HEAD INJURIES (2)

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COMPLICATIONS OF HEAD INJURIES

- **EARLY**
  - HYPONATRAEMIA
  - INTRACRANIAL HEMORRHAGE/HEMATOMA
  - CSF LEAKS
  - EPILEPSY

- **LATE**
  - HYDROCEPHALUS
  - CHRONIC SUBDURAL HEMATOMA
  - EPILEPSY
  - POST TRAUMATIC SYNDROMES

SECONDARY EVENTS

HYPOXIA

It is a decrease in oxygen supply to the brain tissue.

One of the most common and most preventable causes of patient deterioration after primary injury.

Can be caused by:

1. Presence of airway obstruction.
2. Acute respiratory distress syndrome.
3. Central respiratory depression.
4. Chest injury as a part of multi-trauma.
5. Unobserved epileptic attack.
6. Shock state.

SECONDARY EVENTS

ISCHAEMIA

Poor tissue perfusion with impaired cellular metabolism. This is usually due to blood loss.

Hypovolemic shock in neurosurgery is rare in adults except with severe scalp laceration or associated other system injury.

However; it could happen in enfants in subgaleal hematoma or subdural hematoma due to the small volume of their blood

SECONDARY EVENTS

BRAIN EDEMA

- **VASOGENIC**: Problem in BBB
- **CYTOTOXIC**: Problem in Sodium Potassium pump
- **OSMOTIC**: Problem in blood osmolality
- **INTERSTITIAL**: Problem in CSF brain Barrier

SECONDARY EVENTS

CYTOTOXIC EDEMA

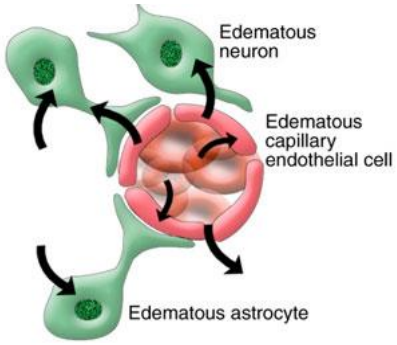
In this type of edema; the BBB remains intact.

This edema is due to the derangement in cellular metabolism resulting in inadequate functioning of the sodium / potassium pump in the glial cell membrane.

As a result; there is cellular retention of sodium and water.

SECONDARY EVENTS

CYTOTOXIC EDEMA



CT without contrast showing edema of both territories supplied by the internal carotid arteries

SECONDARY EVENTS

INTERSTITIAL EDEMA

Here the problem is in the CSF Brain Barrier which is the ependymal lining of the ventricles. It occurs in hydrocephalus

CSF seeps outside of the ventricle and remains close to it. It has no proteins in it.

MRI FLAIR sequence showing edema as periventricular hyperintense signal (arrow)

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EARLY COMPLICATIONS

ELECTROLYTE DISTURBANCE: HYPONATRAEMIA

Due to low sodium levels as a consequence of ADH secretion in response to trauma

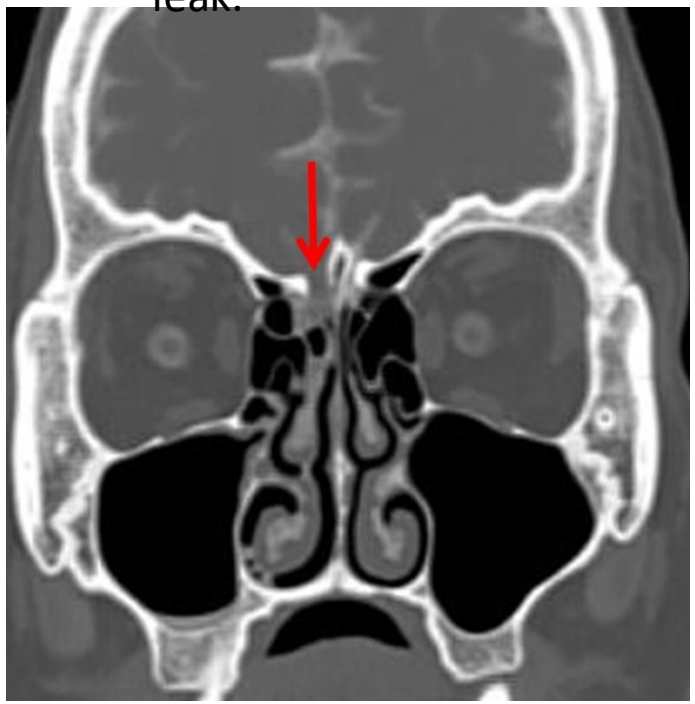
May lead to confusion, nausea and lethargy. If the levels drop to 120 mmol/l it will lead to seizures, and if below 105 mmol/l to status epilepticus.

