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Metrizamide CT Ventriculography in the Evaluation of a Pseudoballooned Fourth Ventricle

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The radiologic appearance of a "ballooned" fourth ventricle usually occurs consequent to obstruction of its exit foramina. One variant of ballooned fourth ventricle is the "isolated" ventricle, which occurs when there is both an aqueductal stenosis as well as extraventricular obstructive hydrocephalus. We describe the neuroradiologic evaluation of a patient originally thought to have an isolated fourth ventricle, the computed tomographic (CT) appearance of which was simulated by a midline posterior fossa ependymal cyst.

Case Report

A 14-year-old girl experienced increasing impairment of vision over the past 2 years and rapid progression over the preceding 3 months. An unsteady gait and "falling to the right" had developed during the previous 2 weeks.

At admission she was able to detect hand movements only with the left eye, and there was no light perception on the right. Her gait was unsteady and there was truncal ataxia, more on the right side. A cranial CT study including transaxial and coronal sections with and without intravenous contrast enhancement showed an apparently dilated ballooned fourth ventricle with no evidence of intraventricular filling defects and no abnormal enhancement (figs. 1A and 1B).

Right coronal external ventriculostomy was performed on the second day of hospitalization, followed by placement of a ventriculoperitoneal shunt 3 days later. A follow-up CT study showed significant diminution of the lateral ventricles with no interval change in size of the presumably ballooned fourth ventricle, and metrizamide ventriculography and CT were performed (figs. 1C and 1D). A smooth filling defect indenting the floor of the fourth ventricle was noted on the radiographs, and CT revealed a midline cystic lesion deforming the normal-sized fourth ventricle, with no evidence of communication with the ventricle. Posterior fossa craniotomy was performed with excision of a cystic lesion, subsequently confirmed pathologically to be an ependymal cyst. The patient made an uneventful postoperative recovery; however, there was no improvement in her visual acuity.

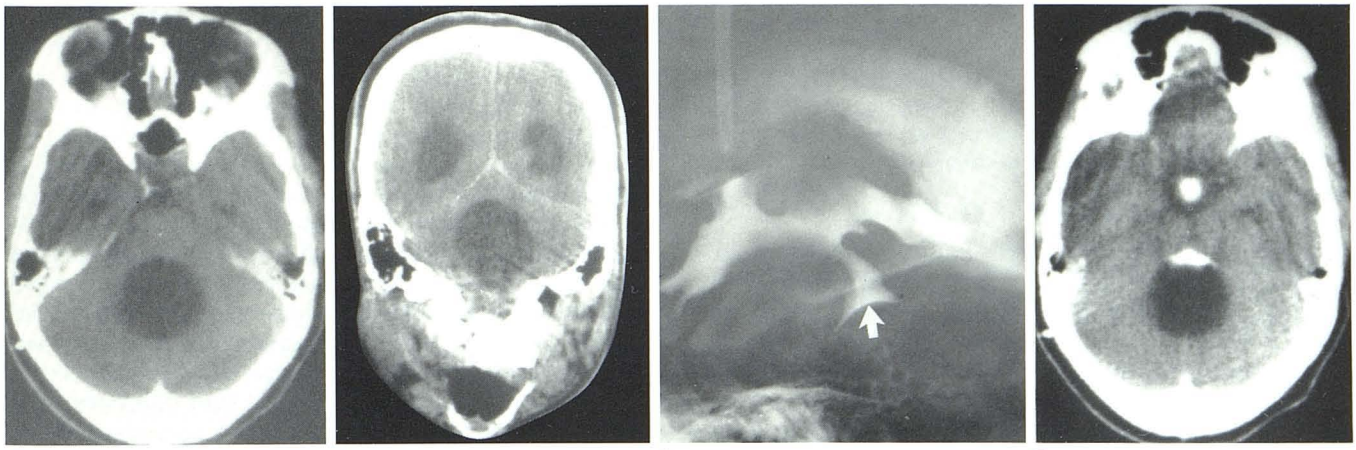

Fig. 1.—Midline posterior fossa ependymal cyst. Initial transaxial (**A**) and coronal (**B**) CT scans. Apparently ballooned fourth ventricle with no filling defects and no abnormal enhancement. **C**, Lateral supine metrizamide ventriculogram after follow-up CT scan. No interval change in size of presumably ballooned fourth ventricle. Smooth filling defect (*arrow*) indenting floor of normal-sized fourth ventricle. **D**, CT after ventriculogram. Midline ependymal cyst deforms normal-sized fourth ventricle with no communication.

