-156-

NEUROLOGICAL AND HEMODYNAMIC ASPECTS IN COMPETITIVE BREATH-HOLDERS

Pancaro C[1], Magno L[2], Del Sette M[2], Kelley S[3], Ferrigno M[1]
[1]Dept. of anesthesiology, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, [2]TESI Underwater and Hyperbaric Technologies, Genoa Italy; [3]Dept. pf Neurosciences, Univ. of Genoa, Italy.

INTRODUCTION: Competitive breath-holding (Static Apnea) is practiced in swimming-pools around the world. Present records are 485s for male and 381s for female competitors. Neurological problems such as loss of motion control (called "Samba"), are sometimes seen during training and competition. We examine some neurological and hemodyanmic aspects of prolonged breath-holds.

MATERIALS AND METHODS: Bispectral index (BIS, a processed EEG parameter measuring alertness level), arterial oxygen saturation (SaO_2) and heart rate (HR) were recorded during maximal immersed (wBHs) and non-immersed (dBHs) in 6 male competitive breath-holders. End-tidal PCO_2 ($PetCO_2$), transcranial Doppler ultrasound measurements of blood flow velocity in the middle cerebral artery (Vmca) and Mini Mental State examinations (MMS) before and after wBHs were also performed.

RESULTS: Maximal duration was longer in the wBHs than in the dBHs (264±76 vs. 205±58s); BIS valued decreased similarly in both types of breath-holds (93±5 in wBHs vs. 91±2 in dBHs, values corresponding to light sedation). SaO_2 decreased more rapidly in dBHs than in wBHs; however, It reached lower values at the end of wBH (59±25%, reaching 28% in one subject) than dBH (82±13%). Bradycardia was more pronounced in wBHs than in dBHs (lowest HR values were 47±18 and 58±3 bpm, respectively). There was no correlation between SaO_2 and BIS values. $PetCO_2$ at the end of both types of breath-holds ranged between 38 and 48 mmHg. Neurological symptoms (mostly, lightheadedness) were reported more frequently in wBHs than in dBHs. The Vmca increased from 49±3.4 pre wBHs to ±64±12.7 cm/s post wBHs. No changes in Mms were observed.

CONCLUSIONS: A stronger diving response, with a slower rate of arterial desaturation, allows longer breath-holds in wBHs compared to dBHs; however, it also leads to lower final values of SaO_2 that my cause transient neurological problems. Changes in Vmca suggest that the diving response induced an increase of cerebral blood flow.