Researchers developing device to detect brain bleeding in pre-term infants

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(Medical Xpress)—Nearly one-third of premature babies develop bleeding in the brain after birth, a problem associated with serious long-term effects such as cerebral palsy, seizures and blindness.

But some of these devastating complications could be prevented if physicians could catch and treat such brain hemorrhaging, also called intraventricular bleeding, when it begins. To this end, University of Florida researchers from the colleges of Medicine and Engineering have received a two-year, $694,000 grant from the National Institute of Neurological Disorders and Stroke in collaboration with EGI Inc. to develop a device that not only monitors preemies' fragile brains, but also detects intraventricular bleeding as soon as it starts. The research also will give physicians a more detailed understanding and timeline of how and when brain hemorrhages typically occur in babies.

"When we look at preterm babies with intraventricular hemorrhages, we detect them after the fact, so we really don't know what is happening in the brain at the time of the hemorrhage," said Dr. Michael Weiss, a neonatologist and an associate professor of pediatrics in the College of Medicine who has teamed with biomedical engineer Dr. Rosalind Sadleir, of the College of Engineering, on the project. "If we can identify the exact moment when a bleed occurs, we may be able to develop therapies that can help prevent bad outcomes from happening."

The researchers will employ a technique known as electrical impedance tomography, or EIT. Using this method, they will be able to view 3-D

reconstructions of bleeding inside the brain at any given moment, said Sadleir, who specializes in the use of EIT to detect bleeding inside the body.

To collect data within the brain, tiny electrodes are placed on the head. For babies, the researchers plan to use eight electrodes, which they aim to place on an easy-to-apply bandage.

"We collect 182 measurements in the head, and from that we make our picture," Sadleir said.

While babies are hooked up to the electrodes, their brains will be continually scanned for signs of bleeding. If bleeding reaches a risky level, an alert will sound, similar to other devices used to monitor premature babies in the neonatal intensive care unit.

Bleeding in the brain is typically detected through routine ultrasounds performed about seven to 14 days after a premature baby is born, according to the National Institutes of Health. Most of the time there are no other symptoms that alert doctors to the bleeding.

"If we detect bleeding right when it starts, we have a much better chance of mitigating ill effects and also preventing other secondary conditions that happen after a bleed," Sadleir said.

EIT is used commercially in lung monitoring, specifically to measure lung activity when patients are placed on ventilators to assist their breathing.

Unlike magnetic resonance imaging or CT scans, the images created through EIT sometimes look a little fuzzy because electrical currents do not travel in straight lines, Sadleir said. But the health care team won't analyze the images in the neonatal intensive care unit, or NICU; instead,

the readings will translate to a number. This number will be compared with an acceptable baseline. When bleeding is detected, the health team can then review the image and conduct an ultrasound to more accurately pinpoint the problem.

"We do a lot of general monitoring in the NICU, but we don't look at a lot of the end organs, such as the brain," Weiss said. "We are starting to find out more and more about babies by using brain-specific monitoring. This knowledge may improve outcomes in pre-term babies."

Provided by University of Florida