

Case Report: Severe Acute Subdural Abscess Originating from Sinuses in Adults

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1. Abstract**1.1. Introduction:** Acute severe subdural abscess represents a life-threatening condition, necessitating prompt diagnosis and intervention. This report highlights the importance of early detection and appropriate treatment strategies.**1.2. Material and Methods:** A 22-year-old woman developed a subdural abscess originating from the sinuses, resulting in rapid disease progression. Neuroimaging revealed a marked displacement of the brain's midline structure five days after admission. Prompt surgical intervention, including drilling and drainage of the right frontal-temporal-parietal-occipital subdural abscess, was performed. However, 15 days later, the patient exhibited an increase in the number of abscesses along the right cerebral falx. Despite attempted puncture drainage, pus extraction was unsuccessful. Given the patient's normotensive intracranial pressure, anti-infective treatment was continued.**1.3. Results:** Favorably, one month after discharge, the patient recovered well, and subsequent head MRI indicated near-complete resolution of the subdural abscess.**1.4. Conclusions:** This case underscores the importance of early detection and prompt management in averting fatal or disabling outcomes in acute severe subdural abscesses.**2. Introduction**

With the widespread use of antibiotics, subdural abscesses stemming from the sinuses are uncommon, particularly among adults. This type of abscess often goes unnoticed or is mistakenly diagnosed, emphasizing the importance of accurate detection and prompt implementation of effective treatment strategies. Failure to recognize and address this condition promptly can result in life-threatening consequences or functional impairments for pa-

tients. Herein, we present a case study of an adult patient who developed a severe acute subdural abscess originating from the nasal sinuses.

3. Case Presentation

On January 4th, 2022, a 22-year-old female patient presented to the Department of Otolaryngology with complaints of a persistent headache for nine days and fever for three days. The headache was initially unexplained, accompanied by forehead swelling and discomfort. Her fever peaked at 40°C, but her body temperature was 38°C during the examination. She was conscious of acute facial features and spontaneous positioning abilities. Mild tenderness was felt on the forehead and body surface, while other nasal and bodily regions were unaffected. Left limb muscle strength was level 4 with normal tone, and physiological reflexes were present without pathological ones. A head scan revealed a small air accumulation in the extracranial right frontal area and no abnormal densities in the cerebral hemispheres or cerebellar parenchyma (Figure 1A). This comprehensive clinical picture will guide further diagnostic considerations and treatment planning.

On the second day, the patient's left muscle strength declined significantly. A subsequent Head MRI examination revealed abnormal signals on the right frontal, temporal, parietal, and occipital lobes, along with inflammation in the sinuses (Figure 1B). These abnormalities pointed to a possible purulent infection and subdural abscess. In response, the patient was transferred to our department for further treatment, including anti-epileptic measures, dehydration therapy, and nutritional support. A lumbar puncture revealed cerebrospinal fluid glucose and chlorine levels of 4.50mmol/L and 125.50mmol/L, respectively, with no bacterial or fungal growth detected after a three-day culture. On January 9th, 2022, a reassessment of the head MRI revealed a significant enlargement of

subdural abscesses compared to previous scans, along with a noticeable shift of the midline structure towards the left (Figure 1C). After preoperative preparation, a drilling and drainage procedure was performed for the right frontal-temporal-parietal-occipital subdural abscess. Holes were drilled in both the frontal and occipital skulls, and yellow pus was evacuated upon cutting the dura mater (Figure 2 A-B). Subsequently, No. 14 drainage tubes were inserted and irrigated with respective solutions - methylnitrate and physiological saline for the frontal region and metronidazole and physiological saline for the occipital region - until the drainage fluid cleared (Figure 2 C). Both tubes were alternately rinsed to ensure thorough cleanliness.

After the surgery, it is recommended to flush the wound with a vancomycin drainage tube and transition to vancomycin 1g administered q12h, discontinuing meropenem. Microscopic examination revealed numerous chain-like formations of Gram-positive cocci with minor presence of other bacteria. A repeat head CT scan showed a marked reduction in the subdural abscess (Figure 3A). Daily flushing with a 0.02% vancomycin drainage tube was initiated postoperatively. Notably, cultures of the purulent material

were negative, suggesting anaerobic bacterial infection. On January 19th, 2022, a repeat head MRI revealed a significant increase in the abscess adjacent to the right cerebral falx, indicating progression compared to previous scans (Figure 3B). A neuronavigation-guided procedure was performed to drain a right parallax brain abscess, addressing the challenges of subdural tube drainage. The original subdural tubes were removed during the operation, and a new tube was inserted into the abscess under neural navigation. However, despite removing the needle core, no pus could be extracted due to the abscess's narrowness, hindering effective penetration. Postoperatively, anti-infection treatment was administered. On February 2nd, 2022, a re-evaluation of the head MRI revealed a significant reduction in the parallax abscess compared to previous observations (Figure 3C). Two days later, the patient regained consciousness and exhibited a level 4 weakness in the left limb. Discharge procedures were completed, and oral administration of linezolid and metronidazole was recommended post-discharge. On March 24th, 2022, a follow-up MRI revealed that the parallax abscess in the brain had resolved, indicating a successful outcome (Figure 4 A-B).

