2. CRANIO-CEREBRAL INJURIES 2

B. Secondary events

- They develop <u>after</u> the injury + lead to <u>augmentation</u> of the original injury + need <u>urgent</u> intervention to prevent death / permanent damage:

1. Continued DAD:

- **Secondary axotomy: molecular basis.**

Injury -> Excitotoxic NT -> Ca influx
*To brain cells -> **phospholipid cascade** ->*
apoptosis and axon disconnection.

2. Brain Ischemia

- **diminished cerebral perfusion (CP)**

or **hypoxia**

Hypovolemia-> low cp
Low O2 -> Hypoxia

- YOU have to maintain CPP as much you can -> adequate BP /+ reduce ICP

3. Brain edema: → Focal / Diffuse

- *a major detrimental factor in the success of management.*

Vasogenic.
*Disruption of **BBB** around the site of injury — IV proteins leaks —withdrawing fluid—Edema.*
- *With brain **<u>contusion</u>***

Cytotoxic.
*Failure of **Na/K** pump.*
—Na retention inside cells.
— retain H2O— swelling
- ***<u>poisonin</u>**, **<u>cardiac arrest</u>**, **<u>ischemia</u>**.*

Osmotic
*Low blood **osmolality**—*
Relatively high brain's O.
— draws fluid into ECS.
- ***<u>Over hydration</u> /<u>ADH</u>***

Interstitial
*- disruption of the **CSF bb** — CSF pass Ependymal— around the Ventricles.*

Management of edema *—> close observation, ICP monitoring, mannitol, if progress ~ craniectomy*

C. Complications

They are life threatening + require urgent attention +detected in close observation/can be missed
Do CT & electrolyte examination once again , don't do them once time!!

1. Early complications

May cause Recurrent Meningitis

Electrolyte disturbance.
Child/Trauma—secret ADH —Volume retention, hyponatraemia.
Or mannitol and diuretics induced.

>> **confusion**, **lethargy**, **general weakness**
or **nausea** with **vomiting**, If *<u>Na <120</u>* **seizures.**
If *<u>Na < 105</u>* **status epileticus.**

here - the rate can be Faster

MUST be corrected as soon as possible....
Infuse saline 5 mmole /1/1hr .... To avoid *pontine myelinolysis*.

CSF Leaks. 4% of Basal Fx
- Fx in *<u>petrous temporal bone</u>*.
- with blood... otorrhagia
- halo test.
- stop alone/ abx cover
- Don't examine the ear

CSF otorrhea

CSF rhinorrhea
- in the <u>cribriform plate</u>
- runny nose? sugar content
Or B2 transferrin
- Stop alone/abx cover + sterile bad
- Don't examine the nose

May Both → Lumbar drainge → 2 wks + Abx → Fistula not healyet → Do it Surgically craniotomy/Duroplasty ~ use Metrizamide & CT to detect fistula

Epilepsy

Infection
_ meningitis
_ Abscess

Intracranial Hematomas

Epidural.

~ **Acute.**

- Arterial… MMA and it's branches
- Needs time to strip the dura.
- Lenticular
- Mostly associated with fx/ adult >child. rare <6o
- Two presentations:

" Classical "

Trauma >> LOC >> wake up /lucid >> LOC
↳ concussion ↳ Transtentorial Herniation

" Non classical ".

1. LOC >> still ! >>> EDH at CT
2. Awake >> still ! >>> EDH at CT
3. Awake >> Nothing at CT >> admitted then deteriorated>> EDH at CT

- If EDH is leftod untreated → Brain herniation + ipsilateral p. dilation
  Death!! ← Kernohan's.P ← contralteral hemiparesis + LOC
  ipsilateral hemiplagia
- At CT >> hemorrhage +- Fx (mainly adult) + Brain shifts.
- Tx :

  Asymptomatic >> more than 30ml/ thicker than 1cm >> Evacuated

  EDH >> with NDs >> Evacuated

  EDH in children >> Evacuated

  ——other wise … wait & Observe with steroids in ICU

~ **Delayed**

- Not present on the initial CT
- Maybe due to reduction of ICP or blood dyscrasias
- 5% of the cases

Subdural

~ **Acute**

- More challenge/ brain damage
- Venous/ bridges veins.
- highly associated with trauma
- LOC + No lucid interval >> high mortality R
- Crescentic & hyperdense at non-c CT + Brain damage / laceration
- Wide spread / sutures >>> associated with shifts & increase ICP
- Tx :

  Large Craniotomy, evacuation & control the source of bleed

  Or try to reduce ICP& monitor it & maintain PP & ventilation, diuresis

~ **Acute Infantile**

- Fall in <2 yr / bridge vein
- Generalized Contusion/ bilateral SDH
- Tx : repeated craniotomy & evacuation

  Or shunt to peritoneum /+ anticonvulsant

  if persistent type

Intracerebral/ellar

- contusion
- No ICP change or shift
- observe/ evacuate

SAH

- codeine ph for headache

2. Late complications

Chronic SDH

-No trauma/ headache+ alter.
Mental function/ language/ weakness.
-in Elderly not taking anticoagulant, alcoholic.
- hypodense at CT >> CSF / osmotic activity.
- Tx :

  Neurological damage/ thick>1 cm >> surgically burr holes

  Left a drain for 48 hrs ++ remove the rigid membrane of the hematoma/ craniotomy and excision.

  If re-accumulation of fluid >> shunt to peritoneum

Hydrocephalus.

- due to blockage CSF /SAS.
- specially if No recovery.
- communicated & discovered in CT
- Tx : peritoneal shunting / drain

Epilepsy.

-Early/ intermediate/ late.
- more in children / trauma.
- early/ intermediate >> prophylactic anticonvulsant.
- Risk factors: GCS<10 , hypovolemic sh. Intracranial H. Depressed fx, amnesia > 24 hrs , neurological sign.

PTS

- biochemical change/ axonal damage
- Headache, difficulty in concentration, memory disturbances, emotional d. & personality change, insomnia
- psychological assessment, analgesia should improve within 12 months.