Title: Cerebral Venous Thrombosis with Skull Base Osteomyelitis and a Retropharyngeal Mass

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Key Clinical Message

Severe complications may not always present with "classic" signs and symptoms. In the setting of recent mastoiditis, complications including CVST, SBO, and RPA should be considered, particularly with persistent or worsening symptoms. A broad differential can lead to prompt diagnosis and treatment, thereby reducing the likelihood of morbidity and mortality.

Key Words: Mastoiditis, Skull Base Osteomyelitis, Cerebral Venous Sinus Thrombosis, Retropharyngeal Abscess

Introduction

Mastoiditis is a bacterial infection of the mastoid air cells, most commonly secondary to acute otitis media (AOM). Mastoiditis can be effectively managed with antibiotics; however incomplete treatment can potentially result in worsening infection with contiguous and hematogenous spread leading to fatal complications. Some of these complications include cerebral venous sinus thrombosis (CVST), skull base osteomyelitis (SBO), and retropharyngeal abscess (RPA). Although these complications are rare, they often have a subtle presentation and can result in significant morbidity[1].

CVST is a stroke that involves a thrombus forming in the cerebral veins or dural sinuses. The exact symptomology and pathogenesis is complex and not entirely understood, however, two major accepted mechanisms include: (1) Thrombosis to the cerebral veins or dural sinuses impairing blood drainage from the brain tissue leading to cerebral parenchymal destruction; (2) Obstruction in dural sinus decreasing cerebrospinal fluid absorption leading to increased intracranial pressure[2].

SBO is an inflammation of the skull bones. Clinical presentations of SBO vary, depending on the location of osteomyelitis. Most often affected regions are the sphenoid and/or temporal bones, due to contiguous spread and resultantly present with severe otalgia, fevers, aural fullness, and purulent otorrhea[3].

RPA is a purulent fluid collection in the retropharyngeal space, located between the buccopharyngeal and alar fascias. In adults, infection of this space and subsequent RPA formation is generally due to trauma of the posterior pharynx, while in children, is often due to compartmental spread of neighboring infection[4].

This is a case report that presents a patient who concomitantly developed all three of these complications.

Case Presentation

An 88-year-old male with a past medical history of hypertension, right eye prosthesis status post remote injury, and recent mastoiditis status post full course of intravenous and oral antibiotics, presented to the emergency department (ED) with progressively worsening neck pain. His neck pain initially started one week ago although significantly worsened over the past three days after receiving a magnetic resonance imaging (MRI) brain to assess for resolution of infection. The neck pain was significantly worsened with minimal movement and associated with bilateral upper extremity weakness which limited his ability to hold himself up with his walker. He denied any recent trauma or having any headaches, dizziness, fever, odynophagia, difficulty breathing, numbness, tingling, saddle anesthesia, bladder or bowel incontinence. No history of illicit drug use, spine surgery or malignancy. The MRI of the brain with contrast was read as negative and reported resolution of previously identified mastoiditis.

Upon arrival at the emergency department, physical exam showed vital signs: heart rate 107, blood pressure 176/110, temperature 36.9 C, respirations 16. The patient was overall well appearing and non-toxic. He did have a stiff neck with significant limitation in mobility. Granulation tissue was noted in the right external auditory meatus. He had bilateral trapezius and cervical paraspinal muscle tenderness and 4/5 bilateral upper extremity strength.

On laboratory blood analysis, complete blood count with differential revealed leukocytosis of 12.4, and coagulation studies were elevated: PT 16.6, INR 1.5, PTT 44.1. At this point, a lumbar puncture was deferred due to low clinical suspicion for meningitis or intracranial hemorrhage in the setting of a

mildly elevated INR. Though the patient's MRI report from three days prior noted resolution of mastoiditis and no other abnormalities, a repeat MRI brain including cervical spine was ordered as the patient had leukocytosis, persistent neck stiffness, and objective bilateral upper extremity weakness. The MRI of the cervical spine demonstrated findings suggestive of osteomyelitis of the clivus and upper cervical spine, a prevertebral abscess possibly retropharyngeal, spinal canal narrowing, and spinal cord edema (Figure 1). MRI brain revealed necrosis and abscess in the right nasopharynx, patchy sclerosis in the adjacent central skull base suspicious for osteomyelitis, and venous thrombosis involving the distal right sigmoid sinus, jugular bulb, and proximal aspect of the right internal jugular vein (Figure 2).

