Subdural Empyema with Negative C.T. Scan: A Case Report

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SUMMARY: *Subdural empyema is a serious intracranial infection. C.T. scanning is the most accurate examination method in this disease. Increasing reliance on C.T. scanning makes it important to realize that even an enhanced scan may produce a false negative result, as outlined in this case.*

RÉSUMÉ: *L'empyème sousdural constitue une infection intracrânienne sérieuse. La tomodensitométrie cérébrale s'avère maintenant l'examen le plus fiable pour aider au diagnostic. Cependant il ne faut pas négliger la possibilité de faux résultats négatifs, tel que montré dans le présent rapport.*

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INTRODUCTION

Subdural empyema has been called the most urgent of neurosurgical emergencies (Stephanov et al., 1979). Consequently, an immediate and accurate diagnosis is necessary if treatment is to be successful. Computed tomography (C.T.) is an accurate, non-invasive technique and its usefulness in intracranial suppuration is well documented. The diagnostic accuracy of the C.T. scan has been demonstrated for both brain abscess and subdural empyema (Chiu et al., 1977; Joubert et al., 1977; Kaufman et al., 1977; Lott et al., 1977; Zimmerman et al., 1976). Brain abscess has been missed by the C.T. scan, especially when contrast enhancement was not used (Claveria et al., 1976; Lott et al., 1977). We know of no report of false negative C.T. examination for subdural empyema.

A case of subdural empyema following penumococcal meningitis is described. Both plain and enhanced C.T. scans failed to demonstrate the lesion, although some asymmetry of cortical markings was noted. Angiography and a nuclear scan demonstrated the subdural empyema. This example demonstrates that C.T. scanning can produce false negative results in this disease. Nuclear scanning or angiography may be more informative when intracranial suppuration is suspected.

CASE REPORT

A 55-year-old woman was admitted to hospital on January 18, 1979 with pneumococcal pneumonia and pneumococcal meningitis. She had been ill with vomiting and diarrhea for four days prior to admission. She had maturity onset diabetes and a history of chronic alcoholism. She smoked 40-50 cigarettes a day.

On admission the patient was acutely ill. She was lethargic, confused and photophobic. She was clinically dehydrated, and had a temperature of 40.3°C. The heart rate was 126/min, and the respiratory rate was 40/min. No organomegaly was noted. The patient had nuchal rigidity and positive Kernig's and Brudzinski's signs. There were no focal neurological signs.

Serum electrolyte values were: Na^+ 133 meq/l, K^+ 2.5 meq/l, Cl 86 meq/l. The patient's blood sugar was 253. A lumbar puncture revealed turbid CSF with a pressure of 200 mm. The protein was 244 mg% and the sugar 20 mg%. A gram stain revealed gram positive diplococci and pneumococci were cultured from CSF and blood. A chest x-ray demonstrated consolidation of the right lung.

Treatment was started with intravenous penicillin G, 20 million units daily. After the third day of treatment, the patient became comatose. Dexamethasone (2 mg q4h) and chloramphenicol (500 mg i.v. q4h) were started on January 20. She woke up and began to improve. She had a left-sided weakness upon regaining consciousness.

By January 27, her meningeal signs had subsided and a chest x-ray showed that the pneumonia had cleared. However, the WBC count was 17,600 and she had a fluctuating persisting fever. She was alert and cooperative, and neurological examination revealed a moderately severe left hemiparesis and an extensor plantar response on the left. The right plantar response was flexor. A nuclear scan was performed (Fig 1) on February 6, using technetium 99 mm DTPA. It showed a large superficial zone of abnormal

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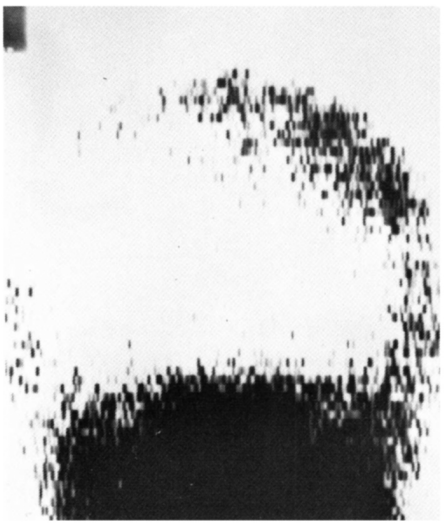

Figure 1A — This anteroposterior projection of the nuclear brain scan shows a large diffuse zone of abnormal uptake over the left cerebral convexity.

