TEXTBOOK FOR
BLOOD BANK & TRANSFUSION TECHNICIANS-II YEAR

As per the Latest Syllabus and Guidelines

Highlights

- Concise yet comprehensive coverage of laboratory methods
- Relevant Surgical & Medical conditions are included
- Several Hematological pathologies incorporated
- Inclusion of Tables, Flowcharts & Diagrams

Kanchan Bhardwaj
BL Bhardwaj
Aastha Miranpuri
Harnoor Singh

JAYPEE

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CHAPTER

Diseases of Nervous System

BL Bhardwaj

The diseases of nervous system are as follows:
1. Stroke
2. Meningoencephalitis
3. Glasgow coma scale
4. Epilepsy
5. Head injury

STROKE

Stroke, known as cerebrovascular accident (CVA) is a result of decreased cerebral perfusion causing neurological deficit. Symptoms include trouble in walking, speaking, and understanding and paralysis/numbness of arm, legs or face.

- **Types of strokes:**
  - **Thrombotic/ischemic stroke:** Most common type. It occurs when cerebral arteries are blocked by blood clot.
  - **Embolic stroke:** Decreased cerebral perfusion due to embolism, vasospasm or atherosclerotic plaque.
  - **Hemorrhagic stroke:**
    - Due to ruptured or leaking aneurysm, intravenous malformation, bleeding disorder, arterial rupture or trauma.
    - Most of the intracerebral hemorrhages are arterial in origin.
    - **Severe explosive headache** is the characteristic feature of hemorrhagic stroke.
- **Signs and symptoms** depend on the affected artery and severity of the damage.
  - **Motor symptoms:**
    - **Hemiplegia:** Paralysis of one side of the body.
    - **Hemiparesis:** Weakness in one side of the body.
    - **Paraplegia:** Paralysis of lower extremities.
    - **Quadriplegia:** Paralysis of all four limbs of the body.
    - **Ataxia:** Unsteady gait
  - **Communication disturbance:**
    - **Dysarthria:** Is difficulty in speaking
    - **Dysphasia or aphasia:** Is defective speech or loss of speech.
    - It can be expressive, receptive or mixed.
    - **Expressive aphasia:** Is due to damage to Brocca's area of speech, here patient can understand what others are communicating but cannot communicate back.
    - **Receptive aphasia:** In this condition Wernike's area in the temporal lobe is affected. Patient is unable to understand spoken or written words.
    - **Apraxia:** Is the inability to perform previously learned activities.

- **Perceptual problems:**
  - **Hemianopsia:** Loss of half of the visual field
  - **Diplopia:** Is double vision
- **Agnosia:** Inability to recognize familiar objects or persons.
- Remember acronym F.A.S.T. to help you diagnose stroke.
  - Face
  - Arms
  - Speech and
  - Time help you to see symptoms of an acute stroke in a patient and treat him as soon as possible.

❖ **Treatment:**
- Prompt treatment can reduce brain damage and the likelihood of death and disability.
- Anticoagulants are contraindicated in patients with hemorrhagic stroke but useful in nonhemorrhagic stroke.
- The fibrinolytic agent tissue plasminogen activator (t-PA) has been shown benefit in selected patients with acute ischemic stroke t-PA if given within 3 hours of onset of stroke brings better outcomes.
- NIH stroke scale/score (NIHSS) is done to ascertain the need of thrombolysis.
- Surgical evacuation of clot or hematoma relieves increased intracranial pressure (ICP).
- Carotid endarterectomy removes plaques.
- Anticonvulsants prevent seizure. Analgesics control pain.

❖ **Important interventions:**
- Assess limb occlusion pressure (LOP)
- Monitor ICP and vital signs
- Bleeding is the most common side effect of t-PA. So closely monitor the patient.
- Speak gently to the patient.
- Monitor fluid input and output hourly.
- Positioning of the patient to prevent deformity.
- Physiotherapy to prevent contractures.

Unilateral neglect or neglect syndrome: Seen in stroke patient who is unaware about the existence of paralyzed part.

MENINGOENCEPHALITIS

Meningoencephalitis is a neurological condition resembling both meningitis which is the inflammation of the meninges, and encephalitis, which is the inflammation of the brain tissue.

