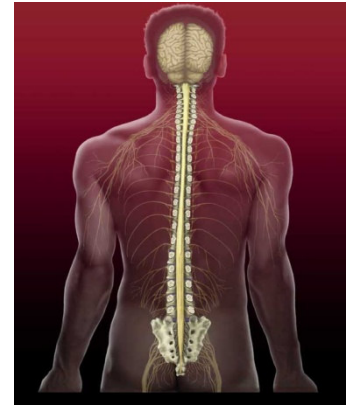
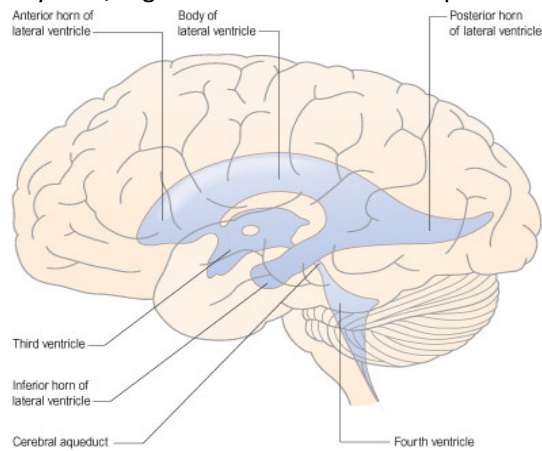


# CEREBROSPINAL FLUID FORMATION, CIRCULATION & DRAINAGE

## INTRODUCTION :

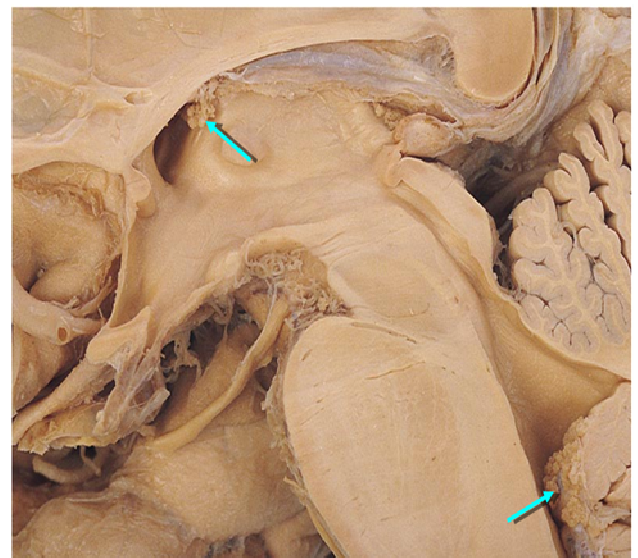
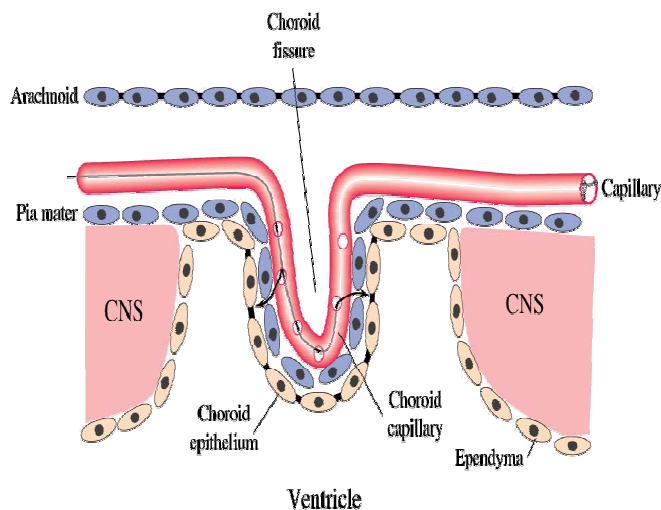
- The ventricular system, together with the cranial & spinal subarachnoid spaces, contains **cerebrospinal fluid (CSF)**.



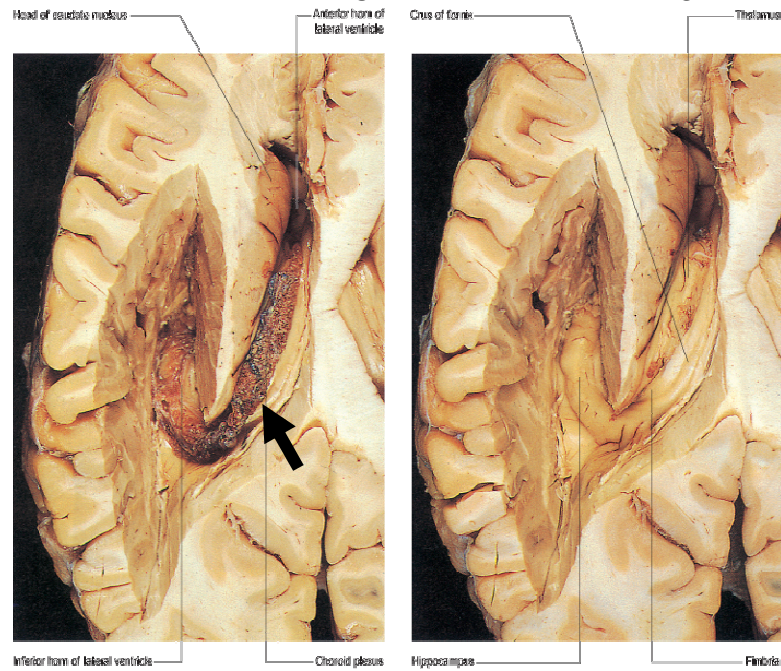
- The CSF is produced by the **choroid plexus** which is located in the **lateral, third and fourth** ventricles.



