

## Brief communications

# Superior Sagittal Sinus Thrombosis after Closed Head Injury

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Superior sagittal sinus thrombosis is a rare but often fatal complication of closed head injury. We present a case diagnosed by computed tomography (CT) and managed with corticosteroids and anticonvulsants with a favorable outcome. The clinical aspects and CT findings of this disease are discussed. (*Neurosurgery* 12:95-97, 1983)

**Key words:** Anticonvulsant, Brain trauma, Complication, Computed tomography, Corticosteroid, Head injury, Sagittal sinus thrombosis

### INTRODUCTION

Superior sagittal sinus thrombosis is a rare complication of closed head injury most often discovered at autopsy (1, 5). We are presenting such a case in an elderly patient that was diagnosed by computed tomography and managed conservatively, with a favorable outcome.

### CASE REPORT

An 82-year-old woman accidentally fell down a flight of stairs, fracturing her right arm and striking her head on a concrete floor. On initial examination, she was disoriented and combative. Blood was present in the right external auditory canal. She was deaf in both ears. No focal neurological deficits were noted. Skull and cervical spine x-ray films were normal. She was taken to the operating room for debridement and reduction of the compound forearm fracture.

Two days after admission, she developed a right peripheral 7th nerve palsy, her level of consciousness deteriorated, and her temperature rose to 38.9°C. A complete blood count, electrolyte determinations, and the blood urea nitrogen and creatinine values were all normal. Computed tomography (CT) showed a small left temporoparietal subdural hematoma with underlying brain contusion. Blood, urine, sputum, and spinal fluid cultures were all negative. Dexamethasone was begun.

The patient improved over the next few days until 9 days after admission, when she developed focal seizures involving the left face. Anticonvulsant therapy was begun. Repeat CT showed a new hemorrhagic lesion in the right parietal parasagittal region and, after contrast infusion, an abnormal filling defect in the posterior portion of the superior sagittal sinus (Fig. 1). A radionuclide brain scan was normal. An aortic arch aortogram with oblique and lateral head views (Fig. 2) showed dilated and tortuous veins of the cerebral surface with the deep medullary veins of the white matter similarly serving as collaterals. There was no filling of the posterior superior sagittal sinus, and partial thrombosis of both transverse sinuses was probable. The patient was continued on phenytoin and dexamethasone with careful hydration. The seizures subsided. Over the next few weeks, she gradually improved until she was conversant but disoriented. She required nasogastric feedings

to maintain adequate hydration and is awaiting placement in an extended care facility.

### DISCUSSION

Superior sagittal sinus thrombosis (SSST) is usually considered an infrequent condition associated with high mortality. The true incidence is not known, although Towbin reported a 9% incidence in 189 consecutive autopsies in a general hospital (10). The patients were mostly over 60 and had associated pulmonary emboli and congestive heart failure. SSST appears mainly in two specific age groups at the extremes of life, the newborn and the aged, and is usually due to antecedent circulatory failure. Other causes include: infection of the scalp, skull, or bony sinus; dehydration and cachexia; blood dyscrasias; metabolic derangements; pregnancy and puerperium; oral contraceptives; brain tumor; and head trauma (6).

Holmes and Sargent first reported 70 cases of wartime injuries to the superior longitudinal sinus, all SSST without penetrating injury or skull fracture (7). Barnett and Hyland later reported 3 similar cases (3). Carrie and Jaffé described SSST in 2 children with closed head injury incurred in motor vehicle accidents (5). Postmortem findings led them to conclude that the thrombus was due to endothelial damage and intramural hemorrhage of the sinus wall.

The symptoms and signs of SSST may present in two patterns: one with headache and papilledema due to elevated intracranial pressure and one with focal signs of paralysis and focal seizures due to cortical vein thrombosis and cerebral venous infarction (6, 8).

