
Can't be Overlooked: A Case Report of Pansinusitis Causing a Rare and Life-Threatening Cavernous Sinus Thrombosis

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ABSTRACT

Sinusitis is a prevalent, mostly favorable medical condition. However, in rare cases, inadequately treated sinusitis can lead to devastating and life-threatening complications, such as cavernous sinus thrombosis (CST). We present the case of a 41-year-old woman presenting with diplopia and ophthalmoplegia, ptosis, facial paresthesia, and less common facial paresis. Diagnostic imaging—including magnetic resonance imaging (MRI), magnetic resonance angiography (MRA), and digital subtraction angiography (DSA)—confirmed bilateral CST secondary to untreated Pansinusitis. Cultures of sinus drainage revealed uncommon pathogens: *Staphylococcus epidermidis* and *Chryseobacterium indologenes*. A multidisciplinary approach involving intravenous antibiotics, anticoagulation, and functional endoscopic sinus surgery (FESS) resulted in significant clinical improvement. This case highlights the critical need for accurate diagnosis, timely and prudent intervention, and enhanced public health education to prevent potentially life-threatening complications of untreated sinusitis. Moreover, it contributes novel insights into the atypical microbiological profile and neurological manifestations of CST.

Keywords : cavernous sinus thrombosis, facial paresis, rhinosinusitis

INTRODUCTION

Sinusitis is prevalent, affecting 12.3% of the United States population, 10.9% in Europe, and 13% in China (Albu, 2020; El Banhaway et al., 2016; Fujieda et al., 2019; Smith et al., 2022; Xu et al., 2021). While most cases resolve well, inadequate treatment may cause rare but life-threatening complications, such as cavernous sinus thrombosis (CST), which accounts for one to four percent of two to 13 annual cases of cerebral venous thrombosis (CVT) per million people. Although antibiotic therapy has reduced the CST mortality rate from 80-100% to 20-30%, it remains a medical emergency with potentially devastating outcomes (Branson et al., 2019; Caranfa & Yoon, 2021; Geng et al., 2020; Weerasinghe & Lueck, 2016). Understanding the pathophysiology, clinical spectrum, and optimal management strategies for CST remains crucial for preventing morbidity and mortality in affected patients.

Previous case reports have documented CST arising from various infectious sources, predominantly sphenoid and ethmoid sinusitis. Weerasinghe and Lueck (2016) presented a comprehensive review of septic CST cases, emphasizing the typical presentation with ophthalmoplegia, chemosis, and proptosis, with *Staphylococcus aureus* as the most common causative organism. Ramanand et al. (2007) reported an atypical presentation of CST featuring bilateral ophthalmoplegia secondary to sphenoid sinusitis, highlighting diagnostic challenges when classical signs are absent. Dolapsakis et al. (2019) described CST due to ipsilateral sphenoid sinusitis with rapid progression despite early antibiotic intervention, underscoring the aggressive nature of this condition. However, none of these reports

documented the combination of bilateral CST with facial nerve involvement secondary to pansinusitis caused by dual rare pathogens—*Staphylococcus epidermidis* and *Chryseobacterium indologenes*.

This case uniquely demonstrates CST due to dual rare opportunistic pathogens (*Staphylococcus epidermidis* and *Chryseobacterium indologenes*) causing pansinusitis with atypical neurological manifestations including cranial nerve VII palsy—a presentation rarely documented in non-otogenic CST. The novelty of this report lies in three key aspects: (1) the identification of uncommon biofilm-producing organisms as causative agents, expanding the known microbiological spectrum of CST; (2) the documentation of facial nerve palsy in non-otogenic CST with proposed mechanisms related to thrombosis extension; and (3) the demonstration of successful multidisciplinary management integrating medical and surgical approaches in a resource-limited setting.

