Intracranial Hematomas

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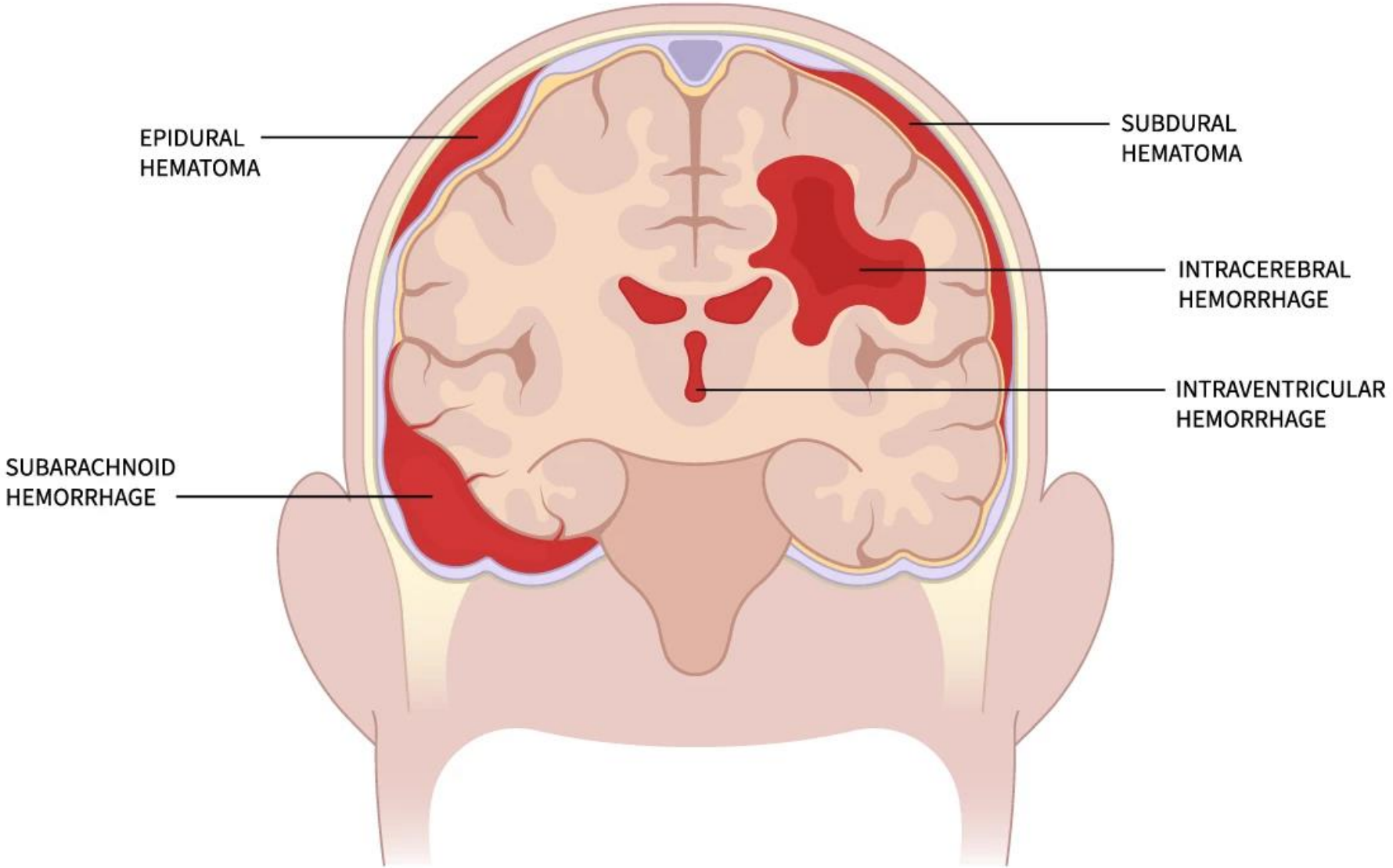
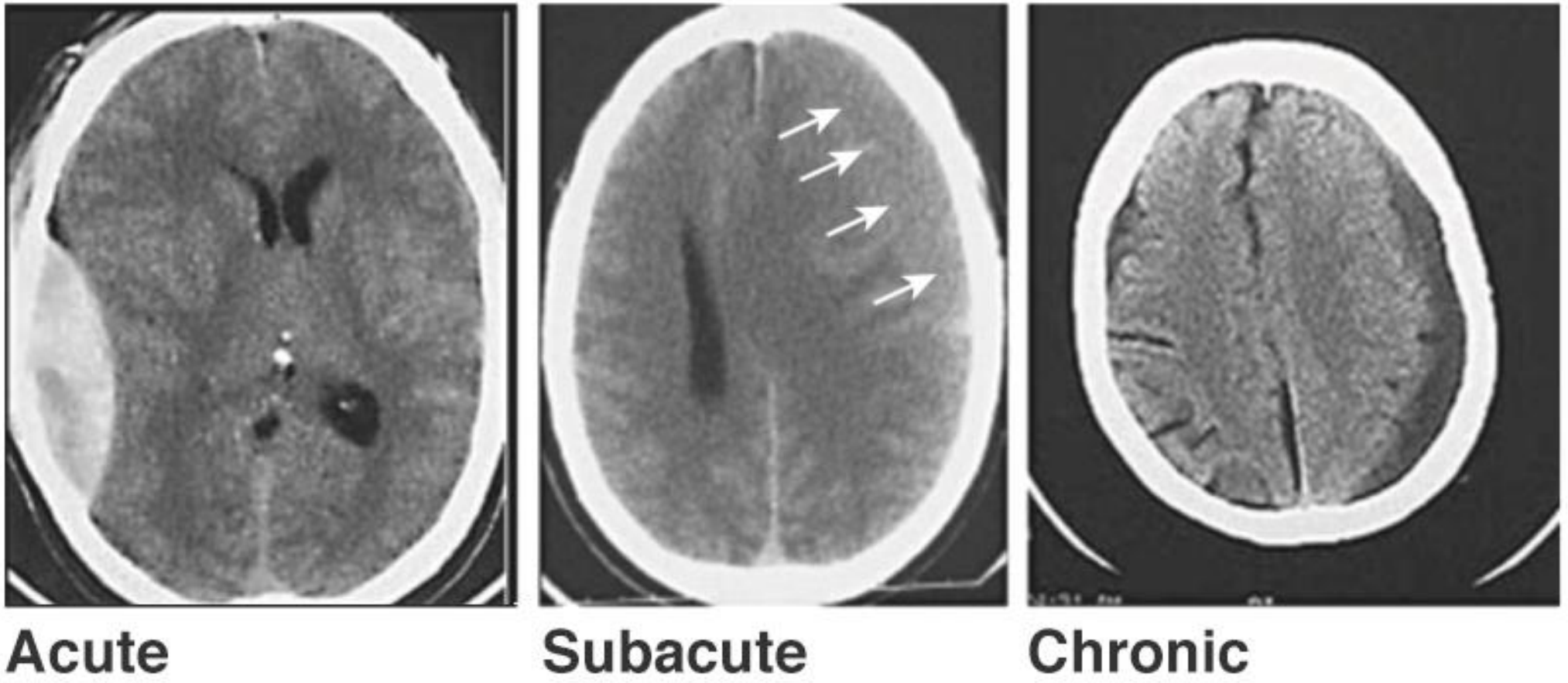
Learning Objectives

