And Now for Something Completely Different

Patent Foramen Ovale

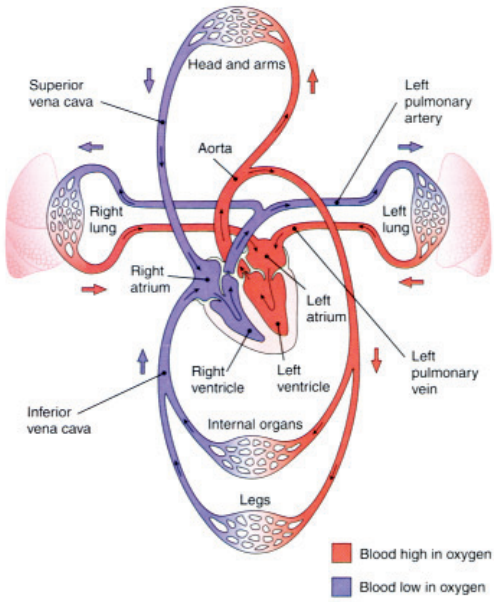
By Ruth Werner

Pathology Perspectives columns are usually connected in some way to the general theme of each issue of *Massage & Bodywork*, but today's topic began apropos of absolutely nothing except my own curiosity, which I am eager to share with anyone willing to read about it. As it turns out, the topic does connect to this issue's theme on the developing role of massage therapists. Read on to find out how.

I have been learning about, teaching about, and writing about pathology for longer than I care to admit. I am blessed to work in a situation where I cycle through all my content at least four times each year, which allows me frequent opportunities to update my sources. And in all my years of reading and teaching about pathology, one surprisingly important and common issue had somehow escaped my attention. This is the frequent occurrence of a structural defect in the heart, called a patent foramen ovale, or PFO. The first cases of PFO were recorded in the time of Galen (the second century CE), and this condition has been connected to some risks since 1877. More recently, PFO has been linked to several other health disorders, including migraine with aura, decompression syndrome, obstructive sleep apnea, and, most significantly, cryptogenic stroke: that is, an ischemic stroke in someone who has no risk factors for an event of this type. The statistical links between PFO and these problems is powerful but not provable, and cardiovascular specialists are by no means united on its significance or the best way to treat it. But this is an emerging issue that may have consequences for massage therapists, so it is interesting to watch.

In order to discuss PFO, it is necessary to do a quick review of the miraculously efficient circulatory system. The heart, we will recall, is divided into left and right halves by a whole and intact wall called the septum. The heart is further divided into upper and lower chambers (atria and ventricles) by valves: the tricuspid valve on the right and the bicuspid valve on the left. (Here's a handy memory trick: you have to ride a tricycle before you can ride a bicycle.)

Starting from the left side, the left ventricle pushes highly oxygenated blood into the aorta, which then divides into all the other arteries: vessels that carry blood away from the heart. When arteries telescope into smaller arterioles and finally capillaries, oxygen and carbon dioxide are exchanged to supply tissue cells with fuel and to carry away wastes. Deoxygenated blood is then carried through venules, veins, and finally the vena cava back to the right atrium: this is the systemic circuit. Then the right ventricle pushes blood to the lungs through the pulmonary artery. (This is the only artery that carries deoxygenated blood, so it is colored blue in anatomical illustrations. See the illustration above.) In the lungs the blood exchanges carbon dioxide and oxygen again, so the pulmonary vein carries bright red (oxygenated blood) back to the heart, where it enters the left atrium to start the process again. The pathway from the heart to the lungs and back again is the pulmonary circuit.

