

**Department of Surgery**  
**2026 Research Day**  
**6<sup>th</sup> May 2026 (Wednesday) | 7 am – Noon | MART Auditorium**

**Title:**

Third Window Phenomenon in Advanced Otosclerosis: The Critical Role of Preoperative CT Imaging

**Author(s) and Affiliations:**

David Shimunov, Juyun Hwang, Huseyin Isildak – Division of Otolaryngology–Head and Neck Surgery, Department of Surgery, Stony Brook University, Stony Brook, New York

**Faculty Mentor(s):**

Huseyin Isildak, MD

**Background:**

Otosclerosis is caused by abnormal bone remodeling in the middle ear, which impairs sound transmission and is a common cause of conductive hearing loss. Third window abnormalities are defects in the bony structure of the inner ear that create an additional compliant opening, producing sound- or pressure-induced vertigo and low-frequency air-bone gaps. Potential third windows include semicircular canal dehiscence, enlarged vestibular aqueduct, and dehiscence of the scala vestibuli. When otospongiosis extends into the otic capsule, a cochlear-perilymphatic communication can act as a third window. Preoperative high-resolution CT imaging is essential for detecting fenestral and retrofenestral otospongiosis and guiding surgical planning.

**Methods:**

A 52-year-old male with bilateral otosclerosis, mixed hearing loss, and multiple previous ear surgeries, including a right-sided bone-anchored hearing aid, presented for revision. He underwent right-sided BAHA abutment removal with ossicular reconstruction using a Lippy bucket-handle prosthesis and left-sided revision stapedotomy with a new prosthesis and cartilage graft. Postoperative hearing outcomes were assessed via audiograms, and computed tomography was used to evaluate persistent hearing loss.

**Results (or Preliminary Results):**

Revision surgery improved right ear hearing by approximately 50 dB at 250–500 Hz, closing the air-bone gap. Left ear surgery resulted in a 10-dB worsening at 3–6 kHz. CT imaging revealed fenestral and retrofenestral otospongiosis with cochlear-perilymphatic continuity, indicating a third window phenomenon contributing to persistent conductive hearing loss.

**Conclusions (or Preliminary Conclusions):**

Third window phenomenon due to otospongiosis should be considered in patients with persistent conductive hearing loss despite appropriate prosthesis placement. Preoperative CT imaging is crucial not only for assessing ossicular status and superior semicircular canal dehiscence but also for detecting abnormal otic capsule demineralization that may create a third window. Recognizing this pathology improves surgical counseling and postoperative management.