

## Fact Sheet

### Endoscopic Third Ventriculostomy (ETV)

In endoscopic third ventriculostomy, a small perforation is made in the thinned floor of the third ventricle, allowing movement of cerebrospinal fluid (CSF) out of the blocked ventricular system and into the interpenducular cistern (a normal CSF space). Cerebrospinal fluid within the ventricle is thus diverted elsewhere in an attempt to bypass an obstruction in the aqueduct of Sylvius and thereby relieve pressure. The objective of this procedure, called an “intracranial CSF diversion,” is to normalize pressure on the brain without using a shunt. Endoscopic third ventriculostomy is not a cure for hydrocephalus, but rather an alternate treatment.

Although open ventriculostomies were performed as early as 1922, they became a less common method of treating hydrocephalus in the 1960s, with the advent of shunt systems. Despite recent advances in shunt technology and surgical techniques, however, shunts remain inadequate in many cases. Specifically, extracranial shunts are subject to complications such as blockage, infection, and overdrainage, often necessitating repeated surgical revisions. For this reason, in selected cases, a growing number of neurosurgeons are recommending endoscopic third ventriculostomy in place of shunting.

The ultimate goal of endoscopic third ventriculostomy is to render a shunt unnecessary. Although endoscopic third ventriculostomy is ideally a one-time procedure, evidence suggests that some patients will require more than one surgery to maintain adequate opening and drainage.

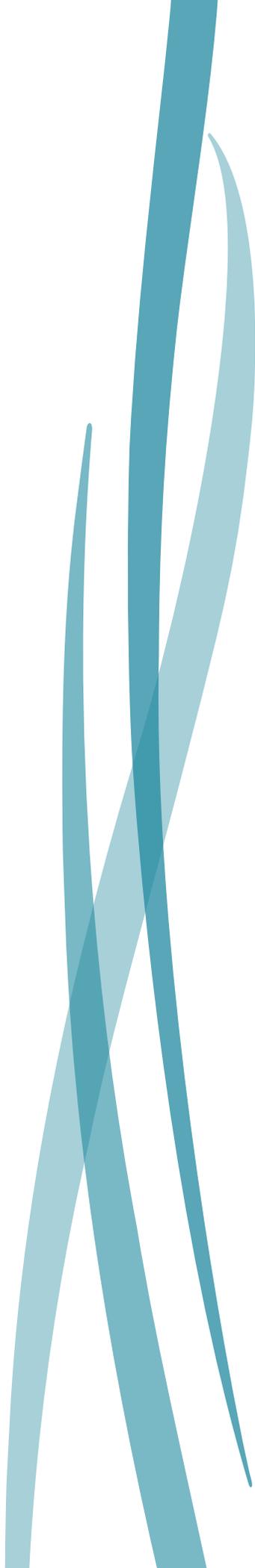
#### New Technologies

The revived interest in ventriculostomy as a viable alternative treatment approach is largely due to the development of a technology called neuroendoscopy, or simply endoscopy. Neuroendoscopy involves passing a tiny viewing scope into the third ventricle, allowing images to be projected onto a monitor located next to the operating table. The neurosurgeon thus has a clear view of the inside of the ventricular system during surgery.

Typically, the endoscopic catheter is passed through a small hole drilled in the skull. In people who already have a shunt, the neurosurgeon may be able to use the original bone defect made when the shunt catheter was first placed. Endoscopic third ventriculostomy thus requires only a small hole in the skull; no additional exposure of the brain is necessary.

#### How Is Success Defined?

“Success” in terms of this procedure is usually considered (by patients and doctors alike) to be avoiding a shunt in a patient who would otherwise require one. Most doctors would categorize endoscopic third ventriculostomy as successful if a patient later shows clinical evidence of normal intracranial pressure (ICP) and structural evidence of stable or decreased ventricular size. If a patient was previously shunted, the shunt must be either removed or proved nonfunctional to demonstrate success.



