

Cochlear Implant in a Burn Patient with a Unique Presentation of SNHL

Janeth G Swartwood, BS, MS¹; Kimberly Smith, AuD²; Alexander Marston, MD², Doron Sagiv, MD²

¹UC Davis School of Medicine, ²UC Davis Health Department of Otolaryngology – Head and Neck Surgery

Introduction

This case describes a patient who sustained a severe burn injury leading to 3rd-degree burns of his face. Despite suffering from complete right facial nerve paralysis, complete loss of his auricle, and a total tympanic-membrane (TM) perforation, the patient was successfully treated with cochlear implantation (CI) for sensorineural hearing loss. CI for asymmetric hearing loss was approved by the FDA in 2019¹.

Case Description

- Initial exam: damage to the auricle, total TM perforation, and complete facial nerve paralysis
- Weber exams lateralized to the left side
- Audiogram confirmed complete deafness on the right, and a moderate high-tones SNHL on the left
- Axial Fast Imaging Employing Steady State Acquisition (FIESTA) demonstrated partial obliteration of the lateral aspect of the basal turn of the cochlea and its apex.
- A monopolar needle EMG showed many motor unit potentials, several of which were polyphasic.
- Cochlear implant surgery occurred 9 months after the incident. After removing extensive scar tissue, and trialing two different gauge depths, a CI-612 was inserted, leaving the stylet inside and achieving a near-complete insertion.