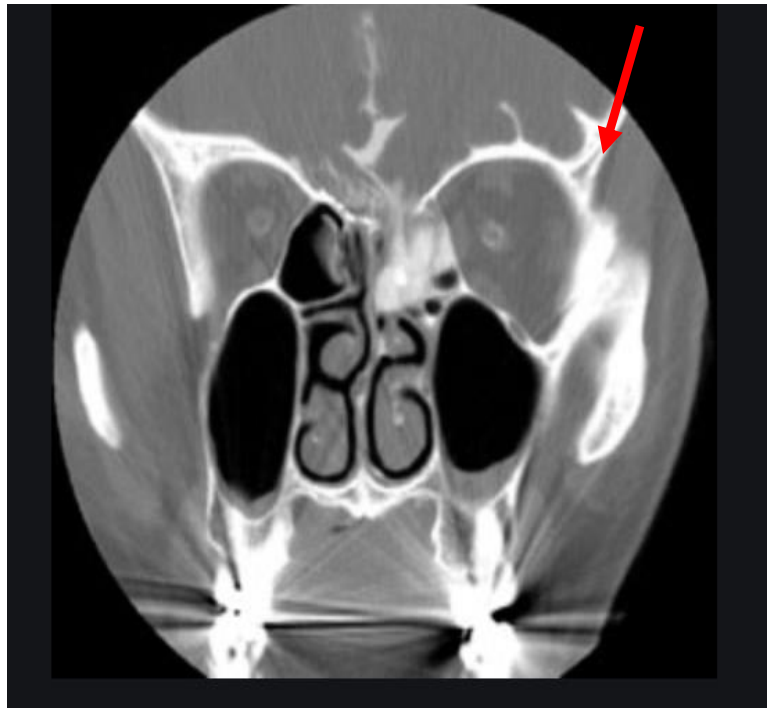
Treated by slow infusion of normal saline or occasionally hypertonic saline depending on the sodium level, the patient age and weight, otherwise; pontine myelinolysis develops.

EARLY COMPLICATIONS

CEREBRO-SPINAL FLUID LEAKS:

High resolution coronal CT with contrast (Cisternogram)showing the site of the CSF leak.





EARLY COMPLICATIONS

CEREBRO-SPINAL FLUID LEAKS

Requires a fracture and a dural tear

- Types
  - CSF Rhinorrhea if from the nose
  - CSF Otorrhea if from the ear
- Diagnosed and suspected by:
  - Leaking fluid confirmed by beta 2 transferrin
  - Presence of pneumocele
  - Development of meningitis

❑ 80% of cases stop spontaneously within 2 weeks

EARLY COMPLICATIONS

CEREBRO-SPINAL FLUID LEAKS:

CSF OTORRHEA

- Occurs in 2% of patients
with basilar temporal fractures
- 95% usually dries up in 2 weeks
- There is 4% risk of infection

EARLY COMPLICATIONS

INTRACRANIAL HEMATOMAS

There are 4 types:

