neurological infection



MENINGITIS

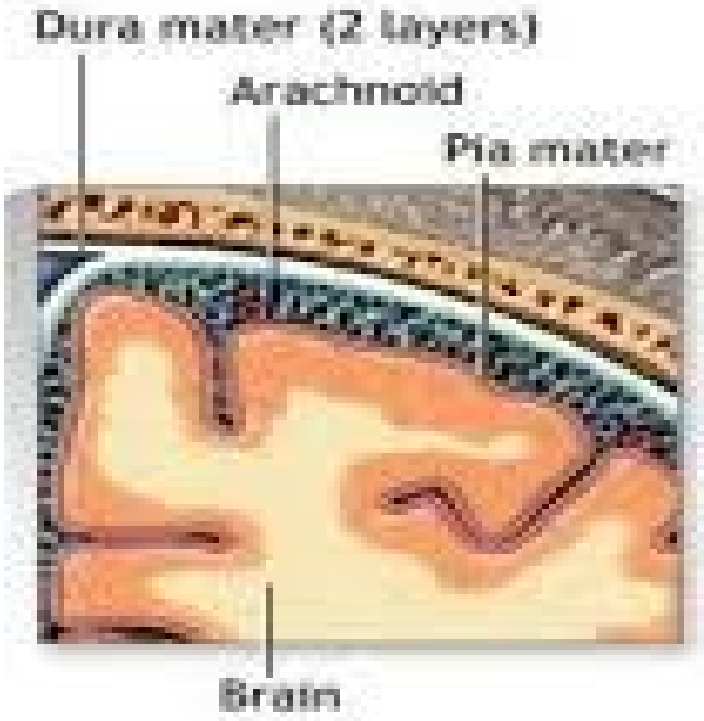
- Definition: Meningitis is inflammation of the protective membranes covering the brain and spinal cord known collectively as the meninges.
- meningitis is inflammation of the coverings around the brain and spinal cord. It is usually caused by an infection.

Meninges

The Meninges

- The Meninges are the membrane covering the brain and spinal cord.
- The Meninges consist of three membranes:

1. The dura mater,
2. The arachnoid mater,
3. The pia mater.



- The inflammation may be caused by infection with viruses, bacteria, or other microorganisms, and less commonly by certain drugs. Meningitis can be life-threatening because of the inflammation's proximity to the brain and spinal cord;

- Meningitis is typically caused by an infection with microorganism. Most infections are due to viruses, with bacteria, fungi and protozoa being the next most common causes. Common causes are group B streptococci Escherichia coli). Listeria monocytogenes

- Viruses that cause meningitis include entero virus, herpes simplex type 2 virus.
- The most common fungal meningitis is cryptococcal meningitis due to *Cryptococcus neoforms.*

