

Unusual Intracranial Suppuration: 2 Case Reports and a Review of the Literature

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Introduction

- Intracranial suppuration (ICS)** is a rare, life-threatening condition which **consists of brain abscess, extradural empyema, and subdural empyema**. Despite advances in modern neurosurgical technique, diagnostic neuroimaging, and new antibiotic therapies, ICS is still considered to be a dangerous neurosurgical emergency due to its potentially lethal nature.
- In low- and middle- income countries, early diagnosis and treatment can be challenging due to limited access to medical facilities.
- The **etiology of ICS typically results as a complication of numerous disease processes** including: paranasal sinusitis, mastoiditis, osteomyelitis of the skull, head trauma with open fracture of the skull, prior cranial surgery, infected hematoma or subdural effusion, otitis, meningitis, bacterial endocarditis, or metastatic spread from distant foci.
- However, in some cases, the source of ICS is not able to be determined. While subdural empyema and brain abscess are well-known disease entities of ICS, **sterile site intracranial suppuration is uncommonly seen** in the field of neurological surgery. The authors of this study hereby present two cases of unusual, sterile intracranial suppuration.

Methods

- These unusual cases were treated at our department in the Neurosurgery Unit at Rwanda Military Hospital.
- Data including demographics, pre- and post-operative symptoms, neuroimaging, labs, neurological examination findings, lesion location, surgical procedure and complications, pathology, and medications was extracted from the records.
- Additionally, the **PubMed database was searched in June 2021 for relevant literature pertaining to sterile or aseptic intracranial suppuration** in accordance with the PRISMA guidelines.

Case Report 1: Sterile Subdural Empyema

Pre-operative History: A 33 year-old male with no significant past medical history presented with symptoms of right-sided body weakness and confusion that began a few weeks prior to seeking medical treatment. The patient had no history of trauma or sinusitis and was otherwise healthy. Of note, the patient was a prisoner. On exam, the patient was noted to have tattoos present bilaterally on his upper extremities, right-sided hemiplegia, afebrile with a temperature of 36° Celsius, and the remainder of his vitals on admission were unremarkable. His labs were within normal limits. CT brain with contrast revealed a left-sided subdural empyema.

Intra-operative Course: The patient was subsequently admitted on the same day and surgical treatment consisted of a craniotomy with 2 burr holes made to evacuate the subdural empyema. During the procedure, a thickening of the dura mater was observed where the subdural empyema was later decompressed.

Post-operative Course: He was empirically treated with ceftriaxone, cloxacillin, and flagyl. He was also started on phenytoin. During the course of the patient's stay at our institution, he remained stable. After the surgical procedure, the patient improved significantly; he was ambulating, had a GCS of 15, and had no signs of hemiplegia on exam. The patient was discharged after four weeks with a course of oral antibiotics: Augmentin 625mg TDS for two weeks and Depakine. Therefore, the patient received a total of six weeks of antibiotic treatment. He was seen for follow-up one month post-discharge and his CT brain showed good evacuation of the subdural empyema.

Case Report 2: Aseptic Brain Abscess

Pre-operative History: 42 year-old male with a past medical history significant for tuberculosis presented with eight weeks of worsening symptoms of chronic headache, vomiting, blurry vision, dizziness, and right homonymous hemianopia. The patient was afebrile with a temperature of 36° Celsius, a blood pressure of 120/60 mmHg, and symptoms of increased intracranial pressure. The patient had a medical history of tuberculosis that arose 7 years prior and was subsequently treated and healed. He did not have any other notable medical issues including hepatitis, HIV, sinusitis, or history of trauma. On exam, he had a field cut in his vision, however, was complaining about blurred vision. On exam of his visual acuity, the patient had 20/40 vision with his right eye and 20/50 vision with his left eye. His neck was soft and supple. The patient was found to have a left occipital abscess on MRI brain scan with contrast.

Intra-operative Course: During the surgical operation, a thick capsule was found and more than 100 cc of pus was drained from the patient's abscess. The capsule was surrounded by necrotic brain tissue which the pathology report noted findings of reactive astrocytes and inflammatory cells, mainly neutrophils, polymorphs, lymphocytes, and macrophages. However, no neoplastic processes were seen. Interestingly, the lab results obtained from the capsule showed only 1 white blood cell.

Post-operative Course: He was started on antibiotics. An x-ray of the chest was conducted and it was clear, however, he had mild circumcised homogenous infiltrate in his right lower lobe that could be fibrosis related to his prior tuberculosis infection. The patient was discharged after four weeks on oral antibiotics. Post-operative imaging showed good evacuation of the abscess. On follow-up, the patient still suffers from seizures.

