

## Ventriculitis as a result of severe untreated rhinosinusitis

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### Abstract

This case demonstrates a rare and extremely severe complication of rhinosinusitis and how this infection can spread via direct extension to the orbit and, hematologically, to the CNS. Persistent rhinosinusitis results from an opportunistic bacterial suprainfection begins roughly 5-7 days after the initial viral infection. Even after this suprainfection, spread beyond the sinus tissue is rare in the vast majority of cases and will resolve without medical intervention.

Ventriculitis has been reported to be fatal in as many as half of the reported cases, with the majority of surviving patients experiencing life-long residual neurologic deficits. This case is unusual due to the extensiveness of the patient's infection resulting from rhinosinusitis, a rare cause of ventriculitis due to today's easy availability of medical care, and the clinical progression from viral rhinosinusitis to a bacterial rhinosinusitis was likely amplified by the patient's underlying medical comorbidities, as well as the failure of earlier intervention.

### Keywords

ventriculitis; rhinosinusitis; critical care; neurology

### Abbreviations

CSF: Cerebral spinal fluid; CT: Computed tomography; EVD: External ventricular drain; ICP: Intracranial pressure; ICU: Intensive care unit; GI: Gastro-intestinal; CNS: Central nervous system

### Introduction

Rhinosinusitis, a common infection that affects thousands of Americans every year, is typically self-limiting and resolves after 2 weeks without any medical intervention apart from symptomatic management. Persistent rhinosinusitis can lead to a progressive spread of the bacterial infection to surrounding tissues and, in 0.08% of untreated cases, to the CNS [1].

We report on an adult female with severe untreated bacterial rhinosinusitis who developed ventriculitis, a potentially life-threatening infection more commonly associated with intraventricular shunts and intracranial surgeries.

## Case Presentation

A 53 year old African American female with a past medical history of morbid obesity, hypertension, and diabetes mellitus presented to a local hospital after she began having altered mental status at home. Her associated symptoms were strabismus of the right eye over the past 4-6 days, facial pain and pressure over her frontal sinus, and a persisting sinus infection for at least the past month. On physical exam, the only abnormalities found were confusion, strabismus in the right eye, tachycardia of 115bpm, and nuchal rigidity. An initial CT only indicated right paranasal sinus disease and she was started on ceftriaxone and vancomycin for suspected meningitis. The patient become more confused and agitated, requiring sedation and intubation for airway protection in order to obtain both immediate imaging of her head and a lumbar puncture. Results from an MRI showed findings suspicious for ventriculitis and meningitis (Image 1).

The neurosurgical team was immediately consulted, placed an EVD, and drew a CSF sample which was notable for decreased glucose (12 mg/dL), elevated lactate (15.4mmol/L), and an elevated protein level (239mg/dL). At this time she was continued on IV vancomycin and started on piperacillin/tazobactam which was eventually modified to only ceftriaxone when specificities returned showing *Streptococcus intermedius* and *Staphylococcus hominis* species. All other cultures were negative for fungi, Lyme Disease, Toxoplasmosis or other organisms, and a complete viral PCR panel was negative including HIV, HSV, and West Nile Virus. After 14 days of antibiotic treatment and multiple negative CSF cultures as well as a stable ICP<15mmHg the patient's EVD was removed. The patient's neurologic status gradually improved to the point where the patient was able to follow simple commands, nod her head "yes" and "no" appropriately, and speak minimally. The patient was subsequently downgraded from the ICU and discharged to a rehab facility and subsequent outpatient care where contact and follow up were lost.

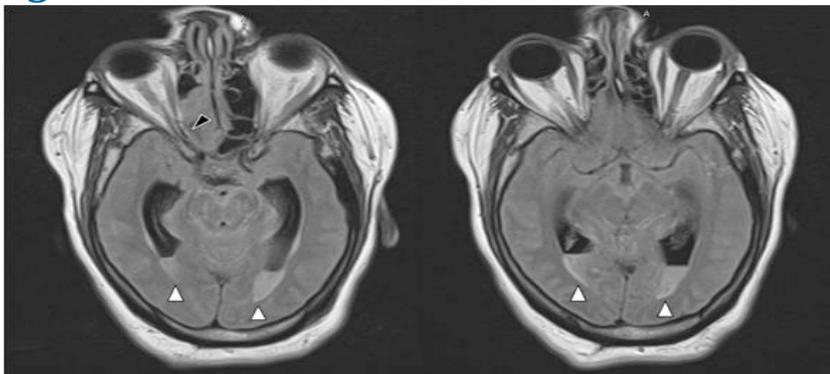
The patient's hospital course was complicated by an episode of coffee ground emesis and suspected upper GI bleed, for which the patient was re-intubated, and started on a pantoprazole drip. This resolved but it resulted in the patient being intubated for a total of 10 extra days after initial intubation due to the patient's body habitus and lethargy.

## Discussion/Conclusions

This case demonstrates a rare and extremely severe complication of rhinosinusitis and how this infection can spread via direct extension to the orbit and, hematologically, to the CNS. Acute rhinosinusitis is one of the most common infections, affecting approximately 1 in 8 adults in the United States annually with the highest incidence in adults in the age range 45-64 years [2]. Of these roughly 38.5 million people who develop acute viral rhinosinusitis, only 0.5-2.0% of these cases advance to bacterial infections and the majority (85%) of even those cases resolve spontaneously [1]. The most commonly involved structure outside the sinuses is the orbit, due to its close anatomical proximity. This was true in the case presented and in addition, the patient's infection met the criteria of a Group 2 orbital complication [3]. The spread of the infection from the paranasal sinuses commonly occurs via the valveless emissary veins allowing a superficial infection to drain to the dural sinuses, leading to the infection of the subdural or epidural space [3, 4].

Ventriculitis has an associated mortality ranging from 30-50%, with 55% of surviving patients with severe CNS infections experiencing residual neurologic deficits. The diagnosis is made using the specific criteria from the Center for Disease Control and National Health Safety Network [4, 6] (Figure 1). Ventriculitis is most commonly seen in patients with indwelling ventricular shunts (3.4-21.9% of cases), or those with recent intracranial surgery (1-2% of cases) [5]. Bacterial skin flora are the most common organisms of ventriculitis in neurosurgical patients or patients with ventricular shunts; however, *S. anginosus*, *S. intermedius*, and *S. constellatus* groups have been shown to be a major causative factor of intracranial infections in adults, particularly those in which acute bacterial rhinosinusitis is the inciting infection [6,7]. This case was unusual due to the extensiveness of the patient's infection resulting from rhinosinusitis, a rare cause of ventriculitis due to today's easy availability of medical care. The clinical progression from viral rhinosinusitis to a bacterial rhinosinusitis was likely amplified by the patient's underlying medical comorbidities, and the failure of earlier intervention.

## Figures



**Image 1:** T2 Image from MRI without contrast. Showing ventriculitis and meningitis. On these images you can clearly see the fluid-fluid levels in the ventricles (white arrow tip), as well as right ethmoid sinus inflammation impinging on the soft tissues and nerves entering the right orbit (black arrow tip).

1.	Organisms in CSF culture
2.	Two of the following:
a.	At least 1 fever
b.	Meningial signs
c.	Cranial nerve signs
3.	And at least 1 of the following:
a.	CSF abnormality (pleocytosis, elevated protein, or hypoglycorrhachia)
b.	Organisms on CSF gram stain
c.	Organisms in blood culture
d.	Positive antigen test

**Figure 1:** Center of Diseases Control and National Health Safty Network diagnostic criteria for ventriculitis

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