



## Repair of Frontal Sinus Posterior Table Defect in a Patient with Brain Abscess: A Case Report

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### Abstract

**Introduction:** Frontal sinusitis is a rare but potentially serious infection that can lead to intracranial complications such as brain abscesses. Herein, we present a case of a brain abscess secondary to frontal sinusitis with a posterior table defect, treated using a combined surgical approach.

**Case:** A 59-year-old man presented with seizures and loss of consciousness one month after being diagnosed with acute sinusitis and preseptal cellulitis. Computed tomography (CT) revealed a brain abscess in the patient's frontal lobe. Following surgical drainage, an 11 mm defect was identified in the posterior table of the frontal sinus, which was repaired through an additional surgical intervention. Endoscopic sinus surgery was performed to remove the pathological tissue, followed by an external osteoplastic approach with fibrin glue and hemostatic agents, and placement of an otologic ventilation T-tube in the frontal sinus ostium.

**Conclusion:** Intracranial complications of frontal sinusitis can be successfully managed using a multidisciplinary approach and appropriate surgical techniques. Early diagnosis, treatment timing, surgical planning, and maintenance of frontal sinus drainage in complicated frontal sinusitis are critical.

**Keywords:** Frontal sinusitis, brain abscess, posterior table defect, endoscopic sinus surgery, T-tube

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## Introduction

Paranasal sinus infections, especially those involving the frontal sinus, can cause serious intracranial complications and increase mortality (1). Because of its anatomical proximity to the frontal lobe, frontal sinus infections carry a high risk of intracranial spread (2). This spread can occur through direct bone erosion, retrograde spread via the venous sinuses, or hematogenous dissemination (3). Intracranial complications of frontal sinusitis include brain abscesses, subdural empyema, epidural empyema, and meningitis, which are life-threatening conditions (3). These complications are most commonly observed in adolescent males (4). Osteitis in the posterior table of the frontal sinus and the resulting bone defect facilitate the passage of infection into the intracranial cavity and predispose factors for brain abscess development (5,6).

Another essential but rare complication of frontal sinus disease is Pott's puffy tumor (PPT), characterized by subperiosteal abscess formation and underlying frontal bone osteomyelitis. Although uncommon today, Pott's puffy tumor remains clinically relevant in both children and adults. Typical findings include forehead swelling and headache, with a risk of intracranial spread (6,7).

A brain abscess is a space-occupying intracranial infection with purulent content localized within a limited area (2,7). It may present with headaches, altered consciousness, fever, and focal neurological findings. Delayed diagnosis or inadequate treatment can result in permanent neurological sequelae or even death (8). Therefore, eradicating the source of infection and appropriately managing intracranial complications are crucial.

Herein, we present a case of a brain abscess secondary to frontal sinusitis accompanied by a posterior table defect of the frontal sinus, in which delayed surgical reconstruction was performed.

## Case Report

A 59-year-old man presented to the otolaryngology outpatient clinic with complaints of headache, burning sensation in the right hemifacial area, and discomfort in the right eye. His medical history included a coronary artery disease. Otolaryngological examination revealed purulent discharge in the right middle meatus and hyperemia of the right eyelid. Eye movements were regular in all the directions. Paranasal sinus computed tomography (CT) revealed soft tissue densities in the bilateral maxillary, ethmoid, frontal, and sphenoid sinuses (Figure 1). The patient was hospitalized with preliminary diagnoses of acute sinusitis and preseptal cellulitis, and intravenous antibiotic therapy was initiated.

On the fourth day of treatment, the patient requested discharge and the therapy was discontinued. No pathology other than sinusitis was detected on imaging performed at this stage. Approximately one month later, he presented to the emergency department with seizures and loss of consciousness. Cranial computed tomography (CT) revealed a 3 × 2 cm brain abscess localized to the frontal lobe (Figure 2). The Neurosurgery Department performed a frontotemporal craniotomy, and the frontal abscess was drained.

