

Temporal scalp abscess and osteomyelitis: A case report of unexpected complications of a common disease

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SUMMARY

We report a case of a 32-year-old diabetic female who presented with undulating symptoms of left chronic otitis media (COM) for three months which progressed to mastoiditis. Temporal scalp abscess with osteomyelitis had ensued, which was a complication of the partially treated COM and mastoiditis. Computed tomography of the temporal bone showed fluid within the middle ear cavity and mastoid air cells, an osteolytic lesion within the left squamous temporal bone with a rim enhancing lesion underlying the left temporalis muscle and focal dural thickening located at the eroded temporal bone. She underwent left cortical mastoidectomy and posterior tympanotomy, followed by an 11-day course of intravenous antibiotics. This case highlights the uncommon extracranial presentation of COM and mastoiditis in a diabetic patient after undergoing multiple courses of antibiotics and surgical intervention. Furthermore, this case implies a high index of clinical suspicion of diagnosis in such patients.

INTRODUCTION

Since the advent of antibiotics, complications arising from chronic otitis media (COM) have significantly reduced, decreasing morbidity and mortality. However, partially treated COM can give rise to intracranial and extracranial complications. The pathophysiology includes thrombophlebitis of the venules of the adjoining cranial bones, bone erosion by pressure or enzymatic actions, preformed pathways, and hematogenous spread.

Presentation of complications of COM has varied, whereby the common signs and symptoms of these complications are replaced by atypical manifestations. In addition, with the extensive use of antibiotics, clinical symptoms are often masked, compromising the precise diagnosis and leading to misdiagnosis. Consequently, the appropriate intervention and treatment approaches are often delayed, as evident in a diabetic patient reported in this case.

CASE REPORT

A 32-year-old lady with underlying type 2 diabetes mellitus presented with left otalgia for three months which was associated with reduced hearing, tinnitus and aural fullness. She attained treatment at a clinic and was given analgesia and antibiotics. Her symptoms resolved but would recur

despite completing multiple treatments. She sought medical attention at a private hospital and underwent left myringotomy and grommet insertion. However, the grommet was extruded after two weeks of insertion. A month later, she developed left temporal swelling and headache. After consultation with our otolaryngologist, she was prompted for urgent admission and planned for further investigations.

On clinical examination, there was a firm and tender swelling at the left temporal region measuring 3 cm and 2 cm in diameter, with no overlying skin changes and no evidence of a punctum. There was no facial asymmetry. Otoloscopic examination of the left ear revealed a dull and retracted tympanic membrane with no posterior wall sagging. Rinne's test was negative on the left, and Weber's test was lateralised to the left.

Tympanometry results of the left ear showed type B. Pure tone audiometry reported left mild conductive hearing loss at low frequencies only. Hearing assessment results were normal for the right ear. There were no neurological deficits. Blood investigations reported a white cell count of $10.4 \times 10^9/L$, erythrocyte sedimentation rate of 67 mm/hr, platelet of $438 \times 10^9/L$, random blood glucose levels of 12 mmol/L and hemoglobin A1c (HbA1c) of 10.4%.

She underwent high resolution computed tomography (HRCT) scan of the temporal bone. Imaging showed fluid within the middle ear cavity and mastoid air cells with erosive changes at the anterior aspect of the left mastoid air cells extending to the temporal bone. There was laminar periosteal reaction and lytic lesion within the left squamous temporal bone (Figure 1). Focal dural thickening and enhancement were seen underlying the eroded squamous temporal bone. However, no adjacent brain parenchymal enhancement was seen. A faint rim enhancing hypodense lesion deep to the left temporalis muscle measuring 1.5 cm by 0.6 cm by 2.0 cm was suggestive of an abscess (Figure 2). The facial canal is intact. The ossicles, semicircular canal and cochlea are normal. She was diagnosed with left otomastoiditis, left temporal scalp abscess, and underlying osteomyelitis.

We proceeded with the surgery and intraoperatively, granulation tissue occupied the entire mastoid air cells involving the retro facial air cells, sinodural angle, mastoid tip, and antrum. The granulation tissue was removed

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Fig. 1: HRCT of temporal bone demonstrated fluid within the middle ear cavity and mastoid air cells (black arrows) with erosive changes at the anterior aspect of the left mastoid air cells (white arrows) extending to the temporal bone. There was laminar periosteal reaction noted at the adjacent left squamous temporal bone (white arrowheads).



Fig. 2: Focal dural thickening and enhancement (black arrows) are seen underlying the eroded squamous temporal bone (arrowhead). However, no adjacent brain parenchymal enhancement seen. There was a faint rim enhancing hypodense lesion (white arrows) deep to the left temporalis muscle suggestive of an abscess.

following standard cortical mastoidectomy and posterior tympanotomy. Histopathological examination (HPE) of the granulation tissue reported fragments of fibrocollagenous tissue lined by benign pseudostratified columnar tissue with neutrophils and lymphoplasmacytic cells infiltration.

