FROM THE VIEWBOX

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Post-Operative Features of a Symptom-Free Canal-Wall Down Mastoidectomy

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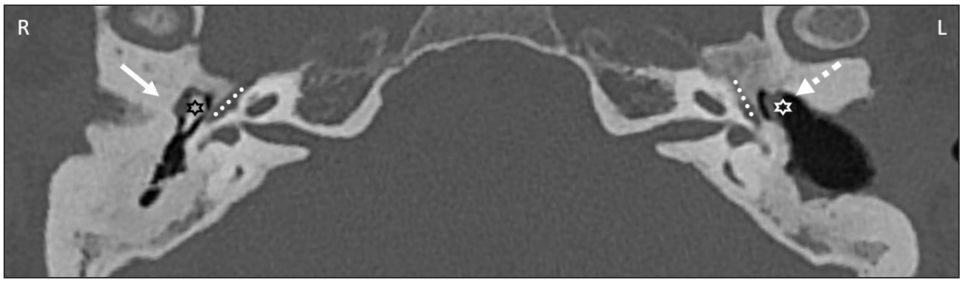
A 52-year-old intellectually disabled man who had previously undergone a left canal-wall down mastoidectomy with cartilage graft tympanoplasty for cholesteatoma 20 years ago presented with new-onset discharge in the contralateral ear. He did not have any symptoms, particularly recurrent discharge, in the post-operative ear, despite infrequent and irregular clinic follow-up for periodic cleaning of the cavity. Clinical examination of the post-operative ear revealed the presence of retained cerumen which was easily removed. The mastoid cavity was noted to have a healthy skin lining, an intact neotympanum, and a smooth bowl-like appearance with no areas that could not be adequately visualized through the surgically widened external auditory meatus. He underwent computerized tomographic imaging of the temporal bone to evaluate the nature and cause of the new-onset discharge in the contralateral ear. This imaging study provided the opportunity to present and describe key post-operative radiologic features of a symptom-free canal-wall down mastoidectomy with tympanoplasty.

A canal-wall down mastoidectomy is a more extensive type of mastoidectomy which, in addition to the resection of the mastoid cortex, all mastoid air cells and Körner septum, is characterized by the resection of the posterior wall of the external auditory canal and scutum. Among the most common causes of failure following this type of surgery are incomplete removal of tegmental air cells and incomplete lowering of the facial ridge.[1] These two factors can and should be purposefully assessed in a post-operative imaging study.

Adequacy of bone removal in the epitympanum to address the issue of tegmental air cell disease is evaluated on axial CT images at the level of the malleus head-incus body complex and the proximal portion of the tympanic segment of the facial nerve. *(Figure 1)* All of the bone lateral to the ossicles, especially that overlying the malleus head and anterior epitympanic recess, should have been surgically removed.

On coronal CT images, this same adequacy is demonstrated by the surgical removal of all bone lateral to the epitympanum, from the scutum to the outer cortex, such that there is a clear



Figures 1. Axial CT image at the level of the epitympanum. On the non-operated right side (R), the ice-cream cone configuration of the malleus head and incus body (black unfilled star) and the proximal portion of the tympanic segment of the facial nerve (white dotted line) are identified and can be used as landmarks. The white solid arrow points to the bone lateral to the anterior portion of the epitympanum. On the operated left side (L), this area of bone has been surgically removed (white dashed arrow), such that the anterior epitympanum (white unfilled star) is now widely accessible within the mastoid cavity. The tympanic segment of the facial nerve (white dotted line) is clearly identified.

Keywords: *post-mastoidectomy changes; temporal bone imaging; recurrent mastoid disease; high facial ridge*

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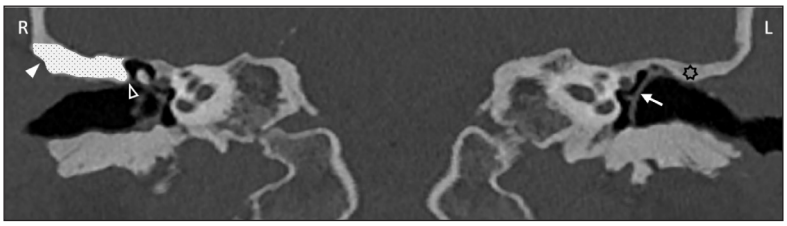