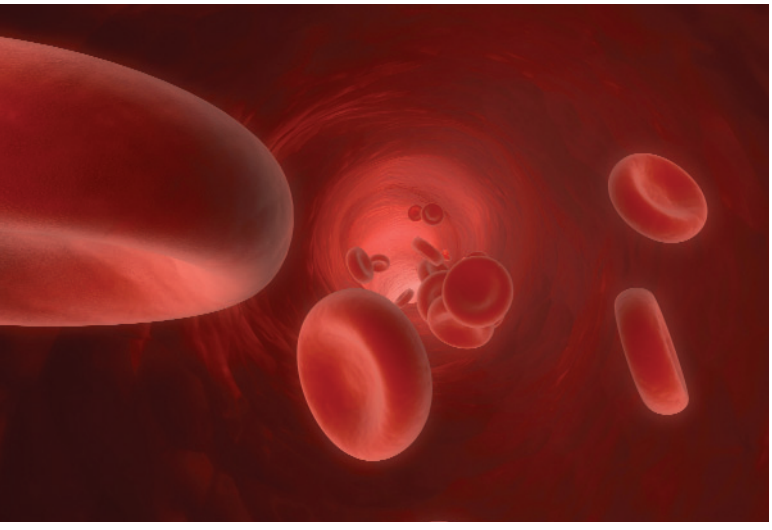


The Heart as a Double Pump. *Reprinted courtesy of Lippingcott, Williams & Wilkins from Barbara Janson Cohen and Jason Taylor,* Memmler's Structure and Function of the Human Body, *8 Ed. (2005).*

Amazingly, the heart pumps about five liters of blood each minute; this is roughly equivalent to an average adult's total blood volume. In other words, each blood cell makes a complete circuit from heart to body, to heart, to lung, and back to the heart every minute. Cumulatively, this

amounts to a cardiac output of seventy-two hundred liters (just over nineteen hundred gallons) of blood pushed through the chambers of the heart each day.

From this description it is clear that the septum functions to separate oxygenated from deoxygenated blood: it prevents mingling between the systemic and pulmonary circuits. But it turns out that the septum is not always completely intact. Before we were born, we depended on maternal circulation to manage gaseous exchange in our growing bodies. The fetal atrial septum has flaps around an opening, the foramen ovale, as a normal part of a developing heart. Sometime before birth or during the first year of life the septal flaps usually fuse into a single strong wall. Evidently, that doesn't always happen completely.



Several kinds of atrial septal defects have been identified, depending on what part of the septum is compromised. The most common defect is called an ostium secundum. One subtype of ostium secundum is a PFO. Most PFOs are too small to cause any problems, but it is possible for blood to get trapped between the incompletely fused flaps, and it is possible for tiny clots to pass from the right side to the left side. In this way, any debris from the venous half of the systemic circuit, which would ordinarily go the lungs, can be pushed back across the atrium into the arterial side of the systemic circuit.

Tiny clots in the pulmonary circuit are not great news, but if damage to the lungs is minimal, no symptoms may be elicited and the lungs can heal well: this probably happens with some frequency, and we just don't know about it. But tiny clots crossing over to the systemic circuit have a risk of traveling to the brain. Very tiny obstructions can then cause a transient ischemic attack (TIA) or ministroke, but only slightly larger clots can cause permanent damage to brain tissue.

This complication is under a lot of scrutiny. Every year, seven hundred thousand people in the United States have a stroke. Of those, 80 percent are ischemic strokes: brain damage related to an obstruction of blood flow to nerve tissue. Of those five hundred sixty thousand ischemic strokes, 20–30 percent are classified as cryptogenic, which simply means the person has no known risk factors: the stroke essentially comes out of the blue. In other words, every year in the United States, more than one hundred thousand people have a cerebral vascular accident with no recognized underlying cause. Patent foramen ovale is being investigated as a contributor to these mysterious events, which are sometimes called paradoxical emboli.

Many questions surround the phenomena of PFOs.

- **How often do PFOs occur?** PFOs are typically too small to cause symptoms on a regular basis. Echocardiograms or bubble tests indicate that between 20–25 percent of adults show signs of PFOs. (That's one in every four or five adults with a hole in the heart!) But random autopsies suggest that up to 27 percent of adults have some level of atrial septal defect.
- **How often do PFOs contribute to cryptogenic stroke or TIA?** This is impossible to identify, because the clots associated with PFOs are typically too small to see on an echocardiogram. However, studies show that while the rate of PFO in the general population is 20–25 percent, the rate of PFO among people who have survived cryptogenic stroke or TIA is 40-50 percent. This statistic is not conclusive, but it is certainly persuasive that PFO is a contributor for a large number of cryptogenic strokes.
- **How often do PFOs contribute to non-cryptogenic stroke?** Again, this is impossible to identify. Because age is a major factor in stroke risk, if a person has a stroke after age fifty-five, PFO is not considered in the diagnosis. But this assumption may miss an important issue: older people can certainly have PFO, and that anomaly may certainly increase the risk of stroke. Indeed, it has been seen that people over fifty-five with PFO have a threefold higher risk of stroke than the rest of the population. →

