Cranial convexity and parafalx subdural empyema: case report

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Abstract
Subdural empyema is a loculated collection between the dura and arachnoid which may be intracranial or develop within the spinal cord. Subdural empyema represents a medical and neurosurgical emergency as rapid compression of the brain or spinal cord may result. The case of a young male with complaints of headache, fever, neck pain and stiffness, progressing to recurrent focal seizures, with a Computed tomographic diagnosis of subdural empyema is presented. Aetiopathologic features, clinical presentation and the role of radiology in diagnosis using Computed tomographic scanning and magnetic resonance imaging are discussed. Treatment modalities are also highlighted.

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Key words : Subdural empyema, Computed tomography, intracranial

Introduction

Subdural empyema represents loculated infection between the outermost layer of the meninges, the dura, and the arachnoid[1]. The empyema may develop intracranially or in the spinal canal. Intracranial subdural empyema is most frequently a complication of sinusitis or, less frequently, otitis media or neurosurgical procedures[1]. Spinal subdural empyema is rare and may result from hematogenous infection or spread of infection from osteomyelitis[1].

The following is a case of subdural empyema in a 13 year old male who was initially misdiagnosed as suffering from malaria and is presented to emphasize the need for early accurate diagnosis and prompt intervention in this frequently severe and potentially fatal condition.

CASE REPORT

A 13-year old male was admitted via the Accident and Emergency Department of the University of Benin Teaching Hospital, Benin City with complaints of persistent headache, fever, neck pain and stiffness all of 5 days duration and a 2- day history of seizures.

An initial assessment of malaria was made at a private clinic and the patient was accordingly managed. However failure to improve 2 days after commencement of antimalarial therapy led to further clinical evaluation with a resultant assessment of bacterial meningitis. The patient was then commenced on intravenous antibiotics (the names of which could not be ascertained from the parents). However the patient began to have recurrent focal seizures and altered sensorium. Two days after he was referred to University of Benin Teaching Hospital for expert management.There had been no previous history of febrile seizures, no history of blood transfusion or drug reaction. There was no history of recent trauma or sinusitis. On examination at presentation, the patient was drowsy. He was febrile (temperature was 37.8C), mildly pale, not jaundiced, not dehydrated, and with no pedal oedema.

Cardiovascular system examination revealed a pulse rate of 64 beats per minute, regular, good volume, blood pressure was

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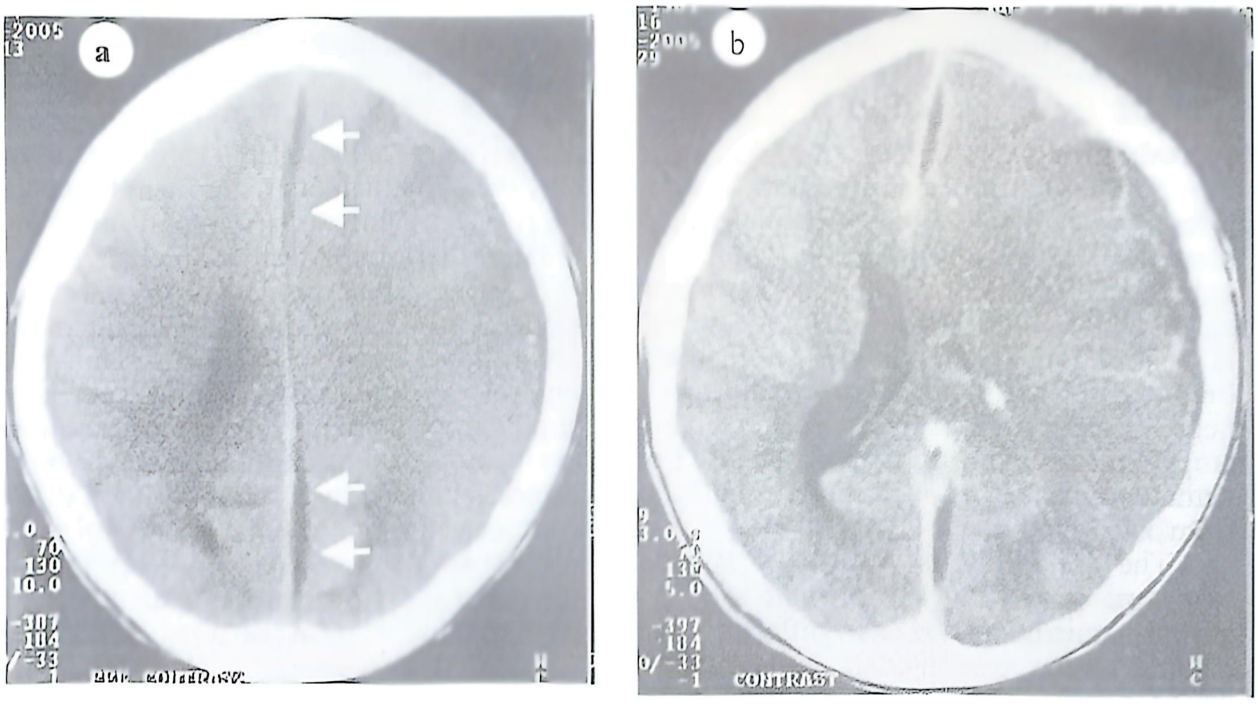
120/80mmHg, and heart sounds heard were 1 and 2, no murmurs. Respiratory rate was 24 cycles per minute and the patient was not dyspnoeic. Abdominal examination revealed no area of tenderness and no palpable organomegaly. Central nervous system examination revealed a Glasgow coma score of 12/15, neck stiffness, but however no obvious cranial nerve deficit.

