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## Gradenigo Syndrome

**Chronic suppurative otitis media** (CSOM) has a potential for intratemporal complications. Gradenigo syndrome, lateral sinus thrombosis and cavernous sinus thrombosis must be considered when patients present with ear discharge, headache, fever and lateral rectus palsy. Computed Tomography and Magnetic Resonance Imaging are essential in confirming the diagnosis but do not substitute for a good clinical eye in establishing the diagnosis and initiating proper treatment.

### CASE

A 17-year-old male with an 11-year history of otorrhea on the right ear was admitted because of on-and-off diffuse headache, drowsiness, occasional sensorial changes, high grade fever and vomiting. Later in the ward, he complained of double vision; anisocoria and lateral rectus palsy were confirmed by active generation test. Associated symptoms included right-sided frontal, orbital and mastoid pain with neck stiffness. Otoscopy showed yellowish foul smelling discharge with a pink, smooth mass partially obstructing the external auditory canal.

Leukocytosis was seen with a count of  $32.9 \times 10^3/L$ . Pure tone audiometry revealed moderate conductive hearing loss on the right ear. CT scan with contrast (*Figure 1*) showed lytic erosion of the underpneumatized right mastoid bone and sigmoid sinus plates with slightly asymmetric right internal auditory canal (IAC). Penicillin G 5 million "IU" every 6 hours and Chloramphenicol 1.5 grams IV every 8 hours were given for 3 weeks, but he continued to deteriorate and two units of PRBC were transfused. Because of his worsening condition, Penicillin G was shifted to Ceftriaxone 2 grams IV BID while Chloramphenicol IV was continued at the same dose. The patient's headache and fever steadily lessened after 4 weeks but orbital pain and diplopia persisted. On the 50<sup>th</sup> hospital day, the patient underwent Modified Radical Mastoidectomy, right. Intraoperatively, granulation tissue was noted occupying the enlarged mastoid cavity and antrum. A 0.5 cm break at the sigmoid sinus was also occupied by granulation tissue. IV antibiotics were continued 2 weeks postoperatively and after 64 days of hospitalization he was discharged on oral Ciprofloxacin 500mg BID for 1 month with steroid/antibiotic otic drops.

Regular follow-up documented gradual lessening of diplopia, headache and orbital pain. Complete resolution of diplopia with normal ophthalmologic findings and a dry mastoidectomy cavity were noted on the fourth month of follow-up.

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Figure 1 Non-contrast Cranial CT Scan showing lytic erosion (arrow) and the underneumatized right mastoid and sigmoid plates

## DISCUSSION

In the Philippines, the prevalence of Chronic Suppurative Otitis Media (CSOM) is estimated at 2.5 – 29.5%.<sup>1</sup> Complications of chronic otitis media can cause grave morbidity and even mortality<sup>2</sup> even though the intratemporal and/or intracranial complications of infectious ear disease have become rarer with the advent of broad spectrum antibiotics.<sup>3</sup> The spread of infection can occur by osteothrombosis, bone erosion and when present along preformed pathways.<sup>2</sup>

The triad of Gradenigo syndrome includes otorrhea, retroorbital pain and abducens nerve palsy. Chole and Donald found that the most common presenting symptom in 22 patients from 1976-1995 was otalgia (72%) followed by deep pain, headache and otorrhea (59%). Cranial nerve VI paralysis was only present in 18.2% of the cases.<sup>4</sup> Homer and others reported 3 cases with middle ear infection and 6<sup>th</sup> nerve palsy without petrositis.<sup>5</sup>

MRI and CT are required to identify the deep seated petrous apex as the site of the inflammatory process.<sup>6</sup> While CT scans may demonstrate opacification of the air cells of the petrous apex with cortical bone erosion, MRI is very useful for assessing inflammatory soft tissue lesions around the petrous apex.<sup>5</sup> Both CT and MRI are essential to establish opacification of air cells in the petrous apex under suspicion, as opposed to asymmetric pneumatization.<sup>2</sup> However, acute petrositis cannot always be equated with Gradenigo syndrome.<sup>7</sup> A study by Back and others documented 8 cases of radiologically confirmed apical petrositis that did not manifest the classical syndrome of deep facial pain, otitis media and ipsilateral abducens nerve palsy.<sup>8</sup>

