



PREDICTED PROBABILITY OF DECOMPRESSION SICKNESS IN 159 TREATED CASES WITH DOCUMENTED DIVE PROFILES



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INTRODUCTION

Decompression sickness (DCS) is a rare adverse outcome of diving. Symptoms are mainly mild, although in some cases they may be severe and leave permanent damage or cause death.

The main recommended measure of DCS risk control in recreational diving is to limit the depth-time exposure to no-decompression (no-D) diving.

The no-D limits vary, and the compliance of divers with recommendations is not known. Thus, the success of this approach is difficult to evaluate.

In this study we used electronically recorded depth-time profiles to compare severities of exposures in symptom-free dives with dives resulting with DCS.

METHODS

Symptom-free, air and nitrox open-circuit dive profiles were obtained through DAN's Project Dive Exploration (PDE). Cases treated for DCS were provided by PDE, Dive Safety Lab (DSL) DAN Europe, DAN Medical Services Call Center (MSCC), and the Dunstaffnage Hyperbaric Unit in Scotland. DCS cases were classified as DCS I, DCS II and Ambiguous.¹

The probability of DCS (P_{DCS}), as an index of severity of depth-time exposure, was calculated using probabilistic model.²

Differences in P_{DCS} values were tested by t-test (significance at $p < 0.05$). We did not explore the compliance of divers with instructions provided by their dive computers.

RESULTS

Comparison of P_{DCS} in DCS-free group and in DCS group is shown in Table 1.

Table 1. Comparison of P_{DCS} in DCS and DCS-free dives

Group	n	P_{DCS} (%)				
		mean	SD	min	max	median
DCS cases	159	1.31*	1.10	0.11	8.80	1.07
DCS-free	62,960	0.55	0.54	0.01	9.00	0.39

* $p < 0.05$

The P_{DCS} in DCS cases was greater than in DCS-free dives. The distribution of P_{DCS} in two groups is shown in Figure 1.

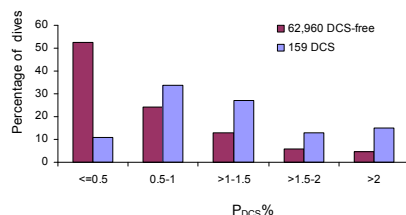


Figure 1. Distribution of P_{DCS} in DCS and DCS-free dives
Most DCS-free dives (77%) occur at $P_{DCS} \leq 1\%$, while only 45% of DCS cases had $P_{DCS} \leq 1\%$.

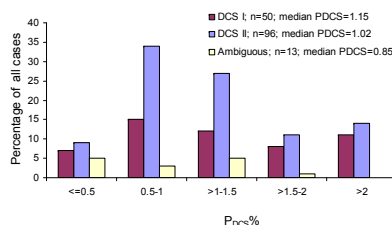


Figure 2. P_{DCS} by DCS type

DCS I and DCS II occurred at similar and Ambiguous cases at smaller P_{DCS} (Figure 2).

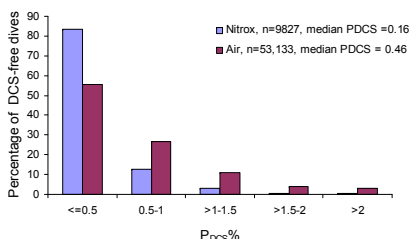


Figure 3. Comparison of nitrox and air DCS-free dives

Use of nitrox was associated with lower P_{DCS} in observed PDE dives ($p < 0.05$).

DISCUSSION

DCS occurs for only a small fraction of recreational dives with $P_{DCS} > 1$. Avoiding exposures with $P_{DCS} > 1$ may reduce the occurrence of DCS to less than a half of current rates.

In recreational diving modifying dive practices would affect only 23% of dives; the use of nitrox also helps to reduce P_{DCS} values.

Safety margins could be increased by modifying dive depth-time profiles without necessarily affecting total dive time though bottom time may be reduced (e.g. Figure 4).

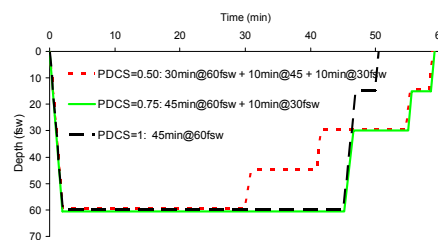


Figure 4. Effects of depth-time modifications on P_{DCS}

CONCLUSION

In most DCS-free dives, the estimated exposure severity was $< 1\%$, while most DCS cases resulted from dives of severity $> 1\%$.

Limiting dive exposure to P_{DCS} of 1% or less may significantly reduce DCS occurrence.

This could be achieved by modifying depth-time profile or by use of nitrox.

Dive computers enable multi-level diving which may help reducing rates of DCS.

REFERENCES

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