two main kinds of meningitis

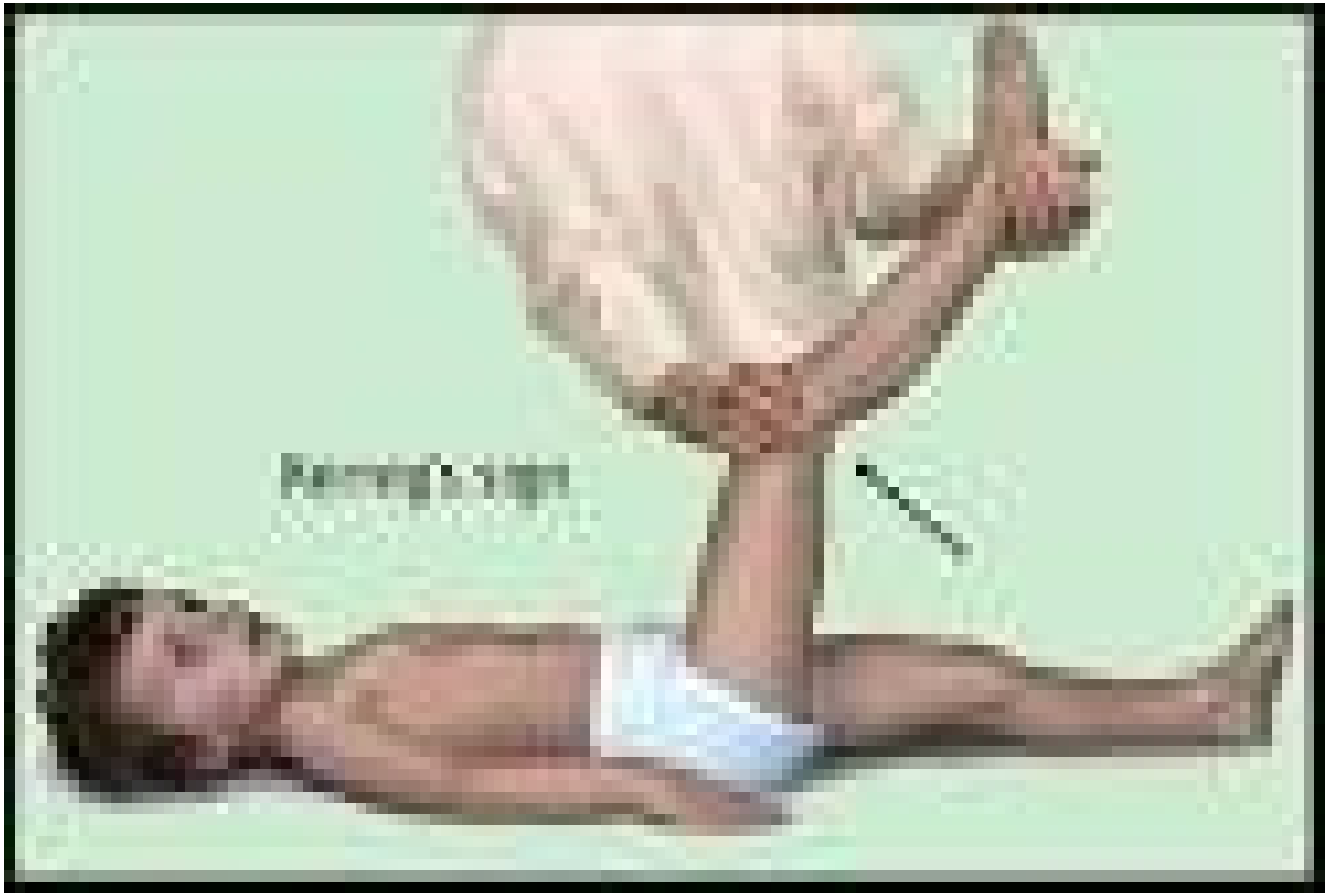
- **Viral meningitis** is fairly common. It usually does not cause serious illness. In severe cases, it can cause prolonged fever and seizures.
- **Bacterial meningitis** is not as common but is very serious. It needs to be treated right away to prevent brain damage and death.

clinical manifestation:

- Headache and neck stiffness associated with fever, confusion or altered consciousness, vomiting, and an inability to tolerate light (photophobia).
- Irritability
- Cyanosis
- Poor sucking ability

- **Nuchal rigidity** occurs in 70% of bacterial meningitis Other signs of meningism include the presence of positive kernign’s sign or brudzinski sign. Kernig's sign is assessed with the person lying supine, with the hip and knee flexed to 90 degrees. In a person with a positive Kernig's sign, pain limits passive extension of the knee.

Kernign's sign



- A positive Brudzinski's sign occurs when flexion of the neck causes involuntary flexion of the knee and hip.

Brudzinski's sign

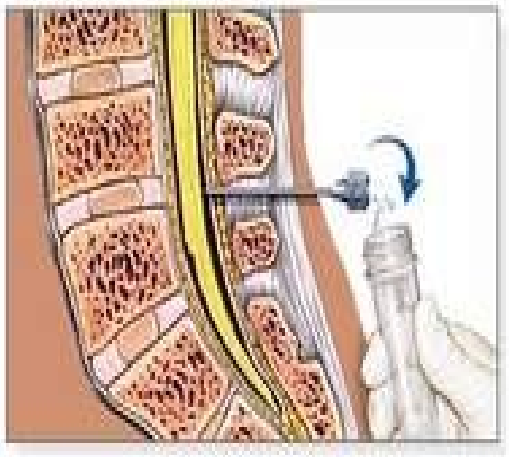


diagnostic evaluation

- Blood test are performed for markers of inflammation (e.g. complete blood count), as well as blood cultures.
- The most important test in identifying or ruling out meningitis is analysis of the cerebrospinal fluid through lumbar puncture test(LP, spinal tap).

- **Lumbar puncture test:** is the most important lab test for meningitis. It is also called a spinal tap. A sample of fluid is removed from the spine and tested to see if it contains organisms that cause the illness.

Lumbar puncture test



Spinal fluid is collected for testing





Treatment:

- Meningitis is potentially life-threatening and has a high mortality rate if untreated;-delay in treatment has been associated with a poorer outcome.[Thus, treatment with wide-spectrum antibiotics should not be delayed while confirmatory tests are being conducted. If meningococcal disease is suspected in primary care, guidelines recommend that benzylpenicillin 5 to 10 mg.