Management and Outcomes

Given these critical findings, Vancomycin, Piperacillin/Tazobactam, and Dexamethasone were immediately given. A heparin drip was initiated, and the patient was transferred to a tertiary care facility for a higher level of care. Over the patient's hospitalization, he was seen by a team of consultants, including interventional radiology, infectious disease, otolaryngology, hematology, neurotology and neurosurgery. The patient underwent exploration by otolaryngology for possible incision and drainage of suspected RPA that revealed a soft tissue mass with no evidence of abscess or malignancy after biopsy. A biopsy of the vertebrae did reveal osteomyelitis. Ultimately, the patient was continued on one month of intravenous antibiotics and three months of anticoagulation therapy. Cervical spine surgery was deferred until resolution of infection, to avoid placing hardware in infected bone. The patient was discharged from the hospital eight days after admission in stable condition.

Over the course of the next two months, the patient returned to the hospital with anemia secondary to gastrointestinal bleeding from duodenal ulcers that required microembolization and nephropathy secondary to medication effects that required a change in antibiotic regimen. The patient was otherwise improving and ultimately underwent neurosurgery for a C1-C2 laminectomy and decompression of spinal cord with occipital fusion (Figure 3).

Discussion

This case illustrates the rare and life-threatening presentation of CVST, SBO, and retropharyngeal mass in the setting of recent mastoiditis. There have been only ten other cases of CVST with SBO reported in literature to date (Table 1)[5-14]. Patient age ranged from 17 to 94 years old with eight out of ten cases occurring above the age of 50 years old. The initial chief complaint in each case varied, however eight out of the ten cases presented with neurologic symptoms, the most common being a headache[5, 6, 7, 9, 11, 13, 14]. In all cases, CVST and SBO developed as secondary complications from a primary infectious etiology. Of note, eight of the ten cases were male patients. The etiology for this gender trend is unclear at this time given the limited number of cases, as it could also be due to an artifact of small sample size.

Case Reference	Age/Sex	Chief Complaint	Complications
[5]	65/M	6 months of pain and discharge in right ear	Complete right facial paralysis; occlusion of right lateral venous sinus; SBO
[6]	51/M	7 days of left temporooccipital and retro-orbital facial pain, hoarseness and dysphagia	Mastoiditis; SBO; cranial nerve palsies; sigmoid sinus thrombosis; septic pulmonary embolus
[7]	17/M	5 days of sore throat, myalgias, vomiting	Internal jugular vein, cavernous sinus, internal carotid artery, and sigmoid sinus thrombosis; vertebral artery dissection; SBO; epidural abscess
[8]	50/M	Right eye pain, swelling, progressive vision loss after a fall	Superior ophthalmic vein thrombosis, bilateral cavernous sinus thrombosis, internal jugular vein thrombosis; orbital cellulitis; clival osteomyelitis
[9]	58/M	Headache, hoarseness of voice, dysphagia, cough, tiredness	SBO; left jugular vein, left sigmoid sinus, and lateral third of transverse sinus thrombosis
[10]	70/F	Left temporal headache	Aseptic meningitis, septic pulmonary embolism, cryptococcal pneumonia, SBO, cavernous sinus thrombosis
[11]	94/M	8 days of fever, unilateral hearing loss	Subdural empyema; SBO; venous sinus thrombosis

[12]	66/M	Sudden epistaxis	Facial nerve palsy; SBO; sigmoid sinus thrombosis; maxillary artery pseudoaneurysm
[13]	71/M	Worsening headaches	SBO, sigmoid sinus thrombosis
[14]	45/F	Left hemiplegia, dysarthria, dysphagia	Transverse sigmoid thrombosis, retropharyngeal abscess, SBO

Table 1: Summary of case reports with skull base osteomyelitis (SBO) and cerebral venous sinus thrombosis (CVST). Other abbreviations: Male (M), female (F).