- Classify intracranial hematomas as epidural, subdural, and intracerebral.
- Describe the clinical presentation and imaging features of different patterns of intracranial bleeding.
- Discuss the medical and operative management of epidural hematomas.
- Discuss the different types of subdural hematomas and differences in their management.
- Enumerate the most common etiologies and locations of intracerebral hematomas.

Patterns of Intracranial Hemorrhage



Age of Blood on Head CT Scan

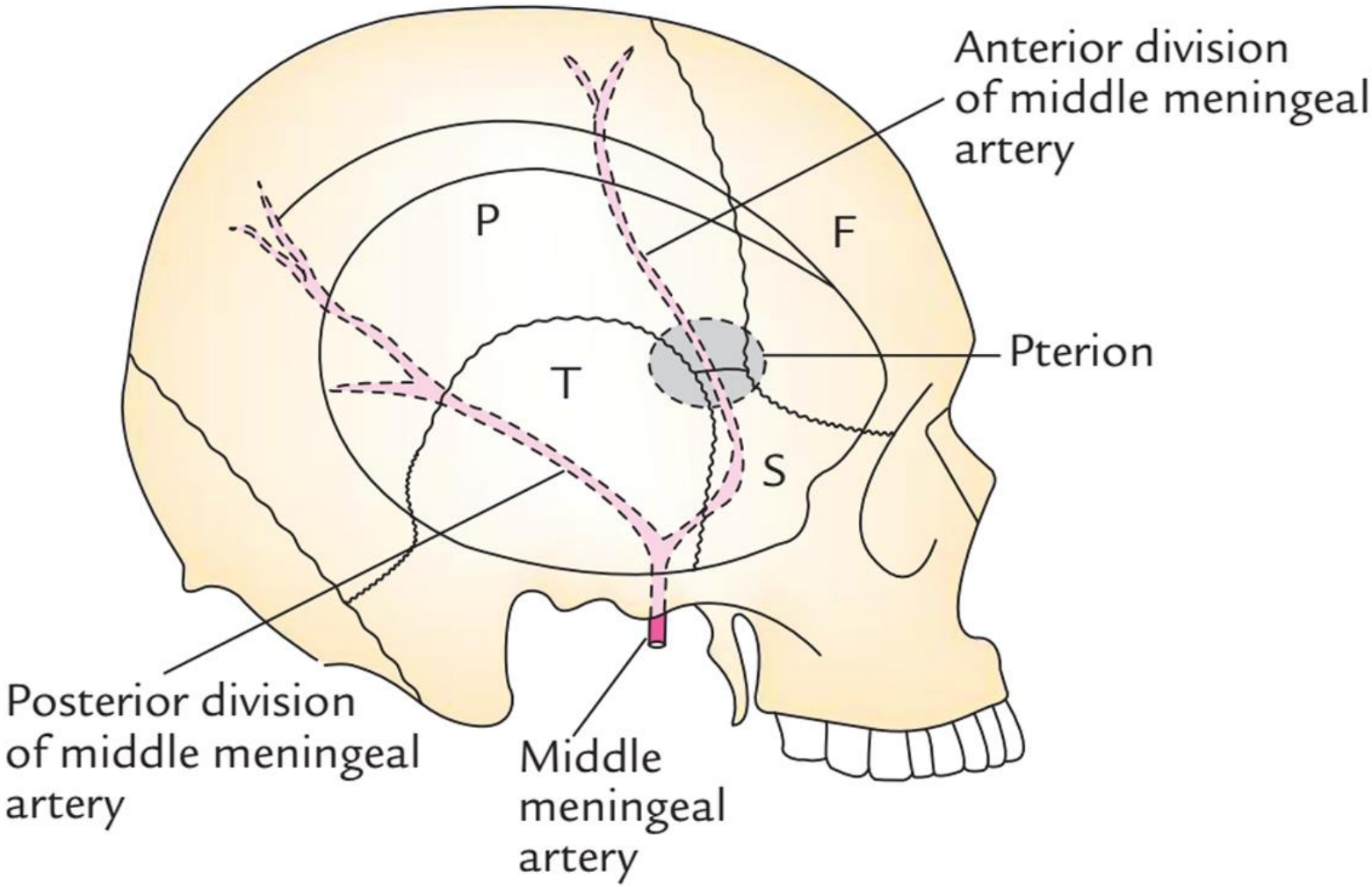


Acute Subacute Chronic

Extradural Hematoma (EDH)

- A neurosurgical emergency.
- Mortality 10-20% in traumatic EDH.
- Can occur in the context of apparently minor trauma.
- Usually associated with skull fractures.
- Most commonly located underlying the parietal bone.
- Common sources of bleeding:
  - Arterial; commonly middle meningeal artery.
  - Venous
