New intracranial sensor serves to measure cerebral pressure

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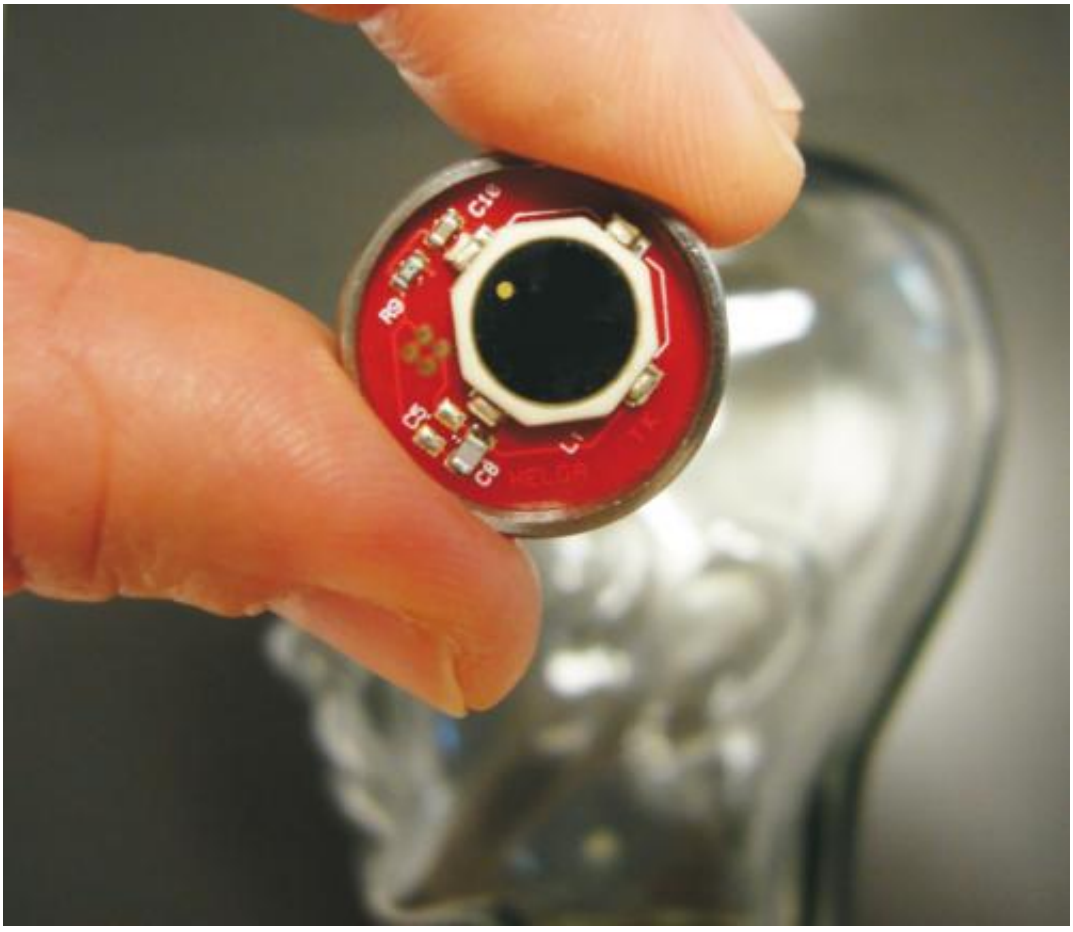

View of the not yet completely enclosed intracranial pressure sensor. Credit: Fraunhofer IBMT

An increase in cerebral pressure may cause dementia and could destroy

the brain. Companies have been seeking to find monitoring sensors that can be implanted into the brain, and read from outside the body. A tiny sensor may provide the help needed.

To this day it remains a mystery why the cerebral pressure in certain people suddenly increases. The consequences, however, are better understood: The blood circulation is disrupted and after a while parts of the brain may die off, similar to what occurs in a stroke. This is how dementia takes its insidious path. Experts estimate that up to ten percent of all cases of dementia in Europe can be attributed to rising blood pressure in the brain. Still, making the diagnosis is tough. People with a heightened susceptibility to a rise in intracranial pressure must be treated with intensive medical care today. A probe is inserted that goes from the outside through the skullcap to the brain. The cable keeps the patient connected to the measuring apparatus. Since cerebral pressure fluctuates, it takes extensive measurements in order to reach a definitive diagnosis of this disease. Patients therefore have to stay in hospital typically for several days, and sometimes even weeks.

Moisture corrodes predecessor prototypes

For some time now, medical device engineers have been working on an intracranial pressure probe that operates without a cable and can be read from the outside using radio wave transmission. But there is no established product on the market to this date for long-term implantation, because the sensors always have the same problem: Their casing – which previously had been produced primarily from biologically accepted synthetics – allows moisture to penetrate, which destroys the sensor in just a few days – or even hours. Researchers at the Fraunhofer Institute for Biomedical Engineering IBMT in St. Ingbert have now developed a small sensor that really stays waterproof. They had to give up the idea of encasing a sensor with synthetic materials. Instead, they produced the casing from high-grade metal. From the

outside, the probe resembles a thick button cell battery. It is only about one centimeter high, two centimeters wide and in the future, should get even smaller. Resting on its inside is a pressure sensor made of silicon, similar to those sensors used today in automobiles, to handle the demanding measurement tasks.

"The cover of the tiny metal container is made from a pliable metal membrane that reacts to pressure changes in the brain," as project manager Dr. Thomas Velten, manager of the department of biomedical microsystems at IBMT, describes the unique aspects of the system. This pressure is transmitted to the silicon chip on the inside. The measurement value is transmitted to the measuring device outside the body through a radio impulse. "The benefits are immense," says Velten. "The patient no longer has to be checked in on an inpatient basis but comes to the clinic for a brief measurement appointment instead."

The sensor is read from the outside within seconds. It operates without batteries, since it is activated by the reading device. Thus, the patient can wear it for several months, or even a number of years, without requiring additional surgery. During the Medica trade fair which takes place in Düsseldorf from November 14 to 17, 2012, researchers from IBMT will demonstrate how the sensor functions using a glass model head at the Fraunhofer joint exhibition stand in Hall 10, stand F05. "We will demonstrate the new kind of intracranial pressure sensor from the medical device technology industry, and seek to discuss it with other device manufacturers."

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