We started her on intravenous (iv) ceftriaxone 1 g twice a day post-surgery. Her temporal swelling and headache improved after treatment, and a repeated HRCT was done four days after her surgery. Imaging showed similar osseous changes, and the previous collection at the temporal region had subsided. After eleven days of iv antibiotics, she was discharged home and prescribed two weeks of oral antibiotics. She had an uneventful postoperative recovery and did not develop any neurological deficit. She has fully recovered and remains in good form for two years of follow-up.

DISCUSSION

Otitis media (OM) is a partial or complete inflammation of the mucoperiosteal lining of the tympanomastoid compartment. Complications of OM is defined as infection beyond the confines of the lining mucosa of the middle ear cleft and is categorised into extracranial and intracranial complications. The pathophysiology includes thrombophlebitis of the venules of the adjoining cranial bones, bone erosion by pressure or enzymatic actions, preformed pathways, and hematogenous spread.^{1,3}

Extracranial complications include mastoid abscess, acute mastoiditis, labyrinthitis, facial nerve paralysis, petrositis, and Bezold's abscess. A study by Yorgancular et al. concluded that mastoid abscess was the common extracranial complication, reporting 26 patients respectively.¹ Ren et al. discovered that acute mastoiditis, labyrinthitis, and facial paresis were the associated complications related to AOM.² Wu et al. reported similar findings with 90 patients developing labyrinthitis and 47 patients with facial paralysis.³ Intracranial complications include intracranial abscess, lateral sinus thrombophlebitis, meningitis, and otitic hydrocephalus.^{1,3}

Diagnosing complications of OM can be difficult. The usage of antibiotics and the concurrence of multiple complications can lead to atypical symptoms. A detailed history and examination of the aural region and nervous system are mandatory to exclude extracranial complications. A vigilant approach should be applied when red flag signs are apparent; sudden cessation of otorrhea in OM accompanied by earache, fever and headache; swelling and pain in the mastoid region, granulation or polyps upon aural inspection, facial paralysis, vertigo, meningism, cranial nerve palsies, intensive headache, vomiting and drowsiness.³

This patient initially presented with symptoms typical of acute OM. However, despite multiple antibiotic treatments, the OM progressed, and she developed effusion requiring myringotomy and grommet insertion. Subsequently, her disease advanced to mastoiditis and left temporal scalp abscess with osteomyelitis.

Four mechanisms of extension of the infection in mastoiditis include preformed pathways, osseous erosion, thrombophlebitis, and hematogenous seeding. Due to unresolved mastoid inflammation, the expanding suppuration causes local acidosis, osseous decalcification, ischemia, and osteoclastic dissolution of the pneumatic cell walls. The pneumatic cells coalesce into larger cavities filled with pus and granulations, resulting in empyema. This osteoclastic osseous resorption proceeds in all directions, and complications threaten to occur before spontaneous resolution.⁴

Complications of mastoiditis can involve sites adjacent or distal to the mastoid air cells, along planes of least resistance. Anteriorly, pus tracks into the posterior canal wall causing sagging of the posterior external auditory canal. Posteriorly, pus extends to the sigmoid sinus or dural lining of the posterior cranial fossa. Superior extension results in meningitis or intracranial abscess formation. Inferior extension causes the extension of pus along the fascial planes lining the strap muscles, forming neck abscesses (Bezold's and Citelli's abscesses). Medial extension results in labyrinthitis, petrositis or facial nerve palsy. The infection can spread laterally and produce a subperiosteal abscess.⁵

In the present case, the temporal scalp abscess and osteomyelitis of the squamous temporal bone are caused by the progression of mastoiditis. As the outer mastoid cortical bone decalcifies, it forms an abscess. This inflammatory process advances anteriorly via osseous destruction and subperiosteal extension of the infection. Another possible route is the infection passing directly from the attic vault to the diploe of the squama.⁶

A combination of HRCT and MRI with gadolinium contrast is often necessary for diagnostic and monitoring purposes. HRCT scan of the temporal bone is the routine investigation for evaluating otomastoiditis and its related intratemporal complications. A computed tomography (CT) or magnetic resonance imaging (MRI) helps assess otitic intracranial complications.^{7,8} MRI is preferred because it is better in visualising otogenic labyrinthitis, retrocochlear or intracranial abnormalities such as meningitis, brain abscesses, and empyema. In addition, MR angiography and MR venography (MRV) help detect venous thrombosis, vasospasm and infarction.⁸ CT scan images of the mastoid cortex in this patient showed osteolysis and periosteal reaction with an erosion of the temporal bone, creating a collection of inflammatory cells beneath the temporalis muscle, contributing to the temporal scalp abscess.