  - Dural sinus

Extradural Hematoma (EDH) - Presentation



Extradural Hematoma (EDH) - Presentation

- Commonly preceded by low energy blunt trauma.
- Initially presents with loss of consciousness followed by a “lucid interval” in ~30% of cases.
- After minutes to hours, patients develop rapid deterioration:
  - Loss of consciousness
  - Contralateral hemiparesis
  - Ipsilateral mydriasis
- Untreated cases quickly develop signs of brain compressions and herniation.

Extradural Hematoma (EDH) - Imaging

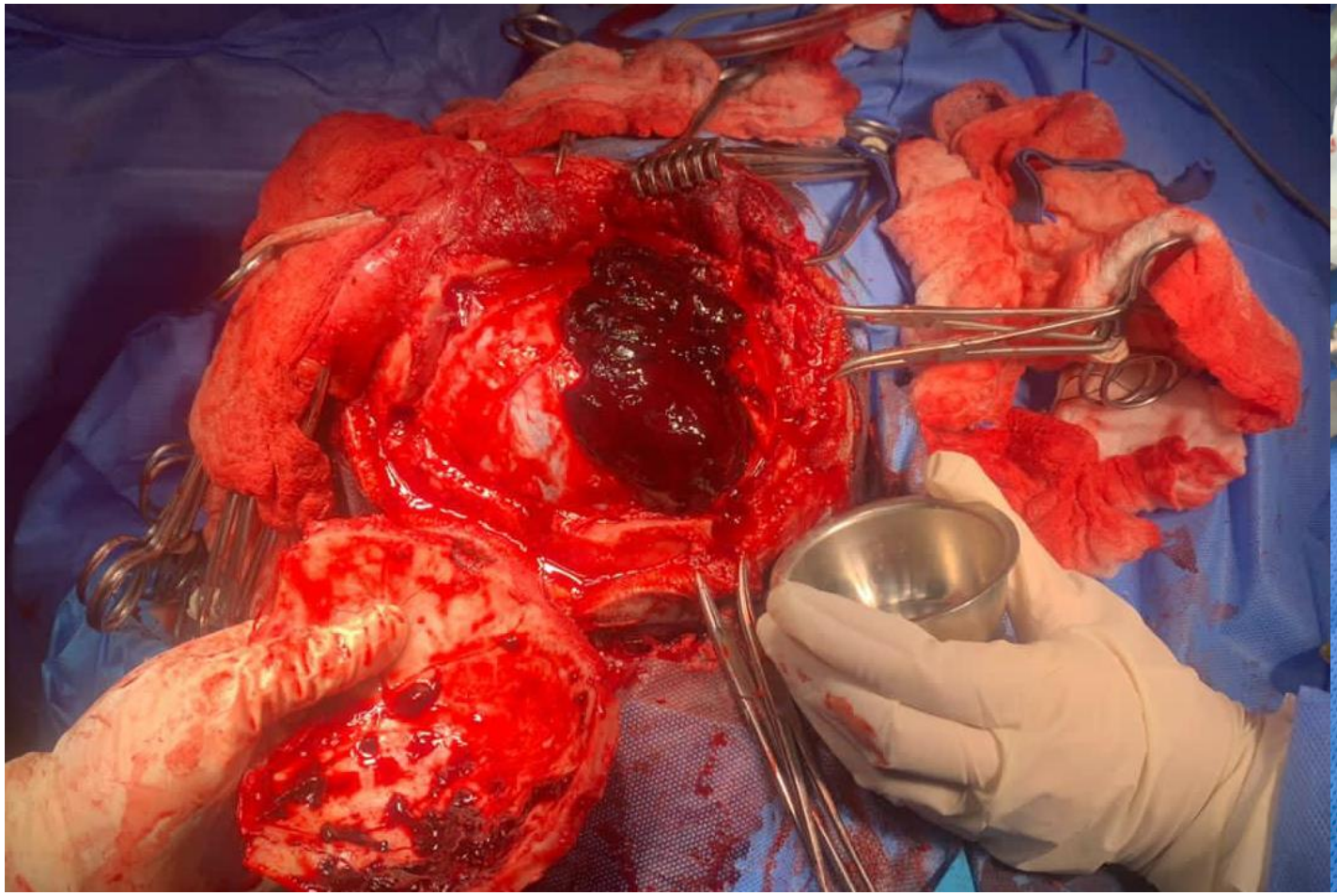
- On head CT, EDHs appear as lentiform (biconvex) hyperdense lesion between bone and brain.
- Does not cross dural suture lines.
- May cause mass effect, with midline shift and compression of surrounding brain.
- Areas of mixed density (swirl sign) suggest active bleeding.
- A concomitant overlying skull fracture can usually be noted ipsilaterally.