Antemortem diagnosis of SSST has been made with venous sinography, angiography, nuclear brain scan, and, most recently, CT (9). Buonanno et al. reported 11 cases of SSST diagnosed with CT and confirmed by angiography or autopsy and discussed the CT findings (4). CT signs of small ventricles, gyral enhancement in a distribution of venous infarcts, and multiple focal bilateral parasagittal hemorrhages may be seen. The most reliable sign, however, is the "empty triangle" or "negative delta" sign seen on the contrast-enhanced scan, confirming the presence of isodense clot within the sinus enclosed by an area of engorged vessels. This sign is seen on cuts slicing perpendicularly across the posterior aspect of the

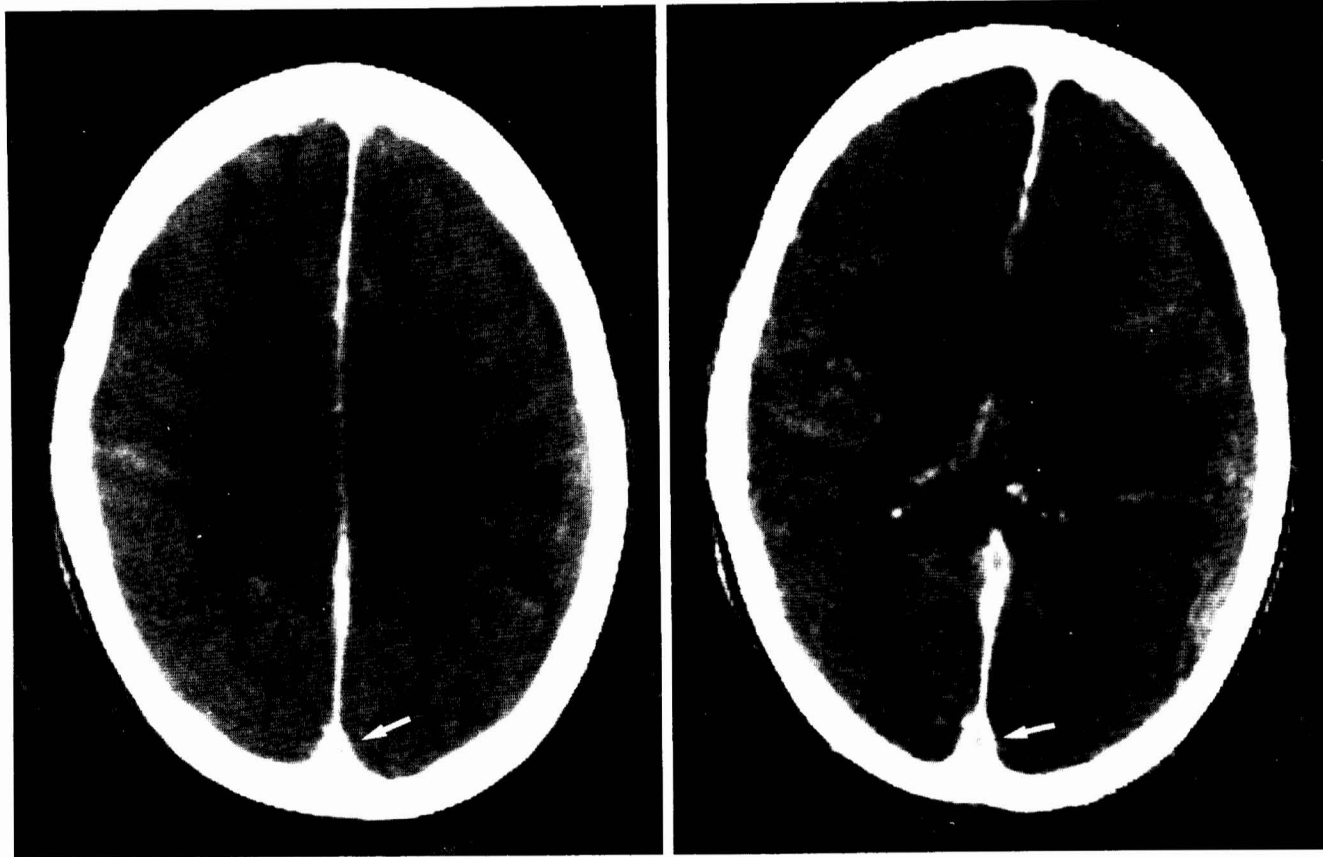


FIG. 1. Follow-up CT shows filling defects in the posterior superior sagittal sinus seen on multiple cuts on contrast-enhanced scans (*arrows*)—the “empty triangle.”