Figure 2. Coronal CT image in the region of the anterior epitympanum, where the labyrinthine segment and proximal tympanic segment of the facial nerves appear as separate structures just posterior to the geniculate ganglion. On the non-operated side (R), the bone lateral to the epitympanum, from the blunted scutum (white unfilled arrowhead) to the outer cortex (white filled arrowhead) is present (highlighted area). On the operated side (L), this bone has been removed, such that the entire epitympanum is visible from the external auditory canal. Osteoneogenesis during the healing phase has caused a slight thickening of the bone at the center of this bony plate (black unfilled 7-point star). A neotympanum of cartilage (white arrow) can be seen extending from the epitympanum to the floor of the external auditory canal.

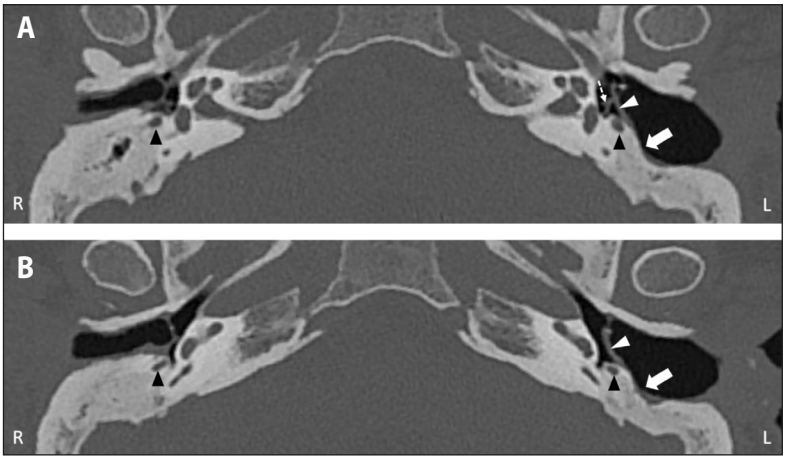

Figure 3A. Sequential axial CT images at the level of the modiolus and **B.** the round window niche. In both images, black arrowheads point to the mastoid segments of the facial nerve on both sides. On the unoperated right side, a thick layer of mastoid cortical bone overlies the facial nerve. On the operated side, only a thin layer of bone overlies the facial nerve, such that the floor of the mastoid cavity (white block arrows) does not have a high ridge of bone separating it from the middle ear space. In both images, a neotympanum of cartilage (white arrowheads) extends from the anterior EAC wall to the facial ridge, effectively sealing off the middle ear space, eustachian tube, and nasopharynx, from the mastoid cavity and ear canal. Additionally, the stapes superstructure (white dashed arrow) can be seen touching the cartilage neotympanum in Figure 3A, demonstrating a type III tympanoplasty.

line of sight from the external auditory meatus to the epitympanum. This helps ensure that there are no pockets of soft tissue medial to any bony ridges; soft tissue that may represent residual or recurrent disease. *(Figure 2)*

In a canal-wall down mastoidectomy, the mastoid (vertical) segment of the facial nerve serves as the boundary between the external auditory canal and the mastoid cavity. All of the bone overlying this segment of the facial nerve should be removed, such that only a thin amount of bone remains covering the nerve. Leaving an excessive amount of bone over this segment of the nerve, a situation called a "high facial ridge," creates a situation where there is a deep trough on the mastoid side. This can create a difficult post-operative situation with trapped mastoid spaces that are hard to clean in the office and that prevent natural cleaning.[2] Proper lowering of the facial ridge is assessed on sequential axial CT images at the level of the mastoid segment of the facial nerve. *(Figures 3A and B)*

Assessing and describing these features in a post-operative CT imaging study of a patient who has undergone a canal-wall down mastoidectomy is particularly important if there is a history of symptoms compatible with residual or recurrent mastoid disease. This will assist the otologic surgeon in identifying and correcting any inadequacies in the original operation during revision mastoid surgery.

Note: All CT scan images were viewed using RadiAnt DICOM Viewer Version 2025.1 (Medixant, Poznań, Poland), available at *https://www.radiantviewer.com*.

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