

# Ophthalmic Manifestations of Paranasal Sinus Mucoceles

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**Background:** Paranasal sinus mucoceles are mucus-containing cysts caused by obstruction of the sinus orifice. Although such mucoceles originate in the paranasal sinuses, they are usually only associated with ophthalmic and not rhinologic symptoms. The purpose of this study was to demonstrate the presence of ophthalmic manifestations in patients with paranasal sinus mucoceles, and to discuss the possible mechanisms and prognosis for such manifestations.

**Methods:** Medical records for 41 patients with paranasal sinus mucoceles, who presented with ophthalmic complaints at our department over a 10-year period (1989–1999), were reviewed retrospectively. For analysis of the relationships between ophthalmic complaints and the affected paranasal sinuses, we considered the paranasal sinuses as anterior and posterior.

**Results:** Proptosis ( $n = 19$ ), periorbital pain (7), and impairment of ocular mobility (5), were common manifestations associated with mucoceles in the anterior paranasal sinuses (25 patients), while blurred vision ( $n = 9$ ) and impairment of ocular mobility (3) were frequently associated with mucoceles in the posterior paranasal sinuses (11 patients). Ophthalmic complaints resolved in 38 of 41 patients (92.7%) after operation.

**Conclusion:** The clinical ophthalmic manifestations of paranasal sinus mucoceles correlated with the paranasal sinuses involved (i.e. anterior or posterior). Because of cranial nerve involvement, mucoceles in the posterior paranasal sinuses had a worse prognosis than those in the anterior paranasal sinuses. [*J Chin Med Assoc* 2005;68(6):260–264]

**Key Words:** mucoceles, ophthalmic manifestations, paranasal sinuses, proptosis, vision

## Introduction

A paranasal sinus mucocele is defined as a collection of mucus lined by the mucus-secreting epithelium of a paranasal sinus. It occurs when a sinus ostium or a compartment of a septated sinus becomes obstructed, thus causing the sinus cavity to become filled with mucus and to become airless. Paranasal sinus mucoceles may result from inflammation, tumor, trauma or surgical manipulation.<sup>1</sup> Because of the anatomic proximity of the orbit, the pathologic process of paranasal sinus mucoceles will easily affect the orbit.<sup>2,3</sup> The frontal, ethmoid, sphenoid and maxillary sinuses all have an interface with the orbit. The maxillary sinus

shares the floor of the orbit, the frontal sinus is part of the orbital roof, the ethmoid extends along most of the medial wall of the orbit, and the sphenoid almost completely surrounds the orbital apex.<sup>2,3</sup> Therefore, mucoceles in the paranasal sinuses can easily affect the orbit and cause ophthalmic symptoms such as proptosis, blurred vision, and displacement of the globe.<sup>3,4</sup> Patients with such mucoceles and symptoms are often seen by ophthalmologists first, and then referred to otorhinolaryngologists.<sup>4</sup>

The objectives of this study were to examine the ophthalmic manifestations in patients with paranasal sinus mucoceles, and to evaluate prognosis in terms of the paranasal sinuses involved.

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## Methods

### Study protocol

We retrospectively reviewed the medical charts of 41 patients with paranasal sinus mucocoeles, who initially presented with ophthalmic symptoms between 1989 and 1999. All patients required an operation and underwent preoperative ophthalmologic and otorhinolaryngologic examinations, including tests of visual acuity, ocular movement, the visual field, sinuscopy, and a computed tomography (CT) scan. The diagnosis was based on clinical and CT findings, and surgical specimens were verified by histopathology. Factors analyzed included age, gender, number of years since the first nasal operation, clinical symptoms, imaging findings, and surgical procedures. Visual disturbances, treatment complications, duration of follow-up and disease recurrences were also reviewed.

### Paranasal sinuses analyzed

For analysis of the relationships between ophthalmic manifestations and lesion locations, the paranasal sinuses were divided into anterior and posterior sinuses based on preoperative, radiologic and intraoperative findings. The anterior sinuses comprised the maxillary, frontal and anterior ethmoid sinuses, whereas the posterior sinuses comprised the posterior ethmoid and sphenoid sinuses.<sup>4</sup>

