Giant Pyocele in the Anterior Intracranial Fossa
—Case Report—

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Abstract
A 43-year-old male presented with headache localized in the right forehead. Computed tomography and magnetic resonance imaging demonstrated a cystic mass in the frontal sinus, with a huge extension into the anterior cranial fossa. The mass was removed by transcranial surgery. The cyst contained pus. Histological examination of the cyst wall revealed mucocele (pyocele). Pyocele with huge intracranial extension is rare and requires combined neurosurgery and otolaryngology for optimum treatment.

Key words: mucocele, pyocele, frontal sinus

Introduction
Mucocele presents as a slowly enlarging mass arising from a paranasal sinus.2,13) Pyocele is an infected mucocele containing pus.1,13) Mucocele is usually defined as an accumulation of mucous secretion in a paranasal sinus obstruction caused by inflammation, fibrosis, trauma, previous surgery, or anatomical abnormality, or to a mass lesion such as an osteoma.1,6,7,10,12) The frontal sinus is most commonly involved, whereas sphenoid and maxillary mucoceles are rare, and ethmoid sinus mucoceles almost always occur in conjunction with frontal or sphenoid mucocele.1,13) Mucocele with intracranial extension is uncommon.3,6,7,14–16)

We describe a case of giant pyocele with extension into the anterior intracranial fossa.

Case Report
A 43-year-old male complained of headache localized in the right forehead for 2 weeks prior to admission. He was admitted on September 9, 1997. Neurological examination revealed no abnormalities. Fundoscopic examination detected no papilledema. Blood examination revealed a white blood cell count of 10,200/mm³ and C-reactive protein of 0.3 (−). Skull radiography showed opacification of the frontal sinus. Computed tomography (CT) showed a low density homogeneous mass in the right frontal sinus, which had eroded through the posterior wall of the frontal sinus and formed a large extension into the anterior cranial fossa. The margin of the mass lesion was partially surrounded by bony fragments and was linearly enhanced by contrast material (Fig. 1). The lesion had severely compressed the right frontal lobe. Three-dimensional (3D) bone density CT demonstrated a defect of the posterior wall of the frontal sinus, and thinning and inferior depression of the superior orbital roof and the anterior ethmoid cell roof. 3D CT also showed thinning of the inner table of the frontal bone and peripheral hyperostotic change (Fig. 2). Magnetic resonance (MR) imaging showed that the mass was slightly hyperintense to the brain on the T₁-weighted images, hyperintense on the T₂-weighted images, and the margin of the mass lesion was linearly enhanced by gadolinium-diethylene-triamine-penta-acetic acid. Sagittal MR imaging suggested that the lesion was extradural and coronal MR imaging showed that the right intrabital contents were compressed extraconically (Fig. 3). Carotid angiography showed an avascular extraxial mass lesion in the right frontal region. Based on these neuroimaging examinations, epidural abscess or mucocele arising from the frontal sinus was suspected. The patient did not have any medical history of paranasal infections. Intranasal examination by fiberoptic scope showed no evidence of paranasal infection.

A bifrontal transbasal craniotomy was performed on September 22, 1997. Removal of the bone flap revealed a thin encapsulated cyst containing yellowish pus. The capsule wall and bony segments were separated from the dura mater. The dura mater over the
The frontal base was intact. The inside of the frontal sinus was completely covered by tight fibrous tissue, so frontal fossa reconstruction was not performed. Culture of the pus was negative. Frontal sinus drainage (enlargement of the frontonasal duct) was achieved by transnasal fiberoptic scope.

Histological examination showed respiratory epithelium with cilia and goblet cells, compatible with mucocele (pyocele) (Fig. 4). The postoperative course was uneventful and his frontal headache disappeared. He was discharged on October 8, 1997 without neurological deficits.

**Discussion**

Mucocele is associated with a preceding history of sinusitis in 50% of the cases, trauma in 28%, and allergy in 11%. Chronic sinusitis resulting in inflammation and scarring of the sinus ostia can result in
mucocoe formation. The frontal sinus has the longest drainer (frontonasal duct), so mild catarrhal inflammation, edema, and ciliary failure of the respiratory epithelium can obstruct the frontonasal duct of the frontal sinus and cause mucocoe formation without purulent sinusitis. Our patient did not have any symptoms of paranasal infection and the preoperative intranasal examination found no abnormalities.

Symptoms of frontal sinus mucocoe vary from none to incapacitating headache and visual disturbance. Proptosis is the most common chief complaint (83%) followed by diplopia (45%). Physical examination of patients with frontal sinus mucocoe often detects frontal tenderness and periorbital swelling, chemosis, decreased visual acuity, epiphora, and restricted extraocular movement. Mucoce may directly invade the surrounding structures (i.e., orbital contents and the brain), causing pressure on these structures. Mucoce can also become infected (pyocele) and may rupture intracranially. Frontal sinusitis or frontal mucocoe have the highest rates of intracranial complications because of the anatomical relationships. In the present case, the pyocele in the frontal sinus had formed a huge extension into the anterior cranial fossa, the symptoms are often subtle without focal neurological changes, unless the patient develops signs of increased intracranial pressure from the mass effect.

CT is the most valuable diagnostic tool. There are three major CT criteria in the diagnosis of mucocoe: homogeneous isodensity mass, clearly defined margin, and patchy osteolysis around the mass. Erosion of the sinus wall with marginal sclerosis in the frontal sinus is also indicative of frontal sinus mucocoe. In the present patient, coronal and sagittal MR imaging clearly demonstrated the mass in the frontal sinus and the large extension posteriorly into the anterior cranial fossa. The MR imaging of the present case was hyperintense on the T1-weighted images, this finding might suggest the pyogenic content of the mucocoe. 3D CT clearly showed the defect in the posterior wall of the frontal sinus with marginal hyperostotic change. We think that 3D CT is useful in the diagnosis and for the preoperative planning of the frontal base reconstruction.

Frontal sinus pyocele extending into the anterior intracranial fossa has a similar appearance to epidural abscess caused by frontal sinusitis. Frontal sinusitis may cause intracranial infectious diseases, such as subdural abscess, brain abscess, and epidural abscess. The neuroimaging findings of epidural abscess caused by frontal sinusitis are the same as those of pyocele. Therefore, the final diagnosis will depend on the histological examination of the abscess wall.

Frontal sinus mucocoe is a disease that falls between the fields of otolaryngology and neurosurgery. Treatment requires removal of the mucocoe sac and the offending obstruction with reestablishment of normal sinus drainage. However, intracranial extension requires transcranial surgery (bifrontal transbasal craniotomy). If cranialization of the frontal sinus occurs, frontal cranial base reconstruction by peristele flap and/or bony implantation is needed with transnasal sinus drainage. Therefore, collaboration with otolaryngologist will achieve optimum treatment for a patient with frontal sinus mucocoe and intracranial extension.

References


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