We report a case of CST following untreated pansinusitis, highlighting the danger of underestimating sinusitis. This report aims to detail the clinical course, diagnostic approach, and multidisciplinary management of CST secondary to pansinusitis, with particular emphasis on atypical clinical features, diagnostic imaging strategies, microbiological considerations, and therapeutic decision-making. By presenting this comprehensive case analysis, we seek to enhance clinical awareness of CST as a potential complication of inadequately treated sinusitis and to inform evidence-based management approaches for this rare but life-threatening condition. Informed consent was obtained.

METHOD

This is a descriptive case report presenting a single patient with cavernous sinus thrombosis secondary to pansinusitis. The patient was managed at Hospital X, a tertiary referral center in Indonesia. The case report follows established guidelines for clinical case documentation, emphasizing comprehensive clinical description, diagnostic workup, therapeutic interventions, and outcomes assessment.

Clinical findings, imaging results, microbiological data, and treatment responses were qualitatively interpreted through systematic clinical review. Comparative analysis with existing literature on CST was conducted to contextualize the atypical features of this case, particularly regarding the rare pathogens identified and the uncommon cranial nerve VII involvement. This interpretive approach enabled comprehensive understanding of the diagnostic and therapeutic challenges encountered and facilitated evidence-based clinical decision-making throughout the patient's care.

Written informed consent was obtained from the patient for publication of this case report, including clinical details, imaging studies, and photographic documentation. The patient was fully informed about the purpose of publication, the anonymous presentation of data, and her right to withdraw consent at any time. This case report was conducted in accordance with the ethical principles of the Declaration of Helsinki and local institutional guidelines for case report documentation.

RESULTS AND DISCUSSION

Clinical Assessment

A 41-year-old woman presented with sudden diplopia and difficulty moving her left eye, gradually involving her right eye. She also experienced headaches, light-headedness, and left-sided facial paraesthesia. She had recurrent cough and yellowish-greenish nasal discharge for the last three months, worsening in the week before admission. She had no prior medical

history. She took over-the-counter flu medications without antibiotics and never sought medical attention.

Her vitals were stable. Neurological examination revealed right cranial nerve (NC) VI and VII palsies, left NC III, IV, and VI palsies, and paraesthesia in the left NC V2 and V3 distribution. Her laboratory results were unremarkable. Contrast head magnetic resonance imaging (MRI) showed minimal small vessel ischemia, pansinusitis, and normal magnetic resonance angiography (MRA). Digital Subtraction Angiography (DSA) confirmed bilateral CST.

She was initially treated with azithromycin, then escalated to intravenous ceftriaxone, metronidazole, and doripenem, along with subcutaneous enoxaparin and supportive medications. After temporarily pausing enoxaparin, endoscopic ethmoidectomy and bilateral Functional Endoscopic Sinus Surgery (FESS) were performed, revealing minimal pus with polypoid sinonasal mucosa. Enoxaparin was continued 48 hours post-operation up to 20 days.

Pus culture identified *Staphylococcus epidermidis* and *Chryseobacterium indologenes*, prompting a switch to cefoperazone/sulbactam and moxifloxacin. She received antibiotics for 29 days. Histopathology confirmed chronic sinusitis without malignancy. Follow-up head MRI/MRA ten days post-operation showed bilateral maxillary, ethmoidal & frontal sinusitis, with MRV (Magnetic Resonance Venography) showing partial thrombosis in the superior sagittal sinus up to the right transverse sinus.

After 32 days of care, the patient was discharged on oral edoxaban, with significantly improved diplopia and eye movement without ptosis, with residual facial paraesthesia and nasal symptoms. Follow-up in three months showed near-normal eye movement with left lid lag.

Clinical Presentation

The patient presented with a constellation of neurological symptoms including bilateral ophthalmoplegia, ptosis, diplopia, facial paresthesia, and the atypical finding of facial paresis (CN VII palsy). The clinical timeline revealed progressive symptom evolution over several days, with initial unilateral left eye involvement subsequently extending to bilateral manifestation. Associated symptoms included persistent headache, light-headedness, and a three-month history of productive cough with purulent nasal discharge that had been inadequately treated with over-the-counter medications.