- corticosteroids (usually dexamethasone 5 to 10 mg.
- Adequate hydration-iv fluid administered.
- Reduce intracranial pressure-inj-manitol-10ml/kg.
- Supportive therapy includes encouraging fluids to prevent dehydration and giving acetaminophen (Tylenol)
  or ibuprofen(Motrin) for pain and fever

nursing management

- Child is admitted with suspected meningitis, isolation is essential to protect health care team, parents are informed on proper procedure and need for hand washing
- Vital signs are obtained and monitor frequently depending on child condition as soon as lumbar puncture other culture are obtained.

- Antibiotics are given for a minimum of 7 to 10 days.
- Child should be observed for any side effect of antibiotic therapy.
- Child environment should be kept calm as early as possible
- Child level of conscious and neurological signs are monitored.
- midwife is responsible for maintaining the prescribed fluid volume intake.
- Administered oxygen

- Child should be observed for any complications that may occur, including ataxia, seizure.
- Parents should be instructed on home care needs and need for follow up.
- Providing psychological support to child and parents.

prevention

- Immunizations are available against organisms that cause meningitis in children.penta violent vaccine.
- Hemophilus B polysaccharide vaccine and three of the four meningococcal vaccines are recommended for over 2 years.
- Prophylaxis are recommended for house hold contacts with H influenza.

EPILEPSY

- Definition: a neurological condition characterized by recurrent seizures. Epilepsy is also referred to as the seizure disorders. epilepsy is neurological sign of underlying nervous system disorders.
- **Seizure (convulsions)** is a transient occurrence of signs and/or symptoms resulting from abnormal excessive or synchronous neuronal activity in the brain

- Seizure sudden attack of altered cerebral function.
- Epileptic seizure: the result of altered cerebral function caused by abrupt, abnormal, excessive, uncontrolled,repetitive electrical discharges of cerebral neurons.

PATHOGENESIS

- More than one pathophysiological mechanism is responsible for the abnormal brain functions of epilepsy, seizure is focal or generalized` epileptic neurons. The usually stable neuronal voltage may suddenly decrease, allowing the cell membrane to reach the critical threshold for discharge.

- Resulting in an excessive firing of nervous impulses. Surrounding nerve tissue may not adequately contain this sudden electrical surge and may allow its spread to other brain regions. Some forms of generalized epilepsy, the whole cerebral cortex is usually sensitive to normal nervous impulses relayed from the thalami and excessive fashions in the form of generalized seizures.

- Some have hereditary generalized epilepsy is usually normal,occasionaly,mild neuropathic abnormalities in the cerebral and cerebellar cortices are present that represent the result of seizure. Mild atrophy of the cortex may result from repeated seizures accompanied by hypoxia-ischemia and chronic consumption of anticonvulsants.

International classification of epilepsy

- **PARTIAL SEIZURES**
- Simple partial (consciousness retained)
- Motor
- Sensory
- Autonomic
- Psychic
- **Complex partial (consciousness impaired)**
- Simple partial, followed by impaired consciousness
- Consciousness impaired at onset
- Partial seizures with secondary generalization

conti...

- **GENERALIZED SEIZURES**
- **Absences**
- Typical
- Atypical
- **Generalized tonic-clonic**
- Tonic
- Clonic
- Myoclonic
- Atonic
- Infantile spasms

CLASSIFICATION

- **1.partial seizures:** partial seizures begins focally and result from abnormal electrical discharges in a circumscribed portion of the brain, partial seizure clinically manifested disturbance of cognition,behaviour,movement.partial seizures may be simple or complex, secondary generalization of seizure may occur abnormal neuronal discharges spread thought the brain.

