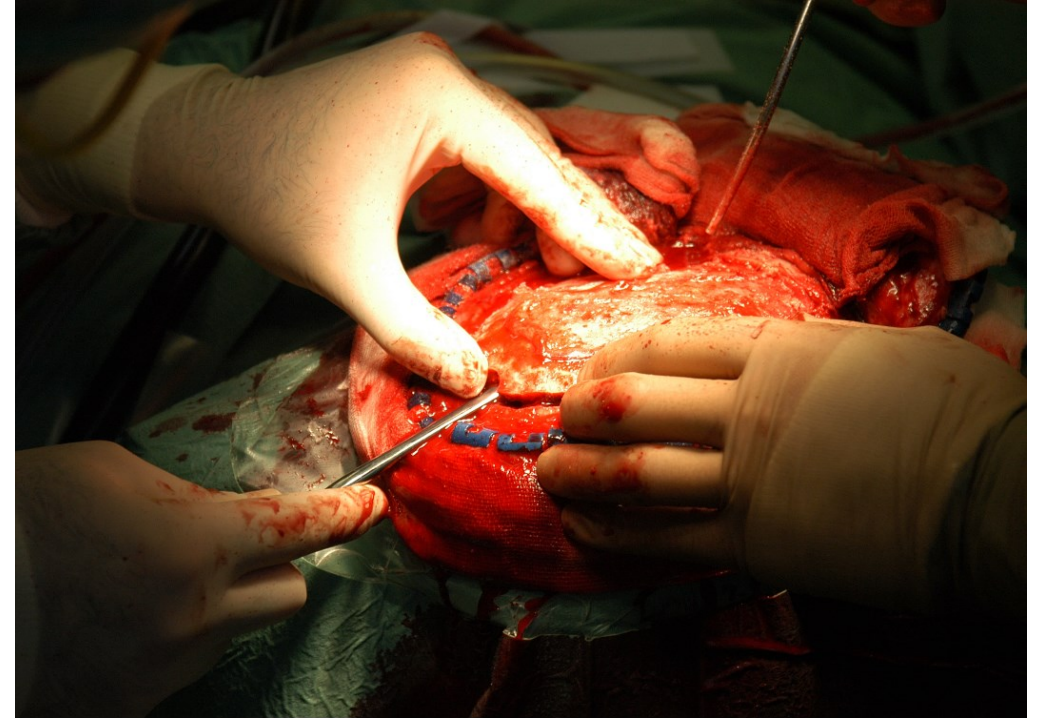


# Trauma Neuroradiology -a neurosurgical perspective



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## Neurotrauma

- **Trauma** is the most common cause of death in ages below 45 in the western world
- **Severe head trauma** represents 40% of traumatic deaths
- Patients with severe head trauma are a median of **35** yo and  $\frac{3}{4}$  are **male**

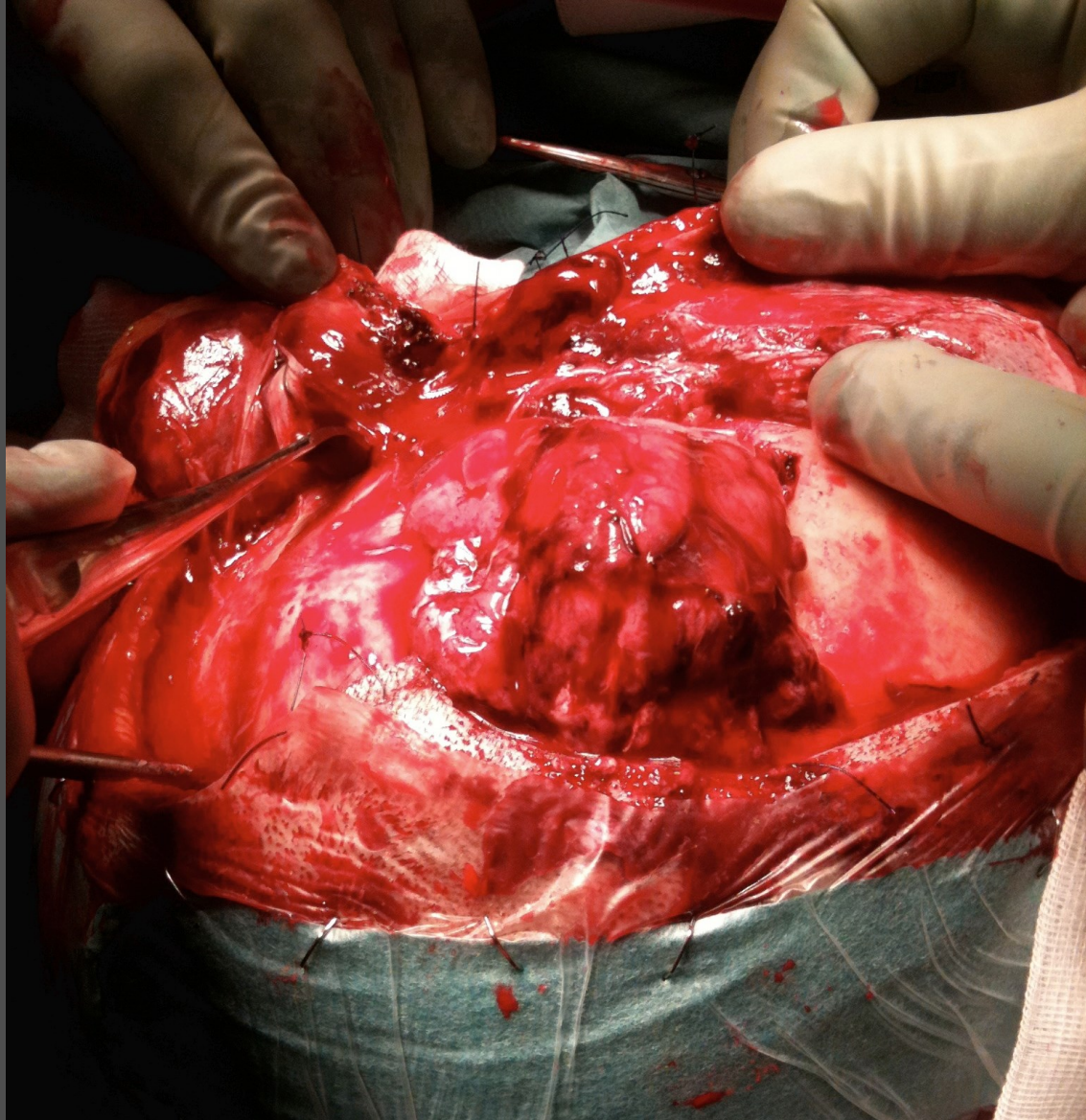
# Neurotrauma

- Hematomas
  - Epidural hematoma
  - Subdural hematoma
  - Contusions and ICH
  - Traumatic SAH
- Cerebral edema
- Cranial fractures
- CSF obstruction

