

Case Report

Postoperative recurrence of traumatic acquired external auditory canal atresia: a case report

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Abstract: Acquired external auditory canal stenosis (EACS) is a rare otologic disorder with diverse etiologies, including infection, trauma, neoplasm, and inflammation. Post-traumatic stenosis is particularly uncommon, accounting for only 10% of cases. Patients typically present progressive conductive hearing loss and notable narrowing of the external auditory canal (EAC). Careful physical examination is essential to identify local inflammatory or fibrotic changes within the EAC. A history of recent trauma, recurrent external ear infections, or previous otologic surgery often suggests the diagnosis and underlying etiology. Surgical intervention remains the mainstay of treatment for post-traumatic stenosis; however, the procedure is technically challenging and recurrence is frequent. Optimal surgical selection combined with meticulous postoperative follow-up is crucial to reducing recurrence. Here, we report a case of recurrent EACS following traumatic EAC atresia. The patient underwent secondary EAC meatoplasty with dermoplasty and remained free of restenosis during a 3-year follow-up.

Keywords: Acquired external auditory canal stenosis, external auditory meatoplasty, skin graft, recurrence

Introduction

Acquired atresia of the external auditory canal (EAC) refers to stenosis resulting from abnormal development of either soft or bony tissue [1]. The EAC functions as a conduit for sound transmission, directing acoustic waves to the tympanic membrane and subsequently to the middle ear, thereby linking the tympanic membrane with the external environment [2]. Acquired external auditory canal stenosis (EACS) is defined by fibrotic occlusion of the medial EAC, leading to conductive hearing loss. It may occur after trauma (e.g., motor vehicle accidents, gunshot injuries, or otologic surgery), as a consequence of neoplastic lesions, or secondary to idiopathic inflammatory processes [3]. The estimated incidence of EACS is 0.6 per 100,000 individuals, with trauma accounting for only 10% of cases [4]. In adults, the EAC measures about 25 mm in length and 8 mm in diameter, with a downward and inward-sloping sigmoid configuration rather than a straight horizontal tube [2]. EACS can occur at the canal's opening or within the bony or cartilagi-

nous portions, presenting in solid or membranous forms. Treatment of EAC atresia remains challenging due to the high risk of delayed recurrence [5]. Recurrence is primarily attributed to granulation tissue formation and subsequent healing [6]. Restenosis is the most prevalent complication, with an incidence of 6-27% [4].

Paparella et al. outlined the standard surgical approach, which includes excision of the fibrotic plug and diseased epithelium, maximal widening of the bony canal, and autologous skin grafting of variable thicknesses to cover the exposed canal wall [7]. The primary goal of surgical treatment is to achieve a well-epithelialized and patent EAC [8]. Subsequent refinements have focused on reducing postoperative complications and minimizing the incidence of restenosis. Here, we report a case of acquired EAC atresia complicated by recurrent stenosis six months after initial surgery. The patient underwent revision surgery with external auditory meatoplasty and dermoplasty and remained free of restenosis during a 3-year follow-up.

