jnm / CASE REPORT

PSEUDOPARASAGITTAL MASSES CAUSED BY DISPLACEMENT OF THE FALX AND SUPERIOR SAGITTAL SINUS

Steven K. Teplick,* Ronald L. Van Heertum, Robert E. Clark, and Anthony P. Carter

Tripler Army Medical Center, San Francisco, California, and Boston City Hospital, Boston, Massachusetts

Two cases of an off-midline position of the falx and superior sagittal sinus due to hemiatrophy are presented. In each, the brain scan simulates a parasagittal mass. Evaluation of the position of the torcular and dural sinuses is important particularly with developmental abnormalities. An eccentric position of the superior sagittal sinus should not be mistaken for abnormal parasagittal uptake. A vertex view is useful for additional evaluation of the superior sagittal sinus. The brain scan findings of hemiatrophy and other causes of displacement of the superior sagittal sinus are described.

False-positive brain scans have been reported to be associated with a myriad of causes including lesions of skull and scalp, choroid plexus uptake as well as technical and positioning artifacts particularly with difficult patients (*1–7*). These problems are diminishing with the advent of more efficient imaging systems and a better understanding of the mechanisms involved in producing the abnormal brain scan. Paramount to accurate brain scan interpretation is a knowledge of the normal anatomy of the ^{99m}Tc-pertechnetate static brain scan. This has been thoroughly described by various investigators (*8–10*). Particularly pertinent to this paper is the anatomy of the superior sagittal sinus region. This structure appears as a midline triangular area of uptake on both the anterior and posterior views. On the lateral view, the superior sagittal sinus constitutes much of the activity superiorly and normally increases in thickness posteriorly. Failure to visualize these structures as described is abnormal.

The purpose of this paper is to present two cases in which the ^{99m}Tc brain scan falsely demonstrated a parasagittal mass due to an off-midline position of the falx and superior sagittal sinus. In one patient this led to extensive further diagnostic studies.

CASE REPORTS

JC, a 28-year-old white man was admitted to Boston City Hospital for evaluation of a seizure disorder consisting of infrequent left-sided focal seizures of 10 years' duration. A history of head trauma was elicited concomitant with the onset of the seizures. Physical examination, routine laboratory investigations, and a lumbar puncture were all within normal limits.

A static brain scan (Fig. 1) was performed 1 hr after intravenous administration of 10 mCi of ^{99m}Tc-pertechnetate and prior potassium perchlorate preparation. Imaging was performed with a commercial rectilinear scanner utilizing 2:1 minification. The

Received April 3, 1974; revision accepted May 29, 1974.

For reprints contact: S. K. Teplick, Dept. of Radiology, Boston City Hospital, 818 Harrison Ave., Boston, Mass. 02118.

* Present address: Dept. of Radiology, Boston City Hospital, Boston, Mass. 02118.

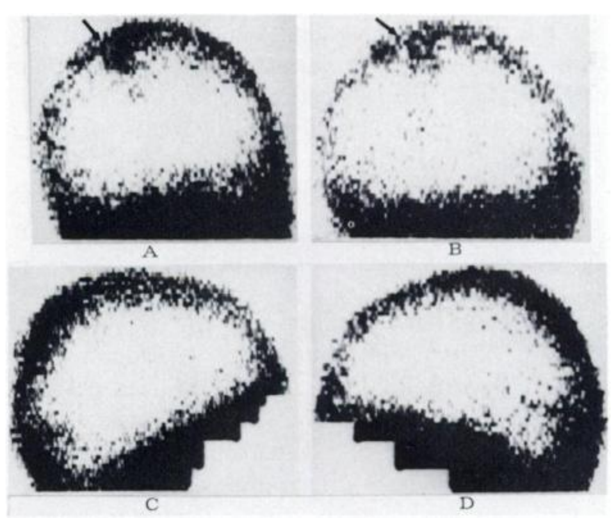

FIG. 1. (A–D) Brain scan. Off midline position of superior sagittal sinus and midline vasculature simulating parasagittal mass on anterior and posterior views (arrows). Torcular is also asymmetrically located. Lateral projections are normal.

