A method that may raise hope of developing new treatments for Meniere's disease and other inner ear disorders with hearing loss, tinnitus and dizziness

Disorders of the inner ear are rather common and may lead to dizziness, tinnitus and loss of hearing. Several of those disorders may include an increased swelling, i.e. hydrops, of parts of the inner ear as a sign or mechanism of a disease. Until now, there has been a void of viable experimental models to test what could induce inner ear hydrops and what could prevent or reverse it.

The inner ear is a minute structure, less than 1,3 mm in mice, lodged deep in the base of the skull. Hydrops would be seen in specific parts less than 0,1 mm of size, of this structure. It has not previously been possible to evoke and visualize hydrops in a small living intact animal as the mouse.

Previous approaches have depended upon microscopy of inner ears of a diseased animal, a very time consuming and not always exact method. Only recently one has been able to induce hydrops in mice and demonstrate it with microscopy. However, until now there has been no method to induce hydrops in an ear that could be assured to be previously normal or to follow the development of hydrops and test possible treatment effects.

The present study suggest such a method by using a high powered (9,4 Tesla) MRI (Magnetic Resonance Imaging) and specially developed analyzes to be able to visually assess small parts of the inner ear of a live mouse simultaneously by applying a technique to induce hydrops. The inner ears of anesthetized mice were first imaged. Thereafter a small osmotic pump were inserted under the skin, slowly infusing a hormone, vasopressin, known to cause increased water retention and possibly inner ear hydrops. After a certain time the mice were again anesthetized and their inner ear imaged. The 'before' and 'after' images could then be compared and appreciated and hydrops was demonstrated in most ears.

This method will surely lead to exploration on what external factors may cause or accelerate inner ear disorders and hence, progressive loss of hearing, dizziness and tinnitus in some diseases. It may also, for the first time, allow possibilities to test drugs, new or old for their effect on inner ear disorders, such as Meniere's disease.

Publication

Vasopressin induces endolymphatic hydrops in mouse inner ear, as evaluated with repeated 9.4 T MRI.

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