The Utility and Outcomes of Diagnostic Imaging in Sudden Sensorineural Hearing Loss Patients – A Retrospective Study

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Introduction

Presentation & Risks: Sudden Sensorineural Hearing Loss (SSNLH) is an otologic emergency defined as >30 dB loss over 3 contiguous frequencies within 72 hours, often presenting with unilateral hearing loss, tinnitus, vertigo, and aural fullness[1]. Risk factors include smoking, alcohol use, ototoxic agents, chronic ear infections, cardiovascular risk factors, and occupational exposures[2].
Audiogram & Triage: Prompt audiometry is critical for diagnosis. If no recovery, initiate intratympanic steroids within 2–6 weeks and hyperbaric oxygen therapy within 4 weeks[3].
Imaging: MRI assesses for retro cochlear causes (e.g., vestibular schwannoma, vascular malformations); CT Temporal Bones evaluates bony abnormalities when MRI is contraindicated[4].
Wait Times & Impact: MRI waits have increased to 16.2 weeks and CT to 8.1 weeks, often delaying salvage therapies and affecting outcomes[6].

Objective

Retrospectively review the utility an outcomes of diagnostic imaging for the assessment and management of SSNHL using comprehensive database from a Calgary Hearing Centre.

Methods

- Retrospective cohort study of adults (≥18 years) presenting with SSNHL to a tertiary Otolaryngology clinic between **Jan 1–Dec 31, 2021**.
- An initial cohort of **141 patients** was screened; after exclusions, **113 patients** were included in the final analysis.
- Exclusion criteria: hearing loss from alternative diagnoses or missing imaging/evaluation dates.
- Imaging wait times were calculated as the interval from requisition to MRI or CT completion.
- Radiology reports were reviewed for pathologies, which were classified as **clinically relevant** if they directly impacted diagnosis or management

Results

Figure 1. Average wait times for MRI and CT imaging among patients with sudden sensorineural hearing loss (SSNHL).

MRI (n=65)	CT (n=7)
162 days	151 days

Figure 2. Temporal bone CT findings in patients with sudden sensorineural hearing loss (SSNHL) and their clinical relevance

CT Finding	Number of Patients (n=5)	Clinically Relevant to SSNHL treatment?
Chronic Otomastoiditis	2 (40%)	No
Chronic Serous Otitis Media	1 (20%)	No
Cholesteatoma	1 (20%)	No
Semicircular Canal Dehiscence	1 (20%)	No

Figure 3. MRI findings among patients with sudden sensorineural hearing loss (SSNHL), categorized by lesion type, laterality relative to the affected ear, and clinical relevance.

Category	Finding	Laterality to the ear with SSNHL	Number of Patients (n=16)	Clinically Significant to Etiology
Intracranial Mass Lesions/ Tumors	Meningioma	Unilateral	1 (5.88%)	Yes
	Pineal Cyst	Unilateral	2 (12.5%)	No
	Vestibular Schwannoma	Contralateral	1 (5.88%)	No
	Vestibular Schwannoma	Unilateral	1 (5.88%)	Yes
Vascular Anomalies/Contact	AICA Loop	Unilateral	1 (5.88%)	No
	AICA Loop	Contralateral	1 (5.88%)	No
	Cerebellar Cavernous Malformations	Unilateral	1 (5.88%)	No
	White Matter Hyperintensities	Unilateral	5 (31.25%)	No
Structure/Bone Malformations	SCDS (superior canal dehiscence)	Contralateral	1 (5.88%)	No
	Cerebellar Arachnoid Cyst	Unilateral	1 (5.88%)	No
Other Neurological Abnormalities	Medulla Lesion	Unilateral	1 (5.88%)	No

Conclusion

- Imaging findings in our cohort were largely consistent with the SSNHL literature, with vestibular schwannoma detection rate of 2.44% within the expected 1-4% range[7,8].
- MRIs had higher diagnostic yield in comparison to CT scans and were successful in catching neoplastic lesions (Fig 2)
- All three patients with vestibular schwannomas and meningiomas presented with no alarming physical exam findings and treatment included surveillance.
- Wait times for CTs and MRIs remain **beyond the timeframe for salvage therapy[3] .**
- However, the relevance of some findings to SSNHL causation is **ambiguous,** especially given the challenges in accessing timely imaging.
- Diagnostic imaging is valuable for uncovering potential underlying pathophysiology. We advocate **for more prompt imaging** after hearing loss onset, as accurate diagnosis can significantly impact treatment and overall prognosis.
- Future strategies should include focused MRI protocols, earlier referral pathways through family physician education, and triage models or rapid-access clinics to improve timely imaging access.

References

1. Hughes GB, Freedman MA, Haberkamp TJ, Guay ME. Sudden sensorineural hearing loss. Otolaryngol Clin North Am. 1996;29(3):393-405.
2. Lin RJ, Krall R, Westerberg BD, Chadha NK, Chau JK. Systematic review and meta-analysis of the risk factors for sudden sensorineural hearing loss in adults. Laryngoscope. 2012;122(3):624-635. doi:10.1002/lary.22480
3. Fetterman BL, Saunders JE, Luxford WM. Prognosis and treatment of sudden sensorineural hearing loss. Am J Otol. 1996;17(4):529-36.
4. Chandrasekhar SS, Tsai Do BS, Schwartz SR, Bontempo LJ, Faucett EA, Finestone SA, et al. Clinical Practice Guideline: Sudden Hearing Loss (Update). Otolaryngol Head Neck Surg. 2019;161(1_suppl):S1-s45.
5. Clyde JW, Patel VA, Kanekar S, Isildak H. Magnetic resonance imaging findings in idiopathic sudden sensorineural hearing loss. Acta Radiol. 2019;60(9):1167-74.
6. Moir M, Barua B. *Waiting Your Turn: Wait Times for Health Care in Canada, 2024 Report*. Vancouver (BC): Fraser Institute; 2024
7. Lee JD, Lee BD, Hwang SC. Vestibular schwannoma in patients with sudden sensorineural hearing loss. Skull Base. 2011;21(2):75-8
8. Baird SM, Nguyen K, Bhatia DDS, Wei BPC. Inner ear and retrocochlear pathology on magnetic resonance imaging for sudden and progressive asymmetrical sensorineural hearing loss. ANZ J Surg. 2019;89(6):738-42