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Visual Diagnosis in Emergency Medicine

PROFOUND PNEUMOCEPHALUS IN AN INFANT

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CASE SUMMARY

A 4-month-old boy with history of communicating hydrocephalus, who was 5 days postoperative from a parieto-occipital ventriculoperitoneal (VP) shunt placement, presented to the emergency department with fussiness and clear drainage from the postoperative incision. The patient was afebrile, mildly tachycardic for age, awake, fussy, and difficult to console. His physical examination revealed a markedly sunken anterior fontanelle and a 5 cm × 1 cm × 2 cm area of fluctuance underlying the parietal incision. Clear fluid was observed leaking from the suture line. A shunt series demonstrated marked intraventricular pneumocephalus (Figure 1), presumably due to a ball valve effect of the leaking shunt, causing it to backfill with air. During neurosurgical repair, the patient was noted to have a pseudomeningocele formation (a pseudomeningocele is an extradural collection of cerebrospinal fluid that results from a dural or arachnoid tear; it is an uncommon complication of spinal surgery). The patient was admitted and underwent prompt neurosurgical revision, including shunt externalization and dural repair. His postoperative course was complicated by a brief episode of meningitis based sepsis. After clinical stabilization, he underwent placement of a revised VP shunt without complication and was subsequently discharged home on the second postoperative day.

DISCUSSION

Shunt failure occurs in 40–50% of patients during the first 2 years after shunt surgery (1). Most commonly, shunt failures are due to obstruction or mechanical failure; however, over-drainage can also occur (2). The strongest clinical predictors of shunt complication include meningismus, peritonitis, lethargy, fluid, or erythema around the shunt. Physical examination findings can include a sunken or bulging fontanelle, a rapid change in head circumference, and over-riding parietal bones (3). The operative site may also demonstrate swelling and active cerebrospinal fluid leakage. Acute shunt failure can result in a cerebrospinal fluid collection that communicates with the central nervous system but is not surrounded by dura mater, known as a pseudomeningocele. The incidence of pseudomeningocele formation after VP shunt placement is unknown.

Imaging is often necessary to evaluate suspected shunt malfunction; however, there is no clear consensus regarding the most effective and cost-efficient imaging modality (4). Imaging choice often varies based upon hospital practice, patient presentation, and suspected etiology. Noncontrast head computed tomography or plain radiograph shunt series are the most commonly used modalities. Rapid magnetic resonance imaging is being utilized by some institutions to minimize radiation exposure. Less frequently, ultrasound may be used in infants with an open anterior fontanelle (5). In one

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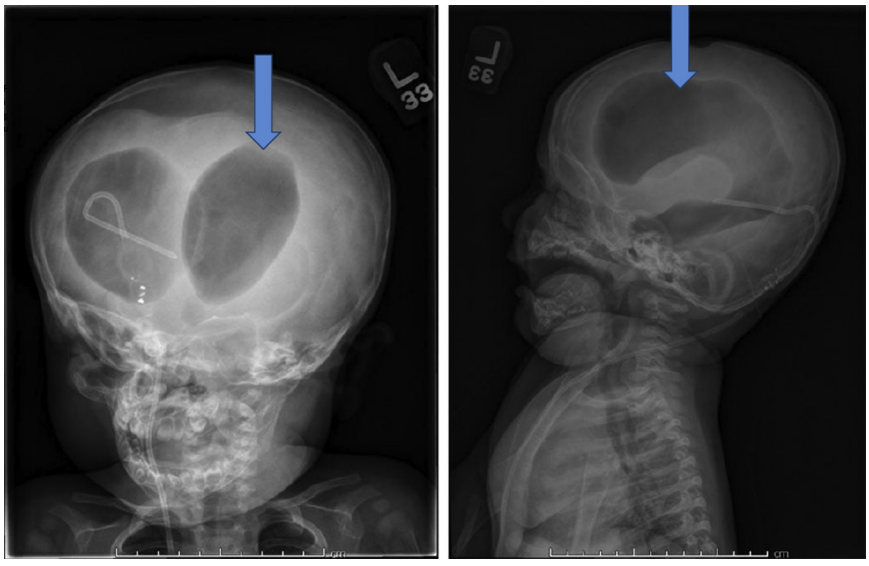

Figure 1. Shunt series images demonstrate profound intraventricular pneumocephalus at arrows.

retrospective review, the sensitivity of plain radiography for detection of VP shunt failure was 31%, whereas head computed tomography had sensitivity of 83% (6).

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Dr. Bianchi is a military service member and Dr. Bottoni is an employee of the United States Government.

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REFERENCES

1. Browd SR, Gottfried ON, Ragel BT, Kestle JR. Failure of cerebrospinal fluid shunts: part II: overdrainage, loculation, and abdominal complications. Pediatr Neurol 2006;34:171–6.
2. Bober J, Rochlin J, Marmeni S. Ventriculoperitoneal shunt complications in children: an evidence-based approach to emergency department management. Pediatr Emerg Med Pract 2016; 13:1–22.
3. Naradzay JF, Browne BJ, Rolnick MA, Doherty RJ. Cerebral ventricular shunts. J Emerg Med 1999;17:311–22.
4. Sivaganesan A, Krishnamurthy R, Sahni D, Viswanathan C. Neuroimaging of ventriculoperitoneal shunt complications in children. Pediatr Radiol 2012;42:1029–46.
5. Lee P, DiPatri AJ. Evaluation of suspected cerebrospinal fluid shunt complications in children. Clin Pediatr Emerg Med 2008; 9:76–82.
6. Zorc JJ, Krugman SD, Ogborn J, et al. Radiographic evaluation for suspected cerebrospinal fluid shunt obstruction. Pediatr Emerg Care 2002;18:337–40.