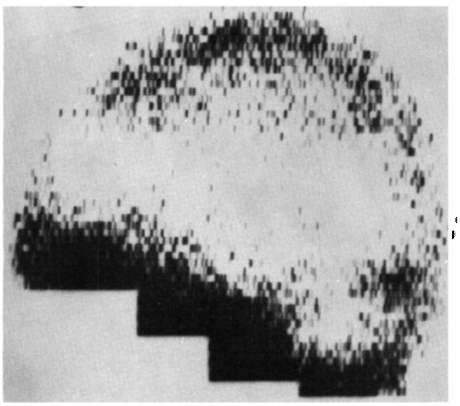

Figure 1B — The left lateral projection of this study again shows a superficial zone of increased activity.

uptake in the left temporal parietal area. A C.T. scan (Fig 2) was performed the same day and was normal except for slight obliteration of sulci over the left cerebral hemisphere.

Because of the persisting pyrexia and the abnormal nuclear scan, intracranial suppuration was suspected and on February 9 cerebral angiography was performed (Fig 3). This showed an avascular area over the left cerebral hemisphere; evidence of an extracerebral collection. The diagnosis of left subdural empyema was made.

On February 10, left frontal and parietal burr holes were placed. Upon opening the dura a thick external membrane was encountered. On opening this copious pus poured forth. Multiloculated membranes were broken down and the subdural space was irrigated with Bacitracin. A right parietal burr hole was placed, but there was no evidence of subdural empyema. Cultures obtained from the left

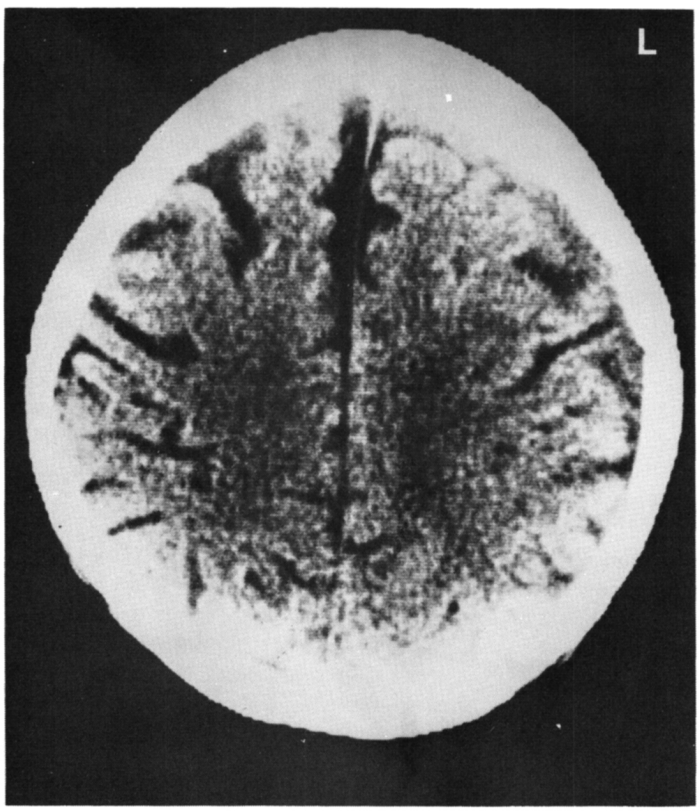

Figure 2A — A plain C.T. scan shows some cerebral atrophy, but no evidence of subdural empyema.

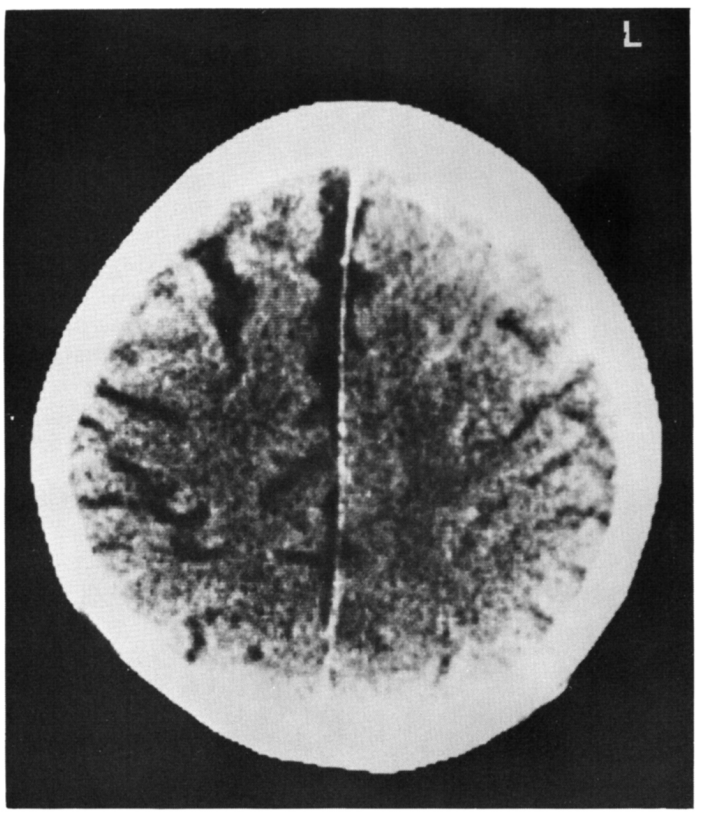

Figure 2B — An enhanced C.T. scan taken at the same level as Fig. 2A shows some obliteration of the sulci of the left cerebral hemisphere, but none of the typical features of subdural empyema.

