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Can I Diagnose a Vestibular Schwannoma Using Non-Contrast Imaging?

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***"I have an adult patient** with new-onset unilateral sensorineural hearing loss. I would like to rule out a vestibular schwannoma by performing an MRI exam. However, the patient has a kidney problem that prevents him from receiving contrast material. Can I still diagnose a vestibular schwannoma using a non-contrast imaging study?"*

The answer to this question is … YES! At the current time, gadolinium-enhanced T1-weighted magnetic resonance imaging (MRI) is considered the gold standard for the diagnosis of vestibular schwannomas.[1] However, the use of gadolinium-based contrast material may be contraindicated in patients with impaired renal function, in those who have had an allergic reaction to such contrast material, and in patients who are or may be pregnant.

High-resolution T2-weighted MR sequences as a means of visualizing the fluid-filled inner ear and the 7th and 8th cranial nerves in the internal auditory canal and cerebellopontine angle cistern was described in the early 1990's.[2] These steady-state imaging sequences currently include various manufacturer-specific sequences such as **CISS** (Constructive Interference into Steady State, Siemens), **FIESTA-C** (Fast Imaging Employing Steady-state Acquisition Cycled Phases, GE), **DRIVE** (Driven Equilibrium Radiofrequency Reset Pulse, Philips), **bFFE** (Balanced Fast Field Echo, Philips) and **SPACE** (Sampling Perfection with Application optimized Contrasts using different flip angle Evolutions, Siemens).[3] The submillimeter-resolution images from these sequences can be manipulated on computer-based DICOM imaging software to provide reformatted images in non-orthogonal planes that allow visualization of the entire 8th cranial nerve, from the brainstem to the fundus of the internal auditory canal. In these sequences, cerebrospinal fluid (CSF) displays a high signal intensity that provides an excellent contrasting background to the inherent low signal intensity of the 7th and 8th cranial nerves. *(Figure 1)*

Similar to the nerves, a vestibular schwannoma will appear as a low-intensity (dark) filling defect that may be nodular, oblong, or ice cream cone-shaped, and located in the internal auditory canal and/or the cerebellopontine angle cistern immediately adjacent to it. *(Figure 2)*

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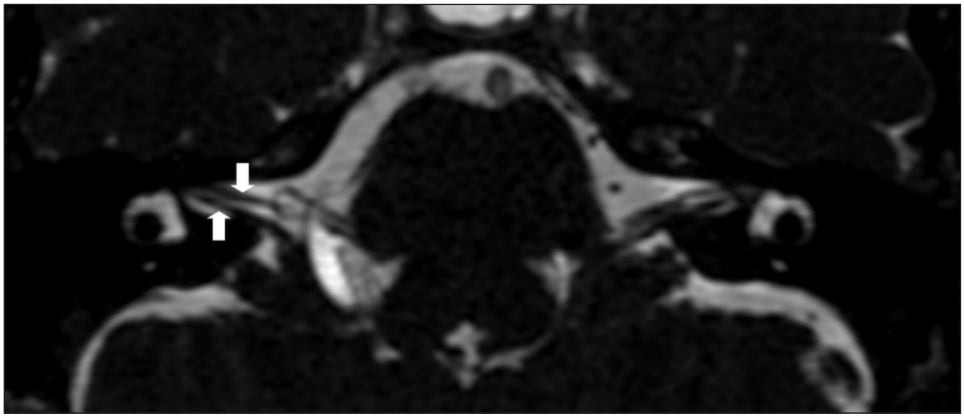

Figure 1. Axial CISS image at the level of the internal auditory canal showing the normal configuration of the 7th and 8th cranial nerves (white arrows)

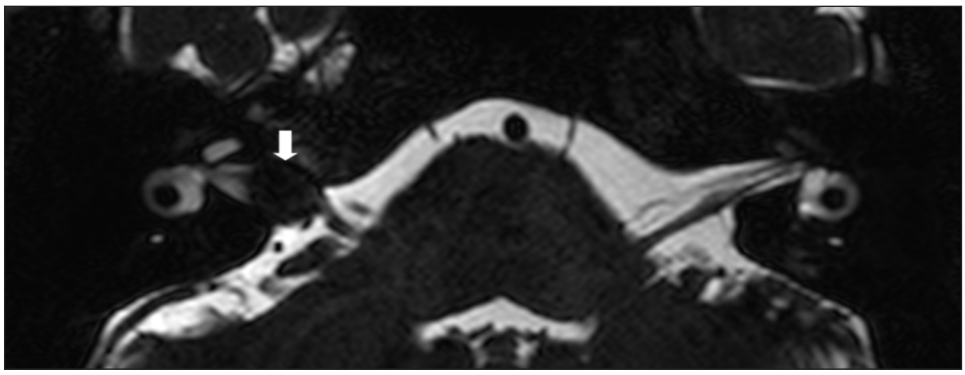

Figure 2. Axial DRIVE image at the level of the internal auditory canal showing a nodular low-intensity filling defect (white arrow) in the medial portion of the internal auditory canal that is characteristic of a vestibular schwannoma

In evaluating a patient for the presence of a vestibular schwannoma, the current medical literature indicates that high-resolution T2-weighted imaging sequences have a high sensitivity and specificity compared to gadolinium-enhanced T1-weighted imaging. However, T2-weighted imaging alone may not detect inflammatory, infectious or malignant conditions that may also present with sensorineural hearing loss.[1] As such, a gadolinium-enhanced T1-weighted sequence will be needed when such conditions are suspected.

Finally, local experience with institutions that perform imaging of the internal auditory canal and cerebellopontine angle shows that not all centers routinely perform the high-resolution T2-weighted imaging sequences. Therefore, it would be prudent to specifically indicate the need for "a T2-weighted imaging sequence with submillimeter-resolution, such as the CISS or FIESTA-C sequence" in the imaging request, in order to ensure the performance of the appropriate imaging strategy.

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