UAB performs Alabama's first transplant where cadaver liver is 'kept alive' outside body

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This normothermic perfusion machine pumps the liver with warm, oxygenated blood and nutrition at or just below body temperature for up to 24 hours before transplant. Credit: UAB News

Physicians in the University of Alabama at Birmingham Department of Surgery have transplanted Alabama's first patient with a cadaver liver that was recovered from the donor and "kept alive" and preserved at body temperature instead of the standard cold solution—a technique that enables the patient to receive a liver that surgeons can watch produce bile before it is transplanted.

The transplant was performed recently by UAB Medicine surgeons on Lana Wiggins, a Valley, Alabama, resident, as part of a clinical trial using a normothermic machine perfusion technique developed by OrganOx. Surgeons place the cadaver liver in the normothermic machine, which then pumps the organ with warm, oxygenated blood and nutrition at or just below body temperature for up to 24 hours before transplant. Devin Eckhoff, M.D., director of UAB's Division of Transplantation, says the technique has shown great success in European studies and appears to provide a significant improvement in the quality of the transplanted cadaver organ.

"Because there is a large shortage of livers available for transplantation, the transplant community is continuing to push the boundaries to increase the availability of organs," Eckhoff said. "These normothermic machines enable us to preserve the liver under near perfect physiological conditions—as opposed to the usual hypothermic conditions in which the organ is typically transplanted. With the normothermic preservation, the liver maintains all aspects of graft function throughout the preservation process; it allows for pre-transplant assessment of organ function and thereby viability to predict suitability for implantation and the delivery of potential agents such as stem cells to further improve the tissue damage caused when blood supply returns to the tissue after a lack of oxygen."

UAB's School of Medicine and UAB Hospital have joined 14 other transplant centers in the United States in this study. Research efforts like

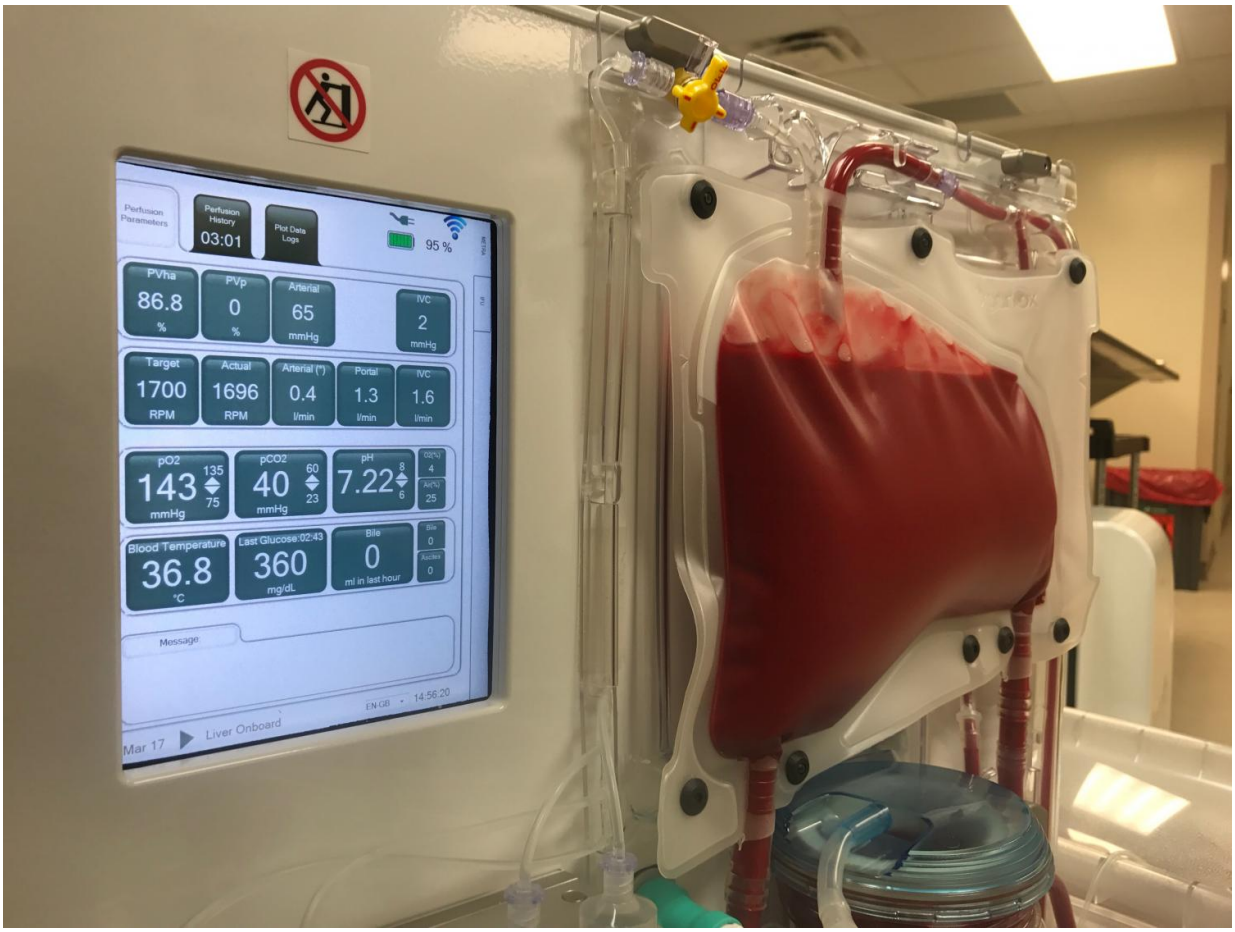
this clinical trial have focused on overcoming the limitations of cold storage, which is the current universal standard for organ preservation, with a move toward normothermic machine perfusion.

