

Maxillary Sinus Fungal Infection as a Possible Cause of Ptosis

Aokun Li

Qingdao University

Boyang Zhu

Shandong Academy of Medical Science

Dehong Qiu

Qingdao University

Xiaojing Wang

wangxj2578@163.com

Qingdao Municipal Hospital

Lihong Zhang

Qingdao Municipal Hospital

Case Report

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Abstract

Fungal rhinosinusitis is an inflammatory disease of the sinuses caused by fungal infection. The maxillary sinus has the highest incidence of involvement. Maxillary sinus fungal infection with ocular involvement is relatively rare, with an insidious onset and atypical symptoms. Ocular involvement is predominantly associated with invasive forms, leading to a high rate of clinical misdiagnosis and missed diagnosis. In recent years, with advancements in imaging technology and the popularization of endoscopic sinus surgery, understanding of this disease has deepened. This article reports a case of a 73-year-old female patient presenting with right-sided ptosis and diplopia, considered to be caused by maxillary sinus fungal infection. Imaging and pathological results are presented to demonstrate the causal relationship. The patient has signed an informed consent form agreeing to the publication of this case.

Case Report

A 73-year-old female patient presented to the Ophthalmology Clinic of Qingdao Municipal Hospital on September 11, 2025, complaining of right-sided ptosis for 2 months, which had worsened over the previous two weeks. Ophthalmic examination revealed: right eye visual acuity 0.5 (corrected to 1.0), left eye visual acuity 0.07 (corrected to 0.12); intraocular pressure was 16 mmHg in the right eye and 15 mmHg in the left eye (1 mmHg = 0.133 kPa). Right eye ptosis was observed [Figure 1]. Bulbar conjunctiva was not significantly congested bilaterally. Corneas were clear, anterior chambers were of medium depth, and aqueous humor was clear. Pupils were round with a positive light reflex. Intraocular lenses were in place bilaterally. Fundoscopic examination revealed bilateral optic discs with clear margins and normal color; retinas were flat. The right eye showed a ring of yellowish-white exudates and hemorrhages in the posterior pole. The left eye showed retinal hemorrhages, exudates, and old laser scars. Diplopia testing revealed atypical findings: with a red glass filter placed over the right eye, the patient reported horizontal diplopia with maximum separation on right gaze, and the peripheral image belonged to the right eye. Extraocular movement examination showed limited abduction of the right eye [Figure 2].

Past medical history was significant for chronic rhinosinusitis for one year, hypertension managed with nifedipine GITS and valsartan, diabetes mellitus managed with insulin, and chronic nephritis managed with Haikun Shenxi capsules. An orbital MRI showed no significant abnormalities. A sinus CT scan revealed mixed high and low-density opacities filling the right maxillary sinus, obstruction of the right maxillary sinus ostium, a mildly deviated nasal septum, and hypertrophy of the right inferior nasal turbinate, with no abnormal density changes within the nasal cavity [Figure 3]. Routine blood and urine tests were unremarkable. Based on these findings, a preliminary diagnosis of fungal sinusitis was made. The patient was referred to the Department of Otorhinolaryngology Head and Neck Surgery at our hospital. She was admitted and subsequently underwent endoscopic multiple sinus ostia surgery and endoscopic radiofrequency ablation of the nasal turbinates. Caseous material from the right maxillary sinus was sent for rapid paraffin section pathology, which reported the presence of fungal hyphae and

spores [Figure 4], confirming the diagnosis of maxillary sinus fungal infection. Upon follow-up in the ophthalmology clinic after discharge, the patient's right eye ptosis had gradually improved.