CVST itself is a rare pathology. The annual incidence ranges from 0.22-1.57 per 100,000 patients[15]. It is most commonly found in young females. Presentation is highly variable, and diagnosis requires imaging via a head computed tomography (CT), preferably with venography, or a brain MRI with contrast. Some previously described symptoms of this pathology include headaches, blurred vision, seizures, ophthalmoplegia and/or coma[16]. Early discovery and treatment with anticoagulation carries a favorable outcome. One multinational study consisting of 624 patients reported 79% of patients having complete recovery or minor residual symptoms after treatment, with 4.3% mortality during hospitalization and 3.4% mortality within 30 days of symptom onset[17]. Recurrence after anticoagulation therapy was found to be 2-4%[18].

SBO is also a rare pathology, as only 84 cases of head or neck osteomyelitis have been reported to date[3]. Diagnosis is typically established with an MRI with contrast or Bone Single Photon Emission Computed Tomography (SPECT) imaging. Gold standard diagnosis modality is via tissue biopsy which is frequently done in these instances in order to rule out malignancy[19]. Early treatment with culture guided long term antibiotic therapy carries a favorable prognosis. Although, patients might require surgical debridement with hyperbaric oxygen therapy[20]. In one study, prognosis for SBO at 18-month follow-up was reported to have a mortality rate of 9.5%[21], while another study quoted a mortality rate as high as 21-70%[3].

RPA clinical presentation varies according to the stage of illness; common signs and symptoms include odynophagia, neck stiffness, hoarseness, neck mass/swelling and respiratory distress[22]. Diagnosis can be made via plain radiography, CT neck with contrast or MRI neck with contrast. Gold standard method of diagnosis is a tissue biopsy. Treatment consists of antibiotics with possible incision and drainage, depending on the severity of pathology.

The final diagnosis for our patient necessitated utilization of almost all of these modalities. More importantly, this case highlights the value of reviewing one's own ordered imaging and reassessment of patients. In this case, the patient's MRI brain with contrast report from three days prior indicated resolution of mastoiditis with no acute abnormalities; however, the patient only had the radiology interpretation available with them when they presented to our ED. With ongoing symptoms and the inability to review previous outpatient imaging, the decision was made to obtain repeat MRI testing; which ultimately lead us to identify the previously missed diagnosis.

Additionally, it is worth noting that none of the patients in previously reported similar cases presented with "classic" signs and symptoms befitting a common pathological process. In situations of atypical patient presentations, a broad differential, and a high index of suspicion is essential to diagnosing life-threatening illnesses.

Authorship:

JO, HV, HR, and PS drafted the article or revised it critically for important intellectual content; and gave final approval of the version of the article to be published.

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Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

Abstract

88-year-old male with recent history of mastoiditis status post completing outpatient antibiotic regimen presented with worsening neck pain. Found to have complications of cerebral venous sinus

thrombosis, skull base osteomyelitis and a retropharyngeal mass. This is the eleventh case in medical literature reporting on this phenomenon.

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Figure Labels and Legends

Figure 1: MRI T1, sagittal. Clivus osteomyelitis (Arrow A). Pannus causing spinal cord compression (Arrow B). Retropharyngeal inflammatory changes (Arrow C).

Figure 2: MRI T1 post contrast, coronal. Arrow shows filling defect from intraluminal thrombus, identifying cerebral venous sinus thrombosis.

Figure 3: CT without contrast, sagittal. Occiput to C5 fusion status post decortication and laminectomy.