

Sphenoid sinus pyocele after transsphenoidal approach for pituitary adenoma

Mario Giordano · Venelin M. Gerganov · Wolfgang Draf · Rudolf Fahlbusch

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Abstract Transsphenoidal pituitary adenoma surgery is related to a low morbidity rate. The complications that can occur are classified as intra- and extracranial. The aim of the study is to discuss one group of these complications involving the sphenoid sinus: mucocele and its possible transformation into pyocele. We evaluate clinical presentation, management strategy and the outcome after long-term follow-up presenting an explicative case and a review of the literature. A patient presented to our outpatient clinic 8 months after transsphenoidal surgery for selective removal of a pituitary adenoma because of an acute onset of frontal headache during an airplane travel, fever and pulsating sensation in left eye and ear. MRI revealed a contrast-enhancing lesion in the left inferior portion of the sphenoid sinus. An endonasal endoscopic revision of the sphenoid sinus was performed. After opening of the scar to enter in the left sinus a pyocele was found and treated with drainage and marsupialisation. Development of sphenoid sinus pyocele is an extremely rare postoperative complication of transsphenoidal surgery. This lesion should be taken in consideration in patients presenting with retroorbital headache of acute onset and fever after pituitary surgery. Diagnosis can be suspected on the MRI studies and confirmed by a targeted flexible endoscope examination. Endoscopic drainage with wide opening of the sphenoid sinus and marsupialisation is the treatment of choice to avoid recurrences.

Keywords Pyocele · Transsphenoidal approach · Pituitary adenoma

Introduction

Transsphenoidal pituitary adenoma surgery [1, 2] is related to a low morbidity rate [3]. The complications that can occur are classified as intra- and extracranial. A rare extracranial complication after transsphenoidal surgery is the formation of a mucocele in the sphenoid sinus [4, 5]. This benign cystic mass is delimited by a modified sinus membrane and filled with aseptic mucus [5]. In case of superimposed infection there is pus formation transforming the cyst into a pyocele. Pyocele can occur in the nasal cavity or frontal sinuses after trauma, nasal obstruction or as complication of a tumor [6–9]. Its formation after transsphenoidal pituitary adenoma surgery is extremely rarely encountered: in the experience of the senior author encompassing more than 4,000 pituitary surgeries, it occurred only in a single case. The presence of pus in 2 from 7 patients operated for refractory isolated sphenoid sinusitis after transsphenoidal surgery has been reported by Lu et al. [10]. In this article we describe the occurrence of pyocele of sphenoid sinus as a complication of transsphenoidal surgery. We discuss its clinical presentation, management strategy and the outcome after long-term follow-up presenting an illustrative case and a review of the literature.

Illustrative case

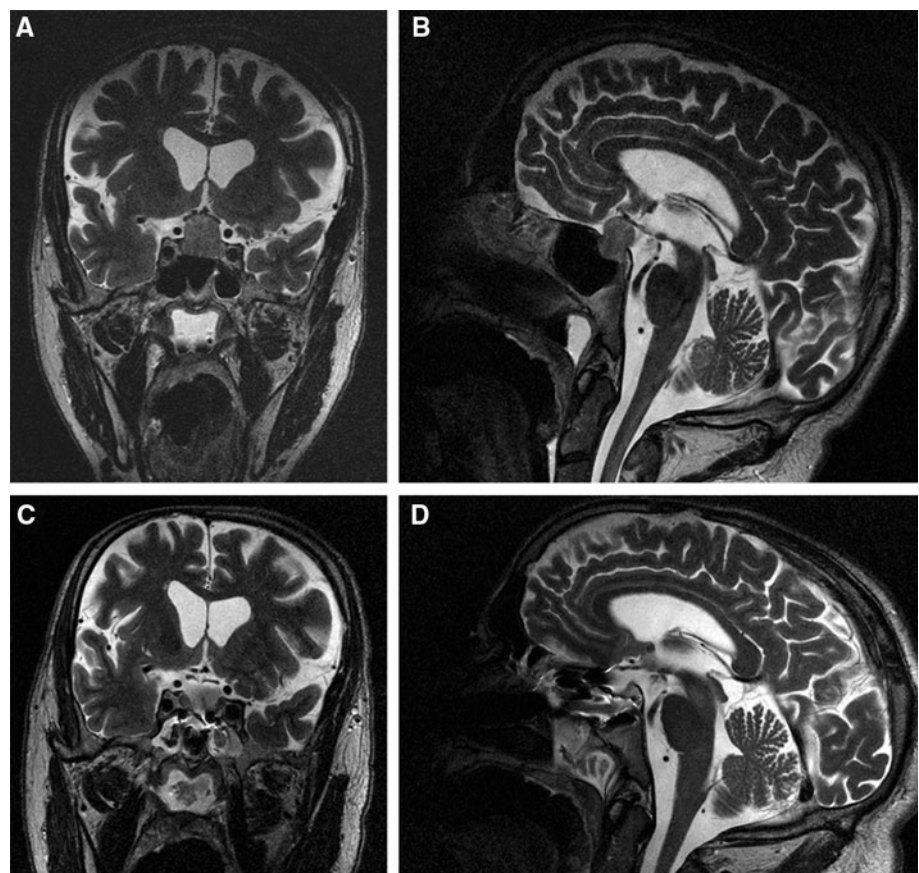
A 60-year-old man presented to our institute with a 2 months history of restricted visual field. The ophthalmological consultation showed an incomplete bitemporal

