

TO DIVE OR NOT TO DIVE

While I was thinking about what to write for this column, I received an email from a diver who was wondering whether he should continue diving or not. His case was complicated and it covered so many useful topics that I thought I would present it in this column. Significant details have been altered to protect his identity.

The diver was in his early 60s and basically had two medical problems of interest in determining if he should continue diving or hang up his fins. He was diabetic and he had some cardiac problems. I wrote two columns on diabetes and diving for Sport Diver near the end of 2008 so I won't dwell on that topic here. This diver had Type II diabetes that was well controlled by oral medications, diet and exercise. He did not suffer symptoms from low or high blood sugar. Basically, his diabetes was not a contraindication for him to continue recreational diving. His cardiac history was much more complicated. In 2005 he had been diagnosed with acute coronary syndrome and suffered a mild heart attack. He had noted a 'sensation' above his chest, outside of his body. There was no pain. He drove himself to the hospital and after a full workup was discovered to have fairly advanced coronary artery disease and eventually had two stents placed in one of the larger coronary arteries to open it up. He was started on several medications and encouraged to make some lifestyle changes.

The diver had smoked when he was much younger but had stopped around 1980. He had high blood pressure (controlled with drugs) and a poor lipid profile (high cholesterol, also controlled with drugs). He had several risk factors for coronary artery disease but the most important was his diabetes. Diabetes is at least as important a risk factor for coronary artery disease as smoking.

Early in 2009 the diver approached his family doctor with the desire to start scuba diving. After several discussions his doctor realized that his diabetes was not really a problem but that his cardiac disease could be. She initiated several investigations to clarify and document his current cardiac status. Since 2005 he had remained asymptomatic from his cardiac disease and had been physically quite active. Part way through the investigations it appeared he was fit to dive so he took and completed his basic open water certification. He subsequently completed several open water dives without difficulty.

The diver had an exercise stress test. The test was stopped when he reached a heart rate of 150 beats per minute as that was his target heart rate (one of the normal end points for a 'clinical' exercise stress test). He was exercising at 12.3 Mets at that point but he had not reached his maximum exercise capacity. When accessing a person's fitness to dive using an exercise stress test (really an 'occupational' exercise stress test), the person should be pushed to their maximum exercise capacity.

In cardiac patients, exercise capacity is often the factor that determines whether they should dive or not. Most authorities believe that a maximum exercise capacity of 13 Mets (one Met is the energy consumption at rest) is a reasonable cut off for commercial or technical diving. For recreational diving most authorities accept 10 Mets as a reasonable limit. This diver's real maximum exercise capacity was most

likely over 13 Mets. He walked/ran for 30 to 90 minutes five times per week and frequently achieved a heart rate of 161 beats per minute while exercising. He also did weight training, Pilates and Yoga on a regular basis. Very few people in their 60s can achieve an exercise level of 13 Mets. Therefore, his exercise capacity was certainly high enough for him to continue recreational diving.

When the exercise stress test was terminated, he had shown some mild signs of cardiac ischemia on the ECG (inadequate oxygen delivery to some of the heart muscle, usually from arteries that are mostly plugged by plaque). These changes had been noted on previous stress tests but the patient had always been asymptomatic so it was not clear what they represented. Technetium 99 was injected and a Myoview scan was done of his heart. The scan was normal and did NOT show areas of ischemia.

These findings are confusing as the stress test suggested ischemia while the scan did not. Therefore he had an IV enhanced CT scan of his heart. It revealed extensive calcification and diffuse coronary artery disease. The stents appeared to be patent (allowing blood to flow through) and there did not appear to be any arteries with obstructions greater than 50%.

In summary this diver had type II diabetes, high blood pressure and abnormal lipids, all well controlled with medications, diet and exercise. In addition he had extensive coronary artery disease but he was fit and

had an excellent exercise capacity. He had made significant lifestyle changes to maximize his performance and to reduce as much as possible his risk of having another heart attack.

In trying to determine if he was fit to dive or not, several factors had to be considered. First, he had taken his course, completed his checkout dives, and done several subsequent dives without problem. His diabetes was not really a problem for recreational diving.

