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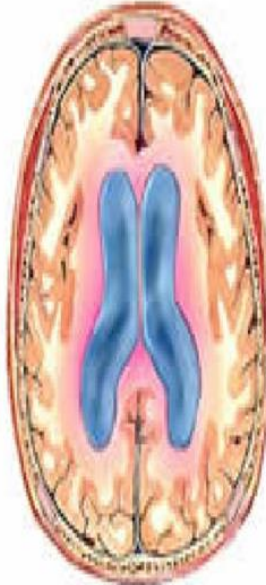
## HYDROCEPHALUS

A Guide for patients and their families

**NORMAL**



**HYDROCEPHALUS**



## Hydrocephalus

### What is cerebrospinal fluid and hydrocephalus?

Cerebrospinal fluid (CSF) is natural clear fluid produced by the brain. The average built produces about 500ml of CSF daily. Under normal condition, CSF circulates through the brain, ventricles and the spinal cord acting as a protective cushion for the delicate brain and spinal cord tissue and as a provider of nutrients. It is subsequently absorbed into the bloodstream.

Hydrocephalus is a condition in which CSF builds up within the ventricles (fluid-containing cavities) in the brain resulting in high pressure. When the balance between production and absorption of CSF is affected, one or more of the ventricles become enlarged as CSF accumulates. In adult, the skull is rigid and cannot expand, so the pressure in the brain may increase profoundly. If left untreated, the pressure may result in brain damage and death.

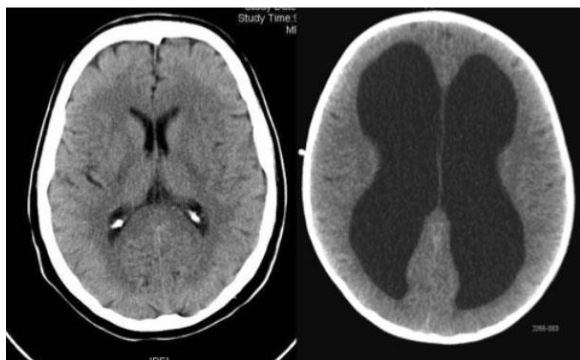
### Who is affected?

In adult, hydrocephalus often usually develops an injury or illness (E.g. bleeding, infection, trauma or tumor)

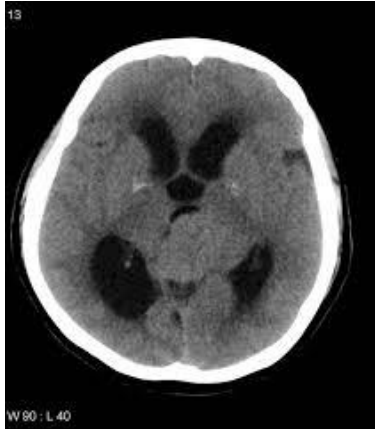
### What are the different types of hydrocephalus and symptoms?

Hydrocephalus may be communicating or non-communicating. Communicating hydrocephalus occurs when the absorption of CSF is affected with no mechanical obstruction to the CSF passage. This form is called communicating because the CSF can still flow through the ventricles, which remain open in communication. Non-communicating hydrocephalus, occurs when the flow of CSF is obstructed along one or more of the narrow pathways connecting the ventricles.

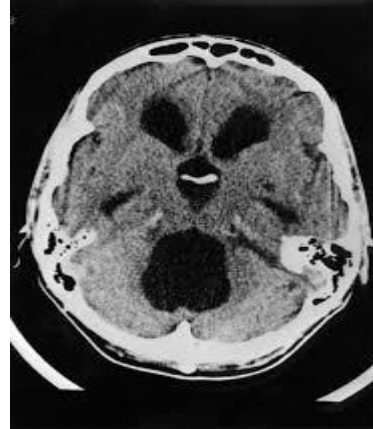
Symptoms of hydrocephalus can be acute (rapid onset) or chronic (slow onset). As CSF accumulates in the ventricles with build up of brain pressure, symptoms such as drowsiness, headache, blurred/double vision, nausea and vomiting may occur. Another condition known as Normal Pressure Hydrocephalus (NPH) presents with a combination of symptoms such as difficulty in walking, dementia-like symptoms and urinary incontinence.



## How is hydrocephalus diagnosed?



**Noncommunicating hydrocephalus**



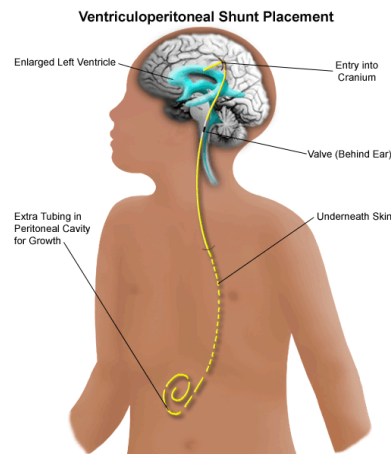
**Communicating hydrocephalus**

When a patient presents with symptoms of hydrocephalus, a thorough neurological examination is performed, followed by a CT or MRI brain scan. These imaging studies may show enlarged ventricles consistent with hydrocephalus. The scan may determine the cause of the hydrocephalus, such as a tumor or other cause obstructing the normal flow of CSF.