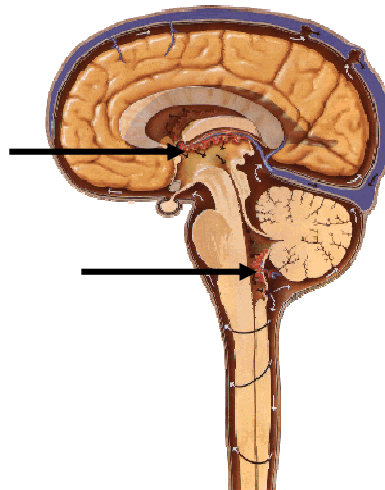
- The choroid plexus is formed by **invagination of the vascular pia mater into the ventricular lumen**, where it becomes highly convoluted, producing a sponge-like appearance.



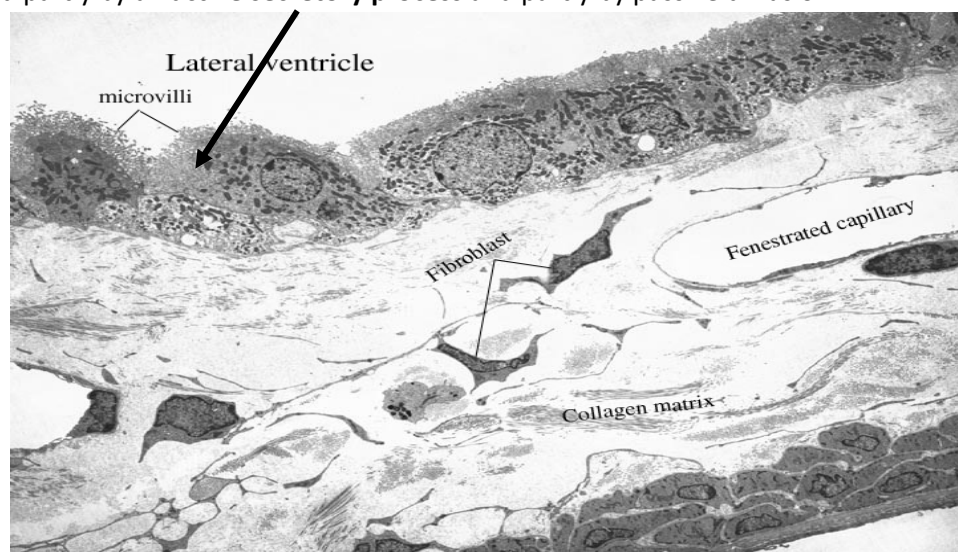
- The choroid plexus enters the lateral ventricle through the choroid fissure, along the line of the fimbria/fornix.



- The choroid plexus enters the third and fourth ventricles through their roofs.



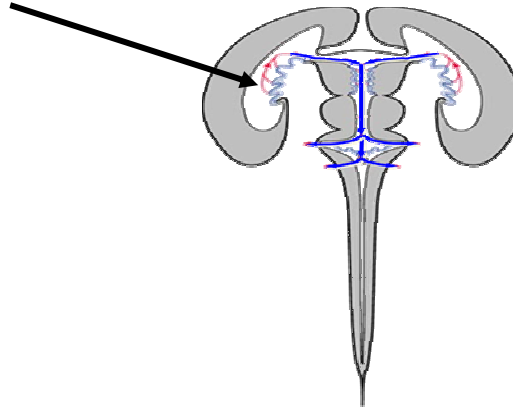
- CSF is produced partly by an **active secretory process** and partly by passive diffusion.



