Delayed and isolated intraventricular tension pneumocephalus after shunting for normal pressure hydrocephalus

Sir,

Tension intraventricular pneumocephalus (TIP) usually occurs during the surgical procedure but delayed and isolated TIP without air in the pericerebral subarachnoid space is a unique complication. We found only one case reported in the French literature.\(^1\)

A 65-year-old man presented with a one-year history of headaches, gait disturbance, urinary incontinence and progressive dementia. Radiological investigation confirmed NPH.

Before operation external drainage was not applied. A shunt system with cerebrospinal fluid (CSF) flow control-medium pressure valve was successfully performed on right frontal. A postoperative CT scan revealed no pneumocephalus. He was discharged on the third postoperative day.

The patient was re-admitted on postoperative day 18, with complaints of progressive loss of consciousness. A thin CT scan demonstrated abundant air collection in all ventricles [Figure 1]. Two weak areas on the suture line showed insufficient wound healing, but there were no signs of infection or CSF leaking. The patient was re-operated on urgently. A second thin catheter was implanted next to the ventricular catheter. The air in the ventricles was replaced by saline using a second catheter. All shunt system components were removed and a new

Figure 1: 18th days postoperative cranial CT scan demonstrated abundant air collection in all ventricles

References


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CSF flow control-high pressure valve shunt was applied. Microbiological examination of CSF was normal. Antibiotic (ceftriaxone) treatment was started, only to prevent any infection and it was stopped 10 days later. Closure of the air entrance source at the dura was covered by the galea aponeurotica flap. The patient was improving and was discharged on postoperative day 7. Cranial CT showed no pneumocephalus after one month.

The pathogenesis of TIP after shunting was described by a different mechanism. There appear to be two requirements for patients to develop pneumocephalus. The presence of a CSF diversion system that causes a decrease in intracranial pressure and the existence of a craniodural defect with or without an obvious CSF leak. Low-pressure valve, shunt without antisiphon system, long-period external CSF drainage and CSF fistulated defect requires siphoning phenomenon. Phenomenon causes negative vacuum effect inside the ventricles with pressures dropping to valves as low as -440 mmH₂O at the foramen of monro. Lundsford named this mechanism with IPBP.[2] The other likely mechanism is a gas-producing bacteria.[3]

CT is the superior method that can be demonstrated in primary disorders. We used thin CT slice for determining probable bony defect. The dehiscated wound was the possible entry point of air. CT scans demonstrated isolated TIP with no air in the pericerebral subarachnoid space. We postulated the adhesive tissue under the duramater on the Burr-hole point to prohibit air from entering the subarachnoid space.

According to the etiology of pneumocephalus, temporary external ventricle drainage and the modification of the shunt system may be an effective treatment. Some authors presumed that modification of the shunt system with the use of high-pressure shunt or antisiphon devices would avoid pneumocephalus. Although despite the use of antisiphon devices pneumocephalus was still reported.[4] All authors share that when infection is present or suspected, the shunt should be externalized. In the present case, a CSF sample was obtained peroperatively. We didn’t have a CSF microbiological examination result on hand that time. Although changing all of the shunt system seems extreme without entity of infection, we required it to reduce risk of infection.

With careful clinical evaluation, the etiology of pneumocephalus has to be verified clearly and the air entrance site may be searched by thin slice CT.


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