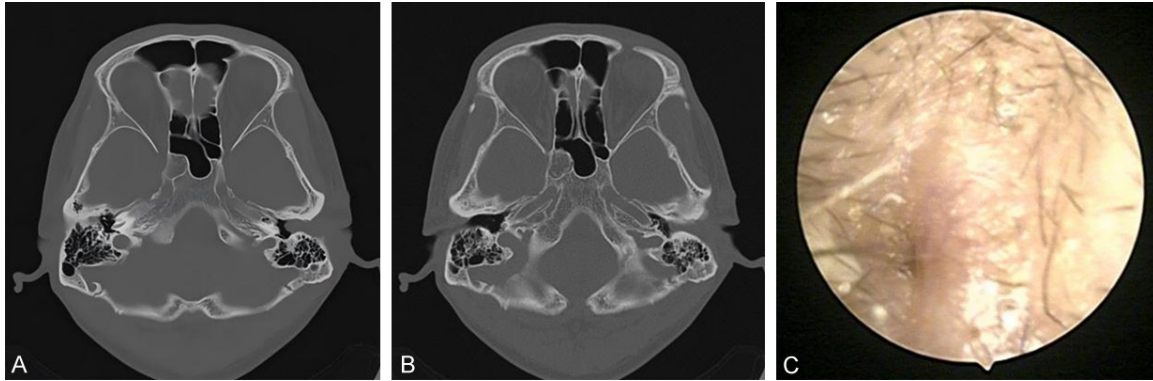


Figure 1. Imaging and endoscopic findings of the left external auditory canal (EAC). A: Temporal bone CT shows a soft-tissue density shadow within the left EAC. B: Temporal bone CT shows soft-tissue density obstructing the left EAC. C: Otoendoscopic view reveals a pinpoint-like narrowing of the left EAC. Note: CT: computed tomography.

Case presentation

Preoperative stage (2018.9-2019.6)

1. Medical history and initial symptoms: In September 2018, the patient sustained trauma to the left ear from a fall, initially presenting with swelling and pain that resolved within one week. Three months later, progressive hearing loss and a sensation of ear fullness developed. Physical examination revealed complete closure of the left external auditory canal.

2. Initial Surgery and Recurrence: In December 2018, the patient underwent left external auditory canal reconstruction, which restored canal patency and improved hearing. However, by June 2019, restenosis occurred, with the canal diameter reduced to approximately 2 mm, and the tympanic membrane was not visible. Temporal bone computed tomography (CT) (**Figure 1A, 1B**) revealed soft tissue proliferation and bony hyperplasia within the external auditory canal. Endoscopic examination (**Figure 1C**) confirmed a needle-tip-like narrowing of the left canal, consistent with traumatic stenosis.

3. Preoperative preparation: temporal bone CT was performed to delineate the extent of the lesion. Comprehensive systemic evaluation revealed no contraindications for surgery. The planned procedure was external auditory canal enlargement combined with a medium-thickness skin graft.

Intraoperative operation (June 2019)

1. Preparation: Following induction of general anesthesia, the surgical field was disinfected,

and the procedure was performed under microscopic visualization.

2. Surgical technique: The left external auditory canal demonstrated stenosis with deep atresia, and a postoperative scar was noted behind the left ear. A longitudinal incision was made through the external auditory canal to separate the perichondrium and scar tissue, revealing bony hyperplasia on the anterior and inferior walls, accompanied by wrinkled perichondrium and extensive scarring. Scar tissue was excised, and hyperplastic bone was meticulously removed with a micro-machete under magnification, enlarging the canal to approximately 9 mm in diameter. Canal contour was achieved by further removal of residual hyperplastic bone and perichondrial trimming. A 0.35 mm medium-thickness skin graft (1.8 cm × 2.2 cm) harvested from the posterior auricle was trimmed into small segments, which were applied to cover the exposed bony walls and tympanic membrane margins, then sutured. The surgical cavity was packed with iodoform gauze strips. Wound closure was completed with layered sutures, followed by pressure dressing with gauze.

Postoperative recovery and follow-up (2019.6-2022.6)

1. Short-term recovery: Postoperatively, antibiotics were administered for 3 days to prevent infection. Sutures were removed on day 7. Partial gauze removal was performed on day 14, with viable skin grafts observed. Complete gauze removal was performed on day 21, revealing a patent canal without stenosis.

2. Long-term follow-up: The patient was evaluated at 3 months, 6 months, 1 year, and annually thereafter. By June 2022 (3 years after surgery), the external auditory canal remained patent with no recurrence of stenosis.