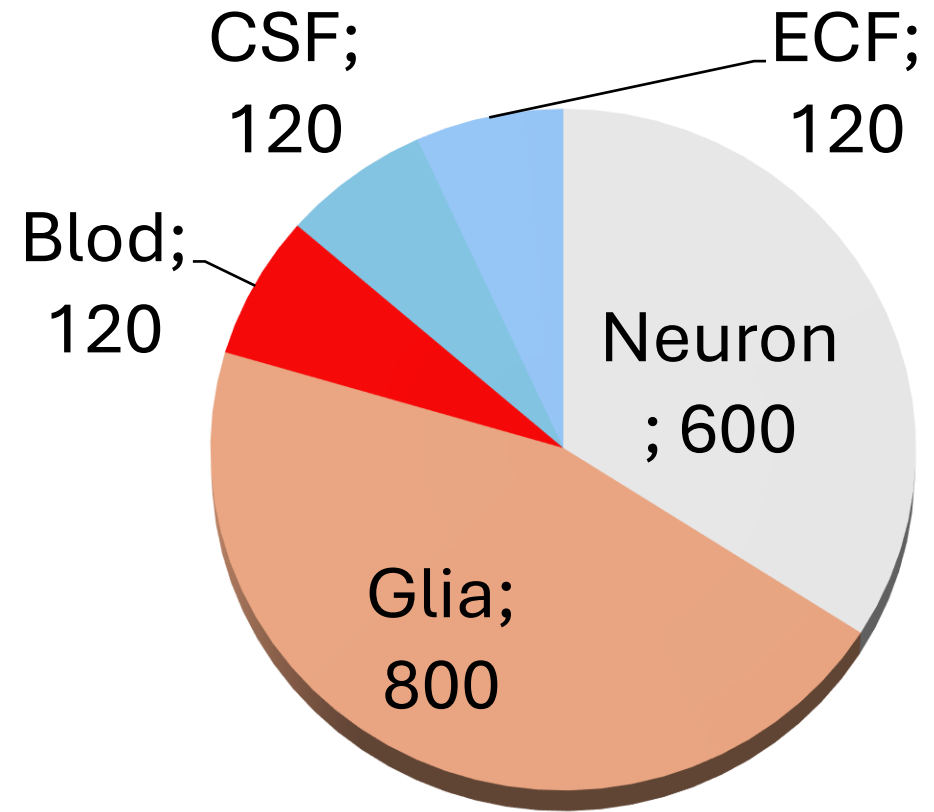


# Cerebral herniation

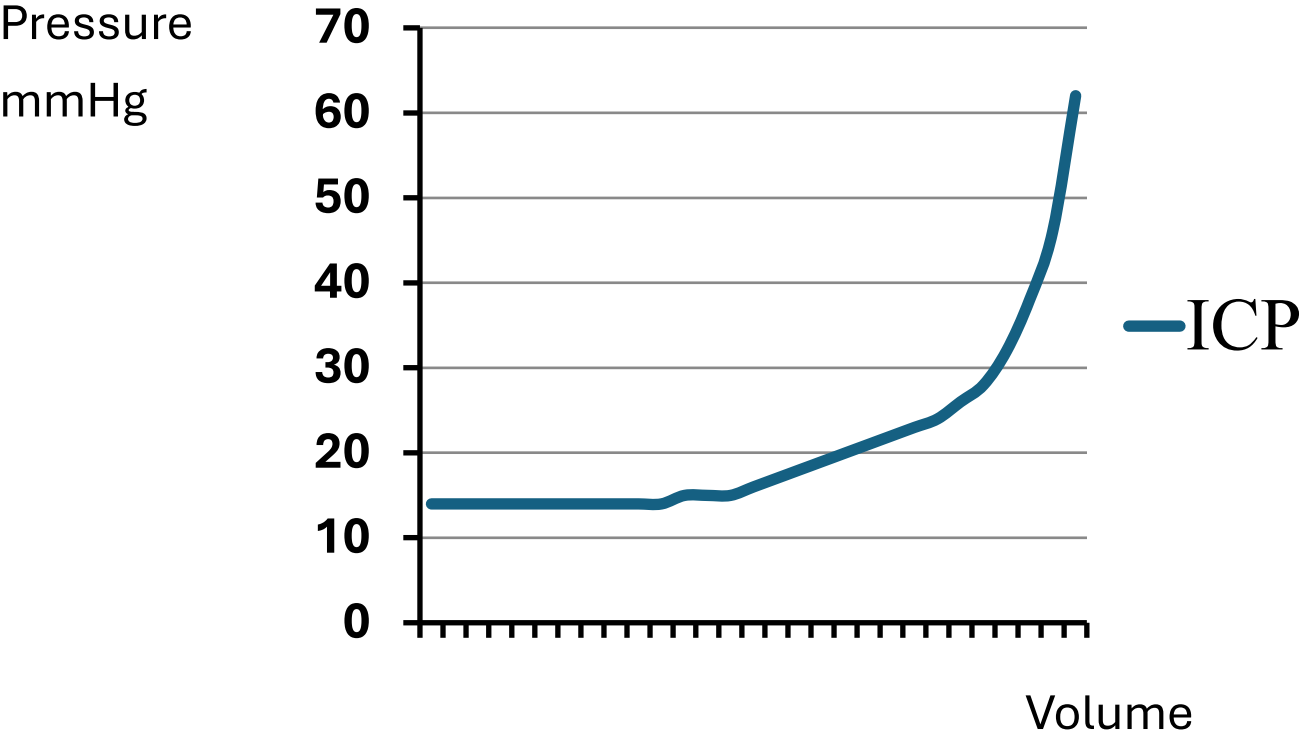
- Gyrus cinguli below falx cerebri
- Uncus through the tentorium
- Cerebellum through the foramen magnum
- ..and through surgical wounds



# Intracranial volumes, ml



# Intracranial pressure



# A systematic approach

## First ABC, ATLS

- SAP >90 mmHg
- Oxygen sat >90%
- Unconscious?
  - Intubation saves lives
- Age and health of the patient?
- Type of trauma
- Impaired coagulation?
- **Neurosurgical decision making is dependent on the Trauma CT**





# Neurosurgical aspects of the trauma CT

## Most urgent –are there indicators of very poor outcome?

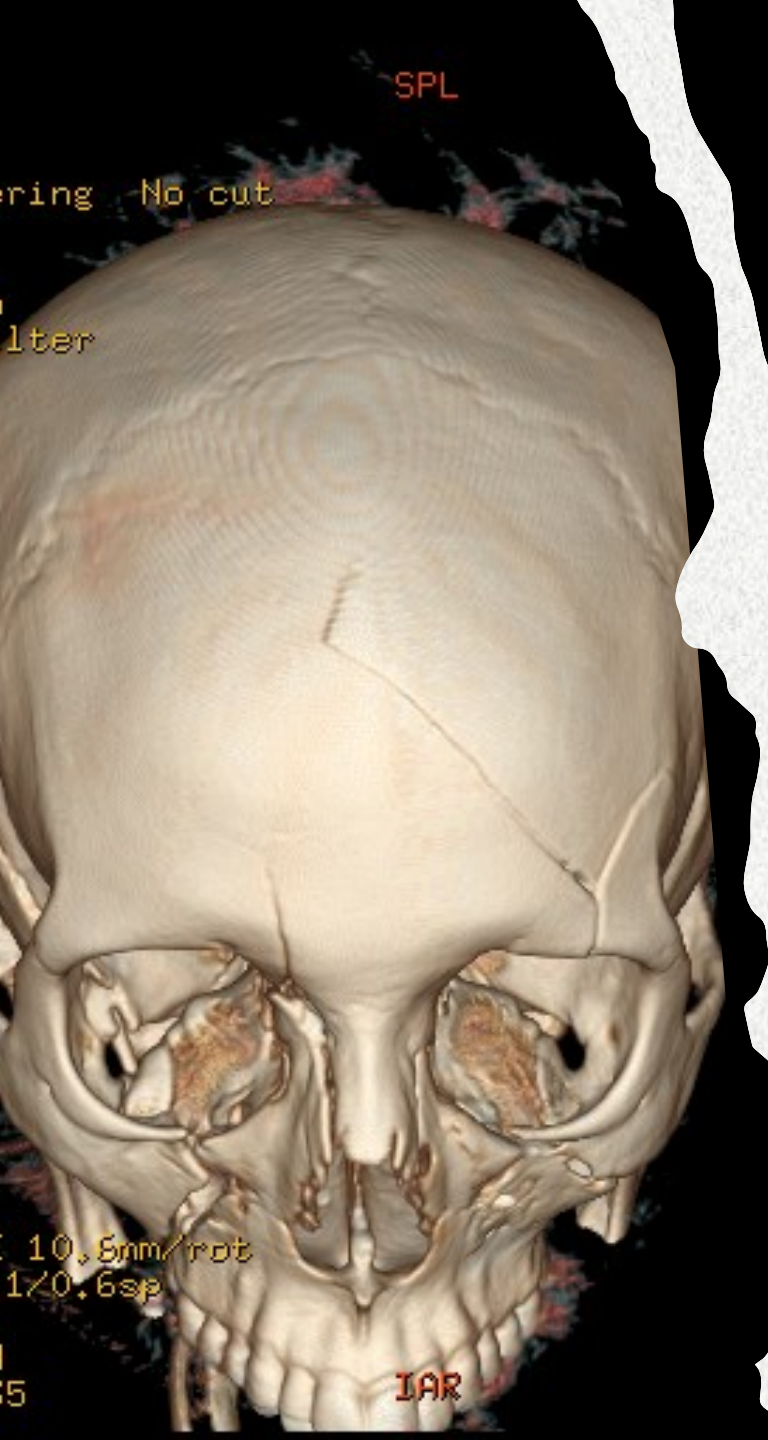
- Massive ongoing intracranial bleedings
- Pronounced brainstem herniation or injury
- Duret bleedings
- Large infarctions
- Carotid injuries
- Severe atlanto-occipital dislocation, AOD
- Penetrating injury through brainstem and circle of Willis, "zone of death"