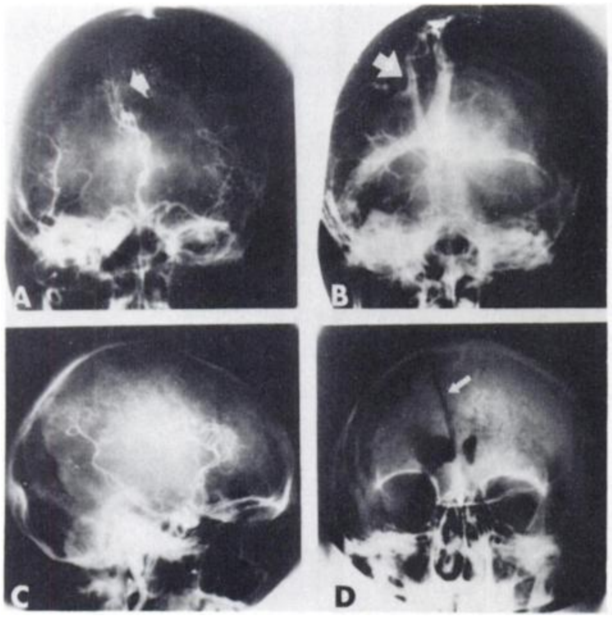

FIG. 2. (A–C) Right carotid arteriogram with cross-compression demonstrates absence of most of right middle cerebral artery branches. Superior sagittal sinus and both pericallosal arteries are displaced to right (arrows). (D) Pneumoencephalogram. Subdural air outlines eccentrically located falx (arrow). Right lateral ventricle is enlarged due to hemiatrophy.

anterior (Fig. 1A) and posterior (Fig. 1B) views demonstrated an area of increased uptake in the right parasagittal region. The right and left lateral views (Fig. 1C and D) were interpreted as normal. A vertex view was not performed.

Bilateral carotid arteriography with cross compression (Fig. 2A, B, C) demonstrated occlusion of most of the middle cerebral arterial vessels on the right side. Both pericallosal arteries and the superior sagittal sinus were to the right of midline.

A pneumoencephalogram (Fig. 2D) showed enlargement of the right lateral ventricle and right cerebral sulci. Inadvertent subdural air injection demonstrated the falx to be displaced to the right of midline.

The findings are consistent with right cerebral hemiatrophy secondary to middle cerebral occlusive disease which probably occurred in utero. The "parasagittal mass" seen on the brain scan is in actuality the displaced superior sagittal sinus.

GF, a 42-year-old white man was admitted to Boston City Hospital for evaluation of head trauma. Rectilinear brain scan performed 1 hr after administration of 10 mCi of ^{99m}Tc-pertechnetate and prior potassium perchlorate preparation demonstrated an area of increased uptake in the right parasagittal region on the anterior and posterior views and a crescent of increased uptake over the left convexity (Fig. 3A, B). The lateral views (Fig. 3C, D) did not demonstrate a parasagittal mass; however, the left lateral view (Fig. 3D) revealed vague increased uptake in the frontal region. A vertex view was not done.

A left carotid arteriogram (Fig. 4A) demonstrated an extracerebral collection. In addition, the midportion of the superior sagittal sinus is to the right of the midline (Fig. 4B). On the lateral view (Fig. 4C) the pericallosal artery is more posterior than normal and follows a wandering course indicating absence of the corpus callosum. At surgery, a left subdural hematoma was removed. The absent corpus callosum suggests that the sagittal sinus is displaced because of right hemiatrophy. Again the "parasagittal mass" noted on the brain scan is due to displacement of the midportion of the superior sagittal sinus.

DISCUSSION

An eccentric position of the superior sagittal sinus, simulating a parasagittal mass on brain scan, may result from asymmetry of the cerebral hemispheres. This has been described with hemiatrophy, asymmetry of the cranial vault, poor positioning of the patient, porencephaly, unilateral occlusion of the foramen of Monro, and intracranial cyst (*11–14*). Superior or inferior displacement of the torcular and measurements of the torcular angle can help evaluate supra- and infratentorial developmental abnormalities. For example, a high position of the torcular and a more acute torcular angle have been described in agenesis of the corpus callosum (*13,14*).

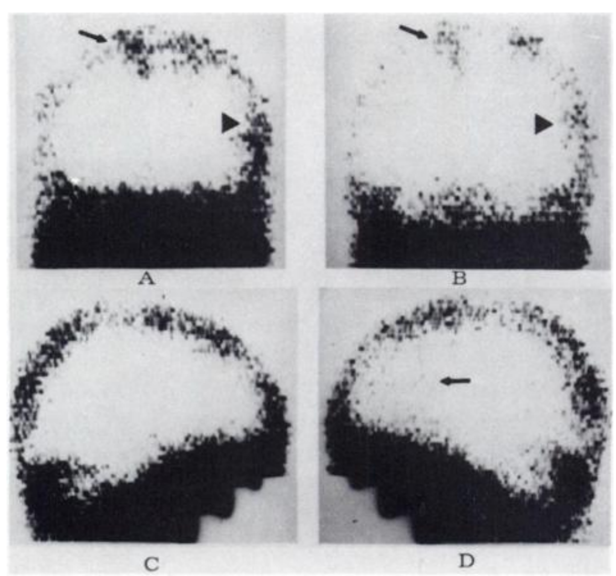

FIG. 3. (A–D) Brain scan. Anterior and posterior views demonstrate right parasagittal area of increased uptake due to displacement of midportion of superior sagittal sinus (arrows). There is positive crescent sign over left convexity (arrow heads) and vague increased uptake on left lateral projection due to subdural hematoma (arrow).