Discussion

Fungal rhinosinusitis is an inflammatory disease of the nasal and paranasal sinuses caused by fungal infection. The maxillary sinus is the most commonly affected site, with *Aspergillus* species being the most frequent pathogens. Other causative fungi include *Aspergillus fumigatus*, *Scedosporium apiospermum*, *Candida albicans*, and *Mucor* species, with distributions varying among different age groups ^[1]. Based on whether the fungus invades the mucosa and bone, it is classified into non-invasive and invasive forms. Invasive fungal rhinosinusitis not only involves the sinus cavity but can also invade the sinus mucosa and bone, potentially spreading to the skull base and orbit, leading to severe complications such as orbital apex syndrome and cavernous sinus thrombosis. Sinus CT may show destructive bony changes in the sinus walls ^[2]. Non-invasive fungal rhinosinusitis is further subdivided into fungus ball and allergic fungal rhinosinusitis based on pathogenesis. Allergic fungal rhinosinusitis is often associated with type I hypersensitivity, where fungi act as allergens triggering a mucosal allergic response, leading to increased mucus secretion and mucosal edema. Patients frequently have polyps and a history of allergies. The etiology of fungus ball is not entirely clear but may be related to factors like previous surgery or mucosal injury that allow fungal colonization within the sinus, eventually forming a localized "fungus ball" that causes physical compression and local inflammation. Common symptoms include nasal malodor, bloody discharge, and facial pain. CT typically shows patchy irregular high-density calcifications within the sinus ^[3, 4]. In this case, the patient's sinus CT showed mixed high and low-density opacities in the right maxillary sinus without evidence of invasive bone destruction. The paraffin section of the right maxillary sinus mucosa revealed fungal hyphae and spores, confirming a diagnosis of maxillary sinus fungus ball. The presentation was insidious and atypical, with the patient seeking ophthalmologic care solely due to right-sided ptosis affecting her appearance. Visual acuity in the affected eye was normal, and there were no significant nasal symptoms. This uncommon scenario makes it difficult to immediately link the ocular symptom to a fungal sinus infection. Such a presentation carries a high risk of misdiagnosis during an ophthalmology visit, potentially leading to delayed treatment, highlighting the need for increased diagnostic awareness among relevant specialists.

When fungal rhinosinusitis involves ocular structures, it is typically the invasive form, presenting with symptoms such as decreased vision, binocular diplopia, proptosis, ptosis, periorbital pain and swelling, and blindness ^[5]. Fungal infections of the sphenoid and ethmoid sinuses are more prone to causing ocular symptoms, likely due to their close anatomical relationships. The sphenoid sinus is located deep within the nasal cavity, with its lateral wall directly adjacent superiorly to the cavernous sinus (which contains the oculomotor nerve). The posterior ethmoid sinuses are located in the posterior part of the ethmoidal labyrinth on the upper lateral wall of the nasal cavity; their lateral wall forms the lamina papyracea of the medial orbital wall (the thinnest part of the orbit). The sphenoid and posterior ethmoid sinuses lie in close proximity to the posterior orbit, separated only by thin bony walls. Infection within

these sinuses can easily breach these thin barriers and spread directly to the posterior orbit, involving the oculomotor and abducens nerves, leading to symptoms like ptosis and restricted eye movements. In this case, the patient had a maxillary sinus fungal infection causing ocular symptoms, which is clinically rare because the maxillary sinus is anatomically farther from the orbit with a relatively thick bony wall. The mechanism by which a maxillary sinus infection affects the orbit likely involves the fungus spreading through the ethmoid sinuses to reach the retro-orbital area. Fungal inflammation from the maxillary sinus can reach the middle meatus via the maxillary ostium, then enter the ethmoid sinuses through their openings. Alternatively, it might directly invade the ethmoid sinus through the ethmomaxillary plate. In this case, the patient had non-invasive maxillary sinus fungus ball without evidence of mucosal or bony invasion. To our knowledge, no previous reports have documented non-invasive maxillary sinus fungus ball causing ocular symptoms like ptosis, and the precise mechanism remains unclear.

