Conservative management of intraventricular migration of a gelatin sponge: illustrative case

Katherine G. Holste, MD, Bridger Rodoni, BS, Arushi Tripathy, MD, Jaes C. Jones, MD, MS, Sara Saleh, MD, and Hugh J. L. Garton, MD

Department of Neurosurgery and School of Medicine, University of Michigan, Ann Arbor, Michigan

BACKGROUND Gelatin sponges, such as Gelfoam, are used as hemostatic agents during surgery and are generally absorbed over the course of 4–6 weeks in most body cavities. The time course of the dissolution of Gelfoam sponges within the cerebral ventricles has not been described.

OBSERVATIONS The authors present a case of intraventricular migration of Gelfoam after ventriculoperitoneal shunt placement in a 6-week-old infant. The infant was imaged regularly after ventriculoperitoneal shunt placement, and the Gelfoam sponge persisted within the ventricles on all images until 11 months after surgery. At no time during follow-up did the patient have any symptoms of hydrocephalus requiring retrieval of the sponge or shunt revision.

LESSONS This is the first case describing time until absorption of a gelatin sponge within the ventricle and successful conservative management.

https://thejns.org/doi/abs/10.3171/CASE22126

KEYWORDS Gelfoam; neurosurgery; shunt; hydrocephalus

Absorbable gelatin sponges, such as Gelfoam (Pfizer Inc.), are a useful hemostatic agent in neurosurgery. Made from purified porcine skin, gelatin sponges are inert, are not water soluble, and can absorb multiples of their weight in fluid. They are regularly left in the surgical cavity postoperatively. The manufacturer of Gelfoam reports an average time of 4–6 weeks until complete dissolution, varying on the basis of the size of the piece, surgical site, and amount of fluid absorbed. In spaces that have a high degree of moisture, such as a bleeding nasal cavity, rectum, or vagina, the sponge may liquify in 2–5 days. Little is known about the absorption of gelatin sponges within the ventricles. This case report describes the time to absorption of retained intraventricular Gelfoam without need for surgical intervention.

Illustrative Case

A 25-week premature male infant was found to have a grade IV intraventricular hemorrhage shortly after birth. He developed posthemorrhagic hydrocephalus diagnosed on serial cranial ultrasound scans and enlarging head circumference. Due to low birth weight, a right-sided intraventricular reservoir was placed at 2 weeks at another hospital. At 6 weeks of age, a left-sided ventriculoperitoneal shunt was placed for persistent hydrocephalus (Fig. 1).

The ventriculoperitoneal shunt was placed in the typical fashion at this institution. The contralateral ventricular reservoir was removed during the same anesthetic. To prevent egress of cerebrospinal fluid (CSF) through the prior reservoir catheter tract, a small, rectangular piece of Gelfoam was placed within the cortical defect. The wound was closed in a layered fashion. The patient tolerated the procedure well.

On postoperative day 1, the patient underwent cranial ultrasound, which showed a rectangular echogenic mass within the occipital horn of the right lateral ventricle (Fig. 2). Although initially interpreted as hemorrhage by the radiologist, this was subsequently evident to be migration of the previously placed piece of Gelfoam because it was perfectly rectangular, unlike a hematoma, which would conform to the

ABBREVIATIONS CSF = cerebrospinal fluid; ETV = endoscopic third ventriculostomy; MRI = magnetic resonance imaging.

INCLUDE WHEN CITING Published May 16, 2022; DOI: 10.3171/CASE22126.

SUBMITTED March 15, 2022. ACCEPTED March 23, 2022.

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shape of the ventricle. At 2-week follow-up magnetic resonance imaging (MRI), the same rectangular hypointense lesion was noted within the right occipital horn of the lateral ventricle (Fig. 3). The patient remained asymptomatic at that time. He underwent subsequent MRI at 7 weeks, 15 weeks, and 11 months after surgery (Fig. 4). All MRI studies were obtained for routine follow-up only. During this period, the patient did not exhibit any symptoms of hydrocephalus or shunt failure. He also had no signs of shunt failure or hydrocephalus, such as tense fontanelle or rapidly increasing head circumference. At 11 months after surgery, the retained piece of Gelfoam was no longer visible within the ventricular system on MRI.

