

Dr Simon Mitchell is happy to assist with your questions.
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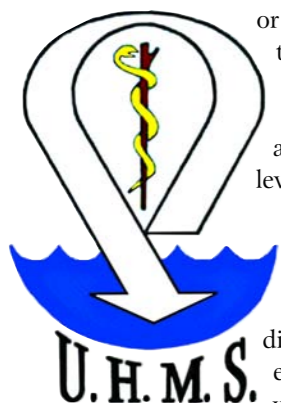
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DIVING MEDICINE

DIVING WITH DIABETES

Most diving enthusiasts are aware that certain diseases are considered incompatible with (or 'contra-indications' to) diving. Most would also identify diabetes, especially in patients requiring insulin, as one such disease. This has certainly been true over the years, and concerns over diving by diabetics are certainly justified. To understand this, it is necessary to briefly summarize the important features of diabetes.

Insulin is a hormone produced by the pancreas and released in precise and automatically controlled amounts to regulate glucose levels in the blood by promoting its uptake into cells. Too little insulin results in blood glucose rising to high levels causing dehydration and severe metabolic disturbances in the short term, and a variety of complications like coronary artery disease in the longer term. Too much insulin results in glucose levels falling dangerously low causing unconsciousness. Diabetes is a disease in which



insulin production by the pancreas is decreased, or the insulin that is produced has less effect than normal. Not surprisingly then, these patients usually have glucose levels that are higher than normal. However, in attempting to establish normal glucose levels by self-administering insulin, a diabetic may "overdo it" and cause their glucose to fall too low. The risk of this would be elevated if, for example, the diabetic gave themselves a normal dose of insulin, then did not have their normal food intake, exercised, and got cold! Low blood sugar with reduced consciousness would obviously be a major potential problem in diving.

The somewhat predictable "ban" on diabetics participating in diving had its origins several decades ago in the concerns that arise logically from the above discussion and in several case reports of divers with diabetes getting into trouble or dying because of diabetes-related events. However, over the intervening period the technology for self monitoring of blood glucose levels by diabetics has dramatically improved, and consequently, so has their ability to adapt to challenging environments and situations. This has seen increasing numbers involving themselves in sports such as diving. Not

uncommonly, this has been by subterfuge because medical authorities have been slow to adapt to a more permissive stance. Indeed, it must be said that many diving physicians have not changed their views at all and still see diabetes as an absolute contraindication to diving. Nevertheless, a growing number (this author included) recognize that diabetics are diving whether we like it or not, and that there is a need to reassess the safety of their activities as objectively as possible and possibly re-evaluate our stance on this issue. The paper I review in this article is one of several attempts to meet this goal.

The reference is:

Edge CJ, St Leger Dowse M, Bryson P. Scuba diving with diabetes mellitus – the UK experience 1991-2001. *Undersea and Hyperbaric Medicine* 2005;32(1):27-37.

THE AIMS OF THE STUDY.

The authors aimed to observe the ordinary diving habits and outcomes for diabetic divers over a protracted period. The word "ordinary" is important, and implies that while the diving and outcomes would be recorded, no attempt was made to control or supervise diving activities as such. Thus, for want of a better description, the study aimed to see what would happen if selected diabetic divers were simply "let loose" in the diving world.

METHODS.

The authors took advantage of the fact that for some time the British Sub-Aqua Club (BSAC) has adopted a permissive stance on diving by diabetics provided the diabetic divers completed an appropriate selection process. "Selection" is an

THIS IS THE LATEST IN A SERIES OF ARTICLES IN WHICH MEMBERS OF THE UNDERSEA AND HYPERBARIC MEDICAL SOCIETY (UHMS) DIVING COMMITTEE REVIEW SPECIFIC DIVING-RELEVANT STUDIES PUBLISHED IN THE MEDICAL LITERATURE.

