

Two Mucocelles, One Lesson: Preoperative Imaging Analysis as the Key to Avoiding Surgical Failure

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ABSTRACT

Background: Frontoethmoidal mucocelles are benign, slowly expansive cystic lesions of the paranasal sinuses. Their occurrence as synchronous double lesions is uncommon and poses specific diagnostic and surgical challenges. When one of the mucocelles occupies a laterally displaced position, standard endoscopic approaches may be insufficient and failure to recognise this preoperatively may result in incomplete drainage and clinical recurrence.

Case Presentation: We report the case of a 50-year-old male with a prior history of functional endoscopic sinus surgery (FESS) for nasosinus polyposis, who presented with progressive headaches and grade 3 proptosis. CT scan and MRI revealed two distinct frontoethmoidal mucocelles: one accessible via an endoscopic approach and one occupying a far lateral position beyond standard endoscopic reach. Bilateral anterior and posterior ethmoidectomy combined with a Draf III frontal sinusotomy was performed endoscopically. The second, laterally displaced mucoccele was addressed via an external Lynch-Howarth approach. Complete resolution of proptosis was observed at the end of the procedure.

Conclusion: Double synchronous frontoethmoidal mucocelles require comprehensive multimodal imaging analysis - CT and MRI - before any intervention. Preoperative identification of each mucoccele's position, extent and relationship to the orbit and skull base is essential to select the correct surgical strategy and to avoid incomplete drainage orbital complications or revision surgery.

Keywords: Frontoethmoidal mucoccele; Double mucoccele; Proptosis; FESS; Draf IIb; External sinusotomy; Preoperative imaging; CT scan; MRI

Introduction

Paranasal sinus mucocoeles are expansile, mucus-filled cystic structures lined by respiratory pseudostratified epithelium. They arise from obstruction of a sinus ostium or a mucosal gland, leading to progressive accumulation of secretions and sinus expansion. The frontal sinus is the most frequently involved site, followed by the ethmoid, maxillary and sphenoid sinuses¹. Growth is slow but relentless and untreated mucocoeles can erode adjacent bone, extend into the orbit or anterior cranial fossa and cause significant morbidity including diplopia, proptosis and, rarely, meningitis².

The most common predisposing factor for frontoethmoidal mucocoeles is previous sinonasal surgery, which may disturb mucosal drainage pathways and create pockets of obstructed mucosa³. The clinical presentation is often insidious, with headache, facial pain or ocular symptoms appearing years to decades after the initial intervention. While solitary mucocoeles are well described in the literature, the simultaneous occurrence of two distinct frontoethmoidal mucocoeles is rare and insufficiently documented. Their management is further complicated when the two lesions differ markedly in their anatomical accessibility. In such circumstances, a single surgical approach is unlikely to achieve complete marsupialization of both cysts.

We present this case to highlight a critical and often underestimated surgical principle: thorough preoperative analysis of CT and MRI is not a formality but a cornerstone of operative planning, capable of determining whether a combined endoscopic and external approach is required to achieve complete and definitive treatment.

Case Presentation

A 50-year-old male was referred to our otolaryngology department for a 4-month history of progressive bilateral frontal headaches and right-sided ocular prominence. The patient reported no visual acuity changes, diplopia or epiphora. His past medical and surgical history was notable for functional endoscopic sinus surgery (FESS) performed several years prior for nasosinus polypoidosis. On clinical examination, grade 3 proptosis of the right eye was noted, without restriction of extraocular movements. Anterior rhinoscopy revealed a scarred nasal cavity consistent with prior endoscopic surgery, with no active polyp recurrence. Intraocular pressure and visual fields were within normal limits.

Computed tomography of the paranasal sinuses with bone-window reconstruction (**Figure 1**) demonstrated two hypodense, expansile lesions involving the frontoethmoidal region bilaterally. The right-sided lesion showed thinning and dehiscence of the lamina papyracea with displacement of the orbital contents, consistent with the observed proptosis. A second lesion was identified in the left frontoethmoidal region but occupied a markedly lateral position, well beyond the midline structures. T2-weighted MRI axial sequences (**Figure 2**) confirmed two distinct, well-delineated, homogeneously hyperintense cystic masses bilaterally. There was no intracranial extension and no enhancement on gadolinium-injected sequences, confirming the benign mucocoele nature of both lesions. The left-sided mucocoele demonstrated a predominantly lateral position relative to the nasal cavity midline, rendering it inaccessible to standard endonasal instrumentation.



Figure 1: Coronal CT scan of the paranasal sinuses (bone window). Two bilateral frontoethmoidal opacifications consistent with mucocoele.