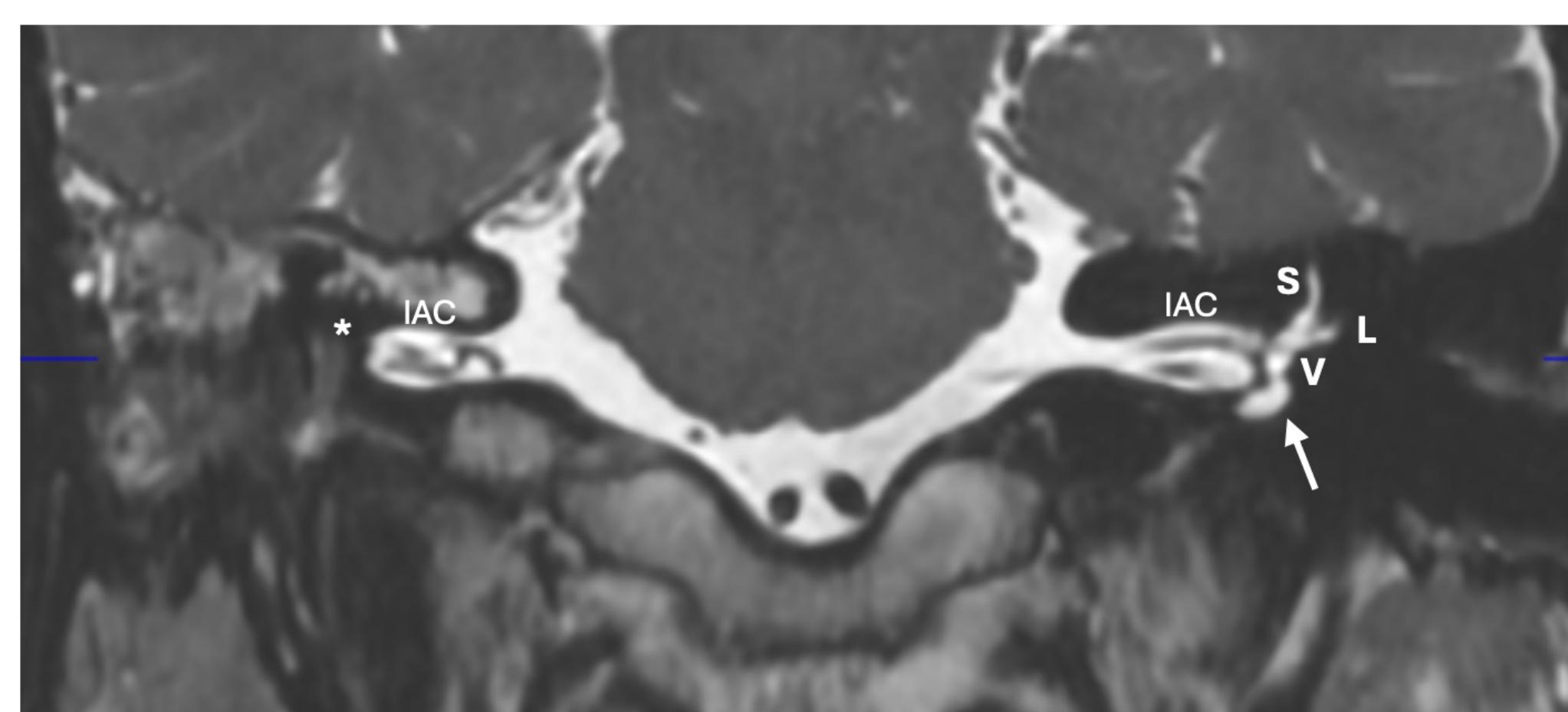


Figure 1A. Normal fluid on the left (hyperintense) vs. no signal on the right (hypointense (*)). Internal auditory canals (IAC), basal turn of cochlea (arrow), vestibule (v), superior semicircular canal (S), lateral semicircular canal (L).

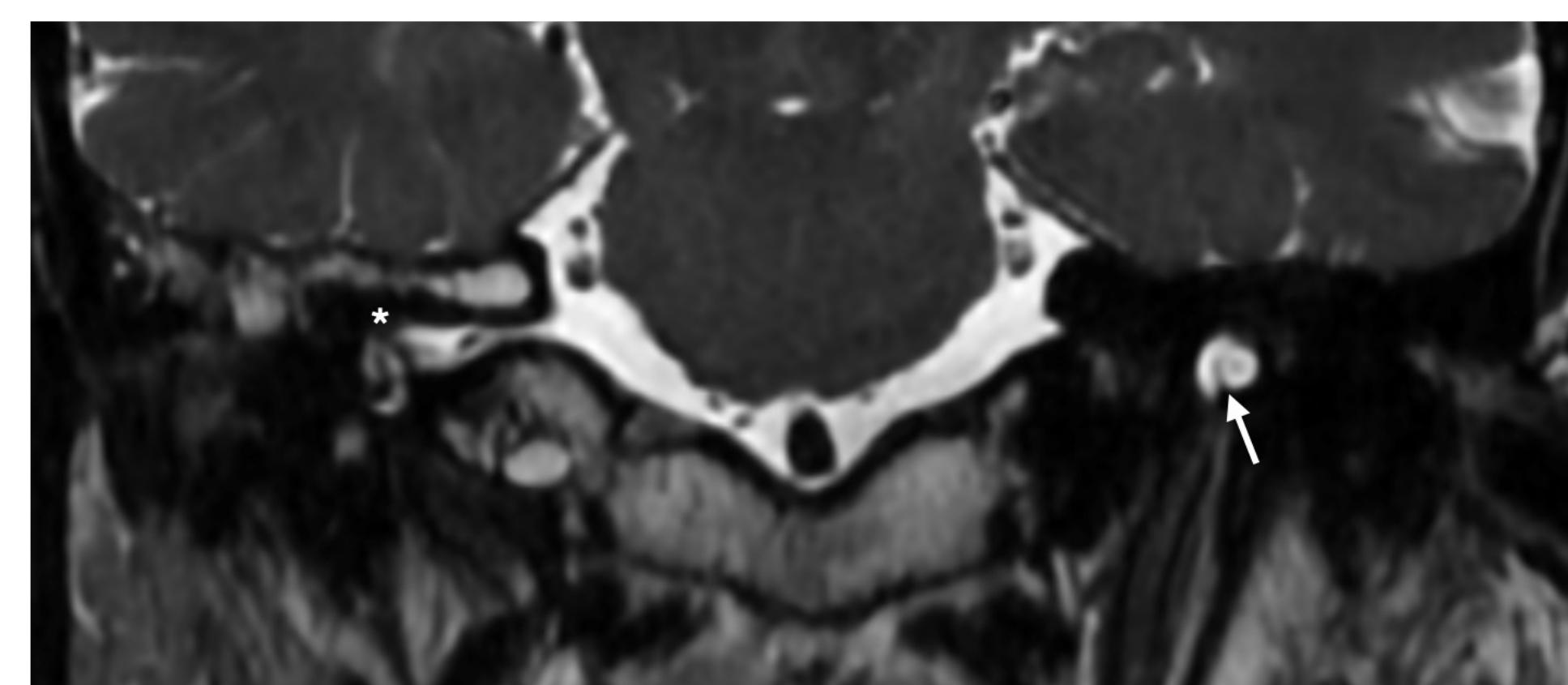


Figure 1B. Demonstrates weaker signal of fluid from the basal and second turns of the cochlea on the right (*) compared to the left (white arrow), suggesting scar tissue in the cochlea.