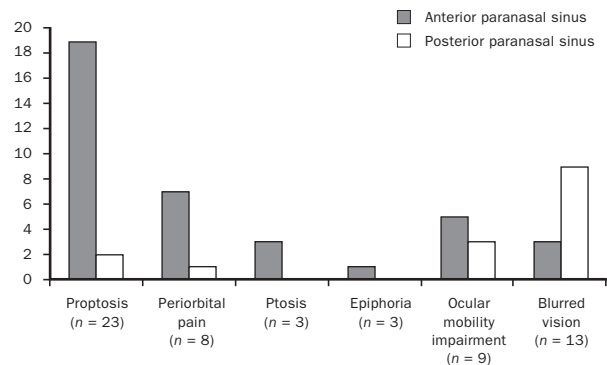
## Results

The mean  $\pm$  standard deviation (SD) age of the 41 patients, 17 men and 24 women, was  $53.7 \pm 16.6$  years (range, 13–76 years). Mucocoeles were evident in sinuses on the right ( $n = 22$ ), left (15), and both sides (4). The time from initial presentation of ophthalmic symptoms until operation ranged from 2 days to 3 years (mean  $\pm$  SD,  $5.2 \pm 7.1$  months). Patients with visual disturbances

usually sought help earlier than those with other ophthalmic manifestations (e.g. proptosis). Nineteen patients (46.3%) had a history of chronic sinusitis, sinus trauma, or nasal surgery. Thirteen (31.7%) had previously undergone nasal surgery, e.g. endoscopic sinus surgery. The period from previous nasal surgery until the first visit to our department ranged from 1 month to 30 years (mean  $\pm$  SD,  $15 \pm 11.5$  years).

Several ophthalmic signs and symptoms were found in patients with paranasal sinus mucocoeles: proptosis ( $n = 23$ ; 56.1%), blurred vision (13; 31.7%); impairment of ocular mobility (9; 22.0%); periorbital pain (8; 19.5%); and both ptosis and epiphoria (3; 7.3%). Measurements with a Hertel exophthalmometer showed mean  $\pm$  SD axial proptosis of  $4.7 \pm 2.9$  mm.

The relationships between ophthalmic signs and symptoms, and the sites affected by mucocoeles, are shown in Table 1 and Figure 1. Proptosis was present in 19 of 25 patients (76.0%) with mucocoeles in the anterior paranasal sinuses, and in 2 of 11 (18.2%) with mucocoeles in the posterior paranasal sinuses. Corresponding rates were 12.0% (3 of 25 patients) and 81.8% (9 of 11) for blurred vision, and 20.0% (5 of 25 patients) and 27.3% (3 of 11) for impairment of ocular



**Figure 1.** Relationships between ophthalmic signs/symptoms and the paranasal sinuses affected by mucocoeles.

**Table 1.** Ophthalmic signs/symptoms and sites affected by mucocoeles

	Mucocoele location		
	Anterior paranasal sinus (n = 25)	Posterior paranasal sinus (n = 11)	Anterior + posterior paranasal sinuses (n = 5)
Proptosis (n = 23)	19	2	2
Periorbital pain (n = 8)	7	1	0
Ptosis (n = 3)	3	0	0
Epiphoria (n = 3)	1	0	2
Impairment of ocular mobility (n = 9)	5	3	1
Blurred vision (n = 13)	3	9	1

mobility. The 5 patients with impaired ocular mobility due to mucocoeles in the anterior paranasal sinuses had either limited upward or lateral movement; whereas the 3 patients with impaired ocular mobility due to mucocoeles in the posterior paranasal sinuses had limited lateral gaze because of abducent nerve palsy. Periorbital pain was present in 7 of 25 patients (28.0%) with mucocoeles in the anterior paranasal sinuses and in 1 of 11 (9.1%) with mucocoeles in the posterior paranasal sinuses. Ptosis and epiphoria were only found in mucocoeles in the anterior paranasal sinuses. Patients with mucocoeles in both the anterior and posterior paranasal sinuses had proptosis ( $n = 2$ ), epiphoria (2), ocular mobility impairment (1), and blurred vision (1) (Table 1).

All patients underwent surgery at the Department of Otolaryngology, Taipei Veterans General Hospital: 10 patients with the Howard-Lynch external frontoethmoidectomy operation; and 31 with endoscopic sinonasal surgery. Ophthalmic complaints had a good outcome (i.e. dissipated or improved) in 38 patients (92.7%) after treatment, while the remaining 3 patients did not recover. Two patients (numbers 10 and 27) had no light perception preoperatively, and surgery failed to correct the visual disturbance (Table 2). One patient (number 15) experienced persistence of diminished visual acuity and a visual-field defect after surgery. In 10 of the 13

patients with blurred vision (76.9%), visual acuity improved with adequate surgical treatment. The patients with persistent visual disturbances all had mucocoeles in the posterior paranasal sinuses.