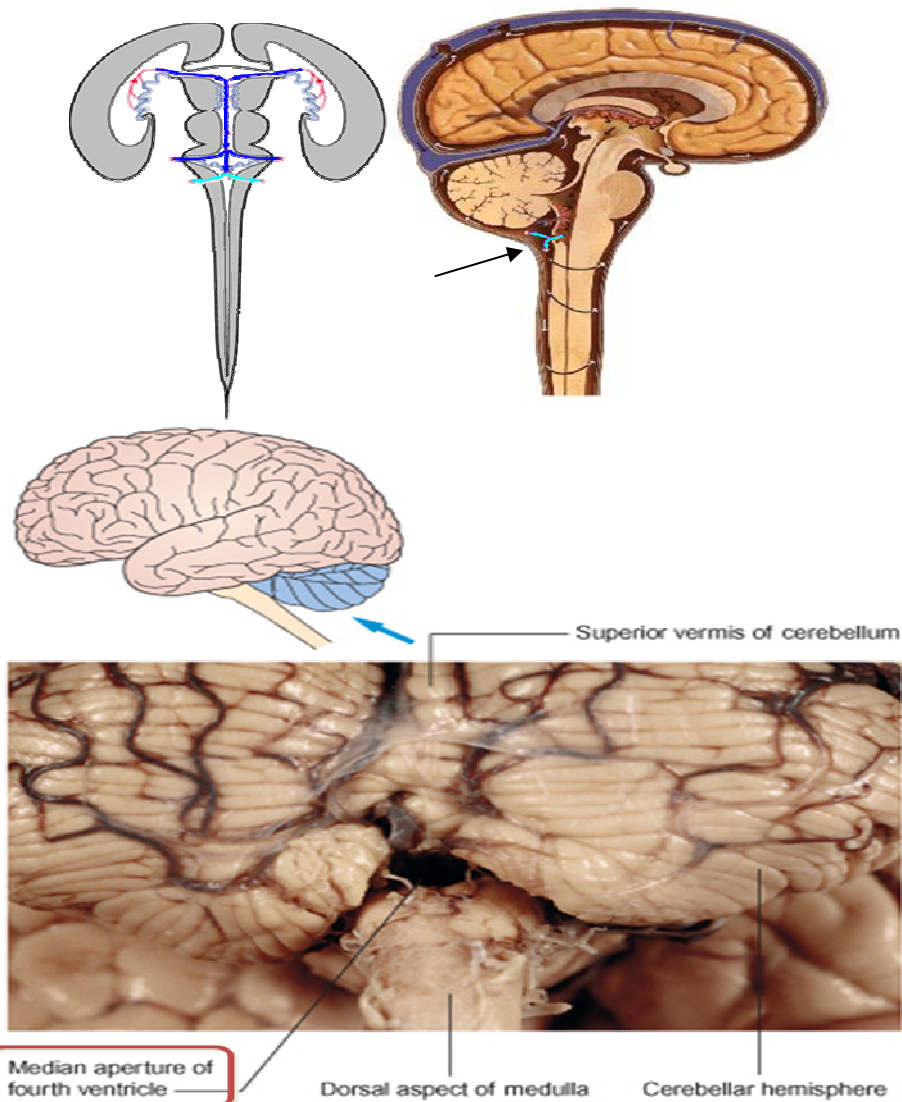
- It is a colourless fluid containing little protein and few cells.
- The **volume** of CSF in the combined ventricular and subarachnoid spaces is of the order of 150 ml.



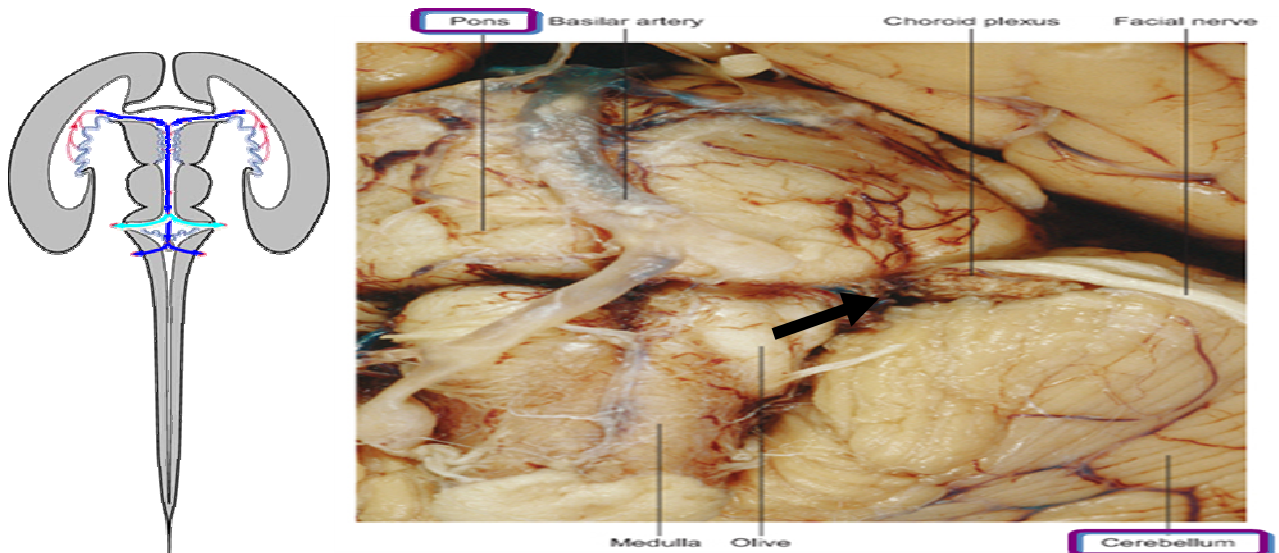
- CSF is **produced continuously**, at a rate sufficient to fill these spaces several times each day.
- This means that an efficient mechanism is required for the circulation of CSF and its reabsorption.
- **Most CSF is produced by the choroid plexus of the lateral ventricle.**



