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Case Presentation

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Double Iatrogenic Ethmoid-Orbito-Frontal Mucocele: The Role of Neuronavigation System in Revision of Endoscopic Sinus Surgery

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Abstract

Background: Paranasal sinuses mucoceles are uncommon delayed complications following FESS, most often involving the frontal sinus producing recurrent sinusitis or headache.

Case report: A 21-year-old male presented with left-sided frontal headache after two FESS procedures. CT and MRI demonstrated two frontal-ethmoidal mucoceles. Revision FESS was performed with image-guided (neuronavigation-assisted) technique, including Draf IIb frontal sinusotomy and mucocele marsupialization.

Conclusion: Double iatrogenic mucoceles following FESS are rare. Neuronavigation-assisted revision surgery facilitates safe.

Keywords: Iatrogenic mucocele; Frontal sinusitis; Endoscopic sinus surgery; Neuronavigation; Draf IIb; Case report

Introduction

Frontal sinus diseases are one of the most challenging issues in rhinology [1]. Additionally, in patients with a history of prior FESS procedures, surgeons may encounter postoperative scarring, and an increased risk of complications, including iatrogenic lesions such as mucoceles [2]. Paranasal sinus mucoceles are benign that gradually expand due to drainage obstruction [3]. They affect people aged 40-60 years old, with no substantial difference between sexes [4]. They are frequently associated with prior trauma, or postoperative complications [5]. According to Molteni G. and et al. [6], the obstruction of the frontal recess by an inflammatory scar process iatrogenic surgical or tumor is incriminated in 64% of the reported cases. In the remaining 36%, the etiology remains unknown. Patients with Samter's triad are at increased risk as a result of chronic inflammation [7]. The term 'mucopyocele' (or 'pyocele') refers to an infected mucocele. These lesions enlarge progressively causing erosion of the surrounding bony structures and most commonly involve the frontoethmoidal region [8]. CT defines the degree of bone erosion and expansion,

while MRI characterizes the lesion's content and enhancement pattern, helping distinguish mucoceles from neoplasms or other cystic lesions [9]. Frontal sinus mucocele may be asymptomatic in the very beginning with a slow progression [10]. The most common symptoms reported are frontal headache and, in some cases, orbital involvement such as pain, proptosis, or diplopia [9,11]. Frontal sinus involvement is one of the most frequent causes of recurrence after FESS [12]. We present a case of a young adult with double iatrogenic frontal–ethmoidal mucoceles developing after two FESS procedures. This case emphasizes the importance of the use of image-guided navigation, and appropriate postoperative follow-up.

Case Presentation

A 21-year-old male presented with left frontal headache, following two FESS procedures performed during 2025. Nasal endoscopy revealed a complete blockage of frontal recess.

His symptoms were evaluated using questionnaires: VAS: 24; SNOT-22: 40; CCS: 2/16; Sniffin' test: 12/16. Eosinophils 7.6% (absolute 0.53 × 10^3/μL), total IgE 526 KU/L. At 12 months following FESS, CT demonstrated near-complete opacification of the left frontal sinus. MRI revealed two retention mucoceles: the first was located in the agger nasi region, while the second in the ethmoido-orbito-frontal recess **(Figure 1)**.