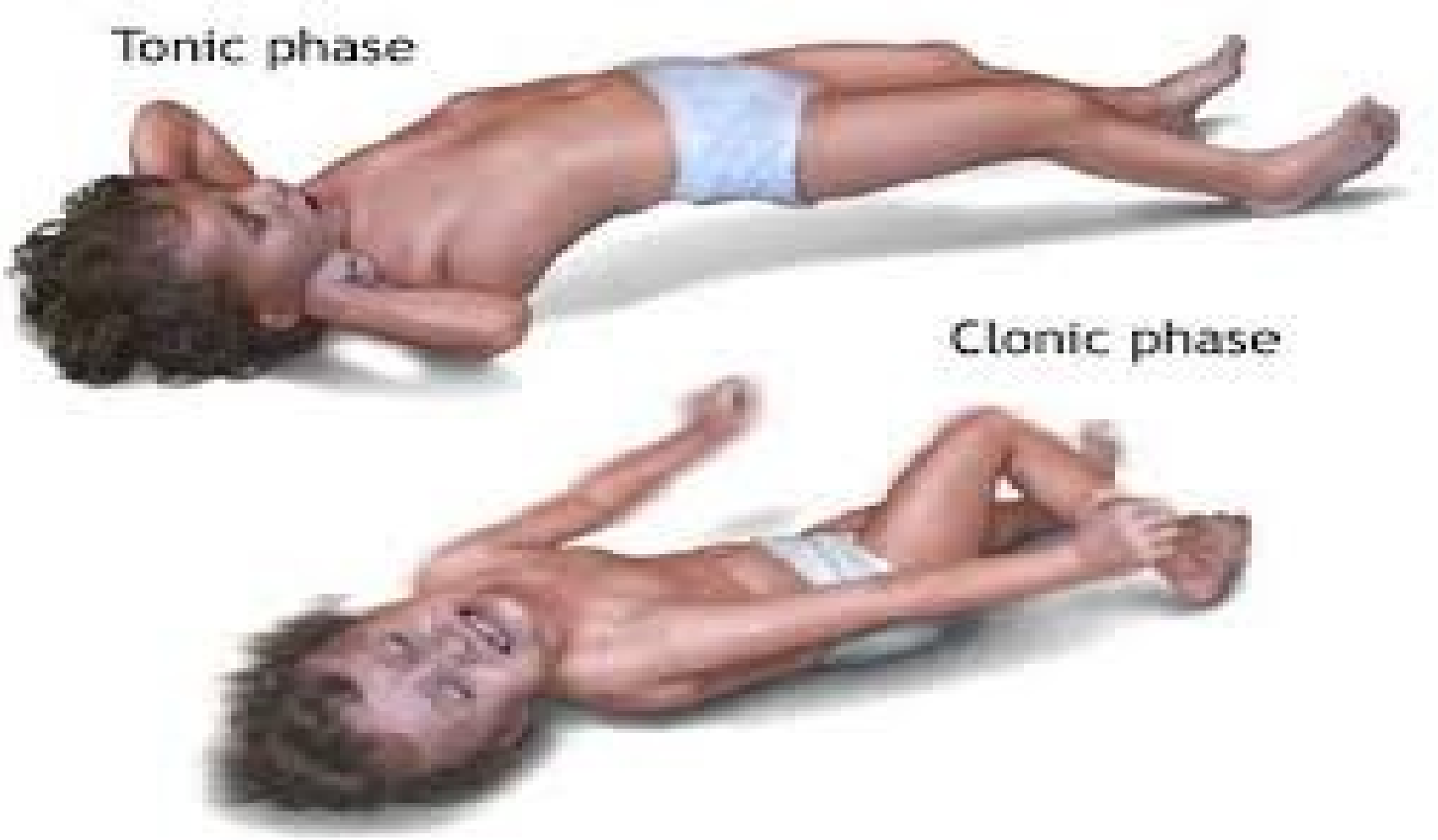
- **SIMPLE PARTIAL SEIZURE**: this type of focal seizure does not involve any changes of consciousness. The manner of expression is determined by the principal origin of excessive electrical discharges

- **NEONATAL SEIZURE:** It is estimated that up to 20 percent of infants in intensive care units may experience seizures it is especially important for midwife working in these settings to recognize neonatal seizure.

GENERALIZED TONIC –CLONIC SEIZURE

- Are the classic convulsive seizures. The child loses consciousness immediately and falls.occasionaly,an epileptic cry, which results from forceful exhalation, may be emitted at the onset. the convulsion consists of the predictable and orderly sequence of steady muscle contractions

Tonic and clonic phase



- Autonomic features such as tachycardia,diaphoresis,pallor,flushing and hypertension accompany generalized tonic-clonic seizures. Cyanosis occurs during the tonic phase.

- **STATUS EPILEPTICUS**; Refers to a single prolonged seizure or a series of closely spaced seizure that repeat so often as to produce a fixed and enduring epileptic condition. Convulsive status epileptics refers to either grand mal seizures occurring in quick succession with no recovery of consciousness between seizures or a single uninterrupted generalized convulsion.

CLINICAL MANIFESTATION

- Disturbance of consciousness
- Speech interrupted
- Purposeless repeated mannerisms
- Ataxia (imbalance)
- Sleepiness
- Slurred speech

investigation

- Complete history of child and family
- Physical and neurological examination
- Complete blood count and levels of glucose, electrolytes like calcium and magnesium
- Lumber puncture test is done suspension of central nervous system infection

- Electroencephalogram (EEG) is extremely helpful in demonstrating the mechanism or type of epileptic seizure. It is important to realize that many epileptics can have a normal (EEG between seizures.
- Computerized tomography scan: may be utilized in the evaluation of seizures. It helpful to evaluate patient with focal seizure.

