcoxon test.

Results: None of the divers showed decompression sickness during the study. Results showed that bubbles grades were significantly decreased after the 4 months daily intensive diving and strenuous physical training. This effect was not due to endothelial vascular improvement since no statistical difference were detected for cutaneous blood flow, neither for peak value (RH) during reactive hyperaemia nor in response to local heating 42°C (T peak).

Conclusion: This study confirms a protective effect of diving against DCS. Repeated diving and exercise training may participate in preventing the risk of scuba divers. However, the mechanisms underlying this adaptation remain to be précised.

Keywords: Diving, Environmental Physiology, Applied Physiology

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