Endoscopic Repair of CSF Rhinorrhea

Intranasal surgery can seal off cerebrospinal fluid drainage

By Christine Martin

Nearly once a month, a patient is referred to the University of Virginia Health System's ENT clinic with a condition known as CSF rhinorrhea, in which cerebrospinal fluid (CSF) leaks into the nose through a defect of the anterior skull base. Until 10 years ago, a frontal craniotomy was the only option for repairing the defect. Now, endoscopic intranasal techniques have replaced this neurosurgical procedure as the surgical standard of care. In fact, UVa was the first to use this procedure in Central Virginia and has reported 42 of the 255 published cases in the literature.

According to Stilianos Kountakis, M.D., Ph.D., associate professor of medicine and director of rhinology in UVa's Department of Otolaryngology—Head and Neck Surgery, 54 percent of CSF rhinorrhea cases referred to UVa have had previous sinus surgery or neurosurgery for related problems. Other causes include trauma and herniation of dura and brain contents through a skull-base defect, known as encephalocele. Leakage can also occur spontaneously.

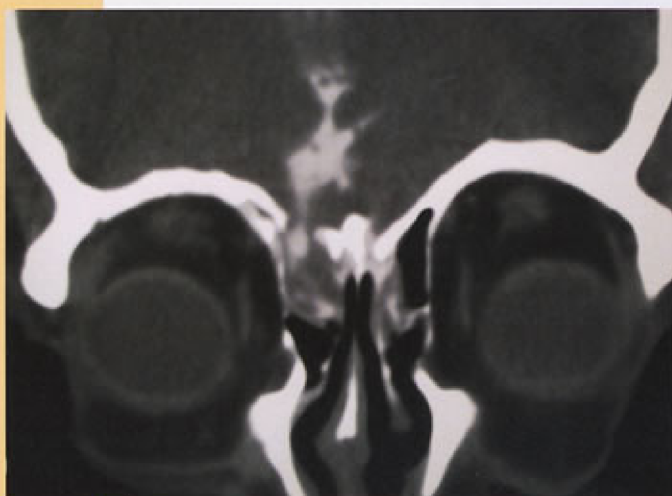
When the skull-base defect is large or in cases where the endoscopic approach does not correct the problem, repair is done using traditional neurosurgical techniques such as transfrontal craniotomy. The departments of Otolaryngology—Head and Neck Surgery and Neurosurgery work closely together to provide the best care for these patients.

"The patient typically presents with clear fluid running out of the nose, especially when the patient bends over. The fluid has low viscosity, and therefore the patient cannot sniff the CSF back as one could with typical nasal congestion," says Kountakis. "If CSF drains down the back of the nasal cavity, patients typically describe a salty taste. When the leakage is severe, patients sometime complain of headaches."

The symptoms are a mere nuisance for some patients. For others, the constant drainage is very embarrassing and

Stilianos Kountakis, M.D., Ph.D., with help from Kathryn Stanford, R.N., demonstrates how he approaches a diagnostic nasal endoscopy to learn whether a cerebrospinal fluid leak exists. When a leak exists, radiologists inject a fluorescent dye and perform a special CT to locate the leak.

William Faust



In CSF rhinorrhea, cerebrospinal fluid (CSF) leaks into the nose through a defect of the anterior skull base. A CT cisternogram shows leakage (light swirl between eye sockets) of cerebrospinal fluid, which is gathering in a patient's nasal cavity. ENT surgeons can use endoscopic intranasal techniques to repair leakage intercranially, avoiding a full craniotomy. This CT shows an encephalocele into the sinus cavities because of a skull base defect. The patient presented with a CSF leak from the encephalocele.

uncomfortable. The main danger associated with CSF rhinorrhea is the risk of meningitis—a 10 percent to 50 percent risk if untreated. Sometimes, CSF rhinorrhea can be managed conservatively, allowing for the defect to heal on its own. If the leak continues, however, the defect should be repaired expeditiously.

After a history and physical, the physician performs a diagnostic nasal endoscopy to study the anatomy of the nose and to see if a CSF leak exists. In cases where the leak is significant, the fluid is collected and tested for beta2 (tau) transferrin, a substance found only in CSF and not in other body fluids. "When we do not have enough fluid to test, we rely on patient history to make the diagnosis. Often, we cannot see the source of the leak using diagnostic endoscopy alone," says Kountakis.

Following the initial endoscopic exam, physicians rely on two procedures to determine the exact location of the leak. Radiologists inject iohexol and fluorescein into the spinal fluid, after which the patient is placed in the Trendelenburg position (legs at higher level than head) for 30 minutes to give the iohexol and fluorescein time to collect in the patient's head. Radiologists then perform a CT cisternogram (a CT scan with contrast), a technique that allows the contrast to concentrate in the area of CSF leakage. "The CT picks up the iohexol, which concentrates in the area of the leak," says Kountakis. Following the CT scan, the patient returns to the ENT clinic for another endoscopic exam. Kountakis notes, "We can see the fluorescein, which is bright green, in the nasal cavity and then track it back to the source of the leak." Using two different contrasts and techniques together increases the chance of identifying the location of the leak.

Surgery, which takes from one to two hours, does not require an external incision. It is typically performed the day after the fluorescein is injected so that surgeons can again follow its path back to the origin of the leak using endoscopic techniques. The location of leaks that are very small sometimes cannot be determined accurately in the rhinology clinic or by CT scan. "Once the leak is identified, we determine its size," says Kountakis. "We also look to see if an encephalocele is the cause. If so, sometimes we simply push it back intracranially. Sometimes it is cauterized and removed."

For leaks that are smaller than 5 mm, surgeons patch the defect using a free graft of nasal mucosa. For defects that are larger than 5 mm, composite grafts are used. Bone is plugged into the defect, which is then patched with mucosa. "If the defect is really large, sometimes we insert bone intracranially and build a bridge across the defect," explains Kountakis. The graft is affixed to the skull base, using fibrin glue, and then supported by layers of absorbable and nonabsorbable packing.

Following surgery, the patient remains in the hospital until the nonabsorbable packing is removed, about two to three days. The patient is asked not to blow the nose, not to strain, not to bend over and to sleep with the head elevated. "Basically our instructions are geared toward preventing any increase of intracranial pressure that will push the support material away and re-create the leak," says Kountakis. Follow-up care continues periodically for about one year.

For more information:

Stilianos Kountakis, M.D., Ph.D.
Otolaryngology—Head & Neck Surgery
(434) 924-8785
E-mail: sek8n@virginia.edu