Discussion

Observations

This is the first reported case in the neurosurgical literature detailing the absorption of a retained intraventricular gelatin sponge. In this case, the retained piece of Gelfoam did not obstruct any CSF outflow during follow-up and was absorbed at some time between 15 weeks and 11 months after surgery. Further imaging between 15 weeks and 11 months after surgery was not performed due to lack of clinical indication. Per the manufacturer, the size of the piece used, the amount of fluid it absorbs, and the location within the body all affect the time to absorption. For example, in more moist areas with mucous membranes such as the vagina or rectum, the sponge is liquified relatively quickly, whereas in other parts of the body, absorption takes place over 4–6 weeks. In a rat model, Gelfoam was completely absorbed at 7 weeks after implantation in the subdural space. In an inert fluid such as CSF, relatively shielded from the immune system, a longer absorption time could be expected within the ventricles than in other parts of the body. Gelatin sponges tend to be hypodense on computed tomography, echogenic on ultrasound, and hypointense on MRI. In a canine model examining imaging characteristics of hemostatic agents on MRI, Gelfoam was heterogeneous and hypointense to gray and white matter, respectively, on T1- and T2-weighted images, heterogeneous on fluid-attenuated inversion recovery images, and hypointense on gradient echo or T2*-weighted imaging. In the immediate postoperative period, it can be easily mistaken for a hematoma or other mass. This is true outside of neurosurgery: One case in the radiology literature illustrates a piece of gelatin sponge thought to be residual thyroid tumor on ultrasound and persisting between 7 weeks and 14 months after surgery. In another case, a Gelfoam slurry had migrated from a percutaneous liver biopsy tract into the gallbladder and common bile duct. The patient developed symptoms and radiological evidence of acalculus cholecystitis that resolved without surgical intervention. In our case, the Gelfoam appeared rectangular on imaging, and differentiating it from a clot was fairly straightforward.

There have been a few prior reports of intraventricular migration of Gelfoam, although in these cases, CSF obstruction was observed, and retrieval of the Gelfoam was performed. One case of a 12-year-old girl who underwent an endoscopic third ventriculostomy (ETV) sustained intraventricular Gelfoam migration and subsequent obstruction of her ETV. In another case, a piece of Gelfoam was found to...
be obstructing the cerebral aqueduct causing triventricular ventriculomegaly 3 months after endoscopic cyst fenestration.11 Yet another case described migration of a piece of Gelfoam 5 months after resection of an epileptogenic focus, resulting in cerebral aqueduct obstruction and need for endoscopic removal.12 In our case, this patient was fortunate to have avoided CSF obstruction and hydrocephalus.

Lessons
We present the case of an infant who was noted to have intraventricular migration of Gelfoam on postoperative day 1. He remained asymptomatic from this and underwent serial imaging that demonstrated absorption of the gelatin sponge between 15 weeks and 11 months postoperatively. This is the first case report describing the time frame for intraventricular absorption of Gelfoam with successful conservative management.

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Disclosures
The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author Contributions
Conception and design: Holste, Rodoni, Jones, Garton. Acquisition of data: Holste, Rodoni, Jones, Saleh, Garton. Analysis and interpretation of data: Holste, Garton. Drafting the article: Holste, Jones, Saleh, Garton. Critically revising the article: Holste, Tripathy, Saleh, Garton. Reviewed submitted version of manuscript: Holste, Tripathy, Jones, Saleh, Garton. Approved the final version of the manuscript on behalf of all authors: Holste.

Correspondence
Katherine G. Holste: University of Michigan, Ann Arbor, MI. holsteka@med.umich.edu.