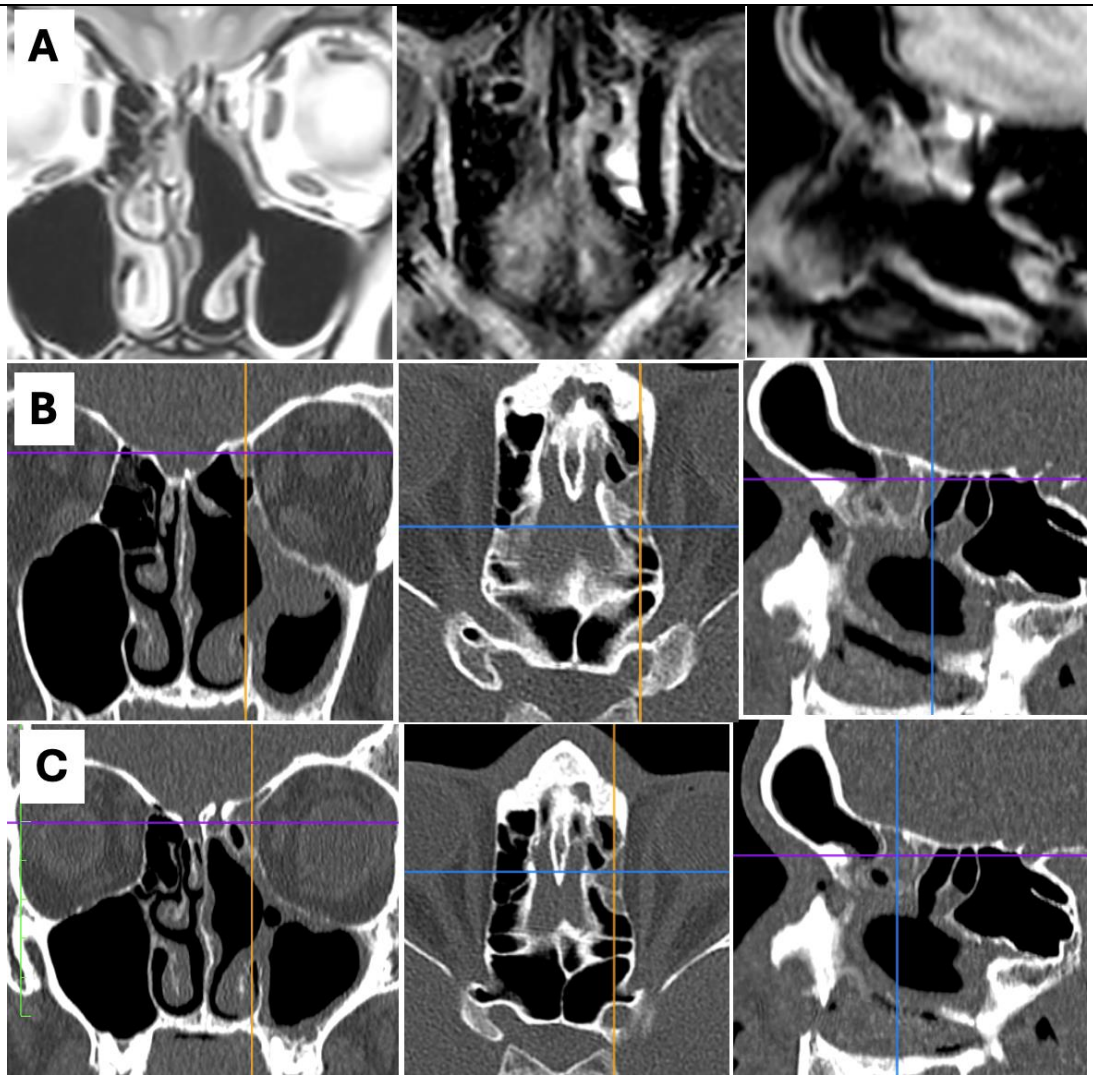

Figure 1: Radiological findings of postoperative frontal sinus obstruction. (A) MRI demonstrating two retention mucoceles in the left agger nasi and ethmoido-orbito-frontal recess. (B) Preoperative CT showing near-complete opacification of the left frontal sinus and frontal recess obstruction. (C) Postoperative CT demonstrating complete marsupialization of both mucoceles and restoration of frontal sinus drainage.

The patient underwent revision FESS using an image-guided neuronavigation system. The first (ethmoido-orbital) mucocele was opened and marsupialized; purulent contents were drained and sent for histology. Hyperostotic bone required drilling to access the frontal recess, where a second (ethmoido-orbito-frontal) mucocele was found and marsupialized. A Draf IIb frontal sinusotomy was completed **(Figure 2).** Histologic examination revealed prominent eosinophilic infiltration.

