Diagnosis of empty sella syndrome using Amipaque cisternography combined with computerized tomography

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A neuroradiological technique for demonstrating the empty sella syndrome using a low dose of intrathecally injected Amipaque (metrizamide) combined with computerized tomography scanning is described. Two case reports illustrating the potential value of the technique are presented. We have performed 55 cisternograms and have demonstrated the empty sella syndrome in six patients. The procedure is easier to perform and the morbidity is less than in pneumoencephalography.

KEY WORDS • empty sella syndrome • Amipaque (metrizamide) cisternography • computerized tomography • pneumoencephalography

The empty sella syndrome (ESS) has presented diagnostic problems for many years because radiographically it can mimic an intrasellar tumor. Since surgery for the ESS is not indicated unless there are symptoms of traction on the optic chiasm, or an associated (but incidental) microadenoma, it is necessary to differentiate this condition from pituitary tumor. Traditionally, the definitive study for the diagnosis of ESS has been pneumoencephalography (PEG). However, this neurodiagnostic procedure, while not usually risky in terms of serious complications, is associated with significant pain and discomfort, particularly severe headaches that might last for several days. Recently, Amipaque (metrizamide) has been approved for intrathecal use. This is a non-ionic water-soluble contrast medium that mixes freely with cerebrospinal fluid (CSF). We wish to report our experience in six patients in whom Amipaque cisternography combined with computerized tomography (CT) scanning was used to demonstrate an ESS.

Technique and Indications

The technique of Amipaque cisternography combined with CT scanning involves a lumbar puncture using a No. 22 needle. After satisfactory placement of the needle tip in the subarachnoid space, 5 cc of Amipaque (190 mg/cc) is slowly injected. The contrast medium is allowed to enter the basilar cisterns by gravity, by placing the patient in a 60° Trendelenberg position for approximately 2 minutes. The CT scans were performed on the General Electric body scanner using serial sections 5 mm thick in both the coronal and sagittal planes.

During the period from November, 1978, to May, 1979, a total of 55 patients underwent Amipaque cisternography at Emory University Hospital. In these 55 patients, common indications for the procedure were for evaluation of the extent of a suprasellar mass lesion, to investigate an enlarged sella turcica with minimal symptoms, to determine CSF absorption rates in adults with hydrocephalus, or to evaluate the brain stem in patients with possible tumors, that is, brain-stem tumors.

Case Reports

In six patients the presence of a significant quantity of Amipaque within the sella turcica, with a flattened pituitary gland displaced posteriorly and inferiorly as revealed by CT scanning, clearly established the diagnosis of ESS. No serious side-effects resulted from the procedure in any of the 55 patients. Transient mild nausea, vomiting, and headache occurred in 50% of the patients, but usually lasted no longer than 4 to 6 hours. Two of the six patients with ESS are described in detail to illustrate the advantages of this technique.
Case 1

This 34-year-old woman was admitted to Emory University Hospital on January 16, 1979, with a 2-year history of non-progressive headaches. In June, 1978, she experienced a "blackout" and was evaluated in another hospital. Skull films showed an enlarged sella turcica, and bilateral carotid angiography was normal. The patient had had four previous uncomplicated pregnancies and 7 years before admission had undergone a hysterectomy. For several months immediately preceding admission she had noted several episodes of clear fluid galactorrhea. Her past history was significant in that she had had arterial hypertension for several years and was being treated with Esidrix (hydrochlorothiazide, 50 mg/day).

The patient was moderately obese. Her blood pressure was 150/100 mm Hg. The neurological examination was unremarkable. Visual acuity was normal and there were no visual field defects.

Routine laboratory studies were normal. Endocrinological testing revealed that all three pituitary target organ axes (thyroid, adrenal, and gonadal axes) were intact. Fasting growth hormone (HGH) level was 2.3 ng/ml with a rise to 17.0 ng/ml 3 hours following administration of 1.0 mg glucagon. Fasting prolactin was 25 ng/ml with a normal response after chlorpromazine administration. These latter tests indicated normal HGH with prolactin reserve. Polytomography of the sella showed that it was ballooned (Fig. 1 left).

Clinically, an ESS was suspected and it was decided to prove this with the use of Amipaque cisternography. Amipaque was instilled into the subarachnoid space, and CT scanning was done in the horizontal and coronal planes. The scans demonstrated extension of the suprasellar cistern into the sella, confirming the diagnosis of ESS (Fig. 1 center and right). The patient tolerated the study well and was discharged from the hospital 2 days following cisternography.

