香港獸醫專科服務

HONG KONG VETERINARY SPECIALTY SERVICES

Hydrocephalus in Dogs

Quick Take

Hydrocephalus means "**water in the brain**." It occurs when **cerebrospinal fluid** (CSF) — the clear fluid that cushions and nourishes the brain — builds up inside the brain's ventricles (fluid spaces) faster than it can drain or be absorbed.
This causes **ventricular dilation, brain compression, and neurologic signs** such as **behavioural changes, vision loss, circling, or seizures**.

Hydrocephalus can be:

- **Congenital** (born with it) — common in toy and brachycephalic breeds (Chihuahua, Yorkshire Terrier, Pomeranian, Maltese, Boston Terrier, Bulldog)
- **Acquired** — from tumors, infections, inflammation, or trauma

Treatment focuses on **reducing CSF pressure** medically or surgically.
Ventriculoperitoneal shunt (VP shunt) placement is the gold-standard surgical therapy for suitable cases.

1) What's going on inside?

Normally, CSF is **produced inside the brain's ventricles** and flows through small channels to **bathe the brain and spinal cord** before being reabsorbed into circulation.

In hydrocephalus:

1. The flow is **blocked** (obstructive hydrocephalus) or
2. The brain **absorbs too little CSF** (communicating hydrocephalus)

Result: CSF pressure rises, stretching the ventricles and compressing brain tissue.

Causes

- Congenital malformations (most common):
  - Narrowed aqueduct (aqueductal stenosis)
  - Chiari-like malformation
  - Dandy–Walker–like cysts
  - Developmental ventricular dilation

- Acquired:
  - Brain tumours or cysts
  - Meningitis/encephalitis
  - Haemorrhage or trauma
  - Parasitic or viral infection

2) What owners notice

Signs often begin in puppies <1 year, or after trauma/infection in adults.

Typical signs:

- Enlarged dome-shaped head (especially in toy breeds)
- "Sunset eyes" (eyes deviated downward)

- Dullness or lethargy
- Circling, aimless wandering
- Loss of house training
- Seizures
- Difficulty walking or uncoordinated gait
- Vision loss (may bump into objects)
- Head pressing or neck pain

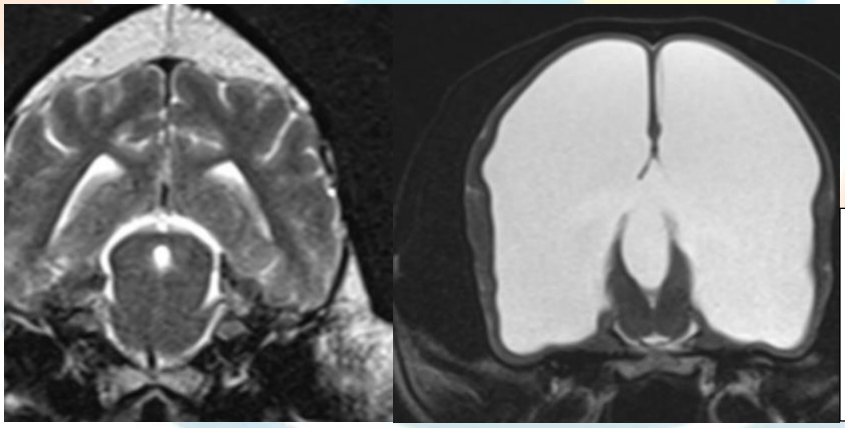
Symptoms may be intermittent or progressive.

3) Diagnosis

Step-by-step:

- Physical and neurologic exam
- Imaging (essential)
    - **Ultrasound** through the open fontanelle (in young/small dogs)
    - **MRI** (best accuracy): shows dilated ventricles, compressed brain tissue, cause (obstruction, mass, inflammation). This degree of definition is however not strictly required in the majority of the congenital forms (as in puppies where tumour is unlikely)
    - **CT** if MRI unavailable: faster, cheaper and already very accurate for the majority of cases.
- CSF analysis sometimes (to rule out infection)
- Electroencephalography (EEG) occasionally, for seizure evaluation

Veterinarians may also perform eye exams to detect **optic nerve swelling** (papilledema).



Magnetic Resonance Imaging 2 1.5T MRI. Sagittal T2WI image of congenital hydrocephalus where the entire ventricular system is dilated.
A normal anatomy is shown on the left, as a comparison

4) Treatment overview

A) Medical management

Used for:

- Mild or stable congenital hydrocephalus
- Poor surgical candidates
- Temporary stabilization before surgery

Goals: decrease CSF production, reduce brain swelling, control seizures.

Medications:

- Prednisolone (steroid): reduces CSF production & inflammation
- Omeprazole or acetazolamide: lower CSF formation rate
- Furosemide: diuretic; short-term use
- Anticonvulsants (phenobarbital, levetiracetam) for seizures

- Mannitol or hypertonic saline (in emergencies)

Can stabilize **mild** cases

Often **temporary** - disease may **progress over time**

B) Surgical treatment — Ventriculoperitoneal shunt (VP shunt)

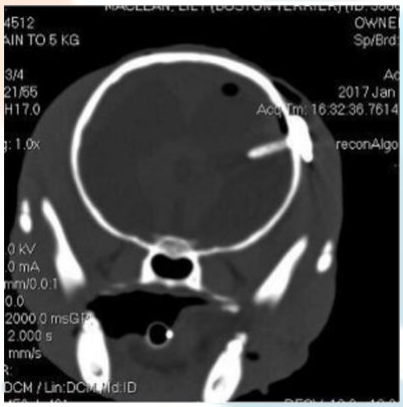
Gold-standard therapy for dogs with symptomatic or progressive hydrocephalus.