Neuroimaging Findings

Initial contrast-enhanced brain MRI demonstrated minimal small vessel ischemic changes and extensive pansinusitis involving maxillary, ethmoid, sphenoid, and frontal sinuses bilaterally. However, the initial MRA did not clearly demonstrate cavernous sinus thrombosis. Given the strong clinical suspicion based on the classical presentation of ophthalmoplegia with multiple cranial nerve palsies, DSA was performed and definitively confirmed bilateral cavernous sinus thrombosis with filling defects in both cavernous sinuses.

Follow-up imaging performed 10 days post-operatively using MRI/MRA with MRV sequences revealed persistent sinusitis in bilateral maxillary, ethmoidal, and frontal sinuses, with additional findings of partial thrombosis extending to the superior sagittal sinus and right transverse sinus. This extension of thrombosis to the dural venous sinuses provided a plausible explanation for the atypical cranial nerve VII involvement observed in this patient.

Microbiological Results

Intraoperative cultures of purulent material obtained during FESS identified two uncommon pathogens: *Staphylococcus epidermidis* and *Chryseobacterium indologenes*. Both organisms are opportunistic, biofilm-producing bacteria rarely implicated in CST. Antibiotic susceptibility testing guided the modification of antimicrobial therapy from initial empiric broad-spectrum coverage to targeted therapy with cefoperazone/sulbactam and moxifloxacin, to which both organisms demonstrated susceptibility.

Histopathological Findings

Histopathological examination of sinonasal tissue revealed features consistent with chronic sinusitis, including submucosal inflammatory infiltrate, goblet cell hyperplasia, and squamous metaplasia. Importantly, no evidence of malignancy, granulomatous inflammation, or fungal elements was identified, ruling out alternative diagnoses.

Treatment Response and Clinical Outcomes

The patient received a comprehensive multidisciplinary treatment regimen including prolonged intravenous antibiotic therapy (29 days total), therapeutic anticoagulation with low-molecular-weight heparin (enoxaparin) followed by direct oral anticoagulant (edoxaban), and surgical source control via bilateral FESS with ethmoidectomy. Clinical improvement was gradual but substantial, with progressive resolution of ophthalmoplegia, ptosis, and diplopia. At hospital discharge after 32 days of inpatient care, the patient demonstrated significantly improved extraocular movements without ptosis, though residual facial paresthesia and mild nasal symptoms persisted.

Long-term follow-up at three months post-discharge revealed near-complete resolution of ophthalmoplegia with only minimal residual left eyelid lag during upward gaze. However, persistent facial paresthesia in the CN V2 and V3 distribution indicated incomplete sensory nerve recovery, suggesting potential permanent neurological sequelae. The patient remained on oral anticoagulation therapy with close hematologic and neurological monitoring.

Discussion

CST, more commonly septic (SCST), is a rare yet severe thrombophlebitis caused by infections in the head and neck area. Most cases of SCST (60-80%) arise from infections in the middle third of the face, especially sphenoid and ethmoid sinusitis (57%), due to the venous drainage pathways and the proximity of these structures to the cavernous sinus (Caranfa & Yoon, 2021; Weerasinghe & Lueck, 2016). Bacteria can trigger thrombosis by releasing prothrombotic factors and toxins, often deeply embedded within the thrombus, impeding antibiotic penetration, and hastening disease progression (Caranfa & Yoon, 2021).

Comparison with Previous Literature

Our patient presented with the classic CST symptoms of ophthalmoplegia and facial paresthesia, caused by obstruction of venous drainage to the cavernous sinus, resulting in involvement of CN V1, V2, VI, III, and IV (Caranfa & Yoon, 2021). However, CN VII palsy in our patient was rare in non-otogenic CST, with only two reported cases. Ramanand et al. (2007) described one case and attributed it to anomalous anastomoses between a branch of the cavernous segment of the internal carotid artery and the middle meningeal artery. Dolapsakis et al. (2019) presented another case and argued that venous hypertension might provoke transient neurapraxia. In our case, thrombosis extending to the superior sagittal and right transverse sinus—documented on follow-up MRV—may explain this atypical

presentation through mechanisms involving increased intracranial venous pressure and potential compression or ischemia affecting the facial nerve's intracranial course. This extension of thrombosis beyond the cavernous sinus itself represents a more extensive thrombotic process than typically reported, highlighting the aggressive nature of infection-related cerebral venous thrombosis.

