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## Luc's Abscess: The Zygomatic Route of Infection from Cholesteatoma

**Keywords:** Cholesteatoma; zygoma; facial nerve paralysis; mastoidectomy; abscess; Luc's abscess

**Luc's abscess** is an uncommon complication of otitis media wherein a subperiosteal abscess develops into the temporalis muscle and follows the route of a pneumatized zygoma.<sup>1</sup> In uncomplicated cases, surgical drainage and antibiotics are adequate management with mastoidectomy reserved for severe or complicated cases. We report a case of complicated Luc's abscess presenting with many complications that required multiple surgical interventions.

### CASE REPORT

A 23-year-old man had a three-month history of yellowish, mucoid, foul-smelling left ear discharge associated with multiple episodes of non-projectile watery vomiting (< 1 cup each) and left-sided facial paresis. These symptoms were accompanied by ipsilateral hearing loss, tinnitus and dizziness prompting consult and admission to a secondary hospital. A cranial Computed Tomographic (CT) scan showed a cholesteatoma in the left ear. The facial asymmetry improved, vomiting was resolved with intravenous antibiotics, hydration, and an anti-emetic, and he was subsequently discharged. He continued to have recurrent, foul-smelling left ear discharge and left hemifacial paresis persisted.

Left-sided otorrhea and ipsilateral hemifacial paresis were subsequently associated with left hemifacial swelling, otalgia (VAS of 7/10, described as sharp), and decreased hearing, prompting an outpatient consult with a private ENT specialist. The symptoms persisted despite 7 days of oral ciprofloxacin, this time associated with drowsiness, neck pain and febrile episodes. The patient consulted in our institution and was advised emergency admission.

He was admitted drowsy, coherent with GCS 15 (E4V5M6). The left temporal area was edematous and tender, extending to the ipsilateral post-auricular area inferiorly and frontal area superiorly. (*Figure 1*) Otoscopy revealed yellowish, foul-smelling, copious muco-purulent discharge and near-total perforated left tympanic membrane. The right ear had unremarkable otoscopic findings. Tuning fork tests at 512 Hz were consistent with sensorineural hearing loss in the left ear with House-Brackmann IV facial nerve paresis. Brudzinski and Kernig tests were negative with no signs of dysmetria, dysdiadochokinesia or dysarthria on cerebellar testing.

Gram stain and KOH smears of the left ear discharge revealed *C freundii* and fungal elements. High resolution temporal bone CT scan showed otomastoid disease on the left with automastoidectomy defect, associated subperiosteal and intracerebral abscess formation on the left, with otherwise unremarkable right temporal bone. (*Figure 2*)

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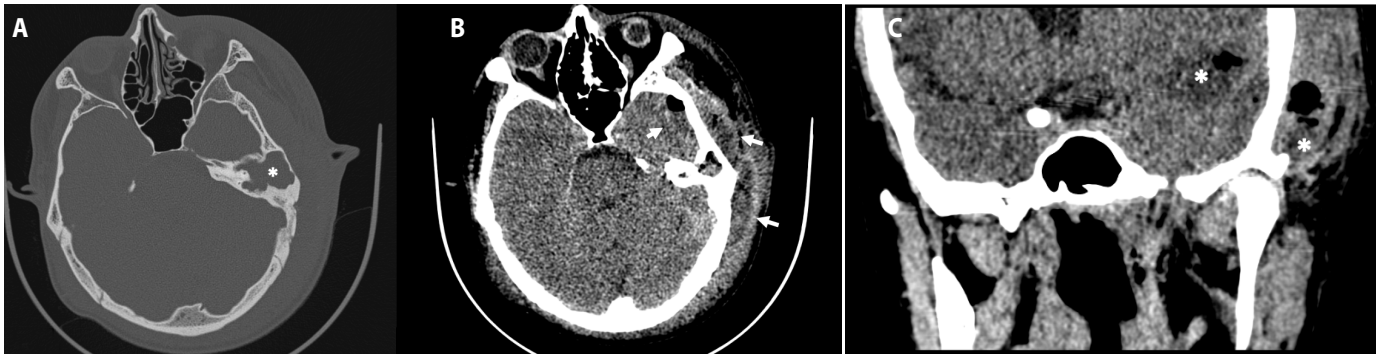
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Presented at the Philippine Society of Otolaryngology-Head and Neck Surgery 1st Virtual Interhospital Grand Rounds June 9, 2021.



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**Figure 2.** Plain axial temporal bone CT scans: **A.** Bone window showing the automastoidectomy defect (white asterisk); **B.** Soft tissue window showing air loculations and rim-enhancing hypodensity at the left temporal region and temporal lobe (white arrows); and **C.** Plain coronal view showing the air loculation and intracerebral abscess (white asterisk).



**Figure 1.** Profile and lateral view of the patient showing soft tissue swelling over the left temporal to post-auricular area with left facial asymmetry.

On the 5th hospital day, the soft tissue swelling over the left frontal area progressed to extend beyond the midline and febrile episodes continued with persistent vomiting. Bedside incision and drainage under local anesthesia drained approximately 80 cc of foul-smelling, purulent discharge. The patient underwent emergency temporoparietal craniotomy and evacuation of brain abscess under general anesthesia on the 6th hospital day. A total of 500 cc subperiosteal abscess and 15 cc intracranial abscess were evacuated. The specimens submitted for culture confirmed the presence of fungal elements.