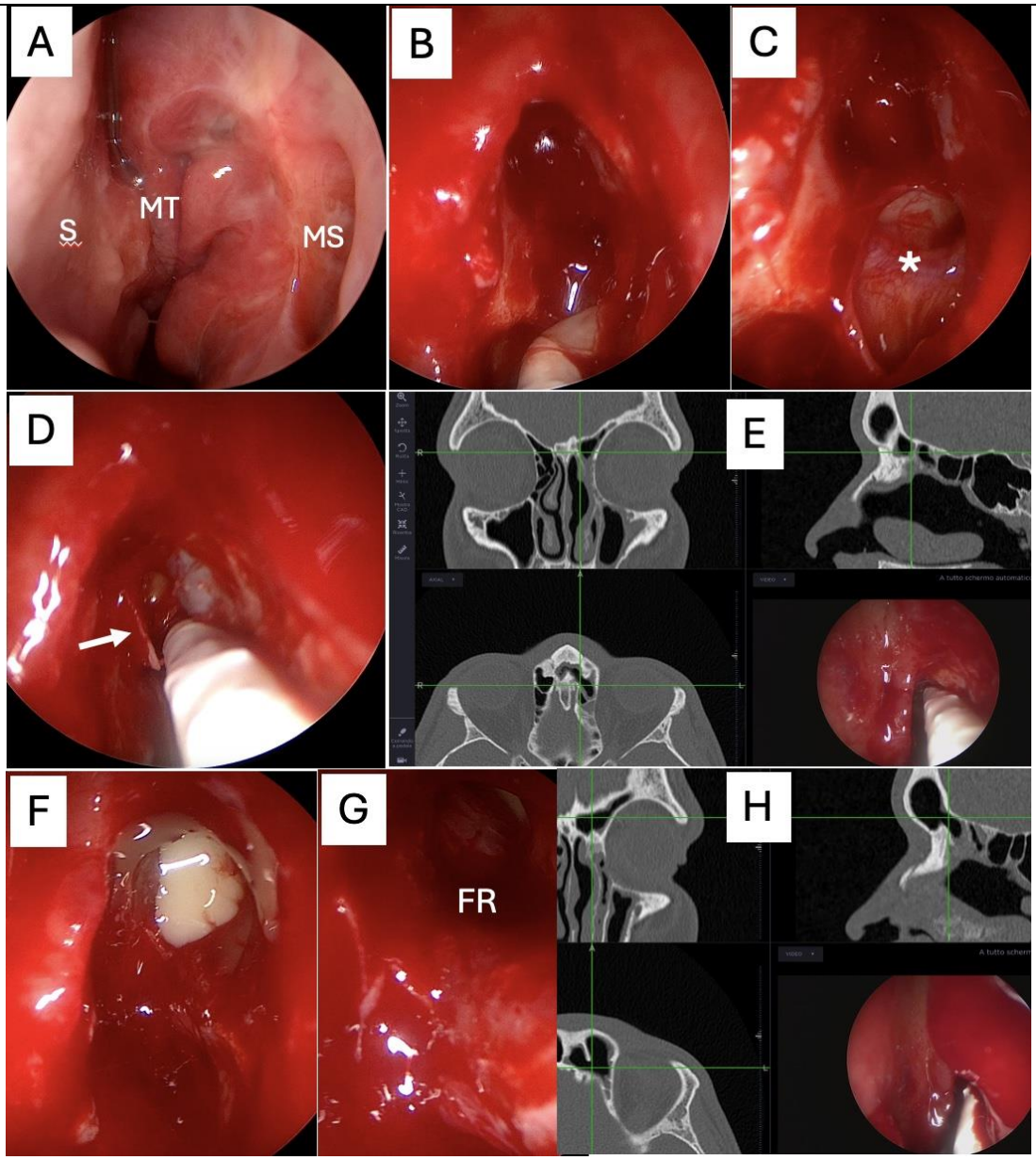

Figure 2: Endoscopic and image-guided revision FESS. (A) Complete obstruction of the left frontal recess. (B–C) Identification of the first retention mucocele (*). (D) Marsupialization of the first mucocele (arrow). (E) Intraoperative neuronavigation for frontal recess localization. (F) Identification of the second retention mucocele after drilling hyperostotic bone. (G) Widely patent frontal recess (FR) following Draf IIb frontal sinusotomy. (H) Final endoscopic and neuronavigation view confirming complete marsupialization and restoration of frontal sinus drainage.

Abbreviations: S, nasal septum; MT, middle turbinate; MS, middle meatus; FR, frontal recess. * Mucocele; arrow, marsupialization opening.

Discussion

Mucoceles are rare benign sinus tumors and in 90% of casesaffect the frontoethmoid complex followed by maxillarysinus (10%) [13]. Mucopyocele formation secondary to FESS has not been frequently reported in literature.. Mucocele or mucopyocele may develop months or years after surgery due to obstruction of mucosal drainage pathways from scarring, synechiae, or bony remodeling. Mucoceles usually grow slowly and may lead to complications due to invasion of neighboring structures such as orbit or brain parenchyma. Super infections with consequent formation of abscesses and meningitis have been reported [14], as well as more uncommon complications, like fistulae [15] and cerebrospinal liquor leakage [16]. The presence of two distinct mucoceles in a single patient is exceptional. Endoscopic sinus surgery is currently treatment of choice in the marsupialization of mucoceles. Frontal sinus surgery if incomplete it's one of the most frequent causes of recurrent. This is due the incomplete dissection of the fronto-ethmoidal cells and the trauma caused to the mucosal lining with stripping [12]. According to that, we would underline the role of the surgical team expertise. In agreement with several Authors, [17,18] computer-assisted neuronavigation could be an important support even experienced surgeons, especially in the frontalsinus surgeryto avoid eventual revision surgery that often was required in 38.3%. Draf IIb frontal sinusotomy guarantees a wide drainage route and it's indicated in inflammatory diseases and tumors and in revision surgery [19]. Postoperative monitoring is mandatory, since mucoceles may recur if drainage pathways re-close due to fibrosis.

Conclusion

Mucopyocele formation is a rare post operative complication of FESS. This case emphasizes the need for careful technique during primary FESS, regular post-operative follow-up, and consideration of neuronavigation in complex revisions to minimize complications.

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