Extradural Hematoma (EDH) - Imaging

Extradural Hematoma (EDH) - Management

- Primary treatment of EDH is prompt surgical evacuation using a craniotomy over the location of hematoma.
- Small EDH with no midline shift in a conscious patient without focal deficits may be managed conservatively, with observation and serial CT scanning.
- Any deterioration requires urgent surgical intervention

Extradural Hematoma (EDH) - Management



Subdural Hematoma (SDH)

- Most common intracranial bleeding pattern (~24%).
- Classified according to duration into:
  - Acute SDH (< 3 days)
  - Subacute SDH
  - Chronic SDH (> 21 days)
- Acute SDH is usually associated with high energy trauma, and is accompanied by significant primary brain injury (lacerations, contusions, edema, DAI, etc.).
- Most commonly arises from injury to cortical vessels.
- High mortality rate in severe injuries (~50%).

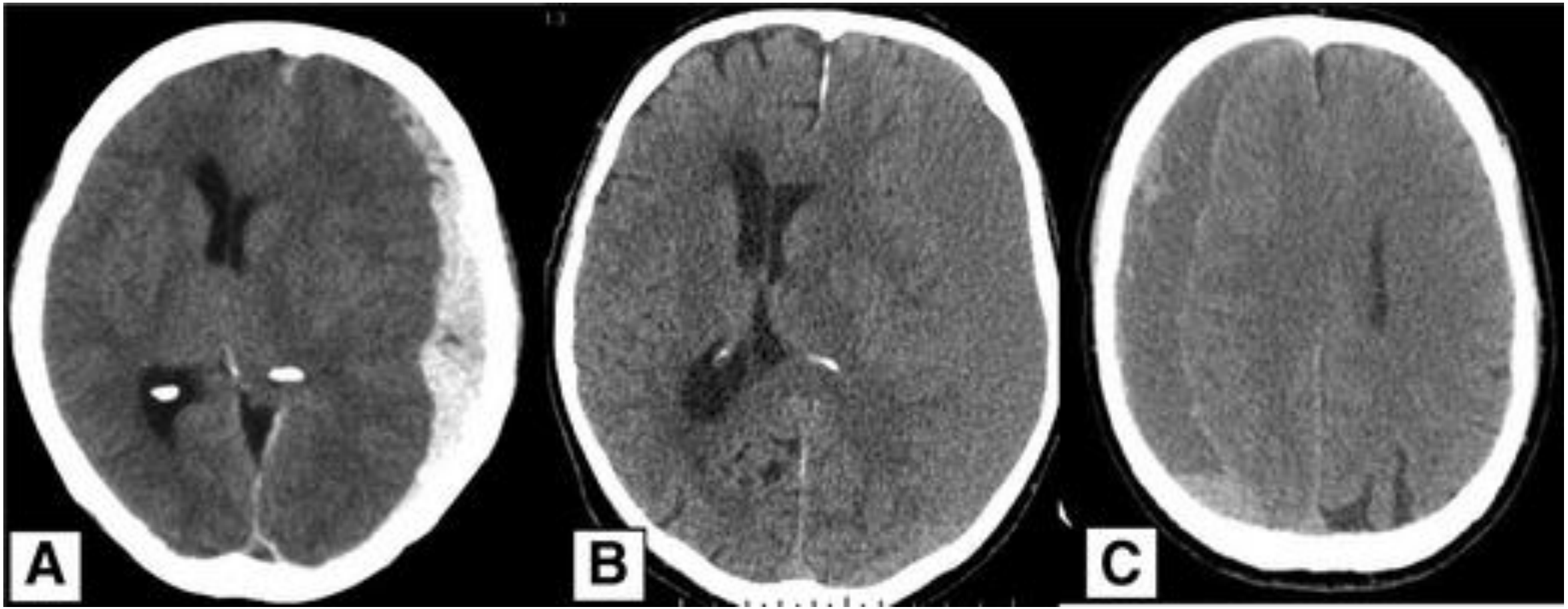
Subdural Hematoma (SDH) - Presentation

- Acute SDH:
  - More common in young adults.
  - Given the significant co-existing primary brain injury, the level of consciousness is impaired at presentation.
  - Further deterioration of LoC is possible as the hematoma expands.
- Chronic SDH:
  - Mostly in the elderly.
  - History of a recent fall in a patient on anticoagulation.
  - Headache, drowsiness, neurological deficits.
  - Seizures.
  - May mimic dementia.