The duration of follow-up ranged from 1 to 136 months (mean  $\pm$  SD,  $31.5 \pm 33.6$  months). Recurrence of mucocoeles was noted in 4 patients (9.8%). One patient had a major surgical complication: a cerebrospinal fluid leak developed after the Lynch procedure for a right frontal mucocoele, but the leak dissipated after postoperative bed rest.

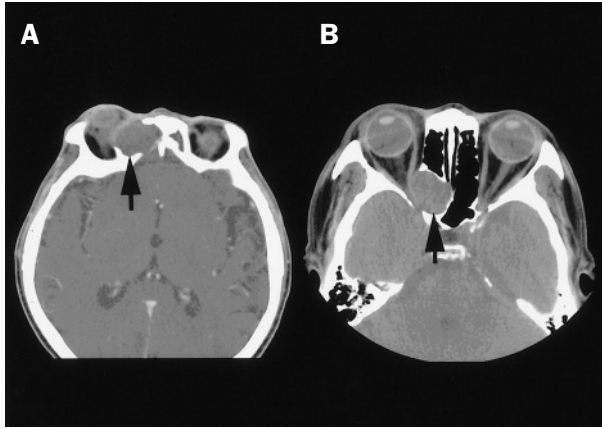
## Discussion

Mucocoeles occur most frequently in the frontal sinus, followed by the ethmoid, maxillary, and sphenoid sinuses.<sup>5</sup> In the present study, 25 of 41 patients (61.0%) had mucocoeles in the anterior paranasal sinuses, 11 of 41 (26.8%) in the posterior paranasal sinuses, and 5 of 41 (12.2%) in both the anterior and posterior paranasal sinuses (Table 1). A CT scan is an excellent diagnostic tool for revealing paranasal sinus mucocoeles with orbital involvement. Mucocoeles can cause bony sinus walls to bow radially outwards, thus giving an expansile appearance on CT scan (Figure 2).<sup>6</sup> The remolded cortex can be identified as a thin and dense line along the edge of an expanded sinus.

**Table 2.** Clinical data for the 13 patients with blurred vision

Patient no.	Pre-op visual acuity		Post-op visual acuity		Ophthalmic findings	Outcome
	OD	OS	OD	OS		
Anterior paranasal sinus						
9	6/20	6/6	6/10	6/6	No specific findings	Improved
13	6/10	6/7.5	6/10	6/7.5	No specific findings	Improved
26	20/20	10/20	20/20	10/20	Oculomotor nerve palsy	Improved
Posterior paranasal sinus						
6	6/60	6/6	6/10	6/6	VFD	Improved
10	NLR	6/6	NLR	6/6	VFD, optic atrophy	No recovery
15	6/30	CF/30	6/15	CF/30	VFD, optic atrophy	No recovery
17	6/60	6/10	6/20	6/6	VFD, compressive optic neuropathy	Improved
27	NLR	20/20	NLR	20/20	Compressive optic neuropathy	No recovery
28	6/60	6/6	6/6	6/6	Compressive optic neuropathy	Improved
29	CF/20	6/6	6/10	6/6.7	Optic neuritis	Improved
30	6/60	6/6	6/10	6/6	Compressive optic neuropathy	Improved
39	6/10	6/6.7	6/6	6/6	VFD	Improved
Anterior + posterior paranasal sinuses						
41	6/10	6/6.7	6/6.7	6/6	VFD, compressive optic neuropathy	Improved

CF = counting fingers; NLR = no light reflex; OD = oculus dexter; OS = oculus sinister; Post-op = postoperative; Pre-op = preoperative; VFD = visual field defect.



**Figure 2.** (A) A mucocoele in the right frontal sinus compressing the right orbit and causing proptosis. (B) A mucocoele in the right posterior ethmoid sinus restricting the medial rectus muscle, compressing the optic nerve, and causing compressive optic neuritis.