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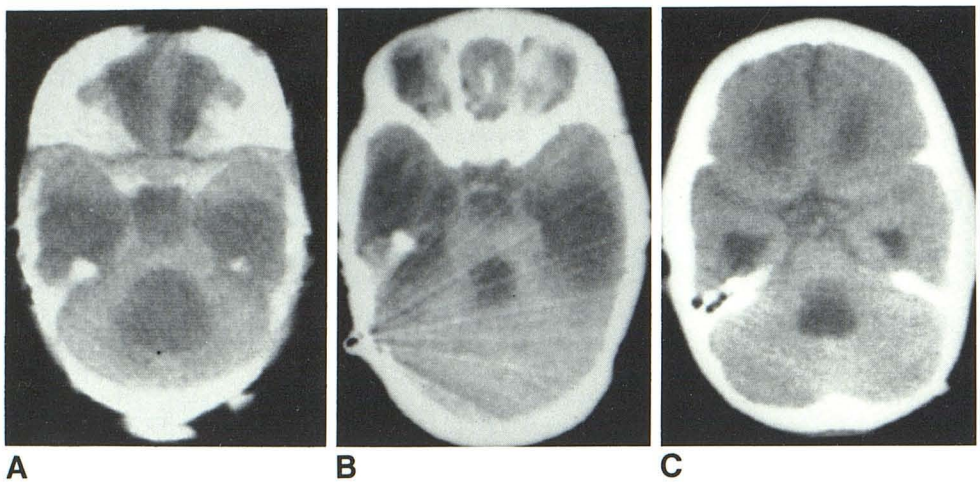

Fig. 2.—Isolated, ballooned fourth ventricle. **A**, Initial CT scan. Ballooned fourth ventricle. Marked dilatation of temporal horns and anterior inferior third ventricle. **B**, 2 months later. Significant diminution of fourth ventricle, indicating patent aqueduct of Sylvius. **C**, 9 months later. Progressive enlargement of fourth ventricle consequent to postshunting aqueductal stenosis.

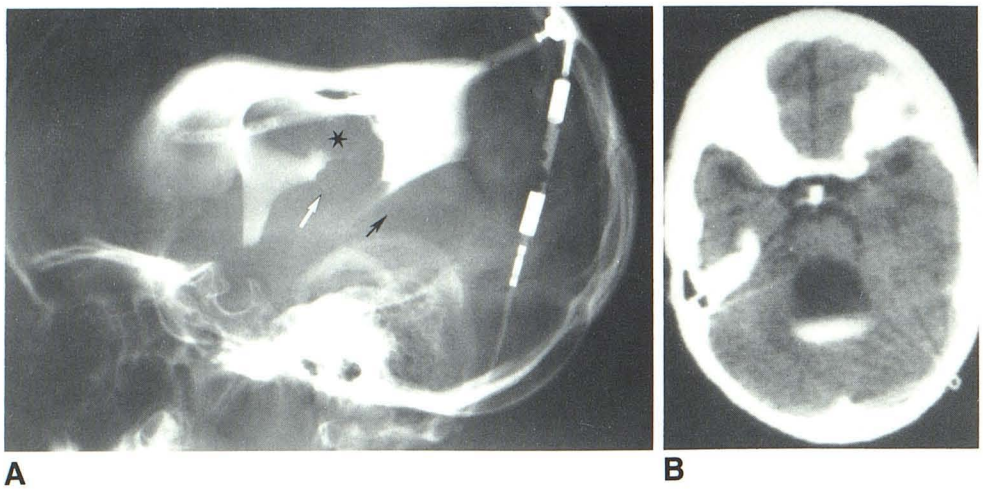

Fig. 3.—Metrizamide ventriculography followed by CT. **A**, Supine lateral projection. Significant regression in size of lateral ventricles, and aqueductal stenosis (*white arrow*). Small amount of contrast material reaches fourth ventricle (*black arrow*). Adhesions in posterior third ventricle (*asterisk*). **B**, Layering of small amount of contrast material in posterior aspect of ballooned isolated fourth ventricle.

