ICP- Increased Intracranial Pressure

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Introduction

- This is the pressure exerted via cranium on 'CSF' (cerebrospinal fluid), 'brain tissue' and circulating 'brain blood volume.'
- The pressure fluctuates continually in response to activities for instance, respiratory cycle, straining, arterial pulsation, coughing, & exercise
- The standard level of ICP is 0–10mmHg and increased ICP is considered to be a elevation of the sustained pressure above 20–25mmHg, that is primarily caused by elevation in the volume of the intracranial contents.

How it Occurs

A skull is a rigid structure with a non-compressible, fixed inner quantity of "1400–1700ml". It is roughly about;

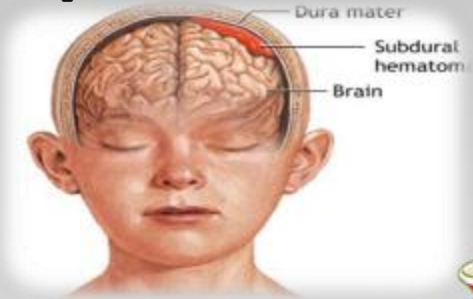
1. 80% filled by the brain ("glial tissue", "extracellular fluid", and "neuronal tissue")
2. 10% blood & 8% cerebrospinal fluid
3. 15% of the skull contents

As the contents of skull are incompressible, and if any of the 3 components (such as cerebrospinal fluid, blood or brain) enhances in volume, then it needs to be compensated for by a decline in the amount of remaining or 1 component or else ICP tends to increase.

Pathophysiology

- Increased ICP affects various patients having acute neurologic aspect
- It is mainly related to the injury of head, demonstrating secondary outcome in other aspects for instance, "viral & toxic encephalopathies", "subarachnoid hemorrhage", & "brain tumors".
- Augmented ICP from any known cause declines "cerebral perfusion", stimulating additional edema or swelling along with shifting brain tissues by means of opening rigid dura, which often results in the herniation of brain, being a fatal event.

"Subdural hematoma" forms when "blood vessels" situated between membranes wrapping brain ("meninges") leak blood after a head injury. It is a critical state as elevation in "intracranial pressure" often tends to cause injury to the tissues of brain ultimately losing function of the brain.



Causes

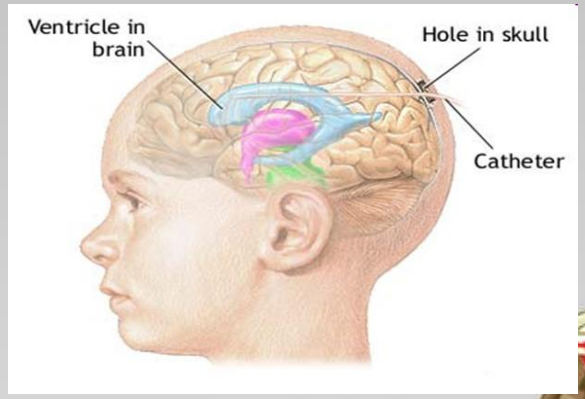
The etiology of increased ICP consists of:

- Elevated pressure inside brain matter
- Raised pressure of cerebrospinal fluid
- Brain matter swelling
- Bleeding either within brain or fluid surrounding it

Dietary Considerations

A person suffering from head injury possesses high protein and energy requirements as a result of induced state of hyper catabolism & hyper metabolism. Early enteral feeding is essential and it needs to be placed within 72 hours of injury.

- The patients are often in hyper catabolic or hyper metabolic condition
- Therefore, there is an increased requirement for glucose
- Patients are considerably kept normovolemic:
- IV: 0.9% or 0.45% 'sodium chloride'



Diagnosis:

This condition can be diagnosed by:

- Magnetic resonance imaging (MRI)
- Computed tomography (CT) scanning
- Cerebral Angiography
- Electrophysiological monitoring

"Intracranial pressure monitoring" is often undertaken by means of catheter insertion within head via a sensing device for the purpose of monitoring brain pressure.