Microbiological Considerations

Notably, *Staphylococcus epidermidis* and *Chryseobacterium indologenes* are rare pathogens in CST. They are both opportunistic, biofilm-producing organisms, complicating their eradication (Chang et al., 2023; Lee & Anjum, 2024). *Staphylococcus epidermidis*, while a common commensal organism of the skin and mucous membranes, rarely causes invasive infections except in immunocompromised hosts or in the presence of foreign materials. Its ability to produce biofilms on mucosal surfaces may have facilitated chronic colonization and subsequent invasive infection in this case (Lee & Anjum, 2024). *Chryseobacterium indologenes* is an environmental gram-negative bacillus increasingly recognized as an emerging opportunistic pathogen, particularly in healthcare settings and immunocompromised patients. Chang et al. (2023) characterized the clinical and microbiological features of *C. indologenes* bacteremia, noting its association with indwelling devices, immunosuppression, and significant antibiotic resistance patterns. The identification of this organism in our patient's sinus cultures is particularly noteworthy given the absence of typical risk factors such as immunosuppression or recent healthcare exposure, suggesting possible community acquisition or environmental contamination of the chronically inflamed sinuses. This finding expands the CST microbial profile and underscores the importance of culture-guided antibiotic therapy.

Diagnostic Imaging Strategies

Neuroimaging is essential for diagnosing CST (Jianu et al., 2022). While contrast-enhanced CT and MRI are commonly used, acute-phase imaging may be nonspecific (Jianu et al., 2022; Weerasinghe & Lueck, 2016). In our case, the initial MRI/MRA only showed minimal small vessel ischemia and pansinusitis, while DSA confirmed bilateral CST. This highlights DSA as a valuable adjunct when MR or CT Venography data are ambiguous, but CVT is highly suspected (Jianu et al., 2022). The diagnostic challenges encountered in this case underscore the limitations of conventional MRI/MRA in detecting early or subtle cavernous sinus thrombosis, particularly in the acute phase when inflammatory changes may obscure venous filling defects. DSA, though invasive, provides superior spatial and temporal resolution for evaluating venous structures and should be considered the gold standard when clinical suspicion remains high despite negative or equivocal non-invasive imaging. Alternatively, high-resolution contrast-enhanced CT venography or dedicated MRV sequences may improve diagnostic accuracy compared to standard MRA protocols (Jianu et al., 2022).

Therapeutic Management

Due to its rarity, there is a lack of guidelines and randomized controlled trials (RCTs) for CST treatment. Our patient was initially treated with broad-spectrum antibiotics, and later tailored according to culture sensitivity. This aligns with previous studies that recommended antibiotic administration for at least three to four weeks, and continuing for two weeks after resolution to prevent recurrence. The use of anticoagulants in SCST is controversial due to its bleeding risk (Caranfa & Yoon, 2021). However, reviews showed lower mortality and morbidity rates and better outcomes with anticoagulants (Weerasinghe & Lueck, 2016). Our patient was treated with enoxaparin followed by edoxaban, a non-vitamin K-dependent oral anticoagulant (NOAC), which has been proven to be safe and effective for venous

thromboembolism. The decision to use NOAC rather than warfarin was based on considerations including predictable pharmacokinetics, absence of dietary restrictions, and reduced need for monitoring—factors particularly relevant for outpatient management following hospital discharge. Emerging evidence supports the use of direct oral anticoagulants for cerebral venous thrombosis, though data specific to septic CST remain limited.

