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Subdural Empyema of Dental Origin Complicated by Intracerebral Collections and Septic Shock in A Young Adult: A Case Report

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Abstract

Introduction: Subdural empyema is a rare but life-threatening intracranial infection, most commonly secondary to sinusitis. Odontogenic origin remains uncommon and is frequently associated with delayed diagnosis and poor prognosis.

Patient and observation: We report the case of a 34-year-old man with a recent dental extraction who presented with progressive headache, fever, altered consciousness, and left-sided hemiparesis. Brain computed tomography revealed a right fronto-parietal subdural empyema associated with pansinusitis of dental origin, complicated by mass effect and a contralateral empyema. Despite urgent surgical drainage, broad-spectrum antibiotics, and intensive care management, the patient developed secondary intraparenchymal collections followed by septic shock and multiple organ failure, leading to death on day seven.

Conclusion: This case highlights the severity of intracranial empyema of dental origin and underlines the importance of early diagnosis, prompt surgical management, and close postoperative monitoring.

Keywords: Subdural empyema; dental infection; intracranial infection; septic shock; case report

Introduction

Subdural empyema represents a neurosurgical emergency accounting for approximately 15–25% of intracranial suppurative infections and is associated with high morbidity and mortality if diagnosis and treatment are delayed [1–3]. It most often occurs as a complication of paranasal sinusitis, particularly frontal sinusitis, whereas odontogenic origin remains rare and frequently underestimated [7,8].

Clinical presentation is often insidious, combining headache, fever, focal neurological deficits, and altered consciousness. Prior antibiotic therapy may mask early symptoms and delay diagnosis [6]. Management relies on urgent surgical drainage combined with broad-spectrum antimicrobial therapy and intensive care support [1,4].

We report a fatal case of subdural empyema of dental origin complicated by intracerebral involvement and septic shock.

Patient and observation

Mr **B.M**, a **34-year-old male**, with no known past medical history, presented with several risk factors including **chronic tobacco smoking** (half a pack per day), **regular cannabis use**, **occasional alcohol consumption**, and a **dental extraction performed two weeks prior to admission**.

Reason for admission

The patient was admitted to the emergency department for **left-sided hemiparesis** associated with **altered consciousness**.

History of present illness

The symptoms began **15 days** prior to admission with **persistent headaches** associated with **unquantified fever**. The patient received outpatient treatment with **spiramycin–metronidazole**, **non-steroidal anti-inflammatory drugs**, and **paracetamol**, without clinical improvement.

The clinical course was marked by a **progressive worsening**, with the onset of **altered mental status** and **left-sided hemiparesis**, prompting emergency consultation.

Clinical examination on admission

On admission, the patient was hemodynamically stable, with a **blood pressure of 130/70 mmHg**, **heart rate of 110 bpm**, **respiratory rate of 20 breaths per minute**, and **oxygen saturation of 99% on room air**. Cardiopulmonary examination was unremarkable. Body temperature was **36.5°C**.

Neurological examination revealed a **Glasgow Coma Scale score of 9**, **anisocoria**, and **left-sided motor weakness graded 3/5**, with preserved deep tendon reflexes.

Initial brain imaging (Day 0)

Initial brain computed tomography (**Figure 1**) demonstrated **right-sided pansinusitis of dental origin**, complicated by a **right fronto-parietal subdural empyema** causing **ipsilateral subfalcine herniation**, as well as a **left posterior parietal subdural empyema**.