Wiggins, who educated and aided families on the value of being an organ donor as a registered nurse at East Alabama Lanier Hospital for 25 years, says she feels better than she has in three years. That was when the combination of a blood clot, fatty liver disease and medications she had taken her whole life for lupus converged to cause the beginning of liver failure.

"I'm doing fantastic, just wonderful, and I'm already back home doing everything I did before my transplant," said the 63-year-old. "It's ironic that I would be the one in need after all of the years of talking about organ donation with patients or patient families. Even before I was a donor coordinator, I believed in organ donation. I signed up when I was in my early 20s. I'm beyond grateful to have received this gift now."

Normothermic preservation advantages

Although limited in terms of the duration of preservation, cold storage has the major advantages of simplicity, portability and affordability. However, with increased use of marginal organs in recent years because of the dearth of livers available, the limitations of static cold storage are a major factor influencing patient and graft survival rates.



Preliminary evidence from clinical trials in Europe have shown organ preservation by normothermic machine perfusion is superior to static cold storage, a breakthrough that could be a major benefit to those with end-stage liver disease. Credit: UAB News

The machine that houses the liver to preserve it prior to transplant is the first completely automated liver perfusion device of its kind. It works similar to a greenhouse, and is constructed from basic components that make up conventional cardiopulmonary bypass, including basic roller pumps, oxygenators and heat exchangers.

"This machine can really help in a number of ways," said Stephen Gray,

M.D., liver transplant surgeon and director of UAB's Abdominal Transplant Fellowship. "The fact that the machine can perfuse the organ with oxygenated red blood cells at normal body temperature—just as it would be inside the body—and that we can observe it making bile before transplant is just an extraordinary feat, and a significant benefit to us as surgeons and our patients. With these normothermic machine-perfused livers, we can assess whether it is going to work before we transplant it into the patient, whereas we typically do not know if the liver will work until the transplant takes place."

This kind of advancement could mean livers can eventually be shipped from coast to coast in the United States, an impossibility for cold-stored livers. If that is the case, geography would not be as much of a hurdle to transplant those most in need. It also means surgeons would not have to operate overnight if a liver can be kept viable for up to 24 hours.

"You can use a liver for transplant that was placed in cold storage for up to 12 hours; but cooling the organ to ice temperature to slow down its metabolism does not stop it from deteriorating, usually within the first six to eight hours," Gray said. "And if the organ is damaged in some way, perhaps by being deprived of oxygen, the combined effect can be catastrophic for the organ. The perfused machine would allow us to extend the storage time and only enhance the viability of the liver."

Eckhoff added that preliminary evidence from clinical trials in Europe have shown organ preservation by normothermic machine perfusion is superior to static cold storage, a breakthrough that could be a major benefit to those with end-stage liver disease.

"If this is as successful as it appears it can be, it will be a significant benefit to those in need of liver transplantation," Eckhoff said. "About 60,000 patients die of liver disease annually in the United States, and many of them could theoretically have been treated with a liver

transplant. This device has the potential to change that radically by enabling us to transplant many organs that are simply unusable with current techniques."

The clinical trial at UAB is expected to last 18 months.

For Wiggins, she is just happy to have a second chance at a healthy life.

"It's hard to describe how you feel about someone who makes the decision to give life to others after they are gone by choosing to be an organ donor," Wiggins said. "I had a cousin who died when he was 19, and his parents donated all of his organs—his heart, kidneys, liver —everything they could. He was a healthy young boy who helped save several lives. To have someone do the same for me is overwhelming. A tremendous blessing."

Provided by University of Alabama at Birmingham

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