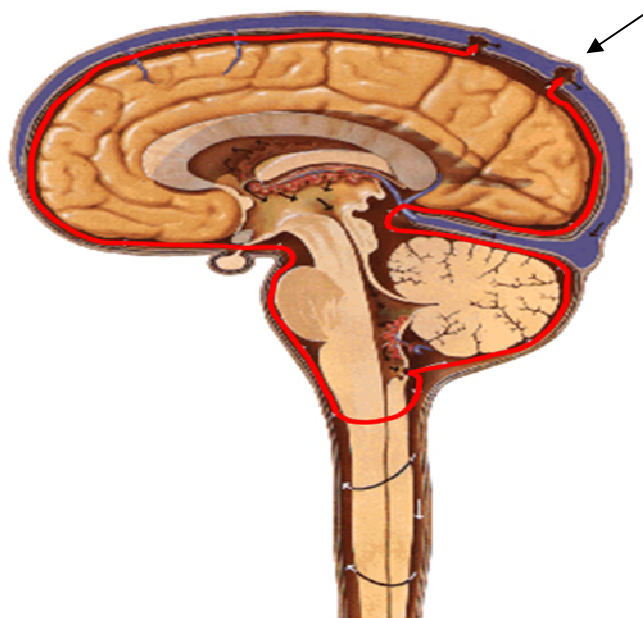
- From here it flows :
  - through the interventricular foramen into the third ventricle
  - and thence, by way of the cerebral aqueduct,
  - into the fourth ventricle.
- CSF leaves the ventricular system through the three apertures of the fourth ventricle and, thus, **enters the subarachnoid space.**
- Most CSF passes through the *median aperture* to enter the **cisterna magna**, located between the medulla and cerebellum.



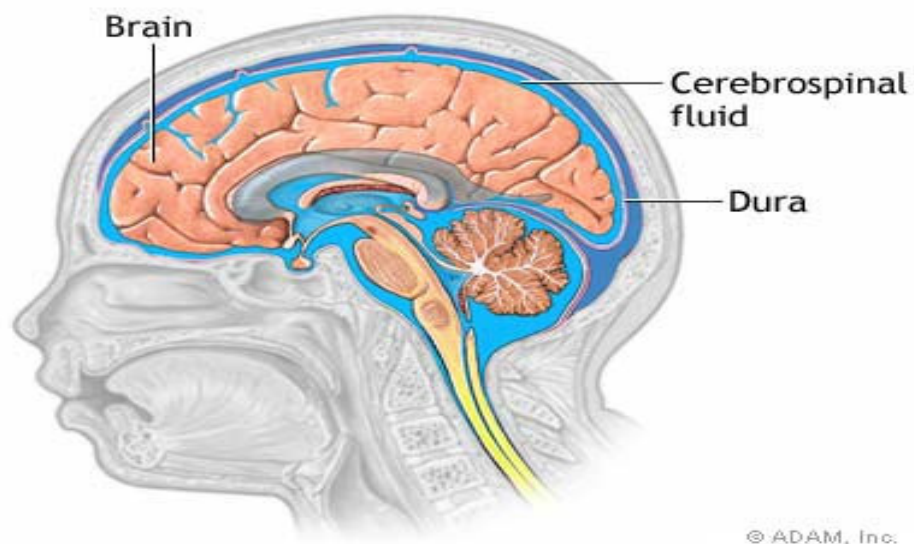
- Lesser amounts of CSF flow through the **lateral apertures** to enter the subarachnoid space in the region of the *cerebellopontine angle*.



- From these sites, the majority of CSF *flows superiorly*, round the cerebral hemispheres, to the **sites of reabsorption**.



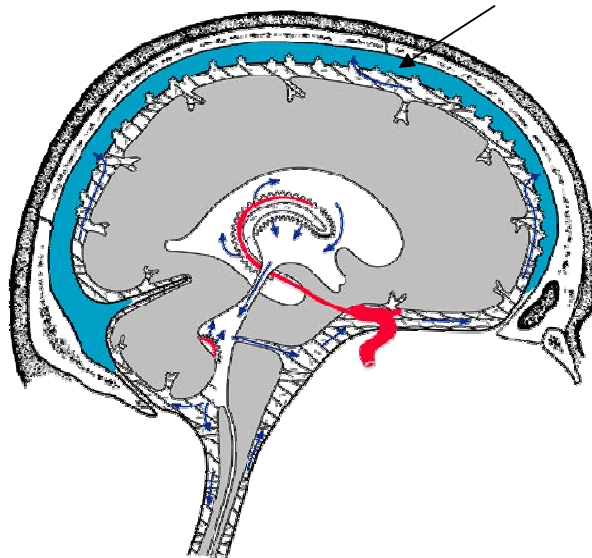
- Within the subarachnoid space, CSF serves partially to **cushion the brain** from sudden movements of the head.