M. Giordano (✉) · V. M. Gerganov · W. Draf · R. Fahlbusch
Department of Neurosurgery, International Neuroscience
Institute, Rudolf-Pichlmayer-Straße. 4,
30625 Hannover, Germany
e-mail: mario.giordano@alice.it

hemianopsia. A magnetic resonance imaging (MRI) demonstrated a solid intra- and suprasellar space-occupying lesion of 2 cm in maximal diameter compressing the optic chiasm (Fig. 1a, b). The tumor was hormonally inactive and the hormonal levels were within normal ranges. We decided to approach the lesion using a direct pernasal transsphenoidal route with endoscopic assistance and high-field intraoperative MRI control. Surgery was uncomplicated and the intraoperative MR control proved the completeness of tumor removal and the preservation of the pituitary gland (Fig. 1c, d). A small CSF leak was visualized during surgery via a small opening of the arachnoid membrane—it was closed with fascia lata, fat tissue and fibrin glue. Lumbar drainage was placed for 5 days and broad-spectrum antibiotic prophylaxis with Cefazolin was performed during this period. On histopathological examination the lesions proved to be a hormonally inactive pituitary adenoma. The patient recovered quickly, had no hormonal deficits and was discharged 10 days after surgery. The clinical examination at 3 months was unremarkable and the MRI control showed no tumor recurrence. Retrospectively, a hyperintense area in the left part of sphenoid sinus could be detected on the T1-weighted images, showing no signs of contrast enhancement (Fig. 2a, b). The patient presented to our

outpatient clinic 5 months later because of an acute onset of frontal headache during an airplane travel, fever and pulsating sensation in left eye and ear. MRI revealed a contrast-enhancing lesion in the left inferior portion of the sphenoid sinus (Fig. 3a, b). The nasal cavity was examined with a flexible endoscope under local anaesthesia. Although the mucosa showed no inflammatory signs at initial inspection, after puncturing of the isolated left compartment of the sphenoid sinus caseous pus leaked out. Surgical treatment was planned after 2 weeks of antibiotic therapy with ciprofloxacin. Navigation guided endonasal endoscopic revision of the sphenoid sinus was performed. After opening of the scar to enter in the left sinus a pyoceles was found (Fig. 4a) and material was collected for microbiological examination. The cavity was then enlarged by drilling the anterior wall and the septum of the sinus (Fig. 4b) in order to obtain a wide drainage (Draf type III) of the sphenoid sinus with marsupialisation of the pyocoele. After abundant irrigation nasal tamponades were placed and removed on the seventh postoperative day. Microbiological examinations revealed no bacteria. Twenty-four months follow-up after the second surgery the patient present with normal hormonal values, normal visual fields and no signs of adenoma or pyocoele recurrence (Fig. 5).

Fig. 1 Preoperative coronal (a) sagittal T2-weighted images (b) showing the intra- and suprasellar hormone-inactive pituitary adenoma. Postoperative coronal (c) sagittal T2-weighted images (d) showing the selective total removal of the lesion after transsphenoidal approach