The patient presented with right-sided ptosis worsening over two months. Acquired ptosis can be classified into several types based on etiology: aponeurotic, myogenic, neurogenic, mechanical, or traumatic ^[6]. Aponeurotic ptosis is common in the elderly due to degenerative changes, involving thinning, dehiscence, or detachment of the levator aponeurosis from the tarsal plate, leading to impaired force transmission. It is often bilateral, with preserved levator function (typically > 10mm) ^[7]. Mechanical ptosis results from direct compression, traction, or obstruction of levator muscle movement by local eyelid or orbital lesions, such as benign or malignant tumors (e.g., hemangioma, chalazion, neurofibroma, dermoid cyst) ^[6]. Myogenic ptosis is rare, caused by autoimmune attack or muscle fiber degeneration affecting the levator muscle, including conditions like mitochondrial myopathies (e.g., chronic progressive external ophthalmoplegia [CPEO], Kearns-Sayre syndrome [KSS]), oculopharyngeal muscular dystrophy (OPMD), oculopharyngeal distal myopathy (ODM), and myotonic dystrophy (MD) ^[8]. Neurogenic ptosis arises from lesions affecting the oculomotor nerve or sympathetic pathway, including oculomotor nerve palsy, Horner's syndrome, and neuromuscular junction disorders. Due to the long anatomical course of the neural pathways involved (oculomotor nerve and sympathetic chain), various pathologies can damage these nerve fibers and cause neurogenic ptosis ^[9]. Wang SH et al., in a study of 96 myasthenia gravis patients presenting with purely ocular symptoms, found ptosis to be the most common initial symptom, followed by diplopia ^[10]. Peng YT et al., reviewing 75 cases (77 eyes) of rhinogenic orbital apex syndrome, identified sinus infections as the primary cause leading to ptosis ^[11]. Additionally, vascular pathologies can cause neurogenic ptosis. Diabetic oculomotor nerve palsy is the most common cause of acquired oculomotor nerve palsy in adults, typically with acute onset. Its pathogenesis involves hyperglycemia-induced neuronal damage and ischemic changes. Pupil-sparing is common because the superficially located pupillomotor fibers may be relatively resistant to diabetic ischemic damage, an important clinical feature for differentiation ^[12]. In this case, the patient had unilateral right-sided ptosis with normal pupillary reflexes and a blood glucose level of 7.18 mmol/L, potentially mimicking diabetic oculomotor nerve palsy. However, given the progressive worsening over two months, the one-year history of chronic rhinosinusitis, and the sinus CT finding of fungal sinusitis

ipsilateral to the ptosis, neurogenic ptosis due to fungal involvement of the oculomotor nerve was considered the most likely mechanism, guiding appropriate treatment.

Surgery is the treatment of choice for fungus ball. The primary goals are to remove the fungal debris from the affected sinus and establish adequate drainage. Traditional open approaches like the Caldwell-Luc procedure, which requires a facial incision and bone window, are largely obsolete due to their invasiveness^[13, 14]. Currently, endoscopic sinus surgery is the standard approach. It utilizes the natural sinus ostia, provides excellent visualization of the intricate nasal and sinus anatomy, allows for precise removal of the disease, and offers advantages of low recurrence rates and minimal trauma. Regarding adjuvant antifungal therapy, while postoperative antifungal treatment can be effective, its routine use after successful surgical removal of a fungus ball is debated. Multiple studies indicate low recurrence rates after endoscopic surgery alone for fungus ball, and given the potential hepatorenal toxicity of many antifungal agents, their use should be considered carefully^[15, 16]. In this case, the patient with right maxillary sinus fungus ball without mucosal or bone invasion underwent successful endoscopic multiple sinus ostia surgery and radiofrequency ablation of the turbinates, achieving clearance of the lesion and establishing drainage. The most notable finding during postoperative ophthalmology follow-up was the significant and progressive improvement of her ptosis.

