

Cerebrospinal Fluid

Function	1- Physical support & protection	2- Provides a controlled <u>chemical</u> environment
Formed	formed at the choroid plexuses & by the cells lining the ventricles.	
	Mechanism of formation: 1-Selective ultrafiltration of plasma 2-Active secretion by epithelial membranes	
Mechanism of excretion (absorption)	<u>Absorption</u> occurs at the <u>arachnoid villi</u> protruding through the dura to the venous sinuses of the brain → bloodstream	
Constant CSF volume. (Excretion volume = production volume)		
Normal CSF	Colorless, Clear, Free of blood, Free of clots.	
Contraindications for performing	1-Bleeding diathesis. 2-Increased intracranial pressure. 3-Infection at the site of needle insertion.	
Indications for laboratory investigation of CSF	1-CNS infections. 2-Demyelinating Diseases. 3-CNS malignancy. 4-Hemorrhage in CNS.	
Physical Examination of CSF	Turbidity is usually due to the presence of leucocytes, but sometimes it may be due to the presence of micro-organism	
	Blood & Hemoglobin pigments in CSF	<p>Traumatic Tap: 1-Bright red color. 2- RBCs in decreasing number as the fluid is sampled.</p> <p>Subarachnoid hemorrhage: Xanthochromia (yellow CSF) it would indicate hemorrhage if we exclude: 1-prior traumatic tap. 2-Hyperbilirubinemia.</p>
Biochemical Analysis of CSF	Glucose	Protein
	Normal 1-Enter the CSF via facilitative transporter (Glut) 2-CSF glucose is 2/3 of plasma glucose. 3-A plasma sample must be obtained 2-4 hours before CSF sample. 4-Glucose in CSF must be immediately after raking the sample or preserved with antiglycolytic.	Normal -mostly Albumin -Source: A.80% from plasma by ultrafiltration. B.20% from intrathecal synthesis.
	Abnormal 1-Elevated CSF glucose: Hyperglycemia 2-Decreased CSF glucose: (hypoglycorrhachia) A- Disorder in carrier-mediated transport. B- Active metabolism of glucose by cells or organisms (like bacteria) C- Increased metabolism by the CNS.	Abnormal (Increased CSF protein) 1.Must be compared to the serum protein. 2. Useful nonspecific indicator of pathological states: <u>1-↑ permeability of the epithelial membrane due to:</u> -Bacterial or fungal infection -Cerebral hemorrhage <u>2-↑ production by CNS tissue in:</u> - Multiple sclerosis (MS) - Subacute Sclerosing Panencephalitis (SSPE) <u>3-Obstruction like tumor or abscess</u> <u>4-Traumatic tap.</u>
		CSF Immunoglobulin -IgG can get elevated due from plasma cells within CSF or from the blood brain barrier -If IgG is high and [Alb] is normal it suggests that it's a local production of IgG, occurs in MS and SSPE
		What to do if ↑ CSF [protein] was detected? 1. Perform electrophoretic separation. 2. If multiple banding (oligoclonal bands) of the γ-globulin is detected: MS, SSPS or Inflammatory diseases.

Parameter	Condition		
	Bacterial Meningitis (pyogenic)	Tuberculous Meningitis	Viral Meningitis
Appearance	Often turbid	Often fibrin web	Usually clear
Predominant cell	Polymorphs	Mononuclear	Mononuclear
Cell count/mm ³	90-1000+	10-1000	50-1000
Bacteria	In smear & culture	Often none in smear	None seen or cultured
Protein (0.15-0.45 g/L)	>1.5 (↑ ↑)	1.5 (↑ ↑)	less than 1 (normal)
Glucose (2.8-4.2 mmol/L)	<1/2 (↓↓)	<1/2 (↓↓)	normal or slightly decreased.
Chlorides (115 - 130 mmol/l)	↓↓	↓↓	↓ or normal