

Hypercapnia and diffusion of gases in avalanche – (Changes in functional parameters of individuals in a crisis situation)

Abstract

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The aim of the work: The aim of this study was a continual monitoring of compensation mechanisms, in particular, changes of ventilation-respiratory indicators in simulated avalanche.

Method: Experiment and non-standard questionnaire were used to obtain data. Choice of the team was, due to subject matter, strictly selective. 22 individuals took place in this research, but 11 of them were rejected after the data had been analyzed, because of not fulfilling required criteria. The team was comprised by 11 healthy men of average age of 25,3. Before the experiment itself, sensitivity to hypercapnia and hypoxia (in - breath endurance) and respiratory efficiency (vital capacity of the lungs with forced exhalation) with the aid of personal spirometer was done. Experimental situation represented both, breathing into closed space (8 l) and into a created air pocket in snow (400 ml). Continual notations of circulatory functions (heart frequency, blood pressure) and ventilation-respiratory parameters (breath frequency, breath volume, minute ventilation, O₂ and CO₂ content in inhaled and exhaled air, exhalation resistance and saturation of blood with oxygen) were monitored by patient monitor DATEX Ohmeda. Due to the data character, analysis of variance was used during a repeated measurement with two factors (two- way ANOVA).

Results: This dissertation thesis was held as a pilot study, for the needs of further researches dealing with a similar topic, i.e. the subject of human survival under avalanche. Technical procedures, of how to simulate breathing in snow while eliminating the risks of hypothermia, were evolved. Hypothesis about possibilities of diffusibility of respiratory gases in snow with the limitation of survival given by the size of air pocket were confirmed by comparison of two experimental situations – breathing into closed space and into air pocket in snow. Inter - individual differences in ways of breathing and possibilities of 'breath through' appeared.

The gained results have their limitations rising from specifically different experimental conditions and from reactions of healthy, physically and mentally efficient individuals.

Key words: avalanche, asphyxiation, hypoxia, hypercapnia, survival, diffusion, convection, air pocket

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