Improvements in soft tissue findings on serial HRCT or MRI are an indicator of recovery. However, they have less practical value in the long-term monitoring of osteomyelitis disease. Even if a patient exhibits a clinical response to treatment, ongoing bone pathology can persist for weeks. In detecting the early stages of osteomyelitis, a technetium Tc99m methylene diphosphonate (Tc99m MDP) bone scan is almost 100% more sensitive than a CT scan. However, a bone scan also demonstrates bone activity in patients with underlying malignancies, recent trauma or surgery, inflammatory conditions, or ongoing bone healing and

remodeling.⁷ A bone scan was not indicated in this case as she fully recovered from her demise after undergoing surgical and medical intervention.

In the medical literature, there are few reports of unusual presentations of complications of otomastoiditis, and most were associated with the paediatric age group. Tsai et al. reported a 5-year-old boy diagnosed with right OM, complicated by Luc's abscess & temporomandibular joint (TMJ) septic arthritis. He underwent myringotomy and grommet insertion, a TMJ arthrotomy with lavage, and drainage of the infratemporal abscess followed by iv antibiotics. He had a complete recovery with no recurrence of the disease.⁹

Subramaniam et al. reported a 10-year-old girl diagnosed with parietooccipital scalp abscess, sigmoid sinus thrombosis and extradural abscess, due to partially treated acute mastoiditis.⁵ She underwent left cortical mastoidectomy via extended postauricular approach followed by six weeks course of antibiotics and subcutaneous low molecular weight heparin. Her postoperative recovery was uneventful and she did not develop neurological complications.⁵ Qin et al. presented a case of a 10-year-old girl who was diagnosed with a right zygomatic root abscess secondary to chronic mastoiditis. Imaging demonstrated soft tissue densities within the right mastoid and tympanic cavity, with osteolytic changes involving tympanic cavity, zygomatic root, and zygomaticotemporal junction.¹⁰ She underwent mastoidectomy and had an uneventful recovery postoperatively.¹⁰

These case reports demonstrate the morbidity associated with otomastoiditis and emphasize the importance of surgical drainage and medical treatment to achieve a good outcome. To our best knowledge, there are no other reports that record complications similar to this case.

CONCLUSION

The morbidity of COM and mastoiditis have reduced significantly throughout the decades due to early identification and treatment. However, with the excessive use of antibiotics and patient factors which may have underlying medical illnesses, the presentations of COM have become atypical, thereby misleading the clinician to a definite

diagnosis and delaying treatment. The clinician needs to diagnose correctly and intercept early to avoid dire complications. Despite adequate treatment, patients with refractory otorrhea should be referred to an otolaryngologist for further assessment. Surgery remains the choice of treatment where the aim is to acquire adequate drainage that eliminates oedema and granulation, and establish good communication between the middle ear and mastoid.

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CONFLICT OF INTEREST

None to declare.

REFERENCES

1. Yorgancılar E, Yıldırım M, Gün R, Bakır S, Tekin R, Gocmez C, et al. Complications of chronic suppurative otitis media: a retrospective review; *Eur Arch Otorhinolaryngol* 2013; 270: 69-76.
2. Ren Y, Sethi RKV, Stankovic KM. Acute Otitis Media and Associated Complications in United States Emergency Departments. *Otol Neurotol* 2018;39(8): 1005-11.
3. Wu JF, Jin Z, Yang JM, Liu YH, Duan ML. Extracranial and intracranial complications of otitis media: 22-year clinical experience and analysis. *Acta Oto-Laryngologica* 2012; 132: 261-5.
4. Vasquez E, Castelote A, Piqueras J, Mauleon S, Creixell S, Pumarola F, et al. Imaging of Complications of Acute Mastoiditis in Children. *Radiographics* 2003; 23: 359-72.
5. Subramaniam S, Ang A, Tan HKK. Mastoiditis presenting as parietooccipital scalp abscess—A case report and literature review. *Int J Pediatr Otorhinolaryngol Extra* 2012; 7: 82-4.
6. Woongsang S, Dong WN, Young HK. Zygomatic mastoiditis, *Korean J Otorhinolaryngol-Head Neck Surg* 2018; 61(2): 110-3.
7. Chapman PR, Choudhary G, Singhal A. Skull Base Osteomyelitis: A Comprehensive Imaging Review. *AJNR Am J Neuroradiol* 2021; 42(3): 404-13.
8. Davila J, Rantes C, Arbelaez A, Restrepo F, Castillo M. Noncongenital Central Nervous System Infections in Children: Radiology Review. *Top Magn Reson Imaging* 2014; 23(3): 153-64.
9. Tsai C, Deramo J, Shen X, Vandiver K, Mittal V. Luc's Abscess and Temporomandibular Joint Septic Arthritis: Two Rare Sequelae of Acute Otitis Media. *Pediatr Emerg Care* 2020; 36(5):e285-7.
10. Qin YL, Li TC, Cong TC, Liu YH. Abscess of Zygomatic Root: A Rare Otogenic Complication. *Chin Med J* 2017;130(6): 749-50.