Petrous apicitis is essentially mastoiditis that occurs in the petrous apex.<sup>2</sup> Because the trigeminal (CN V) or gasserian ganglion lies in Meckel's cave on the antero-superior aspect of the petrous tip, damage

or irritation to the ganglion may explain the deep facial pain in some patients with apicitis. The petroclinoid ligament extends from the tip of the petrous apex to the clinoid. Below this ligament, the gasserian ganglion (CN V) and abducens nerve (CN VI) travel in the small Dorello's canal. Inflammation extending into the canal produces the triad of symptoms recognized by Gradenigo<sup>9</sup>: lateral rectus (CN VI) palsy, retroorbital pain (CN V) and otorrhea.

Lateral Sinus Thrombophlebitis (LST) or thrombosis of the lateral sinus usually forms as an extension of a perisinus abscess following mastoid bone erosion from cholesteatoma, granulation tissue or coalescence which eventually leads to pressure necrosis and mural thrombus formation.<sup>2</sup> Classic symptoms of LST include a "picket fence" fever pattern, chills and progressive anemia. Symptoms of septic emboli, headache and papilledema may indicate extension to involve the cavernous sinus<sup>4</sup> or sudden intracranial hypertension resulting from decreased venous drainage from the skull.<sup>2</sup>

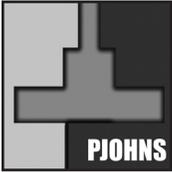
The diagnostic procedure of choice is MRI with MR angiography. The thrombus can be identified by its signal intensity on MRI and the flow void in the affected sinus is clearly documented on MR angiography.<sup>10</sup> Non-contrast CT findings include dense cord sign, dense dural sinuses, diffuse cerebral edema, non hemorrhagic infarct or multifocal haemorrhages.<sup>11</sup> Papilledema and anisocoria may be symptoms of progression of lateral sinus thrombophlebitis or development of cavernous sinus thrombosis.<sup>4</sup> Fresh thrombi from the lateral sinus can propagate and extend to the cavernous sinus via the superior and inferior petrosal sinus.

Cavernous Sinus Thrombosis (CST) is usually a late complication of an infection of the central face or paranasal sinuses. Other causes include bacteremia, trauma and infections of the maxillary teeth or ear, as seen in our patient. CST is generally a fulminant process with high rates of morbidity and mortality. Headache is the most common presenting symptom that usually precedes fever, periorbital edema (which may or may not occur) and cranial nerve dysfunction.

This intimate relationship of veins, arteries, nerves, meninges, petrous apex and paranasal sinuses account for the characteristic etiology and presentation of CST. The internal carotid artery with its surrounding sympathetic plexus passes through the cavernous sinus. The third, fourth and sixth cranial nerves are attached to the lateral wall of the sinus while the ophthalmic and maxillary divisions of the fifth cranial nerve are embedded in the wall.<sup>8</sup>

Other signs and symptoms include chemosis resulting from occlusion of the ophthalmic veins, lateral gaze palsy (isolated cranial nerve VI), ptosis, mydriasis and eye muscle weakness from cranial nerve III dysfunction. These are followed by manifestations of increased retrobulbar pressure (such as exophthalmos) and increased intraocular pressure (such as sluggish pupil and decreased visual acuity). Systemic signs indicative of sepsis are late findings.

The complications of Gradenigo syndrome, lateral sinus thrombophlebitis and cavernous sinus thrombosis from chronic suppurative otitis media need immediate diagnosis and aggressive medical treatment with broad spectrum antibiotics against gram positive cocci (*Staphylococci* and *Streptococci*), gram negative bacilli



(*Pseudomonas aeruginosa*) and to a lesser extent, *Anaerobes*. These antibiotics should also cross the blood-brain barrier.

Mastoidectomy is required once the patient is neurologically stable.<sup>2</sup> In cases of lateral sinus thrombosis, surgical removal of emboli can be done. However, Cummings, Syms and colleagues<sup>2</sup> report 6 patients operated on without opening and evacuating the lateral sinus clot who all survived, albeit with a longer 49 day average hospital stay. Once a highly controversial issue, ligation of the internal jugular vein is seldom needed. In the majority of recent cases, anticoagulation has not been found to be necessary.<sup>2</sup>

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