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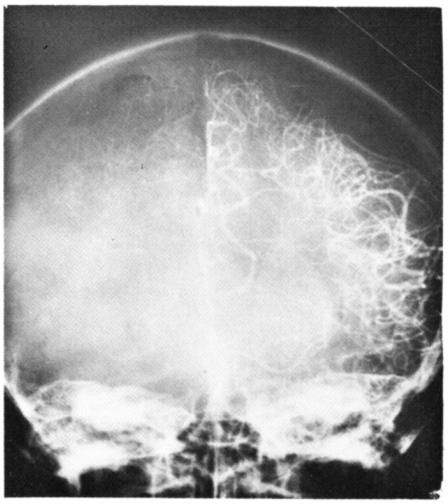

Figure 3 — Anteroposterior projection of a left carotid arteriogram. There is an obvious avascular zone over the left cerebral hemisphere.

subdural empyema failed to grow any organisms. Post-operatively swinging fever persisted. On February 14, the left burr holes were re-opened and three additional left parasagittal and convexity burr holes were placed, but only a small amount of pus was evacuated. Thereafter, the patient improved steadily. She became afebrile nine days after the second procedure and remained so. Chloramphenicol was discontinued on February 16. The left hemiparesis improved steadily and the patient was discharged on March 14, using a cane.

On examination one month after her discharge there was no detectable focal neurological deficit except for an unsteady gait and an inability to do tandem gait. The patient had discarded her cane.

DISCUSSION

Subdural empyema constitutes 25% of all localized intracranial bacterial infections and is an important condition to recognize quickly (Kaufman et al., 1975). Spread from contiguous sinus infection, especially frontal sinusitis, is the commonest cause, but bacterial meningitis, post-traumatic infection, post-operative infection, otitis media, and hematogenous infection have been described as sources for subdural empyema (Joubert et al., 1977; Kaufman et al., 1975; Weisberg et al., 1978 & Zimmerman et al., 1976).

Common neurological findings include seizures, depressed sensorium, hemiparesis, nuchal rigidity, palsy of cranial nerves three and six, and papilledema (Kaufman et al., 1975). The treatment consists of burr holes or craniotomy for evacuation of the pus, and systemic antibiotics in meningitic doses.

Before C.T. scanning angiography was the usual diagnostic procedure (Weisberg, et al., 1978). However, angiography may be negative and was reported to have a 80-90% accuracy (Kaufman et al., 1975). Lumbar puncture may reveal pleocytosis, but in the absence of meningitis CSF sugar is normal and CSF cultures are sterile.

Several reports have now been published outlining the role and value of C.T. scanning in diagnosing and localizing subdural empyemas. The C.T. scan in subdural empyema characteristically shows an elliptical or crescent shaped zone of decreased density adjacent to the dura (Kaufman et al., 1977, Stephanov et al., 1977, Weisberg et al., 1978). The empyema may be interhemispheral and Kaufman et al. (1975) reported that 5 cases in a series of 17 were bilateral. Usually the margins of the empyema were irregular and showed a line of slightly increased density (Stephanov et al., 1979). The empyema itself was of low density. Stephanov (1979) reported that "the decrease in density is also variable but ranges from above that of CSF or fluid blood to a little less than that of brain substance". The C.T. scan may also show a mass effect with compression and displacement of surrounding cerebral structures and of the ventricular system.

The C.T. scan of our patient showed none of these features despite evidence of a lesion on the nuclear scan performed the same day and on cerebral angiography performed two days later. It has been reported that empyemas that are isodense may not always be detected by C.T. scanning unless contrast infusion is performed to detect the presence of an enhancing membrane (Weisberg et al., 1978). Contrast enhancement was used in our C.T. study, but this failed to reveal any evidence of a membrane. There was neither evidence of a low density subdural collection nor evidence of displacement of structures.

C.T. scanning is the preferred method for diagnosing subdural empyema. In other studies, no false positives or negatives were found (Kaufman et al., 1977). The C.T. scan of our patient was of good quality and there was no artifact, yet there was no diagnostic evidence of subdural empyema. Therefore, if there is clinical suspicion of subdural empyema and a C.T. scan is normal, angiography, nuclear scanning, or perhaps a repeat C.T. scan are warranted.

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