The second consideration was his exercise capacity. He worked out on a regular basis and he had proven on his exercise stress test that he was certainly fit enough for recreational diving.

The next consideration was the drugs he was taking to control/treat his medical problems. None of them were an absolute contraindication to diving.

The final consideration was the risk that he would suffer a heart attack while diving.

IN TRYING TO DETERMINE IF HE WAS FIT TO DIVE OR NOT, SEVERAL FACTORS HAD TO BE CONSIDERED.

This diver had made impressive lifestyle changes, but he remained at high risk of suffering another heart attack in the next few years.

One of the problems is that predictions are only good for groups. If 100 people similar to the diver we are discussing are considered, it is relatively accurate to predict that most of them will die in the next few years from a heart attack. A few will die in the next few days/weeks while a few will survive for many years. The problem is that when you are talking to only one member of the group, it is

absolutely impossible to know which member of the group they are. They might be the person who will die in the next few days, the person who will die in the next few years, or the person who will survive for many years.

The situation is not that different for the rest of us, as it is impossible to know if we are going to be killed in a car crash while we are driving to work tomorrow or not. The difference is that it is quite unlikely that we will be killed in a car crash tomorrow while it is quite likely that this diver will suffer a heart attack in the next 10 years.

What else do we know? The diver has never experienced any clear signs of cardiac ischemia, even when he had a heart attack in 2005. Therefore, he may very well not have any signs or symptoms when he has his next heart attack. The concern here is that he will most likely not notice the onset of cardiac ischemia and will not be aware that he has a problem until it is very severe and/or he is dying.

The diver has extensive coronary artery disease, but he also has well developed collateral circulation. When young people have a heart attack, they often die. When older people like our diver have a heart attack, they often survive because the heart has had time to develop collateral circulation. In an older person, when a cardiac artery suddenly is blocked (heart attack) much of the affected heart muscle is supplied with oxygen and nutrients from other arteries and it survives. If a person has a heart attack while skiing, exercising, or pretty well any other time on the surface they will have air to breathe and they will

be taken to a hospital relatively quickly. On the surface, this diver has a fairly good chance of surviving his next heart attack. However, if he has his next heart attack while diving he has a good chance of dying. Even if the heart attack is mild enough that he could survive with proper care and treatment, if he is diving when it happens he will most likely die from drowning and/or arterial gas embolism. In >

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Nitrox and Technical Divers (IANTD) since 2000, and is an active cave, trimix and closed circuit rebreather diver/instructor/instructor trainer. David's first love is cave diving exploration and he's been exploring and surveying underwater passages in Canada since 1985. David was responsible for the exploration and mapping of almost 11 kilometres of underwater passages in the Ottawa River Cave System. In 1995, he executed the first successful rescue of a missing trained cave diver. David received the Canadian Star of Courage for this rescue which took place in the chilly Canadian waters of Tobermory, Ontario. He still dives as much as possible, but admits his five year old son Lukas, four year old daughter Emeline and wife (Dr Debbie Pestell) are currently higher priorities than diving!

diving medicine

addition, people often dive in fairly remote locations and it can take a very long time to get them to a hospital.

Finally, if this diver has his next heart attack while diving, he is also putting his diving companions at risk. They will attempt to assist him and they may very well be injured as a result.

I would never recommend that this diver take up, or continue diving. However, I also firmly believe that every individual has the right to determine the amount of risk that they are willing to take in their lives.

I will never forget a fairly young guy who was brought into the emergency department while I was working. We worked on him for a while but he could not be revived. I eventually learned the story. He knew that he had a very

serious aneurysm of his aorta that could not be operated on. He also knew that it could 'blow' at any time and that violent activity would increase that risk. He had always wanted to go white water rafting and he decided to go, even though the activity might kill him. It did, but it was his choice.

Therefore, I responded to this diver with most of the information above and left it up to him to make an informed decision as to whether he wanted to continue diving or quit. He made what I consider to be the most intelligent decision and quit diving. However, if he had decided to continue diving I would have had no problem with his decision; as long as he always made sure that his dive companions were aware of his medical problems and were aware that he did not want them to do anything that put them at risk if he experienced a problem while diving. ■