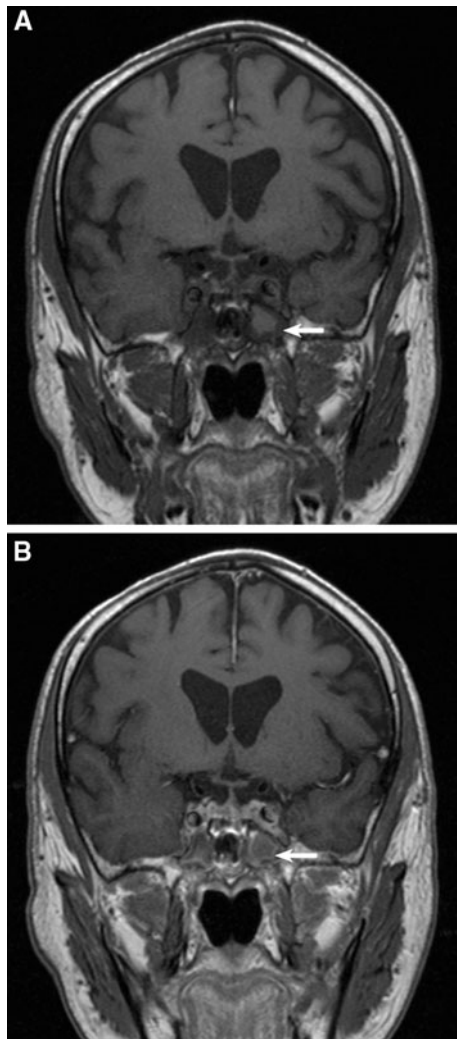


Fig. 2 Coronal native (a) and contrast enhanced (b) T1-weighted images performed 3 months after transsphenoidal surgery showing the lesion in the *left* inferior portion of the sphenoid sinus (*white arrow*) hyperintense in the native sequence and not enhancing after the administration of contrast medium

Discussion

In the recent years, especially after the introduction of new tools such as endoscope and intraoperative MRI, the transsphenoidal surgery for treatment of sellar tumors has become a safe technique with a low complication rate [1, 2, 11, 12]. The most common involve the intracranial compartment: anterior pituitary insufficiency, diabetes insipidus and cerebrospinal fluid leak and meningitis [3, 11]. The complications regarding the extracranial compartment, such as epistaxis, sinusitis or septal deviation, can cause patients discomfort in the early postoperative period [11, 13]. A rare consequence of the transsphenoidal approach involving the sphenoid sinus is the formation of a mucocele. This cystic mass lined with respiratory epithelium and

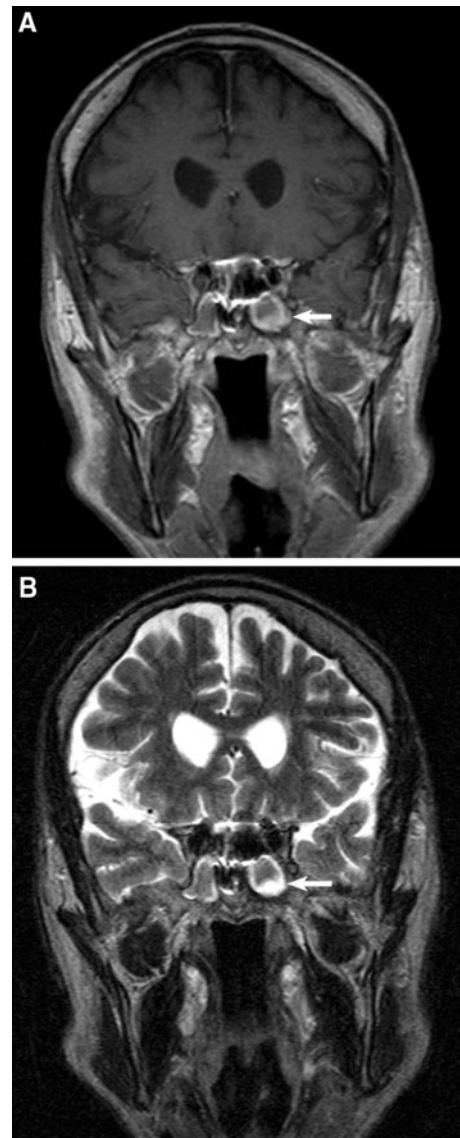


Fig. 3 Coronal contrast enhanced T1-weighted (a) and T2-weighted images (b) performed 8 months after transsphenoidal surgery showing the contrast enhancing space-occupying lesion in the *left* inferior portion of the sphenoid sinus (*white arrow*)

filled with mucoid secretions is usually found in ethmoidal and frontal sinuses [14]. It is caused by sinus obstruction due to sinusitis or to other mechanical factors such as surgical trauma. A bacterial colonization with production of pus can transform an aseptic cyst into a pyocele. Possible cranial location of pyocele are concha bullosa [6, 15], frontal sinus with or without extensive intracranial invasion [9, 16, 17] lachrymal sac [7] and posterior ethmoidal cell [18]. In addition to general symptoms such as fever and headache, the pyocele can have a compressive effect on nearby structures leading to more specific manifestations such as visual loss secondary to optic nerve compression [18]. The treatment of choice in these different locations of