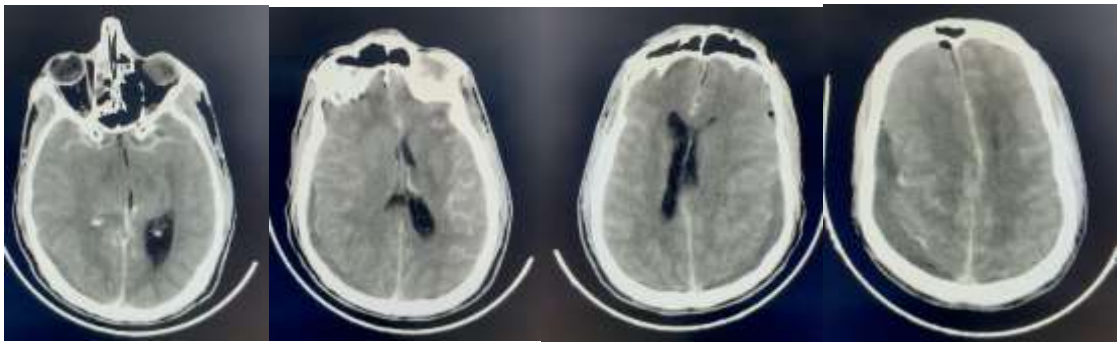

Figure.1 Baseline brain computed tomography (Day 0)

Brain CT scan demonstrating dental-origin pansinusitis with right fronto-parietal subdural empyema, subfalcine herniation, and contralateral parietal empyema.

Laboratory findings

Laboratory investigations revealed a **severe inflammatory syndrome**, with a **C-reactive protein level of 370 mg/L**.

Initial management

The patient was admitted to the intensive care unit, where **fluid resuscitation** and **norepinephrine** were

initiated. Empirical **broad-spectrum antibiotic therapy** with **ceftriaxone and metronidazole** was started.

He was subsequently taken to the operating room and underwent **surgical drainage of the subdural empyema**.

Postoperative course

Postoperative brain CT performed on **day 1 (Figure 2)** showed:

- **Regression of the right fronto-parietal subdural collection** and subfalcine herniation,
- **Appearance of a right fronto-parietal intraparenchymal collection** containing hyperdense areas,
- **Increase in the left parietal collection** with hyperdense components,
- **Postoperative changes**.

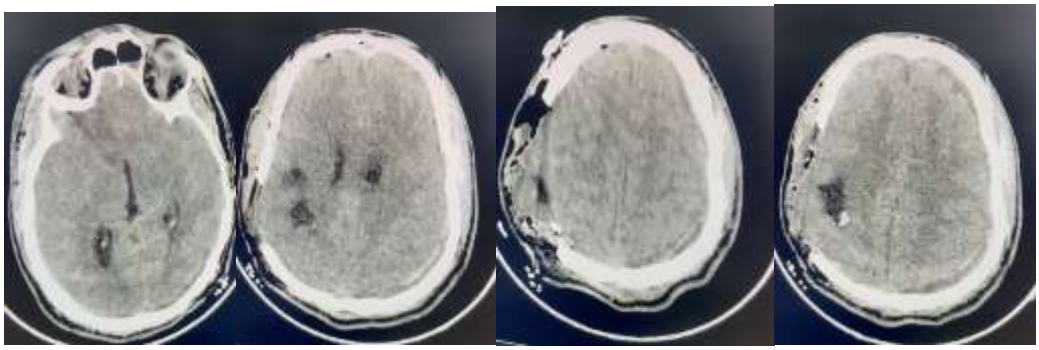

Figure.2 Postoperative day-1 brain CT showing regression of the right subdural empyema, with new intraparenchymal collection and increased contralateral parietal hemorrhagic collection.

The patient remained hospitalized in the intensive care unit, receiving:

- **Deep sedation**,
- **ACSOS-based management**,
- **Close neurological monitoring**, including **transcranial Doppler ultrasound**.

The clinical course initially improved, allowing **progressive sedation withdrawal** and a **decision to proceed toward awakening**.