Subdural Hematoma (SDH) - Imaging

- Subdural hematoma can freely cross suture lines.
- Appears as diffuse concave collection overlying the brain.
- Other primary brain injuries may be noted.
- Appearance according to age of SDH:
  - Acute: hyperdense
  - Subacute: isodense
  - Chronic: hypodense

Subdural Hematoma (SDH) - Imaging

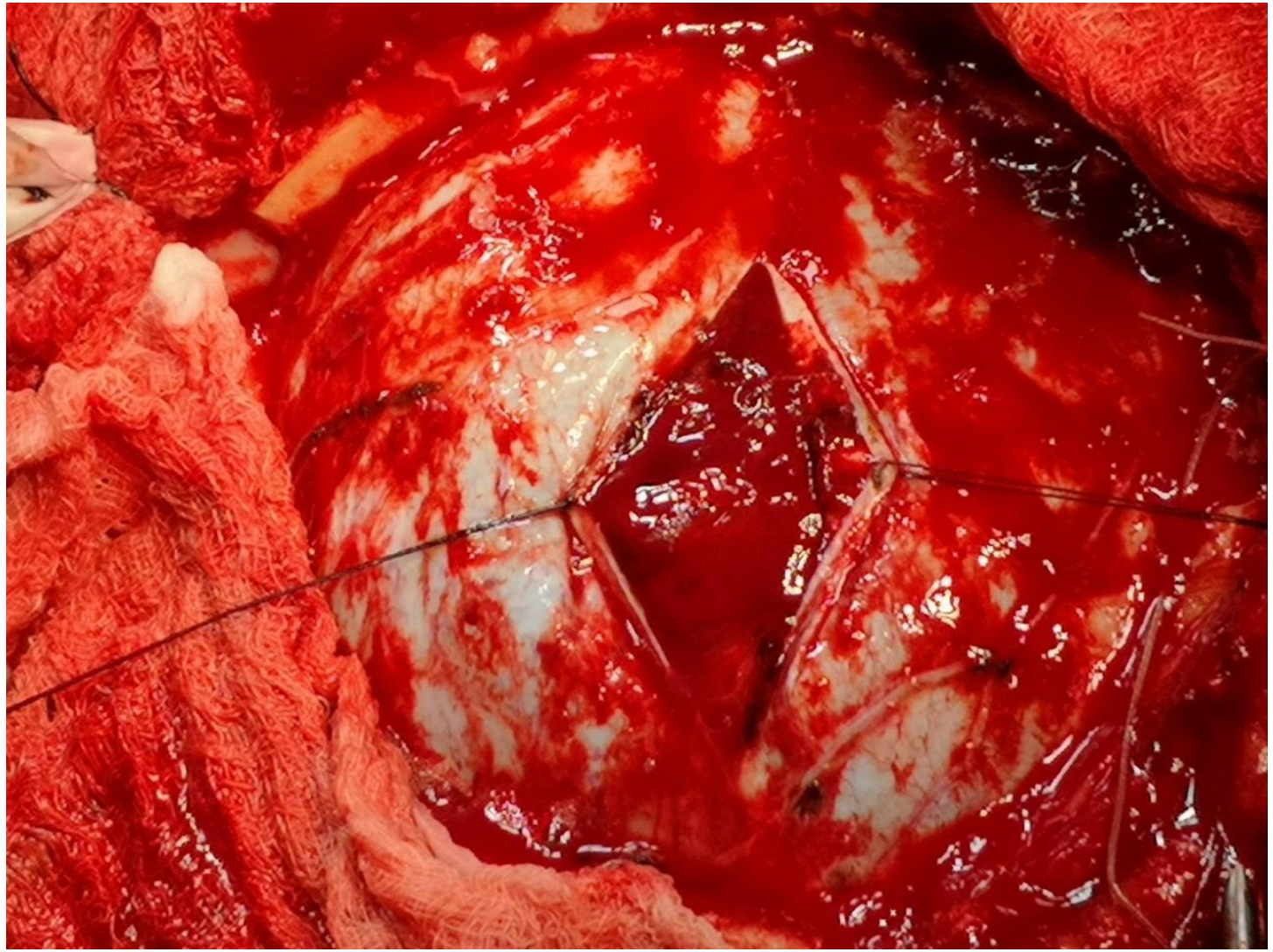


Subdural Hematoma (SDH) - Management

- Large acute SDH or acute SDH with significant midline shift require evacuation by craniotomy.
- Small acute SDH in neurologically intact patients may be managed conservatively under close observation.

- Chronic SDH can be evacuated with craniotomy, or drainage may be done using multiple burr holes with irrigation of the space.
- Underlying coagulopathies should be corrected.

Subdural Hematoma (SDH) - Evacuation



Subdural Hematoma (SDH) – Burr Hole Drainage

Intracerebral Hematoma (ICH)

- Accounts for ~15% of cases of stroke.
- Incidence 10 per 100,000 per year.
- Mortality rate of ~50% within 1 month in supratentorial ICH.
- Mortality rate up to 75% within 1 day in infratentorial ICH.