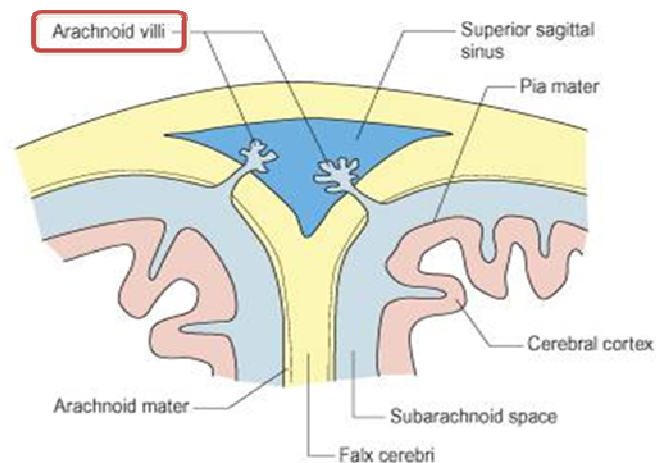
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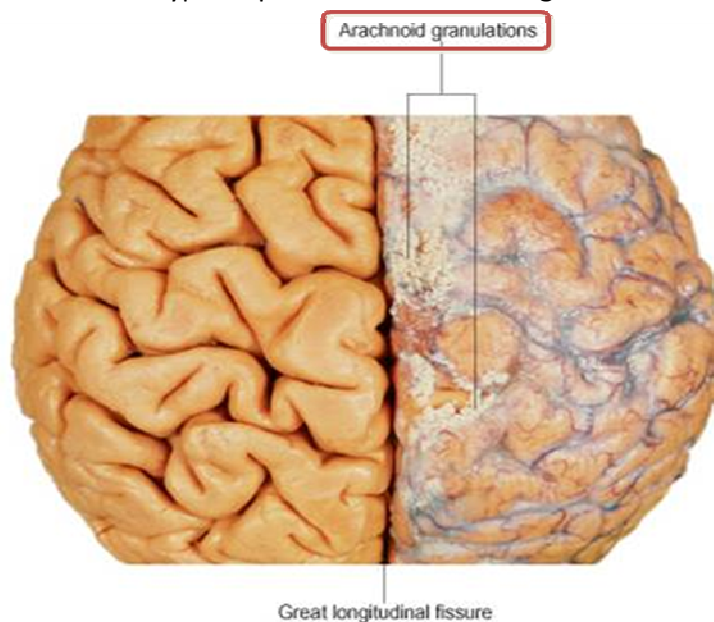
- CSF is reabsorbed into the venous system by passing into the dural venous sinuses, principally the **superior sagittal sinus**.



- Along the sinuses are located numerous **arachnoid villi**, which consist of invaginations of arachnoid mater through the dural wall and into the lumen of the sinus.
- Reabsorption occurs at these sites because :
  - the hydrostatic pressure in the subarachnoid space is higher than that in the sinus lumen and because of*
  - the greater colloid osmotic pressure of venous blood compared to CSF.*



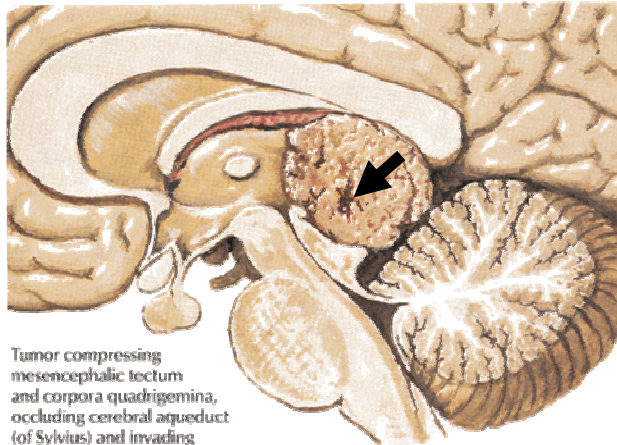
- With age, the arachnoid villi become hypertrophic to form **arachnoid granulations**.



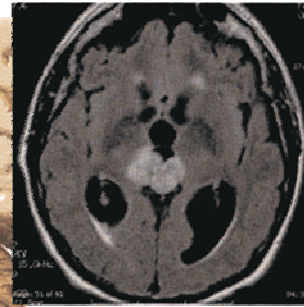
## HYDROCEPHALUS :

- The flow of CSF can be obstructed **within the ventricular system** by *tumors*.