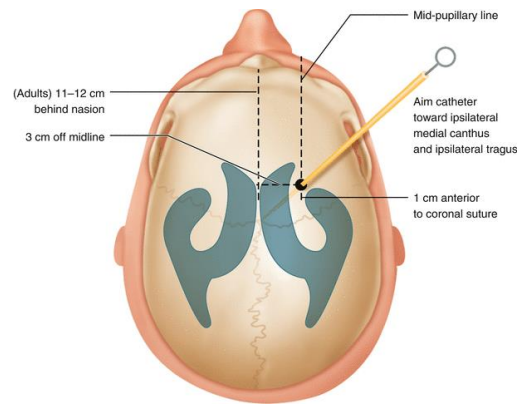
Sometimes, the diagnosis of Normal Pressure hydrocephalus can be difficult and further tests such as lumbar puncture may be required.

## How is hydrocephalus treated?

Treatment for hydrocephalus is variable depending on the type, the patient's condition and other factors. Hydrocephalus can be treated in different ways. It can be treated directly (by removing the CSF to somewhere else or creating additional bypass passage).



**VP SHUNT**

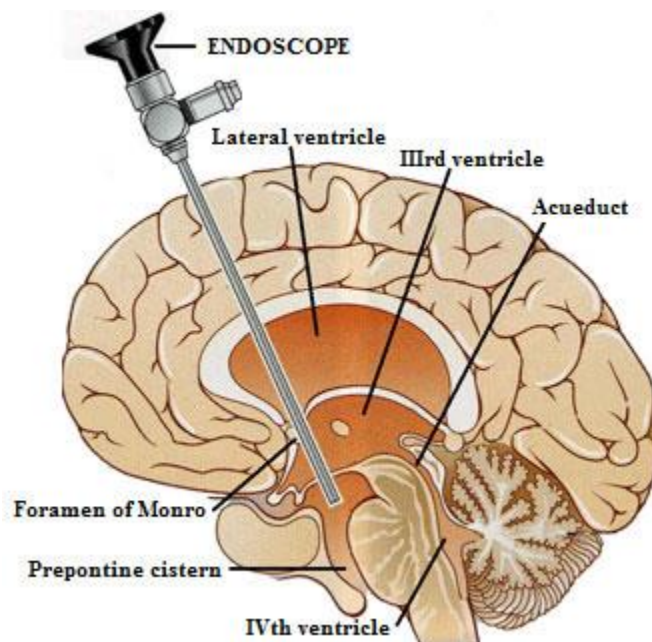


**External Ventricular Drain**

When the pressure in the brain is high, and/or the CSF is mixed with blood (e.g. after a bleed in the brain) an external ventricular drain (EVD) may be inserted to relieve the increased pressure build-up inside the brain by draining the excessive CSF. When the CSF starts to be clear, the brain is gradually elevated. When there is still excessive CSF drainage despite elevation, the normal CSF absorption pathway is deemed affected. A permanent shunt will be inserted to drain the CSF into another body cavity for absorption. A shunt is a flexible tube placed into the ventricular system that diverts the flow of CSF into another area of the body. One end of the catheter is placed within a ventricle inside the brain. The other end of the catheter is usually placed within the abdominal (peritoneal) cavity. Hence it is known as a ventriculo-peritoneal (VP) Shunt. A valve is placed along the catheter to maintain one-way CSF flow and regulates the rate of CSF flow.

This regulation occurs either through different pressure range or different flow rate (i.e. pressure-regulated or flow-regulated). Many different shunts are available in the market. No valve has been proven conclusively to be superior over the other. The most common valve used, however, is the medium pressure valve. Some patients in which the pressure setting can be easily altered.

In some selected cases of obstructive hydrocephalus, a procedure called endoscopic third ventriculostomy (ETV) can be performed. This procedure uses an endoscope (a tube with a lens connected to a TV monitor) to enter the ventricles of the brain. The floor of one of the ventricles, called the 3<sup>rd</sup> ventricle, is opened to create a communication between the ventricles and the fluid space around the brain. The goal of this operation is to allow the fluid to bypass an obstruction so that fluid can be absorbed elsewhere. It avoids placement of a mechanical shunt.



### **What are the possible complications a shunt system?**

Complications may include mechanical failure, infection, obstruction and over/under –draining of CSF. Fortunately these complications are uncommon and can be managed successfully in most cases, although treatment may require additional surgery.

In addition to the common symptoms of hydrocephalus, shunt infection may present with symptoms such as persistent fever, wound discharge and redness along the shunt track. When there is suspicion of shunt malfunction (for example, if the symptoms of hydrocephalus return), medical attention should be sought immediately.

### **What is the prognosis for hydrocephalus?**

The prognosis for hydrocephalus depends on the underlying cause, the extent of symptoms, and the timeliness of diagnosis and treatment. In general, the earlier the hydrocephalus is diagnosed, the better the chance for successful treatment. Some patients show a dramatic improvement with treatment while others do not. In some cases of NPH, dementia may be reversed by shunt placement. Other symptoms such as headache may resolve fairly quickly if the symptoms are related to elevated pressure. Recovery may however, be limited by the extent of the existing brain damage.

Generally, patients with an implanted shunt system are not restricted in their daily activities. If you are unsure, please discuss with your doctor in advance.

### **Follow-up**

Shunts usually perform reliably over a long period of time. however patients do require long-term medical follow-up for monitoring of shunt function and underlying hydrocephalus.