On the 10th hospital day, the patient was afebrile and stable with improved mental status. A left radical mastoidectomy with tegmen repair and facial nerve decompression were performed under general anesthesia to address the otologic disease. Post-operatively, the patient completed 14 days of intravenous metronidazole and fluconazole and a 6-week course of ceftazidime. Surveillance Magnetic Resonance Imaging (MRI) studies performed three months postoperatively showed regression of the cerebral abscess and the patient was discharged improved after a 3-month hospital admission.

### DISCUSSION

The case presented shows a complicated chronic otitis media that also coincided with Luc’s abscess. This is a complication of otitis media that typically presents as a subperiosteal abscess below the temporalis muscles without involvement of the mastoid bone.<sup>1,2</sup> This is attributed to the infection passing through the notch of Rivinus and deep auricular arteries leading towards the subperiosteal plane beneath the temporalis or may also pass directly through the mastoid air cells.<sup>2,3</sup> These classic findings show a stark contrast to our presented case, where other otitis media complications were also present.

A literature review using the keywords “subperiosteal abscess,” “Luc’s abscess,” “complications,” and “otitis media” yielded one systematic review of subperiosteal abscess that included Luc’s abscess.<sup>1</sup> The systematic review noted that Luc’s abscess occurred in 1 of 88 cases and with a reported incidence of 5%. It was mainly noted to occur in the pediatric population (80.9%) with first documented case being a 9-year-old female while only 4 of 21 cases were in adults.

The cause of this condition may be age-related, being attributed to acute otitis media in younger age groups and to chronic infections or immunosuppression in older populations.<sup>2,4</sup> Our patient was neither pediatric nor immunosuppressed. The microbiologic etiology of this condition is mainly bacterial in nature with *Streptococcus pyogenes* being the most common cause.<sup>5,6</sup>

The clinical identification of this disease can be difficult due to nonspecific initial symptoms and possible absence of symptoms pointing to a middle ear pathology. Many patients are reported to be asymptomatic.<sup>4</sup> Possible early symptoms can be nonspecific such as trismus, facial swelling and temporomandibular pain. Otologic symptoms, on the other hand, can also present early as preauricular swelling, otalgia or aural discharge.<sup>1,7</sup> The most common signs are preauricular swelling (19 of 21 cases), fever (15 of 21 cases), and otoscopic findings of acute otitis media (13 of 21 cases). Postauricular

symptoms or signs can be absent early in the disease course (4 of 21 cases).<sup>1</sup> An important clinical sign was soft tissue swelling which can be seen in 90.5% of cases and can increase the index of suspicion if present.<sup>1</sup>

Facial nerve involvement in otitis media (which was present in this case) is rare, presenting in 9% of cases.<sup>6</sup> In cases of Luc's abscess, it had an incidence of 1 in 21 cases.<sup>1</sup> The facial nerve is involved by direct extension of the infectious process or through compression by cholesteatoma or granulation.<sup>1,8</sup> Prognosis is related to the following factors: severity of paralysis, cholesteatoma formation, age of the patient and previous ear surgeries.<sup>9</sup> In our case, there was no progression nor improvement of facial asymmetry immediately post-operatively.

The role of High Resolution Computed Tomography (HRCT) is emphasized in the management of otitis media complications. An HRCT is usually acceptable but a Magnetic Resonance Imaging (MRI) study is indicated if intracranial complications are considered (such as cerebral abscess or facial nerve involvement).<sup>6,10</sup> This is relevant because Luc's abscess classically does not involve the mastoid. Recent studies however have shown that many cases would have radiologic findings of mastoiditis while some will have overt mastoiditis.<sup>1</sup> The CT findings in Luc's abscess follows: fluid collection in the subperiosteal plane deep to the temporalis muscle, soft tissue swelling in the temporal and EAC areas and possible mastoid opacification which were seen in our patient.<sup>6,10</sup>

For uncomplicated cases of Luc's abscess treatment with prompt culture-guided antibiotics with or without drainage of the purulent collection would be adequate for facilitating resolution of disease. While surgical interventions are indicated in cases of Luc's abscess with mastoiditis, they can also be indicated by radiographic studies. In addition to drainage of the abscess, mastoidectomy is indicated if mastoid involvement is present on radiographic studies. Our patient was treated with a 6-week course of intravenous antibiotics while undergoing incision and drainage of the Luc's abscess plus a radical mastoidectomy with drainage of the intracranial abscess.<sup>10</sup>

Post-operative regular follow-up should monitor recurrence of otorrhea by performing otoscopy and aural toilette.<sup>11</sup> Radiographic studies to monitor for recurrence can be obtained after 4 to 8 weeks of intravenous antibiotics.<sup>12</sup>

In conclusion, the classical Luc's abscess is a rare complication and can usually be treated adequately with conservative management if detected early. Complicated and clinically aggressive cases require surgical intervention to facilitate drainage, as well as prolonged intravenous antibiotics to manage these cases. The case presented

emphasized the significance of prompt diagnosis and timely multidisciplinary management, as an initial otitis media can rapidly develop complications if inadequately managed.

#### ACKNOWLEDGEMENTS

The authors would like to acknowledge the contributions of the following physicians, Drs. Gerard Lapiña and Karla Nable-Llanes, for providing the best medical and surgical care and providing valuable insights on the care provided for the patient described. The team also acknowledge the expertise of Dr. Erasmo Llanes in guiding the management of the patient.

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