

## Suprasellar Tension Pneumatocele after Endoscopic Transsphenoidal Surgery for Pituitary Macroadenoma

### Abstract

Tension pneumatocele is a very rare but potentially fatal complication of transsphenoidal surgery that can result from an influx of air into the intracranial cavity through the cerebrospinal fluid fistula. Although transsphenoidal surgeries for pituitary adenomas are very commonly performed procedures, this complication is extremely rare. We report a case of tension pneumatocele after transsphenoidal resection of a pituitary macroadenoma. After a second endoscopic transsphenoidal procedure to remove the air and repair of the sella floor, visual acuity recovered dramatically. Tension pneumatocele is an uncommon but potentially lethal complication of transsphenoidal pituitary surgery, which can present anytime, even after years postoperatively. It is important for all skull base surgeons to be aware of this condition so that prompt treatment can be instituted.

**Keywords:** Pituitary adenoma, tension pneumatocele, transsphenoidal

### Introduction

Tension pneumatocele is a rare but potentially fatal complication of transsphenoidal surgery that can result from an influx of air into the intracranial cavity through the cerebrospinal fluid (CSF) fistula which develops during the operation or after the surgery.<sup>[1]</sup> It has been known that the prompt diagnosis and the management, most likely surgical intervention, are required when the tension pneumocephalus causes neurologic deterioration by a mass effect. We herein report tension pneumatocele after transsphenoidal surgery for pituitary macroadenoma. Tension pneumocephalus can occur at any time after the surgery and deterioration after transsphenoidal surgery should be instantaneously evaluated. Tension pneumatocele following transsphenoidal surgery usually occurs after the presentation of a CSF leak due to an incomplete sealing of the sphenoid sinus. Postoperative insertion of lumbar drainage appears to be a predisposing factor for this complication. Patients who develop this expanding pneumatocele usually present with progressive vision loss and headache. If left untreated, this condition can lead to permanent visual deficits.<sup>[2]</sup> We report a case of tension pneumatocele after

transsphenoidal resection of a pituitary macroadenoma that required treatment with CSF leak repair and lumbar spine drainage. The patient was successfully treated endoscopically with a good clinical outcome. We also discuss important strategies for managing this neurosurgical emergency.

### Case Report

A 40-year-old male patient presented with vision loss and headache of 2 months. Preoperative magnetic resonance images (MRI) revealed a large contrast-enhancing mass in sellar and suprasellar regions abutting bilateral internal carotid arteries [Figure 1]. This finding suggested a pituitary macroadenoma. The neurological examination revealed bilateral hemianopsia. Visual acuity was hand movement positive in the right eye and 6/12 on the left eye. The level of pituitary hormones was within the normal limits. He was diagnosed with a case of nonfunctional pituitary macroadenoma and underwent transsphenoidal resection of pituitary macroadenoma. There was no CSF leak during the surgery and it was confirmed with intraoperative Valsalva maneuver also. The sella and sphenoid sinus were packed with pieces of fat and surgical.

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#### Access this article online

**Website:** www.asianjns.org

**DOI:** 10.4103/ajns.AJNS\_253\_19

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**How to cite this article:** Sharma AK, Mehta R, Chandrakar N, Singh N, Nagarkar NM. Suprasellar tension pneumatocele after endoscopic transsphenoidal surgery for pituitary macroadenoma. Asian J Neurosurg 2020;15:763-5.