We performed endoscopic ethmoidectomy and bilateral FESS to control the primary focus of infection. This is consistent with the European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS) 2020 guidelines for complicated acute rhinosinusitis and has been proven beneficial for CST originating from sinusitis (Caranfa & Yoon, 2021; Weerasinghe & Lueck, 2016). Postoperative recovery was satisfactory, though residual ocular movement restriction persisted, likely reflecting incomplete recovery of affected cranial nerves or potential permanent neurological damage. The surgical approach facilitated direct drainage of infected material, obtained tissue for culture and histopathology, and improved sinus ventilation—all critical components of source control in managing invasive sinogenic infections.

Public Health and Clinical Practice Implications

Our patient's delayed presentation reflects a broader public health issue, particularly the lack of awareness about sinusitis complications and misconceptions about antibiotic resistance. Our patient was reluctant to seek medical care, assuming antibiotics would be prescribed, which she avoided. This behavior prevented her from receiving appropriate treatment. While antibiotic stewardship is essential, under-treatment poses a great risk as well. A Swedish cohort study found an increased risk of brain abscess in the untreated sinusitis group (odds ratio [OR] 5; 95% confidence interval [CI] 1.3-18.7) (Dahlén et al., 2022). Similarly, a cohort study from the United Kingdom found that antibiotic treatment for acute sinusitis was associated with lower odds of subsequent brain abscess (OR 0.12; 95% CI = 0.02 to 0.70) (Cushen & Francis, 2020). These epidemiological data underscore the critical importance of appropriate, timely antibiotic therapy for bacterial sinusitis, particularly when clinical features suggest severe infection or risk factors for complications are present.

This calls for more balanced public education and clinician discretion in managing sinusitis. Public health messaging should emphasize both antibiotic stewardship principles and recognition of warning signs requiring medical evaluation, such as severe headache, visual changes, altered mental status, or persistent symptoms beyond 10 days. Healthcare providers must balance judicious antibiotic prescribing with appropriate clinical assessment and risk stratification to identify patients requiring antimicrobial therapy. The present case illustrates the potential catastrophic consequences of inadequately treated bacterial sinusitis and highlights the need for accessible, affordable healthcare enabling early presentation and appropriate management.

Furthermore, this case emphasizes the importance of multidisciplinary collaboration involving otolaryngologists, neurologists, infectious disease specialists, radiologists, and critical care teams in managing complex cases of CST. Effective communication, coordinated care pathways, and timely surgical intervention when indicated are essential components of optimal management. Early diagnostic imaging with appropriate modalities, including DSA when conventional imaging is inconclusive but clinical suspicion remains high, can facilitate prompt diagnosis and treatment initiation, potentially improving outcomes and reducing morbidity in this life-threatening condition.

CONCLUSION

The case expands the microbial spectrum of cavernous sinus thrombosis (CST) by identifying dual rare pathogens, *Staphylococcus epidermidis* and *Chryseobacterium indologenes*, underscoring the value of culture-driven antibiotic therapy, and it highlights an atypical cranial nerve VII palsy in non-otogenic CST that may result from thrombotic extension to the superior sagittal and transverse sinuses. Core clinical takeaways include maintaining high suspicion for intracranial complications in prolonged untreated sinusitis with neurological symptoms, employing comprehensive neuroimaging (including digital subtraction angiography when MRI/MRA is inconclusive), and pursuing multidisciplinary management that combines culture-guided antibiotics, anticoagulation, and surgical source control via FESS, along with robust public health education on antibiotic stewardship and timely care. Limitations include the single-patient design, lack of long-term follow-up beyond three months, and inability to prove causality between pathogens and CST. For future research, conduct prospective multicenter studies to delineate the full microbiological spectrum of CST, longitudinal cohorts to assess long-term neurological outcomes, comparative studies of anticoagulation strategies (NOACs versus warfarin), and molecular epidemiology to explore virulence factors and biofilm formation in rare CST pathogens, complemented by enhanced clinical registries and systematic case series to strengthen evidence-based management. Include a future research suggestion: develop standardized protocols for rapid culture-based pathogen identification in CST to enable timely targeted therapy.

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