Figure 2: Axial MRI (T2-weighted sequence). Two distinct hyperintense cystic masses in the bilateral frontoethmoidal region.

The patient underwent surgery under general anesthesia. The operative strategy, defined preoperatively on the basis of imaging findings, combined two complementary approaches. Endoscopically, bilateral anterior and posterior ethmoidectomy followed by a Draf III frontal sinusotomy was performed. The first frontoethmoidal mucocoele sac was identified, widely marsupialised and the cavity thoroughly irrigated. Given the far-lateral position of the second mucocoele identified on preoperative imaging, an external approach via a Lynch-Howarth incision was simultaneously performed on the right side to gain direct access to the laterally displaced lesion. The mucocoele was unroofed and completely drained, with careful preservation of the periorbita. Operative findings were entirely concordant with preoperative imaging: the right mucocoele would not have been reachable via the endonasal route without risk of blind instrumentation and incomplete drainage.

Immediate postoperative assessment confirmed complete resolution of right-sided proptosis at the end of the procedure. The patient recovered uneventfully and was discharged on the second postoperative day. Follow-up at one month demonstrated patent frontal neo-ostia endoscopically, normal orbital symmetry and complete resolution of headaches.

Discussion

Frontoethmoidal mucocoeles are the most common mucocoeles of the paranasal sinuses, accounting for approximately 60–65% of all reported cases⁴. Their post-surgical occurrence is well recognised: previous FESS can lead to stenosis of the frontal recess and creation of mucosal pockets that subsequently expand into mucocoeles⁵. In our patient, prior FESS for nasosinus polyposis was the most likely predisposing factor. The simultaneous occurrence of two distinct frontoethmoidal mucocoeles is uncommon, with only a limited number of case series reporting double or multiple synchronous lesions^{6,7}. Their simultaneous presence raises a specific surgical challenge: each lesion must be individually marsupialized and the access route for each may differ fundamentally.

The critical lesson of this case is that preoperative imaging analysis determined the entire surgical strategy. CT remains the reference modality for assessment of bony anatomy, sinus architecture and mucocoele extent⁸. Bone erosion of the orbital walls, skull base integrity and the precise three-dimensional relationship between each mucocoele and adjacent structures are best evaluated on CT with multiplanar reconstructions. MRI, on the other hand, is indispensable for characterising soft-tissue content, ruling out intracranial extension and distinguishing mucocoele from other cystic or neoplastic lesions⁹. The combination of both modalities is therefore not redundant but strictly complementary. Without this dual analysis, the laterally displaced left mucocoele could have been missed, approached through an insufficient route and left incompletely drained, with predictable clinical failure.

The surgical approach to frontoethmoidal mucocoeles has evolved with the widespread adoption of FESS. Endonasal marsupialization, including Draf IIa and IIb procedures for frontal sinus access, now represents the first-line strategy for most frontal mucocoeles¹⁰. The Draf IIb procedure creates a wide neo-ostium by resecting the frontal sinus floor from the lamina papyracea to the nasal septum, maximising endonasal drainage. However, a subset of mucocoeles - particularly those occupying a far-lateral frontal sinus recess - may require external complementary approaches¹¹. The Lynch-Howarth external frontoethmoidectomy remains a reliable approach for lateral frontal sinus mucocoeles inaccessible to purely endonasal surgery¹². A combined approach, as in our case, should not be considered a failure of endoscopic technique but rather an individualised, image-guided decision that ensures complete drainage.

Proptosis associated with frontoethmoidal mucocoele results from erosion or displacement of the medial orbital wall with herniation of orbital fat or from direct mucocoele expansion into the orbit¹³. Resolution is expected after adequate drainage. In our patient, grade 2 proptosis resolved completely intraoperatively, confirming that no additional orbital exploration was required once both mucocoeles were fully marsupialised.

Conclusion

Double synchronous frontoethmoidal mucocoeles represent a rare but clinically significant entity, particularly in patients with a history of previous sinus surgery. This case illustrates that standard endonasal endoscopic surgery, while effective for accessible lesions, may be insufficient when one of multiple

mucocoeles occupies an anatomically challenging position. Meticulous analysis of both CT and MRI before any surgical intervention is not optional - it is mandatory. It defines the true number of lesions, their individual positions and extents and the surgical route best suited to each. Failure to perform this analysis risks incomplete drainage, persistent symptoms orbital complications and inevitable revision surgery. We advocate that in any patient with prior sinonasal surgery presenting with orbital or frontal symptoms, the treating surgeon should actively search for multiple synchronous mucocoeles on preoperative imaging and plan the operative strategy accordingly.

Patient Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images in accordance with the Declaration of Helsinki.

Conflict of Interest

The authors declare no conflict of interest.

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