### Tumors of Pineal Region

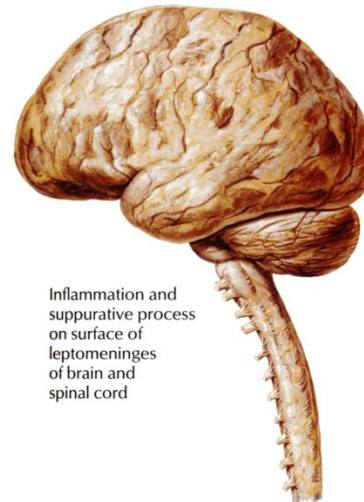


Tumor compressing mesencephalic tectum and corpora quadrigemina, occluding cerebral aqueduct (of Sylvius) and invading 3rd ventricle



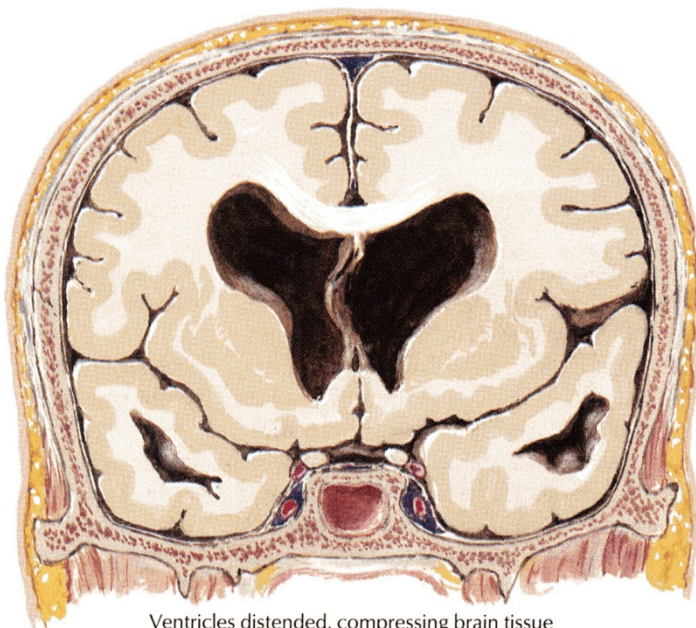
MR scan showing tumor of pineal region, with hydrocephalus

- The flow of CSF can also be obstructed **within of the subarachnoid space** by adhesions following *head injury* or *meningitis*.



Inflammation and suppurative process on surface of leptomeninges of brain and spinal cord

- The obstruction of the flow of CSF leads to a *rise in fluid pressure* causing *swelling of the ventricles (hydrocephalus)*.

