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Contralateral Abducens Nerve Palsy In Gradenigo Syndrome Secondary To Left Petrous Apicitis

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Abstract
Gradenigo syndrome is a rare complication of otitis media characterized by the triad of retro-orbital or facial pain, otorrhea, and sixth cranial nerve palsy, resulting from infection extending into the petrous apex. We report the case of an 80-year-old man who presented with a one-week history of horizontal diplopia, facial pain, and otorrhea. Examination revealed an 18–prism-diopter esotropia with a right abduction deficit consistent with a right CN VI palsy. MRI of the brain demonstrated left petrous apicitis with extension into the cavernous sinus and Meckel's cave. Given his clinical stability and lack of intracranial complications, he was treated conservatively with a six-week course of oral antibiotics, resulting in complete resolution of symptoms. This case highlights the importance of early recognition and imaging of suspected petrous apex infections, as prompt medical therapy can prevent progression to life-threatening neurovascular complications and may reduce the need for surgical intervention.

Keywords: *Gradenigo syndrome; Petrous apicitis; Abducens nerve palsy; Otitis media; Skull base infection.*

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I. Introduction

Petrous apicitis is a rare but serious complication of otitis media in which infection extends into the pneumatized air cells of the petrous apex. If untreated, inflammation may spread to adjacent neurovascular structures, including the abducens nerve (cranial nerve VI) and the trigeminal ganglion, both of which lie in close proximity to the dura mater [1,2]. Gradenigo syndrome, an uncommon subtype of petrous apicitis, is classically defined by a triad of otitis media, ipsilateral facial or retro-orbital pain, and sixth cranial nerve palsy.

We present the case of an 80-year-old patient who developed a one-week history of horizontal diplopia and was subsequently found on MRI to have edema and enhancement of the left skull base consistent with petrous apicitis. The patient's symptoms resolved completely following a six-week course of targeted antibiotic therapy.

II. Case Report

An 80-year-old White male presented with a one-week history of constant horizontal diplopia accompanied by ipsilateral facial pain and otorrhea. He had no prior history of diplopia. Initial physical examination was unremarkable. Ophthalmologic evaluation demonstrated an 18-prism-diopter alternating esotropia and a right abduction deficit, consistent with a right sixth cranial nerve (CN VI) palsy. Given his age and symptom profile, the differential diagnosis included microvascular CN VI palsy and giant cell arteritis (GCA).

STAT laboratory testing, including ESR, CRP, vasculitis panel, serum glucose, and hemoglobin A1c, was within normal limits. MRI of the brain with gadolinium revealed edema and enhancement of the left skull base centered at the petrous apex, with extension into the cavernous sinus, Meckel's cave, and surrounding structures (Figure A–D). The inflammatory process was contiguous with the mastoid and middle ear, consistent with left-sided petrous apicitis. In the context of his contralateral (right-sided) CN VI palsy and otologic symptoms, these findings supported the diagnosis of Gradenigo syndrome.

Neurosurgery was consulted, and the patient was managed conservatively with a six-week course of oral antibiotics. His symptoms began improving shortly after treatment initiation, with complete resolution of diplopia, ocular misalignment, and facial pain by completion of therapy.

III. Discussion

Petrous apicitis is an uncommon but potentially severe complication of otitis media. In a comprehensive retrospective review of cases reported between 1983 and 2020, Talmor et al. identified only 67 patients meeting criteria for petrous apicitis, highlighting its rarity. Approximately 58% of cases arose from otitis media, with a

smaller proportion occurring in immunocompromised or diabetic patients [4]. The classic Gradenigo triad—retro-orbital pain, otorrhea, and sixth cranial nerve palsy—was present in only 20.8% of cases, suggesting that incomplete or atypical presentations are common.

First described by Giuseppe Gradenigo in 1904, the syndrome results from the extension of infection from the middle ear or mastoid into the pneumatized petrous apex of the temporal bone. This region lies in close proximity to several critical neurovascular structures, including the abducens nerve within Dorello's canal and the trigeminal ganglion within Meckel's cave, explaining the constellation of cranial neuropathies associated with this condition. The most frequently implicated pathogens include *Pseudomonas*, *Streptococcus*, and *Staphylococcus* species. Reported complications range from prolonged headache, bilateral abducens nerve palsies, pontine meningitis, and otogenic intracranial suppuration to hearing loss, vertigo, and cavernous sinus thrombophlebitis [5-9].

Imaging plays a central role in diagnosis. High-resolution computed tomography (CT) is useful for detecting mastoid involvement, bony erosion, and petrous apex opacification. Magnetic resonance imaging (MRI) with gadolinium provides superior evaluation of dural enhancement, petrous apex marrow signal changes, abscess formation, and venous sinus pathology. Single-photon emission computed tomography (SPECT) has also been utilized in select cases to monitor response to antibiotic therapy [10].

Management depends on the extent of disease and the patient's clinical status. For uncomplicated cases, or in patients with significant medical comorbidities that increase surgical risk, prolonged medical therapy with a six-week course of targeted antibiotics is often effective and may obviate the need for operative intervention. When surgery is indicated, several approaches exist depending on the location of involvement. A transmastoid approach with mastoidectomy can provide drainage of posterior petrous apex disease, while a hypotympanic subcochlear approach may be preferred for anterior apex involvement. In cases of extensive disease, a complete petrous apicectomy may be required [11].