## More urgent -are there mass lesions to adress?

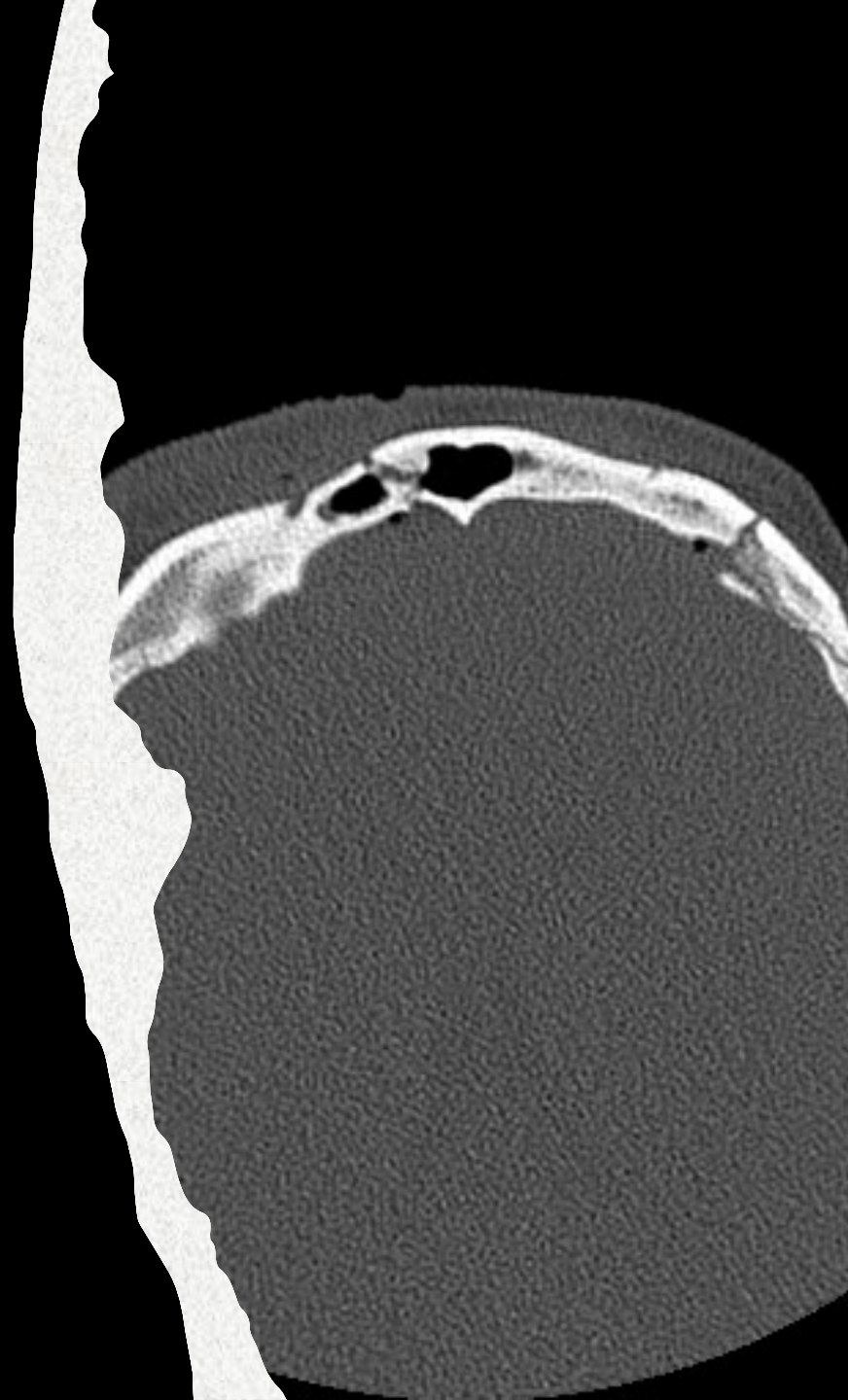
- Hematomas
- Depressed fractures
- Brain edema
- Obstructive hydrocephalus
- Signs of coagulopathy