Figures and Results: Case 1

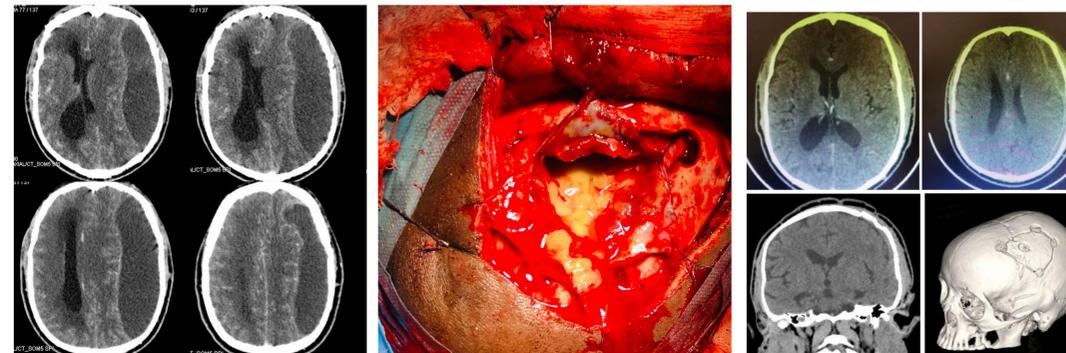


Figure 1. Pre-operative CT brain with contrast showing a subdural empyema as a left-sided hypodense collection with significant mass effect on the ipsilateral ventricle and midline shift. The periphery enhances after contrast.

Figure 2. Intra-operational resection of the hypodense collection was performed via a craniotomy procedure and showed a subdural empyema with thickening of the dura mater.

Figure 3. Post-operative CT brain showing good evacuation and decompression of the subdural empyema post-craniotomy with small residual empyema that was treated with antibiotics.

Figures and Results: Case 2

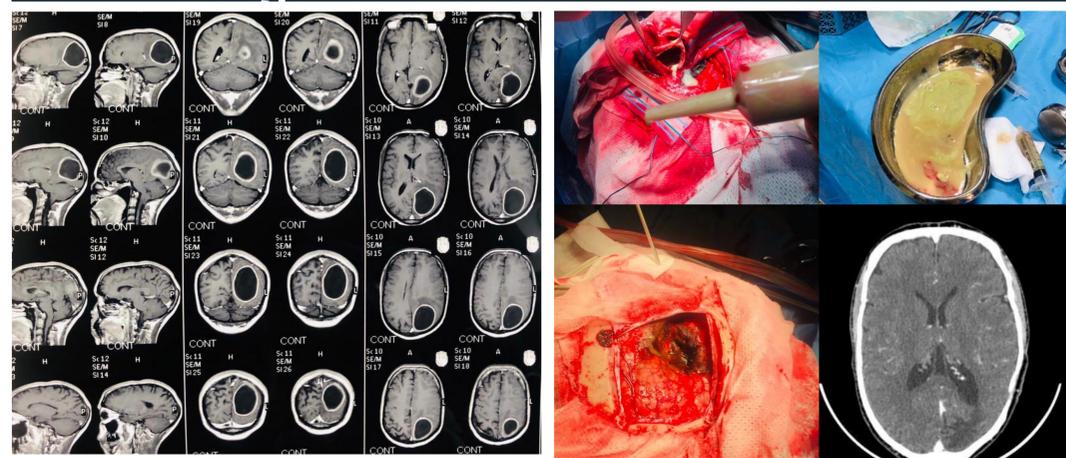


Figure 4. Pre-operative MRI brain with contrast showing a left-sided occipital brain abscess.

Figure 5. Intra-operative drainage of brain abscess revealed a thick capsule. Pus was evacuated and the capsule was resected. Post-operative CT brain showed good evacuation of the abscess.

Discussion

- An intracranial subdural empyema (SDE) is defined as a widespread collection of pus located in the subdural space between the dura mater and arachnoid mater. About 40-80% of patients with SDEs have otorhinologic infections, most frequently of the paranasal sinuses, which leads to bacterial seeding of the subdural space.
- A brain abscess (BA) is characterized as a localized area of necrosis within the brain parenchyma that results from a focal infection or traumatic process. Most commonly, brain abscess arises from chronic, rather than acute, infections of the middle ear.
- Treatment of both SDE and BA consists of surgical excision or drainage combined with prolonged antibiotics. Post-operative imaging may delay to clear.
- A possibility as to why our patients did not present with fever or abnormal labs may be due to localization of the SDE and BA. In 7-53% of cases, operative culture results can be negative potentially due to the frequent use of preculture/preoperative antimicrobial therapy.

Conclusion

This report and literature review details two uncommonly encountered cases of sterile intracranial suppuration in which both patients had no discernible preexisting conditions or history that are frequently seen with ICS. Sterile ICS deserves further investigation to identify the etiology of sterile ICS and determine appropriate treatment to improve clinical outcomes.

References

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Discussion

- Only 1 study satisfied our inclusion criteria from our literature review. Nour et al. was the only study that shared similarities to our rare, sterile subdural empyema case in that there was no known preceding history of trauma or infection and laboratory results were normal. Moreover, the pus that was collected intra-operatively from the subdural empyema was not revealing for infection. This review further corroborates the unusuality and rarity of the two cases we present in this report. It is uncommon that there is no identifiable predisposing condition that led to the development of the ICS and even more unusual to see sterile site ICS.