Large Frontal Sinus Mucopyocele

Anirudh Shukla, Vivek Dudeja

ABSTRACT

A mucocele is an epithelial-lined, mucus-containing sac completely filling the sinus and capable of expansion. This is in contradistinction to a blocked sinus cavity which simply contains mucus within the sinus. The frontal sinus is most commonly involved, whereas sphenoid, ethmoid, and maxillary mucoceles are rare. Frontal sinus is present just above the orbital cavity so any mass causing the expansion of floor of the frontal sinus leads to outwards (proptosis), downward and lateral displacement of orbit. If the cyst continues to expand within the orbital cavity, the mass may mimic an orbital growth or lesion pushing orbit laterally.

A mucocele results from the obstruction of a sinus ostium, leading to the accumulation of secretions and the gradual, smooth expansion of the sinus. The mucocele contents often become increasingly desiccated and have an increasing protein content over time; therefore, they may show an increased density on CT scanning and variable degrees of hyperintensity on T1-weighted MRI sequences and hypointensity on T2-weighted MRI.

Here we came across a patient who had right sided frontal mass causing proptosis and lateral displacement of right eye with vision limited only to perception of light. CT showed an expansile frontal mass with orbital displacement. We did external frontoethmoidectomy and a diagnosis of mucopyocele was made. The case, the experience and the outcome of external frontoethmoidectomy is being discussed.

Keywords: Frontal mucocele, Mucopyocele, Compromised vision in frontal mucocele, External frontoethmoidectomy, Surgical treatment.

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INTRODUCTION

Mucoceles of the paranasal sinuses were first described by Langenbeck (1820) under the name of hydatids. Rollet (1909) suggested the name mucocele.

A mucocele is an epithelial-lined, mucus-containing sac completely filling the sinus and capable of expansion. This is in contradistinction to a blocked sinus cavity which simply contains mucus within the sinus. However, the mucoceles usually behave like real space-occupying lesions that cause bone erosion and the displacement of surrounding structures. The proximity of mucoceles to the brain may cause morbidity and potential mortality, if left without intervention. The frontal sinus is most commonly involved, whereas sphenoid, ethmoid, and maxillary mucoceles are rare.

The etiology of mucoceles is multifactorial, which involve inflammation, allergy, trauma, anatomic abnormality, previous surgery, fibrous dysplasia, osteoma, or ossifying fibroma. Obstruction of natural ostia which impairs the drainage of sinus is an important finding. Sinuses are in close relation to the orbit and brain and hence mucoceles of the paranasal sinuses can spread both intraorbitally and intracranially.

The diagnosis of mucocele is based on a clinical investigation conducted with the aid of computed tomography (CT) and magnetic resonance (MR) imaging. CT is used in determining the regional anatomy and extent of the lesion, specifically the intracranial extension and the bony erosion. MR imaging is useful in differentiating mucoceles from neoplasms via contrast enhancement.

The mainstay of management of mucoceles is surgery, which ranges from functional endoscopic sinus surgery to craniotomy, and craniofacial exposure, with or without obliteration of the sinus. As surgical instrumentation has improved and the pathophysiology is better understood, surgical treatment of mucoceles has evolved into procedures that are less invasive and which emphasize more on surgical drainage over ablation.

CASE REPORT

A 55-year-old male presented to our OPD with chief complaints of right superomedial eye swelling for last 2 months. The swelling was associated with excessive watery discharge and pain in right eye as well as pain in right frontal region. There was no history of diplopia. History of significant decreased vision from right eye was present. There was no history of nasal discharge or nasal obstruction. There was previous history of trauma over the forehead and temple region around 1 year back.

On physical examination, there was fluctuant swelling present in superomedial region above the right eye of size about 3 × 2 × 1 cm (Fig. 1). There was mechanical ptosis due to swelling and the eyeball was pushed inferiorly and laterally. Vision was limited to only perception of light in right eye with full extraocular movements in all directions except in superomedial direction. Pupillary reaction to light and accomodation were normal. Fundus examination showed grade-2 hypertensive changes. On anterior rhinoscopy, nose was normal.

On contrast-enhanced CT (Fig. 2), there was large expansile cystic lesion of size about 10 × 5 × 3 cm with bony
scalloping, was found to be present involving right frontal sinus containing hypodense contents with expansion of both anterior and posterior table of frontal sinus and extension of lesion into medial aspect of right orbit displacing the eye globe laterally.

The patient’s mucocele was explored with an Lynch-Howarth external frontoethmoidectomy. The cavity was found to be filled with mucopurulent thick discharge. The discharge was cleared off, the entire mucocele was removed along with complete excision of mucocele wall. The medial orbital wall was checked for presence of bony septum which could prevent medial replacement of orbit after the surgery. A proper wide opening is made between sinus cavity and nasal cavity to ensure proper drainage.

The size of the swelling reduced significantly with reduction in inflammation (Fig. 3) and the patient’s vision improved significantly from mere perception of light to 6/12 both with pin hole and correction on 5 postoperative day (Table 1).

**DISCUSSION**

Mucoceles are collections of mucus enclosed in a sac of lining sinus epithelium within an air sinus resulting from an obstruction to the outlet of the cavity which may cause an expansion of the sinus by resorption of the bony walls.7 The mucoceles are benign, slow-growing lesions that commonly occur in the frontal or ethmoidal group of sinuses and are rarely found as an isolated intranasal lesion within the confines of the middle turbinate. The sac may be filled with pus as a result of chronic infection, in which event it is known as a chronic pyocele.

- Can form at any age, but the majority are diagnosed in patients 40 to 60 years old.8
- Males and females are equally affected.
- Approximately 60 to 89% occurs in the frontal sinus, followed by 8 to 30% in the ethmoid sinuses, and less than 5% in the maxillary sinus. Sphenoid sinus mucoceles are rare.

