

Ventriculoperitoneal Shunt in Idiopathic Normal Pressure Hydrocephalus

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Indications

- Diagnosed iNPH with positive clinical features
- Radiological evidence of ventriculomegaly (Evans index > 0.3)
- Positive response to CSF tap test or extended lumbar drainage
- Exclusion of other causes (e.g., Alzheimer's disease, Parkinsonism)

Procedure

1. A silicone catheter is placed into the lateral ventricle
2. It is connected to a programmable valve
3. CSF is drained into the peritoneal cavity via distal tubing
4. Valve settings can be adjusted non-invasively post-op

Outcome

[Outcome after ventriculoperitoneal shunt for idiopathic normal pressure hydrocephalus](#)

Complications

Ventriculoperitoneal shunt complications

Follow-up

- Serial clinical and neuroimaging assessments
- Adjustment of valve pressure based on symptoms and radiological findings
- Long-term monitoring for delayed complications

Alternative Treatments

- Lumboperitoneal shunt (less invasive, but higher revision rate)
- Endoscopic third ventriculostomy (rarely used in INPH)

On the basis of a multicentre [prospective randomized trial](#) it is to be recommended to treat patients with [idiopathic normal pressure hydrocephalus](#) with a shunt with an adjustable valve, preset at the highest opening pressure and lowered until clinical improvement or radiological signs of [overdrainage](#) occur although slower improvement and more shunt adjustments might be the consequence ¹⁾

A permanent CSF diversion with a [ventriculoperitoneal shunt](#) (VPS) is a treatment option for patients with [idiopathic normal pressure hydrocephalus](#). An improvement of symptoms is seen in 70% to 85% of patients after [shunting](#) ²⁾.

Complication rates may be as high as $\approx 35\%$ (due in part to the [frailty](#) of the elderly brain). Potential complications include:

1. [subdural hematomas](#) or [hygroma](#): higher risk with low-pressure valve and older patients who tend to have cerebral atrophy. Usually accompanied by a headache, most resolve spontaneously or remain stable. Approximately one-third require evacuation and tying off of the shunt (temporarily or permanently). The risk may be reduced by gradual mobilization post-op
2. shunt infection
3. intracerebral hemorrhage
4. seizures
5. Delayed complications include the above, plus [shunt obstruction](#) or [disconnection](#)

Postoperative Imaging After Ventriculoperitoneal Shunt for idiopathic normal pressure hydrocephalus

- [Preoperative imaging biomarkers combined with tap test for predicting shunt surgery outcome in idiopathic normal pressure hydrocephalus: a multicenter retrospective study](#)
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- [Artificial Intelligence for Automatic Analysis of Shunt Treatment in Presurgery and Postsurgery Computed Tomography Brain Scans of Patients With Idiopathic Normal Pressure Hydrocephalus](#)
- [Usefulness of third ventricle volumetry in patients with normal pressure hydrocephalus](#)

□ Immediate Imaging: Non-Contrast Head CT (within 24-48 hours)

Purpose:

- Confirm [ventricular catheter placement](#).
- Detect postoperative hemorrhage (intraparenchymal, subdural, intraventricular).
- Check for pneumocephalus or other complications.
- Compare ventricular size with preoperative imaging.



In the non-contrast brain CT image, the ventriculoperitoneal [shunt catheter](#) is clearly visible, inserted into the frontal horn of the right [lateral ventricle](#).

Regarding the distance between the catheter tip and the [foramen of Monro](#):

The foramen of Monro (or interventricular foramen) is located approximately at the midline, at the junction between the frontal horn and the body of the lateral ventricle, near the thalamic plane.

In this axial image, the catheter tip is located within the frontal horn, anterior and slightly lateral to the foramen of Monro.

Approximate visual estimation: the catheter tip is at a distance of about 1.5 to 2 cm from the foramen of Monro, following the anteroposterior axis of the lateral ventricle.

 Additional Imaging

2. Abdominal X-ray / Shunt Series (if indicated)

Purpose:

- Visualize the entire shunt system.
- Detect catheter disconnection, kinking, or migration.
- Confirm peritoneal tip location.



3. Brain MRI (1-3 months postoperative)

Purpose:

- Evaluate for change or stabilization in ventricular size.
- Assess periventricular edema or transependymal CSF flow.
- Rule out delayed complications.
- Correlate radiological findings with clinical improvement.

4. Functional Imaging (if shunt malfunction suspected)

Modalities:

- Radionuclide shunt study.
- Phase-contrast MRI for CSF flow.

Purpose:

- Confirm shunt patency.
- Quantify CSF dynamics.

 Summary Table

Imaging Modality	Timing	Purpose
CT Head (non-contrast)	Immediate (24-48 h)	Confirm catheter placement, rule out bleeding
Shunt Series (X-ray)	As needed	Follow catheter path, rule out disconnection
MRI Brain	1-3 months postop	Evaluate ventricular changes and clinical response
Functional Imaging	If clinically indicated	Confirm shunt patency or CSF dynamics

Note: This protocol may vary depending on hospital resources and patient-specific factors.

1)
Delwel EJ, de Jong DA, Dammers R, Kurt E, van den Brink W, Dirven CM. A randomized trial of high and low-pressure level settings on an adjustable ventriculoperitoneal shunt valve for idiopathic normal

pressure hydrocephalus: results of the Dutch evaluation programme Strata shunt (DEPSS) trial. J Neurol Neurosurg Psychiatry. 2013 Jul;84(7):813-7. doi: 10.1136/jnnp-2012-302935. Epub 2013 Feb 13. PMID: 23408069.

2)

Shaw R, Everingham E, Mahant N, Jacobson E, Owler B. Clinical outcomes in the surgical treatment of idiopathic normal pressure hydrocephalus. J Clin Neurosci. 2016 Jul;29:81-6. doi: 10.1016/j.jocn.2015.10.044. Epub 2016 Feb 28. PMID: 26935749.

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