

Recycling a patient's lost blood during surgery better than using banked blood

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Patients whose own red blood cells are recycled and given back to them during heart surgery have healthier blood cells better able to carry oxygen where it is most needed compared to those who get transfusions of blood stored in a blood bank, according to results of a small study at Johns Hopkins.

In a report for the June issue of the journal *Anesthesia & Analgesia*, the researchers say they found that the more units of banked [blood](#) a patient received, the more red cell damage they observed. The damage renders the cells less flexible and less able to squeeze through a body's smallest capillaries and deliver [oxygen](#) to tissues. Among patients who received five or more units of [red blood cells](#) from a hospital [blood bank](#) during the study, the damage persisted for at least three days after surgery. In the past, studies have linked transfusions to increased risk of hospital-acquired infections, longer hospital stays and increased risk of death.

"We now have more evidence that fresh [blood cells](#) are of a higher quality than what comes from a blood bank," says study leader Steven Frank, M.D., an associate professor of anesthesiology and critical care medicine at the Johns Hopkins University School of Medicine. "If banked blood, which is stored for up to six weeks, is now shown to be of a lower quality, it makes more sense to use recycled blood that has only been outside the body for one or two hours. It's always been the case that patients feel better about getting their own blood, and recycling is also more cost effective."

To recycle the blood, a machine known as a cell saver is used to collect what a patient loses during surgery, rinse away unneeded fat and tissue, and then centrifuge and separate the red cells, which are then returned to the patient should he or she need it. Disposable parts of the cell saver, which can be used to process multiple units of blood, cost around \$120, compared to \$240 for each unit of banked blood.

Such recycling first became popular during the early years of the HIV/AIDS crisis, so patients could avoid the risk of getting the virus in transfused blood. Today, Frank says, the blood supply is much safer, with the incidence of contracting HIV from a transfusion down from one in 100 in the early 1980s to one in 2 million now—but focus should be on recycling, because fresher blood is better. The practice also reduces the risk of contracting hepatitis B or C infections, or of bad transfusion-related reactions, Frank adds.

For the study, the Johns Hopkins researchers categorized 32 cardiac surgery patients by their transfusion status: those who received only their own recycled red blood cells (12 patients), those who received their own blood plus fewer than five units of banked blood (10) and those who received their own blood plus five or more units of stored blood (10). All had blood samples drawn before, during and for three days after surgery. The samples were examined for blood cell membrane stiffness and flexibility, a measure of how well oxygen is likely to get to where it is needed.

In patients who received only their own recycled blood, their cells behaved normally right away, as if they had never been outside the body. The more blood a patient got from the bank, the less flexible their entire population of red blood cells. Three days after surgery, the red blood cells in the group that got the largest number of transfused units still had not recovered their full function.

"If something is bad for you, a little bit might be OK, but a lot of it is much worse," Frank says. "It turns out that blood is more like milk, which has a relatively short shelf life, than a fine wine, which gets better with age."

Frank cautions that cell saver machines are not appropriate for all operations, and not all hospitals have access to round-the-clock perfusionists to run them. For heart surgeries, however, a perfusionist is already in the operating room to run the heart-lung bypass machine. And, he adds, many operations are considered to be low risk for blood loss, in which case the cell saver is unnecessary. But he advocates wider use of recycled blood.

"In any patient where you expect to give one unit of red blood cells or more, it's cost-effective and beneficial to recycle," he says.

Patients who lose blood may also need platelets and plasma, which they receive regardless of whether they receive their own blood or blood from a bank.

Frank is medical director of the Johns Hopkins Center for Bloodless Medicine and Surgery, which primarily serves Jehovah's Witnesses, who do not accept blood transfusions but will accept recycled cell saver blood.

By using the cell saver as a primary method of blood conservation, their efforts have allowed these patients to do just as well or better than patients who get transfusions of donated blood, he says. Preliminary findings suggest [patients](#) who avoid banked blood develop fewer hospital-acquired infections.

Provided by Johns Hopkins University School of Medicine

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