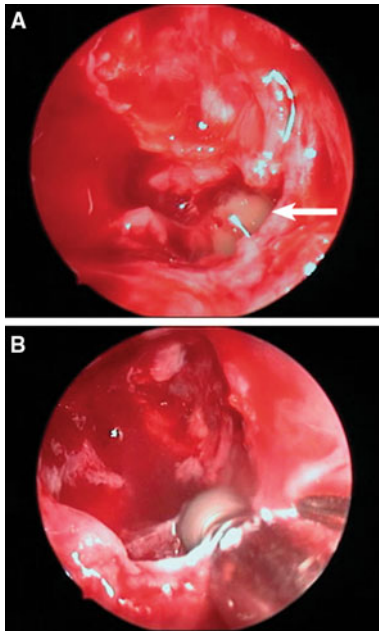


Fig. 4 Endoscopic intraoperative images showing two phases of pyocele treatment. **a** The mass is identified in the inferior part of the sphenoid sinus (*white arrow*). **b** Drilling of the anterior wall and septum of the sphenoid sinus in order to obtain a wide drainage (Draf type III)

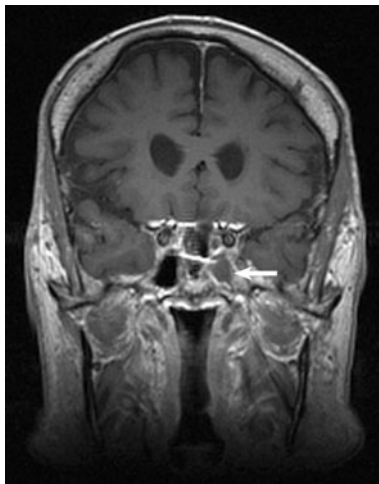


Fig. 5 Coronal contrast enhanced T1-weighted images performed 24 months after the second surgery showing the absence of pyocele recurrence (*white arrow*)

pyocele is endonasal endoscopic surgery eventually combined with an intracranial approach in case of large involvement of this compartment [15–17].

The symptomatology of pyocele and mucocele following transsphenoidal surgery reported in literature [4, 5] are similar, consisting of frontal headache and pulsating sensation in the eye unilaterally. The difference in the clinical presentation is the insurgence of fever due to the infection

of the lesion furthermore in the acuity and severity of the pain; this is usually not present in patients with mucocele. The MRI appearance of pyocele in our patient is hypointense in T1-weighted and hyperintense in T2-weighted images. The mass presents almost homogeneous enhancement after injection of contrast. As we have retrospectively seen in the control 3 months after the first surgery, when the patient was still asymptomatic, there is hyperintensity of the left part of the sphenoid sinus in the T1-weighted images and no contrast enhancement. This finding supports a change of the lesion appearance parallel to its clinical development. The imaging features of sphenoid sinus mucocele depend on the protein content of the cyst: in T1-weighted images with contrast medium there is only a thin rim enhancement of the cyst wall with hypointense content [14]. An important difference between our patient with pyocele and the reported cases of mucocele is the time of presentation after transsphenoidal surgery. The development of a mucocele is usually a late complication, occurring with a time interval of 12–17 years [4, 5]. In the present case the diagnosis was made 8 months after the first surgery. The reason for this considerable discrepancy can be the superimposed infection of the cyst in its early stage of formation. Microorganism colonization and pus production led to a fast development of the clinical symptoms and consequent diagnosis. The small dimensions of the pyocele also support this hypothesis (Fig. 2a, b), a normal mucocele can grow within the sphenoid sinus and invade the intracranial compartment before becoming symptomatic.

Patient's acute and severe complaints, MRI findings and the presence of pus proved during the endoscope examination led us to decide for a surgical treatment. The antibiotic therapy alone was not regarded sufficient to treat this pathology and was used preoperatively only to optimize the clinical conditions of the patient. To prevent recurrence of the cystic lesion we performed an endoscopic drainage and marsupialisation of the pyocele. Scar tissue formation and limited opening of sphenoid sinus are considered as risk factors for development of mucocele [10]. Therefore using a technique developed for frontal sinus surgery [19, 20], a wide opening (Type III drainage) of the sphenoid sinus with drilling of sinus wall and septum was preferred in order to avoid recurrence.

Conclusion

Possible extracranial complication of transsphenoidal surgery is the formation of a sphenoid sinus mucocele. Bacterial colonization with production of pus can transform this aseptic cyst into a pyocele. Development of sphenoid sinus pyocele is an extremely rare postoperative complication.

This lesion should be taken in consideration in patients presenting with retroorbital headache of acute onset and fever after transsphenoidal surgery. Diagnosis can be suspected on the MRI studies and confirmed by a targeted flexible endoscope examination. Endoscopic drainage with wide opening of the sphenoid sinus and marsupialisation is the treatment of choice to avoid recurrences.

Conflict of interest None.

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