1. Extradural hematoma
2. Subdural hematoma
3. Subarachnoid hemorrhage
4. Intracerebral hematoma

EARLY COMPLICATIONS

INTRACRANIAL HEMATOMAS: EXTRADURAL HEMATOMA

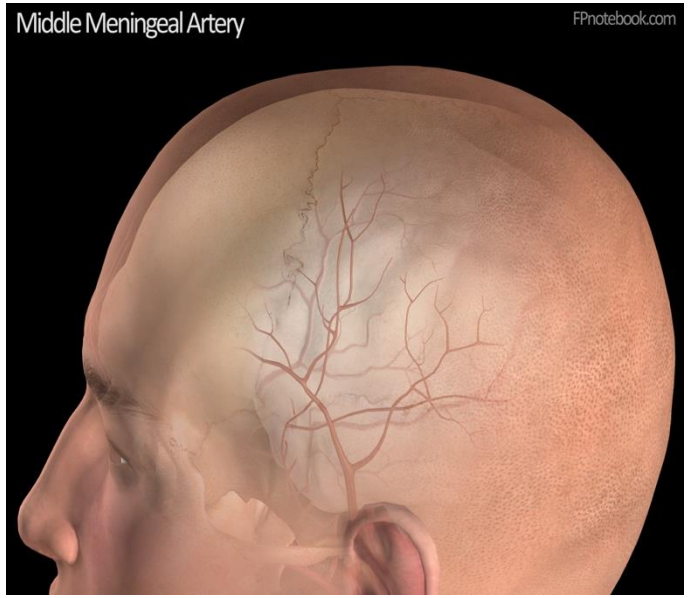
Between dura and skull bone

- Arterial mainly MMA
- In adults 90% associated with fractures
- Only 25% of children have fractures
- Mostly within 6 hours of the injury (stem of MMA)
- 6-24 hours (from anterior branch of MMA)
- 24-36 hours (from posterior branch of MMA)

EARLY COMPLICATIONS

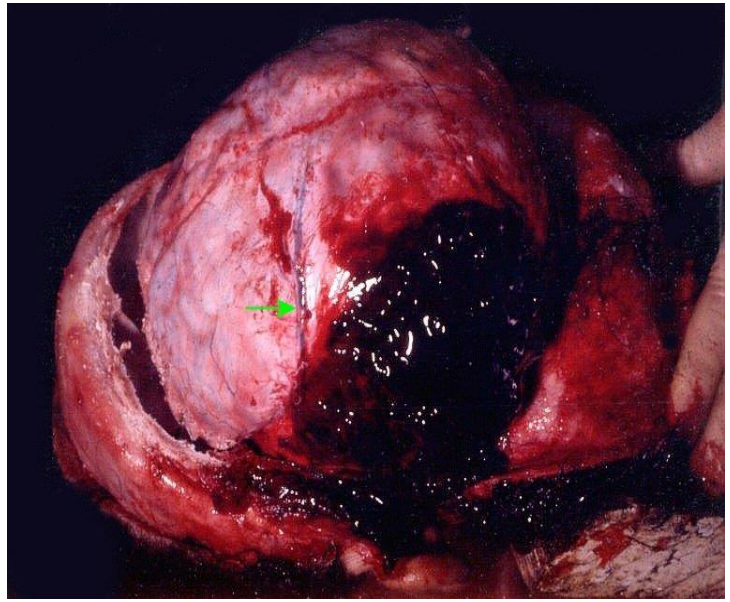
INTRACRANIAL HEMATOMAS: EXTRADURAL HEMATOMA

Surface anatomy of MMA.



Linear fractures of the skull.

