Effect of pre-dive hydration on venous gas buble production in divers.

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Preventive measures for reducing the risk of decompression sickness (DCS) are based on the limitation of diver-specific risk factors and the influence of determining factors during and after the dive such as dive duration and depth, ascent protocol, ambient temperature or exercising. Unfortunately, clinical data to support the importance and the definite role of each factor on DCS development are lacking due in part to the great inter/intra-variability between individuals regarding susceptibility to DCS.

Based on clinical experience (Blatteau et al., 2005) and Divers Alert Network (DAN) statistics (Divers, 2003), it is important to note presently that most of injured divers presenting neurological DCS (75-90%) followed their dive profile with a computer or a dive table without performing an inadequate decompression schedule (i.e. fast ascent or omitted decompression stops). This result puts forward the notion that conservative profiles are no guarantor of protection against DCS and that novel means are required for DCS prevention. Pre-dive procedures that could induce more tolerance to decompression stress and that might operate on the attenuation of bubble formation believed to reduce the occurrence of decompression sickness are a promising way. The activation of endogenous mechanisms that induce preventive protection in divers and makes the organism more resistant to various stimuli associated with diving is a phenomenon that could refer to a sort of preconditioning. The level of pre-dive oral hydration has been recently shown to decrease circulatory bubbles, thus offering a relatively easy way of reducing decompression sickness risk (Gempp et al. 2008).

In this study we focused on the effect of pre-dive hydration after various methods of preconditioning on the decompression stress in divers. To do so, various anthropological, biochemical and physiological parameters were collected before and after a single dive to

34m for 20 min divers undergoing no preconditioning (n=10) or pre-dive preconditioning on vibration mat (n=8) or in sauna (n=7). The level of hydration was assessed by specific urine gravity, multi-frequency bioelectrical impedance analysis and was correlated to number of venous gas bubbles as measured by transthoracic echocardiography 35 and 90 minutes after the dive.

Spearman correlation analysis showed that there was no correlation between pre-dive, post-dive urine density and venous gas bubbles in any group. However, detailed analysis of relatively pre-dive well hydrated divers (urine specific gravity less then 0.01) showed a strong negative correlation between pre-dive resistance value measured by bioelectrical impedance analysis and venous gas bubbles 35 min after the dive ($p=0.048$, $r=-0.77$) in the group of divers with sauna preconditioning. In the group of well hydrated divers from the vibration preconditioning group, pre-dive resistance and reactance has been positively correlated to the number of venous gas bubbles 35 min after the dive ($p=0.049$, $r=0.7$; $p=0.032$; $r= 0.74$).

We conclude that measurement of urine specific gravity and bioelectrical impedance analysis represent a valuable tool to asses divers hydration in field condition. In addition, relatively high pre-dive hydration might represent a potent and easy tool to decrease decompression stress in divers.

References:

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