The British Journal of Radiology, *72* (1999), 704–705 © 1999 The British Institute of Radiology

Case report

Pneumocephalus secondary to colonic perforation by ventriculoperitoneal shunt catheter

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Abstract. We present a case of colonic perforation as a complication arising from ventriculoperitoneal shunt catheter. A 58-year-old woman with a ventriculoperitoneal shunt catheter inserted for obstructive hydrocephalus was admitted to hospital with signs and symptoms of meningitis. CT showed an air–fluid level within both lateral ventricles, raising the possibility of colonic perforation since no other aetiology for the pneumocephalus could be found. The CT demonstration of the colonic perforation played a crucial role in patient management.

Colonic perforation from a ventriculoperitoneal (VP) shunt catheter is an infrequently described complication [1, 2]. Ascending intracerebral sepsis as a result of the migration of the catheter into the colon occurs in approximately half these cases [3–5]. CT vividly demonstrates this complication, leading to prompt treatment.

Case report

A 58-year-old female, a known diabetic, was admitted to hospital with fever, headache, vomiting and altered consciousness. She had undergone a VP shunt catheter insertion for obstructive hydrocephalus with excision of a cyst of the fourth ventricle 8 months previously.

On examination, the patient had altered consciousness with a temperature of 39°C and signs and symptoms suggestive of meningitis. She responded only to deep, painful stimuli. Diffuse guarding and rigidity was present all over the abdomen with no palpable mass.

Ultrasound examination of the abdomen was unremarkable and the catheter tip could not be visualized. CT of the brain showed air within both lateral ventricles, with the tip of the catheter in the left lateral ventricle (Figure 1). No skull fracture was demonstrated. CT of the pelvis, performed to ascertain the cause of the pneumocephalus, showed the catheter tip to lie within the sigmoid colon (Figure 2).

Laboratory examination showed haemoglobin 9.8 g dl^{-1}, WBC count 19.5×10^9 l^{-1} with random blood sugar of 230 mg%. Aspirated cerebrospinal fluid (CSF) was turbid. CSF pressure was elevated to 192 mm of water. The CSF had a protein level of 700 mg dl^{-1}; WBC count of 7520 per ml with 85 polymorphs, 13 lymphocytes and two mononuclear cells; a glucose concentration of 40 mg dl^{-1} and a chloride concentration of 101 meq l^{-1}. Pandy's test was positive. CSF culture grew *E. coli*.

The patient was started on intravenous Cefotaxime 1 g 8 hourly, and Amikacin 1 g daily. Shortly after admission, the patient underwent exteriorization of the shunt with its subsequent removal after 3 days. The perforated colonic site in the region of the sigmoid colon was sutured in two layers. An external ventricular drainage was established the day after the shunt was removed. Sensitivity to Cloxacillin was noted and this was administered intravenously and through the intraventricular drainage catheter. Revision VP shunt surgery was performed after repeated CSF cultures were negative. The patient was discharged on the 36th day post-admission on oral cloxacillin.

Discussion

The reported incidence of bowel perforation by VP shunt is 0.7–0.10% [1, 2], with a mortality rate as high as 15% [3]. The commonest clinical presentation in this condition is meningitis, which occurs in about 43% of the cases [3]. Fewer than 25% of the patients present with peritonitis [6].

The catheter most commonly associated with perforations is the Raimondi spring-coiled catheter [7]. The introduction of softer, more flexible silastic tubing has reduced but not totally eliminated the incidence of bowel perforation [7].

Perforation occurs at the time of insertion because the surgeon mistakes the intestinal wall for peritoneum or when there are peritoneal adhesions. Perforation can also occur later, although no

Received 20 November 1998 and accepted 5 February 1999.