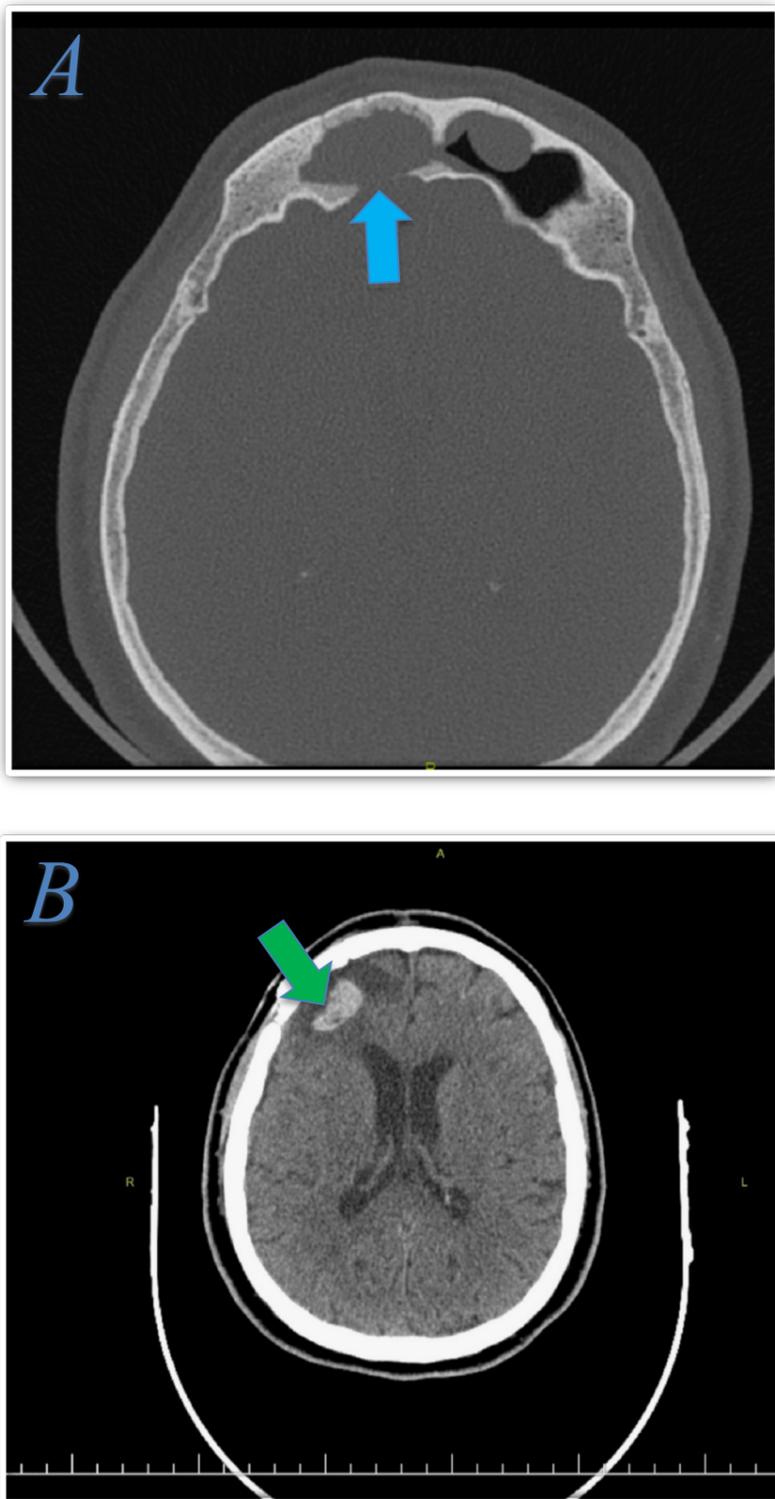


**Figure 1.** Paranasal sinus computed tomography (CT) scan showing bilateral soft tissue densities in the maxillary, ethmoid, frontal, and sphenoid sinuses.



**Figure 2.** Cranial computed tomography (CT) scan showing abscess formation in the right frontal lobe and concomitant frontal sinusitis.

After surgery, the patient received intravenous ampicillin-sulbactam therapy for 14 days, followed by oral amoxicillin-clavulanate for 14 days. No neurological sequelae were observed during the follow-up. At the 1-month postoperative visit, imaging revealed a defect in the medial and posterior walls of the right frontal sinus. Paranasal CT showed an 11 mm defect in the posterior wall of the right frontal sinus, a 2 × 1 cm hyperdense hematoma in the anterior frontal lobe, and surrounding edema (Figure 3).