In recent years, the widespread use of antibiotics has been linked to an increased prevalence of secondary fungal infections. In the external auditory canal, topical quinolone antibiotics may alter the local microbiota and increase pH, eliminating bacterial competitors and allowing fungal overgrowth, leading to otomycosis^[17]. In the gut, antibiotics can shift the intestinal community from mutualism to competition and reduce levels of microbe-derived short-chain fatty acids in the cecum, thereby promoting the growth and intestinal colonization of *Candida albicans*^[18, 19]. In the lungs, *Aspergillus* colonization in elderly patients with chronic obstructive pulmonary disease is also strongly associated with antibiotic use^[20]. Currently, the specific mechanisms by which antibiotic overuse might trigger fungal rhinosinusitis are not fully established. A plausible explanation is that antibiotics disrupt the normal microbial balance on the sinus mucosal surface, compromising the biological barrier formed by the normal flora and facilitating fungal adherence and proliferation. Furthermore, secondary fungal infections are more common in patients with underlying conditions like hematologic malignancies or diabetes mellitus, and frequently affect the elderly. Such patients often have compromised immunity, which can alter the sinus environment and impair the mucociliary clearance function, creating favorable conditions for fungal growth and secondary infection^[21, 22]. Clinicians should pay close attention to the patient's history, including prior antibiotic use and conditions associated with immune dysfunction. In this case, the patient was 73 years old with a history of diabetes mellitus (an immunocompromising state) and had received antibiotic treatment in the past for chronic rhinosinusitis. Therefore, the possibility of fungal overgrowth within the sinus should be considered and investigated with appropriate imaging like sinus CT.

In conclusion, in ophthalmology patients presenting primarily with symptoms such as ptosis or diplopia, especially those with conditions associated with immune compromise or a history of antibiotic use, the possibility of sinusitis should be considered in the differential diagnosis alongside intracranial neurological disorders to avoid misdiagnosis and ensure timely management.

Declarations

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Author contributions

Writing original draft: Aokun Li and Boyang Zhu. Prepared all figures: Dehong Qiu. Guiding the writing of the draft: Xiaojing Wang and Lihong Zhang.

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Data availability

No datasets were generated or analysed during the current study.

Ethics approval and consent Statement

Ethical clearance was obtained from the Ethics Committee of Qingdao Municipal Hospital. The research was conducted in accordance with the Declaration of Helsinki. The authors obtain written informed consent from patient has given her consent for her images and other clinical information to be reported in the journal. Privacy and confidentiality were assured.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Figures



Figure 1

Right eye ptosis.



Figure 2

Limited abduction of the right eye.

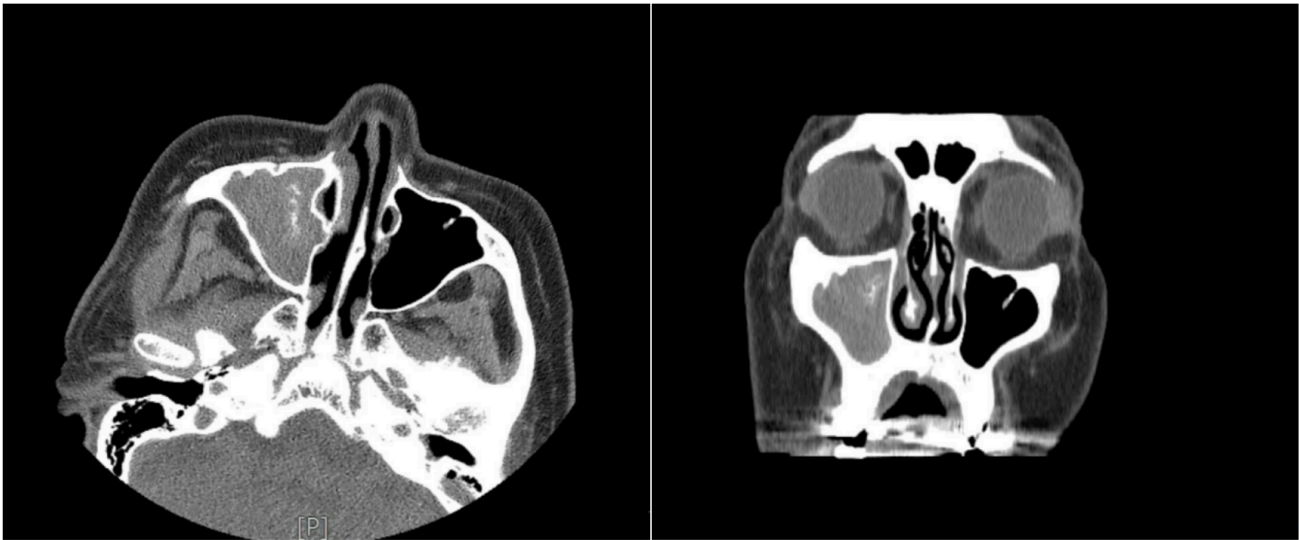


Figure 3

Sinus CT scan (axial view) showing mixed high and low-density opacities filling the right maxillary sinus.