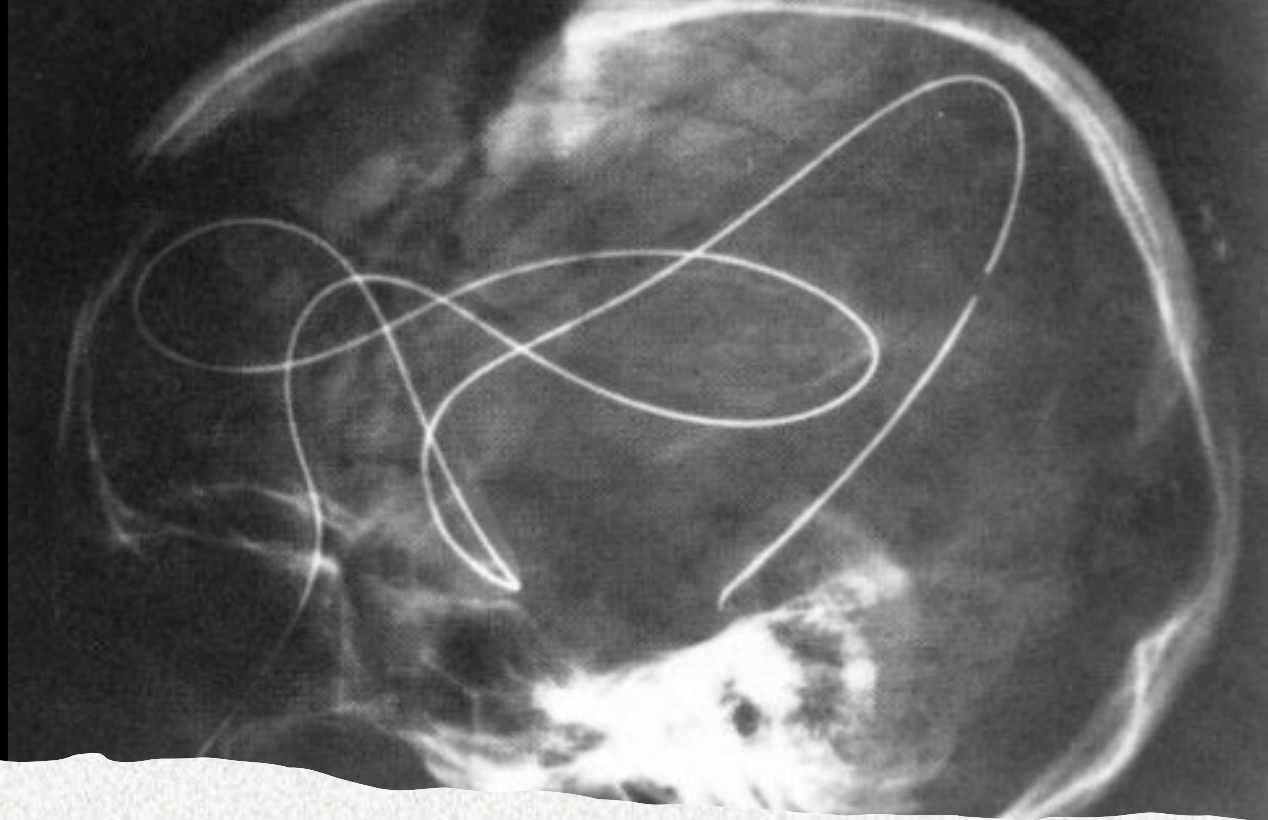
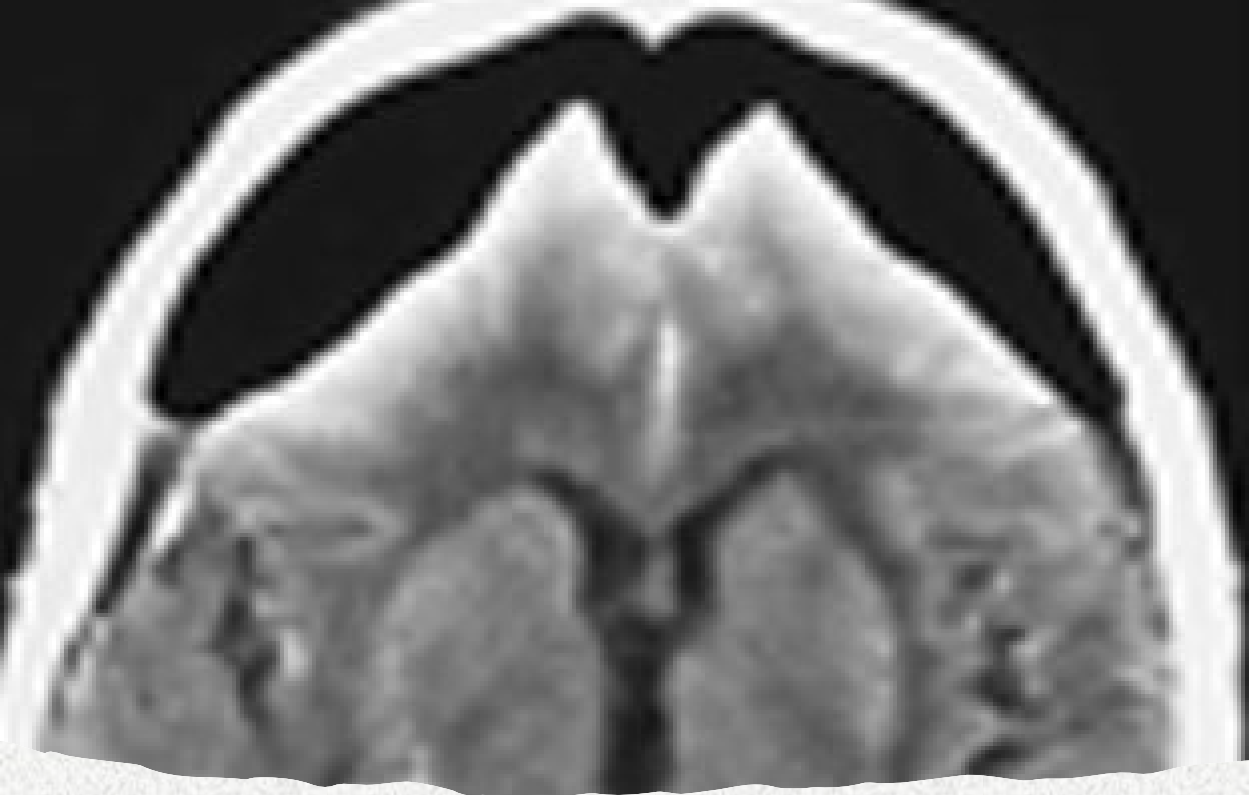
## Less urgent –are there issues to keep in mind

- Intracranial air
- Frontal sinus fractures
- Fractures across dural sinuses
- Spinal fractures
- Skull base fractures

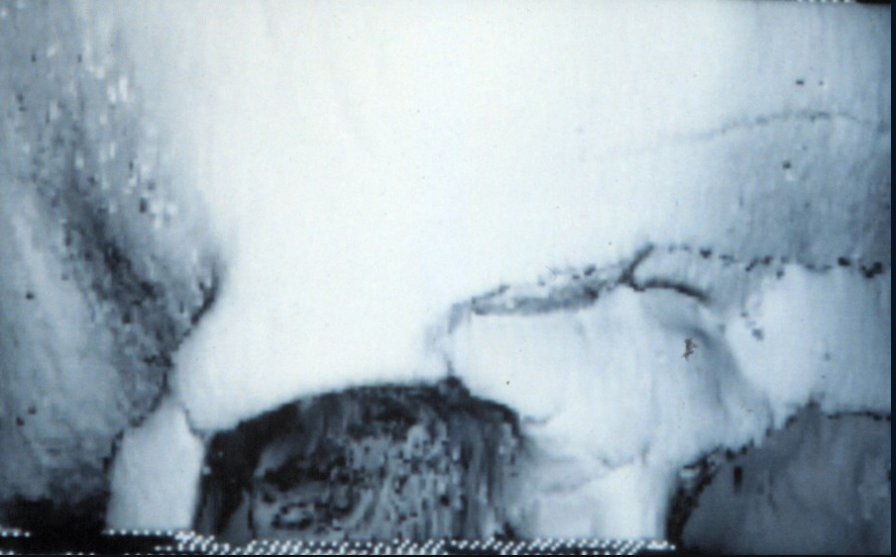


3D-reconstructions  
assist in  
decision making,  
planning of surgical  
access and wound  
closure.

