Anterior clinoidal mucocele causing optic neuropathy: resolution with nonsurgical therapy

Case report

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Inflammatory mucoceles, which are cystic masses of mucoid secretions lined by respiratory epithelium, can develop in the paranasal sinuses secondary to both osteum obstruction and sinus inflammation. In certain individuals, the anterior clinoid processes may become pneumatized during the development of the skull base, making these structures susceptible to mucocele formation. Mucoceles and the resulting inflammation in the anterior clinoid process can cause visual dysfunction due to compression or inflammation of the optic nerve. A reduction in the inflammatory process, brought about by antibiotic therapy, may be effective in reversing optic neuropathies due to an anterior clinoidal mucocele.

Case Report

Presentation and History. This 20-year-old left-handed woman presented with a chief complaint of right-sided visual loss. Approximately 1 month earlier, the patient had noticed a large, centrally located blind spot in the visual field of her right eye at the time a bright flashlight was shone into her eyes. It is unclear whether this visual deficit had been present prior to this event. She was subsequently examined by an ophthalmologist who identified a significant right visual field defect consistent with a cecocentral scotoma (Fig. 1 upper). The Ishihara color evaluation test elicited numerous errors and confirmed optic neuropathy. The vision in her left eye was normal.

Two months prior to noticing the blind spot, the patient had had a significant sinus infection that was accompanied by sore throat and right ear infection, and pain. Antibiotic therapy with azithromycin, taken orally, resulted in complete resolution of these symptoms. The patient was not taking any medications at the time that the visual field dysfunction was noted.

Magnetic resonance images obtained at the time of confirmation of optic neuropathy revealed a signal abnormality in the right anterior clinoid process that was interpreted as a possible clinoidal meningioma. Surgical exploration was recommended and scheduled.

Examination. At evaluation 1 month following the identification of her visual deficit, the patient stated that her vision had improved significantly. Ophthalmological examination revealed no evidence of afferent pupillary defect. Extraocular movements were full with no nystagmus or diplopia. Pupils were equal, round, and reactive to light and accommodation. The results of testing with the Ishihara color plates were normal. No enlargement of the blind spot or perturbation in visual field was found (Fig. 1 lower).

Imaging. Computed tomography revealed normal bone with no evidence of erosion or hyperostosis. There was aeration of the left anterior clinoid process. The right anterior osteum obstruction and sinus inflammation.\(^1\) In certain individuals, the anterior clinoid processes may become pneumatized during the development of the skull base, making these structures susceptible to mucocele formation. Mucoceles and the resulting inflammation in the anterior clinoid process can cause visual dysfunction due to compression or inflammation of the optic nerve. A reduction in the inflammatory process, brought about by antibiotic therapy, may be effective in reversing optic neuropathies due to an anterior clinoidal mucocele.

Key Words • anterior clinoid process • mucocele • inflammation • optic neuropathy • antibiotic therapy

Abbreviation used in this paper: MR = magnetic resonance.
clinoid process contained material of a soft-tissue density (Fig. 2A). Magnetic resonance imaging also showed the left anterior clinoid process to be pneumatized; the right anterior clinoid process contained tissue that could be characterized as inspissated mucus on the basis of MR imaging features (Fig. 2B–D). The MR images obtained 1 month earlier were reviewed for comparison. No difference was found between the two sets of images, and neither study revealed any evidence of meningioma.

Management and Clinical Course. On the basis of the results of imaging studies and the patient’s clinical presentation and history of sinusitis, it was postulated that the episode of sinusitis resulted in inflammation and mucocele formation in the right anterior clinoid process, although the patient was unaware of visual problems at the time of her acute sinusitis. The patient’s right visual field defect likely resulted from a transient optic neuritis due to inflammatory mucocele formation in the right anterior clinoid process. The patient’s symptoms had resolved with appropriate antibiotic therapy, and no surgical exploration of the area was necessary.