EEG WITH CHILD



Computerized tomography scan



MEDICAL MANAGEMENT

- SEIZURE DISORDERs involves findings the right drug in proper dosage to control seizure with fewest side effect. anticonvulsant are given to reduce the level of neuronal excitability below the seizure threshold.
- Simple seizure; **Carbamazepine**
- Syrup-100mg/5ml Tablet-100mg, 200mg

- **Generalized tonic clonic seizure**
- **Valproic acid** Syrup-200mg/5ml Tablet-200mg, 500mg .
- **Clonazepam** Tablet, 0.5mg, 1mg, 2mg
- **Phenytoin** Tablet/capsule-50mg, 100mg .
- **Status epileptics**
- **Phenobarbitone** Tablet-15mg, 30mg, 60mg, 100mg Elixir-20mg/5ml .
- **Inj-diazepam 10mg or phenytoin-10mg/kg-iv**

DIET THERAPY

- A ketogenic diet, which stimulate the ketosis and acidosis of starvation, is sometimes used with certain seizure disorders that are refractory to anticonvulsants. The diet is relatively low in carbohydrate and protein but high in fat, thus providing a satisfactory caloric intake. The mechanism of protection is not clear but the resulting ketosis has been found to raise the threshold for seizures.

- Acceptance of the ketogenic diet is frequently poor .a dietician should be consulted to assist the family with meal planning if the ketogenic diet is ordered.

SURGICAL MANAGEMENT

- Neurosurgery may be considered for certain epileptic children with uncontrolled seizures if a through trial of medical management with anticonvulsants has been unsuccessful. Patient with focal epilepsy arising from a solitary, well circumscribed, easily resectable,prior to surgery, intensive EEG monitoring, continued seizures are recorded.

- A single brain region that can be safely removed surgically, the patient may be a candidate for surgical excision of the offending temporal lobe. The specimens removed reveal a spectrum of pathological changes such as unsuspected tumor,malformation,scar and vascular anomalies.

- Vital signs should be taken every 15 minutes until well stabilized. Intravenous fluids must be monitored meticulously. midwife must watch urine output every hourly.
- Gavage feeding may be necessary, as the patient may temporarily lose swallowing reflex.
- Equipment for emergency measures such as oxygen therapy, blood transfusion setup, emergency stimulants and intravenous fluids should be readily available

Nursing Management

- **Emergency care and observations during a seizure:** midwife should be prepared to administer emergency treatment to seizure patients and should instruct family members concerning first aid measures. The first-aid treatment for grand mal seizures are assist the child to a lying position. if possible ,place something soft under the Childs head.

- Take off glasses .if present , and loosen tight clothing.
- Remove dangerous objects from the area
- Do not force anything into Childs mouth
- Allow the seizure to run its course, make no attempt to restrain the involved body parts.
- When the seizure is over, turn the child to one side to help saliva drain from the mouth

conti…

- **Prevention:**
- Prevention of epilepsy concerns the reduction of its multiple causes such as perinatal damage, head injury and meningitis. Prompt management of hypoglycemia and other metabolic problems may prevent brain injury and seizures.