Postmortem of an EDH



EARLY COMPLICATIONS

INTRACRANIAL HEMATOMAS: EXTRADURAL HEMATOMA

Two clinical presentations:

1. Classical 25%
2. Non classical 75%

EARLY COMPLICATIONS

EXTRADURAL HEMATOMA

CLASSICAL PRESENTATION

Trauma → LOC (concussion) → Wake up (lucid interval)

↑

Investigations

- IF THERE IS TIME DO CT
- IF NO TIME DO SURGERY

Treatment

- Burr-holes
- Craniotomy or Craniectomy

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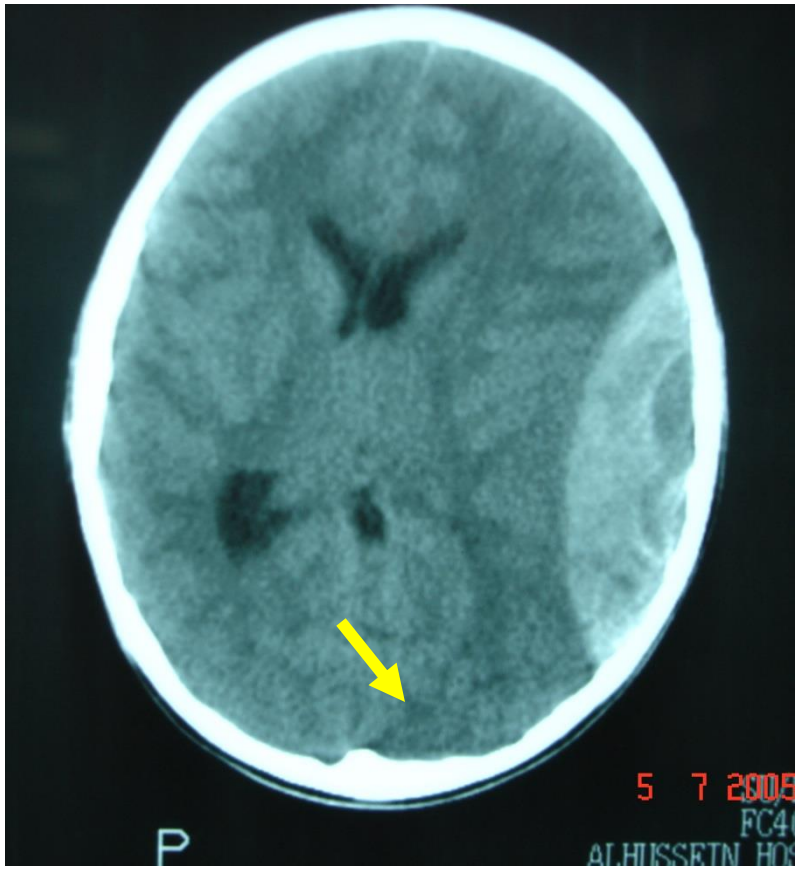
LOC (herniation) Leads to ICP and neurological damage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EARLY COMPLICATIONS

