

## PREDICTION OF BUBBLE GRADES WITH A SIMPLE MODEL; APPLICATION TO AN IDENTICAL REPETITIVE OPEN WATER DIVE

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**Aims:** 1) Developing a simple formalistic model with which bubble grades (BGs) of venous gas embolism (VGE) can be predicted from no-stop square air-dive profiles. 2) Applying this model to an air-dive and an identical, repetitive dive. 3) Comparing the model outcomes with measured BGs of the actually performed dives.

**Methods:** Diving tables indicate that a repetitive dive to the same depth as a first dive should be shortened to obtain the same risk of decompression sickness (rDCS). Without shortening one would expect a higher VGE-grade since VGE and rDCS are (statistically) related. BG data of a previous study (ASEM 2008;79:488-94) of 28 divers who performed 40-min air dives to 20 meters (surface interval 2h30min) were used. VGE-grades were transformed to log bubbles/cm<sup>2</sup>min to allow parametric statistics.

**Results:** The performance of the model is comparable to that of published, more complicated models. According to DCIEM tables, the second dive has a remaining nitrogen time (RNT) of 8 min. Application of the model to a 48-min dive results in a 0.27 higher logB than that of the 40-min dive, but the measurements showed a 0.14 lower logB of the second dive. Both values are significantly different ( $P=0.012$ ). With an experimentally validated model (JAP 1992;72:1541-8), which calculates rDCS, a difference of 0.34 log unit was found (yielding  $P=0.0097$ ).

**Conclusion:** A speculative explanation would be that the divers, who were relatively old and did not perform physical activity for some days before the first dive, were more vulnerable to develop VGE during the first dive. It is also possible that the RBT of 8 min of DCIEM is too high. More research is recommended to investigate the effect of repetition in dependency of profiles and diver characteristics.

**Keywords:** bubble grades, repetitive dive, measurements, model