Differentiation of the Fluid Compartments of the Cochlea in vivo Using Magnetic Resonance Imaging at 1.5 T

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Purpose: To differentiate the fluid compartments of the cochlea in vivo using magnetic resonance imaging at 1.5 T.

Materials and Methods: The cochleae of anesthetized healthy pigmented guinea pigs were studied by high-resolution magnetic resonance imaging (MRI) using an MRI system with the field strength of 1.5 T. High-resolution 2-D images were acquired at various times by the spin-echo and fast spin-echo techniques with and without enhancement by gadodiamide. In addition, effects of different concentrations of the contrast agent and time of its penetration into the cochlea as well as its clearance were investigated.

Results: High-resolution spin-echo T1-weighted and fast spin-echo proton density MR images of the mid-modiolar level of the cochlea demonstrated a clear differentiation of the various fluid compartments in the cochlear membranous labyrinth such as the perilymphatic space of the scalae vestibuli and tympani and endolymphatic space of the scala media. The perilymph appeared to be preferentially enhanced by gadodiamide whereas the contrast agent did not penetrate into the scala media resulting in a clear distinction between the peri- and endolymphatic spaces. In addition, the relationship between the degree of the contrast penetration into the cochlea and time elapsed from the injection, followed a gradual upward slope with a peak occurring four hours post-injection. The effects of different concentrations of gadodiamide on its ability to enhance the cochlea as well as the effects of different kinds of contrast agents were also studied.

Conclusion: We were able to differentiate the various fluid and soft-tissue compartments in the cochlea in vivo using a 1.5 T MRI system.

References