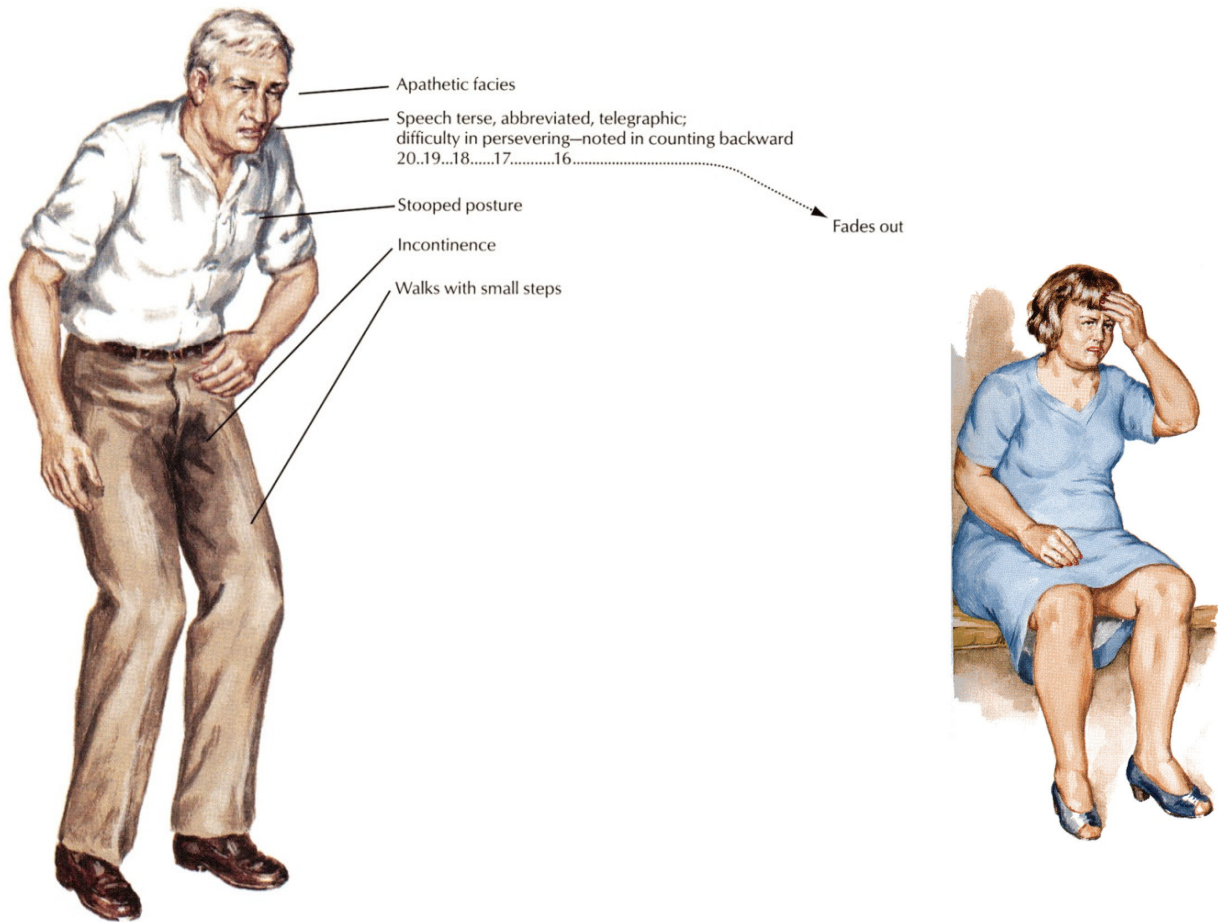


Ventricles distended, compressing brain tissue

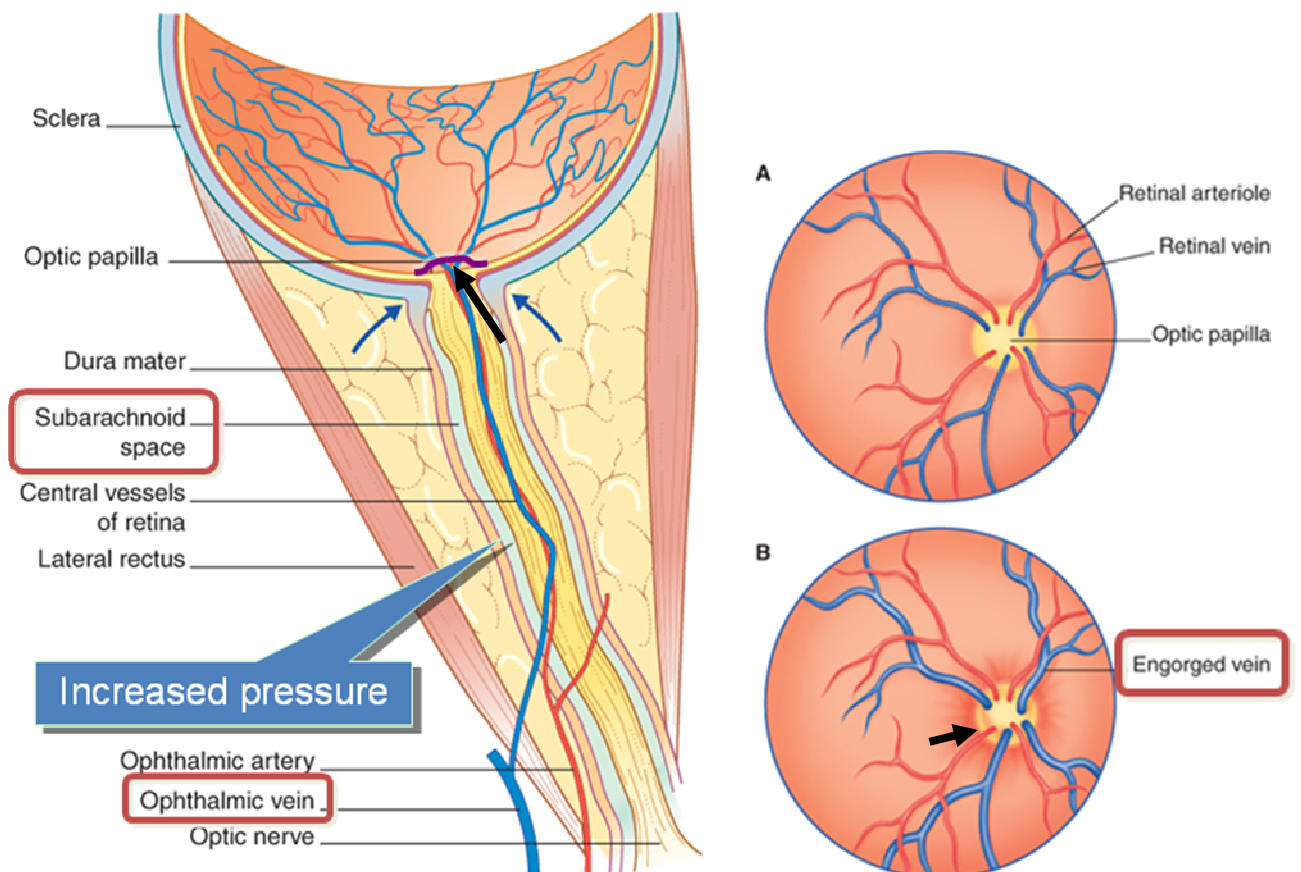




- The clinical effects are similar to those of a brain tumour and consist of **headaches, unsteadiness and mental impairment.**



- Swelling of the optic discs (**papilloedema**) is seen on ophthalmoscopy.