Discussion

Acquired EACS is a rare condition characterized by narrowing of the EAC lateral to the tympanic membrane, resulting in a blind-ending skin-lined canal [9]. Common etiologies include recurrent or persistent suppurative otitis media, foreign bodies, trauma, radiation, and tumors [10]. The disease typically progresses through two stages: the wet phase, characterized by recurrent otorrhea and ongoing inflammation, and the dry phase, characterized by a non-discharging, stenotic canal with dense fibrosis. The dry phase may represent an advanced stage of the wet phase following inadequate treatment [8].

The primary challenge in managing EACS is its high recurrence rate, largely driven by granulation tissue formation and secondary healing [11]. Surgical intervention remains the primary option, aiming to remove the fibrous plug, enlarge the EAC, expose the tympanic membrane, and reconstruct the EAC epithelial lining [12]. Complete excision of fibrotic tissue is essential, as residual tissue is strongly associated with recurrence [13]. Skin grafting plays a critical role in the treatment of EACS. Jacobson and Mills reported a 100% recurrence rate when only the fibrous plug was excised without skin grafting [14]. Kuczkowski and Sierszeń further emphasized that the surgical approach should be tailored to the underlying etiology and EAC morphology, with success largely dependent on maximal bony canal expansion, widening of the tympanic angle, and transplantation of a free epidermal flap [15].

Management during the early stage remains controversial. While some otologists recommend antibiotic and anti-inflammatory therapy, others suggest that delayed surgical intervention exacerbates medial canal fibrosis. Typically, the EAC re-epithelializes within one month after surgery; however, loss of epithelial covering in an annular pattern predisposes to granulation, fibrosis, and stenosis. Therefore, close follow-up during the first one to two months is crucial for early detection and management of scarring

[16]. Yang and Zhao reported favorable long-term outcomes (≥ 1 year) in four patients aged 11-63 years when comprehensive pre- and post-operative management was implemented, concluding that surgical success depends primarily on surgical technique and postoperative care [17].

In this case, recurrence occurred six months after the initial meatoplasty because dermoplasty was not performed, consistent with previous reports. Revision surgery involved complete excision of fibrous tissue, canal enlargement, and re-epithelialization using a medium-thickness retroauricular skin grafting. The intra-auricular approach combined with retroauricular skin grafting resulted in a well-epithelialized, patent canal, with no restenosis observed during three years of follow-up.

An analysis of scholarly literature published between 2021 to 2024 summarizes the clinical manifestations of EACS (**Table 1**). Vulnerable populations include children (referenced as case 1) and middle- to older-aged individuals (cases 2-5). Major etiologies comprise trauma (case 3), infection (case 1), congenital anomalies (case 5), and post-surgical complications (case 4). The underlying pathological mechanisms involve chronic inflammation leading to fibrous tissue hyperplasia (case 1), post-traumatic scar contracture (case 3), congenital malformations (case 5), and postoperative scar formation (case 4). Recent literature highlights the diagnostic value of multimodal imaging, now considered as the standard diagnostic criterion (Yang R, 2024). High-resolution CT provides precise delineation of osseous and soft tissue involvement (cases 1-5), pure-tone audiometry objectively quantifies conductive hearing loss (air-bone gap of ≥ 20 dB HL), and endoscopic examination directly visualizes the degree of EACS (cases 1-4).

Treatment strategies encompass stent placement to preserve canal morphology (cases 1-5), free flap transplantation (cases 3 and 5), tympanoplasty (case 4), and sponge expansion coupled with local steroid injections (case 4) to prevent restenosis. Over a follow-up period ranging from 6 to 52 months, the external auditory canal patency rate was 100%, hearing improvement was achieved in 80% of patients, and the incidence of scar formation was 80%.