Pathological Process

Meningoencephalitis is the result of direct embolization to meningeal vessels, with subsequent parenchymal or cerebrospinal fluid (CSF) invasion by the infecting organism. Meningitis occurs through two routes:

1. Hematogenous seeding during which bacteria colonize the nasopharynx and enter the bloodstream after the mucosal invasion and enter the subarachnoid space, cross the blood-brain barrier causing an inflammatory and immune-mediated reaction.
2. The route of direct contiguous spread during which organisms enter the cerebrospinal fluid (CSF) via neighboring structures, such as otitis media and sinusitis, medical devices, penetrating trauma, or during operative procedures. Encephalitis occurs from direct viral invasion or as a postinfectious immunologic complication caused by a hypersensitivity

reaction to a virus or another foreign protein. These viruses are poliovirus or herpes simplex and varicella-zoster virus.

Meningoencephalitis is caused by bacterial, viral and protozoan infections.

- **Bacterial infection:**
  - *Listeria*
  - *Neisseria meningitidis*
  - *Rickettsia*
  - *Mycoplasma pneumoniae*
  - Tuberculosis
  - *Borreliosis* (lyme disease)
  - Leptospirosis
- **Viral infection:**
  - Tick-borne meningoencephalitis
  - Measles
  - Epstein-barr virus
  - *Varicella-zoster* virus
  - Herpes simplex virus
  - Mumps
  - HIV
- **Protozoal infections:**
  - Primary amoebic meningoencephalitis, e.g., *Naegleria fowleri*
  - *Trypanosoma brucei*
  - *Toxoplasma gondii*

Clinical Presentation

Patients present with symptoms of both meningitis and encephalitis. Some of these symptoms include:

- Fever
- Severe headache
- Nausea and vomiting
- Double vision and stiffness in neck
- Confusion, agitation or hallucinations
- Fatigue or weakness and loss of consciousness

Diagnostic Procedures

The past medical history is important to obtain relevant information from an accompanying person especially if the patient is agitated, confused or disoriented. Past travel history is important to know the cause of meningoencephalitis. Meningoencephalitis can be diagnosed with the following:

- **Magnetic resonance imaging (MRI):** It is more sensitive in detecting subtle changes in the early stages of an acute condition than computed tomography (CT) scanning.
- **Electroencephalography (EEG):** To demonstrate cerebral involvement during the early stage of the disease. It shows a background abnormality prior to evidence of parenchymal involvement on neuroimaging.
- Lumbar puncture (spinal tap) and CSF analysis
- Urine analysis
- Blood tests are helpful to differentiate viral from nonviral pathogens causing the condition.

Management

Treat the symptoms and the cause of inflammation. The treatment modality varies according to the type of meningoencephalitis. One of the most common forms of meningoencephalitis is herpes meningoencephalitis where the treatment involves the administration of an intravenous antiviral medication, acyclovir, for 7 to 14 days. The use of this antiviral medication becomes less effective in later stages of this condition. In meningoencephalitis caused by bacteria the treatment would be intravenous (IV) antibiotics and these antibiotics depend on the causative bacteria. Medications are also prescribed to prevent seizers, such as dilantin/phenytoin or levetiracetam and pain killers. Physical therapy helps in treatment of complications of this condition, such as muscle weakness, poor balance and coordination.

Prognosis

The disease causes severe morbidity and high mortality rate. Patients with mild meningoencephalitis usually recover within a few weeks of starting treatment, but in severe cases, nearly 50–70% of them will develop secondary brain damage, neurological disorders, or coma.

GLASGOW COMA SCALE (GCS)

The Glasgow Coma Scale **(Table 7.1)** is the scoring system used to describe the level of consciousness in a person following a traumatic brain injury. Maximum score is 15 and minimum score is 3.

SEIZURE DISORDERS

- **A seizure** is defined as a sudden break of the brain's normal electrical activity. It is characterized by altered consciousness and/or other neurological and behavioral manifestations.
- **Epilepsy** is defined as a condition with recurrent unprovoked seizures that includes repetitive muscle jerking called convulsions due to increased electrical brain activity.
- **Causes:** Electrolyte imbalance, toxic state, tumors, trauma, increased ICP, central nervous system (CNS) inflammation or idiopathic.

Table 7.1: Showing glasgow coma scale.

