External Auditory Canal Stenosis in a Pediatric Trauma Patient Population

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Introduction

Temporal bone fractures and external auditory canal (EAC) injuries frequently occur in high-impact polytrauma, posing considerable morbidity or even mortality due to their proximity to critical structures. Common complications include facial nerve paralysis, cerebrospinal fluid (CSF) leakage, hearing loss, and vertigo. A less frequently discussed yet serious long-term sequela is EAC stenosis, which can lead to conductive hearing loss, external deformity, cholesteatoma, and potential intracranial complications. This study reviews cases of EAC stenosis from initial injury onward to inform better patient care and underscore the importance of early recognition and management.

Case Presentations

Case #1: A 13-year-old male sustained extensive ballistic trauma to the face, fracturing the right mandible, maxilla, zygomatic complex, and orbital floor. There were also fractures to the petrous and tympanic plates of the temporal bone, but the otic capsule was spared. Initial computed tomography (CT) imaging guided management, yet debris obscured the tympanic membrane (TM). Two months later, there was near-complete stenosis of the EAC associated with moderately severe conductive hearing loss (**Figure 1a, b**). This progressed to complete obstruction by four months. Despite multiple surgeries (i.e., mastoidectomy, canalplasty, tympanoplasty) with cholesteatoma removal and repeat Kenalog/5-FU injections, the patient required further procedures for recurrent stenosis. Ultimately, a patent EAC with mild unilateral conductive hearing loss was achieved five years after initial injury.

Case #2: A 16-year-old female sustained diffuse axonal injury, subdural hematoma, and a right mandibular fracture in a rollover motor vehicle collision (MVC). She later developed granulation in the EAC that was initially managed with Ciprodex drops. However, the patient presented three months later with complete EAC stenosis (**Figure 2**), unilateral conductive hearing loss, and a cholesteatoma. Surgical intervention included combined transcanal and postauricular tympanoplasty, canalplasty, meatoplasty, and split thickness skin grafting. Revision surgery was performed after partial re-closure. She ultimately achieved a patent EAC but was lost to follow-up 15 months after initial injury.

Case #3: A 15-year-old male sustained zygomatic arch, mandibular, and posterior bony EAC fractures, as well as extensive facial lacerations, following MVC. Initial CT scans guided management. Otoscopy revealed bloody otorrhea, but the TM was intact. One month later, the patient developed near-complete EAC stenosis and mild conductive hearing loss. Canalplasty with xeroform packing restored a patent EAC and normal hearing, but the patient was lost to follow up two months postoperatively.

Case #4: A 14-year-old male suffered multiple gunshot wounds leading to subarachnoid hemorrhage, a grade II internal carotid artery injury, and extensive craniofacial fractures which included the bony EAC. Initial imaging (CT IAC/temporal bone and CT/CTA head) guided early care, and a Merocel sponge was placed in the EAC. Seven months later, the patient developed complete EAC stenosis, severe unilateral hearing loss, and suspected cholesteatoma. He is currently scheduled for tympanoplasty, mastoidectomy, and meatoplasty.

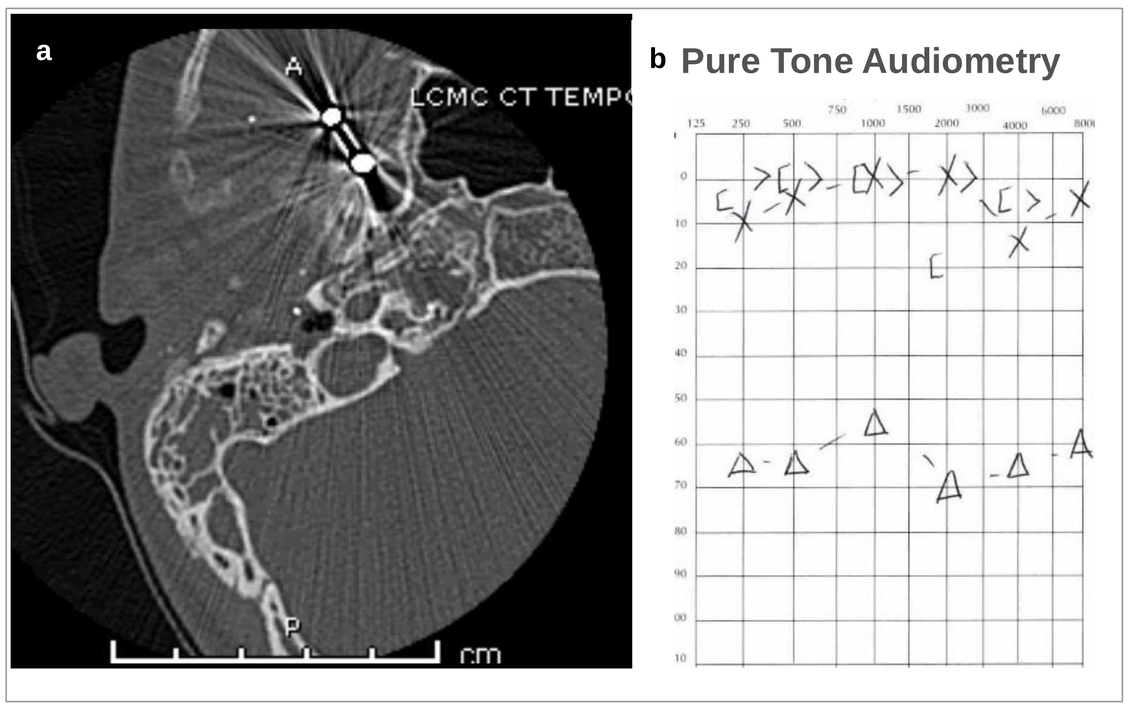

Fig 1. Exam findings from Case #1. Axial CT scan of the right temporal bone (**a**) shows complete occlusion of the EAC. Pure tone audiometry (**b**) shows right-sided moderately severe conductive hearing loss.