INTRACRANIAL HEMATOMAS: ACUTE SUBDURAL HEMATOMA

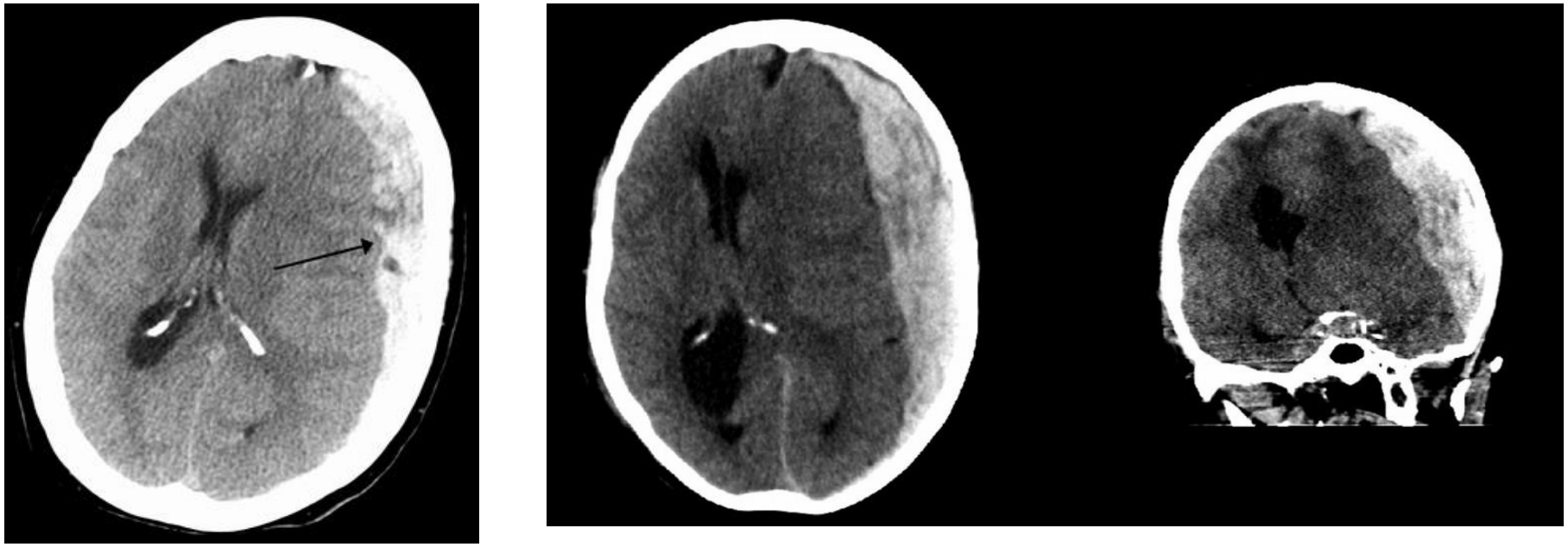
- Between brain and dura
- Originates mainly from bridging veins and brain vessels
- If small may become chronic
- Usually part of severe brain laceration and injury due to direct trauma, acceleration deceleration