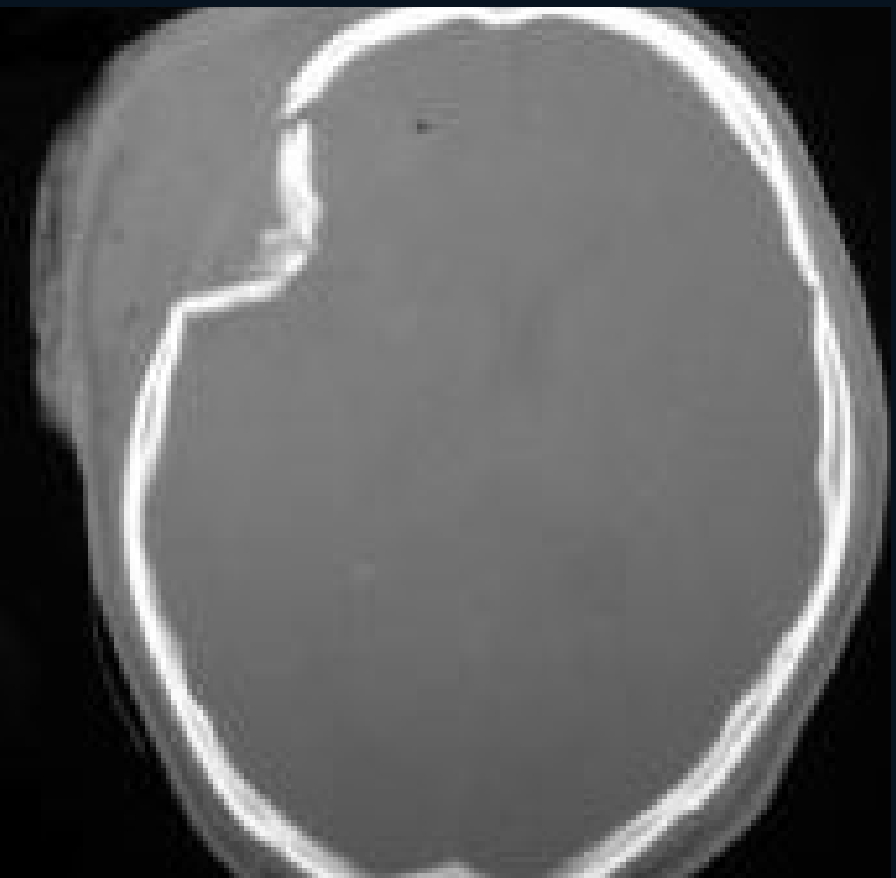




Skull base fractures and defects should be mentioned



## Depressed fractures

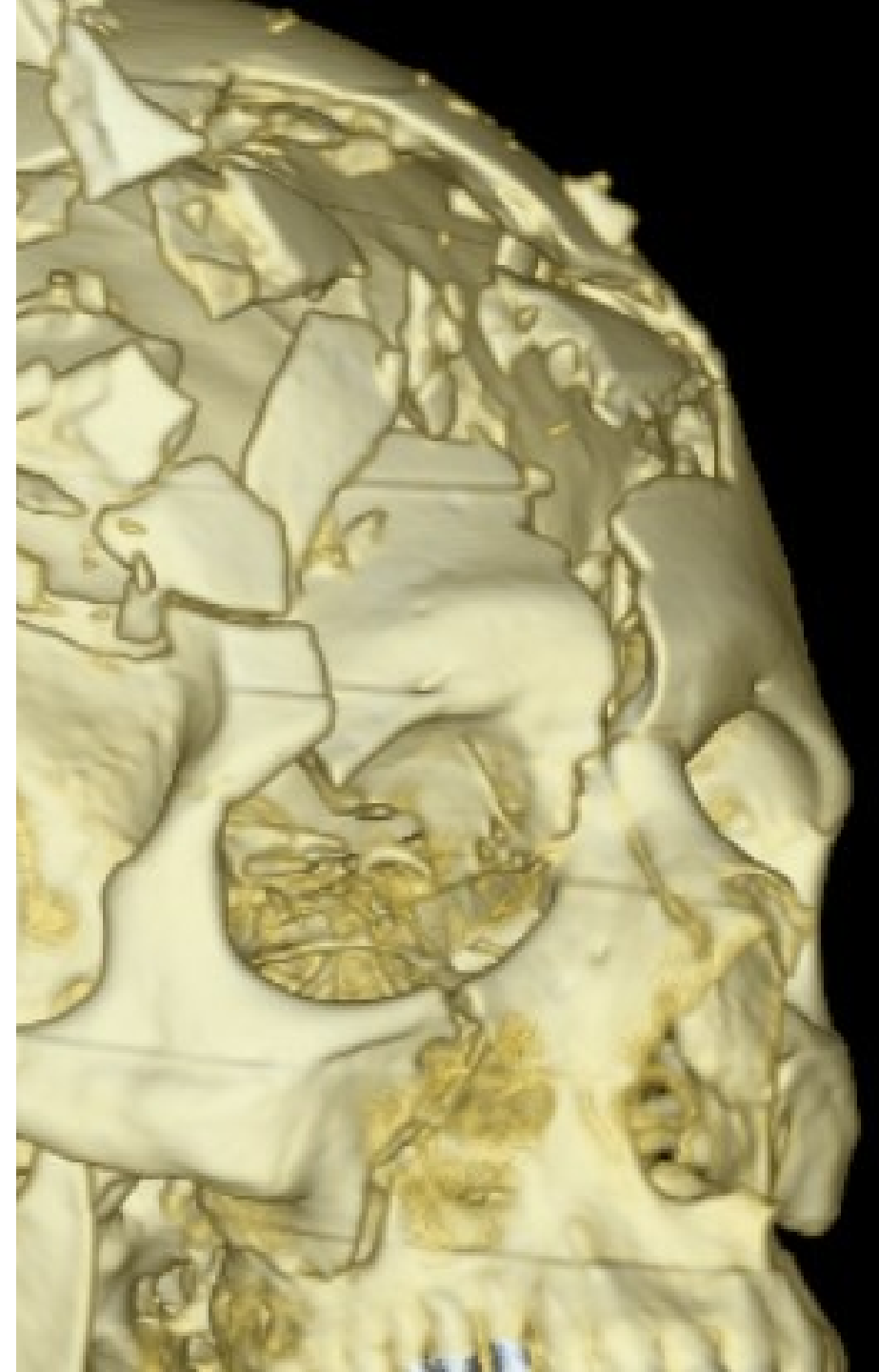


### Indications for surgery

- Open fracture (risk of infection)
- Pushing on parenchyma
- Cosmetic indications
  
- -a bone width of displacement carries little meaning in this context

# Illustrative cases

- Fall from a height
- Blunt force trauma
- Elderly man falling at home
- Removal of a SDH
- Take home messages



# Fall from a height

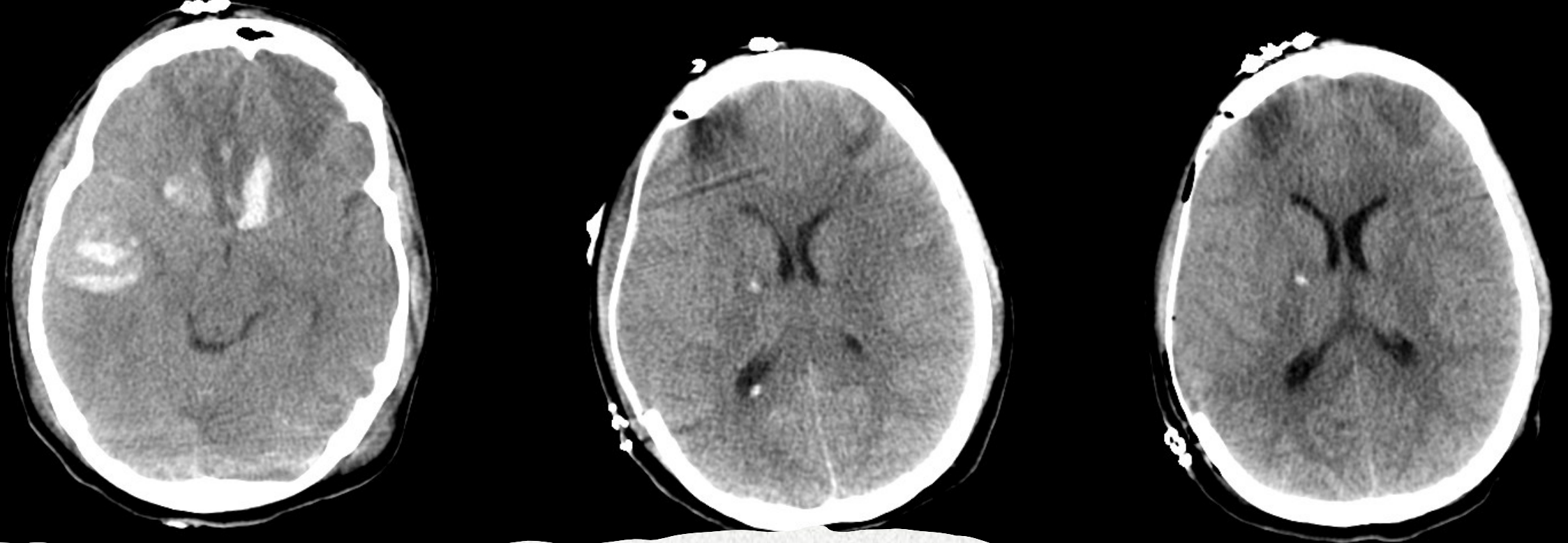
- Fall from 6 floors
- Unconscious
- Severe multitrauma



# Fall from a height

- Confluent frontobasal contusions
- Brain edema
- A pressure monitor is placed to avoid evacuating parenchyma alongside the contusions





## Fall from a height

- Kontusions reflect dynamic processes
- Progress, edema, infarctions?
- Discuss in relation to clinical situation
- Indications for surgery