Most doctors would categorize endoscopic third ventriculostomy as a failure in cases in which a patient shows no change in clinical symptoms or ventricular size or requires placement of a shunt within days or months of the procedure.

The results of endoscopic third ventriculostomy are determined by assessing clinical signs of raised intracranial pressure, head circumference measurements, and fontanelle tension, as well as by MRI/CT scans and post-operative CSF flow studies. It is important to note that, in some cases, ventricles may remain large, in spite of a return to normal intracranial pressure.

Most failed ventriculostomy patients will remain shunt dependent. Doctors attribute failed procedures to the arachnoid villi's inability to absorb the excess CSF or, alternatively, to a block in the subarachnoid pathways carrying CSF to the arachnoid villi.

While achieving shunt independence is usually considered a critical element of "success," currently published statistics may not tell the whole story. Indeed, several doctors have suggested that a "failed" ventriculostomy may still make the resultant shunt easier to manage, though this issue requires further study and consideration. Furthermore, because CSF reabsorption pathways require some time to accommodate the increased amounts of CSF following ventriculostomy, it may not be possible to determine success immediately after the operation.

### **What Are the Potential Complications?**

With new technologies, such as magnetic resonance imaging (MRI), stereotactic guided endoscopy, flexible fiber optic scopes, and improved tools for manipulation and hemostasis, the risks of endoscopic third ventriculostomy have been minimized. High-resolution MRI allows doctors to clearly perceive the absence of flow through a stenosed or occluded aqueduct, while neuroendoscopic procedures offer unprecedented views from within the ventricular system.

The most common complications of endoscopic third ventriculostomy are fever and bleeding. The use of cold light source and monopolar coagulation in the confined volume of the third ventricle can increase CSF temperatures to high levels, sometimes causing fever. Attempts to perforate the ventricular floor can lead to bleeding, as can damage to ventricular walls or perforation of the basilar artery. Large bleeds due to vessel injury under the third ventricle can be catastrophic, but they are rare.

Short-term memory loss is another potential complication of endoscopic third ventriculostomy, since the procedure may affect the hypothalamus and the areas of the mamillary body, which are responsible for memory. However, given time, an individual usually recovers from any short-term memory loss following endoscopic third ventriculostomy.

Because the area of the third ventricle where the opening is made is responsible for some hormonal function, there is also a possibility of endocrinologic dysfunction following endoscopic third ventriculostomy. This complication, too, is often short-lived. Diabetes insipidus is another transient complication.

### **Who Is a Candidate for Endoscopic Third Ventriculostomy?**

According to one doctor, the only thing we know for sure about the indications for endoscopic third ventriculostomy is that we do not know what they are. However, most physicians and recent studies point to three factors most responsible for successful ventriculostomies:

- Age (the individual should be over six months old)

- The prior presence of a shunt
- A diagnosis of noncommunicating hydrocephalus (obstructed ventricular pathways)

Some doctors also report higher success rates in patients with aqueductal stenosis, the most common cause of congenital hydrocephalus. Aqueductal stenosis is the obstruction of the long, narrow passageway between the third and fourth ventricles, which causes fluid to accumulate upstream from the obstruction.

Doctors hypothesize that prior shunt presence may allow the subarachnoid spaces around the brain to develop and that the presence of a functioning shunt may also buy the patient time while he or she develops absorption abilities. It is important to note, however, that when patients have been shunted for a number of years, it often cannot be determined whether the hydrocephalus is communicating or noncommunicating without undergoing invasive testing.

Other factors that can influence the success of endoscopic third ventriculostomy are ventricular width (at least 7 millimeters), no history of previous radiation treatment, and a thinned third ventricular floor.

## Conclusion

Although endoscopic third ventriculostomy can ideally lead to the much-desired result of a shunt-free life, doctors caution that this procedure is not appropriate for everyone. Still, for those who meet the criteria, endoscopic third ventriculostomy offers the possibility of freedom from shunt dependency.

## References

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