Behavior	*Response*	*Score*
Eye opening response	Spontaneously To speech To pain No response	4 3 2 1
Best verbal response	Oriented to time, place and person Confused Inappropriate words Incomprehensible sounds No response	5 4 3 2 1
Best motor response	Obeys command Moves to localized pain Flexion withdrawal from pain Abnormal flexion (decorticate) Abnormal extension (decerebrate) No response	6 5 4 3 2 1
Total score	Best response Comatose client Totally unresponsive	15 8 or less 3

- **Types:**
  - **Partial seizures** involve a part of the brain. They are:
    - **Simple partial seizures:** Symptoms include involuntary twitching of the muscles or arms and legs; changes in vision; vertigo; and unusual taste or smell. The person does not lose consciousness.
    - **Complex partial seizures:** Symptoms are like those of partial seizures, but the person loses awareness for a brief time.
  - **Generalized seizures** involve much more or all of the brain. They are:
    - **Absence seizures (petit mal epilepsy):** Characterized by a short period of blanking out or "absent" stare.
    - **Myoclonic seizures:** Characterized by jerking or twitching of the limbs on both sides of the body.
    - **Tonic-clonic seizures (grand mal epilepsy):** Symptoms are jerking or shaking of the body, LOC (loss of consciousness) and loss of bladder control. There is an aura before the seizure starts. Tonic-clonic seizures may last for 1–3 minutes. A tonic-clonic seizure that lasts longer than 5 minutes is a medical emergency.
- **Diagnosis** is made by medical history, neurological examination, CT scan, cerebral angiography, electroencephalogram (EEG) and MRI.
- **Treatment:** Includes anticonvulsants (e.g., carbamazepine, phenytoin, levetiracetam, clobazam, sodium valproate). If brain tumor is involved, it should be surgically removed.
- **Important:**
  - Diet therapy is also important. Ketogenic diet and modified Atkins diet.
  - Prevent injury
  - Do not force tongue blade during an episode of seizure (it may injure tooth)
  - Loosen tight clothes
  - If possible, place the client on side which prevents falling back of tongue and to facilitate drainage of secretions.
- **Status epilepticus** is characterized by continuous seizure attacks. Between each seizure attack, patients would not gain full recovery of consciousness.

HEAD INJURY

- Head trauma/head injury refers to any trauma to scalp, skull or brain.
- Head trauma ranges from minor bruise to traumatic brain injury.
- **Types of head trauma/injury:**
  - **Primary injuries:** Concussion, contusion and laceration
  - **Secondary injuries:** Intracranial hemorrhage (including cerebral, subarachnoid, epidural and subdural) or hematoma, increased ICP. Herniation of brain.
    - **Concussion:** It occurs following accelerative or decelerative injury. There will be a transient loss of consciousness which may last over 3 minutes.
    - **Contusion (Fig. 7.1):** Closed brain injury which leads to bruising of the tissue within the local area. If the injury occurs at the site of impact, it is called as coup and if it occurs on opposite side away from injury it is known as contrecoup.
    - **Laceration:** It provides tearing of blood vessels due to penetrating trauma or injury. It is associated with bleeding.
- **Signs and symptoms:**
  - **Mild:** Headache, dizziness.
  - **Moderate to severe:** Severe headache, loss of consciousness, seizures.
  - Loss of consciousness (LOC)

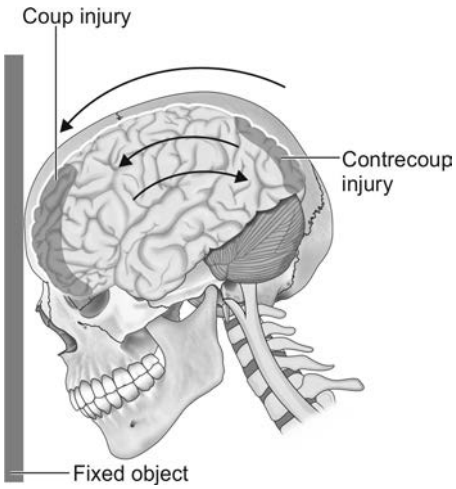

Fig. 7.1: Brain injury.

Fig. 7.2: Battle's sign.

Fig. 7.3: Orbital fracture (Raccoon eye).

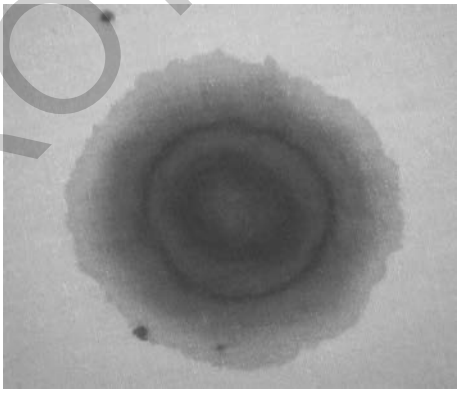

Fig. 7.4: Halo sign.