Discussion

Pneumatization of the anterior clinoid process is a normal anatomical variant in sphenoid sinus development. Aeration of the anterior clinoid process renders it susceptible to both obstruction and secondary inflammation of the sinus osteum, which can lead to the development of an inflammatory mucocele.1,3 Mucoceles, which result from chronic accumulation of mucous secretions and are lined by respiratory epithelium,3 can compress adjacent structures and cause secondary defects in cranial nerve function. Due to the proximity of the anterior clinoid process to the optic nerve, patients with mucoceles in this location often present with ocular symptoms, including optic neuropathy, visual field defects, or blindness.4 In contrast, patients with mucoceles of the sphenoid sinus often present with unilateral abducens palsy resulting in diplopia or oculomotor palsy resulting in ptosis due to the anatomical relationship between the sphenoid sinus and the cavernous sinus.4 The onset of these varied ocular symptoms can be associated with sinus inflammatory disease including a clinical history of chronic sinusitis, allergic rhinitis, and/or previous sinus surgery.3 Mucoceles occurring in the sphenoid sinus (including those of the anterior clinoid process) account for only about 1% of paranasal sinus mucoceles, making them rare, although significant, occurrences.4

Inflammatory mucoceles of the anterior clinoid process are often visualized through computed tomography or MR imaging. The signal characteristics of a mucocele seen on MR images are highly variable, and are determined by the viscosity, water content, and protein content of the accumulated mucoid secretions.3 Early in the disease process, signal intensity may be decreased on T1-weighted images due to a high amount of water being contained in the mucocele.3 Decreasing amounts of water result in an increased proportion of protein, and thus a gradual progression toward hyperintensity is found on T1-weighted images over time.3 Signal intensity on T2-weighted images is also affected by mucocele composition. High signal intensities reflect
high water content early in the disease process, and as the mucocele becomes chronic and loses much of its initial water content, signals on $T_2$-weighted images can be decreased significantly.

Mucoceles that show enhancement with contrast, as well as isointense signal intensity on both $T_1$- and $T_2$-weighted MR images may mimic a neoplasm.

Because of this, the clinical history of a patient with an increased or abnormal signal intensity seen in the anterior clinoid process on imaging studies is important in differentiating between inflammatory conditions and neoplastic processes such as meningioma.

It has been reported that patients with mucoceles in the anterior clinoid process or sphenoid sinus require surgery in order to achieve correction of optic neuropathies. In previous studies, it has also been stated that delays in surgical debridement of an inflammatory mucocele with associated optic neuropathy are associated with poorer visual outcomes. The case we present here represents an important exception to these theories, based on the resolution of the visual field defects after administration of appropriate antibiotic therapy. In our patient, an inflammatory mucocele of the anterior clinoid process seems to have caused a reversible optic neuritis that, when treated in a timely fashion, led to a full recovery of visual function. The patient did not undergo surgery, and imaging studies combined with clinical history led to considerable certainty that a neoplastic process, such as meningioma, was not present. Recognition of the patient’s history of sinusitis in light of the imaging findings of an inflammatory mucocele allowed her to avoid surgery and receive only medical treatment, with no compromise in her visual function.

Conclusions

In cases involving patients with anterior clinoidal mucoceles who present with optic neuropathy, a history of sinusitis can aid in the diagnosis of a reversible form of optic neuritis for which proper antibiotic therapy may be preferable to surgical intervention. For such therapy to be possible, mucoceles of the sphenoid sinus (including the anterior clinoid process) should be included in the differential diagnosis when abnormal signal intensity is seen on imaging in this location. It has been noted that patients who have undergone endoscopic (surgical) marsupialization of an inflammatory mucocele causing optic neuropathy may still not recover full visual function; therefore, consideration of other methods of treatment prior to surgical exploration and debridement seems prudent in certain clinical conditions such as sinusitis. If recognized in a timely manner, patients can experience complete resolution of their visual symptoms with prompt administration of antibiotic therapy.

References