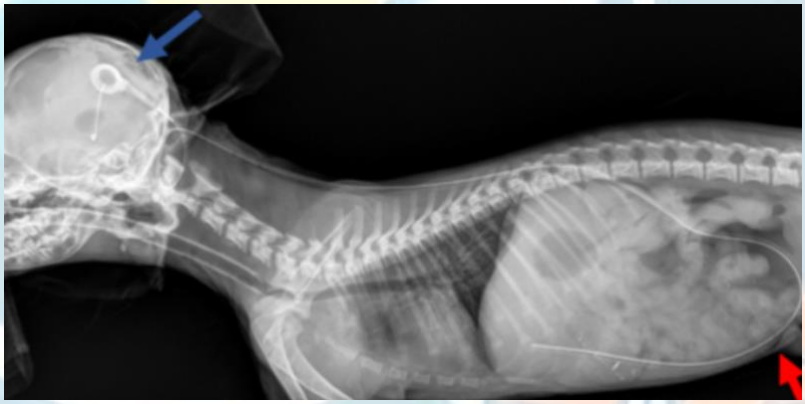
How it works:
A **small catheter (tube) is placed inside one of the brain ventricles** and connected via a valve system to tubing that **drains excess CSF** into the **abdomen**, where it is safely absorbed.

Shunt components:

1. **Ventricular catheter** (in brain)
2. **Pressure-regulating valve** (controls CSF flow)
3. **Peritoneal catheter** (to abdominal cavity)

This **bypasses the blockage**, normalizing brain pressure and allowing the ventricles to shrink.





5) Surgery and hospitalization

Performed by **specialist veterinary neurologists or surgeons** (yes, HKVSS does this procedure!). Requires MRI or CT to plan catheter placement.

Surgery time: ~1h; general anaesthesia used.

Hospital stay: 2–5 days for post-op monitoring, anti-seizure therapy, and antibiotics.

Most dogs show **neurologic improvement within days to weeks**, though some take longer to adapt.

6) Expected outcomes

Category	Outcome after VP shunt	Notes
Congenital hydrocephalus (treated early)	Good–Excellent in 70–85%	Most regain alertness, mobility, normal behaviour
Acquired hydrocephalus (tumour/inflammatory)	Variable (40–70%)	Depends on underlying cause
Medical management only	Improvement in ~30–40%	Usually temporary; relapse common
Long-term survival	>2 years median; many live normal lives	Lifelong follow-up needed

Brain tissue that's already **severely damaged** won't regenerate, but **decompression** prevents further injury.

7) Complications and realistic rates

Complication	Approx. rate	Notes
Shunt blockage (ventricular or peritoneal)	20–30%	May require revision surgery
Shunt infection	5–15%	Managed with antibiotics ± replacement
Over-drainage (ventricular collapse)	10–15%	Causes lethargy or collapse; valve adjustment may help
Shunt migration/kinking	<10%	Mechanical issue, requires correction
Recurrence or incomplete response	10–20%	May need shunt revision or medical adjunct
Anaesthetic/ surgical mortality	<5% (experienced centres)	Varies by age and neurologic status

Modern shunt systems (adjustable or pressure-sensitive valves) have significantly improved safety and long-term success.

8) Recovery & aftercare

Short-term:

- Pain control, antibiotics, steroids tapered over time.
- Anti-seizure meds continued if needed.
- Avoid neck scratching, rough play, or collars near surgical site.

- E-collar for 2–3 weeks.

Long-term:

- Recheck at **2–4 weeks**, **3 months**, and then every **6–12 months**.
- Imaging (ultrasound or MRI) may be repeated to assess ventricular size.
- Owners monitor for:
    - Recurrence of neurologic signs
    - Lethargy or vomiting (possible blockage)
    - Swelling along shunt tract
    - Fever (infection)
- Dogs usually resume normal activity within **2–4 weeks**, with full adaptation by **2–3 months**.

9) Prognosis summary

Type	Prognosis	Key factors
Congenital (treated early)	Good to excellent	Early surgery, mild signs, small ventricles
Acquired (from tumours or meningitis)	Variable to guarded	Depends on cause and response to therapy
Medical management only	Fair to poor long-term	Temporary control, frequent relapse

Overall, surgery provides the **best long-term outcome** for most affected dogs.

10) Questions to ask your neurologist or surgeon

- Is my dog's hydrocephalus communicating or obstructive?
- Is my dog a candidate for VP shunt surgery?
- What are your clinic's shunt revision and infection rates?
- What long-term monitoring schedule should I follow?
- Are there lifestyle restrictions (exercise, collars, diet)?
- What should I watch for as signs of shunt blockage?

11) Trusted veterinary references (English)

- ACVS (American College of Veterinary Surgeons) — Hydrocephalus in Dogs
- VCA Hospitals — Hydrocephalus Overview and Treatment Options
- Bagley, R. S., et al., Vet Clin North Am Small Anim Pract, 1994 — Surgical outcomes for VP shunts in dogs
- Flegel, T., et al., J Vet Intern Med, 2011 — Long-term follow-up of VP shunted dogs
- Fossum, T. (2020). Small Animal Surgery, 5th Ed. — Hydrocephalus and VP shunt management
- Veterinary Evidence Review (2023): Outcomes and complication rates for canine hydrocephalus shunt surgery

Bottom line

- Hydrocephalus = **excessive brain fluid** that causes pressure and **neurologic dysfunction**.
- Medical management can stabilize some, but **surgery (VP shunt) gives the best long-term relief** and survival.
- About **70–85% of dogs improve significantly** after successful shunting.
- **Early diagnosis** and treatment prevent irreversible brain damage.
- **Lifelong follow-up** is needed, but many dogs go on to live happy, playful lives after recovery.