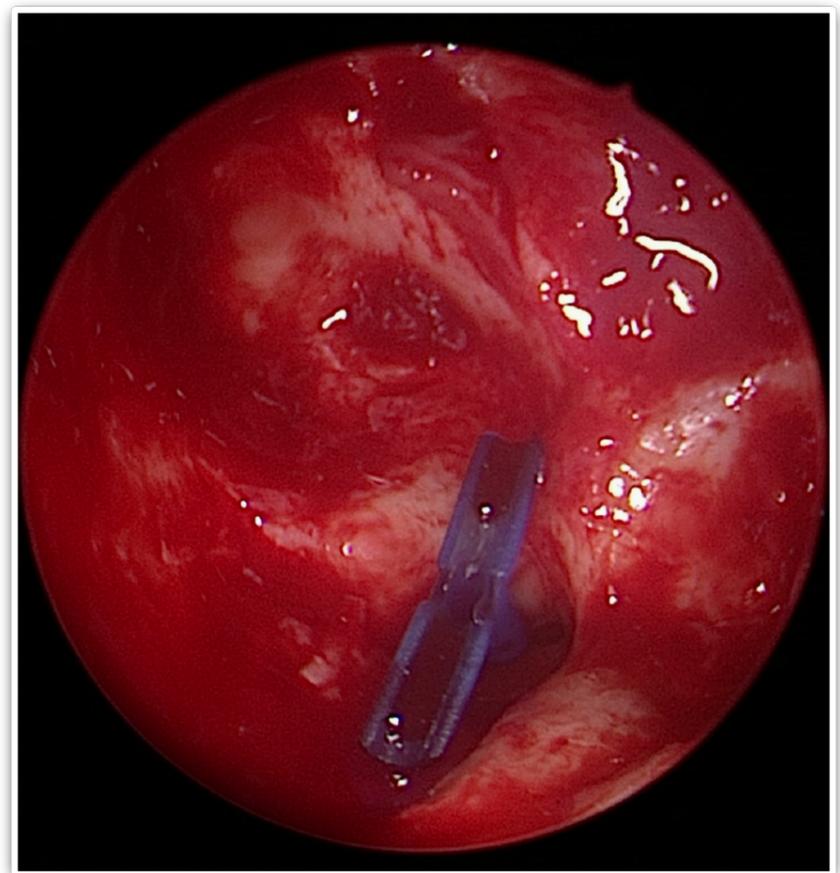
**Figure 3.**

*A: Postoperative computed tomography (CT) scan was obtained one month later, showing an 11 mm defect in the posterior wall of the right frontal sinus (blue arrow).*

*B: Hyperdense hematoma in the anterior frontal lobe with surrounding edema (green arrow).*

Surgical repair was planned under general anesthesia to close the defect and eradicate the source of the infection. Functional endoscopic sinus surgery (FESS) was first performed, reaching the frontal sinus ostium using the intact bulla technique. Pathological tissue around the ostium was removed, and the endoscopic procedure was completed. Subsequently, external osteoplastic frontal sinus surgery was performed through a right supraorbital incision. A 4 cm skin incision was made, and the anterior wall of the frontal sinus was opened. The polypoid and hypertrophic mucosal tissues within the sinus were completely removed. A bone defect of approximately 11 mm was observed in the posterior table. A thickened dura mater was observed at the defect site; however, no cerebrospinal fluid (CSF) leakage was identified.

The defect was repaired using a fibrin tissue adhesive (Tisseel) and a hemostatic agent (Surgicel). To ensure drainage of the infection, an otologic ventilation tube (T-tube) was placed in the frontal sinus ostium (Figure 4). The bone flap of the anterior wall was appropriately repositioned, and layered closure of the incision was performed with a pressure dressing.



**Figure 4.** *An otologic ventilation tube (T-tube) was placed in the frontal sinus ostium to maintain the drainage.*

Preoperative neurosurgical consultation revealed no brain abscess; therefore, neurosurgical intervention was not indicated. However, the neurosurgical team remained present throughout the procedure for contingencies.

The postoperative course was uneventful. The patient received intravenous ceftriaxone (1 g) for seven days, followed by four weeks of oral amoxicillin-clavulanate. No complications were observed. During the first postoperative month, the patient was regularly followed up.

## Discussion

Intracranial complications of acute sinusitis include orbital and systemic complications (5). Although rare today due to widespread antibiotic use, these infections remain potentially life-threatening. The reported incidence of sinusitis-related complications is approximately 3.7% (9). Intracranial complications of sinusitis include subdural empyema, epidural abscess, brain abscess, meningitis, and venous sinus thrombosis, most commonly arising from frontal sinus infections, followed by ethmoid, sphenoid, and maxillary sinus infections (9). Spread occurs via hematogenous dissemination, direct extension or venous sinuses (3). This is especially critical because of the anatomical location of the frontal sinus. Posterior table erosion allows direct infection passage into the brain (2,3).