Discussion

Ependymal cysts may be found throughout the neuraxis, but have been described most often in a supratentorial location [1–3]. A few cases, however, have been reported in the posterior fossa [1, 4–7]. These lesions are cysts of neuroepithelial origin, lined by true, well differentiated ependymal cells, and differ from the much more common arachnoid cysts, both in their pathogenesis and in the histology of the lining of the cyst wall [8–10]. To our knowledge, our case report represents the only illustration to date of the CT and metrizamide ventriculographic appearances of an infratentorial ependymal cyst.

With extraventricular obstruction, the fourth ventricle loses its triangular appearance and assumes a ballooned configuration [11]. Marked dilatation is usually associated with obstruction at or near the exit foramina [12]. An "isolated" or "entrapped" fourth ventricle, as described by DeFeo et al. [13] and Hawkins et al. [14] and discussed by others [15–19], will also produce this ballooned appearance in time. Obstruction of the outlet foramina in association with either a preexisting aqueductal stenosis or in patients in whom aqueduct stenosis develops consequent to lateral ventricular shunting for treatment of hydrocephalus, results in an effective exclusion of the fourth ventricle from the rest of the ventricular system and cerebrospinal fluid pathways. The outlet foramina obstruction is most often from arachnoiditis after subarachnoid hemorrhage, infection, or other inflammatory conditions. The resultant progressive dilatation of the fourth ventricle may eventually produce signs and symptoms of a posterior fossa mass.

A typical example of an isolated fourth ventricle in a patient who developed secondary aqueduct stenosis after lateral ventricular shunting for hydrocephalus is illustrated in figures 2 and 3. The initial CT study in this 5-year-old child with hydrocephalus showed a dilated fourth ventricle as well as

dilated third and lateral ventricles (fig. 2A); a follow-up CT after shunting of the lateral ventricles showed significant diminution of the fourth ventricle, indicating that the aqueduct of Sylvius was patent (fig. 2B). CT study 9 months later, however, revealed progressive enlargement of the fourth ventricle caused by interval development of postshunt aqueductal stenosis (figs. 2C). A metrizamide ventriculogram at this time demonstrated the stenosed aqueduct, and CT revealed a small amount of contrast material layering posteriorly within the ballooned isolated fourth ventricle (fig. 3).

The patient in our case report initially was thought to have an isolated fourth ventricle on the basis of the cranial CT scan appearances after the ventricular shunt without interval change in the size of the fourth ventricle. Further evaluation was carried out with plain film radiography and CT after instillation of the metrizamide contrast material into the ventricular system. The value of the metrizamide CT ventriculogram in this particular case was the preoperative demonstration that the fourth ventricle was in fact normal in size and the lesion that seemed to be a dilated fourth ventricle on the cranial CT study was actually extrinsic to and producing deformity of the fourth ventricle. The use of CT in conjunction with intraventricular metrizamide contrast material, however, would be equally valuable for cystic posterior fossa tumors at or near the midline simulating a ballooned fourth ventricle on the cranial CT study, and for the evaluation of intraventricular lesions of the fourth ventricle.

The case of isolated fourth ventricle illustrated in figures 2 and 3 demonstrates that the plain film and CT parts of metrizamide CT ventriculography may provide complementary information in some cases. The optimal demonstration of the aqueductal stenosis is still obtained by the standard radiographic views rather than by the CT scan. However, CT, with its far superior contrast resolution and the added value of the transaxial projection, best showed the small amount of contrast material that reached the fourth ventricle through the stenosed aqueduct and could be seen layering within the ballooned isolated ventricle. CT with positive intraventricular contrast enhancement will also allow diagnosis of small intraventricular lesions, which may escape detection on a routine enhanced cranial CT study. In the event that only a small amount of contrast material reaches the fourth ventricle through a stenosed aqueduct, as in figure 3, both prone and supine views can be obtained to evaluate completely the entire cavity of the fourth ventricle.

We believe our case report illustrates the value of metrizamide CT ventriculography, which may represent the current diagnostic procedure of choice in the neuroradiologic evaluation of many CT-identified cystic posterior fossa lesions.

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