Case Description Cont'd



Figure 2. Healed burn injuries

Results

The patient continuously reported improved balance in hearing using right cochlear implant and left hearing aid. CI-aided thresholds ranged between 20 to 30dB, and he scored 39% and 49% on AzBio test (Quiet) and CNC phonemes, respectively. The patient showed favorable outcomes in the CIQoL-10 and Speech, Spatial, and Qualities of Hearing-12 questionnaires.

INSTRUCTIONS: Think about your daily life with your cochlear implant (and/or hearing aid, if you also use one). Answer how often each of the following statements applies to your feelings and experiences. Answer how often each statement applies even if you don't use cochlear implants or hearing aids.

	Never	Rarely	Sometimes	Often	Always
1. I am able to have a conversation in a quiet place without asking the other person to repeat themselves				<input checked="" type="checkbox"/>	
2. I can hear and understand without looking at the person speaking				<input checked="" type="checkbox"/>	
3. I can understand strangers without lip-reading in a noisy place				<input checked="" type="checkbox"/>	
4. I feel comfortable being myself			<input checked="" type="checkbox"/>		
5. I keep quiet in a conversation to avoid saying the wrong thing			<input checked="" type="checkbox"/>		
6. I am able to enjoy listening to the radio and TV				<input checked="" type="checkbox"/>	
7. I can hear someone approaching from behind		<input checked="" type="checkbox"/>			
8. I am able to follow a conversation with minimal effort			<input checked="" type="checkbox"/>		
9. I have to concentrate when having a conversation with strangers when in a noisy place	<input checked="" type="checkbox"/>				
10. I avoid socializing with friends, relatives, or neighbors due to my hearing loss				<input checked="" type="checkbox"/>	

	Raw Score	Outcome Measure
CIQoL-10 Global	34	52

Copyright © 2019 MUSC Foundation for Research Development. All Rights Reserved.

Figure 3. The Cochlear Implant Quality of Life-10 (CIQoL-10) provides a comprehensive assessment of functional outcomes in adults with cochlear implants.

Discussion

Having multiple gauge depths available for surgery was extremely helpful. The scar tissue identified on MRI aided in this decision. Additionally, receiving a signal while stimulating the facial nerve during surgery further confirmed the viability of the cochlear nerve, given its deeper anatomical location. This case adds to the limited literature regarding treating patients with a CI in the setting of trauma-induced sensorineural hearing loss.^{2,3}

Case Summary

The clinical dilemma was identifying the viability of the cochlear nerve after a severe thermal injury affecting the facial nerve, tympanic membrane, and auricle. Despite this, the patient was successfully treated with a cochlear implant for his SNHL. Key studies that assisted in our decision for cochlear implant candidacy were the FIESTA sequence on MRI to assess for cochlear patency, and the EMG suggesting immature reinnervation of the facial nerve.

Acknowledgments

Thank you to all the members for their contribution and collaboration on this project. Most of all, thank you to our patient for agreeing to participate in this report.

References

- Premarket Approval (PMA) (July 26, 2019). U.S. Food And Drug Administration. <https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpma/pma.cfm?id=P000025S104> Retrieved April 15, 2025.
- Hervochon, R., Riveccio, F., Picard, D., et al. (2023). Cochlear implantation and facial nerve anastomosis to rehabilitate a burnt middle ear. American journal of otolaryngology, 44(2), 103704.
- Todt, I., Seidl, R., Goepel, F., et al. (2011). Cochlear implantation after burn injury of the head. Cochlear implants international, Advance online publication.

Contact

Janeth Garcia Swartwood
UC Davis School of Medicine
jgsgarcia@health.ucdavis.edu