Recovery from long-term severe visual impairment due to mucocele in the Onodi cell

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Received: 21 June 2021 / Accepted: 10 August 2021

Abstract
The Onodi cell is a pneumatized posterior ethmoid cell that lies on the sphenoid sinus and is closely related to the optic canal. A rare case of a patient who was relieved from long-term severe visual impairment caused by mucocele in the Onodi cell is presented herein. An 80-year-old man was referred to the hospital by an ophthalmologist with a complaint of blurred vision in the right eye for a couple of months. A computed tomography scan demonstrated a cystic lesion occupying the right posterior ethmoid sinus, which suggested the Onodi cell. In addition, a bone defect of the optic canal was present. Ophthalmologic examination showed no papilledema. However, severe visual impairment and narrowing of the visual field in the right eye were noted. Surgical treatment using the endoscopic endonasal approach was performed under general anesthesia. Purulent discharge oozed out when the cystic lesion in the right posterior ethmoid sinus was opened. His visual impairment and severe visual field contraction gradually improved after surgery. In this case, the patient’s severe visual impairment improved although a couple of months had passed before treatment. Preoperative fundus examination showed no optic nerve atrophy or inflammatory optic neuropathy in the right eye, counting fingers and visual acuity was considered to have improved.

Key words: Onodi cell, Mucocele, Visual impairment, Endoscopic sinus surgery

Introduction
The Onodi cell, first described in 19041, is a pneumatized posterior ethmoid cell that lies on the sphenoid sinus and is closely related to the optic canal. Therefore, the optic nerve may be exposed along the superior lateral wall of the posterior ethmoid cell2,3. Pathological processes within Onodi cells, such as a mucocele, can cause ophthalmologic complications. Mucoceles often occur in the frontal and anterior ethmoid sinus rather than in the posterior ethmoid and sphenoid sinuses. Some cases of visual impairment have been reported in studies on mucoceles in the Onodi cell. However, it is believed that only one case has been reported about the recovery of visual dysfunction from Onodi cell mucocele, where symptoms had been presented for over a month before surgical intervention4. The first case of a patient who was relieved from long-term severe visual impairment caused by mucocele in the Onodi cell is presented herein.

Case report
An 80-year-old man was referred to the hospital by an ophthalmologist, complaining of blurred vision in the right eye for a couple of months without other neurological findings. The patient had no history of nasal or paranasal sinus inflammation or surgical manipulation. Computed tomography (CT) demonstrated a cystic lesion occupying the right posterior ethmoid sinus that suggested the Onodi cell, and a bone defect of the optic canal was present (Fig. 1A, B). Ophthalmologic examination showed no papilledema, but it showed severe right-sided visual impairment, 20-cm finger counting (visual acuity in the right eye: VA (R) = 20 cm/F.C.), and narrowing
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SUJMS 34.33-36, March 2022

of the visual field in the right eye (Fig. 2).
Surgical treatment using the endoscopic endonasal approach was performed under general anesthesia. A bulging lesion in the right posterior ethmoid sinus was punctured, and mucus was drained. As the optic nerve was identified, the posterior ethmoid sinus was confirmed as the Onodi cell (Fig. 3A). The patient’s visual impairment and severe visual field contraction gradually improved 6 days after surgery (R.V. = 0.07; Fig. 3B). However, postoperative steroid administration was not performed.

Discussion

Mucoceles are believed to occur secondary to sinus drainage obstruction, resulting in the retention of secretion in the sinus. Their common occurrence sites are the maxillary, frontal, and anterior ethmoid sinuses. Mucoceles in the posterior ethmoid and sphenoid sinuses are rare, representing only 1% of all mucoceles in the paranasal sinus. The reasons for the occurrence of mucoceles may be surgery, inflammation, trauma, tumor, or idiopathic. No previous history of sinus surgery, chronic sinusitis, and trauma was noted in the present case, and the mucocele was considered the idiopathic type.

The Onodi cell is the most posterosuperior cell of the posterior sinus and extends into the superolateral portion of the sphenoid sinus. Axial and coronal CT is useful for identifying the Onodi cell. In a previous study, the CT of patients with chronic sinusitis revealed the Onodi cell in 12% of 200 patients. The diagnosis would not be difficult if the Onodi cell was bulging by the mucocele. However, if a patient has any ocular symptoms, lesions in the posterior paranasal sinuses, including an Onodi cell, may occur because the Onodi cell is closely associated with the optic nerve.

Retrobulbar optic neuropathy caused by mucoceles

Fig. 1. Preoperative findings. CT demonstrates a cystic lesion occupying the right posterior ethmoid sinus that suggested the Onodi cell (asterisk), and bone defect of the optic canal (arrow up) is seen. A Axial and B coronal.

Fig. 2. Ophthalmologic examinations. A The Goldman perimeter shows severe visual field contraction. B Fundoscopy shows no optic atrophy.
may be explained by several mechanisms. First, direct mechanical compression of the optic nerve may cause optic neuropathy. As the optic nerve canal contains the nerve and nerve sheath without the protection of soft tissues, pressure due to expansion of the mucocele may reach the nerve if the thin bony wall of the canal disappears or in the presence of congenital dehiscence. Second, ischemia and venous congestion may also be one of the mechanisms for optic neuropathy. Finally, optic neuritis due to inflammatory reaction from the mucocele may be involved in visual impairment. Fukuda et al. reported that ischemia and inflammation induce an acute onset or deterioration of ophthalmologic signs and symptoms, which may indicate a poor prognosis. In contrast, Lee et al. suggested that patients with a mucocele that cause a direct mechanical compression without superinfection may experience improvement after surgery. In this case, the cause of the retrobulbar optic neuropathy was expected to be a direct mechanical compression without superinfection instead of ischemia and inflammation.

Visual prognosis depends on the time from disease onset until surgery. Thus, patients with visual impairment due to mucoceles should receive surgical treatment as soon as possible. Nonaka et al. reported that surgical treatment should be performed within 24 h from the onset of visual impairment and the visual prognosis will be poor if intervention occurs 1 month after presentation. Morita et al. found that two such patients showed remarkable postoperative improvement after undergoing surgical treatment after 16 and 3 days, respectively, beginning the onset of symptoms. In both cases, preoperative fundoscopy showed no optic atrophy, and no clinical evidence of inflammation and infection was present.

Furthermore, visual prognosis depends on visual impairment severity. In most patients with total loss of light perception, visual acuity does not recover postoperatively. However, Maniglia et al. showed that loss of light perception does not constitute irreversible loss of optic nerve function and that prompt surgical treatment may restore vision in some cases. In the current case, the patient’s visual acuity improved after the surgery although a couple of months had passed since the occurrence of blurred vision. Therefore, irreversible visual impairment may not occur when no abnormalities exist in the optic nerve and fundus even if time has passed since the occurrence of vision impairment. Recognizing complications caused by paranasal mucocele by both ophthalmologists and otolaryngologist is essential for early diagnosis and surgical treatment to avoid permanent severe visual impairment.

Conclusions

The first case in which severe visual impairment improved although a couple of months had passed before surgery is reported herein. The visual prognosis depends on both the interval until surgery and visual impairment severity. Early diagnosis and surgical treatment are essential for recovering from optic neuropathy caused by such sinus diseases. Visual acuity was considered to have improved because preoperative fundus examination showed no optic nerve atrophy or fundus inflammation. Thus, considering the performance of surgery may still be worthwhile when a patient with severe visual acuity loss consults otolaryngologists a while after symptom onset.
Conflicts of interest

None.

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