Case 2

This 33-year-old woman had a 10-year history of intermittent occipital headaches. She was admitted to Emory University Hospital on November 24, 1978, at which time the headache was described as throbbing in nature. There were no symptoms suggestive of endocrinopathy. Past history was significant in that the patient was involved in an automobile accident in 1971 and was unconscious for a short time, but experienced no complications from this.

On physical examination the blood pressure was 130/80 mm Hg. The neurological examination was normal. Specifically, there was no impairment of the visual acuity or fields. Visual acuity was 20/20 in both eyes.

A detailed endocrine evaluation was normal. All three pituitary target organ axes (thyroid, adrenal, and gonadal axes) were normal. Fasting serum prolactin was 8 ng/ml, with a normal rise following chlorpromazine stimulation. Fasting HGH was 1.6 ng/ml with a rise to 4.5 ng/ml 3 hours after glucagon administration. These tests indicated normal HGH and prolactin reserve.

Polytomography revealed a ballooned sella with erosion of the dorsum sellae (Fig. 2 left). The CT scan suggested an area of low density in the region of the sella and raised the possibility of ESS. The Amipaque cisternogram was performed following in-
Amipaque cisternography and the empty sella

Fig. 2. Case 2. Left: Lateral polytomogram of the sella demonstrating a ballooned sella turcica.  Center: Coronal computerized tomography (CT) scan demonstrating Amipaque within the sella turcica. The floor of the sella is outlined by small arrows. Large arrow indicates the posterior clinoid processes. Right: Horizontal CT scan demonstrating Amipaque lying within the sella turcica (arrows).

stillation of Amipaque in the subarachnoid space. This showed extension of the suprasellar cistern into the sella, confirming the diagnosis of ESS (Fig. 2 center and right). The patient tolerated the procedure well and was discharged on December 1, 1978.

Discussion

The ESS is a distinct radiological and anatomical entity which results from an extension of the subarachnoid space into an intrasellar position with subsequent remodeling of the sella turcica and flattening of the pituitary gland. The sella is usually, but not invariably, enlarged. The enlarged sella of ESS usually is indistinguishable on x-ray films from that seen with pituitary adenomas. Two types of ESS are described: 1) the primary type that occurs in patients who have not received prior pituitary radiation or pituitary surgery, and 2) the secondary type that is seen following either one or both of these therapeutic procedures. Although the etiology of primary ESS is unknown, it is known to occur more commonly in obese middle-aged women. Anatomically, the opening in the diaphragma sellae is larger than normal, thus allowing extension of the suprasellar cistern into the sella turcica.

The ESS is relatively common, with a reported autopsy incidence ranging from 5.5% to 23.5%. Although certain complications, such as optic chiasmal traction, headaches, CSF leak, and endocrine abnormalities, have infrequently been reported in patients with ESS, as a general rule, the entity is not associated with either significant symptomatology or endocrinopathy. A relatively small number of cases has been reported in which an ESS occurred in association with a hypersecreting adenoma, but the association can only be regarded as coincidental. Investigation is usually carried out in patients who subsequently are shown to have ESS, on the presumption that a pituitary tumor is the cause of the sellar enlargement.

Routine polytomography and angiography are of little help in differentiating ESS from pituitary tumors since the changes on these studies may be similar. The routine CT scan can occasionally demonstrate a low-density area within the sella that could represent the ESS. However, because of partial volume averaging from the air in the sphenoid sinus and artifacts from the dense bone at the base of the skull, it is frequently difficult to be certain about the etiology of the low-density area. Pneumoencephalography carries some morbidity, particularly severe headaches, nausea, and vomiting. Because of the pain and discomfort associated with PEG, and the possibility of prolonged hospitalization, we attempted to demonstrate the ESS using Amipaque combined with CT scanning. Using a comparatively low dosage (5 cc of a solution containing 190 mg/cc) of Amipaque we were able to demonstrate the ESS successfully in six patients.

A recent report describes the use of Amipaque combined with CT scanning and polytomography in demonstrating the ESS. That technique involved the use of relatively large doses of Amipaque. Recently, several cases of serious reactions, including cortical blindness, have been reported following Amipaque myelography; however, the complications appear to be related to the total dosage. The fact that none of the 55 patients who underwent Amipaque cisternography in our series experienced severe cerebral toxicity probably reflects the relatively low dosages we
Nausea and/or vomiting and moderate transient headache were reported in many of the patients. Thus, morbidity from low-dose cisternography does appear to be less than that associated with PEG. In addition to evaluating the presence of ESS, Amipaque cisternography has the potential for accurately demonstrating the extent of suprasellar extension of pituitary tumors and the position of the optic chiasm and its relationship to the tumor.

References


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