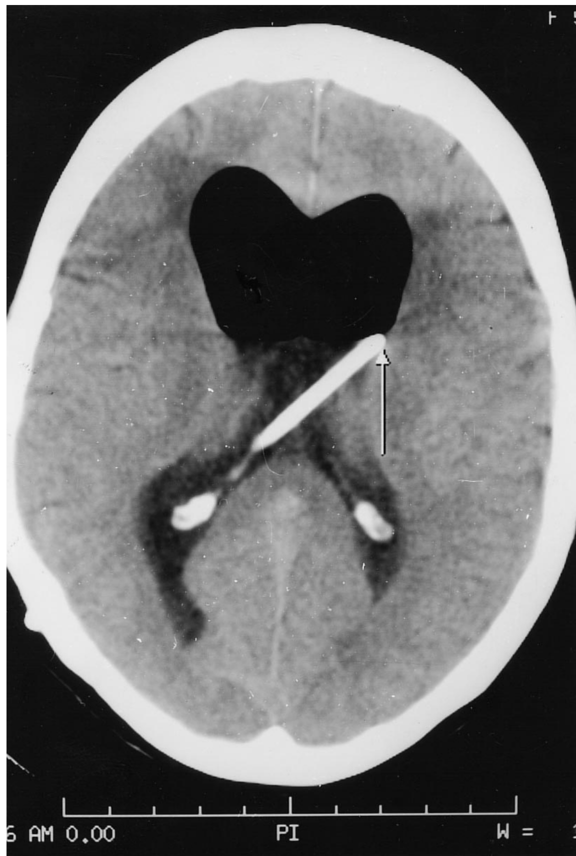

Figure 1. CT demonstrating the tip of the shunt catheter within the body of the left lateral ventricle (arrow). Note the air–cerebrospinal fluid level within both the lateral ventricles.

definite cause for this has been established. It is speculated that local inflammation owing to repeated irritation of the bowel wall by the catheter tip may lead to subsequent perforation.

A high index of clinical suspicion for perforation is therefore warranted in a patient with VP shunt in an appropriate clinical setting. Imaging modalities then play a crucial role in establishing the diagnosis. In the past, this was done by injecting a radio-opaque dye into the shunt catheter after occluding its proximal end and following the course of the dye by obtaining radiographs of the chest and abdomen. Supine and lateral decubitus abdominal radiographs were obtained for definite evaluation [8]. An indirect sign, however, could also be presence of air within the ventricular system on a plain radiograph of the skull, as was noted in our case. Since the advent of CT, the diagnosis can be established more definitely and more easily by taking plain scans through both the end of the shunt tubes.

Pneumocephalus is often overlooked as a non-specific finding which usually occurs following neurosurgery or trauma related to the sinuses or the temporal bone. An abscess due to anaerobic organisms rupturing into the ventricular system or a VP shunt catheter perforating the colon remain unlikely possibilities. It is vital for the radiologist to be well aware of the above aetiologies in order to establish the cause for the pneumocephalus, as demonstrated in our case. The radiologist therefore not only helps to establish the diagnosis of meningitis but can, at times, establish the cause for the same in an appropriate clinical setting.

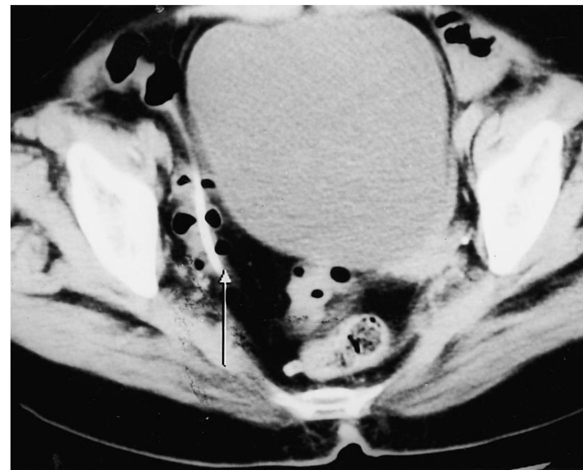

Figure 2. CT of the pelvis demonstrating the tip of the shunt catheter within the sigmoid colon (arrow).

The present case highlights the rarity and illustrates a precise demonstration of the complication. In addition, it emphasizes and brings into focus the key role played by the radiologist in patient management.

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