Spinal bifida

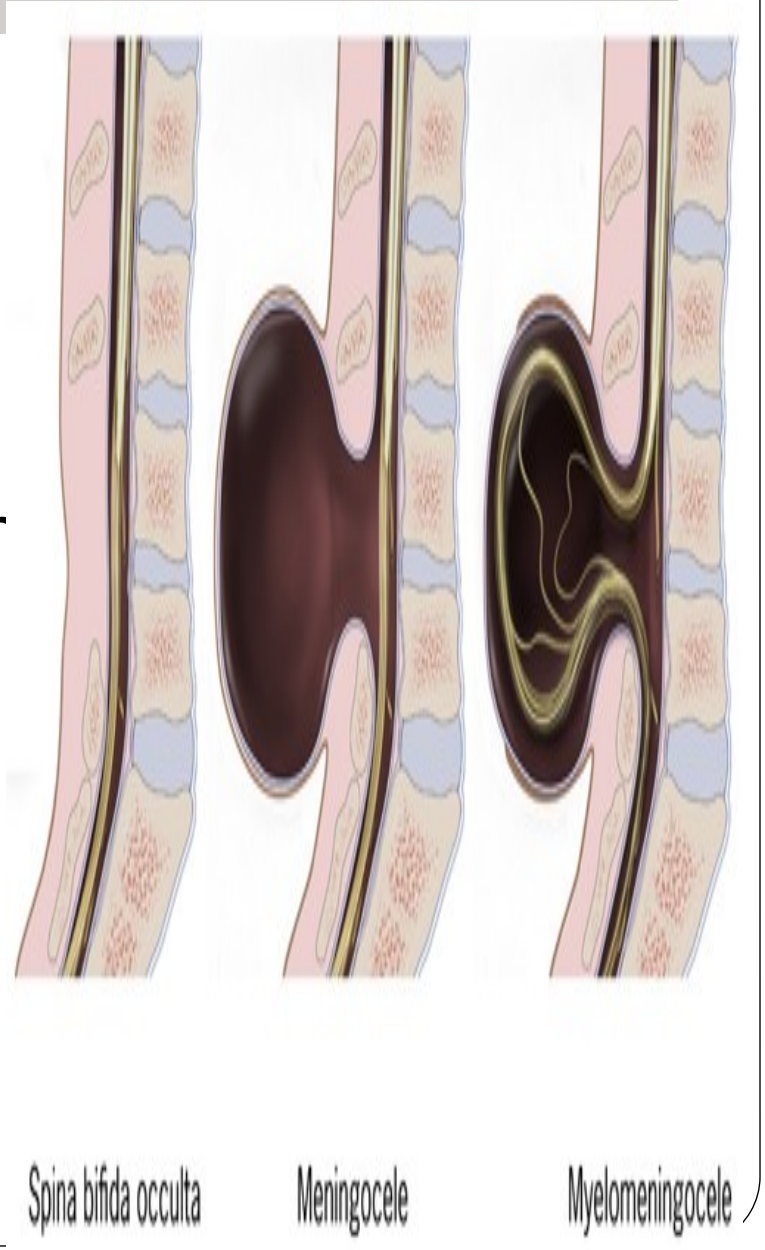
- It is a congenital problem, present before birth and is caused by the incomplete closing of the embryonic neural tube.
- It is a neural tube defect.
  - bones in the vertebral column do not fully cover the spinal cord, leaving it exposed
- causes
  - ✓ Genetic
  - ✓ Environmental
  - ✓ Nutrition
    - Folic acid

Image : spinal bifida



Types

- There are two types:
  - spina bifida occulta
  - spina bifida cystica.
- Spina bifida cystica
- can then be broken down ir
  - ✓meningocele and
  - ✓Myelomeningocel



Occulta:

- Occulta” means hidden, and the defect is not visible .This is the mildest form.
- Most patients have no neurological signs or symptoms.
- There may be a small birthmark, dimple or tuft of hair on the skin.
- a test for another condition reveals it by chance.

CONTI....

- Meningocele:
  - The spinal cord develops normally, but the meninges, or protective membranes around the spinal cord, push through the opening in the vertebrae.
- Myelomeningocele:
  - Myelomeningocele is the most severe form of spina bifida.
  - In this condition, the spinal cord is exposed, causing partial or complete paralysis of the body below the opening.

Symptoms

- An infant who is born with spina bifida may have or develop:
  - weakness or paralysis in the legs
  - urinary incontinence
  - bowel incontinence
  - a lack of sensation in the skin

Diagnosis

- In most cases, spina bifida is diagnosed before birth.
- Some mild cases may go unnoticed until after birth.
- Very mild forms (spinal bifida occulta), in which there are no symptoms, may never be detected.

Before birth

- blood test for alpha-fetoprotein and
- ultrasound scan, which are routinely performed at 16-18 weeks of pregnancy.

Cont..

After birth

- plain film X-ray examination for mild forms.
- X-rays of hips, legs and feet for sever forms.
- MRI
- CT scan

Treatment

- Treatment for spina bifida depends on the severity of the condition.
  - Most babies with spina bifida occulta require no treatment at all.
  - Babies with meningocele typically require surgical removal of the cyst and survive with little, if any, disability.
  - Babies with myelomeningocele require complex and often lifelong treatment and assistance.
  - Almost all of them survive with appropriate treatment starting soon after birth.

Conti…

- A baby born with myelomeningocele requires specialty care.
  - The child should be transferred immediately to a center where newborn surgery can be performed.
  - Treatment with antibiotics is started as soon as the myelomeningocele is recognized; this prevents infection of the spinal cord, which can be fatal.
  - The operation involves closing the opening in the spinal cord and covering the cord with muscles and skin taken from either side of the back. The most common complications are tethered spinal cord and hydrocephalus, which can have very severe consequences.

Nursing management

- Multidisciplinary team consisting of the pediatrician, neurosurgeon and neurologist, orthopedist, urologist, specialist in rehabilitation and physical therapy, dietitian and knowledge nurse required for care of children.
- Surgical correction of the defect is usually done as soon as possible, generally within the first 24 to 48 hours after birth. An advantage of early surgery includes prevention of infection and injury to the sac.

