Pantopaque: Demonstration and Assessment of Lesions of the Third Ventricle and Posterior Fossa

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PANTOPLAQue ventriculography, a time-honored technique for assessment of midline lesions suspected of encroaching upon the third ventricle, the aqueduct of Sylvius, or the fourth ventricle, has received increasing attention in the past few years.1-3,7,10,12,16 Improved surgical and radiotherapeutic capabilities have created a need for more detailed assessment of the posterior fossa, and technical advancements in image intensification have made possible the simple and widespread use of Pantopaque ventriculography.1,4,13,16 In spite of the degree of perfection reached by fractional pneumoencephalography, positive contrast ventriculography is often needed for detailed demonstration of the third ventricle, the aqueduct, and the fourth ventricle.16 Particularly, in the presence of increased intracranial pressure, gas ventriculography and fractional pneumoencephalography may be inadequate or contraindicated as a means of demonstrating the aqueduct and fourth ventricles while Pantopaque ventriculography will readily and safely outline these structures.16 Positive contrast ventriculography should not be considered a replacement or alternative to fractional pneumoencephalography or arteriography; rather it is advocated to complement the information derived from these studies.1-3,5,15,17

The early widespread use of positive contrast ventriculography was marred by frequent complications due to toxicity of the then available contrast media;4,7 this was corrected by the introduction of Pantopaque, a medium well tolerated, without radiation hazards, and of acceptable physical characteristics.6,12

Image intensification greatly facilitates manipulation of Pantopaque from the anterior compartment of the lateral ventricle into the third ventricle, aqueduct, and fourth ventricle, and, because Pantopaque ventriculography is primarily intended for study of these structures, many authors have advocated selective instillation of contrast material into the third ventricle via a catheter.10,18

Retrograde filling of the fourth ventricle through the foramen of Magendie with contrast material pooled in the posterior fossa cisterns has been reported as a success in better than one half of the patients thus examined.9,16 However, the method does not appear to offer any advantage over standard Pantopaque ventriculography, and it is suspected that in the presence of disease of the fourth ventricle or aqueduct, the percentage of successful filling would be greatly decreased.16

The specific needs of stereotaxic surgery and cryosurgery have fostered the development of panventriculography.3 Simultaneous opacification of the entire ventricular system can be accomplished by utilizing a water soluble medium or Pantopaque emulsified in cerebrospinal fluid.8,12 Although this technique admittedly offers an excellent method for simultaneous opacification of the lateral ventricles, the third ventricle, the aqueduct, and the fourth ventricle, minor reactions and discomfort of the patients have increased. Portera12 reported low-grade febrile reactions in 28 of 37 patients examined with a Pantopaque emulsion. The frequent ill effects of water soluble media have been pointed out by many authors and may well outweigh the advantages.1,5,16

Detailed Pantopaque demonstration of the midline CSF compartments permits identification of lesions projecting into the lumen of the ventricles. Moreover, on the basis of the type of displacement caused by extrinsic pressure, localization of lesions situated fur-
ther laterally is possible. The method has proven particularly useful for demonstration of seeding or implanted metastases.

**Technique**

A rubber cannula is introduced into the third ventricle or the frontal horn of the lateral ventricle through a frontal burr hole. The cannula, which is equipped with a stop-cock that can be closed, is then secured between sterile gauze pads. The patient is placed prone on the fluoroscopic table with the head tilted so that the cannulated lateral ventricle lies above the third ventricle and the opposite lateral ventricle. Under television control, approximately 3 cc of Pantopaque are slowly injected into the frontal horn of the lateral ventricle. By gradually extending the patient's head, yet maintaining an oblique position to insure that the injected lateral ventricle is higher than the other two ventricles, the opaque medium is manipulated backward and drops through the foramen of Monro into the third ventricle, the anterior compartment of which is then readily delineated.

The patient is then rotated through approximately 135° from a prone, semi-oblique position to a true supine one. The contrast medium will then fill the posterior third ventricle, the aqueduct, and the fourth ventricle. Elevating the fluoroscopic table to a semirect position will accelerate the flow of contrast medium to the fourth ventricle, while a horizontal position will retard the flow.

The various pertinent stages of filling of the ventricular system are recorded in anteroposterior and cross-table lateral projections. Separate series of roentgenograms of the anterior third ventricle, the posterior third, the aqueduct and fourth ventricle are necessary for optimal documentation. Cine-roentgenographic recordings provide an animated presentation of the passage of Pantopaque; 35 mm cine recordings are preferred over 16 mm ones because of their much greater resolution.

In many instances, direct catheterization of the third ventricle was possible, thus eliminating the process of manipulating Pantopaque through the foramen of Monro into the third ventricle.

**Results**

In this series, critical analysis of 79 patients with lesions involving the third ventricle, aqueduct, and fourth ventricle, examined by gas ventriculography, arteriography, scintiscanograms, and Pantopaque ventriculography, indicated the superiority of Pantopaque ventriculography. Seventy patients were correctly diagnosed on the basis of Pantopaque ventriculography (Table 1). A tabulation of the diagnostic accuracy of this technique revealed its particular value in the diagnosis of metastatic lesions of the posterior third ventricle, aqueduct, fourth ventricle, and cerebellum (Table 1).

**Colloid Cysts.** Four of five colloid cysts involving the anterior third ventricle and the foramen of Monro were diagnosed by gas ventriculograms. In the fifth patient, the cyst, which arose from the paraphysis of the anterior portion of the roof of the third ventricle, was diagnosed only with the help of the Pantopaque ventriculogram. In prone and Trendelenburg positions, the colloid cyst caused a ball-valve obstruction of the foramen of Monro, thus simulating an infiltrative tumor of this region. The propensity of Pantopaque to gravitate to the most dependent point permitted examination in a supine semi-upright position which showed that the cyst, loosely attached to the forward extremity of the choroid plexus in the roof of the third ventricle, shifted posteriorly. The obstruction of the foramen of Monro was thereby relieved, permitting flow of Pantopaque into the third ventricle (Fig. 1). The anterior circumference of the mass was readily delineated, and, on the basis of postural mobility of the mass, an infiltrative tumor was ruled out. Thus, while colloid cysts of the third ventricle are usually identifiable on gas ventriculograms or fractional pneumoencephalograms, the Pantopaque ventriculogram has the additional value of demonstrating its mobility on 35 mm cine roentgenograms.

**Hypothalamic Tumors.** Four of six hypothalamic tumors were readily identified on gas ventriculograms. The superior aspect of these tumors obliterating the lower compartment of the third ventricle can be delineated on gas ventriculogram in a dependent occi-