'Smart' Cerebrospinal Fluid Shunt

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Technology description

Hydrocephalus is a life-threatening condition caused by abnormal accumulation of cerebrospinal fluid within the ventricles of the brain. Typically it is treated through the surgical placement of a shunt system that drains the excess fluid from the brain to another part of the body. Valves positioned within the shunt pathway help regulate flow.

Shunt failure is a very common complication and requires immediate medical attention. A leading cause of failure is partial or complete blockage of the shunt. Blockage may be caused by continuous over-draining. Over time the ability of the tissue to rebound diminishes, causing the tissue to become permanently deformed and lodged within the catheter holes. UW–Madison neurological surgeons and their collaborators have developed a ‘smart’ shunt that is self-regulating and overcomes the issue of over-drainage associated with all commercially available systems.

The new system features continuous intracranial pressure sensing and a novel valve design actuated by a piezoelectric lever. An external wireless transmitter (e.g., RFID device) connected to a computer enables physicians to control the shunt, to set parameters or thresholds for the valve.

By monitoring intracranial pressure and continuously alternating between opened/closed valve position, the system prevents fluid from constantly draining. This allows the surrounding tissue to rebound from the catheter holes, allows the brain to retain its normal shape, and mitigates blockage concerns.

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an improved cerebral shunt for relieving pressure on the brain caused by excess fluid accumulation.

Unlike commercially available shunts, the new design permits sophisticated control over valve operation to minimize the long periods of drainage that can cause tissue distortion. The device has been prototyped and testedin vitro.

Application area

Implantable medical device for treating hydrocephalus

Advantages

Significantly reduces over-drainage
Minimizes tissue deformation
Provides continuous monitoring without continuous drainage
Features simplified electrically actuated valves
Permits external communication and control of the system
Prevents sudden pressure changes or spikes (e.g., caused by patient coughing)

Institution

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