Preoperative & postoperative care

- Prevention of infection and injury of the sac: after birth, the neonate is usually placed under a warmer. in order to prevent infection of the sac preoperatively
- Prevention of skin breakdown
- Provision of adequate nutrition
- Correction of musculosketal deformities
- Regulation of bladder and bowel functions
- Vital signs are taken and recorded frequently.

prevention

- There is neither a single cause of spina bifida nor any known way to prevent it entirely. However, dietary supplementation with folic acid has been shown to be helpful in reducing the incidence of spina bifida.

Hydrocephalus

- Hydrocephalus is a condition that occurs when fluid builds up in the skull and causes the brain to swell.
- Hydrocephalus is not a specific disease; it represents a diverse group of conditions that result from impaired circulation and/or absorption of CSF or, in rare circumstances, from increased production of CSF by a choroid plexus papilloma
- The name means “water on the brain.”
- This can lead to developmental, physical, and intellectual impairments

hydrocephalus



Classification

- Hydrocephalus resulting from obstruction within the ventricular system is called obstructive or non communicating hydrocephalus.
  - Due to a lesion in the fourth ventricle
- Hydrocephalus resulting from obliteration of the subarachnoid cisterns or malfunction of the arachnoid villi is called non obstructive or communicating hydrocephalus.
  - Due to intraventricular hemorrhage

Causes

- Cerebrospinal fluid (CSF) flows through the brain and spinal cord in normal conditions.
- Under certain conditions, the amount of CSF in the brain increases.
- The amount of CSF can increase when:
  - a blockage develops that prevents CSF from flowing normally
  - there is a decrease in the ability of blood vessels to absorb it
  - brain produces an excess amount of it
  - Too much of this fluid puts the brain under too much pressure. This pressure can cause brain swelling, which can damage brain tissue.

- a birth defect in which the spinal column doesn’t close
- a genetic abnormality
- certain infections that occur during pregnancy, such as rubella
- central nervous system infections such meningitis especially in babies
- bleeding in the brain during or shortly after delivery, especially in babies born prematurely
- injuries that occur before, during, or after delivery
- Head trauma
- central nervous system tumors

CLINICAL Manifestations

- infant with severe hydrocephalus.
- Eyes that appear to gaze downward
- Irritability
- Seizures
- Separated sutures
- Sleepiness
- Vomiting

Conti..

- Symptoms that may occur in older children can include:
- Brief, shrill, high-pitched cry
- Changes in personality, memory, or the ability to reason or think
- Changes in facial appearance and eye spacing
- Crossed eyes or uncontrolled eye
- Difficulty feeding
- Excessive sleepiness

Conti..

- Headache, Sunset eyes. Irritability, poor temper control
- Loss of bladder control (urinary incontinence)
- Loss of coordination and trouble walking
- Muscle spasticity (spasm)
- Slow growth (child 0–5 years)
- Slow or restricted movement

Diagnosis

- physical examination
  - Examination includes careful inspection, palpation, and auscultation of the skull and spine.
- ultrasound
  - ✓ These tests use high-frequency sound waves to create images of the brain. This type of ultrasound can only be done in babies whose fontanel (soft spot) is still open.
- Magnetic resonance imaging (MRI)
  - ✓ scans can be used to look for signs of excess CSF. MRIs use a magnetic field and radio waves to make a cross-sectional image of the brain.
- Computerized tomography (CT) scans

Treatment

- Mild ventriculomegally/gross hydrocephalus is treated with diuretics.
- Acetazolamide 50 to 100mgkg/day to reduce csf.
- **Ventricular peritoneal shunting**
  This is by far the most common procedure for cerebrospinal fluid diversion. A ventricular catheter is inserted into the anterior portion of a lateral ventricle through a burr hole in the skull. The valve unit is tested and attached to the catheter. An incision is then made in the abdomen and through the rectus muscle into the peritoneum. The proximal end of the catheter is slipped beneath the skin of the anterior abdominal and chest wall to the neck.

Conti...

- The ventricular catheter with the attached valve unit is then sutured to the peritoneal catheter. The CSF is absorbed by tissues in the abdominal
- 2. **Ventriculo-atrial shunting** CSF drain in to the right atrium. A silicone catheter is inserted into the lateral ventricle and down through the internal jugular vein into the right atrium of the heart. The CSF drains into the circulating blood. This type of shunt become easily infected or obstructed, if infection occurs, bacterial endocarditis.