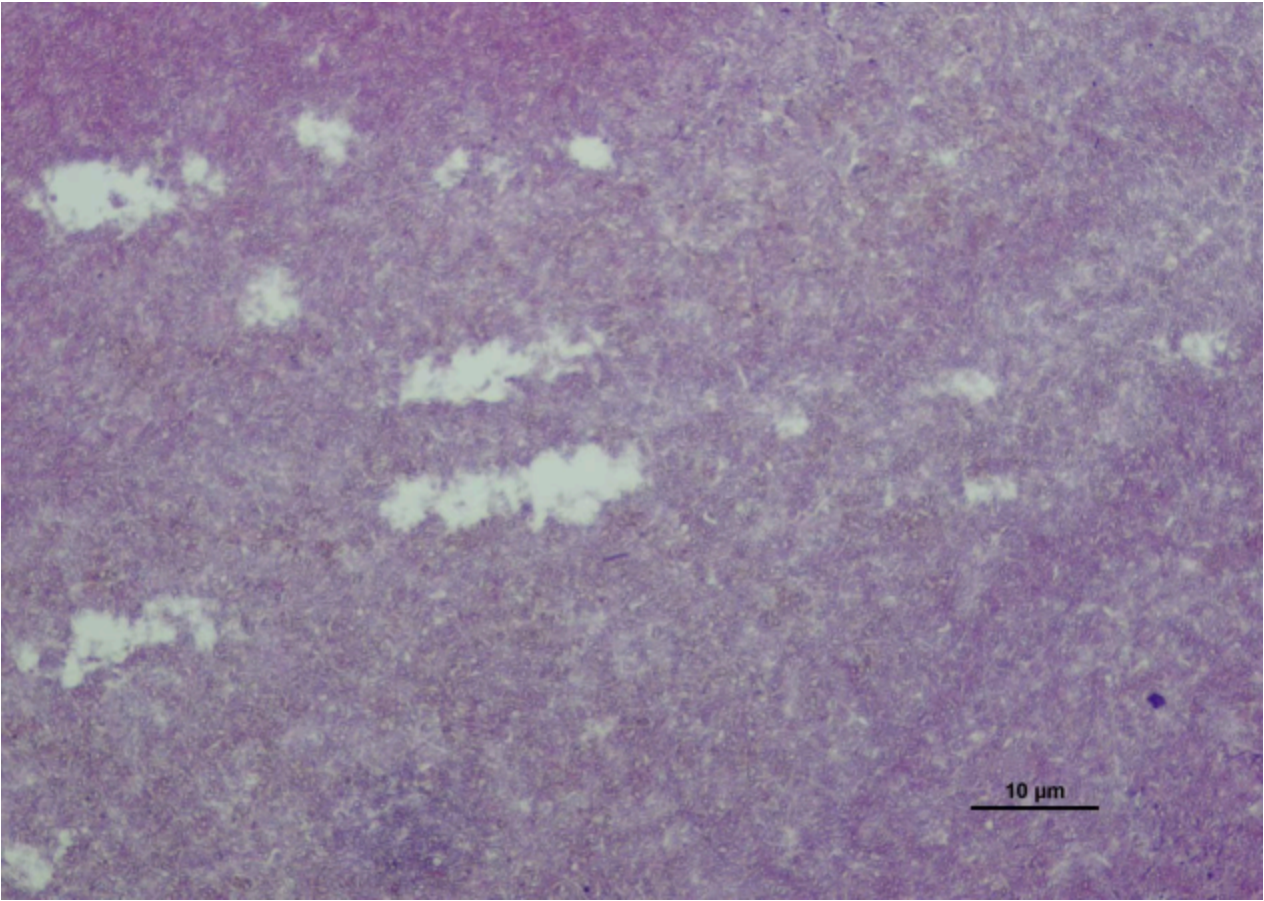


Figure 4

Rapid paraffin section pathology report showing fungal hyphae and spores.