Intracerebral Hematoma (ICH) - Etiology

- Hypertensive ICH in up to 75% of cases.
- Other causes:
  - Vascular malformations – particularly spontaneous ICH in young adults
  - Trauma – requires high energy mechanism of injury
  - Bleeding diathesis
  - Tumors
  - IV drug abuse

Intracerebral Hematoma (ICH) - Locations

- Most common locations of hypertensive ICH:
  - Basal ganglia
  - Thalamus
  - Cerebellum
  - Pons
  - Midbrain
  - Lobar
- Traumatic ICH is commonly found in the frontal and temporal lobes, often associated with contusions.

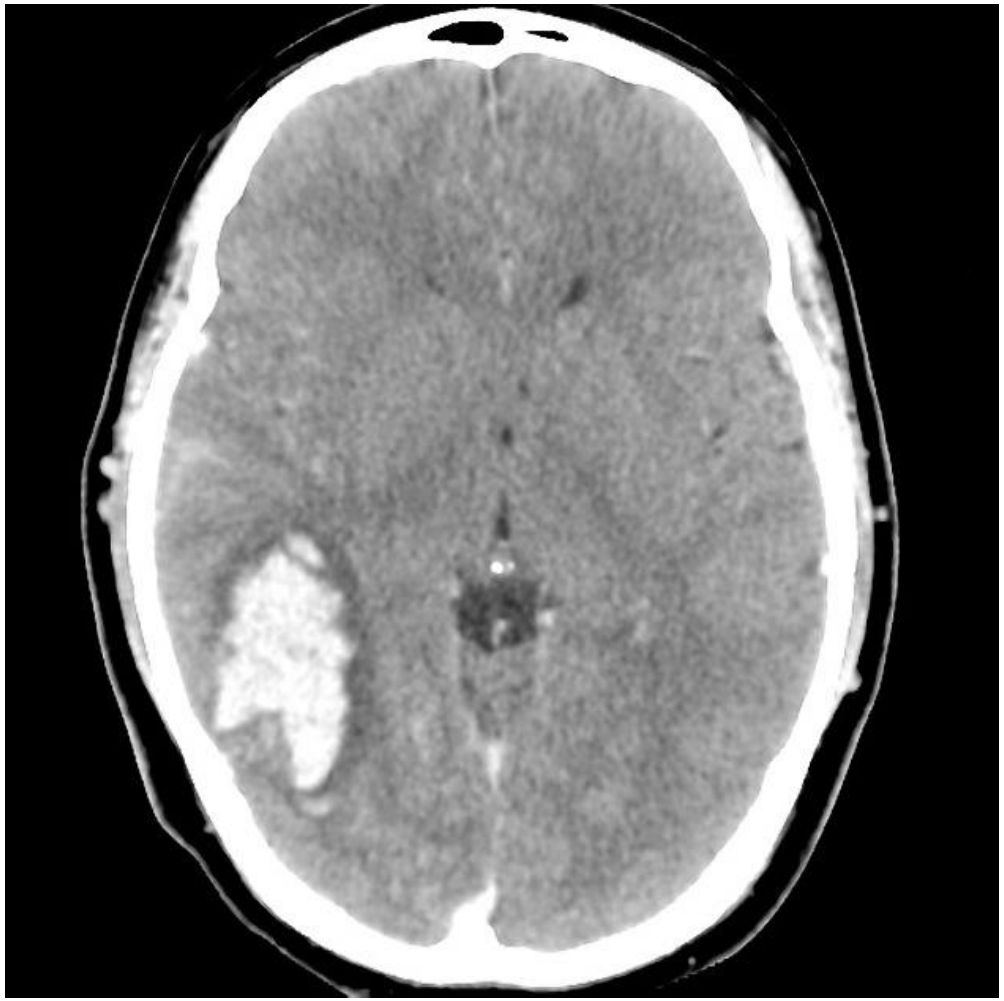
Intracerebral Hematoma (ICH) - Presentation