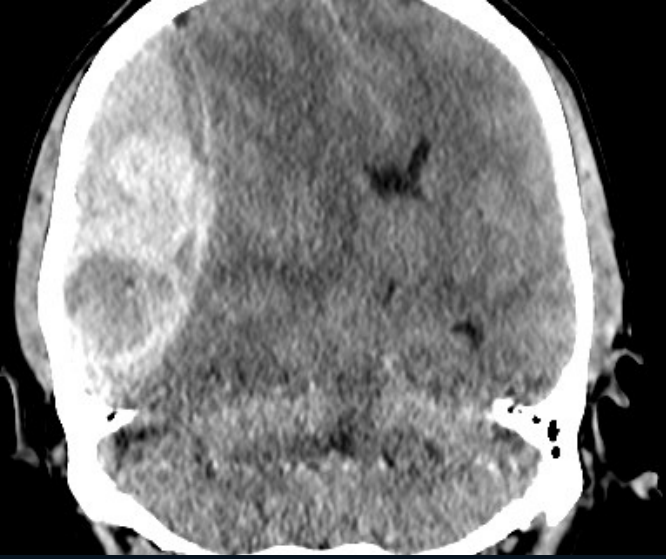


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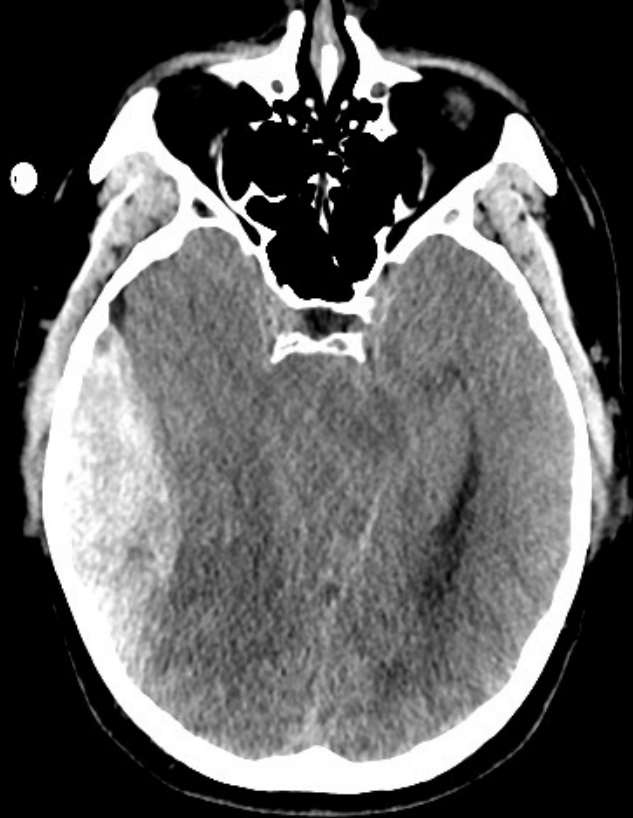


Two years post  
trauma

- Atrophy
- Ventriculomegaly ex vacuo

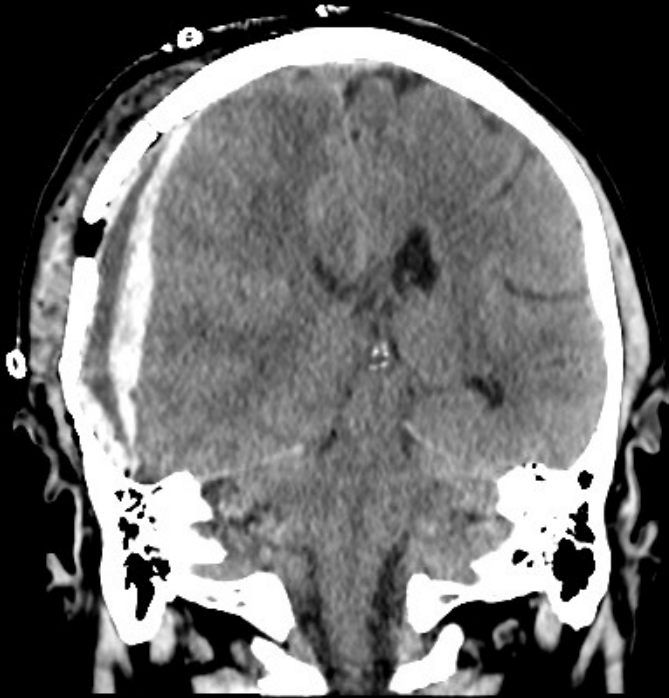


## Blunt force trauma

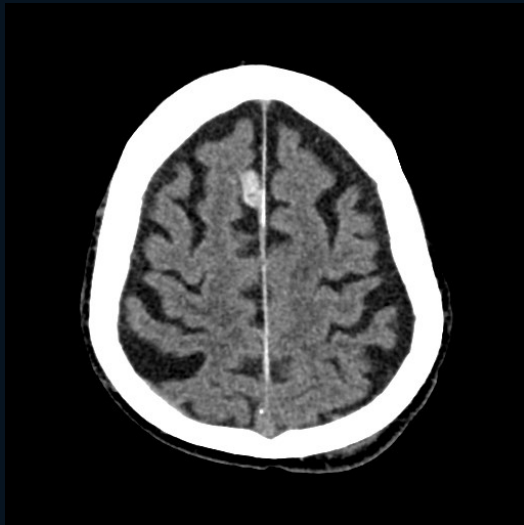
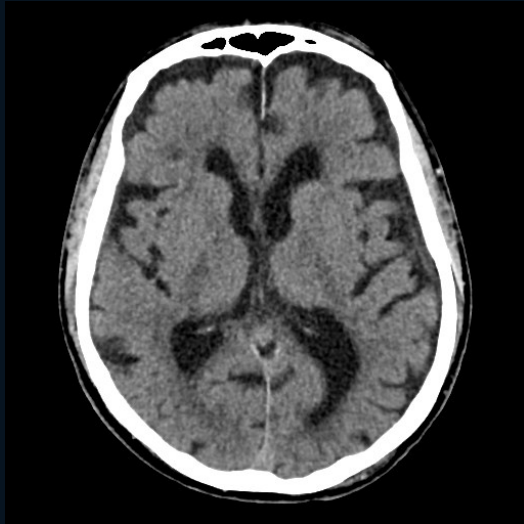


- Found outdoors, unknown trauma
- Unconscious male
- Dilated right pupil

## Postop imaging

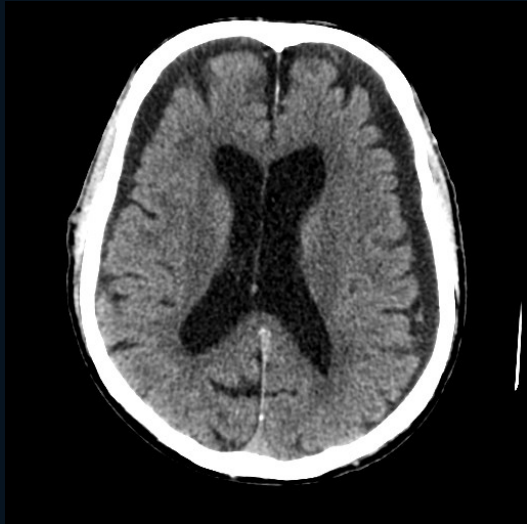


- Tethering the dura to the inside of the bone flap is difficult.
- Sufficient decompression?
- Signs of ischemia?
- New hematomas?
- Overlooked injuries



## Elderly man falling at home

- Male, 85 years old
- Anticoagulant treatment due to atrial fibrillations
- Fell over backwards during the night
- Disorientation and elevated BP