- Presents like a non-classical EDH but the picture is over-shadowed by the TBI

EARLY COMPLICATIONS

INTRACRANIAL HEMATOMAS: ACUTE SUBDURAL HEMATOMA

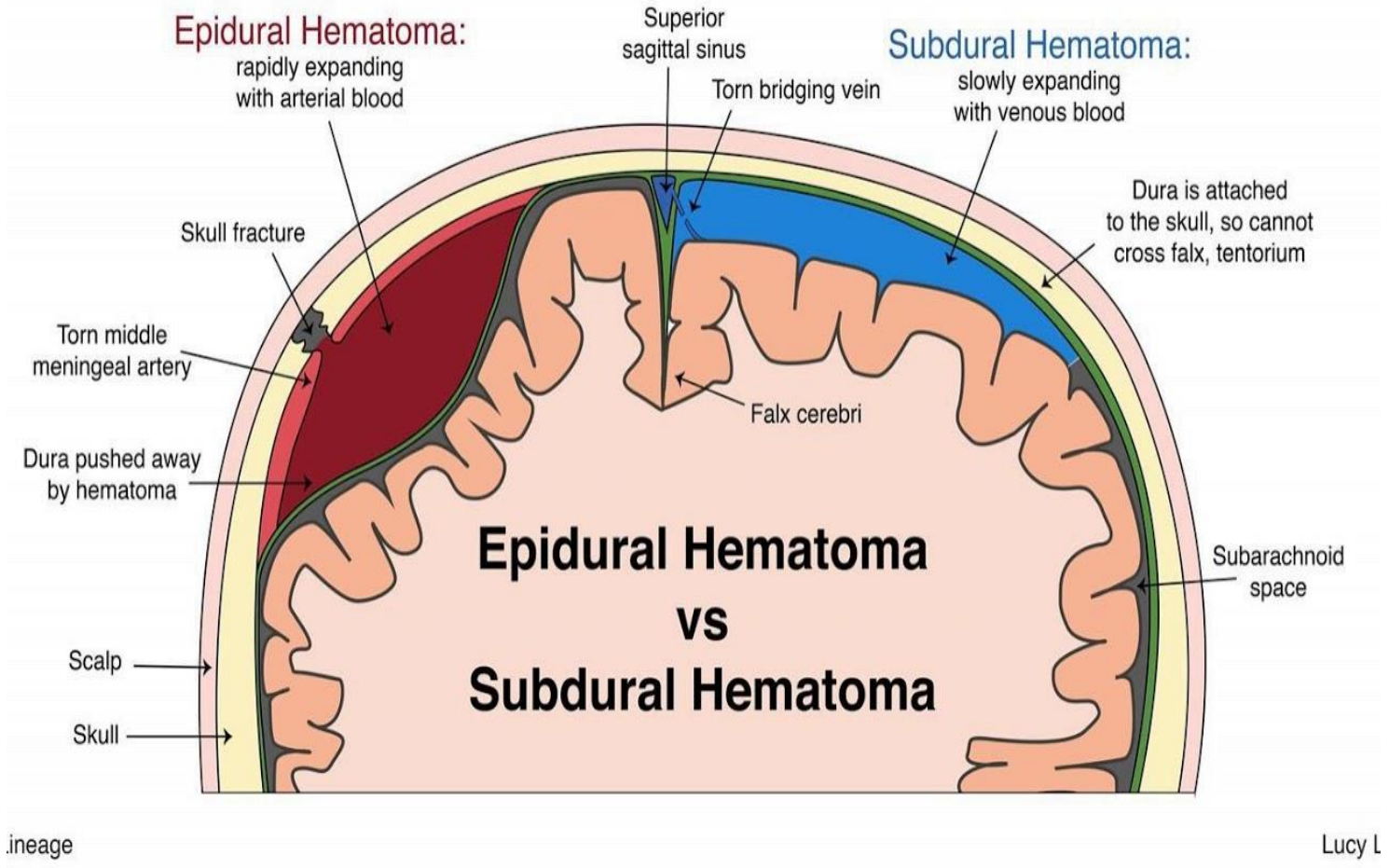
Imaging: Confirmed by a non contrasted CT



Non contrasted CT showing the hyperdense semilunar or crescentic appearance of an acute subdural hematoma