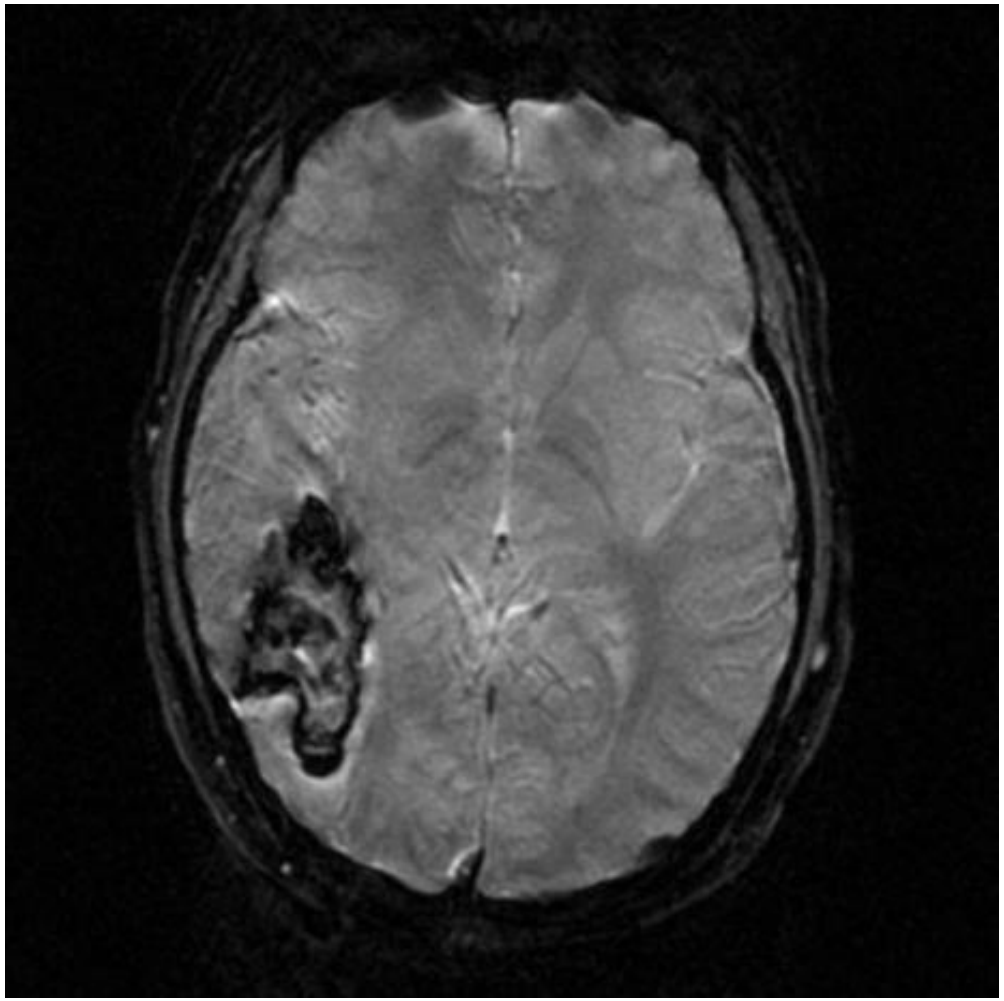
- Disturbed level of consciousness (DLoC)
- Headache
- Nausea, vomiting
- Seizures
- Cerebellar signs (posterior fossa ICH)
- Focal neurological deficits

Intracerebral Hematoma (ICH) - Imaging

- Head CT scanning is the gold standard for imaging intracranial bleeding.
- CT angiography or digital subtraction angiography (DSA) can help detect and characterize underlying vascular malformations.
- MRI is superior to CT scanning in detecting underlying structural lesions.

Intracerebral Hematoma (ICH) - Imaging





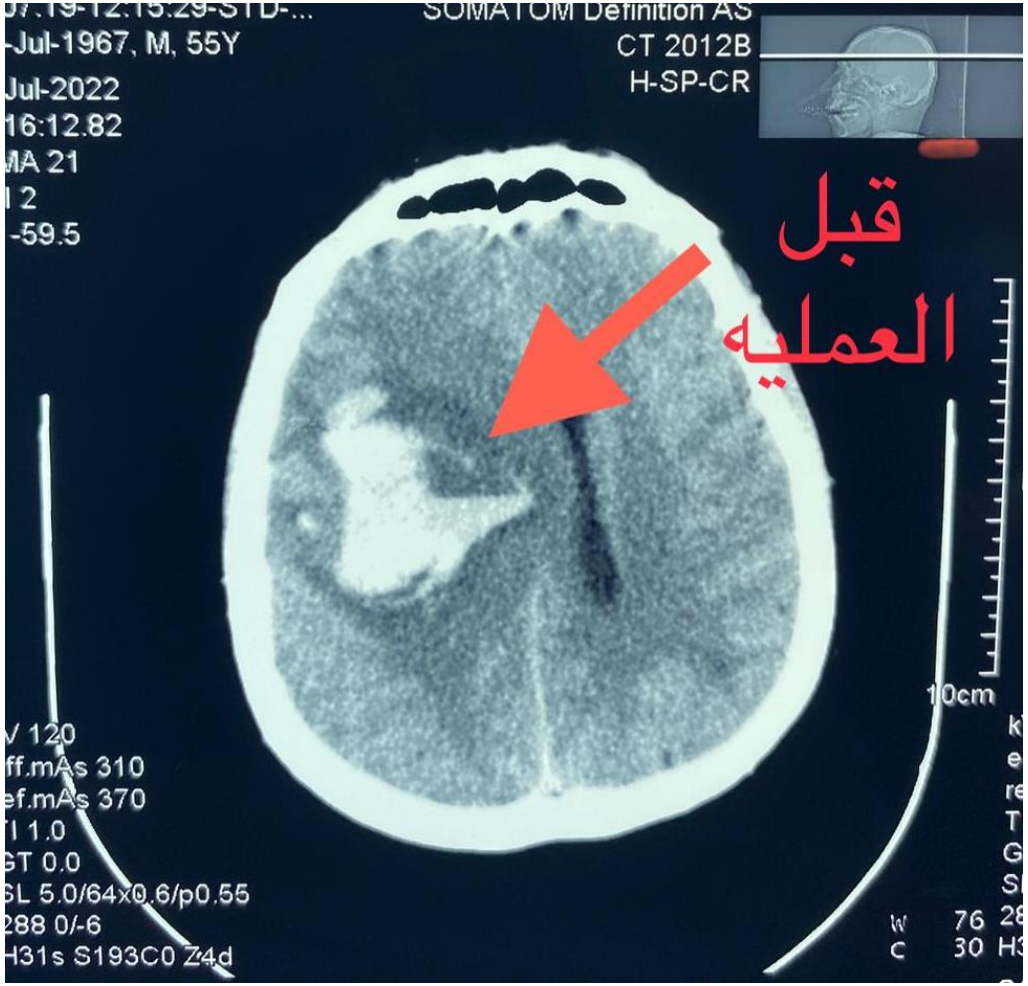
Intracerebral Hematoma (ICH) - Management

