

U.G. (4th Year B.V.Sc. & A.H.) Class

Collection and examination of CSF

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Indications:

- ☞ In diseases of CNS as a prognostic aid.
- ☞ As therapeutic measure to remove certain amount of CSF.
- ☞ To introduce opaque substances for conducting X-ray studies.
- ☞ To administer anesthetics or drugs.

Site of collection:-

Animal species	Site of collection
Bovine	Postoccipital or lumbar puncture. In lateral recumbency, postoccipital method is more suitable.
Ovine	Postoccipital puncture
Porcine	Lumbosacral puncture method is the method of choice.
Equine	Postoccipital puncture
Dog	Cisterna magna or atlanto-occipital puncture. Lumbar puncture is extremely difficult due to the lumbar vertebral arches and the small subarachnoid area.

Technique:-

1. Lumbar puncture

midline between the two tubercosae, in the hollow between the spinous process of the last lumbar vertebra and the sacrum.



inserted vertically through the skin, and then slowly in a ventral or cranioventral direction



When needle reach the duramatter, remove the stylet and fit the syringe

2. Postoccipital puncture:-

The animal is sedated and cast



Its head is bent towards the brisket to its fullest extent, with the entire head and neck adequately restrained



The puncture site is in the midline, a handbreadth behind the poll



needle is inserted precisely in the midline in the direction of the occipital bone



After reaching the bone, the needle is withdrawn a little and then reinserted at a more acute angle so that the tip of the needle passes below the occiput into the foramen magnum



Upon withdrawal of the stylet, it is usual for CSF from the cerebromedullary cistern (which communicates with the 4th cerebral ventricle) to drip spontaneously from the needle

Storage/preservation of CSF

*** The anticoagulants are used as same as the blood.**

***Sodium fluoride is used as anticoagulant for the estimation of glucose in CSF, while for other examinations it should be collected without any preservative.**

*** However, if the delay is expected in examination, any suitable coagulant can be used for the preservation of CSF.**

EXAMINATION

The CSF is examined for colour, turbidity, coagulation, specific gravity, cell count, microorganism and estimation of glucose, chloride, Ca, Mg, P, K and urea. In diseased animals the CSF is opaque, of high specific gravity and contains high protein and other constituents.

Color:

Normal- **crystal clear and colorless and resembles distilled water.**

Intracranial haemorrhage- Red tinged

Dull red or brown fluid indicates previous hemorrhage

In suppurative condition – Creamish

Turbidity :

Normal- Clear

Maningitis – Turbid

Coagulation:

Normal CSF does not coagulate

But in abnormal conditions like acute suppurative meningitis the coagulation is seen due to increased protein and fibrinogen contents owing to the damage of blood brain barrier.

Sp. Gravity : 1.003 to 1.008

Microscopic Examination

- 👉 The cell counts of CSF must be made within an hour of its collection. Cells have a tendency to degenerate rapidly because CSF is relatively protein deficient.
- 👉 Normal CSF is almost cell free, having <math><5</math> nucleated cells/ μl of domestic animals, which may increase to 400 cells/ μl in non-purulent encephalomyelitis.
- 👉 Lymphocytes are mainly (70%) in the CSF.
- 👉 Increased number of leukocytes is known as **pleocytosis**, noticed in encephalitis, meningitis, abscesses of brain and spinal cord.
- 👉 Increased number of neutrophils is observed in pyogenic bacterial infections, abscess, bacterial encephalitis, meningitis and haemorrhages.

- ➡ **Increased lymphocytes is seen in viral infections, chronic diseases of brain and spinal cord, toxic conditions and in uraemia.**
- ➡ **An increase in eosinophils has been reported in cryptococcosis. In protozoal infections, macrophages predominate although there is also an increase in neutrophils. Continuous increase in number of neutrophils may be a sign of progressive lesions which may be considered as unfavourable prognosis.**
- ➡ **If the cell patterns change and a rise in lymphocyte count is observed then it can be considered as a **favourable** sign of prognosis.**

Chemical examination

Protein-

Albumin is seen normally in the CSF of healthy animal, while globulin is of pathological interest. The increased level of globulin in CSF is reported in abscess of brain and spinal cord, convulsive state, uraemia, haemorrhages and extensive non-inflammatory degeneration of brain parenchyma.

Total protein:- (trichloroacetic acid-turbidimetric procedure)



0.5 ml of CSF + 1.5 ml of 5% trichloroacetic acid



allowed to react at room temperature for 5 minutes

The sample is agitated and the turbidity measured against a bovine serum albumin standard at 420 nm.

Tests for globulin:

- a) **Foam test** – Take about 1 ml CSF in a test tube and shake well. The foam will appear which would disappear within few minutes in case of normal CSF. The extent of foams would be more and for longer duration in CSF having high protein content.
- b) **Pandy's test** - Take 1 ml of Pandy's reagent (10 g phenol crystals/100 ml of distilled water) and add few drops (1-2) of CSF, shake well. If turbidity or foam develops, it indicates presence of globulin. Normal CSF produces only faint turbidity. It becomes turbid (cloudy) in inflammatory conditions of brains and spinal cord which may be scored as +, ++, +++ and ++++ depending upon the intensity of turbidity.
- c) **Nonne applet (Ross-Jones) test** – Take 1 ml of saturated ammonium sulfate solution in a test tube. Add 1 ml CSF along the walls of test tube slowly and the test tubes are allowed to stand for few minutes. If **white to grayish ring** is formed at the junction of two fluids indicates presence of globulin.

Properties	Normal CSF	Nonpurulent encephalomyelitis	Purulent encephalomyelitis
Pressure (mm water)	< 200	Rarely > 200	often > 200
Color	Colourless (watery)	Colourless	Yellowish-white
Transparency	Clear (some times white white floccules with	Clear or fairly with strings	cloudy with fibrinous strings lumb.
Specific gravity (g/ml)	1.003-1.008	Increased	Increased
Cell count (per mm³)	0-25	30-400	200-6000
Cell differentiation	Nearly all (95%) lymphocytes;	Mainly (70%) lymphocytes also monocytes & neutrophils	Mainly neutrophils
Protein (mg/dl)	10-40	<300	>200-1000
Pandy reaction	-	- / +++	+++
Nonne-Apelt reaction	-/+	+ / ++	+++

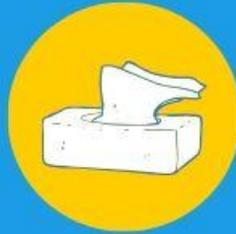
Microroganisms	None	- / + (viruses)	often bacteria
Glucose (mg/dl)	30-80	-	50-80
pH	7.0-7.4		
Chloride (mg/dl)	620-750		
Calcium (mg/dl)	5.1-6.3		
Magnesium (mg/dl)	2.1		
Phosphorous (mg/dl)	0.9-4.0		
Potassium (mg/dl)	11.2-13.8		
Urea (mg/dl)	6-12		

THANK YOU

Coronavirus: How to stay safe



Wash your
hands
regularly



Sneeze/
cough into
a tissue



Bin it!
Throw your
tissues away
immediately



Sneeze/
cough inside
your elbow