Follow-up imaging (Day 4)

A control brain CT performed on **day 4** demonstrated:

- **Marked regression of the right fronto-parietal subdural collection**,
- A **stable appearance of the right fronto-parietal intraparenchymal collection**,
- **Resolution of subfalcine herniation**,
- **Partial decompression of the right lateral ventricle**, with contralateral exclusion hydrocephalus,
- A **stable left parietal collection**,
- **Postoperative changes**, including a **fronto-parieto-temporal bone defect** with **cerebral herniation through the defect**.

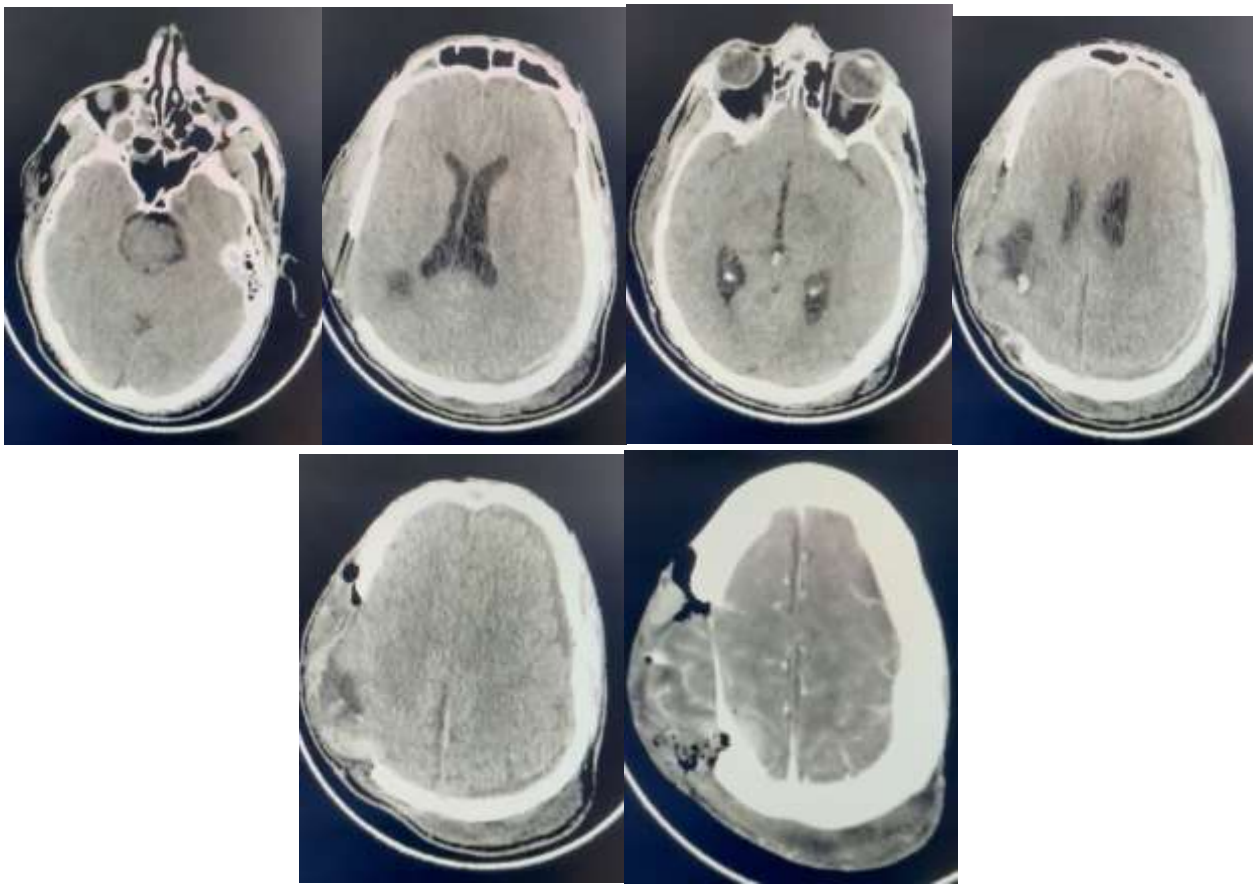

Figure.3 Control brain CT on day 4 showing marked regression of the right fronto-parietal subdural collection, stable right fronto-parietal intraparenchymal collection, resolution of subfalcine herniation, partial decompression of the right lateral ventricle with contralateral exclusion hydrocephalus, stable left parietal collection, and postoperative changes including a fronto-parieto-temporal bone defect with cerebral herniation.