**Submission:** 14-Aug-2019 **Revised:** 14-Aug-2019

**Accepted:** 24-Mar-2020 **Published:** 28-Aug-2020



**Figure 1: Preoperative sagittal (a) and coronal (b) gadolinium-enhanced magnetic resonance images shows large pituitary tumor with suprasellar extension**

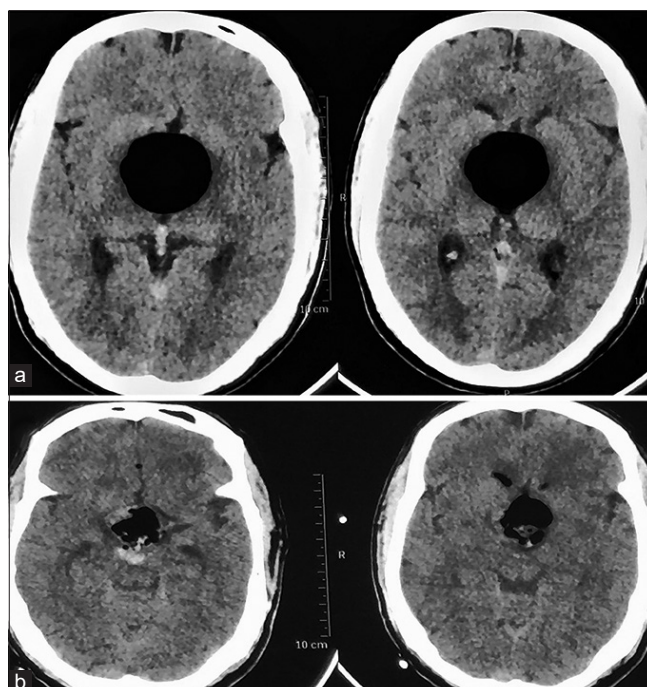
On day 1 after the surgery, patient reported significant subjective improvement in vision. Postoperatively, on day 2, the patient had CSF rhinorrhea and an external lumbar drain catheter was inserted to prevent CSF rhinorrhea. CSF was drained through the catheter at the rate of 5–10 ml/h. On the 3<sup>rd</sup> postoperative day, the patient complained of severe headache and decreased vision in both eyes to only perception of hand movements bilaterally. An emergent computed tomography (CT) scan was obtained. It revealed a large amount of air collection in the suprasellar region [Figure 2a]. The patient underwent immediate reoperation through an endonasal endoscopic approach. After the trapped air was evacuated, the sella floor was subsequently repaired with fascia lata graft and muscle using fibrin glue. Examination of the cavity was performed with 0° and 30° nasal telescopes, and no residual tumor was appreciated. The pneumatocele was endoscopically decompressed using a transnasal approach guided by intraoperative fluoroscopy.

Skull lateral films which were obtained during surgery revealed a decrease in the air gradually [Figure 3a and b]. A CT scan obtained after the second surgery showed that the intracranial air decreased markedly [Figure 2b]. The patient's symptoms resolved and vision improved postoperatively.

The external lumbar drain was clamped postoperatively and was removed after 3 days when no CSF leak was observed. After these procedures, he showed a significant improvement of his symptoms and his headache and CSF leakage resolved. At the time of 3 months follow-up, the patient was free of symptoms, and his visual acuity was 6/18 in the right eye and 6/6 in the left eye.

## Discussion

Tension pneumatocele following transsphenoidal surgery is extremely rare and may arise in the setting of a surgical sellar floor defect.<sup>[3]</sup> Patients with this complication specifically present with progressively deteriorating vision and bitemporal hemianopsia and sometimes, a headache.<sup>[4]</sup> Tension pneumatocele may develop a few weeks, months, or years after the surgery.<sup>[2]</sup> Two factors which influence the development of tension pneumatocele after transsphenoidal