An assessment of poorly treated bacterial meningitis with a differential diagnosis of an intracranial collection was made. The patient was placed on intravenous metronidazole 500mg 12 hourly for 24 hours, intravenous ceftriaxone 1g daily for 48 hours, and intravenous 20% mannitol 250mls 12 hourly for 24 hours.

An immediate cranial Computed Tomographic scan showed a hypodense collection in the left fronto parietal region extending to the falx with ipsilateral ventricular effacement and shift of the midline structures of the brain to the contralateral side and effacement of sulci and gyri (Figs 1 a and b). Contrast injection revealed enhancement of the adjacent cerebral cortex and oedema of the ipsilateral cerebral hemisphere (Figs 1 b and c). There was no evidence of calvarial fracture on bone window slices. Based on the Computed Tomographic findings, an impression of left subdural empyema was made and the patient was immediately referred to University College Hospital Ibadan for neurological intervention.The patient subsequently had burrhole surgery to drain the subdural abscess and was on admission for 2 weeks post-surgery after which he was discharged to commence physiotherapy for residual right hemiparesis.



Figures 1a and b: Axial Computed Tomographic scans (a) Precontrast slice shows hypodense collection in the left fronto - parietal region (black arrow heads) and adjacent to the falx (white arrow heads) with significant mass effect. Note effacement of the left lateral ventricle. (b) Contrast enhanced slice at a slightly lower level depicts enhancement of the inner membrane of the subdural empyema (black arrows).

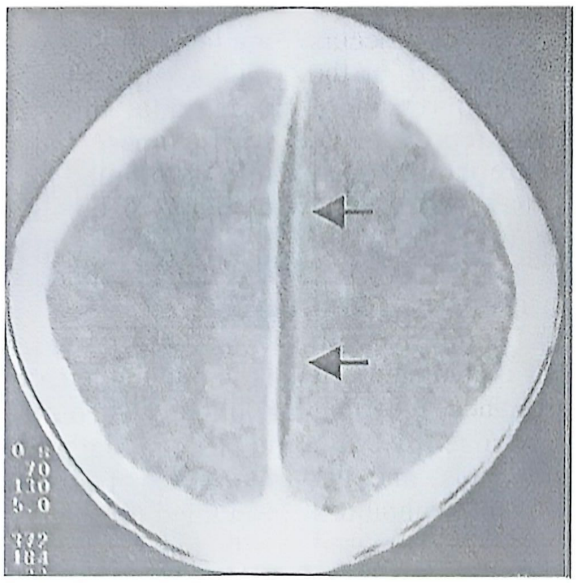


Fig 1c: Contrast enhanced cranial Computed Tomographic scan showing parafalx collection to the left of the midline. Note marginal enhancement of the inner margin of the subdural empyema (arrows).

Discussion

Subdural empyema, an infection of the subdural space, occurs most often in paediatric patients as a complication of meningitis, sinusitis or otitis media[2]. It represents 13 20% of all intracranial suppuration, and about 9% of children with brain abscess have associated subdural empyema[3].