IV. Conclusion

Petrous apicitis remains a rare but potentially life-threatening complication of otitis media. Because clinical presentations may be incomplete or atypical, timely recognition is essential to prevent progression to serious neurovascular complications. This case highlights the importance of early imaging and prompt initiation of appropriate antibiotic therapy, which can lead to full recovery and may prevent the need for surgical intervention.

Declaration of Financial Interest
None.

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Figures A-D

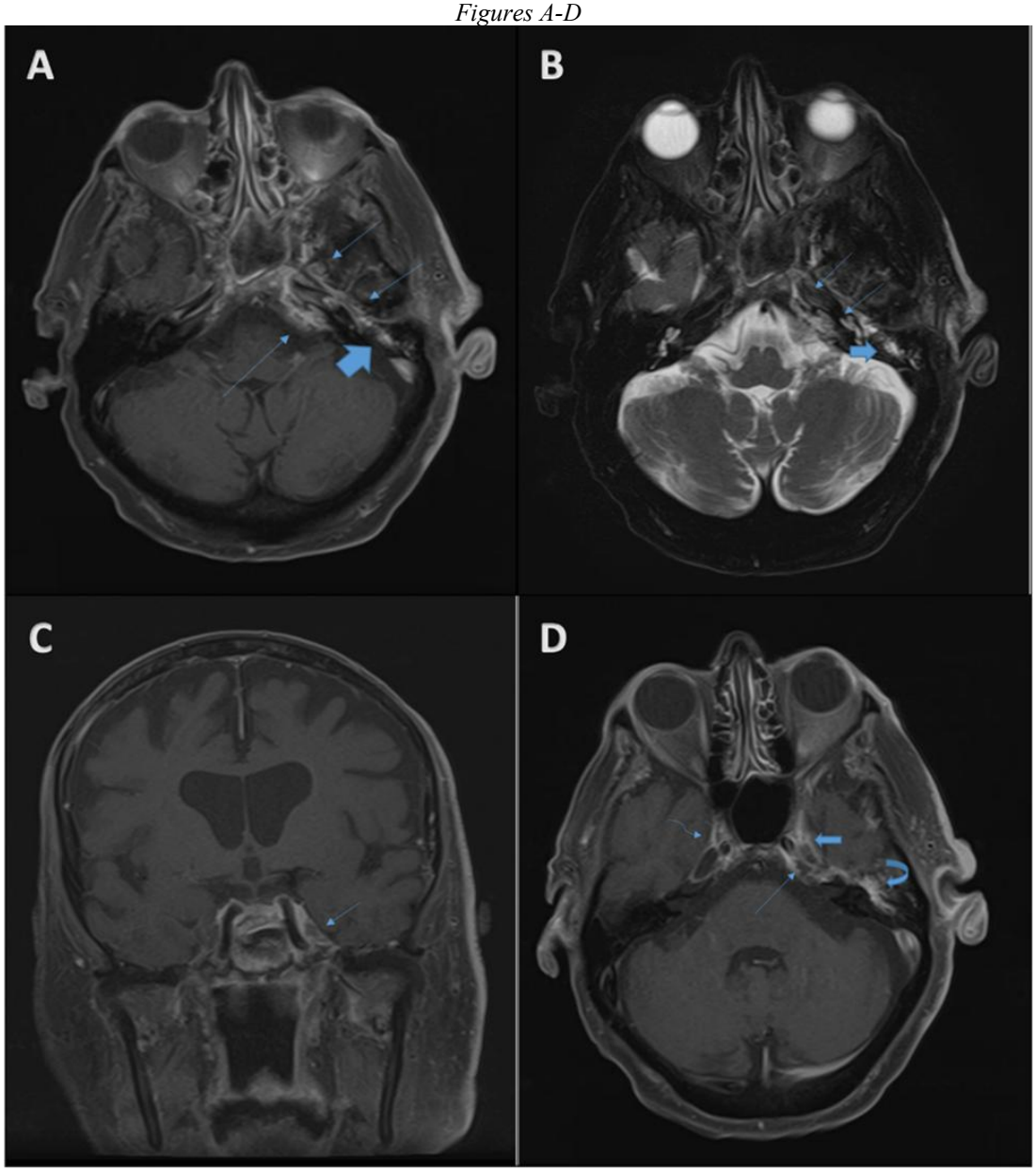

Figure A: Axial T1 fat saturated MRI image through temporal bones after administration of IV gadolinium is showing abnormal heterogeneous enhancement of the left petrous apex with adjacent mild meningeal thickening and enhancement (thin arrows) consistent with apical petrositis (petrous apicitis). Partial enhancement of the left mastoid air cells are consistent with mastoiditis.

Figure B: Axial T2 weighted image of the brain through petrous bones using fat saturation is showing edema within the apical air cells of the left petrous bone (thin arrows). Small amount of fluid within the left mastoid air cells are consistent with mastoiditis (thick arrow).

Figure C: Coronal T1 weighted fat saturated image following administration of IV gadolinium at the level of sella turcica. There is meningeal thickening along the lateral surface of the left cavernous sinus secondary to the inflammatory process at the petrous apex (thin arrow). No abnormality at the area of the right cavernous sinus is noted.

Figure D: Axial T1 weighted fat saturated MRI through petrous apices following IV gadolinium demonstrates heterogeneous enhancement of the left petrous apical air cells containing inflammatory fluid (thin arrow). There is meningeal thickening and enhancement along the medial aspect of the left middle cranial fossa indicating meningitis (thick straight arrow). Abnormal enhancement of the left mastoid air cells are indicating of mastoiditis (curved thick arrow). Linear enhancement on the right at the similar location is related to normal enhancement of the right cavernous sinus (thin curved arrow).