

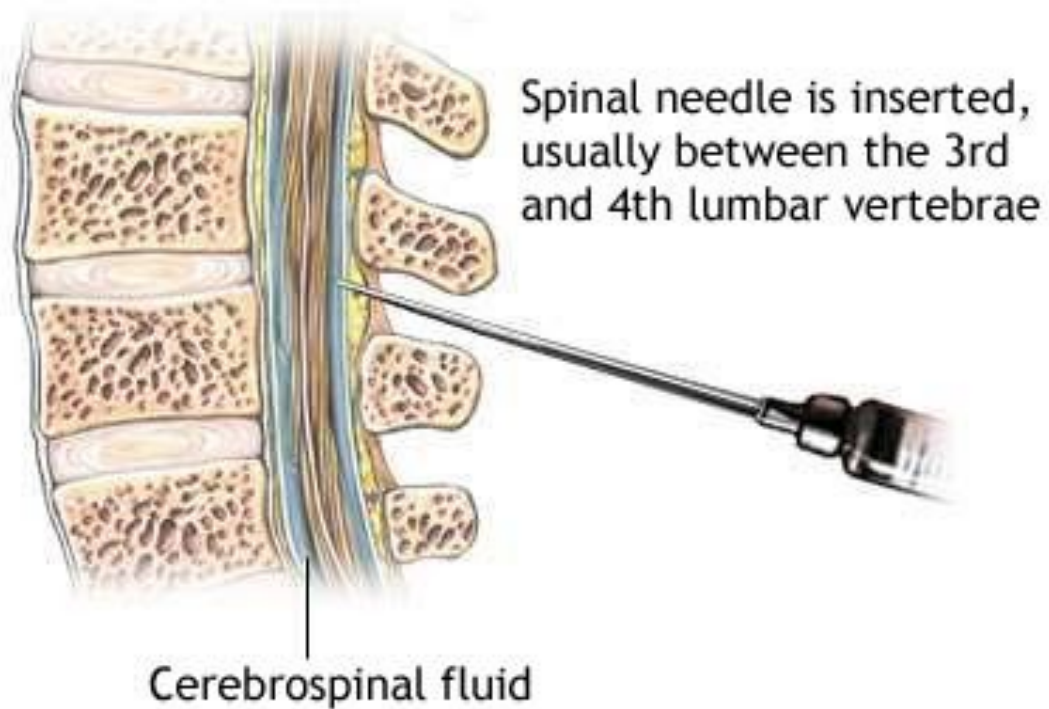
Perform and interpret CSF Examinations



CSF

- The cerebrospinal fluid is a colourless fluid that, as the name indicates, can be found around and inside the brain and spinal cord in the subarachnoid space and the ventricular system. It is produced in the choroid plexus and provides a basic mechanical and immunological protection to the brain. It is composed of about 99% water.

Lumbar puncture



Lumbar puncture

- The patient is placed in a lateral position with the knees bent in full flexion up to the chest (fetal position) (sit and bend position also possible)
- Introduction of 1% lidocain into the subcutaneous space
- Insertion of a spinal needle into the subarachnoid space at the L3-L4 or L4-L5 intercostal spaces (inserted until the second “give” - subarachnoidal space).
- Removal of the stylet of the needle in order to collect the fluid

Indications for lumbar puncture

- Suspicion of meningitis
- Suspicion of subarachnoid hemorrhage
- Suspicion of central nervous system diseases such as Guillain-Barré syndrome and carcinomatous meningitis
- Therapeutic relief of pseudotumor cerebri
- Injection of drugs and anesthetics

Contra Indications of lumbar punctures

- **Increased intracranial pressure (ICP) of and unidentified origin**
 - Can cause cerebral herniation
 - Exception: therapeutic use of lumbar puncture to reduce ICP
- **Infections**
 - Skin infections at puncture site may cause sepsis
- **Abnormal respiratory pattern**
 - Hypertension with bradycardia and deteriorating consciousness
 - Vertebral deformities (scoliosis or kyphosis), in hands of an inexperienced physician.
- **CBleeding diathesis**
 - Coagulopathy
 - Decreased platelet count ($<50 \times 10^9/L$)

Indications for CT prior to LP

(in suspicion of meningitis)

- Patients who are older than 60 years
- Patients who are immunocompromised
- Patients with known central nervous system (CNS) lesions
- Patients who have had a seizure within 1 week of presentation
- Patients with an abnormal level of consciousness
- Patients with focal findings on neurologic examination
- Patients with papilledema seen on physical examination, with clinical suspicion of an elevated ICP

CSF analysis - Colour

- Crystal clear- normal finding, viral meningitis
- Turbid- indicates the presence of >200 WBC's or >400 RBC's, bacterial meningitis
- Xanthochromia- yellow, orange or pink discoloration (in more than 90% subarachnoid hemorrhages), physiologic in newborns
- Yellow: RBC's breakdown, high bilirubin levels, high protein levels >150 mg/dL , tubercular and fungal meningitis (viscous)
- Pink: RBC's breakdown
- Orange: RBC's breakdown; high carotenoid intake
- Green: hyperbilirubinemia , purulent CSF,(bacterial meningitis)
- Brown: meningeal melanomatosis

CSF analysis - Pressure



- Measured with a column manometer (fetal position is optimal)
- Increased pressure: congestive heart failure, cerebral edema, subarachnoid hemorrhage, hypo-osmolality resulting from hemodialysis, purulent or tuberculous meningitis, hydrocephalus, or pseudotumor cerebri.
- Decreased pressure: complete subarachnoid blockage, leakage of spinal fluid, severe dehydration, hyperosmolality, or circulatory collapse

CSF analysis- cell count

- Normal cell count: < 5 WBC's/mm in adults and < 20 WBC's/mm in newborns (70% lymphocytes, 30% monocytes).
- 99% of patients with bacterial meningitis have >100 WBC's/mm (less than that is only common for viral meningitis)
- Viral meningitis: predominance of lymphocytes T
- Bacterial meningitis: predominance of PMN's
- Fungal and tubercular meningitis: predominance of lymphocytes and high content of proteins, decreased glucose
- RBC's: abnormal finding (be careful with traumatic taps, 3 samples are needed)

CSF analysis – other tests

- Present compounds :
 - cl: tuberculous meningitis
 - lactate: cancer, MS, etc.
 - LD: bacterial meningitis
 - Glucose (60% of serum glucose): inflammations, lymphomas
 - proteins (18-58mg/dL normal range): infections, MS, Guillain Barré sy, malignancies, some medications, etc.
 - IgG: multiple sclerosis, transverse myelitis, and neuromyelitis optica of Devic.
 - Glutamine: hepatic encephalopathies, Reye's syndrome, hepatic coma, cirrhosis and hypercapnia.
- India Ink test (cryptococcus neoformans)
- PCR
- Microbiology: Gram stain, Acid fast



Thank you for
your attention!!