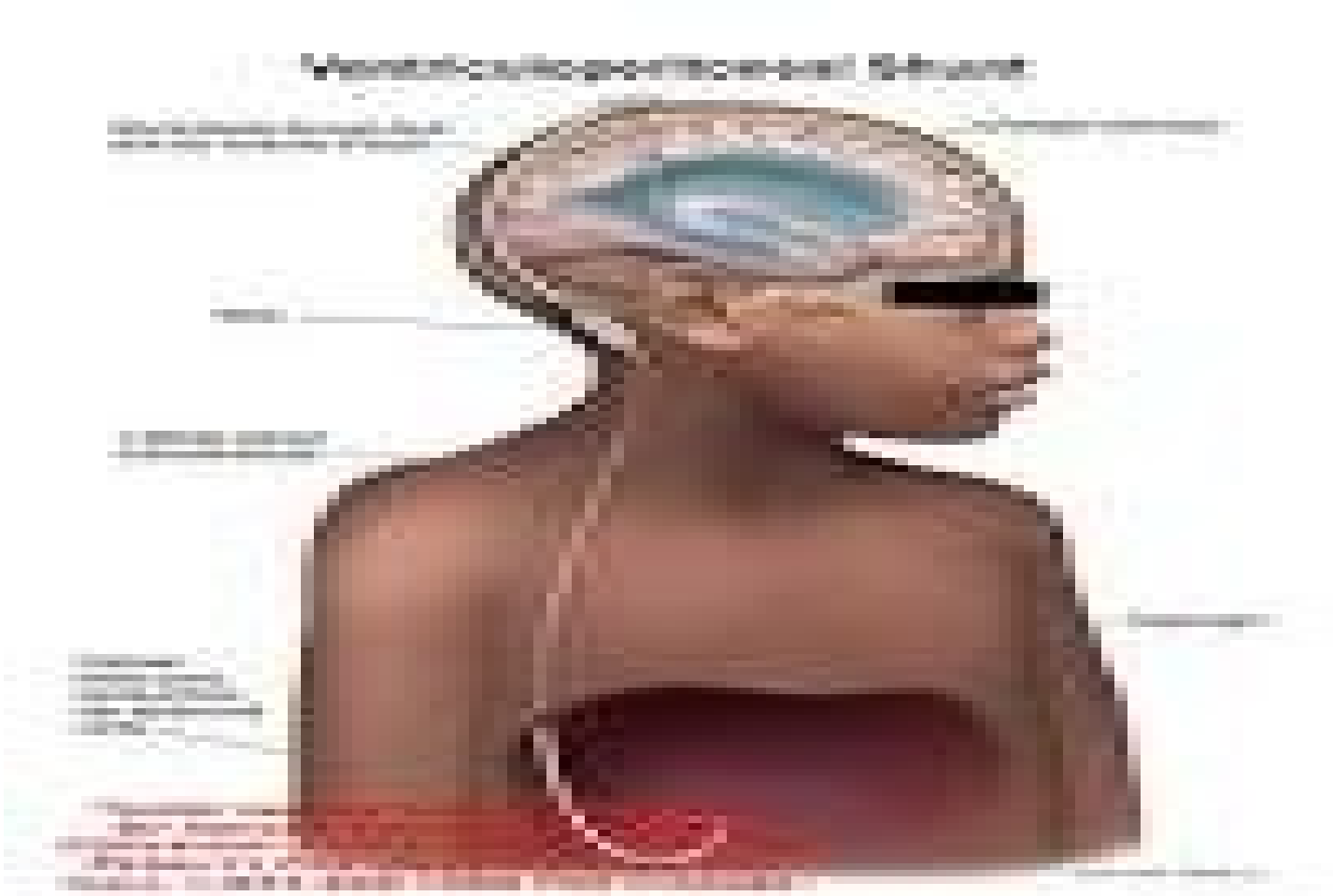
VP SHUNT



VA SHUNT



Conti..



Management

- **Preoperative care :** the infant is observed carefully for signs of increased signs of increased intracranial pressure.
- Daily head circumference to be measured.
- Fontanels and suture lines are palpated for size, signs of bulging
- Psychological aspect of care
- Adequate nutrition-small and frequent feeding
- Prevent pressure sores.

Postoperative care

- **Postoperatively**, patient is kept in horizontal position for 12-24 hours and then gradually elevation of head is allowed depending upon condition of anterior fontanel.
- Oral intake is initiated within 12 hours if there is no abdominal distension and peristalsis is audible.
- Position the baby on unprotected side to prevent pressure on the shunt valve.

Conti...

- Follow up includes regular fortnightly visits for first three months and then after every month up to age of one year.
- From age of 1-3 years, 6 monthly visits and after that annual visits are required.
- Observe signs of increased intracranial pressure
- Prevent infection-observe the sign of elevated vital signs, poor feeding and vomitting,decreased response and seizure activity.