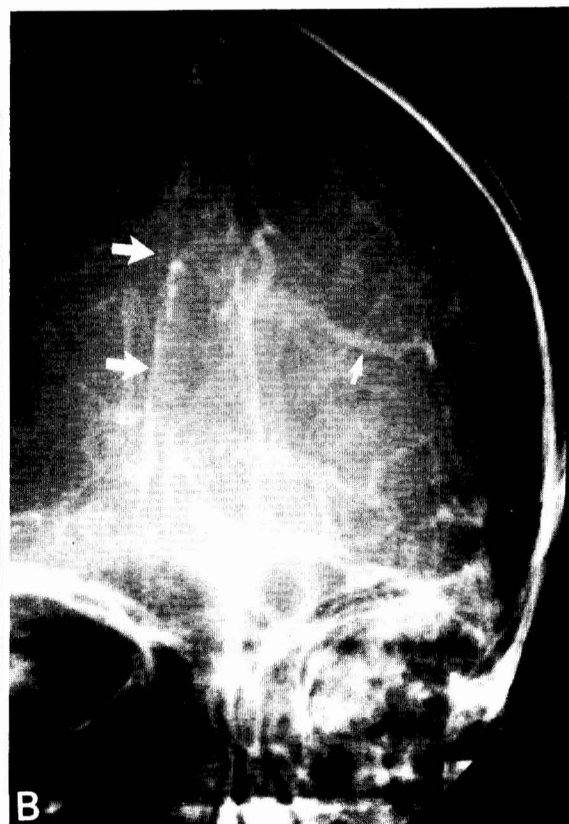


FIG. 2. Aortic arch aortogram with lateral (*A*) and oblique (*B*) head views showing dilated surface cerebral veins (*small arrows*) and nonfilling of the posterior superior sagittal sinus (*large arrows*).

sinus on postinfusion scans. It must be seen on cuts at different levels to differentiate it from a high splitting of the sinus. Coronal reconstruction may be of value in clarifying this sign.

The treatment of SSST should be aimed at correcting the predisposing condition, along with a regimen to reduce edema and anticonvulsant agents. Anticoagulant therapy has been advocated in some cases, but is clearly hazardous in the face of recent cerebral trauma. No comparative studies of the efficacy of various types of therapy exist (6).

Mortality rates of 40 to 81% have been reported (4). With increased awareness of this rare but fatal complication and with early recognition by CT, treatment can be instituted immediately, which we hope will improve the outlook.

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#### COMMENT

Drs. Stringer and Peerless have documented a vignette of a woman with proven superior sagittal sinus thrombosis in the posterior one-third of the sinus with a favorable outcome. This is another example of the practical application of CT scanning in the assessment of vascular disease, as it calls our attention to the triangle sign of the superior sagittal sinus on selected cuts of the enhanced scan. As the authors imply, routine CT scans will identify this sign in the posterior sagittal sinus, but coronal views would be necessary for a more anteriorly situated lesion. In spite of this sign, the diagnosis of this and other vascular diseases can only be definitely confirmed by vascular contrast studies (angiography, sinography, or digital venous angiography).

The authors judiciously and cautiously managed their patient with conservative measures, which were fortunately successful, implying a greater than normal collateral venous drainage in this patient. A late vascular study to document whether the superior sagittal sinus has recanalized would be of academic interest.

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