EARLY COMPLICATIONS

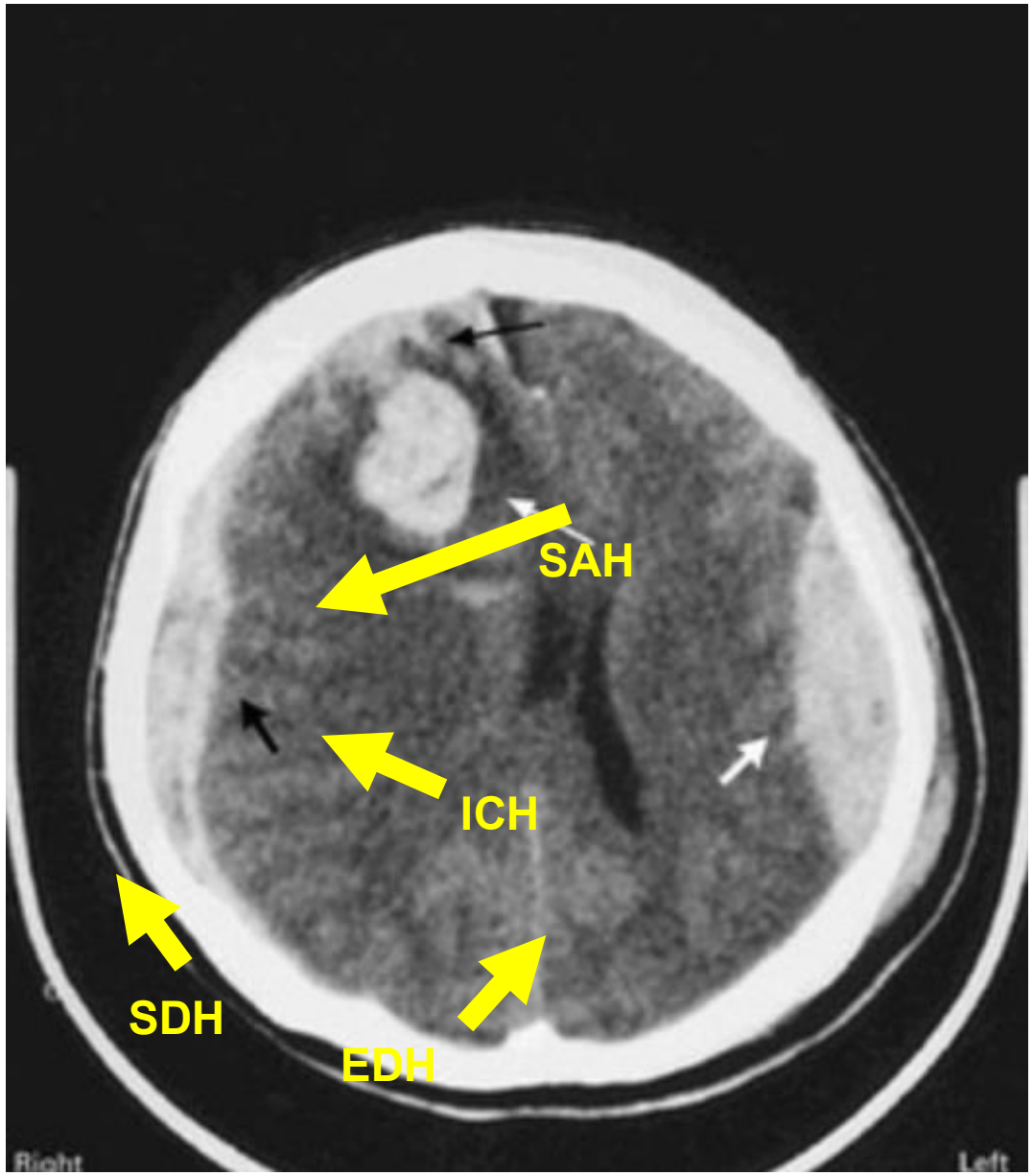
INTRACRANIAL HEMATOMAS: ACUTE SUBDURAL HEMATOMA
EXTRA Vs SUBDURAL HEMATOMA



EARLY COMPLICATIONS

INTRACRANIAL HEMATOMAS: SUBARACHNOID HEMORRHAGE

- A very common occurrence
- May lead to hydrocephalus by blocking the arachnoid granulations and prevent absorption.
- Could be seen on CT as a separate entity or accompanying other injuries.
- Treatment:
  - Analgesia for headache
  - Treat the hydrocephalus if it develops


