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When "No Abnormality Seen" Means "Cannot See": Non-Diagnostic Temporal Bone CT in Suspected Superior Semicircular Canal Dehiscence

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A 38-year-old woman with recurrent vertigo for several years underwent computed tomographic (CT) imaging of the temporal bones as part of her evaluation. The order specifically requested a study with a slice thickness of 0.625 mm or smaller, to allow assessment for superior semicircular canal dehiscence (SSCD).[1] The radiologic report described the study as showing no CT evidence of semicircular canal dehiscence or other focal osseous abnormality of the temporal bones.

On independent review of the DICOM images, the DICOM metadata documented a slice thickness of 1.25 mm and a spacing between slices of 1.25 mm – approximately twice the requested thickness. At this slice interval, the thin bony roof of the superior semicircular canal cannot be reliably resolved, and the study is therefore not capable of excluding SSCD. Reconstructions in the Pöschl plane showed poorly defined superior semicircular canals, with suggestion of dehiscence. *(Figure 1)* The diagnostic question therefore remains open—which is itself the consequence of the initial technical failure.

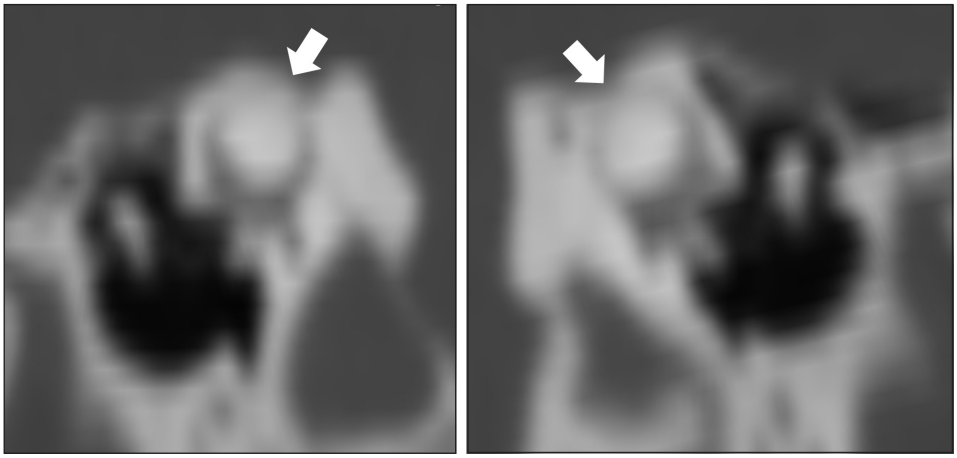


Figure 1. Pöschl plane reconstruction from the index study, displayed on a standard bone window (window width 4000 HU, window level 1000 HU)2 of the temporal bone showing poorly defined superior semicircular canals (arrows). The DICOM metadata documented a slice thickness and spacing of 1.25 mm, exceeding the requested ≤0.625 mm. Dehiscence cannot be confidently diagnosed or excluded at this slice interval. Poor image resolution is the result of using the wrong slice thickness.

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For comparison, a temporal bone CT performed at ≤0.625 mm in a different patient permits clear visualization of the intact canal roof, *(Figure 2A)* and in another patient demonstrates a frank dehiscence. *(Figure 2B)* These represent the standard required to evaluate for SSCD and what the index study could not show.

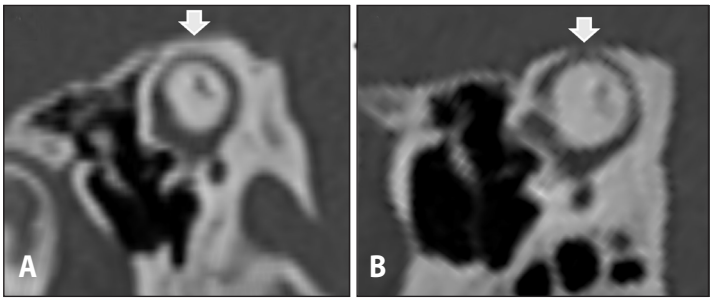


Figure 2. Pöschl plane reconstructions from temporal bone CT performed at ≤0.625 mm in two different patients, displayed on a standard temporal bone window (window width 4000 HU, window level 1000 HU):2 **A.** Normal appearance, with clear visualization of the intact superior semicircular canal roof (arrow); and **B.** Frank dehiscence of the superior semicircular canal (arrow). These images represent the standard required to evaluate for SSCD.

This case illustrates two failures in the diagnostic pathway. The first is a technical and quality-control failure: the study was performed with parameters that did not meet the specified protocol, and the radiologist—who is ultimately responsible for verifying that a study is adequate before interpretation—did not identify this discrepancy.[3] The second is a reporting failure: the study was reported as negative for a diagnosis it could not exclude. A non-diagnostic study cannot be reported as normal; the correct report states that the study is technically inadequate for the clinical question, and recommends repeat imaging with the appropriate protocol.

The distinction matters because it changes clinical behavior. A report of "inadequate" prompts a repeat study, whereas a report of "normal" closes the question—and the patient's SSCD remains undiagnosed. Three checkpoints exist in the diagnostic pathway: acquisition (the technologist should verify that the protocol matches the order), interpretation (the radiologist should verify technical adequacy before interpreting), and clinical receipt (the ordering clinician should verify that the study meets the parameters required to answer the clinical question). In this case, the first two failed. The third did not: independent review of the DICOM images revealed the slice interval discrepancy, and the study was recognized as unable to answer the clinical question. This caveat extends beyond dedicated temporal bone studies. CT images covering the temporal bones are frequently acquired for other purposes—on-call head CT, facial bone trauma protocols, or outpatient paranasal sinus studies—and these are nearly always obtained at slice thicknesses substantially larger than 0.625 mm. When the temporal bones are included in such studies, any comment on the superior semicircular canal or other fine osseous structures should be made with caution and with explicit acknowledgment of the limitations imposed by the acquisition parameters. A repeat study with the correct parameters has been requested.

The third checkpoint deserves particular emphasis for otolaryngologists. Independent evaluation of radiologic studies is an increasingly recognized competency in otolaryngology training,[4] and it carries a corresponding responsibility: the clinician who orders the study and will act on its result should verify not only the reported findings but also the technical adequacy of the study itself. Had the "normal" report been accepted at face value in this case, the patient's evaluation would have been closed, and a potentially treatable cause of vertigo would have remained undiagnosed. Independent review of the images identified the technical failure and prompted a repeat study. This is not a substitution for radiologic expertise, nor an invitation to disregard the radiologist's interpretation. It is a recognition that the clinical question and the imaging parameters required to answer it are often best defined by the clinician, and that the clinician is therefore well positioned to confirm that the study meets those requirements. When independent image review is part of training, adequacy assessment should be part of it.

Submillimeter collimation—typically 0.5 to 0.625 mm—is essential for temporal bone CT in suspected SSCD, as it minimizes partial-volume averaging that can both obscure a true dehiscence and create the appearance of one where none exists.[1,5] This is of critical importance when performing image reconstruction in the plane of the semicircular canal – the Pöschl view. When these parameters are not met, the study should not be interpreted as if they were.

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