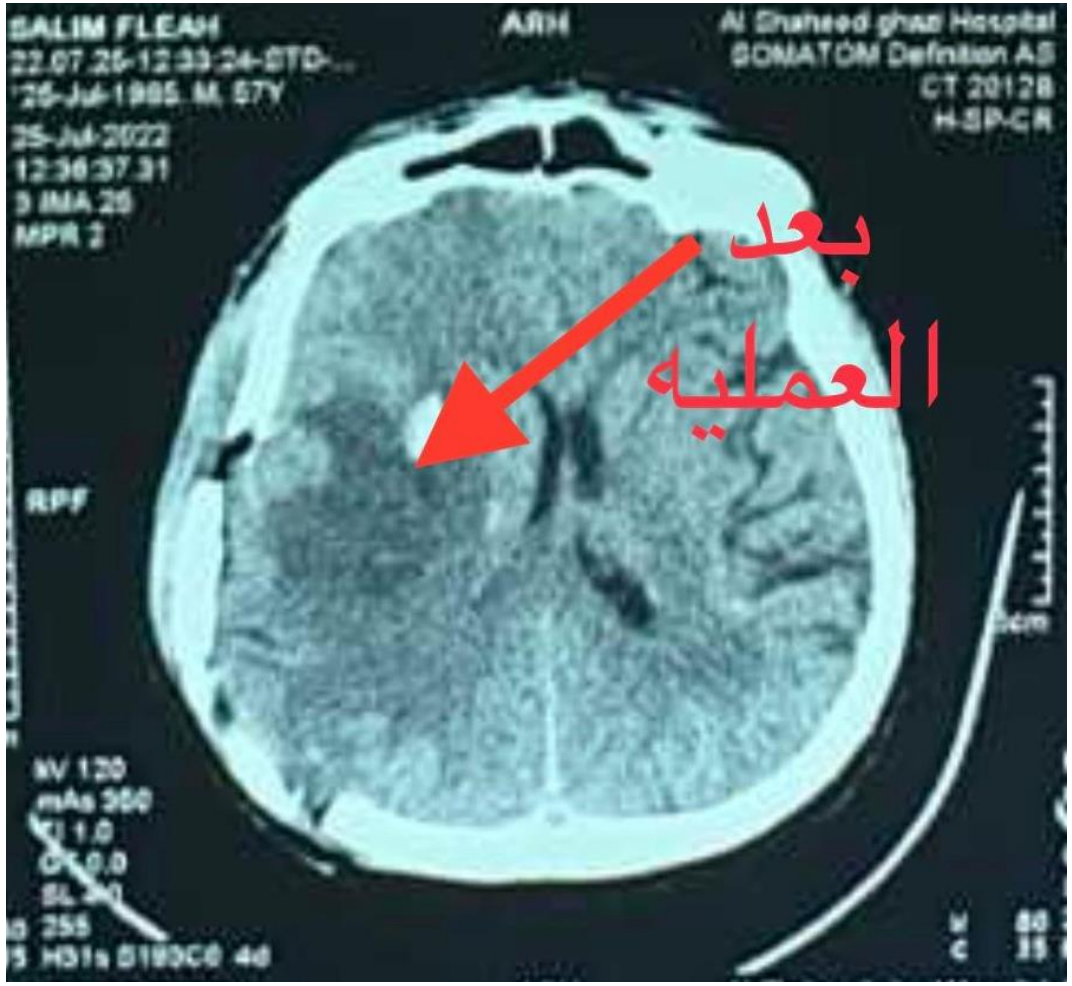
- Medical management focuses on blood pressure control and reducing the risk of rebleeding or hematoma expansion.
- Anticoagulants should be discontinued.
- Any coagulopathy should be reversed with agents like Vitamin K, FFP.
- In cases of hypertension, acute lowering of systolic blood pressure to 140 mmHg is considered sage.
- ICP monitor may be instated on clinical and radiological suspicion, and mannitol can be used appropriately.

Intracerebral Hematoma (ICH) - Surgery

- Surgical management of intracerebral hematomas is a hotly debated topic.
- No established guidelines for when to evacuate an ICH.
- Possible indications for surgical intervention:
  - Posterior fossa ICH with neurological deterioration, brainstem compression, or hydrocephalus.
  - Supratentorial hemorrhage with neurological deterioration
  - Supratentorial hemorrhage with GCS<8, midline shift, and refractory raise in ICP.

Intracerebral Hematoma (ICH) - Surgery





Thank You

For Your Time