- **What other health risks are associated with PFO?** Strokes are not the only problem now associated with PFO. Another common condition, migraine headache (especially with a perceived aura) has a high statistical correlation with this anomaly. Interestingly, migraine, especially in otherwise healthy young women, also has a statistical correlation with cryptogenic stroke. This relationship is so well established that many migraine patients pursue having their PFOs repaired as a way to decrease their headache frequency and severity. Some find success with this approach, and studies to evaluate this treatment option are underway.
  In addition to migraines, PFOs are now found to be common in other situations as well. People who are prone to decompression sickness ("the bends") in relationship to scuba diving have a higher incidence of PFO than the general population. Connections between PFO and obstructive sleep apnea have been found as well, where repairing a PFO reduces sleep apnea symptoms.
- **How are PFOs treated?** A couple of different treatment options to seal the open flaps in the interatrial septum have been developed. These interventions involve open surgery, or a percutaneous procedure that threads a device through the blood vessels into the heart to insert a seal that eventually is covered with scar tissue. While these interventions have relatively low complication rates, they are not risk free. They are also painful, expensive, and not widely available at this time.
  Alternatively, a person with a recognized PFO might be put on long-term doses of anticoagulant or anti-platelet drugs. The risks with these, of course, involve uncontrolled bleeding and other complications.

  One intervention that is specifically not recommended in the case of PFO is prophylactic antibiotics. At one time this condition was thought to be connected to a risk of heart valve infection, so antibiotics were prescribed as a precaution. This is no longer true.
- **Should PFOs be treated?** The importance of treating PFO is an issue of much debate among cardiovascular specialists. While the rate of repeated TIA and stroke drops to near zero among those who have their PFOs sealed (and anecdotal evidence supports sealing PFOs to treat migraines and sleep apnea), the procedures aren't easy nor are they widely available. Many doctors don't recommend pursuing them unless a patient has already experienced at least one cryptogenic stroke or TIA.

Implications for Massage

The existence of PFOs poses some interesting questions for massage therapists. Obviously, the vast majority of people with this condition don't even know they have it. Think of it: one out of five of the people reading this article probably has a tiny hole in her interatrial septum. If PFO doesn't restrict activity or reduce a person's tolerance for cardiovascular stress, it seems safe to suggest that massage doesn't pose much of a threat either.

But how many massage therapists have clients with migraines? Or sleep apnea? Or a history of stroke? It is not our place to say, "Oh, you might have a hole in your heart; you better get that checked out." But it is perfectly legitimate to suggest that your clients might be interested in getting more information. Share this article with them or any of the resources listed in the references section.

This brings us to the theme of this issue: over the past twenty years massage therapy has become increasingly viewed not as a recreational splurge, but as professional healthcare resource, and therapists are often seen in a more positive and supportive light than our overworked, time-constrained doctors. Our clients trust us to listen to them carefully and to give them good advice about their self-care. Watching the current debate about this and other medical issues is an important part of the service we can provide to people who are actively invested in making good choices about their health—and isn't that a quality that most people who get massage have in common? M&B

Ruth Werner is a writer and educator for massage therapists. She teaches several courses at the Myotherapy College of Utah and is approved by the NCTMB as a provider of continuing education. She wrote A Massage Therapist's Guide to Pathology *(Lippincott, Williams & Wilkins, 2005), now in its third edition, which is used in massage schools worldwide. Werner is available at www.ruthwerner.com or wernerworkshops@ruthwerner.com.*

Resources

Aetna InteliHealth. Health A to Z, ask the expert: patients with recurrent stroke/TIA and PFO are recommended for surgical or catheter closure. www.intelihealth.com/IH/ihtIH?d=dmtATD&c=404135&p=~br,IHW|~st,9339|~r,WSIHW000|~b,*| (accessed summer 2007).

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