Systemic Approach to Decompression Sickness (DCS) Risk Management

The recurrence of DCS despite the compliance with the diving procedures is revealing a limit:

- **Decompression sickness is still today the first cause of diving accidents**

Around 300 DCS are reported in France and thousands around the world each year. One special aspect of these accidents is that they occur in a non-deterministic way (stochastic risk) despite the compliance with diving procedures (decompression stops, ascending speed).

- **What is science's approach to it?**

In order to predict DCS risk - and thus better prevent it - the latest scientific techniques call on probabilities. Parametric models are elaborated and the correlation of factors to risk is evaluated *a posteriori* (multifactorial statistical analysis).

- **What progress can be expected?**

Despite their recurrence, the number of DCS stays small compared to the quantity of factors potentially involved (individuals, diving conditions), preventing *de facto* any prospect of a quick progress.

Thus, a paradigm change considering some additional risk indicators than sole accidents themselves is necessary to hasten the progress process.

Adapting the diving procedures, ensuring their control over time and granting a safety standard through O-Dive PRO system

O-Dive PRO is a patented innovation that enables the **analysis of the quality of decompression procedures** by **considering** two indicators for whom a correlation to the DCS risk has been proven: precise diving profile (parameters) and **the quantity of microbubbles detected in the diver's bloodflow**.

O-Dive includes a vascular microbubble sensor (ultrasonic Doppler technology) connected to a server with specialized analysis tools. This compact and robust sensor is coupled with **a dive computer whose aim is to precisely record and store the diving profile.**
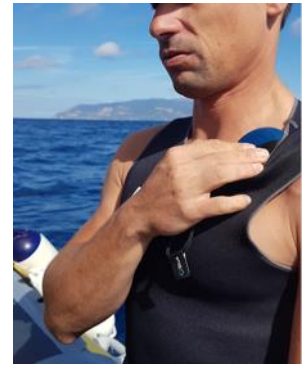
How does it work?

After the dive, divers place the sensor for 20 seconds under their left then right clavicle to record their signals on the O-Dive PRO app.

Divers import then their dive profile (depth as a function of time) by connecting their dive computer to the app once ashore.

All these parameters are later analyzed on a data server.

What do results look like?

A quality index QI is calculated for each point of the decompression table. This index reflects an average degree of prevention towards DCS risk for the monitored population. The higher the quality index is, the lower the DCS risk. When the index value increases by 33 points, DCS risk is divided by 10.

PROF/DT	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
6 m	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
8 m	100%	100%	78%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
10 m	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	98%	95%
12 m	100%	83%	100%	98%	95%	95%	94%	93%	90%	88%	87%	86%	86%	82%	76%
15 m	100%	100%	100%	97%	66%	90%	88%	84%	56%	80%	78%	83%	81%	78%	76%
18 m	100%	82%	98%	70%	88%	83%	80%	79%	77%	75%					
20 m	100%	98%	80%	68%	80%	83%	79%	76%	79%	78%	75%	75%			
22 m	100%	90%	77%	78%	76%	77%	75%	75%							
25 m	100%	63%	81%	59%	78%										
28 m	100%	61%	49%	76%											
30 m	100%	83%	78%	75%	31%	84%	81%	77%	75%	76%	78%				
32 m	100%	76%	56%												
35 m	100%	68%	76%	88%	76%						Indice de qualité IQ				
38 m	84%	77%													
40 m	83%	67%	78%									75 à 100%			
42 m	87%	76%													
45 m	85%	41%	77%									50 à 74%			
48 m	87%	79%	60%	79%											
50 m	80%	53%	76%									0 à 49%			
52 m	76%	58%	51%												

Display of a diving procedure's personalized quality indexes

Better preventing DCS without impacting operational capability

As part of a continuous improvement process, it becomes possible to better prevent DCS by quickly identifying the most risky points of a decompression table, by having an objective knowledge of the effects of various options (longer stops, gas change) on risk and by controlling over the time the performance level of the procedures (preventing of potential deviation).

Références :

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