Headache, diplopia, proptosis, visual disturbances, and displacement of the globe, are common manifestations of paranasal sinus mucocoeles.<sup>7,8</sup> In our study, proptosis ( $n = 19$ ), periorbital pain (7), and impairment of ocular mobility (5) were the most common manifestations of mucocoeles in the anterior paranasal sinuses, while blurred vision ( $n = 9$ ) and impairment of ocular mobility (3) were frequently seen in mucocoeles in the posterior paranasal sinuses (Table 1, Figure 1). Mucocoeles in the anterior paranasal sinuses may expand the anterior and medial sinus walls, push the globe outward and downward, and restrict movement of the extraocular muscles, thus causing proptosis and impairment of ocular mobility.<sup>3,6,9</sup>

Blurred vision is more often associated with mucocoeles in the posterior than anterior paranasal sinuses, and can affect the optic or other cranial nerves via 2 mechanisms: first, expansion of the paranasal sinus wall may compress the optic nerve or compromise its blood supply, with subsequent optic atrophy;<sup>6,10,11</sup> second, optic neuritis may result from direct spread of suppuration from adjacent paranasal sinuses via bone loss or bone fissure.<sup>6,12</sup> Both optic nerve compression and neuritis can cause deterioration of visual acuity.<sup>6,12</sup> Besides the optic nerve, other cranial nerves (abducent or oculomotor) passing through the orbital apex or superior orbital fissure may be involved, thus resulting in impairment of ocular mobility.<sup>6,11-13</sup> Indeed, 3 patients in the present study had abducent nerve palsy, causing limited lateral gaze. Patients with mucocoeles in both the anterior and posterior paranasal sinuses may share all the ocular manifestations mentioned above.

Periorbital pain was experienced by 8 patients (19.5%), 7 of whom (87.5%) had involvement of the anterior paranasal sinuses. Such pain sensations are caused by inflammation or stretching of the paranasal sinus mucosa, nasal cavity mucosa, or dura, with nerve impulses transferred by the trigeminal nerve.<sup>4</sup> However, several studies have reported that about 70% of patients with sphenoid mucocoeles have the sensation of pain.<sup>14,15</sup> Among our patients, 29 of 41 (70.7%) presented with ophthalmic complaints alone, without accompanying rhinologic problems such as rhinorrhea or nasal obstruction. Therefore, delayed diagnosis of sphenoid mucocoeles, an obscure paranasal sinus problem, is possible.

The transnasal endoscopic management of paranasal sinus mucocoeles is associated with a recurrence rate of almost 0%.<sup>16-20</sup> Outcomes in our study also revealed a good surgical success rate for resolution of ophthalmic symptoms (38 of 41 patients, 92.7%). The prognosis for visual disturbances after operation depends on the prevalence, the time from onset of mucocoeles until surgery, and the severity of preoperative impairment of visual acuity. Rapid loss of visual acuity is usually caused by the spread of infection or inflammation from sinus lesions to the optic nerve, whereas gradual deterioration of visual acuity may result from ischemia of the optic nerve due to pressure from mucocoeles.<sup>4,6</sup> The sudden onset of visual loss usually has a poor prognosis.<sup>4</sup> In our study, the mean time from symptom manifestation to treatment in patients with improvement of visual disturbances was 8.6 months, whereas in patients without such improvement, it was 1.3 months. Thus, patients who lost their vision rapidly sought treatment sooner, but their prognosis was worse than that of patients with a gradual disease onset.

Severe preoperative visual disturbances, such as blindness and loss of light perception, usually imply difficult recovery.<sup>4</sup> In our patients, ophthalmic complaints improved after surgery in 38 patients, while the remaining 3 patients, who presented with severe preoperative visual disturbances such as loss of light perception, decreased visual acuity and visual field defects (Table 2), all associated with mucocoeles in the posterior paranasal sinuses, had no resolution of ophthalmic complications. McCarthy and Frenkel<sup>15</sup> found that visual acuity was reduced, because of pressure on the optic nerve or central artery, in 46 of 72 patients (63.9%) with sphenoid sinus mucocoeles. No improvement could be attained in more than 50% of these patients, even with surgical intervention.<sup>15</sup>

Eight of 11 patients (72.7%) with mucocoeles in the posterior paranasal sinuses in our study experienced

preoperative deterioration in visual acuity. Three of these 8 patients (37.5%) had no subsequent improvement in vision, despite surgery. Conversely, ophthalmic complications caused by mucocèles in the anterior paranasal sinuses all resolved with surgical intervention. Thus, distinction between mucocèles in the anterior and posterior paranasal sinuses can be helpful for the clinical assessment and general management of paranasal sinus mucocèles.

Usually, patients with paranasal sinus mucocèles have no nasal symptoms, and initially seek help only for subjective ophthalmologic complaints. Therefore, a good understanding of paranasal sinus mucocèles by both ophthalmologists and otorhinolaryngologists is particularly important for early diagnosis and rapid surgical intervention.

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