

Diving Medicine FAQs

Pacemakers and Diving

DAN Offers Some Sage Advice on Mixing the Two, By CDR Jim Caruso, M.C., U.S. Navy Diving Medical Officer

Q: Is it safe to begin scuba diving - or to continue to dive - after having a cardiac pacemaker implanted?

A: It was probably easier in the past to take an overly conservative approach to this question and provide an unqualified blanket statement like: "No one who has a cardiac pacemaker in place should ever scuba dive."

For military and commercial diving, a cardiac pacemaker is invariably considered a disqualification.

For sport divers, however, the limited medical literature available on the topic takes a more rational, but defensive approach. Each diver or dive student must be evaluated individually. The two most important factors to take into account are:

1. Why is the individual dependent on a pacemaker? and
2. Is the individual's pacemaker rated to perform at depths (i.e., pressures) compatible with recreational diving, including an added margin of safety?

As with any medication or medical device, the underlying medical problem determines one's fitness to participate in scuba diving after a cardiac pacemaker is implanted. Having a permanent pacemaker in place usually indicates a serious disturbance in the heart's own conduction system. If this is due to damage of the heart muscle itself, as is often the case when an individual suffers a large heart attack, the individual may lack the cardiovascular fitness to safely perform in the water.

Some individuals, however, depend on a pacemaker because of an identified rhythm disturbance or chronic abnormality in the conduction system. The area of the heart that generates the electrical impulse (resulting in the mechanical contraction that moves blood) may function inconsistently or inadequately.

Alternatively, the circuitry that conducts the electrical impulse to the rest of the heart may be faulty, resulting in improperly or irregularly conducted signals. Without the assistance of a pacemaker, the individual may suffer syncopal (fainting) episodes. Other individuals may have suffered a heart attack with minimal residual damage to the heart muscle, but the heart's conducting system remains unreliable.

If a diver's cardiologist determines that his/her level of cardiovascular fitness is sufficient for safe diving (i.e., exercising to a level of 13 mets or greater on a standard treadmill test) and the pacemaker is rated to function at 130 fsw equivalent pressures or greater, that individual may be considered fit for recreational diving. It is essential, however, that divers with cardiac issues check

with their doctor before diving.

A cardiac pacemaker is implanted in the individual's subcutaneous tissue and will be exposed to the same ambient pressures as the diver. For diving, an adequate pacemaker must be rated to perform at least a maximum depth of 130 feet / 40 meters and must operate satisfactorily during conditions of relatively rapid pressure changes - e.g., ascent and descent.

All that being said, the most common reason people depend on pacemakers is underlying ischemic* heart disease. A significant number of recreational diving fatalities each year are attributable to coronary artery disease. Diving often takes place in remote locations far from facilities that provide emergency cardiac care.

While each individual's health status must be considered on a case-by-case basis, divers or dive students with significant cardiovascular disease and less-than-optimal exercise tolerance should be discouraged from participating in scuba diving. Remember, the individual must not only have adequate exercise tolerance for safe diving under routine conditions, but must also possess enough cardiovascular reserve to safely perform at the higher level needed in emergency situations.

- * Having local decreased blood flow (therefore inadequate oxygen reaching the tissue) due to a mechanical obstruction, such as a narrowing of blood vessels.

Ref: Bove, AA. Bove and Davis' Diving Medicine. W.B. Saunders, 1997; and Divers Alert Network.

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