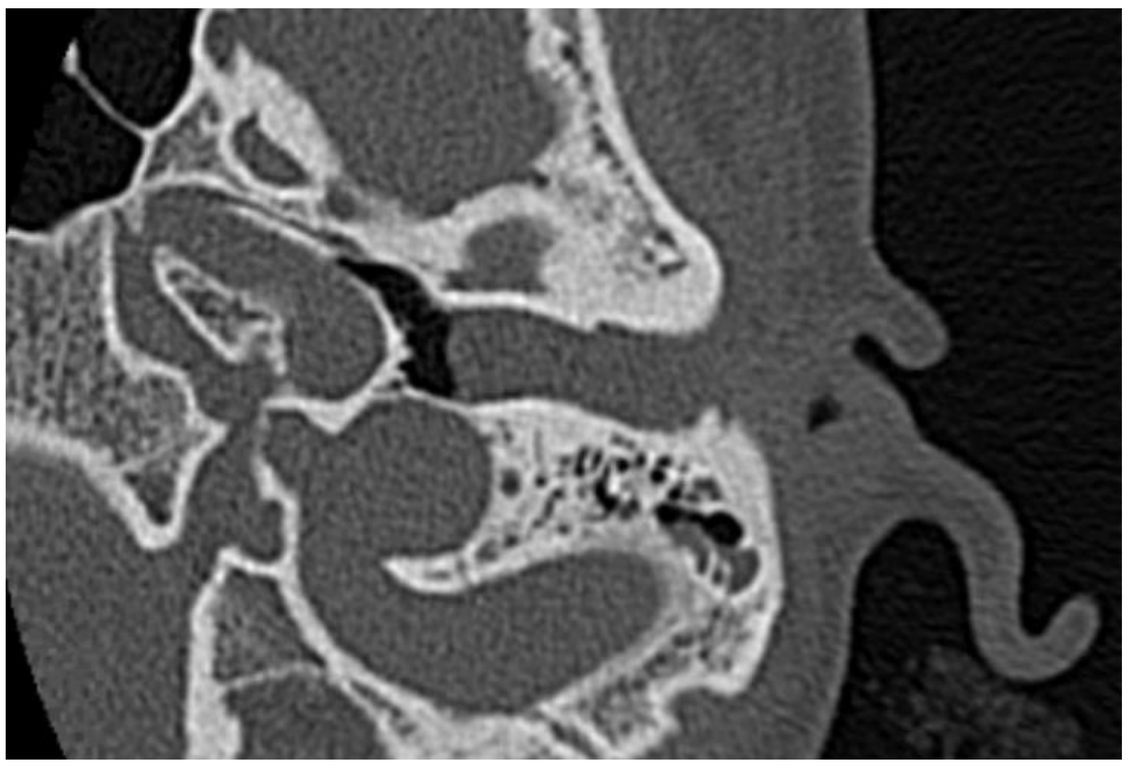

Fig 2. Exam findings from Case #2. Axial CT scan of the left temporal bone shows complete occlusion of the EAC.

Results

Four pediatric polytrauma patients (average age 14.5 years) presented with EAC stenosis and otologic trauma from MVCs or gunshot wounds. All had CT scans of the head and maxillofacial region (one patient also had IAC/temporal bone) which revealed EAC lacerations, granulation, and/or debris. Each patient received antibiotic drops, and one had a Merocel sponge place. Follow-up ranged from one to seven months post-injury with monitoring up to five years, during which time additional CT scans were obtained. Three patients developed cholesteatoma with varying degrees of unilateral hearing loss, and all required surgical intervention (**Table 1**).

Patient	Age	Mechanism	Imaging	Surgery	Revision	Outcome
Case #1	13	Ballistic	CT head CT max/face	Mastoidectomy Tympanoplasty Canalplasty	Yes	Patent EAC
Case #2	16	MVC	CT head CT max/face	Tympanoplasty Canalplasty Meatoplasty (with STSG placement)	Yes	Patent EAC
Case #3	15	MVC	CT head CT max/face	Canalplasty	No	Patent EAC
Case #4	14	Ballistic	CT head CT max/face CT IAC CTA head	-	-	Awaiting surgery

Table 1. Summary of presentation, management, and outcomes of EAC stenosis in four pediatric patients. CT, computed tomography; EAC, external auditory canal; MVC, motor vehicle collision; STSG, split thickness skin graft; IAC, internal auditory canal.

Conclusion

This retrospective review explores EAC stenosis in patients with trauma-induced temporal bone and mandibular fractures, aiming to refine management from initial care onward. It highlights cases requiring multiple surgeries for persistent stenosis and cholesteatoma, underscoring the complexities and need for vigilant follow-up. Current preventive measures, like antibiotic drops and cautious packing, remain unstandardized, but early intervention may reduce surgical morbidity. Despite a small sample size, the study advocates a proactive, flexible protocol—particularly in pediatric patients—to address the dynamic challenges of post-traumatic canal stenosis

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