Adolescents are particularly susceptible because of diploic venous flow and bony spaces within the frontal sinus, and males are affected twice as often as females (3,10). The patient was a 59-year-old man. The annual incidence of intracranial complications of sinusitis in the United States is reported as 3-4 per million (9). Antibiotic therapy is the first-line treatment. Brain abscesses smaller than 2 cm may be managed conservatively with antibiotics alone; however, abscesses larger than 2 cm or those causing a mass effect typically require surgical drainage (5,9). Our patient presented with seizures and loss of consciousness due to a 3 × 2 cm abscess, requiring surgical drainage and prolonged antibiotic therapy. Persistent or recurrent infections can occur if local treatments are insufficient (5). As the frontal sinusitis did not regress after antibiotic treatment and a posterior wall defect was observed, secondary surgery was performed to repair the defect and treat the sinusitis. Endoscopic sinus surgery is the preferred approach in most cases (5). The aim is to clear the pathological tissue and provide adequate drainage (11). If a functional drainage pathway cannot be established, permanent separation of the intracranial and extracranial compartments and sinus obliteration may be required (11). In our patient, pathological tissue was removed using endoscopy and a supraorbital incision. The literature reports the placement of biliary stents or Montgomery tubes to maintain frontal sinus drainage (12,13). Stenting helps prevent ostial stenosis but may cause blockage, edema, infection, or pain (12). Mansour et al. (14) used double J stents in frontal sinuses, achieving drainage in 6-7 cases. In our case, an otologic ventilation tube was used, which is biocompatible and spontaneously extrudable; however, its small caliber may predispose patients to obstruction.

A purely endoscopic approach may not consistently achieve sufficient exposure in complex frontal sinus disease or in revision cases. Combined endoscopic and external approaches have been described for such patients. These techniques aim to merge the advantages of endoscopy with the direct access of external procedures, improving visualization and disease clearance. Several studies have reported favorable long-term patency rates with combined approaches, particularly in cases of osteoneogenesis, lateral frontal recess disease, or tumors (8,11). However, they are associated with longer operative times and potential morbidity related to external incisions; thus, they are generally reserved for selected refractory cases rather than routine primary surgery.

One of the major challenges in frontal sinus surgery is the restenosis of the frontal ostium following the procedure. To overcome this problem, various materials and techniques have been proposed to maintain long-term patency of the graft. Silicone stenting is the most widely used method for treating this condition. Devices such as T-tubes or Silastic drains can temporarily maintain ostial patency and reduce early restenosis rates. However, prolonged stenting is associated with complications, such as infection, granulation tissue formation, and foreign body reactions. (12,14,15)

Alternative strategies include the use of mucosal flaps and anti-adhesion agents. Pedicled mucosal flaps have been shown to promote epithelialization around the neo-ostium and may decrease the risk of restenosis, particularly in revision cases. Mitomycin C has been investigated as an adjunct due to its inhibitory effect on fibroblast proliferation among antifibrotic agents. Although some experimental and clinical studies have suggested potential benefits, the evidence remains inconsistent and does not support routine use. (13)

Another critical but rare complication of frontal sinus disease is Pott's puffy tumor (PPT), characterized by subperiosteal abscess formation and underlying frontal bone osteomyelitis. Although uncommon today, it remains clinically relevant in both children and adults alike. Typical findings include forehead swelling and headaches, with a risk of intracranial spread. Management requires combined surgical drainage—endoscopic and sometimes external for extensive disease—together with prolonged intravenous antibiotics (11–14).

Frontal sinus bone defects most frequently occur in the posterior table (14). The causes include trauma, infection, congenital anomalies, tumors, and iatrogenic injury (14). These may lead to intracranial infections, orbital complications, and CSF leaks. Treatment depends on the defect location, size, symptoms, and associated complications. Endoscopic endonasal approaches are preferred for repair (5).

External approaches (e.g., osteoplastic flaps) are used for larger defects, and autologous grafts, such as fascia, cartilage, or bone, may be required (14). An 11 mm posterior wall defect without CSF leak was successfully repaired using fibrin glue and hemostatic agents.

A multidisciplinary approach is essential for the effective management of this condition. The combination of endoscopic and external surgery allows for the clearance of intranasal pathology and repair of potential CSF leaks. The placement of a ventilation tube ensured postoperative sinus drainage. Broad-spectrum antibiotics were administered for four weeks.

### Conclusion

Brain abscess and posterior table defects secondary to frontal sinusitis are rare but potentially life-threatening conditions. Early diagnosis, timely surgical intervention, and a multidisciplinary approach are crucial for successful treatment outcomes.

**Ethical Approval:** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

**Informed Consent:** Informed consent was obtained from all the participants included in the study.

**Conflict of Interest:** The authors declare no conflicts of interest in this study.

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