IN THIS ARTICLE I REVIEW A RECENT PAPER WHICH ADDRESSES A VERY TOPICAL ISSUE: DIVING BY PERSONS SUFFERING FROM DIABETES.

important point: the diabetics were screened by the authors and had to meet certain criteria relating to standards of glucose control and absence of complications of diabetes in order to be considered appropriate for diving. This process had to be repeated on an annual basis along with reporting of diving activity and incidents. The patient treatment records of UK recompression facilities were checked against names in the diabetic diver database as a double check on the accuracy of incident reporting. Aside from this selection and reporting process, and the provision of a set of recommendations for safe diabetic diving, the divers were allowed to participate in diving in an otherwise "normal" and unsupervised manner. The survey was conducted over 11 years.

RESULTS.

At the time the survey was concluded in 2001 323 diabetic divers had participated in the survey: 241 (75%) of these were insulin users and the others controlled their glucose levels with tablets; 211 (65%) were current divers at the time the survey ended, whilst the rest had dropped out of diving (13 of these because they had failed to continue meeting the selection standard for diving by diabetics).

These divers had completed 8760 dives during the survey period. Over the 11 year period the mean number of dives per diver per year fluctuated between 25 to 35. No cases of decompression illness were reported, and none of the registered diabetic divers appeared in the patient databases of UK hyperbaric units. There was only one low blood glucose event reported. This occurred in a diver using insulin and was recognized and treated by the use of oral glucose

paste without further incident. There were two deaths whilst diving. Both were in divers who did not use insulin to manage their diabetes. One was subsequently proven at autopsy to be caused by a heart attack, whilst details of the other were unavailable.

The vast majority of the diabetic divers who used insulin reported utilizing pre-operative blood glucose monitoring and carrying glucose paste with them during diving as recommended in the diabetic diving guidelines.

Follow up of the diabetic divers who dropped out of diving revealed that the reasons were usually socio-economic, and not related to diving accidents or problems. The proportion dropping out over the 11 year survey was similar to that for a similar group of non-diabetic divers for which data was available over the same period.

COMMENTS

Notwithstanding the two deaths which I address below, this survey suggests that well-controlled and properly selected diabetic divers can dive at a level of safety comparable to that of the general diving population. In particular, despite the high proportion of participating divers using insulin, very few low blood sugar events were reported. The authors are quick to point out that this type of survey is easily confounded by "under-reporting" of adverse events by respondents, but it is reassuring that no DCI events appeared in UK recompression facility databases that should have been reported by the survey participants.



Dr Simon Mitchell (BHB, MB ChB, DipDHM, DipOccMed, PhD) began diving in his teenage years and what became a recreational passion subsequently drove his academic and professional career. Simon now looks back on a 33 year diving history that has spanned sport, scientific, commercial, and military diving and more than 6000 dives. Simon trained in medicine, completed a PhD in embolic brain injury, and received certification in diving and hyperbaric medicine from the Australian and New Zealand College of Anaesthetists. He has published more than 30 research and review papers in the medical literature, and wrote two chapters for the latest edition of Bennett and Elliott's Physiology and Medicine of Diving. He is an active technical diver, and in 2002 with Trevor Jackson completed a 178m dive to the wreck of the 'Kyogle' off Brisbane. This was the world's deepest wreck dive. Simon is a dual New Zealand and Australian citizen and currently lives in Auckland with his partner Sian.

The two deaths, only one of which is detailed, are of concern though it is difficult to draw conclusions from such low numbers of events. Although the detailed death was not due to acute abnormal blood sugar control, the severe coronary artery disease which led to the heart attack is a known complication of diabetes. This case can perhaps best be seen as illustrating the need for a relatively comprehensive screening process when diabetics present for diving. Unfortunately, such events are inevitable in both diabetics and non-diabetics from time to time, despite attempts to screen divers for problems.

This paper, and a number of others describing diving activity by diabetics, has given support to the proposal that properly selected and informed diabetics may be able to dive relatively safely, particularly if they adhere to appropriate safety guidelines for “diabetic diving”. This issue was comprehensively discussed and a series of guidelines developed at a workshop hosted jointly by the UHMS and the Divers Alert Network at Las Vegas in 2005. The proceedings of this workshop have just been published. These proceedings provide a consensus view on just what selection, training and diving practice is appropriate for diabetic divers, and will form the basis for another of these articles in the near future.