A next day follow up, and again on day seven

- Neurosurgical intervention has no place



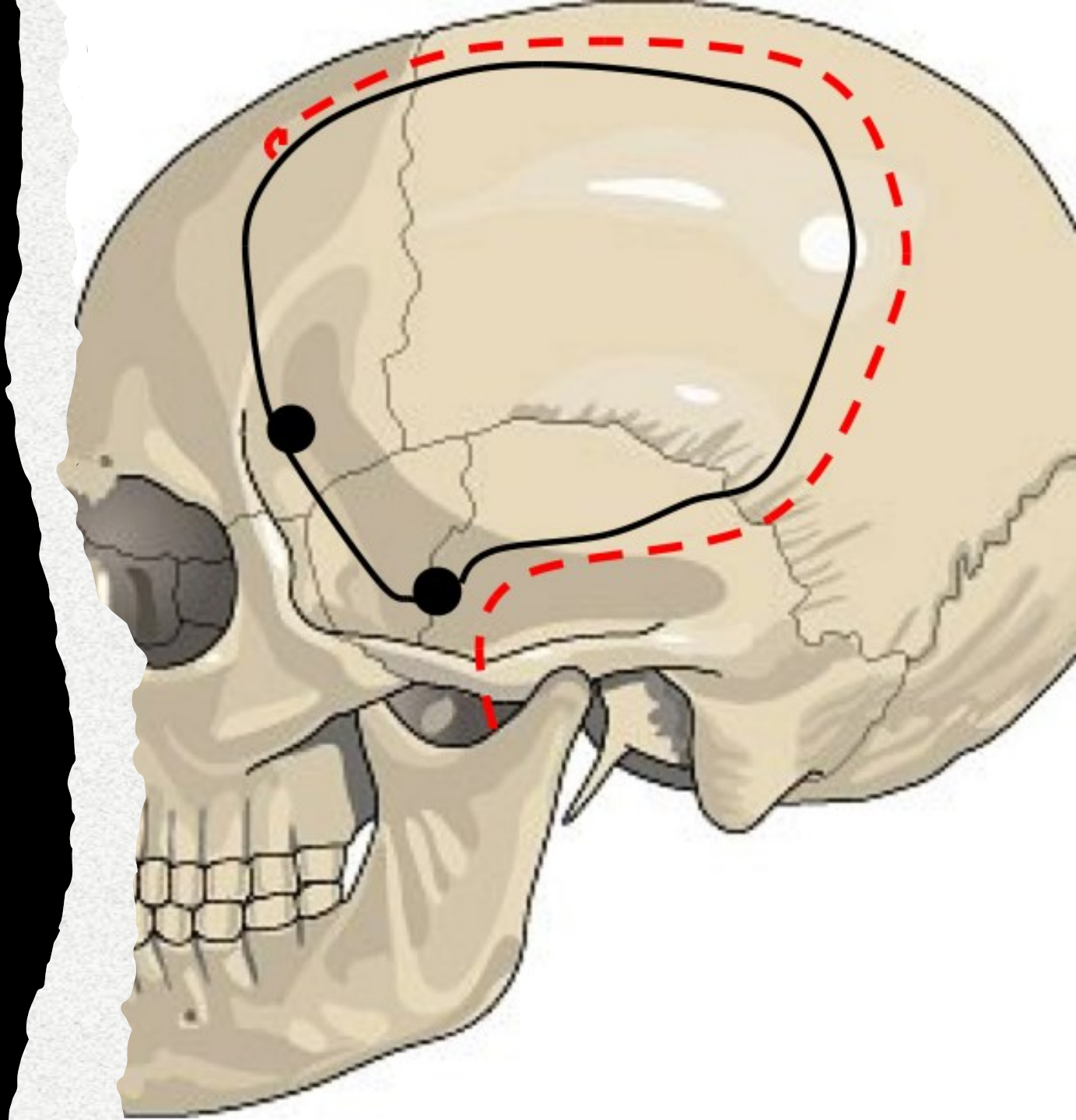
# Acute subdural hematoma

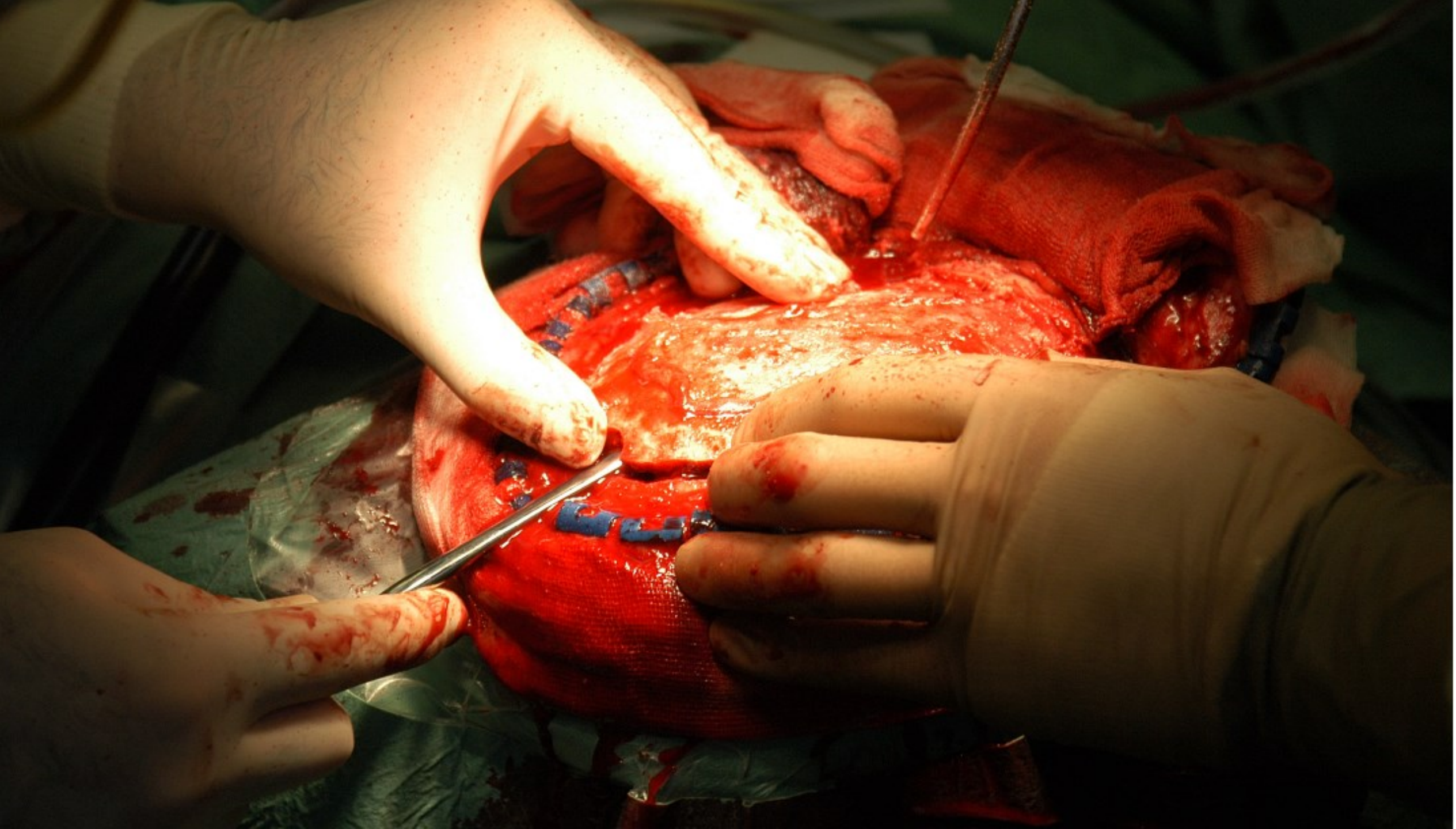
- Common traumatic bleeding
- Evacuated through large bone flap
- Sometimes ongoing bleeding from bridging vein
- Any signs of a dural AV-fistula?