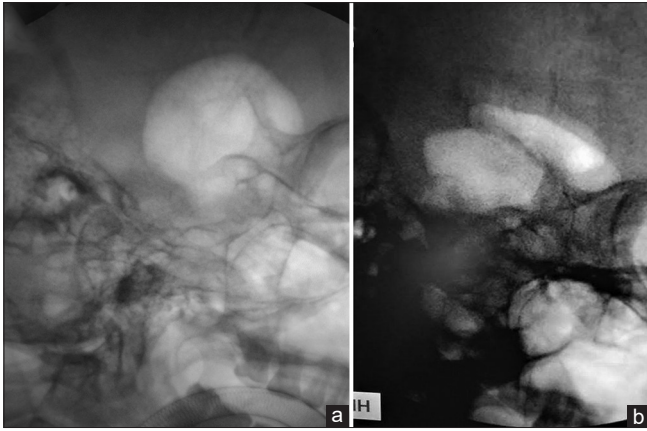
**Figure 2: On the postoperative day 3, the patient developed severe headache and sudden visual deterioration. CT of the head (a) demonstrates suprasellar tension pneumatocele. The patient underwent emergent endoscopic exploration and revision of the skull base repair was performed to obliterate a ball-valve fistula. (b) Postoperative computed tomography (CT) demonstrates resolution of the tension pneumatocele**

surgery are a one-way valve (ball-valve) mechanism and low intracranial pressure.<sup>[3-6]</sup>

The predisposing factors which have been described for expanding pneumatocele includes sub-optimal packing of the sella and sellar floor reconstruction, CSF leaks, large pituitary tumor, and postoperative lumbar drainage catheter. Other factors which may predispose to development of this complication include alteration of the pressure gradient across CSF fistula with sneezing, vigorous nose blowing, nose bleeds, and positive pressure ventilation, untreated obstructive sleep apnea, diminished CSF formation by acetazolamide diuretic use, dehydration or systemic hypotension.<sup>[1,2,7]</sup> The factors predisposing to tension pneumatocele in the present case include CSF leak, large pituitary tumor, and postoperative lumbar drainage catheter.

A plain skull X-ray can help in making the diagnosis. However, head CT is diagnostic and may be superior when ruling out other complications, such as hemorrhage or infarction. MRI may be required to evaluate tumor recurrence and to best visualize any distortion of the optic chiasm.

Once diagnosed, clinical management of pneumatocele is dictated by the degree of mass effect and clinical symptoms and should be managed promptly as it can lead to permanent visual changes. The endoscopic approach offers a straightforward repair with minimal trauma to the sphenoid and posterior nasal tissue. Intraoperative



**Figure 3:** Intraoperative fluoroscopy was used to verify adequate decompression of the tension pneumatocele, (a) before starting surgery, (b) prior to closure of the operation

fluoroscopy can be used to verify adequate decompression of the tension pneumatocele before closure of the operation.

It has been postulated that air from the paranasal sinuses may be entrapped through an anatomic one-way ball valve mechanism through the fascia lata graft and into the intracranial compartment.<sup>[7]</sup> In the present case, the air accumulation probably occurred when fascia and fat packing of the sphenoid sinus created a ball-valve effect. In our patient, incomplete closure of the sellar floor, postoperative CSF leak and forced air entry due to the negative pressure created by lumbar drainage probably played major roles in the development of the tension pneumatocele.

It is important to be vigilant for the possibility of evolving pneumatocele in all patients undergoing transsphenoidal surgery, who develop headache and/or the delayed appearance of visual deterioration. This will remain a rare complication but should be considered in a patient with postoperative deterioration with chiasmal compression. A plain skull X-ray is usually sufficient for the diagnosis. This complication should be added to the list of possible differential diagnoses after transsphenoidal surgery in a patient who postoperatively develops headaches, becomes somnolent, and develops visual difficulties.

## Conclusion

Tension pneumatocele is an uncommon but potentially lethal complication of transsphenoidal pituitary surgery, which can present anytime, even after years postoperatively. Prompt identification and management of this condition can be lifesaving. As such, it could be overlooked at the time of following up if one is not aware of this extremely rare possibility. It is crucial to consider this as a differential diagnosis in patients presenting with headaches or visual deterioration after transsphenoidal surgery. A large number of factors can predispose to CSF leak and pneumocephalus and the prevention of intraoperative CSF leak is important. It is important for neurosurgeons and otorhinolaryngologists to be aware of this condition so that prompt treatment can be instituted.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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