Clinical Manifestation

Subjective Symptoms

1.Headache, especially when coughing, or lying flat (e.g., on awakening in the morning)
2.Sneezing, or bending over,
3.Vomiting and Nausea
4.Blurred or double vision with head movement
5.Seizures
6.Decreased motor response to command
7.Bradycardia
8.Decreased sensory response toward excruciating stimuli
9.Changes in reactivity & pupil size
10.Papilledema
11.Flexion posturing or Extension
12.Coma

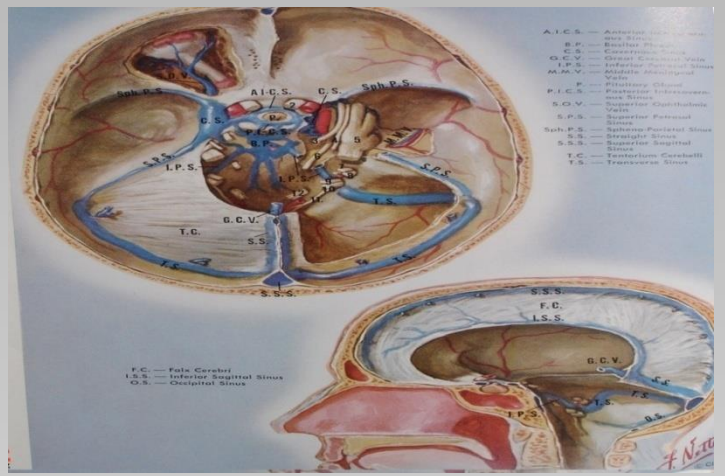
Early signs and symptoms of increased ICP:

1. Headache
2. Vomiting,
3. Personality changes
4. Irritability
5. Fatigue

Medications

Non-drug treatments

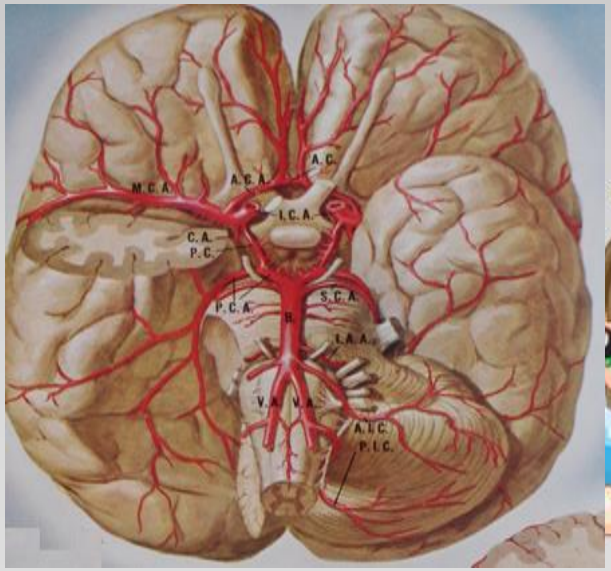
- Moderate hyperventilation
- Homeostasis maintenance
- Body Positioning
- Mild Sedation
- Osmotic diuretics usage
- External ventricular drainage



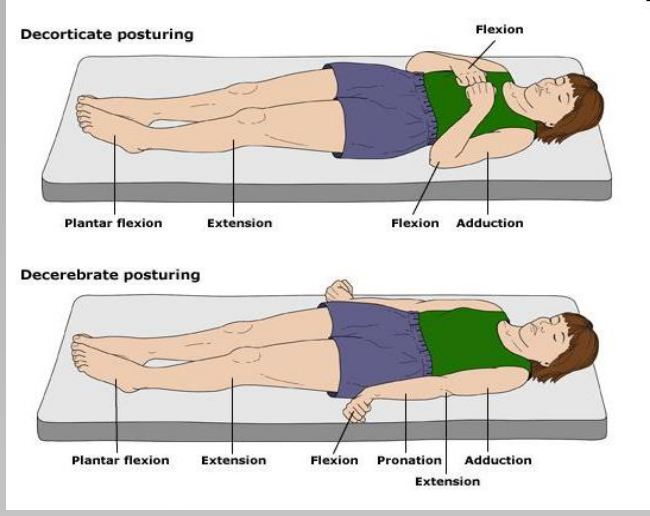
Drug treatments

Medical management often includes:

- Barbiturates
- Propofol
- Diuretics use such as Mannitol therapy, Glycerol, and Urea
- Anticonvulsant therapy for seizures



Nursing considerations



Nursing Assessment:

Alterations in consciousness level

Modification in Cushing triad or vital signs:

- Enhanced systolic BP
- Brady or tachy cardia
- Extended pulse pressure

Irregular respiration

Decline in the motor function and strength

Ocular sign

Examine stimuli response

Assess movements

Evaluate positioning:

- Decorticate posturing (flexor)
- Decerebrate posturing (extensor)- which tend to indicate a serious damage

Nursing Goals:

Maintain electrolyte balance and Normal fluid

Maintain patent airway

No complication, secondary to immobility

Monitor Respiratory function

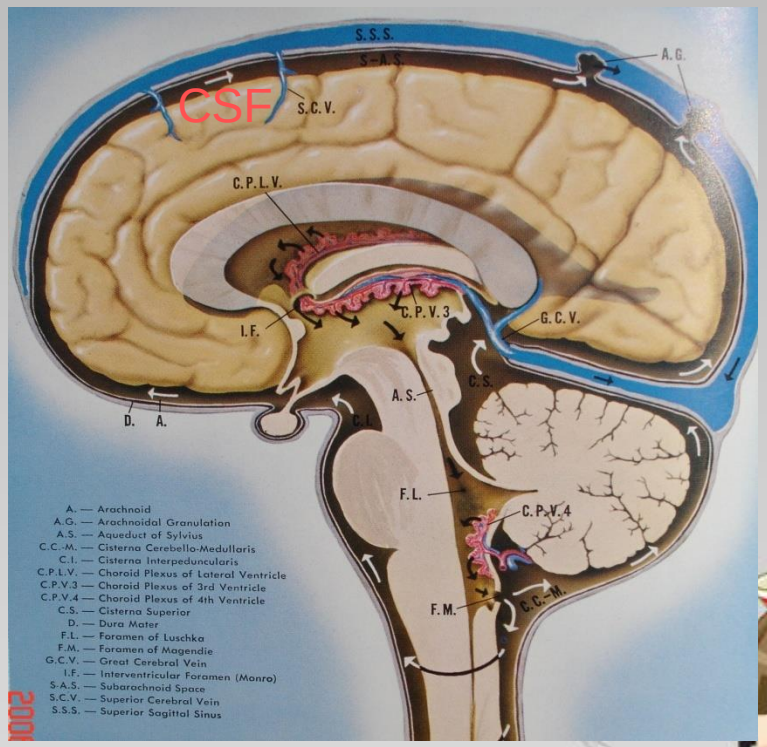
Control pain

Offer injury protection: turning/positioning

Maintain body position in head up position: enhanced HOB 30°

Surgeries

- Surgical intracranial mass removal
- **Temporary**: extraventricular drain placement
- **Permanent**: VP shunt placement



Family Teaching

- Nurses need to offer education to family.
- Determine the understanding of parents including their needs for occupational, speech and physical therapy.
- Teach parent about the significant signs and symptoms to monitor medication side effects linked to the condition of child, and when to call the nurse or physicians
- Refer the parents to internet based support groups and community

NCLEX Style Question

Which specific drug type might be offered to control elevated ICP?

A. Carbonic anhydrase inhibitors
B. Barbiturates
C. Histamine receptor blockers
D. Anticholinergics

References

Hockenberry, M. J., & Wilson, D. (2015). *Wong's nursing care of infants and children* (10th ed.). St. Louis, MO: Elsevier Mosby.

Li, L. M., Timofeev, I., Czosnyka, M., & Hutchinson, P. J. (2010). The surgical approach to the management of increased intracranial pressure after traumatic brain injury. *Anesthesia & Analgesia*, *111*(3), 736-748.