### Pathophysiology3,17

Obstruction of frontal recess and subsequent infection within the frontal sinus

| Continued stimulation of lymphocytes and monocytes |
| Production of cytokines by the lining fibroblasts (prostaglandin E2 and collagenase) |
| Promote bone resorption and remodeling |
| Result in expansion of the mucocele |

Culture of the aspirated mucocele contents can sometimes confirm the presence of infection. A study demonstrated that the most common isolates were *Staphylococcus aureus*, alpha-hemolytic streptococci, *Haemophilus* species, and Gram-negative bacilli. The predominant anaerobic isolates were *Propionibacterium acnes*, *Peptostreptococcus*, *Prevotella*, and *Fusobacterium* species.6

Studies have found that high levels of prostaglandin E2 plays a major role in the osteolytic process in mucoceles and explains the locally-aggressive behavior of these expanding masses.9

### Clinical Presentation

#### Complaints

Frontal headache, facial asymmetry, or swelling ophthalmological manifestations, such as impaired visual acuity, reduced ocular mobility or proptosis.

#### Examination

Periorbital tenderness, swelling, chemosis, decreased visual acuity, and restriction of extraocular movements.

Frontoethmoidal complex produce a lateral, downward, and forward (proptosis). Ethmoidal lesions in infants produce a proptosis which is characteristically lateral, forward and upward.

### Radiological Findings

There are three criteria for CT diagnosis of a mucocele:

- Homogeneous isodense mass.

**Table 1: Vision of patient preoperatively and postoperatively were as follows**

<table>
<thead>
<tr>
<th>Vision</th>
<th>Right</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Without pin hole</td>
<td>With pin hole</td>
</tr>
<tr>
<td>Preoperative</td>
<td>PL</td>
<td>PL</td>
</tr>
<tr>
<td>Postoperative day 2</td>
<td>6/60</td>
<td>6/60</td>
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<tr>
<td>Postoperative day 5</td>
<td>6/24</td>
<td>6/12</td>
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<tr>
<td>Postoperative day 7</td>
<td>6/24</td>
<td>6/12</td>
</tr>
<tr>
<td>Postoperative day 7 (with correction)</td>
<td>6/12</td>
<td>6/12</td>
</tr>
</tbody>
</table>
Fig. 2: Preoperative CT scan of the patient showing the lesion involving frontal sinus and evident displacement of eye

Fig. 3: Postoperative photographs of the patient showing reduction in swelling and medial displacement of the eye
• Clearly defined margin, and
• Patchy osteolysis around the mass.\textsuperscript{2,19}
  Erosion of the sinus wall with marginal sclerosis is also an indicative finding.
• MRI: Bright on T1W images compared to the brain and
• Isohyperintense on T2W images.\textsuperscript{2}
• It is pathognomonic MRI finding for mucoceles

**Diff**ential Diagnosis\textsuperscript{3,5}

• Dermoid cysts
• Histiocytosis
• Fungal and tuberculosis infections
• Fronto-orbital cholesterol granuloma
• Neoplasia:
  – Benign
  – Malignant.

**Treatment**

Surgery is the mainstay of treatment. Its goal is to drain the mucocele and ventilate the sinus involved along with eradication of the mucocele with minimal morbidity and prevention of recurrences.\textsuperscript{11} Surgical approaches are based on the size, location and extent of the mucocele (Table 2). In the presence of infection, adjunctive antibiotic treatment is indicated.

1. **External approach:**
   – Lynch-Howarth frontoethmoidectomy\textsuperscript{12}
   – Osteoplastic flaps with sinus cavity obliteration
2. **Endoscopic drainage with preservation of the frontal sinus mucosa and maintenance of a patent frontal recess.**\textsuperscript{11} With the advent and development of endoscopic sinus surgery, the radical procedure has given way to a more functional intervention which is minimally invasive, preserves sinus architecture and notably, leaves no facial scarring.\textsuperscript{10}

**Contraindications to Endoscopic Approach**\textsuperscript{13}

• Presence of any sinonasal involvement preventing drainage of the ostium (\textit{e.g.} osteoma)
• The onset of the mucocele in the most external and posterosuperior region of the sinus
• The presence of major sclerosis on the floor of the sinus.
Management in complicated cases of frontal mucocele.\textsuperscript{20}

Complex cases with extensive intracranial extension have been managed in a number of different ways. Neurosurgeons tend to use an open approach (craniotomy) and to remove the entire cyst lining.\textsuperscript{14} Other authors have advocated wide marsupialization via an endoscopic transnasal approach.\textsuperscript{12}

Alternatively, mucoceles with intracranial extension are approached with a combined craniofacial and endoscopic approach.\textsuperscript{15} It is important to realize that mucoceles are prone to recurrences if marsupialization is inadequately done. Endoscopy has become a standard treatment now-a-days but sometimes very large sized complex mucoceles require an open external approach to widen the drainage pathway and to prevent recurrence.

**CONCLUSION**

Mucoceles of the frontal and ethmoidal sinuses are an uncommon cause of unilateral proptosis, but they have characteristic features which enable a diagnosis to be established without undue difficulty.

Mucoceles can cause long-standing proptosis which fluctuates in size.

The characteristic radiological features of a mucocele are of considerable value in establishing a diagnosis.

Radical approaches like frontoethmoidectomy are required if the size of mucoceles is large and if there appears to be extensive bone erosion causing orbital or intracranial complications.

Endoscopic sinus surgery and marsupialization should be the treatment of choice for asymptomatic simple frontal mucoceles.

Excision or drainage of mucocele leads to significant improvement in vision if done in early cases.

**REFERENCES**


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