Intracranial subdural empyema may be supra or infratentorial[4]. The infratentorial variety, with or without coexisting cerebellar abscess, is a rare clinical entity that carries a high mortality rate[4]. The patient in this case had the supratentorial variety of subdural empyema. Almost 80% of subdural empyemaoccur over the convexities and 12% in the interhemispheric fissure[3]. The patient in this case had an extensive collection which occurred over the convexities and also in the interhemispheric fissure.

In a study in Oman[5] of 45 cases of subdural empyema, it was found that there were 35 males and 10 females. The majority of the patients were either infants (22.2%) or in their second or third decade of life (37.8%)[5], as was found in this case who was a 13 year old male.

The most common organisms in intracranial subdural empyema are anaerobic and microaerophilic streptococci, in particular those of the streptococcus milleri group (*S. milleri* and *Streptococcus anginosus*[1]). *Staphylococcus aureus* is present in a majority of cases, and multiple additional organisms, including gram-negative organisms, such as *Escherichia coli*, and anaerobic organisms such as Bacteroides may be present in cases related to neurosurgical procedures. Salmonella species have been detected in patients with advanced acquired immunodeficiency syndrome (AIDS) in whom multiple organisms may be found simultaneously[1].

The three most frequently encountered clinical features in a study in China[6] included fever, disturbed consciousness, and seizures, all of which were present in the case presented. Post neurosurgical and posttraumatic states and complication after meningitis were the two most common modes of infection. The origin of the empyema in the case presented is unknown but may probably have been as a result of poorly treated meningitis.

Subdural empyema, whether it occurs in the skull, as in the case presented, or the spinal canal may cause rapid compression of the brain and spinal cord, and represents an extreme medical and neurosurgical emergency[1,3,5,7,8]. If the mass effect and vasogenic oedema are not controlled the brain may be fatally damaged[8].

Advances in diagnosis and treatment of brain abscess and subdural empyema with neuroimaging technique such as computerised tomography, magnetic resonance imaging, magnetic resonance spectroscopy, the availability of new antimicrobials, and the development of novel surgical techniques have significantly contributed to the decreased morbidity and mortality associated with these infections.

The findings on plain radiographs are nonspecific. With ultrasonography, (especially in infants or in the older patient with a burr hole) subdural fluid typically appears as a sonolucent cap of fluid over the cerebral hemispheres[9]. However subdural collections not located over the convexities are a little more difficult to identify and it is usually not possible to differentiate the type of fluid collection. Recourse has to be made to Computed Tomography and magnetic resonance imaging in the end because these modalities are more productive[9].

On Computed Tomographic scanning, subdural empyema usually appears as a thin rim of fluid slightly hyperdense to cerebrospinal fluid with surrounding enhancement, adjacent disproportionate cortical oedema and effacement of the cortical sulci[5]. The features were demonstrated in our case. Differentiating subdural empyema from other causes of subdural fluid collection such as subdural haematoma, hygroma and hydroma may be difficult. Enhancement of the underlying cerebral cortex (indicating associated cerebritis), and the disproportionate cerebral oedema in cases of subdural empyema[10] as was found in our case are helpful. Calcifications, not demonstrated in the case presented, are rare in subdural empyema but may occur in subdural haematomas. Calvarial fractures which were also not found in our case are also more common in subdural haematomas[10]. In cases of subdural empyema with high protein content, the fluid may show increased density on CT[10].

Magnetic resonance imaging although not done in the case presented due to its non - availability in our centre, is also very useful in identifying the presence of and differentiating the causes of subdural collection[11]. T1 and T2 weighted images show characteristic changes with the presence of blood in the subdural space (high signal due to the presence of methemoglobin). Subdural empyema may show increased signal on gadolinium enhanced MRI. Subfrontal and subtemporal subdural empyemas which are sometimes difficult to assess on axial Computed Tomographic scans due to partial volume effect are also better appreciated on magnetic resonance imaging[5]. The use of diffusion - weighted magnetic resonance imaging in the diagnosis of subdural empyema has also been studied[2,11]. It was found that subdural empyemas had a high signal intensity on diffusion weighted images and low signal intensity on the corresponding apparent diffusion coefficient maps when compared with normal cortical gray matter and reactive subdural effusions[2]. It was thus found to be of value in distinguishing subdural empyema from effusion and in the follow up of subdural collections.

Treatment of subdural empyema as in the case presented consists of surgical decompression via a craniotomy to relieve the compression, and the use of potent antimicrobials to treat infection[7,12]. With the availability of stereotactic techniques for aspiration and confirmation of diagnosis, empirical therapy is best avoided in the present era[13].

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