SAH
ICH
SDH
EDH
Right
Left

LATE COMPLICATIONS

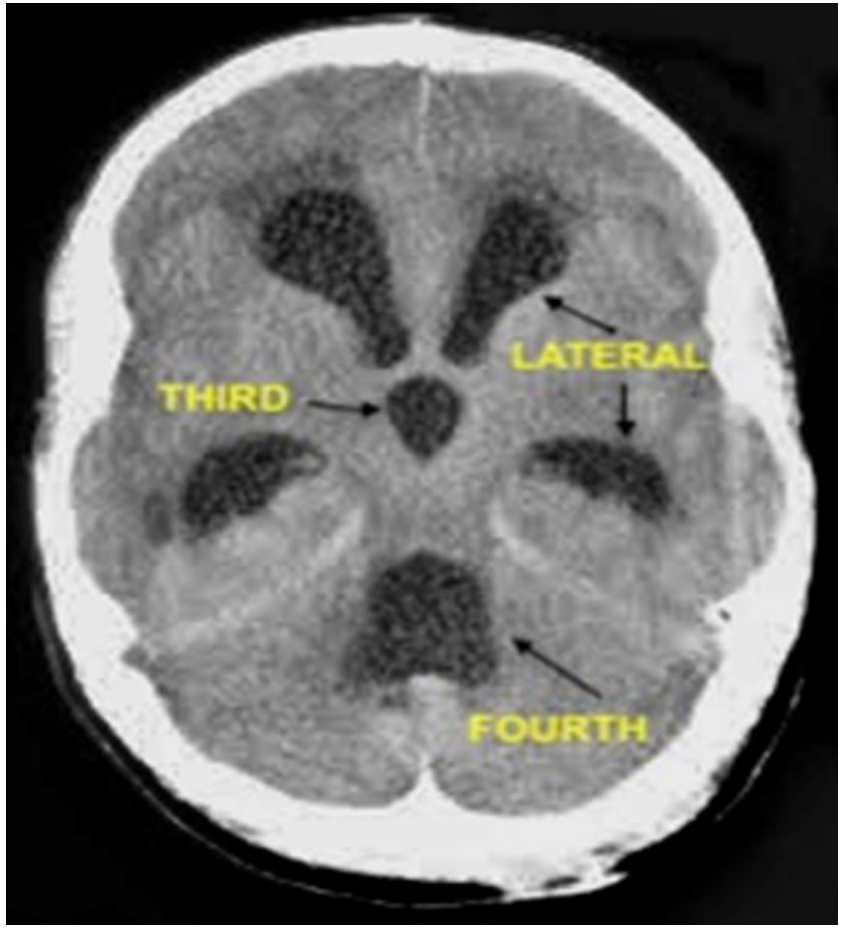
CHRONIC SUBDURAL HEMATOMA

- There is usually no history of trauma, or a minor trauma 6 weeks earlier.
- The patient is usually an elderly person mostly taking anticoagulants
- Usually; the complaint starts by headache then memory disturbances, unsteadiness. Later neurological deficits may appear and occasionally incontinence of urine.
- The reason for delay in presentation is for the clot to enlarge by absorbing CSF into the organized clot which is surrounded by a semipermeable membrane (THE OSMOTIC THEORY)

LATE COMPLICATIONS

HYDROCEPHALUS

- DUE TO BLOOD IN CSF
- USUALLY OF COMMUNICATING TYPE
- SHOULD BE SUSPECTED IN DELAYED RECOVERY
- MAY; LEAD TO:
  - HEADACHE
  - DETERIORATION IN MENTAL FUNCTION
  - ATAXIA
  - INCONTINENCE
- MAY REQUIRE SHUNTING



LATE COMPLICATIONS

EPILEPSY

TWO CATEGORIES

- **EARLY**
  - WITHIN FIRST WEEK OF INJURY
  - 5% OF CASES
  - 10% IN CHILDREN BELOW 5 YEARS

- **LATE**
  - AFTER FIRST WEEK OF INJURY
  - 5% OF CASES
  - 50% DEVELOP DURING FIRST YEAR

POST CONCUSSION SYNDROME

- COLLECTION OF SYMPTOMS DUE TO MINOR HEAD TRAUMA
- CONTROVERSIAL WHETHER ORGANIC OR PSYCHOLOGICAL

SYMPTOMS:

- SOMATIC:
  - HEADACHE
  - DIZINESS
  - VISUAL DISTURBANCES
  - HEARING PROBLEMS
  - BALANCE DIFFICULTIES
- COGNITIVE:
  - CONCENTRATION DIFFICULTY
  - DEMENTIA
- *PSYCHOLOGICAL:*
  - *EASY FATIGABILITY*
  - *LOSS OF LIBIDO*
  - *EMOTIONAL DISTURBANCES*
  - *PERSONALITY CHANGES*
  - *INSOMINIA*
  - *PHOTOPHOBIA*