Return of Flow in a Nonflowing Shunt using a Noninvasive Bioinspired Retrograde Flushing Device: Demonstration by Thermal Flow Detection.

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OBJECTIVE: Occlusion of ventriculoperitoneal shunts poses risk of morbidity in patients treated with shunts. We sought to utilize a new a non-invasive method for managing acute shunt occlusion recently cleared by the US Food and Drug Administration (FDA), with confirmation documented by a thermal flow detection system.

MATERIAL-METHODS: The new device is comprised of a subcutaneous “flusher” implanted proximal to a conventional shunt valve, and a special ventricular catheter with a new "relief membrane" covering one or more backup holes in the catheter which can be opened by the retrograde flushing action. The buildup and release of pressure in the flusher is biomimetic of the cough response in clearing the trachea. Since FDA clearance, 22 such devices have been implanted in the U.S. Demonstration of flow return with pumping of the implanted flusher was tested with standard flow detection protocol.

An 18 year-old patient presented with severe exacerbation of problematic migraine headaches. Ventricular imaging showed stable ventricular size, and activation of the reflow system was attempted with thermal flow monitoring.

RESULTS: An initial thermal flow test showed no temperature change suggestive of absence of flow. The flusher chamber was compressed twice. After the first flush there was still no temperature change, but after the second flush a 0.15 degree drop was noted. To confirm flow, the opening pressure of the shunt valve was adjusted from performance level 2.5 to 1.0, and a robust flow (indicated by a temperature drop of 0.25 degrees) was observed. Though the headache did not immediately resolve, the patient was discharged the following day without surgery or invasive procedure.

CONCLUSION: This is the first instance of a ventriculoperitoneal shunt with documented failure to flow resolved using the new retrograde flow device. Noninvasive flow evaluation may have a role in evaluating the role and efficacy of the new device.