Pulmonary oil embolization following Pantopaque ventriculography in a patient with a ventriculovenous shunt

Case report

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A case of pulmonary oil embolization subsequent to Pantopaque ventriculography is reported in a patient with a ventriculovenous shunt. The possibility of this complication and its sequelae are discussed.

KEY WORDS positive contrast ventriculography cerebrospinal fluid shunts pulmonary oil embolization lipoid pneumonia

PULMONARY oil embolization has been shown to occur following various radiographic procedures. It has been demonstrated with high frequency in conjunction with lymphangiography, hysterosalpingography, and urethrography. Although the symptomatology is usually minor, severe morbidity and, on rare occasion, mortality have been reported. Pantopaque has been implicated in rendering shunt valves nonfunctional but we have found no reports of pulmonary oil embolization following Pantopaque ventriculography.

Case Report

A 6-year-old girl with communicating hydrocephalus was admitted to the Yale-New Haven Hospital for elective revision of a right ventriculovenous shunt. Because the diagnosis of communicating hydrocephalus was questioned, a right ventriculogram using carbon dioxide was performed on the fourth hospital day. Both lateral ventricles were easily demonstrated with high frequency in conjunction with lymphangiography and has been reported as a complication of myelography, hysterosalpingography, and urethrography. Although the symptomatology is usually minor, severe morbidity and, on rare occasion, mortality have been reported. Pantopaque has been implicated in rendering shunt valves nonfunctional but we have found no reports of pulmonary oil embolization following Pantopaque ventriculography.

However, on the first postoperative day her temperature rose to 38.5°C and she de-
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Fig. 1. Postoperative chest film taken on the first day following the Pantopaque ventriculogram and shunt revision. The lungs at this time are clear. The catheter (arrows) can be seen to the right of the upper thoracic spine. The tip (not well demonstrated here) was at the level of the seventh thoracic vertebra.

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Developed positive Kernig and Brudzinski signs. Ventricular pressure was greater than 200 mm via Rickham measurement. Cerebrospinal fluid studies were normal. The Holter valve emptied easily and filled readily. A chest film taken that same day was unremarkable and showed the catheter at T-7 (Fig. 1). On the second postoperative day the patient was afebrile, without meningismus, and neurologically unchanged from her preoperative status. However, a follow-up chest film revealed a large globular collection of Pantopaque in the right atrium at the distal tip of the cardiac catheter (Fig. 2). There was also a fine granular appearance throughout both lung fields indicating diffuse oil embolization. The patient remained afebrile and neurologically unchanged.

A subsequent chest film taken 2 days later showed residual droplets of the iodinated oil within the shunt tubing. The diffuse granular pattern was no longer evident yet there were residual focal collections of the contrast medium in the lung bases (Fig. 3). The Holter valve continued to function without difficulty. The patient was discharged on the 15th postoperative day in satisfactory condition.

Discussion

Positive contrast ventriculography is often used in the diagnosis of lesions of the posterior third ventricle, aqueduct, and posterior fossa, and is considered by some physicians to be the procedure of choice.27 Many of these patients either have or will require a shunt procedure. The roentgenological fea-

Fig. 2. Postoperative chest films, posteroanterior (left) and lateral (right) views, taken 2 days after Pantopaque ventriculography. Note the droplets of Pantopaque within the shunt tubing (arrowheads) and the large collection at the tip of the shunt within the right atrium. There is a fine stippled granular appearance throughout both lung fields, more marked in the lower lung zones, indicating diffuse oil embolization. These changes were more striking on the original radiograph.

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tures demonstrated in this case exemplify the potentiality of pulmonary oil embolization occurring under these circumstances. Although this complication may have been recognized by some in the past, the potential severity has not been emphasized and serves as the main purpose of this report.

Pulmonary oil embolization occurs in all patients subjected to lymphangiography. The radiographic demonstration of this entity has been reported in 20% to 55% of the cases. Pathological studies and animal experimentation have demonstrated that considerable oil may be present within the pulmonary capillaries and arterioles even when not seen radiographically.

The radiologic appearance is usually a diffuse, finely granular or stippled pattern throughout both lung fields, and occasionally a linear or reticular pattern. In addition, patchy infiltrates have occasionally been reported and attributed to a chemical pneumonitis secondary to the oil. Pulmonary infarction can have a similar appearance. Less commonly, transverse linear shadows (Kerley's B lines) and plate-like atelectasis have been described.

The majority of patients are either asymptomatic or show mild symptoms consisting of chills, fever, cough, pleuritic pain, and minimal to moderate dyspnea. Severe manifestations, although infrequent, have been described consisting of sudden hypotension, cyanosis, dyspnea, and evidence of right-sided heart strain. These patients, however, are usually found to have underlying pulmonary disease. Investigators have shown that some alteration of pulmonary function occurs in almost every patient subjected to lymphangiography; they have demonstrated a uniform fall in diffusion capacity resulting in an alveolar-capillary block syndrome that was usually transient and reversible. In addition to the manifestations of pulmonary compromise, hypersensitivity has been implicated and related to fatalities.

Severe morbidity and mortality have been attributed to oil embolizing to the central nervous system. Cerebral manifestations range from confusion to stupor and coma. Several mechanisms have been postulated including passage through intracardiac right to left shunts or directly through the pulmonary capillary bed. Direct communication via Batson's plexus is implicated following myelography.

Our patient did not manifest any significant symptomatology other than fever and
mencingismus. These findings could have been related to the ventriculogram itself. Had the large collection of Pantopaque not been observed within the heart, the significance of the radiographic appearance of the lungs may not have been appreciated and not considered a complication of the procedure. Nevertheless, the fine, stippled pattern observed on the film taken 2 days after the Pantopaque ventriculogram (Fig. 2) is considered diagnostic of iodinated oil embolization. On a subsequent film taken 2 days later, this pattern was no longer evident, yet larger linear and globular collections of the contrast medium could be seen in the lower lung fields (Fig. 3). This pattern has been described previously and is thought to indicate an extensive accumulation of oily contrast medium within the pulmonary capillaries and arterioles. There is no direct correlation between this particular pattern and the incidence or severity of symptoms.

It is not unreasonable to assume that pulmonary oil embolization may occur with relative frequency in patients with ventriculovenous shunts, especially when large amounts of Pantopaque have been left within the ventricular system. If the clinician is unaware of this possibility, the significance of related symptomatology may go unrecognized. Also to be considered is the frequency of diminished pulmonary reserve seen in these shunted patients. Among the known complications of ventriculovenous shunts, thromboembolic disease is prevalent, and has been implicated in shortened postoperative survival. As previously mentioned, the severe complications of pulmonary oil embolization have usually been associated with pre-existing pulmonary compromise. Therefore, these patients present an increased risk if subjected to oil embolization.

In a recent review of Pantopaque ventriculography, Lang and Russell point out that residual Pantopaque will often obstruct shunt valves and render them nonfunctional; these authors advocate complete removal of the residual oil at the completion of the procedure. In view of the additional hazards of pulmonary oil embolization and its potential severity in this category of patients, this precaution is certainly justified and should be re-emphasized.

References


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