The brain scan in cases of cerebral hemiatrophy will demonstrate a small unilateral cerebral hemisphere. There is usually increased uptake in the affected hemisphere. In addition, there is a widened crescent of peripheral uptake over the ipsilateral convexity (crescent sign). This may be associated with thickening of the cranial vault (*12–15*). On review of the literature, the authors were unable to find any other examples where partial or complete displacement of the superior sagittal sinus simulated a mass lesion. A vertex view should help clarify additional cases of this nature by demonstrating the position of the entire sagittal sinus and showing a good comparison of the overall size of the two cerebral hemispheres (*16*). In addition, the absence of a "mass lesion" on the lateral views should be helpful in suggesting displacement of superior sagittal sinus rather than a true space-occupying lesion.

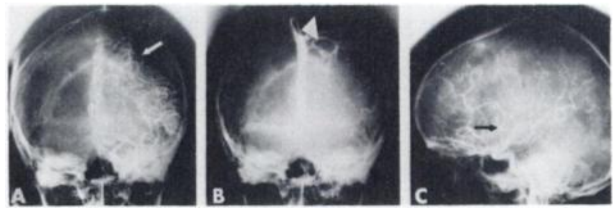

FIG. 4. (A–C) Left carotid arteriogram. Eccentric position of superior sagittal sinus (arrow head) corresponds to "parasagittal mass" seen on brain scan. There is left subdural hematoma (arrow). Course of anterior cerebral artery on lateral view indicates absence of corpus callosum (arrow).

ACKNOWLEDGMENT

We wish to acknowledge Hideo Niiyama, supervisor of medical photography, for his excellent photographic assistance.

REFERENCES

1. MAYNARD CD, HANNER TG, WITCOFSKI RL: Positive brain scans due to lesions of the skull. *Arch Neurol* 18: 93–97, 1968

2. WITCOFSKI RL, JANEWAY R, MAYNARD CD, et al: Visualization of the choroid plexus on the technetium 99m brain scan. *Arch Neurol* 16: 286–289, 1967

3. NUSYNOWITZ ML, CLARK RW: False positive brain scan associated with febrile convulsions. *Am J Roentgenol Radium Ther Nucl Med* 110: 71–73, 1970

4. KRISHNAMURTHY GT, MEHTA A, TOMIYASU U, et al: Clinical value and limitations of ^{99m}Tc brain scan: an autopsy correlation. *J Nucl Med* 13: 373–378, 1972

5. WITCOFSKI RL, ROPER TJ, MAYNARD CD: False positive brain scans from extracranial contamination with 99m Technetium. *J Nucl Med* 6: 524–527, 1965

6. ARKLES LB, ANDREWS JT, STEVEN LW: A reappraisal of the scan diagnosis of subdural hematomas. *Am J Roentgenol Radium Ther Nucl Med* 115: 62–71, 1972

7. HEISER WJ, QUINN JL, MOLLIHAN WV: The crescent pattern of increased radioactivity in brain scanning. *Radiology* 87: 483–488, 1966

8. WEBBER MM: Technetium 99m normal brain scans and their anatomic features. *Am J Roentgenol Radium Ther Nucl Med* 94: 815–818, 1965

9. DELAND FH, WAGNER HN: *Atlas of Nuclear Medicine.* Philadelphia, WB Saunders Co, 1969, pp 4–14

10. MACK JF, WEBBER MM, BENNETT LR: Brain scanning; normal anatomy with technetium 99m pertechnetate. *J Nucl Med* 7: 633–640, 1966

11. MISHKIN F, TRUKSA J: The diagnosis of intracranial cysts by means of the brain scan. *Radiology* 90: 740–746, 1968

12. CONWAY JJ, YARZAGARAY L, WELCH D: Radionuclide evaluation of the Dandy-Walker malformation and congenital arachnoid cyst of the posterior fossa. *Am J Roentgenol Radium Ther Nucl Med* 112: 306–314, 1971

13. MISHKIN F: Brain scanning in children. *Semin Nucl Med* 2: 328–342, 1972

14. CONWAY JJ: Radionuclide imaging of the central nervous system in children. *Radiol Clin North Am* 10: 291–312, 1972

15. KUHL DE, BEVILACQUA JE, MISHKIN MM, et al: The brain scan in Sturge-Weber syndrome. *Radiology* 103: 621–626, 1972

16. HOLMES RA: Value of the vertex view in brain scanning. *Semin Nucl Med* 1: 48–55, 1971