REVERSIBLE MYOCARDIAL DYSFUNCTION AND CLINICAL OUTCOME
IN SCUBA DIVERS WITH IMMERSION PULMONARY EDEMA

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Introduction
Immersion pulmonary edema (IPE) during scuba diving is increasingly observed for 10 years but the prevalence, risk factors and individual predispositions contributing to the development of this injury are still unknown.

It has been recently reported that IPE tended to recur with a potentially fatal outcome, particularly in older divers without evidence of underlying cardiac disease1.

Spontaneous cases of IPE were found to be associated with myocardial injury clinically inconsequential2,3, but the pathophysiology linking the 2 conditions have received little attention. Actually, transient cardiac dysfunction of adrenergic origin has largely been observed after a variety of neurologic events or emotional sources of stress4.

We hypothesized that the detection of cardiac abnormalities at initial admission for IPE are at greater risk of acute heart failure that may explain some fatalities during diving. The purposes of this study was therefore to determine the clinical outcome and the risk factors associated to this condition.

Methods
We retrospectively collected information on scuba divers with a clinical and chest computed tomography evidence of IPE treated in 2 French hyperbaric facilities (Toulon near the Mediterranean Sea and Brest near the Atlantic Ocean) from January 2007 to Juin 2012. After exclusion of cases with incomplete data (lack of ECG or laboratory investigations) or presenting 12 hours after surfacing with resolving symptoms, 54 patients were eligible for the study.

Demographic, clinical, biological and diving characteristics were tested as potential predictors of reversible myocardial dysfunction (RMD).

A follow-up study at 1-month with laboratory investigations was performed.

Results
Forty three patients (80%) were originated from Toulon and 11 (20%) from the area of Brest. Divers with IPE treated in Toulon during the period in question represented 12% of all patients referred for diving injury in this facility if we include the cases with incomplete data.

Data regarding demographic, medical history, biological findings and details of incident dives as a function of myocardial impairment are reviewed in following table.

All the patients had complete resolution of symptoms within 72 hrs but 3 required intensive ventilation or hemodynamic support at admission. RMD was observed in 28% of patients and was more associated with age > 50 yrs (OR = 5.5; 95%CI, 1.5-20.7; P = 0.013), hypertension (OR = 8.2; 95% CI, 2.1-31.8; P = 0.002), diabetes (OR = 22.1; 95% CI, 1.1-458; P = 0.002) and release of natriuretic peptides (OR = 9.1; 95% CI, 2.4-35.2; P = 0.001). Follow-up evaluation revealed a significant number of patients with occult hypertension.

Conclusion
Reversible Myocardial Dysfunction is not uncommon in divers with Immersion Pulmonary Edema. Short-term overall prognosis is not adversely altered but a severe heart failure with fatal outcome is unpredictable. A close monitoring of older divers with latent cardiovascular risk factors is warranted.

The hypoxic or catecholaminergic nature of this condition remains to be established.

References