- Decompression of the dilated ventricles is achieved by inserting a **shunt** connecting the ventricles to the jugular vein or the abdominal peritoneum.

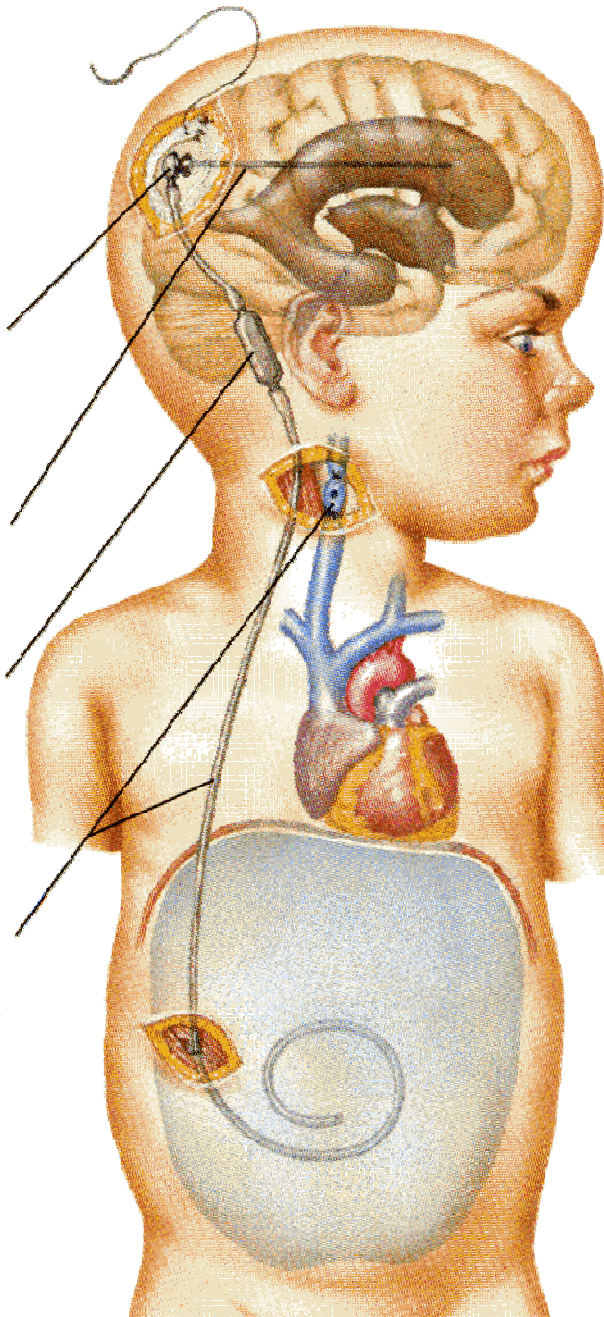
### Shunt procedure for hydrocephalus

Reservoir at end of cannula implanted beneath galea permits transcutaneous needle puncture for withdrawal of CSF, introduction of antibiotics, or dye to test patency of shunt.

Cannula inserted into lateral ventricle

One-way valve to prevent reflux of blood or peritoneal fluid and control CSF pressure

Drainage tube may be introduced into internal jugular v. and thence into right atrium via neck incision, or may be continued subcutaneously to abdomen.



## THE END



LoveTomy Team 426

Team leader : Dr. hams

Dr. S      Dr. noop      Omar H

!!بتسم      همي بروحي

M.A.M      Abo Slo7      Cute Killer



## SELF QUIZ

**1. All the following correct about choroid plexus, EXCEPT :**

- a. It is located in all ventricles.
- b. The choroid plexus is formed by invagination of the vascular pia mater.
- c. Enters the lateral ventricles through their roofs.
- d. Is produced CSF.
- e. It is produce a sponge-like appearance.

**2. Regarding the CSF one of the following is INCORRECT :**

- a. Most CSF is produced in the fourth ventricle.
- b. The majority of CSF flows superiorly then absorbed there.
- c. The arachnoid villi and granulations are the main site of absorption (drainage).
- d. It is produced continuously.
- e. CSF is produced by active secretory process and passive diffusion.

**3. Regarding the road CSF one of the following is INCORRECT :**

- a. Lateral ventricle --- interventricular foramen --- third ventricle.
- b. Third ventricle --- cerebral aqueduct --- fourth ventricle.
- c. Fourth ventricle --- median aperture --- cisterna magna.
- d. Fourth ventricle --- 2 lateral apertures --- cerebellopontine angle.
- e. It reaches the subarachnoid space through the 2 foramina of the fourth ventricle.

1. c	2. a	3. e
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