Secondary deterioration and outcome

On **day 6**, the patient experienced **clinical deterioration**, with the onset of **septic shock**, probably secondary to **ventilator-associated pneumonia**.

Sedation was resumed, vascular access was changed, multiple microbiological samples and blood cultures were obtained, and antibiotic therapy was **broadened to cefepime and colistin**.

Despite aggressive management, the patient rapidly developed **multiple organ failure** and **died on day 7**.

Discussion

Subdural empyema is an aggressive intracranial infection with rapid progression and potentially fatal outcome. Although sinusitis remains the most common source, odontogenic infections represent an uncommon but severe etiology associated with delayed diagnosis and poor prognosis [7–9].

In the present case, recent dental extraction strongly suggests an odontogenic source complicated by pansinusitis and intracranial spread. Infection may extend intracranially via direct contiguous spread through the paranasal sinuses or through venous pathways [8]. Partial antibiotic treatment prior to admission may have contributed to delayed recognition and disease progression [6].

Neurological deterioration is usually related to mass effect, cerebral edema, venous thrombosis, or secondary parenchymal involvement [2,3]. Despite adequate surgical drainage, our patient developed secondary intraparenchymal collections and hemorrhagic changes, reflecting severe inflammatory and vascular involvement.

Urgent surgical evacuation combined with broad-spectrum antibiotics remains the cornerstone of treatment [1,4]. However, mortality remains high in complicated cases, particularly when septic shock and multiple organ failure occur [10,11]. The development of probable ventilator-associated pneumonia further worsened the prognosis [12].

Antibiotic therapy plays a critical role in the management of subdural empyema and must be initiated promptly. Empirical treatment should cover the most common pathogens, including aerobic and anaerobic bacteria, particularly in cases of odontogenic origin. Current recommendations support the use of a third-generation cephalosporin (such as ceftriaxone or cefotaxime) combined with metronidazole, ensuring adequate coverage against Streptococcus species, oral anaerobes, and Gram-negative organisms [4,13]. In severe presentations or in patients at risk for resistant pathogens, broader-spectrum regimens such as cefepime or carbapenems may be required, with additional coverage for Staphylococcus aureus, including MRSA, using vancomycin [13,14].

Antimicrobial therapy should be adapted based on microbiological findings whenever possible, although cultures are frequently negative, especially after prior antibiotic exposure. The duration of treatment is generally prolonged, ranging from 4 to 6 weeks, and should be guided by clinical evolution and neuroimaging findings [4,13]. In our patient, empirical therapy with ceftriaxone and metronidazole was appropriately initiated in accordance with current recommendations. However, the occurrence of septic shock and suspicion of ventilator-associated pneumonia required escalation to broader-spectrum antibiotics, including cefepime and colistin, reflecting a probable nosocomial superinfection. This underscores the importance of continuous reassessment of antimicrobial therapy in critically ill patients

Conclusion

Subdural empyema of dental origin is a rare but devastating condition. Early recognition, prompt surgical intervention, and aggressive multidisciplinary management are essential. Prognosis remains poor in severe forms complicated by intracerebral involvement and septic shock.

Learning points

- Dental infections may lead to life-threatening intracranial empyema.
- Persistent headache and fever after dental procedures warrant early neuroimaging.
- Despite optimal management, prognosis may remain unfavorable in severe cases.

Declarations

- Competing interests : none
- Authors' contributions: all authors contributed to patient management and manuscript preparation
- Patient consent: written informed consent obtained from the patient's family

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