Single-Shot, Turbo Spin-Echo, Diffusion-Weighted Imaging versus Spin-Echo-Planar, Diffusion-Weighted Imaging in the Detection of Acquired Middle Ear Cholesteatoma

**SUMMARY:** Diagnosis of acquired middle ear cholesteatoma on MR imaging is mostly done on late postgadolinium T1-weighted MR images and/or echo-planar (EPI) diffusion-weighted (DWI) MR images. We describe the appearance of a case of a complicated attical middle ear cholesteatoma on single-shot (SS) turbo spin-echo (TSE) DWI compared with EPI-DWI. This case suggests a higher reliability of SS TSE-DWI in the diagnosis of acquired middle ear cholesteatoma.

**Case Report**

A 76-year-old man presented with chronic ear discharge at the otorhinolaryngology department. Otoscopic findings revealed a tympanic membrane perforation and retraction with suspicion of a partially evacuated cholesteatoma. CT of the left ear revealed a soft tissue lesion (0.8 cm) in the attic with loss of the bony delineation of the anterior limb of the lateral semicircular canal (Fig 1) and the tegmen (Fig 2). Erosion of the incus body as well as the short and long process of the incus was noted (Fig 1). MR imaging was performed for evaluation of possible invasion into the membranous labyrinth and the middle cranial fossa. MR imaging was done on a 1.5T superconduc-

**Fig 1.** Axial high-resolution CT at the level of the lateral semicircular canal shows a nodular attical soft tissue lesion (white arrow) with erosion of the anterior limb of the lateral semicircular canal (black arrow), highly suggestive of a cholesteatoma with erosion of the anterior limb of the lateral semicircular canal. Note the loss of delineation of the body and short process of the incus suggesting an extensive erosion (small arrow).
under the temporal lobe highly suggestive of a small cholesteatoma (Fig 6). On the basis of the late postgadolinium T1-weighted images and single-shot TSE-DWI, an attical cholesteatoma with surrounding inflammation without middle cranial fossa and membranous labyrinth invasion was diagnosed. Surgery confirmed the presence of a 5-mm large attical cholesteatoma surrounded by inflammation with erosion of the lateral semicircular canal but without invasion of the membranous labyrinth. The tegmen was thinned but not disrupted.

Discussion
Thin-section, high-resolution CT remains the primary imaging technique for the diagnosis and description of extension of a suspected middle ear cholesteatoma. In selected cases, MR imaging has an additional value for the evaluation of cholesteatoma extension and for the assessment of possible complications such as erosion of the lateral semicircular canal, invasion of the membranous labyrinth, and invasion of the middle cranial fossa through an eroded tegmen. Other complications, such as intracranial extension with temporal lobe abscess formation and facial nerve involvement can also be evaluated on MR imaging. MR imaging is extremely useful for the demonstration and delineation of a temporal lobe en-
gests that single-shot TSE-DWI with an actual size of 2 mm is able to discriminate smaller cholesteatomas. In this particular case, because of the absence of susceptibility artifacts at the interface between temporal lobe and temporal bone, the cholesteatoma could obviously be depicted. This demonstrates the advantage of this sequence. The size of the actual cholesteatoma at surgery was 5 mm. It was surrounded by inflammatory tissue. Furthermore, the late postgadolinium T1-weighted images also succeeded in differentiating the nonenhancing cholesteatoma from the surrounding enhancing inflammatory and granulation tissue.

Although in this case the combination of late postgadolinium T1-weighted images and single-shot TSE-DWI proved to be very convincing for the diagnosis of a primary acquired cholesteatoma, further studies on larger series are needed to prove the value of single-shot TSE-DWI in combination with late postgadolinium T1-weighted images for the diagnosis of primary acquired and residual cholesteatoma.

**References**


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**Detailed description of imaging parameters**

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**Note:**—EPI indicates echo-planar imaging; DWI, diffusion-weighted MR imaging; SS, single-shot; TSE, turbo spin-echo; T1WI, T1-weighted imaging; T2WI, T2-weighted imaging; TR, repetition time; TE, echo time; FOV, field of view.

**Fig 6.** Coronal single-shot TSE-DWI shows no curvilinear interface artifact but clearly demonstrates a hyperintensity under the temporal lobe, indicating that a cholesteatoma is present (white arrow).