

Press Release

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New technology to prevent obstructions in catheters of patients with hydrocephalus

It would allow the preventive treatment of a frequent complication that affects approximately 8,000 people in Andalusia alone.

Spanish researchers from the University of Seville (US) and the University Hospital 'Virgen del Rocío' have published the results of the successful proof-of-concept of a new technology created to prevent obstructions of catheters and valves (shunts) implanted in the brain of patients with hydrocephalus.

Early diagnosis and treatment of this complication constitutes a great medical challenge since there are currently no preventive technologies or protocols to avoid them and, over time, they affect the vast majority of hydrocephalus patients with implanted shunts. In the region of Andalusia alone (with a population of 8.5 million people), it is estimated that -considering adults and children- there are approximately between 6,000 and 10,000 people with hydrocephalus.

The experiments, carried out in a European project called FUSCLEAN, show how the technology works and that, by concentrating ultrasound emitted from outside the body, materials adhered to the inner walls of shunts implanted in patients can be detached in a controlled manner. FUSCLEAN technology would allow preventive cleaning of catheters and valves without affecting the brain or other areas of the body.

The study has been recently published in the journal *Operative Neurosurgery*. The idea and the technology have been designed and developed by Emilio Gomez-Gonzalez, professor of Applied Physics at the ETSI Engineering School of the University of Seville, with the collaboration of Javier Marquez-Rivas, neurosurgeon of the Neurosurgery Service of the University Hospital 'Virgen del Rocío' and the Institute of Biomedicine of Seville (IBIS) and lecturer at the US.

This research includes 3D numerical simulations, and experiments with real catheters and valves on mannequins and laboratory models.

A technology for a relevant pathology

Hydrocephalus is a very relevant neurological pathology and, if left untreated, it is fatal. In most cases (80%), treatment consists of implanting a cerebrospinal fluid shunt system (using a catheter and a valve) into a distal cavity (typically the peritoneum). However, complications are frequent and difficult to anticipate. The most common ones are flow obstructions through implanted catheters and valves, and they require immediate neurosurgical treatment due to the risk of severe neurological damage and even death. Such complications have a profound social impact on the quality of life of patients, their families and caregivers, and a high economic cost.

The FUSCLEAN technology would allow the development of a personalized preventive treatment, according to the conditions of the affected people and their shunts. Such 'preventive cleaning' could be programmed within the periodic check-ups of the patients.

A highly competitive project

The idea and its design began within the framework of the high-impact European ATTRACT Program, led by CERN, whose objective is to develop innovative technologies for science and society. More than 1,200 proposals from 40 countries were submitted to this program, with FUSCLEAN being the only Andalusian project selected for funding.

This research has been also supported by the Regional Government (Junta de Andalucía), through the Campus of International Excellence 'Andalucía-Tech' of the Universities of Malaga and Seville in the area of health and social welfare, and by the 'Foundation for the Innovation and Health Prospective in Spain' (FIPSE) and the 'Technological Corporation of Andalusia' (CTA), in charge of technology transfer.

Scientific paper:

Gomez-Gonzalez E et al. *Contactless Ultrasonic Cavitation for the Prevention of Shunt Obstruction in Hydrocephalus: A Proof-of-Concept Study*. doi: 10.1227/ons.0000000000000372.

https://journals.lww.com/onsonline/Fulltext/9900/Contactless_Ultrasonic_Cavitation_for_the.379.aspx

Video of the project:

<https://www.youtube.com/watch?v=Wm7BzL4CqHE>

More information:

<https://en.gfi-us.org/proyecto-fusclean>

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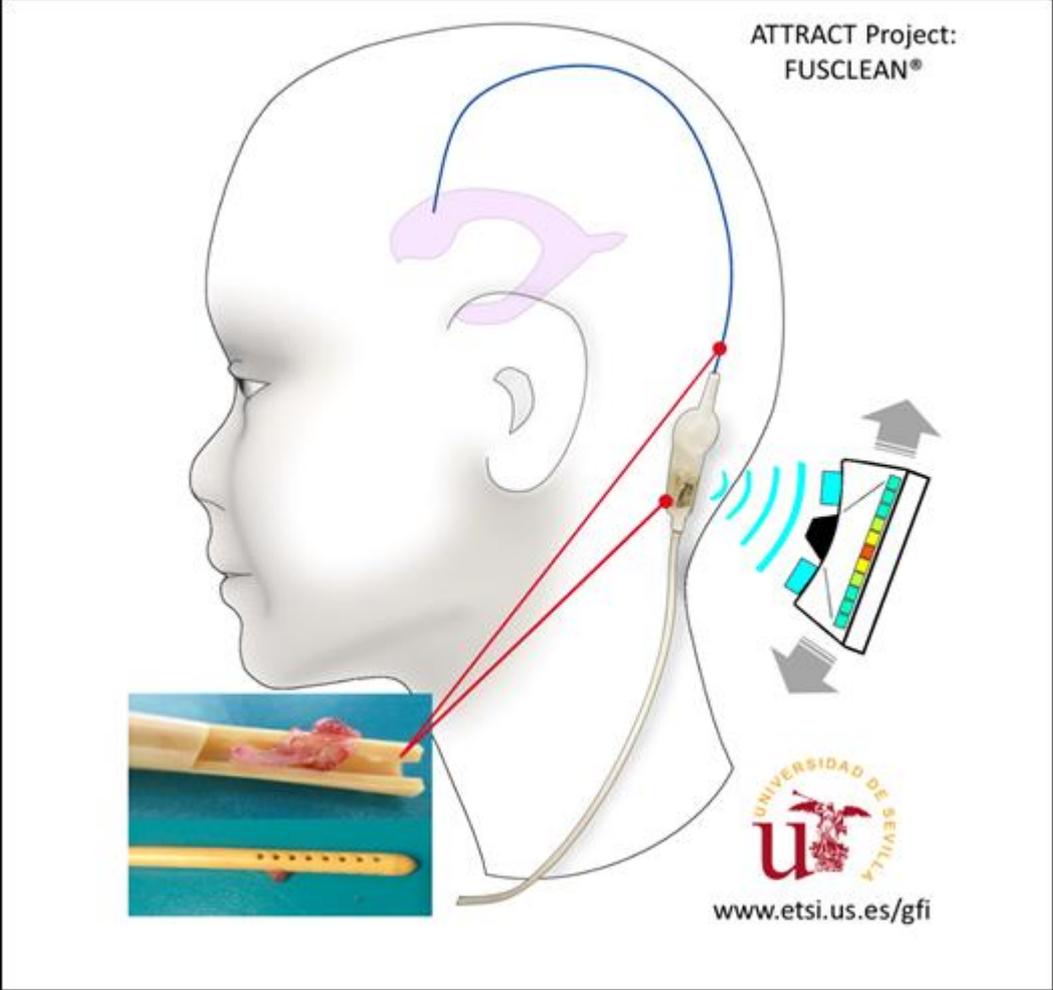


Figure. Example of the accumulations that obstruct catheters and the new FUSCLEAN device.