

PFOs and the Risks Associated with Diving

By Dr. Brian Bourgeois

We continue our medical series with a discussion with Dr. Brian Bourgeois on the topic of Patent foramen ovale (PFO). Here, Dr. Bourgeois will define what a PFO is and speaks about how they are related to decompression illness and what is at stake when diving with the condition.

A Patent foramen ovale (PFO) is a communication between the right and left sides of the heart. In actuality, it is simply a hole in the septum of the heart, or the dividing structure of the heart. PFOs are actually not acquired. Everyone, when in the womb, has a PFO present. While you are in the womb, your mother is doing the breathing for you. The child does not need to use its lungs to breathe. The PFO allows the blood to bypass the lungs, which allows the communication between the right and left side of the heart. This communication is intended to be closed by birth or immediately thereafter, but in approximately 20% of the population it remains open.

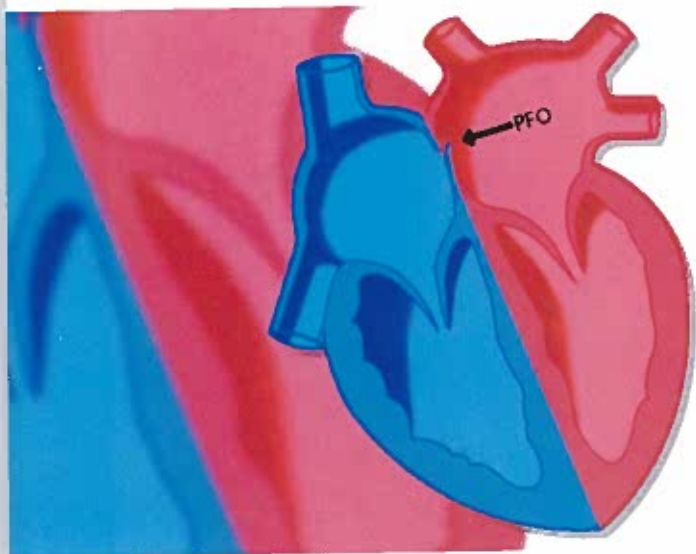
Most of these PFOs are very small and cause little to no symptomatology. In fact, most people will never know they have a PFO. When you dive, there are bubbles forming in the venous system. These bubbles are normally removed by your lungs. They are effectively scrubbed. When there is a communication between the right and left side of the heart, the lungs are directly bypassed by those bubbles. This allows the bubbles to enter the left side of the heart, or the outflow track, which often allows them to end up in the brain or other neurologic structures.

PFOs, in and of themselves, do not cause symptoms. The great majority of people never know they have a PFO unless they have a study looking for them. There are tests for PFOs. These tests are effectively ultrasound tests. The gold standard for testing for a PFO

is called an esophageal echocardiogram. This is done by placing an ultrasound probe down into the esophagus and allowing a direct visualization of the interior of the heart. These tests do carry risks and cost a fair sum of money. So, there is a way to look for PFOs, but this is not done during general routine medical examinations.

PFOs can be repaired using an intravascular technique, where a small umbrella is used to open and close a PFO. This acts as a patch. It closes the PFO, thereby stopping the right to left blood flow. These procedures are invasive; they're not 100% effective, but a PFO can be repaired.

It is my recommendation, and, in fact, I believe most diving professionals' recommendation, that divers with PFOs are not cleared to dive. Diving with a known PFO is effectively like playing Russian Roulette.



See the video on diving and PFOs and other issues on medicine and diving on ADCI TV (videos.adc-int.org/home).