Treatment and prognosis of a rare otologic condition

Table 1. Analysis of scholarly literature published between 2021 and 2024

Case number	Author	Patient	Clinical presentation	Diagnosis	Diagnostic basis	Treatment strategies	Treatment outcome	Note
Case 1	Saranya Sasikumar 2020 [11]	A 2-year-old child	Right-sided hearing loss for 6 months following otitis externa.	Post-inflammatory EACS	(1) Complete occlusion of right ear canal opening by skin; (2) HRCT: intact bony canal wall with soft-tissue density obliterating cartilaginous canal; (3) Moderate conductive hearing loss on the right side, with normal left hearing.	Debrider-assisted endoscopic ear surgery with stenting.	At 1-year follow-up: well-healed, patent EAC with intact tympanic membrane and normal hearing.	
Case 2	Runqin Yang 2024 [17]	A 63-year-old woman	Otorrhea and right-sided hearing loss.	Acquired aural atresia	(1) Atretic tissue on otoscopy; (2) CT: Soft-tissue and bony invasion; (3) Marked air-conduction impairment.	EAC reconstruction, auricle cavity reconstruction, and stenting.	Well-epithelialized EAC with improved hearing.	
Case 3	Runqin Yang 2024 [17]	A 50-year-old male	Hearing gradually decreases after trauma.	Acquired aural stenosis of the left ear	(1) Severe EAC stenosis on otoscopy; (2) CT: soft-tissue mass in EAC; (3) Pure-tone audiometry: ABG ≥ 20 dB HL.	Extracanalicular reshaping, enlargement of the EAC opening, free flap repair, and stenting.	Stable widened EAC at 4 months, no recurrence on long-term follow-up.	
Case 4	Runqin Yang 2024 [17]	An 11-year-old boy	A year after cholesteatoma surgery, hearing has declined, and an external auditory canal atresia was discovered.	Acquired aural atresia	(1) Otoscopy/HRCT: complete EAC atresia; (2) Pure-tone audiometry: conductive hearing loss.	EAC formation and expansion, tympanic membrane reconstruction, skin flap transplantation.	At 52-month follow-up: no restenosis, significant hearing improvement.	This patient developed hypertrophic scars 6 weeks after surgery, with cicatrix tissue formation in the cartilaginous segment of the EAC and at the retroauricular incision site. Local triamcinolone acetonide was administered once every 2 weeks, delivered circumferentially into the narrowest section via multiple injections. A total of three sessions were performed. Subsequently, EAC support was maintained using a trimmed expansive sponge. At 6 months post-surgery, the EAC remained stable.
Case 5	Runqin Yang 2024 [17]	A 20-year-old man	Left-sided hearing loss and otalgia; history of cranial FD.	Acquired aural stenosis caused by FD	(1) Polyostotic FD with multiple cranial bone involvement on CT; (2) Otoscopy: marked EAC stenosis; (3) Pure-tone audiometry: ABG 22.5 dB HL.	Retroauricular incision, canalplasty, meatoplasty, post-auricular free flap reconstruction, and stenting.	Stable widened EAC at 6 months, hearing notably improved and maintained for 2 years (Figure 5G, 5H).	

Note: EACS: external auditory canal stenosis; HRCT: high resolution computed tomography; FD: fibrous dysplasia.

Several key issues remain under discussion. Scar management: postoperative scar development shows marked individual variability (case 4), and although steroid injections may reduce fibrosis, they must be used cautiously to avoid local skin atrophy. Hearing prognosis: outcomes appear more favorable in cases with bony closure (case 2) compared with those involving soft tissue, while incomplete data in fibrous dysplasia (FD) preclude firm conclusions. Follow-up limitations: most studies report follow-up durations of <5 years, underscoring the need for long-term data to validate efficacy. Future research should focus on novel approaches, including the development of biodegradable stent materials to replace current metallic or silicone devices, application of AI-driven CT quantification systems for more precise lesion assessment, and tailored treatment protocols for specific conditions such as FD.

Conclusion

Acquired EACS is a rare and challenging otologic condition. Effective management requires meticulous meatoplasty with complete excision of fibrotic tissue, followed by re-epithelialization using a medium-thickness autologous skin graft. This combined approach not only restores canal patency but also minimizes the risk of recurrence, offering a reliable strategy for the treatment of EAC stenosis or atresia.

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Disclosure of conflict of interest

None.

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