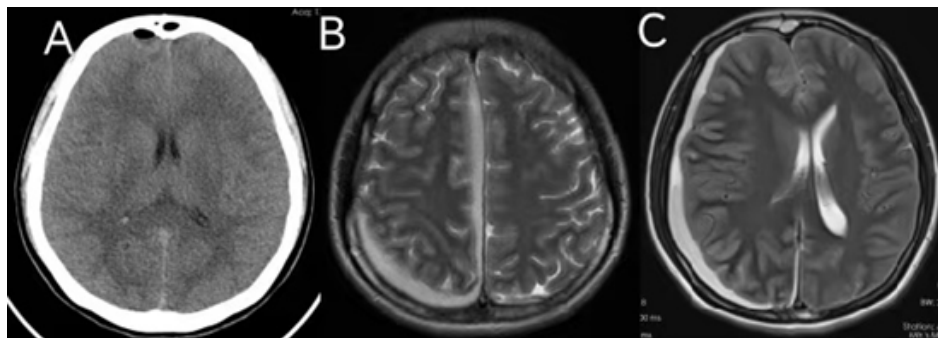


Figure 1: A: Head CT at admission B: Head MRI before transfer C: Head MRI on January 9th, 2022



Figure 2: Surgical images

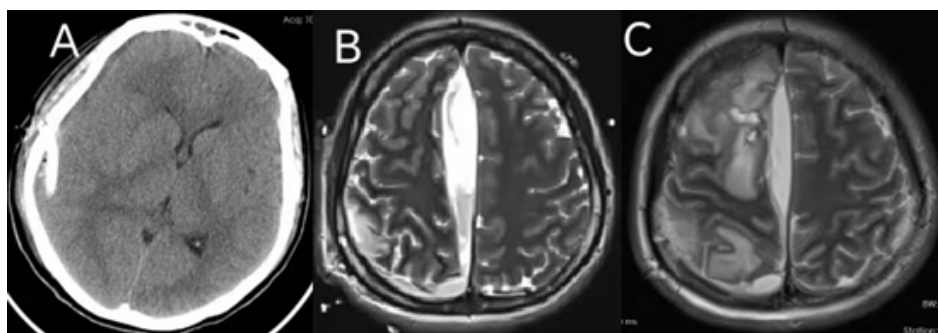


Figure 3: A: Head CT on the first day after surgery B:Head MRI on February 2nd C:Head MRI on February 2nd, 2022

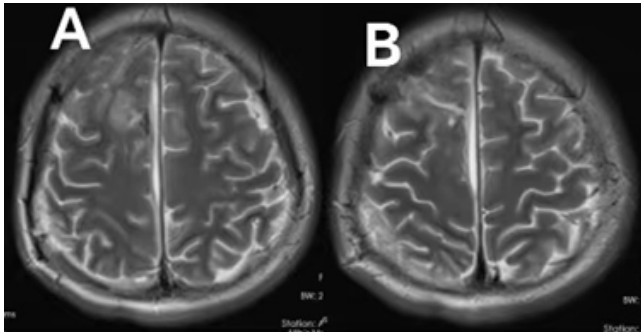


Figure 4: Head MRI on March 24th, 2022

4. Discussion

Subdural abscess is characterized by pus accumulating between the dura mater and arachnoid membrane, primarily on the brain's surface, with a minority occurring beneath the cerebral falx and cerebellar tentorium. The bacteria responsible can stem from ear infections, sinusitis, or purulent meningitis or may result from hematogenous dissemination due to trauma or compromised immune systems, such as from renal pelvis infections or nasopharyngeal carcinoma following radiotherapy and chemotherapy [1-6]. With China's economic growth and increased antibiotic use, subdural abscesses have become increasingly rare. Initially presenting with fever and headache, the patient's condition worsened rapidly, revealing multiple subdural abscesses. A cranial CT scan upon admission showed a frontal sinus infection with skull base bone destruction and pneumocephalus, allowing bacteria to infiltrate the cranial cavity and form abscesses in the subdural space. These abscesses caused a toxic reaction and significant occupying effect. Despite high-dose antibiotics, the patient's condition deteriorated, necessitating surgical intervention due to a significant midline structure shift. When discussing surgical methods, it is noteworthy that we utilize two boreholes and corresponding drainage tubes to efficiently extract pus for rinsing. Notably, the majority of bacteria from the sinuses are anaerobic. To minimize pus residue, thorough flushing is performed using a combination of metronidazole and physiological saline. Analysis of the surgical specimen smear indicated the presence of Gram-positive bacteria, despite negative bacterial culture results, suggesting the involvement of anaerobic bacteria, which cannot be cultured using standard methods. Post-surgical re-examination showed clearance of most subdural abscesses on the brain's surface but an increase in abscesses in the lower part, possibly due to gravity-induced pus accumulation. Regrettably, the abscess within the brain could not be effectively drained through the implanted subdural drainage tube, and surgical puncture attempts were unsuccessful due to anatomic constraints and challenges in achieving the necessary puncture angle and force to penetrate the pus cavity. Following the initial surgery, the intracranial pressure was significantly reduced, justifying conservative treatment due to the residual brain abscess exerting no significant mass effect [7]. Subsequently, the patient received high-dose, long-term treatment with linezolid, leading to gradual shrinkage

and ultimate disappearance of the lesion. Overall, the patient recovered well with significant improvement in limb dysfunction. This case study yields several key insights: Prompt treatment is vital for managing recurrent and recalcitrant sinusitis. Urgent cranial CT or MRI is necessary for patients with altered consciousness or limb dysfunction. Surgical intervention should be considered for patients with subdural abscesses unresponsive to antibiotics. Tailored administration of sensitive antibiotics based on microbial etiology identified through pus cultures may necessitate higher dosages and extended treatment courses.

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