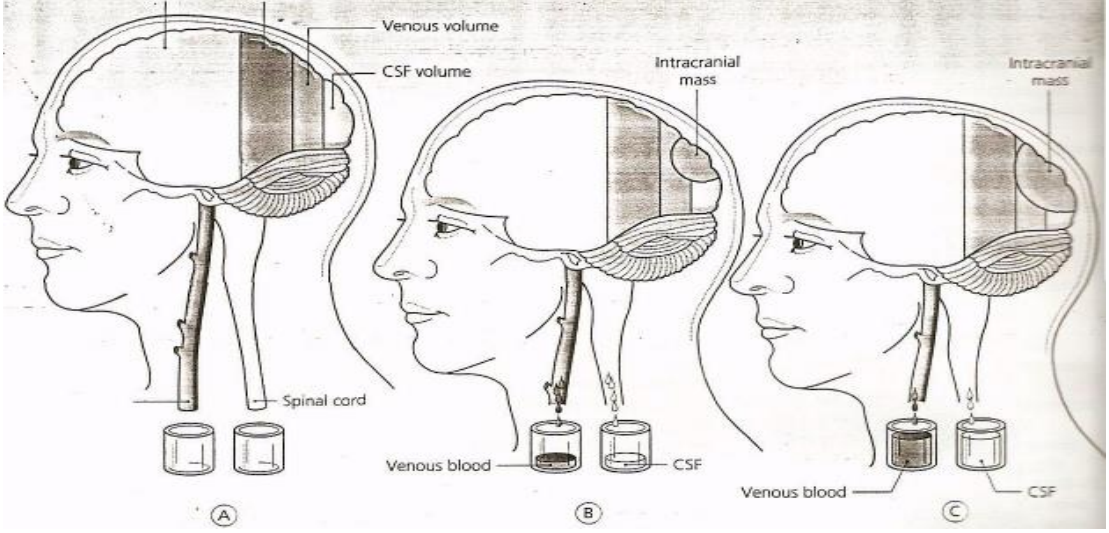
Raised Intracranial pressure(ICP)

Raised ICP is a major clinical feature of many neurological illnesses. It is most important neurological condition, requiring prompt diagnosis and often needing urgent treatment.

The normal supine (ICP) is (10-15)mmHg,measure at a position equal to the level of the foramen of monro.The major intracranial contents are the brain(including neurological elements and interstitial fluid),blood(arterial and venous)and cerebrospinal fluid (CSF).The cranial cavity is a rigid sphere filled to capacity with non compressible contents, there is one large vent; the foramen magnum and a number of smaller foramina for cranial nerves and blood vessels, and that an increase in volume lead to a rise (ICP).

CONTENT	VOLUME	PERCENTAGE
Brain(70%) I,fluid(10%)	1400ml	80%
Blood	150ml	10%
CSF	150ml	10%
Total	1700ml	100%

Because the intracranial volume is constant;whene intracranial mass expands or brain swells, compensation must occur trough a reciprocal decrease in the volume of CSF(main buffer)and venous blood .Only in children whose sutures have not yet fused can the cranium itself expand to accommodate extra volume. To maintain pressure within the physiological range the venous system collapse easily, squeezing venous blood out through the jugular veins or through the emissary and scalp veins. CSF,likewise,can be displaced through the foramen magnum in to the spinal subarachnoid space.Whene these compensatory mechanism have been exhouseted,minute changed in volume produce precipitous increase in pressure. Brain parenchyma and arterial blood do not participate, to any significant extent, in the intracranial pressure-buffering mechanism.



Causes of raised (ICP)

(1) Brain:

(a)Neurological element(tumors)
(b)Interstitial fluid(edema).

(2) Blood:

(a)Arterial (Systemic hypertension)
(b)Venous(Venous sinus thrombosis)
(c) Both(Hematomas,increase CO2)

(3) CSF

As in hydrocephalus.

Clinical Feature

(1)No symptom and sign:

(2)Symptoms :

A-General:

(a)Headache :

Is generalized in nature and often severest in the morning(because of vascular congestion due to (1) vascular dilatation secondary to increase CO2 during sleep (2)Recumbent position during sleep),and frequently relieved by vomiting(decrease ICP by hyperventilation).

(b) Vomiting: which is usually without nausea.
(c)Blurring of vision(due to papilledema).

(d)Diplopia(due to 6th. Nerve palsy).

B-Specific: Symptoms related to the cause of rise ICP.

(3)Sign:

A-General:

(a)Vital signs(Cushing Triad ;bradycardia,hypertention and respiratory irregularity). Respiratory changes occur early, followed by bradycardia,with hypertention occur at a very late stage.

(b)Papilledema.

(c)Squint(due to 6th nerve pulsy(usuallybilateral)).

B-Specific:sign related to the cause of rise ICP.

Treatment

(1)Measures that treat causes related to the brain:

(a)Neurological elements(tumour):treated by removal or decompression of tumor.

(b)Interstitial fluid(edema):treatment include;

A-Hypertonic solution(Manitol):Manitol is not metabolized and it does not cross the blood brain barrier so it increase serum osmolality and thus helps to draw fluid from brain parenchyma in to the vascular space. Manitol generally is given in small boluses rather than as continues drip.The usual dose is 0.25g/kg at 4 to 6 hour interval .Manitol is generally effective for 2 to 3 days, because manitol slowly leaks out of the blood vessels ,especially in areas of blood brain barrier breakdown with resulting loss of osmotic gradient .Electrolyte should be monitored closely during the use of any hypertonic agents.hypokalemia and hypernatremia are common side effect That can complicate chronic manitol administration.

B-Loop diuretics(furosemide):In contrast to osmotic agents which are effective only where the (BBB) is intact ,furosimide decrease brain edema in pathological area as well

.In addition to its primary action on the kidney, it is thought to reduce CSF production as well.

*C-Steroids(Dexamethasone):*Dexamethasone is used for treating chronic increase ICP especially related to vasogenic edema caused by primary or metastases neoplasm. it is ineffective in the management of vasogenic edema related to the head trauma or cerebral infarction. It is thought to stabilized the cell membrane and restore the normal permeability of endothelial cell. The usuall loading dose is 10 mg ,IV followed by 4mg,every 6 hour. When the appropriate therapeutic goal has been achieved, more than 10 days the dose should be slowly tapered over a period of 3 to 4 days.

(2)Measure that treat causes related to the blood:

(a)Arterial :treatment of systemic hypertention.

(b) Venous: *1-treatment of venous sinus thrombosis.*

2-Head elevation in (euvolemic patien) can significantly reduce ICP without altering cerebral perfusion pressure,through improvement of venous out flow from the head.

(c)Both*:* *1-treatment of intracranial haematoma.*

2-Hyperventilation can cause a fall in ICP by reducing intracranial blood volume through vasoconstriction by washing out CO2 .It is generally initiated for acute management of increased ICP.

(3)Measure that treat the causes related to the CSF : Hydrocephalus treated by shunt system

(4) Barbiturate coma: Induction of coma with short acting barbiturates is the last resort in the management of rise ICP when all other measure failed .The most commonly used drug is thiopental. It decrease ICP by inhibit cerebral metabolism and reduce cerebral blood flow.

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