Subcutaneous Pneumocele Associated With Ventriculoperitoneal Shunt Migration Into the Mechanically Occluded Colon

—Case Report—

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Abstract

A 62-year-old man presented with shunt failure manifesting as consciousness disturbance 4 years after placement of a ventriculoperitoneal shunt for subarachnoid hemorrhage. Physical examination found subcutaneous pneumocele around the peritoneal catheter extending from the abdomen to the neck. He had undergone pelvic radiation therapy for bladder cancer 2 years before. The peritoneal catheter was removed from the cervical region, and external ventricular drainage and a descending colon stoma for ileus release were positioned. The cerebrospinal fluid was clear and yielded no cultures. No inflammatory changes were seen. He developed carcinomatous peritonitis and died 4 months later. Retrograde colon gas reflux due to catheter perforation into the colon occluded by metastatic sigmoid cancer was probably the cause. Fragility of the wall of colon associated with the prior abdominal radiation therapy might have been a contributing factor. Subcutaneous pneumocele around the peritoneal catheter, i.e. pneumocele within the fibrous sheath surrounding the catheter, is a differential diagnosis to cerebrospinal fluid collection in patients with subcutaneous swelling around the catheter.

Key words: shunt failure, subcutaneous pneumocele, colonic perforation, abdominal radiotherapy

Introduction

Abdominal complications after the placement of a ventriculoperitoneal (VP) shunt are well known. The bowel has thin walls which are particularly susceptible to perforation. The reported incidence of perforation of the bowel associated with VP shunt catheter is 0.1–0.7%[10,12] and the consequent mortality is approximately 15%.[13] Perforation usually occurs within 1 year of VP shunt insertion and is often reported in infants.[7] The initial symptoms of catheter perforation of the bowel include shunt infection, prolonged unexplained diarrhea with sterile cultures,[1] peritonitis, increased intracranial pressure due to shunt failure,[6] extrusion of the peritoneal shunt catheter from the body,[2,8] and pneumocephalus caused by retrograde colonic gas flow through the shunt catheter.[3,9,11] The incidence of peritonitis due to VP shunt perforation is less than 25%.[11] However, colonic perforation does not result in peritonitis if fibrous tracts formed around the shunt catheter block spillage of the bowel contents into the peritoneum.[1,9]

We treated a patient with perforation of the bowel manifesting as subcutaneous pneumocele around the VP shunt catheter from the abdomen to the neck.

Case Report

A 62-year-old man presented with consciousness disturbance 4 years after he had undergone clip occlusion of a ruptured anterior communicating artery aneurysm and VP shunt placement (Pudenz medium-pressure valve and silicone peritoneal catheter) for normal-pressure hydrocephalus. The shunt functioned well, although he exhibited mild dementia. He had also received pelvic radiation therapy (56 Gy) 2 years after shunt placement for...
advanced bladder cancer.

On admission he was drowsy. His abdomen was distended with silent peristalsis and signs of peritoneal irritation. There was an apparent subcutaneous mass extending from the abdomen to the neck along the VP shunt catheter (Fig. 1). Palpation of the mass felt just like sponge, suggesting pneumocele but not fluid. Brain computed tomography (CT) demonstrated dilation of the ventricles with periventricular lucency but no pneumocephalus. Abdominal CT showed the peritoneal catheter in the lumen of the descending colon (arrow). Palpation of the mass felt just like sponge, suggesting pneumocele but not fluid. Brain computed tomography (CT) demonstrated dilation of the ventricles with periventricular lucency but no pneumocephalus. Abdominal CT showed the peritoneal catheter in the lumen of the descending colon (arrow). Examination of serial abdominal roentgenograms showed the position of the peritoneal catheter had not changed for 1 year, so we thought that asymptomatic colonic perforation had been present for at least 1 year.

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Shuntgraphy demonstrated opacity of the descending colon and stricture of the sigmoid colon, suggestive of migration of the catheter into the colon, and metastasis from the primary cancer with associated mechanical ileus (Fig. 3).

The peritoneal catheter was removed from the cervical region, and external ventricular drainage and a descending colon stoma for ileus release were positioned. The cerebrospinal fluid was clear and cultures yielded no growth. No inflammatory changes were seen. He developed carcinomatous peritonitis and died 4 months later.

Discussion

In our patient, mechanical ileus, caused by metastatic involvement of the sigmoid colon, resulted in increased colon pressure, leading to retrograde colon gas reflux within the fibrous tract surrounding the catheter. This probably caused the unusual manifestation of subcutaneous pneumocele and shunt failure without peritonitis. The mechanism underlying the catheter perforation of the bowel is unclear. Local inflammation due to chronic irritation of the bowel wall by the catheter tip may have induced erosion and subsequent perforation. In addition, the high dose of pelvic radiation may have been a promoting factor.

Radiation colitis is most frequent complication associated with abdominal radiation therapy and the incidence is clearly dose-related. Abdominal symptoms are common after 30–40 Gy and more
than 33% of patients sustain radiation injury at 60 Gy. Chronic radiation-induced injury develops 3 to 24 months post-irradiation,\textsuperscript{5} such as chronic diarrhea due to fibrosis of the bowel and peritoneum, ulcer formation, and bleeding secondary to damage of the bowel vasculature.\textsuperscript{4}

The catheter most commonly associated with perforations is the Raimondi spring-coiled catheter.\textsuperscript{11} The introduction of softer, more flexible silastic tubing has reduced but not totally eliminated the incidence of bowel perforation.\textsuperscript{11}

The present case suggests that patients undergoing abdominal radiation therapy after VP shunt placement should be monitored regularly to detect complications from the abdominal shunt catheter as early as possible. The development of subcutaneous pneumocele around the peritoneal shunt catheter may indicate VP shunt migration into the bowel, although whether the bowel without increased pressure can cause such apparent pneumocele is unknown. Pneumocele is a differential diagnosis to cerebrospinal fluid collection in patients with subcutaneous swelling around the catheter.

\textbf{References}

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