- Increased ICP
- Motor and sensory changes, seizures
- Frequent swallowing, rhinorrhea and otorrhea may manifest, if CSF leakage occurs.

❖ **Battle's sign (Fig. 7.2):** Area of ecchymosis or bruising over temporal bone. It indicates basilar skull fracture. CSF otorrhea and CSF rhinorrhea are the major manifestations.

❖ **Raccoon eyes:** Periorbital ecchymosis following orbital fracture is known as Raccoon eyes. **(Fig. 7.3)**.

❖ **Halo sign (Fig. 7.4):** It is also known as ring sign, or double-ring sign. It indicates CSF leakage. Drainage from the nose is collected over a white paper or filter paper produces characteristic halo sign, i.e., following the ring of blood another concentric yellow-colored ring will be formed by CSF.

❖ **Diagnosis:** Skull X-ray, CT scan, MRI, lumbar puncture, cerebral angiography and EEG.

❖ **Treatment:** (depends on severity and location)

- Drug therapy for increased ICP
- Intubation and mechanical ventilation
- Invasive hemodynamic monitoring
- Invasive ICP monitoring

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BLOOD BANK & TRANSFUSION TECHNICIANS-II YEAR

Salient Features

- Covers every aspect of blood transfusion required for the diploma and degree students in easy language.
- Covers relevant surgical and medical conditions.
- Nursing procedures have been explained.
- Common laboratory tests and serology related to blood transfusion are discussed in detail.
- Covers diseases of hematology.
- Blood donation and its processing are discussed.
- Explains drugs used in blood banking and basic life support.
- Community involvement in transfusion has been explained in detail.
- Comprises 54 chapters with tables, figures, flowcharts, and diagrams for ease of understanding of students.

Kanchan Bhardwaj MD MAMS FICA FIMSA is a Professor and Head Department of Immunohematology and Blood Transfusion (Retd), Government Medical College, Patiala, Punjab, India. Currently, she is working as a Professor and Head, Department of Pathology, MM College of Medical Sciences and Research, Sadopur, Ambala, Haryana, India. She has 30 years of undergraduate and postgraduate teaching experience. She is a member of prestigious National Academy of Medical Sciences, Fellow of International Medical Sciences Academy, Fellow of Indian Academy of Cytology, Member of Indian Society of Blood Transfusion and Immunohematology, etc. She has authored five books including Transfusion Guide for Clinicians and Transfusion Update. She has written 16 chapters in various books and has more than 50 paper publications and 49 presentations.

BL Bhardwaj MD (Medicine) MAMS FCCP FIMSA FICCP FGSI FIACM is Vice-Chancellor of Maharishi Markandeshwar University, Sadopur, Ambala, Haryana, India. Formerly, Principal of Government Medical College, Patiala and Adesh Medical College, Mohri, Shahbad, Haryana, India. He has published six books, several book chapters, more than 50 paper publications and more than 100 presentations. He has 29 years of teaching experience of undergraduate and postgraduate students. He is the President elect of a prestigious Indian Academy of Clinical Medicine for the year 2025–26. He is an expert member for several Universities and the State and Union Public Service Commission. He has been the senate member and member of Board of Medical Faculty (Baba Farid University of Medical sciences, Faridkot), Court member of PBDS University Rohtak and Member faculty of Life Sciences, Punjabi University, Patiala, Punjab, India. He is a fellow/member of a dozen International and National Associations of medical teachers.

Aastha Miranpuri MBBS is a former resident in Med-Peds in Marshfield, Wisconsin and Internal Medicine in Rochester General Hospital, Rochester, New York, USA. Former faculty in prestigious PASS Program, Champaign, Illinois, USA. She is contributor of the book titled Transfusion Guide for Clinicians and a principal author of Chase Yours Dreams Little Princess.

Harnoor Singh MD MISBTI is working as a Transfusion Safety Officer in Department of Pathology at University of Iowa Health Care, Iowa, USA. Former Senior Resident, Postgraduate Institute of Medical Education and Research, Chandigarh, India. He has 8 years of experience in Immunohematology and Blood Transfusion (IHBT)/Blood banking. He has been an Assistant Editor of book titled Transfusion Update, Production Editor of New England Journal of Medicine Healer application, and author of USMLERx-Step-2 CK QMax. He has nine paper publications and three chapters in books.

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