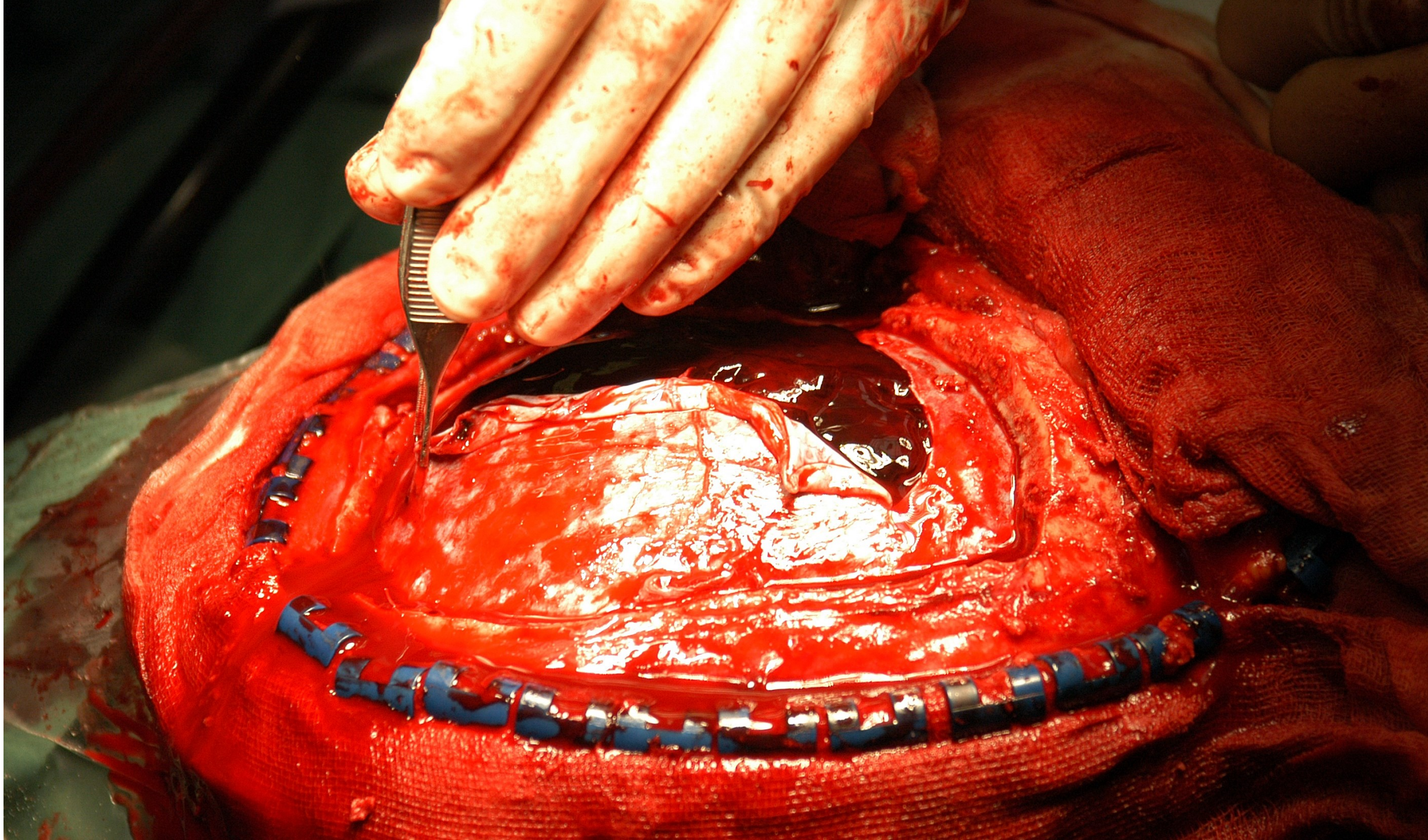
# Trauma incision

- Large bone flap to manage brain swelling
- Can be converted to hemicraniectomy



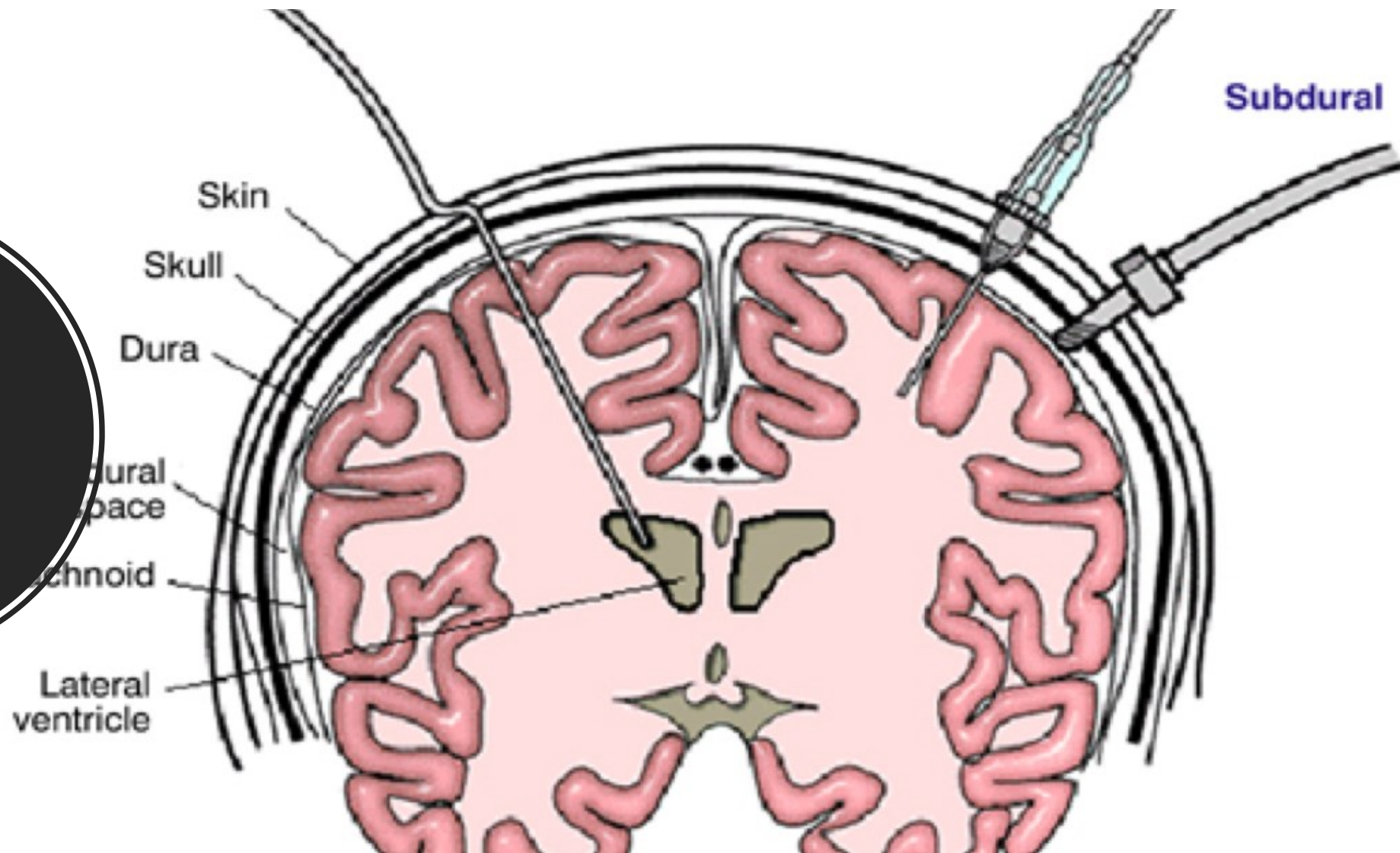








**Intracranial  
monitoring**



# Take home messages

- Understand management principles
- Assist in prioritizing injuries
- Identify risk factors and indicators of poor outcome
- Suggest additional imaging
- Ideally, a dialogue is achieved